Organisme belge d'Accréditation
Belgische Accreditatieinstelling
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EA MLA Signatory

Bijlage bij accreditatie-certificaat
Annexe au certificat d'accréditation
Annex to the accreditation certificate
Beilage zur Akkreditierungszertifikat

001-CAL

EN ISO/IEC 17025:2017

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Voorzitster van het Accreditatiebureau
La Présidente du Bureau d'Accréditation
Chair of the Accreditation Board
Vorsitzende des Akkreditierungsbüro

De accreditatie werd uitgereikt aan / L'accréditation est délivrée à / The accreditation is granted to / Die akkreditierung wurde erteilt für:

TRESCAL nv
Vosstraat, 200
2600 Antwerpen

Activiteitencentra / Sites d'activités / Sites of activities / Standorte mit aktivitäten:

Locatie 1: BERCHEM	Vosstraat 200 2600 Antwerpen
Locatie 2: WELLIN	Rue Jean Meunier, 2 6922 Wellin
Locatie 3: LOUVAIN-LA-NEUVE	Rue du Bosquet, 7 1348 Ottignies-Louvain-la-Neuve

DCLF Electricity Berchem (In House or Onsite)

Calibration and Measurement Capabilities

Direct voltage
Measure

Measuring range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
± 100 mV	DC	$5{,}0 \times 10^{-6} \times U$	• Transfer standard in "30 day" loop • Fixed points • positive /negative • measuring	P2-02-E.006
± 1 V	DC	$2{,}7 \times 10^{-6} \times U$		
± 10 V	DC	$2{,}1 \times 10^{-6} \times U$		
± 19 V	DC	$2{,}3 \times 10^{-6} \times U$		
± 100 V	DC	$3{,}0 \times 10^{-6} \times U$		
± 1000 V	DC	$3{,}0 \times 10^{-6} \times U$		

Measuring range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
0 mV to 200 mV	DC	$7{,}0 \times 10^{-6} \times U$ or 0,1 µV[1]	• measure • positive / negative	P2-02-E.019
0,2 V to 2 V	DC	$5{,}0 \times 10^{-6} \times U$		
2 V to 20 V	DC	$4{,}5 \times 10^{-6} \times U$		
20 V to 200 V	DC	$5{,}5 \times 10^{-6} \times U$		
200 V to 1000 V	DC	$5{,}5 \times 10^{-6} \times U$		
1 kV to 75 kV	DC	$3{,}0 \times 10^{-4} \times U$	Measure	P2-02-E.016
0,2 V to 11 V	DC	$1{,}0 \times 10^{-4} \times U$	Loop calibration	P2-02-E.019

[1] Whichever is greater

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Generate

Generating range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
0 mV to 200 mV	DC	$18 \times 10^{-6} \times U$ or 0,5 µV[1]	• generate • positive / negative	P2-02-E.005
0,2 V to 2 V	DC	$8{,}0 \times 10^{-6} \times U$		
2 V to 20 V	DC	$4{,}5 \times 10^{-6} \times U$		
20 V to 200 V	DC	$7{,}0 \times 10^{-6} \times U$		
200 V to 1100 V	DC	$10 \times 10^{-6} \times U$		
1,1 kV to 40 kV	DC	$3{,}0 \times 10^{-4} \times U$	Generate	P2-02-E.016
0,2 V to 11 V	DC	$1{,}0 \times 10^{-4} \times U$	Loop calibration	P2-02-E.005

[1] Whichever is greater

Direct current
Measure

Measuring range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
±100 µA	DC	$24 \times 10^{-6} \times I$	• Transfer standard in "30 day" loop • Fixed points • positive / negative • Measurement	P2-02-E.006
±1 mA	DC	$16 \times 10^{-6} \times I$		
±10 mA	DC	$16 \times 10^{-6} \times I$		
±100 mA	DC	$19 \times 10^{-6} \times I$		
±1 A	DC	$31 \times 10^{-6} \times I$		
±10 A	DC	$60 \times 10^{-6} \times I$		

Measuring range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
0 µA to 200 µA	DC	$12 \times 10^{-6} \times I$ or 0,5 nA[1]	• measure • in the lowest possible range • positive / negative	P2-02-E.019
0,2 mA to 2 mA	DC	$11 \times 10^{-6} \times I$		
2 mA to 20 mA	DC	$9{,}0 \times 10^{-6} \times I$		
20 mA to 200 mA	DC	$16 \times 10^{-6} \times I$		
0,2 A to 2 A	DC	$90 \times 10^{-6} \times I$		
2 A to 20 A	DC	$90 \times 10^{-6} \times I$		
0,2 mA to 24 mA	DC	$1{,}0 \times 10^{-4} \times I$	Loop calibration	P2-02-E.019
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[1] Whichever is greater

Measuring range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
20 A to 3000 A	DC	$2{,}0 \times 10^{-4} \times I$	measure/generate	P2-02-E.030

Calibration of current clamps

Measuring range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
20 A to 1000 A	DC	$5{,}0 \times 10^{-3} \times I$	• with current coils	P2-02-E.021

Generate

Generating range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
0 µA to 20 µA	DC	1,5 nA	• generate • positive / negative	P2-02-E.005
20 µA to 200 µA	DC	$1{,}7 \times 10^{-4} \times I$		
0,2 mA to 200 mA	DC	$0{,}70 \times 10^{-4} \times I$		
0,2 A to 2 A	DC	$1{,}9 \times 10^{-4} \times I$		
2 A to 11 A	DC	$2{,}7 \times 10^{-4} \times I$		
11 A to 20 A	DC	$6{,}0 \times 10^{-4} \times I$		
0,2 mA to 24 mA	DC	$1{,}0 \times 10^{-4} \times I$	Loop calibration	P2-02-E.005

Alternating voltage

Measure

Measuring range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
1 mV	20 Hz to 20 kHz	$3{,}0 \times 10^{-4} \times U + 2\ \mu V$	• Transfer standard in "30 day" loop • Fixed points • measuring	P2-02-E.006
	30 kHz & 50 kHz	$4{,}0 \times 10^{-4} \times U + 2\ \mu V$		
	100 kHz	$6{,}5 \times 10^{-4} \times U + 2\ \mu V$		
10 mV	20 Hz to 20 kHz	$1{,}7 \times 10^{-4} \times U + 2\ \mu V$		
	30 kHz & 50 kHz	$2{,}5 \times 10^{-4} \times U + 2\ \mu V$		
	100 kHz	$4{,}5 \times 10^{-4} \times U + 2\ \mu V$		
100 mV	20 Hz to 20 kHz	$1{,}2 \times 10^{-4} \times U + 2\ \mu V$		
	30 kHz & 50 kHz	$2{,}0 \times 10^{-4} \times U + 2\ \mu V$		
	100 kHz	$4{,}0 \times 10^{-4} \times U + 2\ \mu V$		
1 V	10 Hz to 30 Hz	$4{,}0 \times 10^{-5} \times U$		
	40 Hz to 30 kHz	$3{,}0 \times 10^{-5} \times U$		
	50 kHz	$4{,}0 \times 10^{-5} \times U$		
	100 kHz	$5{,}0 \times 10^{-5} \times U$		
	300 kHz	$12 \times 10^{-5} \times U$		
	500 kHz	$25 \times 10^{-5} \times U$		
	1 MHz	$60 \times 10^{-5} \times U$		
10 V	10 Hz to 30 Hz	$4{,}0 \times 10^{-5} \times U$	• Transfer standard in "30 day" loop • Fixed points • measuring	P2-02-E.006
	40 Hz to 30 kHz	$3{,}0 \times 10^{-5} \times U$		
	50 kHz	$3{,}5 \times 10^{-5} \times U$		
	100 kHz	$4{,}0 \times 10^{-5} \times U$		
	300 kHz	$11 \times 10^{-5} \times U$		
	500 kHz	$22 \times 10^{-5} \times U$		
	1 MHz	$60 \times 10^{-5} \times U$		
19 V	1 kHz	$4{,}0 \times 10^{-5} \times U$		
100 V	10 Hz to 30 Hz	$4{,}5 \times 10^{-5} \times U$		
	40 Hz & 55 Hz	$4{,}0 \times 10^{-5} \times U$		
	300 Hz to 20 kHz	$3{,}0 \times 10^{-5} \times U$		
	30 kHz	$3{,}5 \times 10^{-5} \times U$		
	50 kHz	$4{,}5 \times 10^{-5} \times U$		
	100 kHz	$7{,}4 \times 10^{-5} \times U$		
1000 V	40 Hz to 1 kHz	$4{,}0 \times 10^{-5} \times U$		
	10 kHz	$4{,}5 \times 10^{-5} \times U$		
	20 kHz	$5{,}0 \times 10^{-5} \times U$		
	30 kHz	$7{,}5 \times 10^{-5} \times U$		
700 V	50 kHz	$13 \times 10^{-5} \times U$		
	100 kHz	$35 \times 10^{-5} \times U$		

Measuring range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
0,7 mV to 2,2 mV	10 Hz to 20 Hz	$17 \times 10^{-4} \times U + 1{,}3$ µV	• measure	P2-02-E.019
	20 Hz to 40 Hz	$7{,}4 \times 10^{-4} \times U + 1{,}3$ µV		
	40 Hz to 20 kHz	$4{,}2 \times 10^{-4} \times U + 1{,}3$ µV		
	20 kHz to 50 kHz	$8{,}2 \times 10^{-4} \times U + 2{,}0$ µV		
	50 kHz to 100 kHz	$12 \times 10^{-4} \times U + 2{,}5$ µV		
	100 kHz to 300 kHz	$23 \times 10^{-4} \times U + 4{,}0$ µV		
	300 kHz to 500 kHz	$26 \times 10^{-4} \times U + 8{,}0$ µV		
	500 kHz to 1 MHz	$50 \times 10^{-4} \times U + 8{,}0$ µV		
2 mV to 7 mV	10 Hz to 20 Hz	$8{,}5 \times 10^{-4} \times U + 1{,}3$ µV	• measure	P2-02-E.019
	20 Hz to 40 Hz	$3{,}7 \times 10^{-4} \times U + 1{,}3$ µV		
	40 Hz to 20 kHz	$2{,}1 \times 10^{-4} \times U + 1{,}3$ µV		
	20 kHz to 50 kHz	$4{,}1 \times 10^{-4} \times U + 2{,}0$ µV		
	50 kHz to 100 kHz	$6{,}1 \times 10^{-4} \times U + 2{,}5$ µV		
	100 kHz to 300 kHz	$12 \times 10^{-4} \times U + 4{,}0$ µV		
	300 kHz to 500 kHz	$14 \times 10^{-4} \times U + 8{,}0$ µV		
	500 kHz to 1 MHz	$36 \times 10^{-4} \times U + 8{,}0$ µV		
7 mV to 22 mV	10 Hz to 20 Hz	$2{,}9 \times 10^{-4} \times U + 1{,}3$ µV	• measure	P2-02-E.019
	20 Hz to 40 Hz	$1{,}9 \times 10^{-4} \times U + 1{,}3$ µV		
	40 Hz to 20 kHz	$1{,}1 \times 10^{-4} \times U + 1{,}3$ µV		
	20 kHz to 50 kHz	$2{,}1 \times 10^{-4} \times U + 2{,}0$ µV		
	50 kHz to 100 kHz	$3{,}1 \times 10^{-4} \times U + 2{,}5$ µV		
	100 kHz to 300 kHz	$8{,}2 \times 10^{-4} \times U + 4{,}0$ µV		
	300 kHz to 500 kHz	$10 \times 10^{-4} \times U + 8{,}0$ µV		
	500 kHz to 1 MHz	$26 \times 10^{-4} \times U + 8{,}0$ µV		
22 mV to 70 mV	10 Hz to 20 Hz	$2{,}4 \times 10^{-4} \times U + 1{,}5$ µV	• measure	P2-02-E.019
	20 Hz to 40 Hz	$1{,}3 \times 10^{-4} \times U + 1{,}5$ µV		
	40 Hz to 20 kHz	$0{,}69 \times 10^{-4} \times U + 1{,}5$ µV		
	20 kHz to 50 kHz	$1{,}3 \times 10^{-4} \times U + 2{,}0$ µV		
	50 kHz to 100 kHz	$2{,}6 \times 10^{-4} \times U + 2{,}5$ µV		
	100 kHz to 300 kHz	$5{,}3 \times 10^{-4} \times U + 4{,}0$ µV		
	300 kHz to 500 kHz	$6{,}8 \times 10^{-4} \times U + 8{,}0$ µV		
	500 kHz to 1 MHz	$13 \times 10^{-4} \times U + 8{,}0$ µV		
70 mV to 220 mV	10 Hz to 20 Hz	$21 \times 10^{-5} \times U + 1{,}5$ µV	• measure	P2-02-E.019
	20 Hz to 40 Hz	$8{,}7 \times 10^{-5} \times U + 1{,}5$ µV		
	40 Hz to 20 kHz	$4{,}3 \times 10^{-5} \times U + 1{,}5$ µV		
	20 kHz to 50 kHz	$7{,}3 \times 10^{-5} \times U + 2{,}0$ µV		
	50 kHz to 100 kHz	$16 \times 10^{-5} \times U + 2{,}5$ µV		
	100 kHz to 300 kHz	$28 \times 10^{-5} \times U + 4{,}0$ µV		
	300 kHz to 500 kHz	$40 \times 10^{-5} \times U + 8{,}0$ µV		
	500 kHz to 1 MHz	$120 \times 10^{-5} \times U + 8{,}0$ µV		
220 mV to 700 mV	10 Hz to 20 Hz	$21 \times 10^{-5} \times U + 1{,}5$ µV	• measure	P2-02-E.019
	20 Hz to 40 Hz	$8{,}7 \times 10^{-5} \times U + 1{,}5$ µV		
	40 Hz to 20 kHz	$3{,}8 \times 10^{-5} \times U + 1{,}5$ µV		
	20 kHz to 50 kHz	$5{,}6 \times 10^{-5} \times U + 2{,}0$ µV		
	50 kHz to 100 kHz	$8{,}4 \times 10^{-5} \times U + 2{,}5$ µV		
	100 kHz to 300 kHz	$21 \times 10^{-5} \times U + 4{,}0$ µV		
	300 kHz to 500 kHz	$34 \times 10^{-5} \times U + 8{,}0$ µV		
	500 kHz to 1 MHz	$120 \times 10^{-5} \times U + 8{,}0$ µV		

0,7 V to 2,2 V	10 Hz to 20 Hz	$20 \times 10^{-5} \times U$	• measure	P2-02-E.019
	20 Hz to 40 Hz	$6,9 \times 10^{-5} \times U$		
	40 Hz to 20 kHz	$2,9 \times 10^{-5} \times U$		
	20 kHz to 50 kHz	$5,2 \times 10^{-5} \times U$		
	50 kHz to 100 kHz	$7,6 \times 10^{-5} \times U$		
	100 kHz to 300 kHz	$20 \times 10^{-5} \times U$		
	300 kHz to 500 kHz	$31 \times 10^{-5} \times U$		
	500 kHz to 1 MHz	$120 \times 10^{-5} \times U$		
2,2 V to 7 V	10 Hz to 20 Hz	$20 \times 10^{-5} \times U$	• measure	P2-02-E.019
	20 Hz to 40 Hz	$7,0 \times 10^{-5} \times U$		
	40 Hz to 20 kHz	$2,9 \times 10^{-5} \times U$		
	20 kHz to 50 kHz	$5,3 \times 10^{-5} \times U$		
	50 kHz to 100 kHz	$8,8 \times 10^{-5} \times U$		
	100 kHz to 300 kHz	$22 \times 10^{-5} \times U$		
	300 kHz to 500 kHz	$47 \times 10^{-5} \times U$		
	500 kHz to 1 MHz	$150 \times 10^{-5} \times U$		
7 V to 22 V	10 Hz to 20 Hz	$20 \times 10^{-5} \times U$	• measure	P2-02-E.019
	20 Hz to 40 Hz	$7,0 \times 10^{-5} \times U$		
	40 Hz to 20 kHz	$3,1 \times 10^{-5} \times U$		
	20 kHz to 50 kHz	$5,3 \times 10^{-5} \times U$		
	50 kHz to 100 kHz	$8,5 \times 10^{-5} \times U$		
	100 kHz to 300 kHz	$22 \times 10^{-5} \times U$		
	300 kHz to 500 kHz	$47 \times 10^{-5} \times U$		
	500 kHz to 1 MHz	$150 \times 10^{-5} \times U$		
22 V to 70 V	10 Hz to 20 Hz	$20 \times 10^{-5} \times U$	• measure	P2-02-E.019
	20 Hz to 40 Hz	$7,2 \times 10^{-5} \times U$		
	40 Hz to 20 kHz	$3,9 \times 10^{-5} \times U$		
	20 kHz to 50 kHz	$6,3 \times 10^{-5} \times U$		
	50 kHz to 100 kHz	$11 \times 10^{-5} \times U$		
	100 kHz to 300 kHz	$22 \times 10^{-5} \times U$		
	300 kHz to 500 kHz	$51 \times 10^{-5} \times U$		
	500 kHz to 1 MHz	$150 \times 10^{-5} \times U$		
70 V to 220 V	10 Hz to 20 Hz	$20 \times 10^{-5} \times U$	• measure	P2-02-E.019
	20 Hz to 40 Hz	$7,2 \times 10^{-5} \times U$		
	40 Hz to 20 kHz	$3,8 \times 10^{-5} \times U$		
	20 kHz to 50 kHz	$7,7 \times 10^{-5} \times U$		
	50 kHz to 100 kHz	$11 \times 10^{-5} \times U$		
	100 kHz to 300 kHz	$26 \times 10^{-5} \times U$		
	300 kHz to 500 kHz	$70 \times 10^{-5} \times U$		
220 V to 700 V	10 Hz to 20 Hz	$20 \times 10^{-5} \times U$	• measure	P2-02-E.019
	20 Hz to 40 Hz	$11 \times 10^{-5} \times U$		
	40 Hz to 20 kHz	$4,7 \times 10^{-5} \times U$		
	20 kHz to 50 kHz	$15 \times 10^{-5} \times U$		
	50 kHz to 100 kHz	$85 \times 10^{-5} \times U$		
700 V to 1000 V	10 Hz to 20 Hz	$20 \times 10^{-5} \times U$	• measure	P2-02-E.019
	20 Hz to 40 Hz	$11 \times 10^{-5} \times U$		
	40 Hz to 20 kHz	$4,4 \times 10^{-5} \times U$		
	20 kHz to 50 kHz	$15 \times 10^{-5} \times U$		
	50 kHz to 100 kHz	$85 \times 10^{-5} \times U$		
1 kV to 53 kV	50 / 60 Hz	$3,0 \times 10^{-3} \times U$	• measure	P2-02-E.016

Generate

Generating range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
2 mV to 20 mV	1 kHz to10 kHz	$7{,}0 \times 10^{-4} \times U$	• generate	P2-02-E.005
	10 kHz to100 kHz	$11 \times 10^{-4} \times U$		
20 mV to 200 mV	10 Hz to 300 Hz	$2{,}1 \times 10^{-4} \times U$	• generate	P2-02-E.005
	300 Hz to 10 kHz	$1{,}8 \times 10^{-4} \times U$		
	10 kHz to 30 kHz	$2{,}8 \times 10^{-4} \times U$		
	30 kHz to 100 kHz	$6{,}1 \times 10^{-4} \times U$		
0,2 V to 2 V	10 Hz to 300 Hz	$1{,}6 \times 10^{-4} \times U$	• generate	P2-02-E.005
	300 Hz to 1 kHz	$1{,}1 \times 10^{-4} \times U$		
	1 kHz to 30 kHz	$0{,}70 \times 10^{-4} \times U$		
	30 kHz to 100 kHz	$1{,}6 \times 10^{-4} \times U$		
	100 kHz to 300 kHz	$6{,}0 \times 10^{-4} \times U$		
	300 kHz to 1 MHz	$30 \times 10^{-4} \times U$		
2 V to 20 V	10 Hz to 300 Hz	$1{,}6 \times 10^{-4} \times U$	• generate	P2-02-E.005
	300 Hz to 1 kHz	$1{,}0 \times 10^{-4} \times U$		
	1 kHz to 10 kHz	$0{,}80 \times 10^{-4} \times U$		
	10 kHz to 30 kHz	$0{,}70 \times 10^{-4} \times U$		
	30 kHz to 100 kHz	$1{,}7 \times 10^{-4} \times U$		
	100 kHz to 300 kHz	$6{,}0 \times 10^{-4} \times U$		
	300 kHz to 1 MHz	$30 \times 10^{-4} \times U$		
20 V to 200 V	10 Hz to 300 Hz	$1{,}6 \times 10^{-4} \times U$	• generate	P2-02-E.005
	300 Hz to 1 kHz	$1{,}2 \times 10^{-4} \times U$		
	1 kHz to 10 kHz	$1{,}0 \times 10^{-4} \times U$		
	10 kHz to 30 kHz	$1{,}1 \times 10^{-4} \times U$		
	30 kHz to 100 kHz	$2{,}1 \times 10^{-4} \times U$		
200 V to 1000 V	40 Hz to 300 Hz	$2{,}3 \times 10^{-4} \times U$	• generate	P2-02-E.005
	300 Hz to 1 kHz	$2{,}3 \times 10^{-4} \times U$		
	1 kHz to 10 kHz	$1{,}7 \times 10^{-4} \times U$		
	10 kHz to 30 kHz	$2{,}2 \times 10^{-4} \times U$		
200 V to 750 V	30 kHz to 100 kHz	$15 \times 10^{-4} \times U$	• generate	P2-02-E.005
1 kV to 45 kV	50 / 60 Hz	$3{,}0 \times 10^{-3} \times U$	• generate	P2-02-E.016

Alternating currect
Measure

Measuring range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
100 µA	10 Hz to 30 Hz	$1{,}4 \times 10^{-4} \times I$	• Transfer standard in "30 day" loop • Fixed points • Measurement	P2-02-E.006
	40 Hz to 1 kHz	$1{,}1 \times 10^{-4} \times I$		
	5 kHz	$1{,}7 \times 10^{-4} \times I$		
1 mA	10 Hz to 30 Hz	$1{,}3 \times 10^{-4} \times I$		
	40 Hz to 1 kHz	$1{,}0 \times 10^{-4} \times I$		
	5 kHz	$1{,}5 \times 10^{-4} \times I$		
10 mA	10 Hz to 30 Hz	$1{,}3 \times 10^{-4} \times I$		
	40 Hz to 1 kHz	$1{,}0 \times 10^{-4} \times I$		
	5 kHz	$1{,}5 \times 10^{-4} \times I$		
100 mA	10 Hz to 30 Hz	$1{,}3 \times 10^{-4} \times I$		
	40 Hz to 1 kHz	$1{,}0 \times 10^{-4} \times I$		
	5 kHz	$1{,}5 \times 10^{-4} \times I$		
1 A	10 Hz to 30 Hz	$1{,}8 \times 10^{-4} \times I$		
	40 Hz to 1 kHz	$1{,}2 \times 10^{-4} \times I$		
	5 kHz	$2{,}3 \times 10^{-4} \times I$		
10 A	40 Hz	$3{,}0 \times 10^{-4} \times I$		
	50 Hz to 1 kHz	$2{,}9 \times 10^{-4} \times I$		
	5 kHz	$4{,}0 \times 10^{-4} \times I$		
	10 kHz	$7{,}0 \times 10^{-4} \times I$		

Measuring range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
5 µA to 200 µA	10 Hz to 5 kHz	$1{,}6 \times 10^{-4} \times I$	• measure	P2-02-E.019
	5 kHz to 10 kHz	$5{,}0 \times 10^{-4} \times I$		
0,2 mA to 2 mA	10 Hz to 5 kHz	$0{,}60 \times 10^{-4} \times I$		
	5 kHz to 10 kHz	$1{,}3 \times 10^{-4} \times I$		
2 mA to 20 mA	10 Hz to 5 kHz	$1{,}0 \times 10^{-4} \times I$		
	5 kHz to 10 kHz	$5{,}0 \times 10^{-4} \times I$		
20 mA to 200 mA	10 Hz to 1 kHz	$1{,}0 \times 10^{-4} \times I$		
	1 kHz to 10 kHz	$26 \times 10^{-4} \times I$		
0,2 A to 2 A	10 Hz to 1 kHz	$1{,}0 \times 10^{-4} \times I$		
	1 kHz to 10 kHz	$4{,}0 \times 10^{-4} \times I$		
2 A to 20 A	10 Hz to 1 kHz	$1{,}0 \times 10^{-4} \times I$		
	1 kHz to 5 kHz	$3{,}0 \times 10^{-4} \times I$		
	5 kHz to 10 kHz	$10 \times 10^{-4} \times I$		

Measuring range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
20 A to 6000 A	50 / 60 Hz	$5{,}0 \times 10^{-4} \times I$	measure	P2-02-E.030
20 A to 4000 A	50 / 60 Hz	$5{,}0 \times 10^{-4} \times I$	generate	P2-02-E.030

Calibration of current clamps

Measuring range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
20 A to 1000 A	45 Hz to 440 Hz	$5{,}0 \times 10^{-3} \times I$	• with current coils	P2-02-E.022

Generate

Generating range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
20 µA to 200 µA	10 Hz to 1 kHz	$4{,}0 \times 10^{-4} \times I$	• generate • in the lowest range possible	P2-02-E.005
	1 kHz to 5 kHz	$6{,}0 \times 10^{-4} \times I$		
0,2 mA to 2 mA	10 Hz to 1 kHz	$3{,}2 \times 10^{-4} \times I$		
	1 kHz to 5 kHz	$4{,}0 \times 10^{-4} \times I$		
2 mA to 20 mA	10 Hz to 1 kHz	$3{,}1 \times 10^{-4} \times I$		
	1 kHz to 5 kHz	$4{,}1 \times 10^{-4} \times I$		
20 mA to 200 mA	10 Hz to 1 kHz	$3{,}1 \times 10^{-4} \times I$		
	1 kHz to 5 kHz	$4{,}0 \times 10^{-4} \times I$		
0,2 A to 2 A	10 Hz to 1 kHz	$6{,}0 \times 10^{-4} \times I$		
	1 kHz to 5 kHz	$7{,}1 \times 10^{-4} \times I$		
2 A to 10 A	10 Hz to 1 kHz	$6{,}1 \times 10^{-4} \times I$		
	1 kHz to 5 kHz	$12 \times 10^{-4} \times I$		
	5 kHz to 10 kHz	$34 \times 10^{-4} \times I$		
10 A to 20 A	45 Hz to 100 Hz	$17 \times 10^{-4} \times I$		
	100 Hz to 1 kHz	$20 \times 10^{-4} \times I$		

Power and Energy

Measuring range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
Mono phase , direct without measuring clamps				- - -
33 mV to 1000 V / 0,33 mA to 330 mA	DC	$3{,}0 \times 10^{-4} \times P$	11 µW to 330 W generate	P2-02-E.013
33 mV to 1000 V / 0,33 A to 3,3 A	DC	$5{,}0 \times 10^{-4} \times P$	3,3 kW generate	
33 mV to 1000 V / 3,3 A to 10,5 A	DC	$6{,}0 \times 10^{-4} \times P$	10,5 kW generate	
33 mV to 1000 V / 10,5 A to 20,5 A	DC	$11 \times 10^{-4} \times P$	20,5 kW generate	
33 mV to 1000 V / 0,1 mA to 20,5A	45 Hz to 1 kHz	$15 \times 10^{-4} \times P$	3,3 µW to 20,5 kW / kVA(r) generate cosphi/sinphi > 0,5	
33 mV to 1000 V / 0,1 mA to 20,5A	45 Hz to 1 kHz	$40 \times 10^{-4} \times P$	3,3 µW to 20,5 kW / kVA(r) generate cosphi/sinphi > 0,25	
Mono phase , direct with measuring clamps				- - -
33 mV to 1000 V / 20 A to 500 A	DC	$10 \times 10^{-3} \times P$	0,66 W to 500 kW / kVA(r) generate	P2-02-E.013 P2-02-E.022
33 mV to 1000 V / 20 A to 500 A	45 Hz to 100 Hz	$11 \times 10^{-3} \times P$	0,66 W to 500 kW / kVA(r) generate cosphi/sinphi > 0,25	
33 mV to 1000 V / 20 A to 500 A	100 Hz to 440 Hz	$16 \times 10^{-3} \times P$	0,66 W to 500 kW / kVA(r) generate cosphi/sinphi > 0,25	

3-phase, direct without measuring clamps				- - -
1 V to 300 V / 0,3 A to 100 A	50 Hz & 60 Hz	$2{,}0 \times 10^{-3} \times P$	0,3 W to 30 kW / kVA(r) generate cosphi/sinphi > 0,5	P2-02-E.018
1 V to 300 V / 0,3 A to 100 A	50 Hz & 60 Hz	$4{,}0 \times 10^{-3} \times P$	0,3 W to 30 kW / kVA(r) generate cosphi/sinphi > 0,25	
1 V to 1000 V / 0,3 A to 100 A	10 Hz to 1 kHz	$2{,}0 \times 10^{-3} \times P$	0,3 W to 100 kW / kVA(r) measure cosphi/sinphi > 0,5	
1 V to 1000 V / 0,3 A to 100 A	10 Hz to 1 kHz	$4{,}0 \times 10^{-3} \times P$	0,3 W to 100 kW / kVA(r) measure cosphi/sinphi > 0,25	
3-phase, direct with measuring clamps				- - -
1 V to 300 V / 20 A to 500 A	50 Hz & 60 Hz	$11 \times 10^{-3} \times P$	20 W to 150 kW / kVA(r) generate cosphi/sinphi > 0,25	P2-02-E.013 P2-02-E.022
1 V to 1000 V / 20 A to 100 A	15 Hz to 440 Hz	$16 \times 10^{-3} \times P$	20 W to 100 kW / kVA(r) measure cosphi/sinphi > 0,25	
Phase / phase angle				- - -
Cosphi/sinphi -1 to 1	10 Hz to 1 kHz	0,000 40	measure / generate	P2-02-E.018
Phase angle -180 to 180 °	10 Hz to 1 kHz	0,02°	measure / generate	
P indicates active,reactive as well as apparent power.				- - -

RF Power

Range amplitude	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
-67 dBm to -19 dBm	20 kHz to 100 MHz	0,056 dB	• measure	P2-02-E.036
	100 MHz to 4 GHz	0,047 dB		
-19 dBm to 1 dBm	20 kHz to 100 MHz	0,066 dB	• measure	P2-02-E.036
	100 MHz to 4 GHz	0,058 dB		
1 dBm to 23 dBm	20 kHz to 100 MHz	0,083 dB	• measure	P2-02-E.036
	100 MHz to 4 GHz	0,072 dB		
24 dBm to 20 dBm	10 Hz to 20 kHz	0,050 dB	• generate	P2-02-E.035
	20 kHz to 100 kHz	0,050 dB		
	100 kHz to 10 MHz	0,050 dB		
	10 MHz to 125 MHz	0,050 dB		
20 dBm to 14 dBm	10 Hz to 20 kHz	0,050 dB	• generate	P2-02-E.035
	20 kHz to 100 kHz	0,050 dB		
	100 kHz to 10 MHz	0,050 dB		
	10 MHz to 125 MHz	0,050 dB		
	125 MHz to 300 MHz	0,10 dB		
	300 MHz to 1,4 GHz	0,25 dB		
14 dBm to -17 dBm	10 Hz to 20 kHz	0,050 dB	• generate	P2-02-E.035
	20 kHz to 100 kHz	0,050 dB		
	100 kHz to 10 MHz	0,050 dB		
	10 MHz to 125 MHz	0,050 dB		
	125 MHz to 300 MHz	0,10 dB		
	300 MHz to 1,4 GHz	0,25 dB		
	1,4 GHz to 3 GHz	0,30 dB		
	3 GHz to 4 GHz	0,50 dB		

-17 dBm to -48 dBm	10 Hz to 20 kHz	0,050 dB	• generate	P2-02-E.035
	20 kHz to 100 kHz	0,050 dB		
	100 kHz to 10 MHz	0,050 dB		
	10 MHz to 125 MHz	0,050 dB		
	125 MHz to 300 MHz	0,10 dB		
	300 MHz to 1,4 GHz	0,50 dB		
	1,4 GHz to 3 GHz	0,50 dB		
	3 GHz to 4 GHz	0,50 dB		
-48 dBm to -74 dBm	100 kHz to 10 MHz	0,20 dB	• generate	P2-02-E.035
	10 MHz to 125 MHz	0,20 dB		
	125 MHz to 300 MHz	0,20 dB		
	300 MHz to 1,4 GHz	0,50 dB		
	1,4 GHz to 3 GHz	0,50 dB		
	3 GHz to 4 GHz	0,50 dB		
-74 dBm to -84 dBm	100 kHz to 10 MHz	0,50 dB	• generate	P2-02-E.035
	10 MHz to 125 MHz	0,50 dB		
	125 MHz to 300 MHz	0,50 dB		
	300 MHz to 1,4 GHz	1,0 dB		
	1,4 GHz to 3 GHz	1,0 dB		
	3 GHz to 4 GHz	1,0 dB		
-84 dBm to -94 dBm	100 kHz to 10 MHz	0,50 dB	• generate	P2-02-E.035
	10 MHz to 125 MHz	0,50 dB		
	125 MHz to 300 MHz	0,50 dB		
	300 MHz to 1,4 GHz	1,0 dB		
	1,4 GHz to 3 GHz	1,0 dB		
-94 dBm to -124 dBm	100 kHz to 10 MHz	1,5 dB	• generate	P2-02-E.035
	10 MHz to 125 MHz	1,5 dB		
	125 MHz to 300 MHz	1,5 dB		
	300 MHz to 1,4 GHz	1,5 dB		
	1,4 GHz to 3 GHz	1,5 dB		

Impedance (DC/LF)
Measure

Measuring range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
1 Ω	DC	$11 \times 10^{-6} \times R$	• Transfer standard in "30 day" loop • Fixed points • Measuring • 4-wire resistance measurement • Negligible dissipated power	P2-02-E.006
10 Ω	DC	$9{,}5 \times 10^{-6} \times R$		
100 Ω	DC	$6{,}5 \times 10^{-6} \times R$		
1 kΩ	DC	$4{,}5 \times 10^{-6} \times R$		
10 kΩ	DC	$4{,}5 \times 10^{-6} \times R$		
100 kΩ	DC	$7{,}5 \times 10^{-6} \times R$		
1 MΩ	DC	$1{,}4 \times 10^{-5} \times R$		
10 MΩ	DC	$2{,}5 \times 10^{-5} \times R$		
100 MΩ	DC	$2{,}0 \times 10^{-4} \times R$		
Measuring range or point	**Frequency**	**expanded uncertainty (*)**	**Remark**	**Calibration procedure**
0 Ω to 2 Ω	DC	$18 \times 10^{-6} \times R$ or 20 μΩ[1]	• measure • 4-wire resistance measurement • negligible dissipated power	P2-02-E.019
2 Ω to 20 Ω	DC	$3{,}1 \times 10^{-6} \times R$		
20 Ω to 200 Ω	DC	$5{,}5 \times 10^{-6} \times R$		
0,2 kΩ to 2 kΩ	DC	$2{,}6 \times 10^{-6} \times R$		
2 kΩ to 20 kΩ	DC	$5{,}0 \times 10^{-6} \times R$		
20 kΩ to 200 kΩ	DC	$6{,}3 \times 10^{-6} \times R$		
0,2 MΩ to 2 MΩ	DC	$6{,}0 \times 10^{-6} \times R$		
2 MΩ to 20 MΩ	DC	$11 \times 10^{-6} \times R$		
20 MΩ to 200 MΩ	DC	$60 \times 10^{-6} \times R$		
0,2 GΩ to 2 GΩ	DC	$1{,}2 \times 10^{-3} \times R$		
[1] Whichever is greater				- - -

Generate

Generating range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
0 Ω	DC	100 μΩ		
1 mΩ	DC	$12 \times 10^{-6} \times R$	• generate • standard resistors • also combinations of these resistors1 • 4-wire resistance • maximum dissipated power 10 mW[1,2]	P2-02-E.020
10 mΩ	DC	$12 \times 10^{-7} \times R$		
100 mΩ	DC	$3 \times 10^{-6} \times R$		
1 Ω	DC	$12 \times 10^{-7} \times R$		
10 Ω, 25 Ω, 100 Ω, 1 kΩ, 10 kΩ, 100 kΩ	DC	$5 \times 10^{-7} \times R$		
1 MΩ	DC	$15 \times 10^{-7} \times R$		
10 MΩ	DC	$8 \times 10^{-6} \times R$		
100 MΩ	DC	$2 \times 10^{-5} \times R$		
1 GΩ	DC	$7 \times 10^{-5} \times R$		
10 GΩ	DC	$3 \times 10^{-4} \times R$		
100 GΩ	DC	$1 \times 10^{-3} \times R$		
1 TΩ	DC	$2 \times 10^{-3} \times R$		
10 TΩ	DC	$6 \times 10^{-3} \times R$		
100 TΩ	DC	$2 \times 10^{-2} \times R$		
378 Ω	DC	$4 \times 10^{-6} \times R$		
10 Ω	75 Hz	$3{,}0 \times 10^{-6} \times R$	• generate • standard resistors • also combinations of these resistors[1] • 4- wire resistance	P2-02-E.020
25 Ω	75 Hz	$1{,}5 \times 10^{-6} \times R$		
100 Ω	75 Hz	$1{,}5 \times 10^{-6} \times R$		
378 Ω	75 Hz	$3{,}0 \times 10^{-6} \times R$		
[1] The uncertainty varies as the combinations and the dissipated power are different.				- - -

[2] these resistors can be used to generate/measure currents from 10pA up to 10A with decreased uncertainties.

Calibration of resistor / insulation meters

Measuring range or point	@Voltage range	expanded uncertainty (*)	Remark	Calibration procedure
10 kΩ to 40 MΩ	50 V to 250 V	$1{,}0 \times 10^{-4} \times R$		RP/02/KC/E.17
40 MΩ to 200 MΩ		$5{,}0 \times 10^{-4} \times R$		
100 kΩ to 200 MΩ	250 V to 1000 V	$1{,}0 \times 10^{-4} \times R$		
200 MΩ to 1000 MΩ		$3{,}0 \times 10^{-4} \times R$		
1 MΩ to 10 GΩ	1 kV to 10 kV	$60 \times 10^{-4} \times R$		

Capacity

Measuring range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
10 pF to 100 pF	1 kHz	$15 \times 10^{-4} \times C$	Measure / generate	P2-02-E.010
100 pF to 1000 nF	1 kHz	$10 \times 10^{-4} \times C$	Measure / generate	
1000 nF	100 Hz	$4{,}0 \times 10^{-4} \times C$	Measure / generate	
10 pF, 100 pF, 1 nF, 10 nF	1 kHz	$1{,}0 \times 10^{-4} \times C$	Generate	P2-02-E.040
100 nF, 1 µF	1 kHz	$1{,}5 \times 10^{-4} \times C$		
10 µF	1 kHz	$3{,}0 \times 10^{-4} \times C$		
100 µF	1 kHz	$5{,}0 \times 10^{-4} \times C$		
1 µF	100 Hz	$2{,}0 \times 10^{-4} \times C$		
10 µF	100 Hz	$3{,}0 \times 10^{-4} \times C$		
100 µF	100 Hz	$5{,}0 \times 10^{-4} \times C$		

Inductance

Measuring range or point	Frequency	expanded uncertainty (*)	Remark	calibration/procedure
100 µH to 1 H	1 kHz	$10 \times 10^{-4} \times L$	Measure / generate	P2-02-E.010
1 H to 10 H	1 kHz	$20 \times 10^{-4} \times L$	Measure / generate	
100 µH, 1 mH, 10 mH, 100 mH, 1H	1 kHz	$5{,}0 \times 10^{-4} \times L$	Generate	P2-02-E.040
10 H	100 Hz, 1 kHz	$7{,}0 \times 10^{-4} \times L$		

Oscilloscopes (on screen) – input impedance 50 Ω and 1 MΩ

Measuring range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
± 1 mV to 200 V	DC	$2{,}5 \times 10^{-4} \times U + 25\ \mu V$	50 Ω to 5,56 V	P2-02-E.007
1 mVpp to 21 mVpp	10 Hz to 10 kHz	$25 \times 10^{-4} \times U + 10\ \mu V$	Square wave	
21 mVpp to 556 mVpp	10 Hz to 10 kHz	$10 \times 10^{-4} \times U + 10\ \mu V$	Square wave	
556 mVpp to 210 Vpp	10 Hz to 10 kHz	$5{,}0 \times 10^{-4} \times U + 10\ \mu V$	Square wave 50 Ω to 5,56 V	
4,44 mVpp to 5,56 Vpp	100 mHz to 100 MHz	$1{,}5 \times 10^{-2} \times U$	Sine wave	
4,44 mVpp to 5,56 Vpp	100 MHz to 550 MHz	$3{,}0 \times 10^{-2} \times U$	Sine wave	
4,44 mVpp to 3,35 Vpp	550 MHz to 1 GHz	$4{,}0 \times 10^{-2} \times U$	Sine wave	
4,44 mVpp to 3,54 Vpp	1 GHz to 4 GHz	$6{,}0 \times 10^{-2} \times U$	Sine wave	
500 ps	-	40 ps	Rise/ falltime (max. 3 V)	
250 ps to 10 ks	-	$5{,}0 \times 10^{-9} \times t$	Time base	
40 Ω to 90 Ω	1 kHz	$1{,}0 \times 10^{-3} \times Z$	Input impedance	
0,8 MΩ to 1,2 MΩ				
10 Ω to 150 Ω	1 kHz	$5{,}0 \times 10^{-3} \times Z$	Input impedance	
50 kΩ to 12 MΩ				
	0,1 Hz to 100 MHz	0,15 dB	Attenuation at bandwidth	
	100 MHz to 550 MHz	0,30 dB	Attenuation at bandwidth	
	550 MHz to 1 GHz	0,40 dB	Attenuation at bandwidth	
	1 GHz to 4 GHz	0,50 dB	Attenuation at bandwidth	P2-02-E.035

Bridge calibration

Measuring range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
-2,5 mV / V to 2,5 mV / V	225 Hz	50×10^{-6} mV / V	5 V supply / 350 Ω bridges	

(*) the smallest uncertainty of measurement the laboratory can provide to its customers, expressed as the expanded uncertainty having a coverage probability of approximately 95%.

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Calibration and Measurement Capabilities

Direct voltage

Measure

Measuring range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
0 mV to 200 mV	DC	$5{,}0 \times 10^{-6} \times U + 2{,}0\ \mu V$	• measure • positive / negative	P2-02-E.019.C
0,2 V to 2 V	DC	$5{,}0 \times 10^{-6} \times U + 2{,}0\ \mu V$		
2 V to 20 V	DC	$5{,}0 \times 10^{-6} \times U + 5{,}0\ \mu V$		
20 V to 200 V	DC	$5{,}5 \times 10^{-6} \times U + 60\ \mu V$		
200 V to 1000 V	DC	$6{,}0 \times 10^{-6} \times U + 550\ \mu V$		

Generate

Generating range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
0 mV to 220 mV	DC	$8{,}0 \times 10^{-6} \times U + 2{,}0\ \mu V$	• generate • positive / negative	P2-02-E.039.C
220 mV to 2,2 V	DC	$8{,}0 \times 10^{-6} \times U + 2{,}0\ \mu V$		
2,2 V to 22 V	DC	$8{,}0 \times 10^{-6} \times U + 6{,}5\ \mu V$		
22 V to 220 V	DC	$9{,}0 \times 10^{-6} \times U + 80\ \mu V$		
220 V to 1100 V	DC	$11 \times 10^{-6} \times U + 500\ \mu V$		

Direct current

Measure

Measuring range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
0 µA to 200 µA	DC	$12 \times 10^{-6} \times I + 1{,}0\ nA$	• measure • in the lowest possible range • positive / negative	P2-02-E.019.C
0,2 mA to 2,0 mA	DC	$12 \times 10^{-6} \times I + 6{,}0\ nA$		
2,0 mA to 20 mA	DC	$15 \times 10^{-6} \times I + 50\ nA$		
20 mA to 200 mA	DC	$55 \times 10^{-6} \times I + 2{,}5\ \mu A$		
0,2 A to 2 A	DC	$20 \times 10^{-5} \times I + 20\ \mu A$		
2 A to 20 A	DC	$41 \times 10^{-5} \times I + 450\ \mu A$		
20 A to 100 A	DC	$1{,}5 \times 10^{-4} \times I$ or 2,0 mA[1]		

[1] Whichever is greater

Calibration of current clamps

Measuring range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
20 A to 1000 A	DC	$5{,}0 \times 10^{-3} \times I$	• with current coils	P2-02-E.021

Generate

Generating range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
0 µA to 2,2 mA	DC	$55 \times 10^{-6} \times I + 8{,}0\ nA$	• generate • positive / negative	P2-02-E.039.C
2,2 mA to 22 mA	DC	$55 \times 10^{-6} \times I + 80\ nA$		
22 mA to 220 mA	DC	$90 \times 10^{-6} \times I + 1{,}0\ \mu A$		
220 mA to 2,2 A	DC	$12 \times 10^{-5} \times I + 30\ \mu A$		
2,2 A to 11 A	DC	$38 \times 10^{-5} \times I + 490\ \mu A$		
11 A to 100 A	DC	$10 \times 10^{-4} \times I$		

Alternating voltage

Measure

Measuring range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
10 mV to 200 mV	20 Hz to 10 kHz	$14 \times 10^{-5} \times U + 5{,}0\ \mu V$	• measure	P2-02-E.019.C
	10 kHz to 30 kHz	$35 \times 10^{-5} \times U + 10\ \mu V$		
	30 kHz to 100 kHz	$77 \times 10^{-5} \times U + 22\ \mu V$		
200 mV to 2 V	20 Hz to 10 kHz	$12 \times 10^{-5} \times U + 25\ \mu V$	• measure	P2-02-E.019.C
	10 kHz to 30 kHz	$25 \times 10^{-5} \times U + 50\ \mu V$		
	30 kHz to 100 kHz	$57 \times 10^{-5} \times U + 210\ \mu V$		
2 V to 20 V	20 Hz to 10 kHz	$12 \times 10^{-5} \times U + 200\ \mu V$	• measure	P2-02-E.019.C
	10 kHz to 30 kHz	$25 \times 10^{-5} \times U + 400\ \mu V$		
	30 kHz to 100 kHz	$58 \times 10^{-5} \times U + 2000\ \mu V$		
20 V to 200 V	20 Hz to 10 kHz	$12 \times 10^{-5} \times U + 2{,}0\ mV$	• measure	P2-02-E.019.C
	10 kHz to 30 kHz	$22 \times 10^{-5} \times U + 5{,}0\ mV$		
	30 kHz to 100 kHz	$57 \times 10^{-5} \times U + 22\ mV$		
200 V to 1000 V	50 Hz to 10 kHz	$30 \times 10^{-5} \times U + 50\ \mu V$	• measure	P2-02-E.019.C
	10 kHz to 30 kHz	$15 \times 10^{-4} \times U + 50\ mV$		

Generate

Generating range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
2,2 mV to 22 mV	20 Hz to 20 kHz	$13 \times 10^{-5} \times U + 6{,}0\ \mu V$	• generate	P2-02-E.039.C
	20 kHz to 100 kHz	$87 \times 10^{-5} \times U + 30\ \mu V$		
22 mV to 220 mV	20 Hz to 20 kHz	$13 \times 10^{-5} \times U + 9{,}0\ \mu V$	• generate	
	20 kHz to 100 kHz	$88 \times 10^{-5} \times U + 30\ \mu V$		
0,22 V to 2,2 V	20 Hz to 20 kHz	$10 \times 10^{-5} \times U + 10\ \mu V$	• generate	
	20 kHz to 100 kHz	$26 \times 10^{-5} \times U + 90\ \mu V$		
2,2 V to 22 V	40 Hz to 20 kHz	$11 \times 10^{-5} \times U + 70\ \mu V$	• generate	
	20 kHz to 100 kHz	$28 \times 10^{-5} \times U + 360\ \mu V$		
22 V to 220 V	40 Hz to 20 kHz	$11 \times 10^{-5} \times U + 1{,}0\ mV$	• generate	
	20 kHz to 100 kHz	$52 \times 10^{-5} \times U + 10\ mV$		
220 V to 1100 V	50 Hz to 1 kHz	$11 \times 10^{-5} \times U + 5{,}0\ mV$	• generate	
	1 kHz to 20 kHz	$18 \times 10^{-5} \times U + 8{,}0\ mV$		

Alternating current

Measure

Measuring range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
10 µA to 200 µA	55 Hz to 5 kHz	$31 \times 10^{-5} \times I + 40\ nA$	• measure	P2-02-E.019.C
0,2 mA to 2 mA	50 Hz to 5 kHz	$31 \times 10^{-5} \times I + 400\ nA$		
2 mA to 20 mA	50 Hz to 5 kHz	$31 \times 10^{-5} \times I + 2{,}5\ \mu A$		
20 mA to 200 mA	50 Hz to 5 kHz	$30 \times 10^{-5} \times I + 25\ \mu A$		
0,2 A to 2 A	50 Hz to 1 kHz	$63 \times 10^{-5} \times I + 25\ \mu A$		
	1 kHz to 5 kHz	$73 \times 10^{-5} \times I + 25\ \mu A$		
2 A to 20 A	50 Hz to 1 kHz	$85 \times 10^{-5} \times I + 250\ \mu A$		

Calibration of current clamps

Measuring range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
20 A to 1000 A	45 Hz to 440 Hz	$5{,}0 \times 10^{-3} \times I$	• with current coils	P2-02-E.021

Generate

Generating range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
10 µA to 220 µA	40 Hz to 1 kHz	$14 \times 10^{-5} \times I$ + 35 nA	• generate	P2-02-E.039.C
220 µA to 2,2 mA	40 Hz to 1 kHz	$20 \times 10^{-5} \times I$ + 35 nA		
2,2 mA to 22 mA	40 Hz to 1 kHz	$20 \times 10^{-5} \times I$ + 350 nA		
22 mA to 220 mA	40 Hz to 1 kHz	$20 \times 10^{-5} \times I$ + 3,5 µA		
220 mA to 2,2 A	40 Hz to 1 kHz	$70 \times 10^{-5} \times I$ + 35 µA		
2,2 A to 11 A	40 Hz to 1 kHz	$65 \times 10^{-5} \times I$ + 200 µA		

Impedance (DC/LF)

Measure

Measuring range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
0 Ω to 2 Ω	DC	($18 \times 10^{-6} \times R$ + 5,0 µΩ) or 20 µΩ[1]	• measure • 4-wire resistance measurement • negligible dissipated power	P2-02-E.019.C
2 Ω to 20 Ω	DC	$10 \times 10^{-6} \times R$ + 15 µΩ		
20 Ω to 200 Ω	DC	$10 \times 10^{-6} \times R$ + 50 µΩ		
200 Ω to 2 kΩ	DC	$10 \times 10^{-6} \times R$ + 500 µΩ		
2 kΩ to 20 kΩ	DC	$10 \times 10^{-6} \times R$ + 5 mΩ		
20 kΩ to 200 kΩ	DC	$10 \times 10^{-6} \times R$ + 50 mΩ		
0,2 MΩ to 2 MΩ	DC	$11 \times 10^{-6} \times R$ + 1,2 Ω		
2 MΩ to 20 MΩ	DC	$25 \times 10^{-6} \times R$ + 120 Ω		
20 MΩ to 200 MΩ	DC	$13 \times 10^{-5} \times R$ + 12 kΩ		
200 MΩ to 2 GΩ	DC	$16 \times 10^{-4} \times R$ + 1,2 MΩ		

[1] Whichever is greater

Generate

Generating range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
0 Ω	DC	100 µΩ	• generate • fixed points • 4-wire resistance • lowest possible power dissipation • * 2-wire resistance	P2-02-E.039.C
1 Ω, 1,9 Ω	DC	$12 \times 10^{-5} \times R$		
10 Ω, 19 Ω	DC	$35 \times 10^{-6} \times R$		
100 Ω, 190 Ω	DC	$20 \times 10^{-6} \times R$		
1 kΩ, 1,9 kΩ, 10 kΩ, 19 kΩ, 100 kΩ, 190 kΩ	DC	$17 \times 10^{-6} \times R$		
1 MΩ, 1,9 MΩ	DC	$30 \times 10^{-6} \times R$		
10 MΩ, 19 MΩ	DC	$60 \times 10^{-6} \times R$		
100 MΩ*	DC	$15 \times 10^{-5} \times R$		

Calibration of resistor / insulation meters

Measuring range or point	Resistance	expanded uncertainty (*)	Remark	Calibration procedure
50 V to 250 V	10 kΩ to 40 MΩ	$1{,}0 \times 10^{-4} \times R$		P2-02-E.017
	40 MΩ to 200 MΩ	$5{,}0 \times 10^{-4} \times R$		
250 V to 1000 V	100 kΩ to 200 MΩ	$1{,}0 \times 10^{-4} \times R$		
	200 MΩ to 1000 MΩ	$3{,}0 \times 10^{-4} \times R$		

Capacity

Measuring range or point	Frequency	expanded uncertainty (*)	Remark	Calibration procedure
1 µF	20 Hz, 100 Hz, 1 kHz	0,50%	Capacitance generation on all DUTs with a "capacitance measurement" function.	P2-02-E.053
10 µF	20 Hz, 100 Hz, 1 kHz	0,50%		P2-02-E.053

(*) the smallest uncertainty of measurement the laboratory can provide to its customers, expressed as the expanded uncertainty having a coverage probability of approximately 95%.