

Accredited Lab. n° 005:

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The Best Measurement Capabilities (BMC) reported in this document is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation assigned by SIT when performing more or less routine calibrations of nearly ideal measurement standards of nearly ideal measuring equipment. Best uncertainties represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of $k = 2$. The best uncertainty of a specific calibration performed by the laboratory may be greater than the best uncertainty due to the behavior of the customer's device and to influences from the circumstances of the specific calibration.

The accredited uncertainties achievable on a customer's site (On Site Calibration) are reported in this document from the page 16 to 21. They are larger than the Best Measurement Capabilities (BMC) that the accredited laboratory has been assigned as Best Uncertainty on the SIT Scope. Allowance must be made for aspects such as the environment at the place of calibration and for other possible adverse effects such as those caused by transportation of the calibration equipment. The usual allowance for the uncertainty introduced by the item being calibrated, (e.g. resolution) must also be considered and this, on its own, could result in the calibration uncertainty being larger than the values calculated and reported in the table below.

Time & Frequency

BEST MEASUREMENT CAPABILITY – Metrological Standards Lab.

Quantity	Device Under Test	Range	Uncertainty (*)	Note
Frequency	Frequency Standards, Atomic Oscillators	1 MHz, 5 MHz, 10 MHz	$3 \cdot 10^{-13}$	①
	Quartz oscillators	from 1 MHz to 10 MHz	$1,3 \cdot 10^{-11}$	②
	Signal Generators	from 1 mHz to 0,1 Hz	$1 \cdot 10^{-2}$	③
		from 0,1 Hz to 1 Hz	$1 \cdot 10^{-3}$	
from 1 Hz to 10 Hz		$1 \cdot 10^{-5}$		
from 10 Hz to 100 Hz		$1 \cdot 10^{-6}$		
from 100 Hz to 1000 Hz		$1 \cdot 10^{-8}$		
from 1 kHz to 10 kHz		$1 \cdot 10^{-9}$		
from 10 kHz to 1GHz		$1 \cdot 10^{-11}$		
from 1 GHz to 50 GHz	$1 \cdot 10^{-10}$			
Frequency Counters	from 1 mHz to 0.1 Hz	$1 \cdot 10^{-2}$	④	
	from 0,1 Hz to 1 Hz	$1 \cdot 10^{-3}$		
	from 1 Hz to 10 Hz	$1 \cdot 10^{-5}$		
	from 10 Hz to 100 Hz	$1 \cdot 10^{-6}$		
	from 100 Hz to 1000 Hz	$1 \cdot 10^{-8}$		
	from 1 kHz to 10 kHz	$1 \cdot 10^{-9}$		
	from 10 kHz to 1 GHz	$1 \cdot 10^{-10}$		
from 1 GHz to 50 GHz	$1 \cdot 10^{-10}$			

(*) The measurement uncertainties stated in this document have been determined according to EA-4/02. They were estimated as expanded uncertainty obtained multiplying the standard uncertainty by the coverage factor k corresponding to a confidence level of about 95%. Normally, this factor k is 2

- ① Phase measurements or time interval measurements with measurement time not less than one day.
- ② Direct frequency measurements with integration time of 100s
The uncertainty contribution is referred only to the frequency oscillator. To obtain the total uncertainty it needs to add the trigger error contribution of the counter used to measure the frequency (UUT). For the counter HP53132A see formulas in the service manual at page 7-5.
- ③ Direct frequency measurements with integration time of 1s.
The uncertainty contribution is referred only to the counter used to measure the frequency. It needs to add the uncertainty contributions of the stability and noise of the source (UUT). For frequencies greater than 1 GHz in needs to add the quantization error contribution of the counter used to measure the frequency signal generated by UUT.
To obtain the total uncertainty see formulas in the service manual of the used counters (i.e. HP53132A, HP5343A, HP5352A).
- ④ The uncertainty contribution is referred only to the signal source. It needs to add the uncertainty contributions of the counter under test (UUT): time base stability, trigger error and/or quantization error, resolution. To obtain the total uncertainty see formulas in the manufacturer service manual of the counter under test.

Electrical – DC and Low Frequency

BEST MEASUREMENT CAPABILITY – Metrological Standards Lab.

Quantity	Device Under Test	Range	Uncertainty (*)		Note
			U ₁	U ₂	
Direct Voltage	Generators and measuring devices. HI level DMM, Hi Level Calibrators, DCV Solid State references, Std Cells	1 V, 1,018 V, 10 V	1,3·10 ⁻⁶		⑤
		from 1 μV to 1 mV	1·10 ⁻⁵	0,15 μV/U	
		from 1 mV to 10 mV	5·10 ⁻⁶	0,2 μV/U	
		from 10 mV to 100 mV	5·10 ⁻⁶	0,25 μV/U	
		from 100 mV to 1 V	2,5·10 ⁻⁶	0,25 μV/U	
		from 1 V to 10 V	1,5·10 ⁻⁶		
		from 10 V to 100 V	2·10 ⁻⁶	10 μV/U	
from 100 V to 1000 V	4·10 ⁻⁶				
Direct Current	Generators and measuring devices. HI level DMM, Hi Level Calibrators,	from 0,1 μA to 1 μA	14·10 ⁻⁶	5 pA//	⑤
		from 1 μA to 10 μA	7,0·10 ⁻⁶	50 pA//	
		from 10 μA to 100 μA	4,5·10 ⁻⁶	0,5 nA//	
		from 0,1 mA to 1 mA	5,5·10 ⁻⁶	5 nA//	
		from 1 mA to 10 mA	5,5·10 ⁻⁶	50 nA//	
		from 10 mA to 100 mA	9·10 ⁻⁶	0,5 μA//	
		from 100 mA to 1 A	36·10 ⁻⁶	5 μA//	
		from 1,05 A to 2 A	0,1·10 ⁻³	10 μA//	
		from 2 A to 20 A	0,1·10 ⁻³	0,1 mA//	
		from 20 A to 100 A	0,2·10 ⁻³	1 mA//	
	Current Clamps	from 10 A to 1000 A	5·10 ⁻³		

(*) The measurement uncertainties stated in this document have been determined according to EA-4/02. They were estimated as expanded uncertainty obtained multiplying the standard uncertainty by the coverage factor k corresponding to a confidence level of about 95%. Normally, this factor k is 2. The measurement uncertainty is the root square sum of the contributors U₁ and U₂ reported in the table.

BEST MEASUREMENT CAPABILITY – Metrological Standards Lab. (cont'd)

Quantity	Device Under Test	Range	Uncertainty (*)		Note
			U ₁	U ₂	
DC Resistance	Standard resistors, Generators and measuring devices.	from 1 mΩ to 3 mΩ from 3 mΩ to 30 mΩ from 30 mΩ to 300 mΩ	1·10 ⁻³ 4·10 ⁻⁵ 4·10 ⁻⁵	0,002 μΩ/R 0,02 μΩ/R 0,2 μΩ/R	⑤
	HI level DMM, Hi Level Calibrators	from 0,3 Ω to 3 Ω from 3 Ω to 30 Ω from 30 Ω to 300 Ω from 0,3 kΩ to 3 kΩ from 3 kΩ to 30 kΩ from 30 kΩ to 300 kΩ from 0,3 MΩ to 3 MΩ from 3 MΩ to 30 MΩ from 30 MΩ to 300 MΩ from 0,3 GΩ to 3 GΩ from 3 GΩ to 30 GΩ from 30 GΩ to 300 GΩ from 0,3 TΩ to 1 TΩ	7·10 ⁻⁶ 7,5·10 ⁻⁶ 3,5·10 ⁻⁶ 3,5·10 ⁻⁶ 1,1·10 ⁻⁶ 6·10 ⁻⁶ 8·10 ⁻⁶ 8,5·10 ⁻⁶ 14·10 ⁻⁶ 0,2·10 ⁻³ 0,5·10 ⁻³ 1·10 ⁻³ 3·10 ⁻³	0,002 mΩ/R 0,01 mΩ/R 0,03 mΩ/R 0,5 mΩ/R 0,005 Ω/R 0,05 Ω/R 1 Ω/R 90Ω/R 900 Ω/R 9 kΩ/R 900 kΩ/R 900 kΩ/R 9 MΩ/R	
	Standard resistors and Generators	1 mΩ 10 mΩ 100 mΩ 1 Ω 10 Ω 100 Ω 1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ 1 GΩ 10 GΩ 100 GΩ 1 TΩ	1·10 ⁻³ 4·10 ⁻⁵ 4·10 ⁻⁵ 8·10 ⁻⁶ 8·10 ⁻⁶ 3,5·10 ⁻⁶ 4·10 ⁻⁶ 1,5·10 ⁻⁶ 6,5·10 ⁻⁶ 8·10 ⁻⁶ 1,5·10 ⁻⁵ 1,7·10 ⁻⁵ 2·10 ⁻⁴ 5·10 ⁻⁴ 1·10 ⁻³ 3·10 ⁻³		⑤

(*) The measurement uncertainties stated in this document have been determined according to EA-4/02. They were estimated as expanded uncertainty obtained multiplying the standard uncertainty by the coverage factor k corresponding to a confidence level of about 95%. Normally, this factor k is 2. The measurement uncertainty is the root square sum of the contributors U₁ and U₂ reported in the table.

BEST MEASUREMENT CAPABILITY – Metrological Standards Lab. (cont'd)

Quantity	Device Under Test	Range	Uncertainty (*)	Note
DC Resistance	Measuring devices HI level DMM Megaohmmeters Microohmmeters	1 m Ω	1·10 ⁻³	
		10 m Ω	4·10 ⁻⁵	
		100 m Ω	4·10 ⁻⁵	
		1 Ω	7·10 ⁻⁶	
		10 Ω	7,5·10 ⁻⁶	
		100 Ω	3,5·10 ⁻⁶	
		1 k Ω	3,5·10 ⁻⁶	
		10 k Ω	1,5·10 ⁻⁶	
		100 k Ω	6·10 ⁻⁶	
		1 M Ω	9·10 ⁻⁶	
		10 M Ω	20·10 ⁻⁶	
		100 M Ω	15·10 ⁻⁶	
		1 G Ω	2,5·10 ⁻³	
		10 G Ω	4·10 ⁻³	
		100 G Ω	7,5·10 ⁻³	
		1 T Ω	7,5·10 ⁻³	

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BEST MEASUREMENT CAPABILITY – Metrological Standards Lab. (cont'd)

Quantity	Device Under Test	Range	Frequency	Uncertainty (*)		Note
				U ₁	U ₂	
Alternating Voltage	Generators and measuring devices.	from 1 mV to 2,2 mV	from 40 Hz to 10 kHz	1,5·10 ⁻³	1,4 μV/U	⑤
		from 2,2 mV to 7 mV	from 40 Hz to 10 kHz	0,4·10 ⁻³	1,4 μV/U	
		from 7 mV to 22 mV	from 40 Hz to 10 kHz	0,25·10 ⁻³	1,4 μV/U	
		from 22 mV to 70 mV	from 40 Hz to 10 kHz	85·10 ⁻⁶	1,6 μV/U	
		from 70 mV to 220 mV	from 40 Hz to 10 kHz	65·10 ⁻⁶	1,6 μV/U	
	Hi level DMM, Hi Level Calibrators	from 220 mV to 700 mV	from 40 Hz to 20 kHz	38·10 ⁻⁶	1,6 μV/U	
			from 20 kHz to 50 kHz	55·10 ⁻⁶	2,1 μV/U	
			from 50 kHz to 100 kHz	0,1·10 ⁻³	2,5 μV/U	
			from 100 kHz to 300 kHz	0,2·10 ⁻³	4 μV/U	
			from 300 kHz to 500 kHz	0,4·10 ⁻³	8 μV/U	
from 700 mV to 2,2 V	from 40 Hz to 20 kHz	37·10 ⁻⁶	1 μV/U			
	from 20 kHz to 50 kHz	55·10 ⁻⁶	1 μV/U			
	from 50 kHz to 100 kHz	0,1·10 ⁻³	1 μV/U			
	from 100 kHz to 300 kHz	0,2·10 ⁻³	2 μV/U			
	from 300 kHz to 500 kHz	0,4·10 ⁻³	2 μV/U			
from 2,2 V to 7 V	from 40 Hz to 20 kHz	37·10 ⁻⁶	1 μV/U			
	from 20 kHz to 50 kHz	56·10 ⁻⁶	1 μV/U			
	from 50 kHz to 100 kHz	0,1·10 ⁻³	1 μV/U			
	from 100 kHz to 300 kHz	0,2·10 ⁻³	2 μV/U			
	from 300 kHz to 500 kHz	0,5·10 ⁻³	2 μV/U			
from 7 V to 22 V	from 40 Hz to 20 kHz	37·10 ⁻⁶	10 μV/U			
	from 20 kHz to 50 kHz	56·10 ⁻⁶	10 μV/U			
	from 50 kHz to 100 kHz	0,1·10 ⁻³	10 μV/U			
	from 100 kHz to 300 kHz	0,3·10 ⁻³	20 μV/U			
	from 300 kHz to 500 kHz	0,5·10 ⁻³	20 μV/U			
from 22 V to 70 V	from 40 Hz to 20 kHz	39·10 ⁻⁶	10 μV/U			
	from 20 kHz to 50 kHz	57·10 ⁻⁶	10 μV/U			
	from 50 kHz to 100 kHz	0,1·10 ⁻³	10 μV/U			
	from 100 kHz to 300 kHz	0,3·10 ⁻³	20 μV/U			
	from 300 kHz to 500 kHz	0,6·10 ⁻³	20 μV/U			
from 70 V to 220 V	from 40 Hz to 20 kHz	39·10 ⁻⁶	0,1 mV/U			
	from 20 kHz to 50 kHz	60·10 ⁻⁶	0,1 mV/U			
	from 50 kHz to 100 kHz	0,1·10 ⁻³	0,1 mV/U			
	from 100 kHz to 300 kHz	0,3·10 ⁻³	0,2 mV/U			
	from 300 kHz to 500 kHz	0,6·10 ⁻³	0,2 mV/U			

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BEST MEASUREMENT CAPABILITY – Metrological Standards Lab. (cont'd)

Quantity	Device Under Test	Range	Frequency	Uncertainty (*)		Note
				U ₁	U ₂	
Alternating Voltage	Generators and measuring devices.	from 220 V to 700 V	from 45 Hz to 20 kHz	47·10 ⁻⁶	0,1 mV/U	⑤
			from 20 kHz to 50 kHz	0,1·10 ⁻³	0,1 mV/U	
	HI level DMM, Hi Level Calibrators	from 700 V to 1050 V	from 50 kHz to 100 kHz	0,5·10 ⁻³	0,1 mV/U	
			from 45 Hz to 20 kHz	56·10 ⁻⁶	1 mV/U	
		from 20 kHz to 30 kHz	0,1·10 ⁻³	1 mV/U		
Alternating Current	Measuring devices HI level DMM	from 10 μA to 200 μA	from 40 Hz to 1 kHz	0,2·10 ⁻³	20 nA//	⑤
		from 0,2 mA to 2 mA	from 40 Hz to 1 kHz	0,2·10 ⁻³	23 nA//	
			from 1 kHz to 5 kHz	0,4·10 ⁻³	32 nA//	
		from 2 mA to 20 mA	from 40 Hz to 1 kHz	0,2·10 ⁻³	0,11 μA//	
			from 1 kHz to 5 kHz	0,4·10 ⁻³	0,11 μA//	
		from 20 mA to 200 mA	from 40 Hz to 1 kHz	0,2·10 ⁻³	1,1 μA//	
			from 1 kHz to 5 kHz	0,4·10 ⁻³	1,1 μA//	
		from 0,2 A to 2 A	from 40 Hz to 1 kHz	0,2·10 ⁻³	11 μA//	
			from 1 kHz to 5 kHz	0,4·10 ⁻³	11 μA//	
		from 2 A to 20 A	from 40 Hz to 1 kHz	0,5·10 ⁻³	1 mA//	
			from 1 kHz to 5 kHz	0,5·10 ⁻³	1 mA//	
		Current Clamps	from 10 A to 1000 A	from 40 Hz to 400 Hz	5·10 ⁻³	
	Generators Hi Level Calibrators, Transconductance Amplifiers	from 10 μA to 200 μA	from 40 Hz to 1 kHz	0,34·10 ⁻³	20 nA//	⑤
		from 0,2 mA to 2 mA	from 40 Hz to 1 kHz	0,25·10 ⁻³	50 nA//	
			from 1 kHz to 5 kHz	0,34·10 ⁻³	54 nA//	
		from 2 mA to 20 mA	from 40 Hz to 1 kHz	1·10 ⁻⁴	0,12 μA//	
			from 1 kHz to 5 kHz	1,4·10 ⁻⁴	0,5 μA//	
		from 20 mA to 200 mA	from 40 Hz to 1 kHz	1,1·10 ⁻⁴	1 μA//	
			from 1 kHz to 5 kHz	1,5·10 ⁻⁴	3,2 μA//	
from 0,2 A to 2 A		from 40 Hz to 1 kHz	1,7·10 ⁻⁴	30 μA//		
		from 1 kHz to 5 kHz	2·10 ⁻⁴	36 μA//		
from 2 A to 10 A		from 40 Hz to 1 kHz	3·10 ⁻⁴	0,5 mA//		
	from 1 kHz to 5 kHz	3,2·10 ⁻⁴	0,5 mA//			
	from 10 A to 20 A	from 40 Hz to 1 kHz	3,1·10 ⁻⁴	0,5 mA//		
	from 20 A to 100 A	from 40 Hz to 1 kHz	0,4·10 ⁻³	1 mA//		

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BEST MEASUREMENT CAPABILITY – Metrological Standards Lab. (cont'd)

Quantity	Device Under Test	Range	Frequency	Uncertainty (*)	Note	
Electrical Capacitance	Standard capacitors LCR bridges	1 pF	1 kHz	$3,5 \cdot 10^{-4}$		
		10 pF	from 20 Hz to 1 MHz	$4 \cdot 10^{-4}$		
		100 pF	1 kHz	$3 \cdot 10^{-4}$		
		1000 pF	from 20 Hz to 1 MHz	$3,5 \cdot 10^{-4}$		
		10 nF	1 kHz	$3 \cdot 10^{-4}$		
		100 nF	from 20 Hz to 1 MHz	$3,5 \cdot 10^{-4}$		
		1 μ F	1 kHz	$3 \cdot 10^{-4}$		
		da 10 μ F a 1 mF	from 20 Hz to 1 MHz	$4,5 \cdot 10^{-4}$		
			from 0,1 kHz to 1 kHz	$2,5 \cdot 10^{-4}$		
			from 20 Hz to 100 kHz	$6,5 \cdot 10^{-4}$		
Inductance	Decade capacitors Capacitance generators	from 1 to 10 pF	1 kHz	$2 \cdot 10^{-3}$		
		from 10 to 100 nF	1 kHz	$5 \cdot 10^{-4}$		
		from 100 nF to 10 μ F	1 kHz	$2 \cdot 10^{-3}$		
		Standard Inductors LCR bridges	100 μ H	1 kHz	$2,5 \cdot 10^{-4}$	
			1 mH	1 kHz	$2,5 \cdot 10^{-4}$	
	10 mH		1 kHz	$2,5 \cdot 10^{-4}$		
	100 mH		1 kHz	$2,5 \cdot 10^{-4}$		
	1 H		1 kHz	$2,5 \cdot 10^{-4}$		
	Decade inductors	10 H	1 kHz	$2,5 \cdot 10^{-4}$		
		from 100 μ H to 1 mH	1 kHz	$2 \cdot 10^{-3}$		
from 1 mH to 1 H		1 kHz	$1 \cdot 10^{-3}$			
AC Resistance		Standard resistors, LCR bridges, Decade resistors, Impedance generators	1 Ω	1 kHz	$3 \cdot 10^{-4}$	
			10 Ω	1 kHz	$3 \cdot 10^{-4}$	
	100 Ω		from 20 Hz to 1 MHz	$2 \cdot 10^{-3}$		
	1 k Ω		1 kHz	$3 \cdot 10^{-4}$		
	10 k Ω		from 20 Hz to 1 MHz	$2 \cdot 10^{-3}$		
	100 k Ω		1 kHz	$3 \cdot 10^{-4}$		
		from 20 Hz to 1 MHz	$2 \cdot 10^{-3}$			

(*) The measurement uncertainties stated in this document have been determined according to EA-4/02. They were estimated as expanded uncertainty obtained multiplying the standard uncertainty by the coverage factor k corresponding to a confidence level of about 95%. Normally, this factor k is 2.

- ⑤ U is the voltage expressed in volt, I is the current expressed in ampere, R is the resistance expressed in ohm.
- ⑥ The maximum value of current depends of the current clamp under test.

Electrical – RF and Microwave

BEST MEASUREMENT CAPABILITY – Metrological Standards Lab.

Quantity	Device Under Test	Range		Uncertainty (*)	Note
		Attenuation	Frequency		
High frequency Attenuation	Dipoles and quadripoles for 3,5mm, 7 mm and "N" connectors	from 0 dB to 3 dB	from 0,3 MHz to 3 GHz from 3 GHz to 9 GHz from 9 GHz to 15 GHz from 15 GHz to 18 GHz from 18 GHz to 26,5 GHz	0,02 dB 0,02 dB 0,04 dB 0,05 dB 0,05 dB	① ②
		from 3 dB to 10 dB	from 0,3 MHz to 3 GHz from 3 GHz to 9 GHz from 9 GHz to 15 GHz from 15 GHz to 18 GHz from 18 GHz to 26,5 GHz	0,04 dB 0,03 dB 0,04 dB 0,05 dB 0,06 dB	
		from 10 dB to 20 dB	from 0,3 MHz to 3 GHz from 3 GHz to 13 GHz from 13 GHz to 18 GHz from 18 GHz to 26,5 GHz	0,04 dB 0,05 dB 0,06 dB 0,07 dB	
		from 20 dB to 30 dB	from 0,3 MHz to 3 GHz from 3 GHz to 13 GHz from 13 GHz to 18 GHz from 18 GHz to 26,5 GHz	0,05 dB 0,07 dB 0,08 dB 0,09 dB	
		from 30 dB to 60 dB	from 0,3 MHz to 3 GHz from 3 GHz to 9 GHz from 9 GHz to 18 GHz from 18 GHz to 26,5 GHz	0,05 dB 0,01 dB + 0,002 A 0,003 A 0,004 A	
		from 60 dB to 70 dB	from 0,3 MHz to 3 GHz from 3 GHz to 9 GHz from 9 GHz to 18 GHz from 18 GHz to 26,5 GHz	0,2 dB 0,3 dB 0,4 dB 1 dB	
		from 70 dB to 80 dB	from 0,3 MHz to 3 GHz from 3 GHz to 9 GHz from 9 GHz to 18 GHz from 18 GHz to 26,5 GHz	0,4 dB 0,6 dB 1 dB 2,5 dB	
Reflection coefficient	Dipoles and quadripoles for 3,5mm, 7 mm and "N" connectors	0 to 1	from 0,3 MHz to 3 GHz from 2 GHz to 6 GHz from 6 GHz to 9 GHz from 9 GHz to 13 GHz from 13 GHz to 17 GHz from 17 GHz to 26,5 GHz	0,006 0,007 0,008 0,009 0,010 0,011	

(*) The measurement uncertainties stated in this document have been determined according to EA-4/02. They were estimated as expanded uncertainty obtained multiplying the standard uncertainty by the coverage factor k corresponding to a confidence level of about 95%. Normally, this factor k is 2.

- ① The uncertainties are referred to a matched device..
- ② A is attenuation expressed in decibel.

BEST MEASUREMENT CAPABILITY – Metrological Standards Lab. (cont'd)

Quantity	Device Under Test	Range		Uncertainty (*)	Note
		Power	Frequency		
High frequency Power	Reference sources for power meters with female "N" type output connector and 50 Ω impedance	1 mW	50 MHz	0,5·10 ⁻²	①
	RF sources with coaxial connectors	from 1 μW to 10 mW	from 1 MHz to 500 MHz	0,6·10 ⁻²	
			from 500 MHz to 800 MHz	0,7·10 ⁻²	
			from 800 MHz to 1 GHz	0,8·10 ⁻²	
			from 1 GHz to 2 GHz	1,0·10 ⁻²	
			from 2 GHz to 3 GHz	1,2·10 ⁻²	
			from 3 GHz to 4 GHz	1,9·10 ⁻²	
			from 4 GHz to 5 GHz	2,2·10 ⁻²	
Waveguide RF sources	from 1 μW to 10 mW	from 6 GHz to 12 GHz	2,9·10 ⁻²		
		from 12 GHz to 16 GHz	3,6·10 ⁻²		
		from 16 GHz to 18 GHz	4·10 ⁻²		
		from 8 GHz to 12,4 GHz	1,2·10 ⁻²		
Power ranges	from 1 μW to 3 μW from 3 μW to 10 μW from 10 μW to 30 μW from 30 μW to 100 μW from 0,1 mW to 1 mW from 1 mW to 10 mW	from 12,4 GHz to 18 GHz	1,4·10 ⁻²		
		from 18 GHz to 26,5 GHz	1,8·10 ⁻²		
		from 26,5 GHz to 40 GHz	2,6·10 ⁻²		
		from 100 kHz to 40 GHz	3·10 ⁻²		
		from 100 kHz to 40 GHz	1·10 ⁻²		
		from 100 kHz to 40 GHz	3·10 ⁻³		
50 Ω Sensors	from 0,1 μW to 100 mW	from 100 kHz to 40 GHz	1·10 ⁻³		
		from 100 kHz to 40 GHz	1·10 ⁻³		
		from 100 kHz to 40 GHz	3·10 ⁻⁴		
		from 100 kHz to 40 GHz	1,5·10 ⁻⁴		
		100 kHz	1,5·10 ⁻²		
		300 kHz	1·10 ⁻²		
		from 1 MHz to 500 MHz	5·10 ⁻³		
75 Ω Sensors	0,1μW to 100 mV	from 500 MHz to 1 GHz	7·10 ⁻³		
		from 1 GHz to 5 GHz	1,0·10 ⁻²		
		from 5 GHz to 9 GHz	1,5·10 ⁻²		
Waveguide sensor	from 0,1 mW to 10 mW	from 9 GHz to 13 GHz	2,0·10 ⁻²		
		from 13 GHz to 18 GHz	2,5·10 ⁻²		
		from 18 GHz to 26,5 GHz	3·10 ⁻²		
		from 8 GHz to 12,4 GHz	1,2·10 ⁻²		
		from 12,4 GHz to 18 GHz	1,4·10 ⁻²		
		from 18 GHz to 26,5 GHz	1,8·10 ⁻²		
		from 26,5 GHz to 40 GHz	2,6·10 ⁻²		

(*) The measurement uncertainties stated in this document have been determined according to EA-4/02. They were estimated as expanded uncertainty obtained multiplying the standard uncertainty by the coverage factor k corresponding to a confidence level of about 95%. Normally, this factor k is 2.

BEST MEASUREMENT CAPABILITY – Metrological Standards Lab. (cont'd)

Quantity	Device Under Test	Range	Uncertainty (*)	Note
High frequency Power	Power meters for power sensors	100 mW	12 μ W	2
		30 mW	3,5 μ W	
		10 mW	1,2 μ W	
		3 mW	0,35 μ W	
		1 mW	0,12 μ W	
		300 μ W	35 nW	
		100 μ W	12 nW	
		30 μ W	4,4 nW	
		10 μ W	3,0 nW	
		3 μ W	2,6 nW	

(*) The measurement uncertainties stated in this document have been determined according to EA-4/02. They were estimated as expanded uncertainty obtained multiplying the standard uncertainty by the coverage factor k corresponding to a confidence level of about 95%. Normally, this factor k is 2.

Quantity	Device Under Test	Range		Uncertainty (*)		Note
		Power	Frequency	U ₁	U	
High frequency Power	Power generators,	from 100 pW to 10 nW	from 0,1 MHz to 4 GHz	2·10 ⁻²	14 pW/P	1 3
			from 4 GHz to 5 GHz	2,2·10 ⁻²	14 pW/P	
	from 5 GHz to 13 GHz	2,6·10 ⁻²	14 pW/P			
	from 13 GHz to 18 GHz	3·10 ⁻²	14 pW/P			
	from 18 GHz to 26 GHz	3,2·10 ⁻²	14 pW/P			
Power measuring devices	from 10 nW to 1 μ W	from 0,1 MHz to 4 GHz	2,0·10 ⁻²		1	
		from 4 GHz to 5 GHz	2,2·10 ⁻²			
Low power	from 1 μ W to 100 μ W	from 0,1 MHz to 0,3 MHz	1,6·10 ⁻²	0,14 μ W/P	1 3	
		from 0,3 MHz to 1 MHz	1,4·10 ⁻²	0,14 μ W/P		
from 1 MHz to 5 GHz	1,4·10 ⁻²	0,14 μ W/P				
from 5 GHz to 12 GHz	1,8·10 ⁻²	0,14 μ W/P				
from 12 GHz to 18 GHz	2,2·10 ⁻²	0,14 μ W/P				
from 18 GHz to 26 GHz	2,6·10 ⁻²	0,14 μ W/P				
	2,6·10 ⁻²	0,14 μ W/P				
from 100 μ W to 10 μ W	from 0,1 MHz to 0,3 MHz	1,6·10 ⁻²		1		
	from 0,3 MHz to 1 MHz	1,4·10 ⁻²				
from 1 MHz to 5 GHz	from 1 MHz to 5 GHz	1,3·10 ⁻²		1		
	from 5 GHz to 12 GHz	1,8·10 ⁻²				
from 12 GHz to 18 GHz	from 12 GHz to 18 GHz	2,2·10 ⁻²		1		
	from 18 GHz to 26 GHz	3,5·10 ⁻²				
from 10 mW to 100 mW	from 0,1 MHz to 0,3 MHz	2,7·10 ⁻²		1		
	from 0,3 MHz to 2,6 GHz	1,8·10 ⁻²				
from 2,6 GHz to 4,2 GHz	from 2,6 GHz to 4,2 GHz	2,0·10 ⁻²		1		
	from 4,2 GHz to 5 GHz	2,7·10 ⁻²				
from 5 GHz to 12 GHz	from 5 GHz to 12 GHz	2,9·10 ⁻²		1		
	from 12 GHz to 18 GHz	3,2·10 ⁻²				
from 18 GHz to 26 GHz	from 18 GHz to 26 GHz	3,5·10 ⁻²		1		
	from 18 GHz to 26 GHz	3,5·10 ⁻²				

(*) The measurement uncertainties stated in this document have been determined according to EA-4/02. They were estimated as expanded uncertainty obtained multiplying the standard uncertainty by the coverage factor k corresponding to a confidence level of about 95%. Normally, this factor k is 2. The measurement uncertainty is the root square sum of the contributors U₁ and U₂ reported in the table.

BEST MEASUREMENT CAPABILITY – Metrological Standards Lab. (cont'd)

Quantity	Device Under Test	Range		Uncertainty (*)		Note	
		Power	Frequency	U ₁	U ₂		
High frequency Power	Power generators,	from 100 mW to 1 W	from 0,1 MHz to 0,3 MHz from 0,3 MHz to 2,6 GHz from 2,6 GHz to 4,2 GHz	2,7·10 ⁻² 1,8·10 ⁻² 2,0·10 ⁻²		①	
	Power measuring devices	from 1 W to 3 W	from 0,1 MHz to 0,3 MHz from 0,3 MHz to 2,6 GHz from 2,6 GHz to 4,2 GHz	3,5·10 ⁻² 2,9·10 ⁻² 3,1·10 ⁻²		①	
	<i>Low power</i>	from 100 mW to 10 W	from 4,2 GHz to 5 GHz from 5 GHz to 12 GHz from 12 GHz to 18 GHz	2,0·10 ⁻² 2,3·10 ⁻² 2,6·10 ⁻²		①	
		from 10 W to 35 W	from 4,2 GHz to 5 GHz from 5 GHz to 12 GHz from 12 GHz to 18 GHz	3,0·10 ⁻² 3,3·10 ⁻² 3,5·10 ⁻²			
		from 100 mW to 1 W	from 18 GHz to 26 GHz	3,0·10 ⁻²		①	
		from 1 μW to 100 μW	from 0,1 MHz to 1 MHz from 1 MHz to 5 MHz from 5 MHz to 1 GHz from 1 GHz to 3 GHz	1,6·10 ⁻² 1,4·10 ⁻² 1,2·10 ⁻² 1,6·10 ⁻²	0,14μW/P 0,14μW/P 0,14μW/P 0,14μW/P	① ③	
		from 100 μW to 10 mW	from 0,1 MHz to 1 MHz from 1 MHz to 5 MHz from 5 MHz to 1 GHz from 1 GHz to 3 GHz	1,6·10 ⁻² 1,4·10 ⁻² 1,2·10 ⁻² 1,7·10 ⁻²		① ④	
		from 10 mW to 100 mW	from 0,1 to 5 MHz from 5 MHz to 1 GHz from 1 GHz to 3 GHz	2,8·10 ⁻² 2,6·10 ⁻² 2,9·10 ⁻²		① ④	
	<i>High power</i>	Power generators,	from 35 W to 50 W	from 0,1 GHz to 5 GHz from 5 GHz to 12 GHz from 12 GHz to 18 GHz	2,0·10 ⁻² 2,3·10 ⁻² 2,7·10 ⁻²		①
			from 50 W to 1 kW	from 1,5 MHz to 1 GHz	2,0·10 ⁻²		

(*) The measurement uncertainties stated in this document have been determined according to EA-4/02. They were estimated as expanded uncertainty obtained multiplying the standard uncertainty by the coverage factor k corresponding to a confidence level of about 95%. Normally, this factor k is 2. The measurement uncertainty is the root square sum of the contributors U₁ and U₂ reported in the table.

BEST MEASUREMENT CAPABILITY – Metrological Standards Lab. (cont'd)

Quantity	Device Under Test	Range	Uncertainty (*)		Note
			U ₁	U ₂	
Power bandwidth	Oscilloscopes	from 1 MHz to 5 GHz from 5 GHz to 12 GHz from 12 GHz to 18 GHz	2,0·10 ⁻² 2,3·10 ⁻² 2,7·10 ⁻²		❶
DC Voltage generated	Digital Oscilloscopes	from 0 V to 10 V	1·10 ⁻³	0,01 <i>p/U</i>	❷
DC Voltage measured		from 0 V to 50 V	1·10 ⁻³		
Input impedance.		50 Ω, 1 MΩ	1·10 ⁻³		
Frequency measured		from 1 Hz to 100 kHz from 100 kHz to 18 GHz	5·10 ⁻³ 1·10 ⁻³		
AC Voltage measured	Analog Oscilloscopes	from 1 mV to 1000 V	2·10 ⁻²		❹
Input impedance		50 Ω, 1 MΩ	1·10 ⁻³		
Frequency measured		from 1 Hz to 500 MHz	1,4·10 ⁻²		

(*) The measurement uncertainties stated in this document have been determined according to EA-4/02. They were estimated as expanded uncertainty obtained multiplying the standard uncertainty by the coverage factor *k* corresponding to a confidence level of about 95%. Normally, this factor *k* is 2. The measurement uncertainty is the root square sum of the contributors U₁ and U₂ reported in the table.

- ❶ The uncertainties are referred to a matched device..
- ❷ Alignment point.
- ❸ *P* is the measured power expressed in the same measurement unit of the numerator...
- ❹ Impedance of the measuring system is 75 Ω.
- ❺ Considering a 10 bit resolution oscilloscope (HP mod. 54520) . *p* is the range. Range is defined at 7 mV for ranges below 7 mV. *U* is the measured voltage.
- ❻ Considering an oscilloscope with 0,25 ps resolution (HP mod. 54120). *T* is the measured period.
- ❼ Uncertainty values include the repeatability of the measures and of the measurement system.

Optical Quantities

BEST MEASUREMENT CAPABILITY – Metrological Standards Lab.

Quantity	Device Under Test	λ	Range	Uncertainty (*)	Note
Optical Wavelength	Optical Wavelength Meters, Spectrum Analysers	1310 nm 1530 nm 1550 nm		0,4 pm	1
	Laser Sources	from 1270 nm to 1650 nm	from 0,1 μ W to 10 mW (from -40 dBm to +10 dBm)	0,4 pm	1,2
Optical Power	Optical Power Meters	850 nm	100 μ W (-10 dBm)	1,5 %	3
			from 1 mW to 1 nW (from 0 dBm to -60 dBm)	1,8 %	
			100 μ W (-10 dBm)	1,1 %	
	Laser Sources	1310 nm 1550 nm	from 10 mW to 10 nW (from +10 dBm to -50 dBm)	1,2 %	4
			from 100 nW to 10 nW (from -50 dBm to -60 dBm)	1,3 %	
			from 10 mW to 1 nW (from +10 dBm to -60 dBm)	2,5 %	
Optical Power Linearity	Optical Power Meters	850 nm	from 10 mW to 1 nW (from +10 dBm to -60 dBm)	1,9 %	4
			from 1 mW to 10 nW (from 0 dBm to -60 dBm)	0,7 %	
			from 100 mW to 10 nW (from +20 dBm to -60 dBm)	0,6 %	
Optical Power Stability	Laser Sources	from 600 nm to 1020 nm from 970 nm to 1630 nm	from 10 mW to 1 nW (from +10 dBm to -60 dBm)	0.001 dB	3
			from 10 mW to 1 nW (from +10 dBm to -60 dBm)	0.002 dB	4

(*) The measurement uncertainties stated in this document have been determined according to EA-4/02. They were estimated as expanded uncertainty obtained multiplying the standard uncertainty by the coverage factor k corresponding to a confidence level of about 95%. Normally, this factor k is 2.

BEST MEASUREMENT CAPABILITY – Metrological Standards Lab. (cont'd)

Quantity	Device Under Test	λ	Range	Uncertainty (*)	Note
Optical Attenuation	Optical Fixed Attenuators, Fiber Optic Coils	850 nm	from 0 dB to 60 dB	2,1 %	3
		1310 nm	from 0 dB to 60 dB	1,5 %	4
		1550 nm	from 0 dB to 60 dB	1,5 %	4
	Optical Step Attenuators	850 nm	Insertion loss (0 dB nominal)	2,1 %	3
			from 1 dB to 60 dB	1,1 %	
		1310 nm	Insertion loss (0 dB nominal)	1,5 %	4
	1550 nm	from 1 dB to 60 dB	0,6 %		

(*) The measurement uncertainties stated in this document have been determined according to EA-4/02. They were estimated as expanded uncertainty obtained multiplying the standard uncertainty by the coverage factor k corresponding to a confidence level of about 95%. Normally, this factor k is 2.

- 1 Wavelength measurement results are reported in vacuum.
- 2 The power of the laser source must be within the specified range.
- 3 Measurements are made with multi mode (MM) fiber 50/125 μ m and FC/PC connectors
- 4 Measurements are made with single mode fiber (SM) 9/125 μ m and FC/PC connectors.

Electrical – DC and Low Frequency

BEST MEASUREMENT CAPABILITY – On Site Calibration

Quantity	Device Under Test	Range	Uncertainty (*)		Note
			U ₁	U ₂	
Direct Voltage	Generators, Calibrators	from 1 μ V to 100 mV	1,6·10 ⁻⁵	1,7 μ V/U	① ②
		from 100 mV to 2,2 V	1,5·10 ⁻⁵	5,3 μ V/U	
		from 2,2 V to 11 V	1,5·10 ⁻⁵	6,5 μ V/U	
		from 11 V to 22 V	1,6·10 ⁻⁵	32 μ V/U	
		from 22 V to 100 V	1,7·10 ⁻⁵	0,11 mV/U	
		from 100 V to 220 V	1,6·10 ⁻⁵	0,14 mV/U	
		from 220 V to 600 V	1,8·10 ⁻⁵	0,61 mV/U	
	from 600 V to 1 kV	2,1·10 ⁻⁵	0,62 mV/U		
	Measuring devices, DMM	from 1 μ V to 220 mV	1,1·10 ⁻⁵	1 μ V/U	
		from 220 mV to 2,2 V	1,0·10 ⁻⁵	1,5 μ V/U	
		from 2,2 V to 11 V	1,0·10 ⁻⁵	4,0 μ V/U	
		from 11 V to 22 V	1,1·10 ⁻⁵	30 μ V/U	
		from 22 V to 100 V	1,2·10 ⁻⁵	0,11 mV/U	
		from 100 V to 220 V	1,2·10 ⁻⁵	0,14 mV/U	
from 220 V to 600 V		1,5·10 ⁻⁵	0,62 mV/U		
from 600 V to 1 kV	1,8·10 ⁻⁵	0,62 mV/U			
Direct Current	Generators, Calibrators	from 1 μ A to 100 μ A	8,2·10 ⁻⁵	12 nA//	②
		from 100 μ A to 1 mA	8,2·10 ⁻⁵	13 nA//	
		from 1 mA to 2,2 mA	8,2·10 ⁻⁵	55 nA//	
		from 2,2 mA to 10 mA	8,2·10 ⁻⁵	0,12 μ A//	
		from 10 mA to 22 mA	8,7·10 ⁻⁵	0,6 μ A//	
		from 22 mA to 100 mA	9,4·10 ⁻⁵	1,2 μ A//	
		from 100 mA to 220 mA	1,4·10 ⁻⁴	10 μ A//	
	from 220 mA to 1 A	1,6·10 ⁻⁴	32 μ A//		
	Measuring devices, DMM	from 1 μ A to 100 μ A	6,4·10 ⁻⁵	10 nA//	
		from 100 μ A to 1 mA	6,4·10 ⁻⁵	11 nA//	
		from 1 mA to 2,2 mA	6,4·10 ⁻⁵	51 nA//	
		from 2,2 mA to 10 mA	6,4·10 ⁻⁵	0,12 μ A//	
		from 10 mA to 22 mA	7,0·10 ⁻⁵	0,5 μ A//	
		from 22 mA to 100 mA	8,0·10 ⁻⁵	1,2 μ A//	
from 100 mA to 220 mA		1,3·10 ⁻⁴	10 μ A//		
from 220 mA to 2,2 A	1,5·10 ⁻⁴	32 μ A//			

(*) The measurement uncertainties stated in this document have been determined according to EA-4/02. They were estimated as expanded uncertainty obtained multiplying the standard uncertainty by the coverage factor k corresponding to a confidence level of about 95%. Normally, this factor k is 2. The measurement uncertainty is the root square sum of the contributors U₁ and U₂ reported in the table.

BEST MEASUREMENT CAPABILITY – On Site Calibration (cont'd)

Quantity	Device Under Test	Range	Uncertainty (*)		Note
			U ₁	U ₂	
DC Resistance	Standard Resistors, Generators	from 1 Ω to 1,9 Ω	1,3·10 ⁻⁴	60 μΩ/R	②
		from 1,9 Ω to 10 Ω	6,3·10 ⁻⁵	60 μΩ/R	
		from 10 Ω to 19 Ω	6,1·10 ⁻⁵	0,5 mΩ/R	
		from 19 Ω to 100 Ω	5,6·10 ⁻⁵	0,5 mΩ/R	
		from 100 Ω to 190 Ω	5,6·10 ⁻⁵	0,5 mΩ/R	
		from 190 Ω to 1 kΩ	5,4·10 ⁻⁵	0,5 mΩ/R	
		from 1 kΩ to 1,9 kΩ	5,4·10 ⁻⁵	5 mΩ/R	
		from 1,9 kΩ to 10 kΩ	5,4·10 ⁻⁵	5 mΩ/R	
		from 10 kΩ to 19 kΩ	5,4·10 ⁻⁵	50 mΩ/R	
		from 19 kΩ to 100 kΩ	5,5·10 ⁻⁵	50 mΩ/R	
		from 100 kΩ to 190 kΩ	5,6·10 ⁻⁵	2 Ω/R	
		from 190 kΩ to 1 MΩ	5,8·10 ⁻⁵	2 Ω/R	
		from 1 MΩ to 1,9 MΩ	7,6·10 ⁻⁵	0,1 kΩ/R	
		from 1,9 MΩ to 10 MΩ	8,5·10 ⁻⁵	0,1 kΩ/R	
		from 10 MΩ to 19 MΩ	5,1·10 ⁻⁴	1 kΩ/R	
	from 19 MΩ to 100 MΩ	5,2·10 ⁻⁴	1 kΩ/R		
	Measuring devices, DMM	1 Ω	1,7·10 ⁻⁴		
		1,9 Ω	2,7·10 ⁻⁴		
		10 Ω	4,3·10 ⁻⁵		
		19 Ω	1,2·10 ⁻⁴		
		100 Ω	3,1·10 ⁻⁵		
		190 Ω	5,3·10 ⁻⁵		
		1 kΩ	2,0·10 ⁻⁵		
		1,9 kΩ	4,2·10 ⁻⁵		
		10 kΩ	2,0·10 ⁻⁵		
		19 kΩ	4,0·10 ⁻⁵		
		100 kΩ	2,1·10 ⁻⁵		
190 kΩ		6,4·10 ⁻⁵			

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BEST MEASUREMENT CAPABILITY – On Site Calibration (cont'd)

Quantity	Device Under Test	Range	Frequency	Uncertainty (*)		Note
				U ₁	U ₂	
Alternating Voltage	Generators	from 1 mV to 10 mV	from 40 Hz to 1 kHz from 1 kHz to 20 kHz	2,8·10 ⁻⁴ 3,6·10 ⁻⁴	17 μV/U 17 μV/U	②
		from 10 mV to 22 mV	from 40 Hz to 1 kHz from 1 kHz to 20 kHz	1,0·10 ⁻⁴ 2,4·10 ⁻⁴	12 μV/U 12 μV/U	
		from 22 mV to 100 mV	from 40 Hz to 1 kHz from 1 kHz to 20 kHz	2,0·10 ⁻⁴ 2,3·10 ⁻⁴	15 μV/U 15 μV/U	
		from 100 mV to 220 mV	from 40 Hz to 1 kHz from 1 kHz to 20 kHz	2,0·10 ⁻⁴ 2,3·10 ⁻⁴	25 μV/U 25 μV/U	
		from 220 mV to 1 V	from 40 Hz to 1 kHz from 1 kHz to 20 kHz from 20 kHz to 100 kHz from 100 kHz to 300 kHz from 0,3 MHz to 1 MHz	1,6·10 ⁻⁴ 2,0·10 ⁻⁴ 8,6·10 ⁻⁴ 3,1·10 ⁻³ 1,1·10 ⁻²	24 μV/U 24 μV/U 83 μV/U 0,18 mV/U 1,0 mV/U	
		from 1 V to 2,2 V	from 40 Hz to 1 kHz from 1 kHz to 20 kHz from 20 kHz to 100 kHz from 100 kHz to 300 kHz from 0,3 MHz to 1 MHz	1,6·10 ⁻⁴ 2,0·10 ⁻⁴ 8,6·10 ⁻⁴ 3,1·10 ⁻³ 1,1·10 ⁻²	0,2 mV/U 0,2 mV/U 0,2 mV/U 1,0 mV/U 1,4 mV/U	
		from 2,2 V to 10 V	from 40 Hz to 1 kHz from 1 kHz to 20 kHz from 20 kHz to 100 kHz from 100 kHz to 300 kHz from 0,3 MHz to 1 MHz	1,6·10 ⁻⁴ 2,0·10 ⁻⁴ 8,6·10 ⁻⁴ 3,1·10 ⁻³ 1,1·10 ⁻²	0,2 mV/U 0,2 mV/U 0,5 mV/U 2,0 mV/U 9,1 mV/U	
		from 10 V to 22 V	from 40 Hz to 1 kHz from 1 kHz to 20 kHz from 20 kHz to 100 kHz from 100 kHz to 300 kHz from 0,3 MHz to 1 MHz	2,5·10 ⁻⁴ 2,5·10 ⁻⁴ 1,3·10 ⁻³ 3,1·10 ⁻³ 5,0·10 ⁻³	2,0 mV/U 2,0 mV/U 2,1 mV/U 10 mV/U 14 mV/U	
		from 22 V to 100 V	from 40 Hz to 1 kHz from 1 kHz to 20 kHz from 20 kHz to 50 kHz from 50 kHz to 100 kHz	2,6·10 ⁻⁴ 2,6·10 ⁻⁴ 4,6·10 ⁻⁴ 1,4·10 ⁻³	2,2 mV/U 2,2 mV/U 4,5 mV/U 7,0 mV/U	
		from 100 V to 200 V	from 40 Hz to 1 kHz from 1 kHz to 20 kHz from 20 kHz to 50 kHz from 50 kHz to 100 kHz	4,4·10 ⁻⁴ 6,3·10 ⁻⁴ 1,3·10 ⁻³ 3,1·10 ⁻³	20 mV/U 20 mV/U 21 mV/U 23 mV/U	
		from 220 V to 700 V	from 40 Hz to 1 kHz from 1 kHz to 20 kHz	4,4·10 ⁻⁴ 6,4·10 ⁻⁴	21 mV/U 21 mV/U	

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BEST MEASUREMENT CAPABILITY – On Site Calibration (cont'd)

Quantity	Device Under Test	Range	Frequency	Uncertainty (*)		Note
				U ₁	U ₂	
Alternating Voltage	Measuring devices, DMM	from 1 mV to 2,2 mV	from 40 Hz to 1 kHz from 1 kHz to 20 kHz	2,4·10 ⁻⁴ 3,3·10 ⁻⁴	13 μV/U 13 μV/U	②
		from 2,2 mV to 10 mV	from 40 Hz to 1 kHz from 1 kHz to 20 kHz	2,4·10 ⁻⁴ 3,3·10 ⁻⁴	13 μV/U 13 μV/U	
		from 10 mV to 22 mV	from 40 Hz to 1 kHz from 1 kHz to 20 kHz	1,4·10 ⁻⁴ 1,9·10 ⁻⁴	6,9 μV/U 6,9 μV/U	
		from 22 mV to 100 mV	from 40 Hz to 1 kHz from 1 kHz to 20 kHz	1,3·10 ⁻⁴ 1,8·10 ⁻⁴	11 μV/U 11 μV/U	
		from 100 mV to 220 mV	from 40 Hz to 1 kHz from 1 kHz to 20 kHz	1,3·10 ⁻⁴ 1,8·10 ⁻⁴	23 μV/U 23 μV/U	
		from 220 mV to 1 V	from 40 Hz to 1 kHz from 1 kHz to 20 kHz from 20 kHz to 100 kHz from 100 kHz to 300 kHz from 0,3 MHz to 1 MHz	1,1·10 ⁻⁴ 1,7·10 ⁻⁴ 8,5·10 ⁻⁴ 3,1·10 ⁻³ 1,1·10 ⁻²	22 μV/U 22 μV/U 83 μV/U 0,18 mV/U 1 mV/U	
		from 1 V to 2,2 V	from 40 Hz to 1 kHz from 1 kHz to 20 kHz from 20 kHz to 100 kHz from 100 kHz to 300 kHz from 0,3 MHz to 1 MHz	1,1·10 ⁻⁴ 1,7·10 ⁻⁴ 8,5·10 ⁻⁴ 3,1·10 ⁻³ 1,1·10 ⁻²	0,2 mV/U 0,2 mV/U 0,22 mV/U 1,0 mV/U 1,4 mV/U	
		from 2,2 V to 10 V	from 40 Hz to 1 kHz from 1 kHz to 20 kHz from 20 kHz to 100 kHz from 100 kHz to 300 kHz from 0,3 MHz to 1 MHz	1,1·10 ⁻⁴ 1,7·10 ⁻⁴ 8,5·10 ⁻⁴ 3,1·10 ⁻³ 1,1·10 ⁻²	0,22 mV/U 0,22 mV/U 0,45 mV/U 2,0 mV/U 9,1 mV/U	
		from 10 V to 22 V	from 40 Hz to 1 kHz from 1 kHz to 20 kHz from 20 kHz to 100 kHz from 100 kHz to 300 kHz from 0,3 MHz to 1 MHz	2,2·10 ⁻⁴ 2,2·10 ⁻⁴ 1,3·10 ⁻³ 3,1·10 ⁻³ 5,2·10 ⁻³	2,0 mV/U 2,0 mV/U 2,1 mV/U 10 mV/U 14 mV/U	
		from 22 V to 100 V	from 40 Hz to 1 kHz from 1 kHz to 20 kHz from 20 kHz to 50 kHz from 50 kHz to 100 kHz	2,2·10 ⁻⁴ 2,2·10 ⁻⁴ 4,3·10 ⁻⁴ 1,4·10 ⁻⁴	2,2 mV/U 2,2 mV/U 4,5 mV/U 10 mV/U	
		from 100 V to 220 V	from 40 Hz to 1 kHz from 1 kHz to 20 kHz from 20 kHz to 50 kHz from 50 kHz to 100 kHz	4,1·10 ⁻⁴ 6,1·10 ⁻⁴ 1,3·10 ⁻³ 3,1·10 ⁻³	20 mV/U 20 mV/U 20 mV/U 22 mV/U	
		from 220 V to 1000 V	from 40 Hz to 1 kHz from 1 kHz to 20 kHz	4,1·10 ⁻⁴ 6,3·10 ⁻⁴	20 mV/U 21 mV/U	

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BEST MEASUREMENT CAPABILITY – On Site Calibration (cont'd)

Quantity	Device Under Test	Range	Frequency	Uncertainty (*)		Note
				U ₁	U ₂	
Alternating Current	Generators	from 10 µA to 100 µA	from 40 Hz to 1 kHz	6,4·10 ⁻⁴	0,4 µA//	②
		from 100 µA to 220 µA	from 40 Hz to 100 Hz	6,4·10 ⁻⁴	0,5 µA//	
			from 100 Hz to 1 kHz	3,7·10 ⁻⁴	0,5 µA//	
		from 220 µA to 1 mA	from 40 Hz to 100 Hz	6,4·10 ⁻⁴	0,5 µA//	
			from 100 Hz to 1 kHz	3,7·10 ⁻⁴	0,5 µA//	
			from 1 kHz to 5 kHz	7,8·10 ⁻⁴	0,7 µA//	
		from 1 mA to 2,2 mA	from 40 Hz to 100 Hz	6,4·10 ⁻⁴	2,0 µA//	
			from 100 Hz to 1 kHz	3,7·10 ⁻⁴	2,0 µA//	
			from 1 kHz to 5 kHz	7,8·10 ⁻⁴	2,2 µA//	
from 2,2 mA to 10 mA	from 40 Hz to 100 Hz	6,4·10 ⁻⁴	2,0 µA//			
	from 100 Hz to 1 kHz	3,7·10 ⁻⁴	2,0 µA//			
	from 1 kHz to 5 kHz	7,8·10 ⁻⁴	5,4 µA//			
from 10 mA to 22 mA	from 40 Hz to 100 Hz	6,4·10 ⁻⁴	20 µA//			
	from 100 Hz to 1 kHz	3,7·10 ⁻⁴	20 µA//			
	from 1 kHz to 5 kHz	7,8·10 ⁻⁴	21 µA//			
from 22 mA to 100 mA	from 40 Hz to 100 Hz	6,5·10 ⁻⁴	21 µA//			
	from 100 Hz to 1 kHz	3,8·10 ⁻⁴	21 µA//			
	from 1 kHz to 5 kHz	7,8·10 ⁻⁴	54 µA//			
from 100 mA to 220 mA	from 40 Hz to 100 Hz	8,4·10 ⁻⁴	0,2 mA//			
	from 100 Hz to 1 kHz	1,0·10 ⁻³	0,2 mA//			
	from 1 kHz to 5 kHz	1,3·10 ⁻³	0,2 mA//			
from 220 mA a 1 A	from 40 Hz to 100 Hz	1,1·10 ⁻³	0,2 mA//			
	from 100 Hz to 1 kHz	1,3·10 ⁻³	0,2 mA//			
	from 1 kHz to 5 kHz	1,4·10 ⁻³	0,22 mA//			

(*) The measurement uncertainties stated in this document have been determined according to EA-4/02. They were estimated as expanded uncertainty obtained multiplying the standard uncertainty by the coverage factor k corresponding to a confidence level of about 95%. Normally, this factor k is 2. The measurement uncertainty is the root square sum of the contributors U₁ and U₂ reported in the table.

BEST MEASUREMENT CAPABILITY – On Site Calibration (cont'd)

Quantity	Device Under Test	Range	Frequency	Uncertainty (*)		Note
				U ₁	U ₂	
Alternating Current	Measuring devices, DMM	from 10 µA to 100 µA	from 40 Hz to 1 kHz	6,3·10 ⁻⁴	40 nA//	②
		from 100 µA to 220 µA	from 40 Hz to 100 Hz	6,3·10 ⁻⁴	0,21 µA//	
			from 100 Hz to 1 kHz	3,5·10 ⁻⁴	0,21 µA//	
		from 220 µA to 1 mA	from 40 Hz to 100 Hz	6,3·10 ⁻⁴	0,21 µA//	
			from 100 Hz to 1 kHz	3,5·10 ⁻⁴	0,21 µA//	
			from 1 kHz to 5 kHz	7,7·10 ⁻⁴	0,6 µA//	
		from 1 mA to 2,2 mA	from 40 Hz to 100 Hz	6,3·10 ⁻⁴	2 µA//	
			from 100 Hz to 1 kHz	3,5·10 ⁻⁴	2 µA//	
			from 1 kHz to 5 kHz	7,7·10 ⁻⁴	2,1 µA//	
		from 2,2 mA to 10 mA	from 40 Hz to 100 Hz	6,3·10 ⁻⁴	2 µA//	
from 100 Hz to 1 kHz	3,5·10 ⁻⁴		2 µA//			
from 1 kHz to 5 kHz	7,7·10 ⁻⁴		5,4 µA//			
from 10 mA to 22 mA	from 40 Hz to 100 Hz	6,3·10 ⁻⁴	20 µA//			
	from 100 Hz to 1 kHz	3,5·10 ⁻⁴	20 µA//			
	from 1 kHz to 5 kHz	7,7·10 ⁻⁴	21 µA//			
from 22 mA to 100 mA	from 40 Hz to 100 Hz	6,3·10 ⁻⁴	21 µA//			
	from 100 Hz to 1 kHz	3,6·10 ⁻⁴	21 µA//			
	from 1 kHz to 5 kHz	7,7·10 ⁻⁴	54 µA//			
from 100 mA to 220 mA	from 40 Hz to 100 Hz	8,3·10 ⁻⁴	0,2 mA//			
	from 100 Hz to 1 kHz	1,1·10 ⁻³	0,2 mA//			
	from 1 kHz to 5 kHz	1,3·10 ⁻³	0,2 mA//			
from 220 mA to 1 A	from 40 Hz to 100 Hz	1,1·10 ⁻³	0,2 mA//			
	from 100 Hz to 1 kHz	1,3·10 ⁻³	0,2 mA//			
	from 1 kHz to 5 kHz	1,4·10 ⁻³	0,23 mA//			
from 1 A a 2,2 A	from 40 Hz to 100 Hz	1,1·10 ⁻³	0,2 mA//			
	from 100 Hz to 1 kHz	1,3·10 ⁻³	0,2 mA//			
	from 1 kHz to 5 kHz	1,4·10 ⁻³	0,23 mA//			

(*) The measurement uncertainties stated in this document have been determined according to EA-4/02. They were estimated as expanded uncertainty obtained multiplying the standard uncertainty by the coverage factor k corresponding to a confidence level of about 95%. Normally, this factor k is 2. The measurement uncertainty is the root square sum of the contributors U₁ and U₂ reported in the table.

① Upper limit of the range excluded.

② U is the voltage expressed in volt, I is the current expressed in ampere, R is the resistance expressed in ohm.