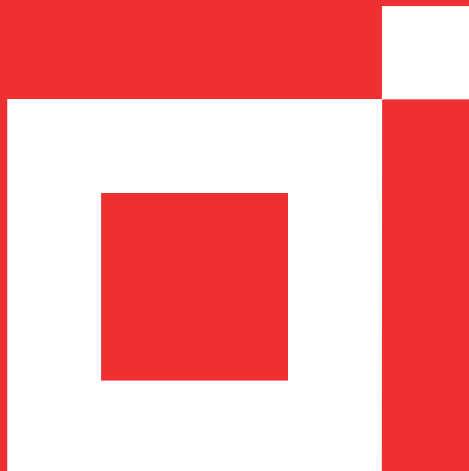




Potvrda o akreditaciji Accreditation Certificate

Ovime se utvrđuje da je

This is to recognize that

LUMIO21 d.o.o.

Mjeriteljski laboratorij

Nikole Božidarevića 13, HR-10000 Zagreb

osposobljen prema zahtjevima norme

is competent according to

HRN EN ISO/IEC 17025:2017

(ISO/IEC 17025:2017;

EN ISO/IEC 17025:2017)

za/to carry out

Umjeravanje etalona i mjerila: električnih veličina, frekvencije, vremenskog intervala, temperature, tlaka, relativne vlažnosti, osvjetljenja i brzine protoka zraka

Calibration of measurement standards and electrical measuring instruments, frequency, time interval, temperature, pressure, relative humidity, illuminance and airflow velocity

u području opisanom u prilogu koji je sastavni dio ove potvrde o akreditaciji.

for the scope described in the annex which is the constituent part of this accreditation certificate.

Br./No.: 2058

Klasa/Ref.No.: 383-02/24-80/003

Urbroj/Id.No.: 569-02/10-24-44

Zagreb, 2024-09-16

Akreditacija istječe-Accreditation expiry: 2029-09-15

Prva akreditacija-Initial accreditation: 2004-09-03

HAA je potpisnica multilateralnog sporazuma s Europskom organizacijom za akreditaciju (EA)

HAA is a signatory of the European co-operation for Accreditation (EA) Multilateral Agreement

Ravnateljica:

Director General:

mr. sc. Mirela Zečević



HAA

Hrvatska akreditacijska agencija
Croatian Accreditation Agency



HAA

Hrvatska akreditacijska agencija
Croatian Accreditation Agency

PRILOG POTVRDI O AKREDITACIJI br.: 2058

Annex to the Accreditation Certificate No.:

Klasa/Ref. No.: 383-02/24-80/003

Urbroj/Id. No.: 569-02/10-24-43

Datum izdanja priloga/Annex issued on: 2024-09-16

Zamjenjuje prilog/Replaces Annex:

Klasa/Ref. No.: 383-02/19-80/008

Urbroj/Id. No.: 569-02/11-23-25

Datum izdanja priloga/Annex Issued on: 2023-10-18

Norma: HRN EN ISO/IEC 17025:2017

Standard:(ISO/IEC 17025:2017; EN ISO/IEC 17025:2017)

Akreditacija istječe: 2029-09-15

Accreditation expiry:

Prva akreditacija: 2004-09-03

Initial accreditation:

Akreditirani laboratorij

Accredited laboratory

Lumio21 d.o.o.

Gradiška 3, HR-10000 Zagreb

Mjeriteljski laboratorij

Nikole Božidarevića 13, HR-10000 Zagreb

Područje akreditacije:

Scope of Accreditation:

**Umjeravanje etalona i mjerila: električnih veličina, frekvencije,
vremenskog intervala, temperature, tlaka, relativne vlažnosti,
osvjetljenja i brzine protoka zraka**

*Calibration of measurement standards and electrical measuring instruments,
frequency, time interval, temperature, pressure, relative humidity,
illuminance and airflow velocity*

Važeće izdanje Priloga dostupno je na web adresi: www.akreditacija.hr
Valid issue of the Annex is available at the web address: www.akreditacija.hr

Ravnateljica:

Director General:

mr. sc. Mirela Zečević

PODRUČJE AKREDITACIJE/SCOPE OF ACCREDITATION

Mjerne sposobnosti umjeravanja (CMC)/Calibration and Measurement Capabilities (CMC)

Umjeravanje u laboratoriju/Calibration performed in a laboratory						
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded Uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks
1.	Istosmjerni napon DC Voltage	0 mV do/to 120 mV		$1,5 \cdot 10^{-5} \cdot U + 2 \mu V$	TP-ELQ-01-U Izdanje/Issue 02 2023-12-28;	Mjerenje + generiranje Measurement + generating
		120 mV do/to 1000 V		$1,5 \cdot 10^{-5} \cdot U$		
		1 kV do/to 7,5 kV		$1,6 \cdot 10^{-2} \cdot U$	TP-ELQ-07-DMM Izdanje/Issue 02 2023-12-28	Mjerenje/Measurement
		7,5 kV do/to 15 kV		$1,5 \cdot 10^{-2} \cdot U$		
		15 kV do/to 30 kV		$1,5 \cdot 10^{-2} \cdot U$	EURAMET cg-15 v.3.0, 2015-02	
		30 kV do/to 40 kV		$2,4 \cdot 10^{-2} \cdot U$		

Umjeravanje u laboratoriju/Calibration performed in a laboratory								
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded Uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks		
2.	Izmjenični napon AC Voltage	0 mV do/to 10 mV	1 Hz do/to 40 Hz	$4,0 \cdot 10^{-4} \cdot U + 6 \mu V$	TP-ELQ-01-U Izdanje/Issue 02 2023-12-28;	Mjerenje/Measurement		
			40 Hz do/to 1 kHz	$2,5 \cdot 10^{-4} \cdot U + 5 \mu V$				
			1 kHz do/to 20 kHz	$4,0 \cdot 10^{-4} \cdot U + 5 \mu V$			TP-ELQ-07-DMM Izdanje/Issue 02 2023-12-28	
			20 kHz do/to 50 kHz	$1,2 \cdot 10^{-3} \cdot U + 5 \mu V$				
			50 kHz do/to 100 kHz	$6,0 \cdot 10^{-3} \cdot U + 5 \mu V$				EURAMET cg-15 v.3.0, 2015-02
			100 kHz do/to 300 kHz	$4,7 \cdot 10^{-2} \cdot U + 5,5 \mu V$				
			300 kHz do/to 1 MHz	$1,4 \cdot 10^{-2} \cdot U + 7,5 \mu V$				
			1 MHz do/to 2 MHz	$8,5 \cdot 10^{-2} \cdot U + 9,5 \mu V$				
		10 mV do/to 10 V	1 Hz do/to 1 kHz	$4,0 \cdot 10^{-4} \cdot U$				
			1 kHz do/to 20 kHz	$2,0 \cdot 10^{-4} \cdot U$				
		10 mV do/to 10 V	20 kHz do/to 50 kHz	$4,0 \cdot 10^{-4} \cdot U$				
			50 kHz do/to 100 kHz	$1,0 \cdot 10^{-3} \cdot U$				
		10 mV do/to 10 V	100 kHz do/to 300 kHz	$4,0 \cdot 10^{-3} \cdot U$				
			300 kHz do/to 1 MHz	$1,2 \cdot 10^{-2} \cdot U$				
			1 MHz do/to 2 MHz	$3,0 \cdot 10^{-2} \cdot U$				
		10 V do/to 100 V	1 Hz do/to 20 kHz	$3,0 \cdot 10^{-4} \cdot U$				
			20 kHz do/to 50 kHz	$4,5 \cdot 10^{-4} \cdot U$				
			50 kHz do/to 100 kHz	$1,5 \cdot 10^{-3} \cdot U$				
			100 kHz do/to 300 kHz	$5,0 \cdot 10^{-3} \cdot U$				
			300 kHz do/to 1 MHz	$1,8 \cdot 10^{-2} \cdot U$				

Umjeravanje u laboratoriju/Calibration performed in a laboratory						
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded Uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks
2.	Izmjenični napon AC Voltage	100 V do/to 1000 V	1 Hz do/to 40 Hz	$5,5 \cdot 10^{-4} \cdot U$	TP-ELQ-01-U Izdanje/Issue 02 2023-12-28; TP-ELQ-07-DMM Izdanje/Issue 02 2023-12-28 EURAMET cg-15 v.3.0, 2015-02	Mjerenje/Measurement
			40 Hz do/to 1 kHz	$5,0 \cdot 10^{-4} \cdot U$		
			1 kHz do/to 20 kHz	$7,5 \cdot 10^{-4} \cdot U$		
			20 kHz do/to 50 kHz	$1,5 \cdot 10^{-3} \cdot U$		
			50 kHz do/to 100 kHz	$3,5 \cdot 10^{-3} \cdot U$		
		1 kV do/to 7,5 kV	50 Hz	$1,5 \cdot 10^{-2} \cdot U$		Generiranje/Generating
		7,5 kV do/to 15 kV	50 Hz	$1,5 \cdot 10^{-2} \cdot U$		
		15 kV do/to 30 kV	50 Hz	$1,5 \cdot 10^{-2} \cdot U$		
		0 mV do/to 10 mV	10 Hz do/to 3 kHz	$8,5 \cdot 10^{-4} \cdot U + 0,45 \text{ mV}$		
			3 kHz do/to 10 kHz	$1,5 \cdot 10^{-3} \cdot U + 0,6 \text{ mV}$		
			10 kHz do/to 30 kHz	$2,0 \cdot 10^{-3} \cdot U + 1,2 \text{ mV}$		
			30 kHz do/to 50 kHz	$3,0 \cdot 10^{-3} \cdot U + 2,3 \text{ mV}$		
			50 kHz do/to 100 kHz	$4,5 \cdot 10^{-3} \cdot U + 6 \text{ mV}$		
		10 mV do/to 32 mV	10 Hz do/to 3 kHz	$4,0 \cdot 10^{-3} \cdot U$		
			3 kHz do/to 10 kHz	$5,5 \cdot 10^{-3} \cdot U$		
			10 kHz do/to 30 kHz	$9,5 \cdot 10^{-3} \cdot U$		
			30 kHz do/to 50 kHz	$1,9 \cdot 10^{-2} \cdot U$		
			50 kHz do/to 100 kHz	$5,0 \cdot 10^{-2} \cdot U$		
		32 mV do/to 3,2 V	10 Hz do/to 3 kHz	$9,0 \cdot 10^{-4} \cdot U$		
			3 kHz do/to 10 kHz	$1,5 \cdot 10^{-3} \cdot U$		
			10 kHz do/to 30 kHz	$2,0 \cdot 10^{-3} \cdot U$		
			30 kHz do/to 50 kHz	$3,0 \cdot 10^{-3} \cdot U$		
			50 kHz do/to 100 kHz	$5,0 \cdot 10^{-3} \cdot U$		

Umjeravanje u laboratoriju/Calibration performed in a laboratory						
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded Uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks
2.	Izmjenični napon AC Voltage	3,2 V do/to 105 V	10 Hz do/to 10 kHz	$1,5 \cdot 10^{-3} \cdot U$	TP-ELQ-01-U Izdanje/Issue 02 2023-12-28;	Generiranje/Generating
			10 kHz do/to 30 kHz	$2,5 \cdot 10^{-3} \cdot U$		
			30 kHz do/to 50 kHz	$3,5 \cdot 10^{-3} \cdot U$		
			50 kHz do/to 100 kHz	$6,5 \cdot 10^{-3} \cdot U$		
		105 V do/to 800 V	40 Hz do/to 100 Hz	$6,0 \cdot 10^{-3} \cdot U$	TP-ELQ-07-DMM Izdanje/Issue 02 2023-12-28	
			100 Hz do/to 10 kHz	$4,0 \cdot 10^{-3} \cdot U$		
			10 kHz do/to 30 kHz	$4,5 \cdot 10^{-3} \cdot U$		
		800 V do/to 1050 V	40 Hz do/to 100 Hz	$6,0 \cdot 10^{-3} \cdot U$	EURAMET cg-15 v.3.0, 2015-02	
			100 Hz do/to 10 kHz	$4,0 \cdot 10^{-3} \cdot U$		
			10 kHz do/to 20 kHz	$4,5 \cdot 10^{-3} \cdot U$		
3.	Istosmjerna struja DC Current	0 do/to 100 nA		$4,5 \cdot 10^{-5} \cdot I + 0,05 \text{ nA}$	TP-ELQ-02-I Izdanje/Issue 02 2023-12-28;	Mjerenje/Measurement
		100 nA do/to 1 μA		$8,0 \cdot 10^{-5} \cdot I$		
		1 μA do/to 100 μA		$4,5 \cdot 10^{-5} \cdot I$		
		100 μA do/to 10 mA		$4,0 \cdot 10^{-5} \cdot I$	TP-ELQ-07-DMM Izdanje/Issue 02 2023-12-28;	
		10 mA do/to 100 mA		$5,5 \cdot 10^{-5} \cdot I$		
		100 mA do/to 1 A		$1,5 \cdot 10^{-4} \cdot I$		
		1 A do/to 20 A		$3,0 \cdot 10^{-3} \cdot I$		

Umjeravanje u laboratoriju/Calibration performed in a laboratory						
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded Uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks
3.	Istosmjerna struja DC Current	4 A do/to 50 A		$7,0 \cdot 10^{-3} \cdot I$	TP-ELQ-02-I Izdanje/Issue 02 2023-12-28	Mjerenje pomoću strujnog transformatora Measurement with current transformer
		50 A do/to 600 A		$4,0 \cdot 10^{-3} \cdot I$		
		0 μA do/to 320 μA		$2,0 \cdot 10^{-4} \cdot I + 0,015 \text{ μA}$	TP-ELQ-02-I Izdanje/Issue 02 2023-12-28;	Generiranje/Generating
		0,32 mA do/to 32 mA		$2,0 \cdot 10^{-4} \cdot I$		
		32 mA do/to 320 mA		$2,5 \cdot 10^{-4} \cdot I$	TP-ELQ-07-DMM Izdanje/Issue 02 2023-12-28;	
		0,32 A do/to 10,5 A		$7,5 \cdot 10^{-4} \cdot I$		
		10,5 A do/to 20 A		$9,0 \cdot 10^{-4} \cdot I$	EURAMET cg-15 v.3.0, 2015-02	
		10 μA do/to 320 μA		$2,0 \cdot 10^{-4} \cdot I + 0,02 \text{ μA}$	TP-ELQ-02-I Izdanje/Issue 02 2023-12-28	Generiranje/Generating Umjeravanje strujnih kliješta Current clamp calibration
		0,32 mA do/to 3,2 mA		$2,0 \cdot 10^{-4} \cdot I + 0,2 \text{ μA}$		
		3,2 mA do/to 32 mA		$2,0 \cdot 10^{-4} \cdot I + 2 \text{ μA}$		
		32 mA do/to 320 mA		$2,0 \cdot 10^{-4} \cdot I + 0,05 \text{ mA}$		
		0,32 A do/to 3,2 A		$7,0 \cdot 10^{-4} \cdot I + 0,01 \text{ A}$		
		3,2 A do/to 105 A		$2,5 \cdot 10^{-3} \cdot I + 0,2 \text{ A}$		
		105 A do/to 160 A		$2,5 \cdot 10^{-3} \cdot I + 0,4 \text{ A}$		
		160 A do/to 525 A		$2,5 \cdot 10^{-3} \cdot I + 1 \text{ A}$		
		525 A do/to 1000 A		$2,5 \cdot 10^{-3} \cdot I + 2 \text{ A}$		

Umjeravanje u laboratoriju/Calibration performed in a laboratory						
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded Uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks
4.	Izmjenična struja AC Current	0 µA do/to 100 µA	10 Hz do/to 20 Hz	$5,0 \cdot 10^{-3} \cdot I + 0,035 \text{ µA}$	TP-ELQ-02-I Izdanje/Issue 02 2023-12-28; TP-ELQ-07-DMM Izdanje/Issue 02 2023-12-28; EURAMET cg-15 v.3.0, 2015-02	Mjerenje/Measurement
			20 Hz do/to 45 Hz	$2,0 \cdot 10^{-3} \cdot I + 0,035 \text{ µA}$		
			45 Hz do/to 5 kHz	$7,5 \cdot 10^{-4} \cdot I + 0,035 \text{ µA}$		
		100 µA do/to 100 mA	10 Hz do/to 20 Hz	$5,0 \cdot 10^{-3} \cdot I$		
			20 Hz do/to 45 Hz	$2,0 \cdot 10^{-3} \cdot I$		
			45 Hz do/to 100 Hz	$9,5 \cdot 10^{-4} \cdot I$		
			100 Hz do/to 5 kHz	$6,2 \cdot 10^{-4} \cdot I$		
			5 kHz do/to 20 kHz	$2,5 \cdot 10^{-3} \cdot I$		
			20 kHz do/to 50 kHz	$5,5 \cdot 10^{-3} \cdot I$		
			50 kHz do/to 100 kHz	$8,5 \cdot 10^{-3} \cdot I$		
		100 mA do/to 1 A	10 Hz do/to 20 Hz	$5,0 \cdot 10^{-3} \cdot I$		
			20 Hz do/to 45 Hz	$2,5 \cdot 10^{-3} \cdot I$		
			45 Hz do/to 100 Hz	$1,5 \cdot 10^{-3} \cdot I$		
			100 Hz do/to 5 kHz	$2,0 \cdot 10^{-3} \cdot I$		
		100 mA do/to 1 A	5 kHz do/to 20 kHz	$5,4 \cdot 10^{-3} \cdot I$		
			20 kHz do/to 50 kHz	$1,3 \cdot 10^{-2} \cdot I$		
		1 A do/to 20 A	0,05 Hz do/to 45 Hz	$1,0 \cdot 10^{-3} \cdot I$		
		1 A do/to 2,5 A	45 Hz do/to 65 Hz	$2,0 \cdot 10^{-3} \cdot I$		
		2,5 A do/to 20 A	45 Hz do/to 65 Hz	$3,0 \cdot 10^{-3} \cdot I$		
		1 A do/to 20 A	65 Hz do/to 1 kHz	$3,0 \cdot 10^{-3} \cdot I$		
			1 kHz do/to 3 kHz	$3,0 \cdot 10^{-3} \cdot I$		
			3 kHz do/to 15 kHz	$9,0 \cdot 10^{-3} \cdot I$		

Umjeravanje u laboratoriju/Calibration performed in a laboratory						
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded Uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks
4.	Izmjenična struja AC Current	4 A do/to 600 A	0,05 Hz do/to 1 kHz	$1,5 \cdot 10^{-2} \cdot I$	TP-ELQ-02-I Izdanje/Issue 02 2023-12-28	Mjerenje pomoću strujnog transformatora Measurement with current transformer
		4 A do/to 1000 A	2 Hz do/to 10 Hz	$1,5 \cdot 10^{-2} \cdot I$		Mjerenje pomoću strujnih kliješta Measurement with current clamp
			10 Hz do/to 45 Hz	$4,0 \cdot 10^{-3} \cdot I$		
		4 A do/to 20 A	45 Hz do/to 65 Hz	$8,5 \cdot 10^{-3} \cdot I$		
		20 A do/to 120 A		$6,0 \cdot 10^{-3} \cdot I$		
		120 A do/to 240 A		$7,0 \cdot 10^{-3} \cdot I$		
		240 A do/to 1000 A		$6,0 \cdot 10^{-3} \cdot I$		
		4 A do/to 120 A	65 Hz do/to 1 kHz	$1,5 \cdot 10^{-2} \cdot I$		Generiranje/generating Umjeravanje strujnih kliješta Current clamp calibration
		120 A do/to 1000 A		$2,0 \cdot 10^{-2} \cdot I$		
		10 µA do/to 3,2 mA	10 Hz do/to 3 kHz	$1,5 \cdot 10^{-3} \cdot I + 3 \mu\text{A}$		
		3,2 mA do/to 32 mA		$1,5 \cdot 10^{-3} \cdot I + 0,03 \text{ mA}$		
		32 mA do/to 320 mA	10 Hz do/to 3 kHz	$1,5 \cdot 10^{-3} \cdot I + 1 \text{ mA}$		
		320 mA do/to 3,2 A		$3,0 \cdot 10^{-3} \cdot I + 10 \text{ mA}$		
		3,2 A do/to 32 A	10 Hz do/to 100 Hz	$4,0 \cdot 10^{-3} \cdot I + 0,2 \text{ A}$		
		32 A do/to 160 A		$4,0 \cdot 10^{-3} \cdot I + 0,6 \text{ A}$		
		160 A do/to 500 A		$4,0 \cdot 10^{-3} \cdot I + 3 \text{ A}$		
		500 A do/to 1000 A	10 Hz do/to 50 Hz	$4,0 \cdot 10^{-3} \cdot I + 3 \text{ A}$		
		3,2 A do/to 32 A	100 Hz do/to 440 Hz	$1,5 \cdot 10^{-2} \cdot I + 0,2 \text{ A}$		
		32 A do/to 200 A		$1,0 \cdot 10^{-2} \cdot I + 0,5 \text{ A}$		

Umjeravanje u laboratoriju/Calibration performed in a laboratory						
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded Uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks
4.	Izmjenična struja AC Current	0 µA do/to 32 µA	10 Hz do/to 3 kHz	$1,5 \cdot 10^{-3} \cdot I + 1,1 \text{ µA}$	TP-ELQ-02-I Izdanje/Issue 02 2023-12-28; TP-ELQ-07-DMM Izdanje/Issue 02 2023-12-28; EURAMET cg-15 v.3.0, 2015-02	Generiranje/Generating
			3 kHz do/to 10 kHz	$3,5 \cdot 10^{-3} \cdot I + 2,1 \text{ µA}$		
			10 kHz do/to 20 kHz	$5,5 \cdot 10^{-3} \cdot I + 7 \text{ µA}$		
			20 kHz do/to 30 kHz	$8,0 \cdot 10^{-3} \cdot I + 11 \text{ µA}$		
		32 µA do/to 320 µA	10 Hz do/to 3 kHz	$3,0 \cdot 10^{-3} \cdot I$		
			3 kHz do/to 10 kHz	$1,3 \cdot 10^{-2} \cdot I$		
			10 kHz do/to 20 kHz	$4,5 \cdot 10^{-2} \cdot I$		
			20 kHz do/to 30 kHz	$9,2 \cdot 10^{-2} \cdot I$		
		0,32 mA do/to 3,2 mA	10 Hz do/to 3 kHz	$2,0 \cdot 10^{-3} \cdot I$		
			3 kHz do/to 10 kHz	$4,0 \cdot 10^{-3} \cdot I$		
			10 kHz do/to 20 kHz	$8,0 \cdot 10^{-3} \cdot I$		
			20 kHz do/to 30 kHz	$1,4 \cdot 10^{-2} \cdot I$		
		3,2 mA do/to 32 mA	10 Hz do/to 3 kHz	$2,0 \cdot 10^{-3} \cdot I$		
			3 kHz do/to 10 kHz	$3,5 \cdot 10^{-3} \cdot I$		
		3,2 mA do/to 32 mA	10 kHz do/to 20 kHz	$7,0 \cdot 10^{-3} \cdot I$		
			20 kHz do/to 30 kHz	$1,1 \cdot 10^{-2} \cdot I$		
		32 mA do/to 320 mA	10 Hz do/to 3 kHz	$2,0 \cdot 10^{-3} \cdot I$		
			3 kHz do/to 10 kHz	$3,5 \cdot 10^{-3} \cdot I$		
			10 kHz do/to 20 kHz	$5,5 \cdot 10^{-3} \cdot I$		
			20 kHz do/to 30 kHz	$8,0 \cdot 10^{-3} \cdot I$		

Umjeravanje u laboratoriju/Calibration performed in a laboratory						
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded Uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks
4.	Izmjenična struja AC Current	0,32 A do/to 3,2 A	10 Hz do/to 3 kHz	$3,0 \cdot 10^{-3} \cdot I$	TP-ELQ-02-I Izdanje/Issue 02 2023-12-28; TP-ELQ-07-DMM Izdanje/Issue 02 2023-12-28; EURAMET cg-15 v.3.0, 2015-02	Generiranje/Generating
			3 kHz do/to 10 kHz	$1,4 \cdot 10^{-2} \cdot I$		
		3,2 A do/to 10,5 A	10 Hz do/to 3 kHz	$4,0 \cdot 10^{-3} \cdot I$		
			3 kHz do/to 10 kHz	$1,5 \cdot 10^{-2} \cdot I$		
		10,5 A do/to 20 A	10 Hz do/to 3 kHz	$4,5 \cdot 10^{-3} \cdot I$		
			3 kHz do/to 10 kHz	$2,0 \cdot 10^{-2} \cdot I$		
5.	Otpor/Resistance	0 Ω do/to 10 Ω		$2,5 \cdot 10^{-5} \cdot R + 0,12 \text{ m}\Omega$	TP-ELQ-03-R Izdanje/Issue 02 2023-12-28; TP-ELQ-07-DMM Izdanje/Issue 02 2023-12-28; EURAMET cg-15 v.3.0, 2015-02	Mjerenje/Measurement
		10 Ω do/to 100 Ω		$3,5 \cdot 10^{-5} \cdot R$		
		100 Ω do/to 100 k Ω		$2,0 \cdot 10^{-5} \cdot R$		
		100 k Ω do/to 1 M Ω		$3,0 \cdot 10^{-5} \cdot R$		
		1 M Ω do/to 10 M Ω		$1,0 \cdot 10^{-4} \cdot R$		
		10 M Ω do/to 100 M Ω		$1,5 \cdot 10^{-3} \cdot R$		
		100 M Ω do/to 1 G Ω		$1,2 \cdot 10^{-2} \cdot R$		
		0 Ω do/to 0,06 Ω	1 kHz	$5,0 \cdot 10^{-2} \cdot R + 0,6 \text{ m}\Omega$		
		0,06 Ω do/to 0,6 Ω		$5,0 \cdot 10^{-3} \cdot R$		
		0,6 Ω do/to 6 Ω		$2,5 \cdot 10^{-3} \cdot R$		

Umjeravanje u laboratoriju/Calibration performed in a laboratory						
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded Uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks
5.	Otpor/Resistance	6 Ω do/to 100 Ω	1 kHz	$2,0 \cdot 10^{-3} \cdot R$	TP-ELQ-03-R Izdanje/Issue 02 2023-12-28; TP-ELQ-07-DMM Izdanje/Issue 02 2023-12-28; EURAMET cg-15 v.3.0, 2015-02	Mjerenje/Measurement
		100 Ω do/to 1,6 k Ω		$2,5 \cdot 10^{-3} \cdot R$		
		1,6 k Ω do/to 400 k Ω		$3,5 \cdot 10^{-3} \cdot R$		
		400 k Ω do/to 4 M Ω		$5,0 \cdot 10^{-3} \cdot R$		
		0,06 m Ω (1000 A, 60 mV)		$1,0 \cdot 10^{-2} \cdot R$		Generiranje/Generating Shunt/Shunt
		0,4 m Ω (150 A, 60 mV)		$6,1 \cdot 10^{-3} \cdot R$		
		0,6 m Ω (100 A, 60 mV)		$5,8 \cdot 10^{-3} \cdot R$		
		1,5 m Ω (40 A, 60 mV)		$5,8 \cdot 10^{-3} \cdot R$		
		2 m Ω (30 A, 60 mV)		$5,8 \cdot 10^{-3} \cdot R$		Generiranje/Generating Dekada/Decade
		0,01 Ω do/to 0,1 Ω		$4,7 \cdot 10^{-2} \cdot R$		
		0,1 Ω do/to 1 Ω		$7,0 \cdot 10^{-3} \cdot R$		
		1 Ω do/to 10 Ω		$1,5 \cdot 10^{-3} \cdot R$		
		10 Ω do/to 100 Ω		$5,0 \cdot 10^{-4} \cdot R$		
		100 Ω do/to 10 M Ω		$1,5 \cdot 10^{-4} \cdot R$		Generiranje/Generating
		0 Ω do/to 40 Ω		$3,0 \cdot 10^{-4} \cdot R + 0,012 \Omega$		
		40 Ω do/to 400 Ω		$2,5 \cdot 10^{-4} \cdot R$		
		0,4 k Ω do/to 40 k Ω		$2,0 \cdot 10^{-4} \cdot R$		
		40 k Ω do/to 400 k Ω		$2,5 \cdot 10^{-4} \cdot R$		
		0,4 M Ω do/to 4 M Ω		$3,0 \cdot 10^{-4} \cdot R$		
		4 M Ω do/to 40 M Ω		$6,5 \cdot 10^{-4} \cdot R$		
		40 M Ω do/to 400 M Ω		$8,5 \cdot 10^{-4} \cdot R$		

Umjeravanje u laboratoriju/Calibration performed in a laboratory						
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded Uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks
5.	Otpor/Resistance	100 MΩ		$1,0 \cdot 10^{-4} \cdot R$	TP-ELQ-03-R Izdanje/Issue 02 2023-12-28;	Generiranje/Generating
		1 GΩ		$1,0 \cdot 10^{-3} \cdot R$		
		10 GΩ		$5,0 \cdot 10^{-3} \cdot R$	TP-ELQ-07-DMM Izdanje/Issue 02 2023-12-28;	
		100 GΩ		$2,8 \cdot 10^{-3} \cdot R$		
		1 TΩ		$1,7 \cdot 10^{-2} \cdot R$	EURAMET cg-15 v.3.0, 2015-02	
6.	Kapacitet Capacitance	0 pF do/to 4 pF	1 kHz	$5,0 \cdot 10^{-2} \cdot C + 0,01 \text{ pF}$	TP-ELQ-04-C Izdanje/Issue 02, 2023-12-28	Mjerenje/Measurement
		4 pF do/to 40 pF		$5,0 \cdot 10^{-3} \cdot C$		
		40 pF do/to 25 μF		$6,0 \cdot 10^{-4} \cdot C$		
		25 μF do/to 250 μF		$5,0 \cdot 10^{-3} \cdot C$		
		250 μF do/to 2500 μF		$5,0 \cdot 10^{-2} \cdot C$		
		1 pF do/to 10 pF		$5,9 \cdot 10^{-2} \cdot C$		Generiranje/Generating
		10 pF do/to 100 pF		$6,5 \cdot 10^{-3} \cdot C$		
		100 pF do/to 1000 pF		$1,5 \cdot 10^{-3} \cdot C$		
		1 nF do/to 10 nF		$6,5 \cdot 10^{-4} \cdot C$		
		10 nF do/to 1 μF		$6,0 \cdot 10^{-4} \cdot C$		
		1 μF do/to 10 μF		$2,4 \cdot 10^{-2} \cdot C$		Dekada/Decade
		0,5 nF do/to 4 nF		$1,6 \cdot 10^{-2} \cdot C$		
		4 nF do/to 40 nF		$9,0 \cdot 10^{-3} \cdot C$		

Umjeravanje u laboratoriju/Calibration performed in a laboratory						
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded Uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks
6.	Kapacitet Capacitance	40 nF do/to 400 nF	1 kHz	$8,0 \cdot 10^{-3} \cdot C$	TP-ELQ-04-C Izdanje/Issue 02, 2023-12-28	Generiranje/Generating
		400 nF do/to 4 μ F		$1,1 \cdot 10^{-2} \cdot C$		
		4 μ F do/to 4 mF		$1,3 \cdot 10^{-2} \cdot C$		
		4 mF do/to 40 mF		$2,7 \cdot 10^{-2} \cdot C$		
7.	Induktivitet Inductance	0 mH do/to 0,01 mH	1 kHz	$5,0 \cdot 10^{-2} \cdot L + 0,06 \mu\text{H}$	TP-ELQ-05-L Izdanje/Issue 02, 2023-12-28	Mjerenje/Measurement
		0,01 mH do/to 0,1 mH		$5,0 \cdot 10^{-3} \cdot L$		
		0,1 mH do/to 64 H		$8,0 \cdot 10^{-4} \cdot L$		
		64 H do/to 640 H		$5,0 \cdot 10^{-3} \cdot L$		
		640 H do/to 6400 H		$5,0 \cdot 10^{-2} \cdot L$		
		0,01 mH do/to 10 mH		$1,2 \cdot 10^{-2} \cdot L$		Generiranje/Generating Dekada/Decade
8.	Vremenski interval Time interval	2 μ s do/to 1 s		3 ns	TP-TIF-01-TI Izdanje/Issue 02 2023-12-28	Ručni elektronički sekundomjeri - mjerenje odstupanja s/d
		1 s do/to 10^8 s		$2,2 \cdot 10^{-9} \cdot t$		
		0,00 s/d do/to $\pm 9,99$ s/d		0,03 s/d		Digital hand stopwatches - measurement of deviation s/d
		$\pm 9,99$ s/d do/to $\pm 59,9$ s/d		0,06 s/d		
		5 s do/to 7200 s		0,08 s		Ručni mehanički sekundomjeri Mechanical hand stopwatches

Umjeravanje u laboratoriju/Calibration performed in a laboratory						
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded Uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks
9.	Frekvencija/Frequency	2 mHz do/to 10 Hz		6 nHz	TP-TIF-02-F Izdanje/Issue 02 2023-12-28	Mjerenje/Measurement
		10 Hz do/to 3 GHz		$6,0 \cdot 10^{-10} \cdot f$		
		3 GHz do/to 46 GHz		$1,3 \cdot 10^{-9} \cdot f$		
		1 μHz do/to 10 Hz		0,5 μHz		Generiranje/Generating
		10 Hz do/to 250 kHz		$5,0 \cdot 10^{-8} \cdot f$		
		250 kHz do/to 40 GHz		$6,0 \cdot 10^{-9} \cdot f$		
10.	Impulsi/Pulses	0 do/to 10 ⁵	Broj/Number	2	TP-TIF-03-IMP Izdanje/Issue 02 2023-12-28	Mjerenje/Measurement Generiranje/Generating
		0,1 Hz do/to 1 Hz	Frekvencija/Frequency	$6,0 \cdot 10^{-7} \cdot f + 0,8 \mu\text{Hz}$		
		1 Hz do/to 10 Hz		$6,0 \cdot 10^{-7} \cdot f + 8 \mu\text{Hz}$		
		10 Hz do/to 100 Hz		$6,0 \cdot 10^{-7} \cdot f + 80 \mu\text{Hz}$		
		0,1 kHz do/to 1 kHz		$6,0 \cdot 10^{-7} \cdot f + 0,8 \text{ mHz}$		
		1 kHz do/to 10 kHz		$6,0 \cdot 10^{-7} \cdot f + 8 \text{ mHz}$		
		10 kHz do/to 100 kHz		$6,0 \cdot 10^{-7} \cdot f + 80 \text{ mHz}$		
		0,1 MHz do/to 1 MHz		$6,0 \cdot 10^{-7} \cdot f + 0,8 \text{ Hz}$		
		1 MHz do/to 10 MHz		$6,0 \cdot 10^{-7} \cdot f + 8 \text{ Hz}$		
		0,1 μs do/to 100 μs	Period/Period	$6,0 \cdot 10^{-7} \cdot t + 3 \text{ ns}$		
		0,1 ms do/to 1 ms		$6,0 \cdot 10^{-7} \cdot t + 3,5 \text{ ns}$		
		1 ms do/to 10 ms		$6,0 \cdot 10^{-7} \cdot t + 15 \text{ ns}$		
		10 ms do/to 100 ms		$6,0 \cdot 10^{-7} \cdot t + 0,15 \mu\text{s}$		
		0,1 s do/to 1 s		$6,0 \cdot 10^{-7} \cdot t + 20 \mu\text{s}$		
		1 s do/to 10 s		$6,0 \cdot 10^{-7} \cdot t + 0,25 \text{ ms}$		

Umjeravanje u laboratoriju/Calibration performed in a laboratory						
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded Uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks
10.	Impulsi/Pulses	10 s do/to 100 s	Period/Period	$6,0 \cdot 10^{-7} \cdot t + 0,5 \text{ ms}$	TP-TIF-03-IMP Izdanje/Issue 02 2023-12-28	Mjerenje/Measurement Generiranje/Generating
		0,1 μ s do/to 100 μ s	Širina/Width	$6,0 \cdot 10^{-7} \cdot t + 3 \text{ ns}$		
		0,1 ms do/to 1 ms		$6,0 \cdot 10^{-7} \cdot t + 4 \text{ ns}$		
		1 ms do/to 10 ms		$6,0 \cdot 10^{-7} \cdot t + 15 \text{ ns}$		
		10 ms do/to 100 ms		$6,0 \cdot 10^{-7} \cdot t + 0,15 \mu\text{s}$		
		0,1 s do/to 10 s		$6,0 \cdot 10^{-7} \cdot t + 20 \mu\text{s}$		
		10 s do/to 100 s		$6,0 \cdot 10^{-7} \cdot t + 0,9 \text{ ms}$		
		10 ns do/to 100 ns	Vrijeme porasta/ Rise Time	$6,0 \cdot 10^{-6} \cdot t + 3,5 \text{ ns}$		
		0,1 μ s do/to 1 μ s		$6,0 \cdot 10^{-6} \cdot t + 8 \text{ ns}$		
		1 μ s do/to 10 μ s		$6,0 \cdot 10^{-6} \cdot t + 55 \text{ ns}$		
		10 μ s do/to 100 μ s		$6,0 \cdot 10^{-6} \cdot t + 0,3 \mu\text{s}$		
		0,1 ms do/to 1 ms		$6,0 \cdot 10^{-6} \cdot t + 7 \mu\text{s}$		
		1 ms do/to 10 ms		$6,0 \cdot 10^{-6} \cdot t + 40 \mu\text{s}$		
		10 ms do/to 100 ms		$6,0 \cdot 10^{-6} \cdot t + 55 \mu\text{s}$		
		0,1 s do/to 1 s		$6,0 \cdot 10^{-6} \cdot t + 20 \text{ ms}$		

Umjeravanje u laboratoriju/Calibration performed in a laboratory						
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded Uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks
11.	Impulsi Pretvornici impulsa u druge mjerne veličine i drugih mjernih veličina u impulse Pulses Pulse transducers to other measuring quantities and other measuring quantities to pulses	0 do/to 10 ⁵	Broj/Number	2	TP-TIF-03-IMP Izdanje/Issue 02 2023-12-28	Mjerenje/Measurement Generiranje/Generating
		0,1 Hz do/to 1 Hz	Frekvencija/Frequency	$1,0 \cdot 10^{-4} \cdot f + 1 \mu\text{Hz}$		
		1 Hz do/to 10 Hz		$1,0 \cdot 10^{-4} \cdot f + 10 \mu\text{Hz}$		
		10 Hz do/to 100 Hz		$1,0 \cdot 10^{-4} \cdot f + 0,1 \text{ mHz}$		
		0,1 kHz do/to 1 kHz		$1,0 \cdot 10^{-4} \cdot f + 1 \text{ mHz}$		
		1 kHz do/to 10 kHz		$1,0 \cdot 10^{-4} \cdot f + 10 \text{ mHz}$		
		10 kHz do/to 100 kHz		$1,0 \cdot 10^{-4} \cdot f + 0,1 \text{ Hz}$		
		0,1 MHz do/to 1 MHz		$1,0 \cdot 10^{-4} \cdot f + 1 \text{ Hz}$		
		1 MHz do/to 10 MHz		$1,0 \cdot 10^{-4} \cdot f + 10 \text{ Hz}$		
12.	Osciloskopi Oscilloscopes	0 mV do/to 320 mV	Vertikalni otklon - istosmjerni napon Vertical deflection - DC voltage	$5,0 \cdot 10^{-4} \cdot U + 10 \mu\text{V}$	TP-ELQ-08-OSC Izdanje/Issue 02 2023-12-28	Generiranje/Generating
		0,32 V do/to 3,2 V		$5,0 \cdot 10^{-4} \cdot U + 0,1 \text{ mV}$		
		3,2 V do/to 32 V		$5,0 \cdot 10^{-4} \cdot U + 1 \text{ mV}$		
		32 V do/to 320 V		$5,0 \cdot 10^{-4} \cdot U + 10 \text{ mV}$		
		0 mV do/to 320 mV	Vertikalni otklon - izmjenični napon Vertical deflection – AC voltage	$1,0 \cdot 10^{-2} \cdot U + 6 \text{ mV}$		
		0,32 V do/to 3,2 V		$1,0 \cdot 10^{-2} \cdot U + 5 \text{ mV}$		
		3,2 V do/to 32 V		$1,0 \cdot 10^{-2} \cdot U + 60 \text{ mV}$		
		32 V do/to 105 V		$1,0 \cdot 10^{-2} \cdot U + 0,25 \text{ V}$		
		105 V do/to 320 V		$1,0 \cdot 10^{-2} \cdot U + 0,25 \text{ V}$		

Umjeravanje u laboratoriju/Calibration performed in a laboratory						
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded Uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks
12.	Osciloskopi Oscilloscopes	1 Hz do/to 10 kHz	Frekvencijski raspon Frequency bandwidth	$1,0 \cdot 10^{-2} \cdot f + 0,1 \text{ Hz}$	TP-ELQ-08-OSC Izdanje/Issue 02 2023-12-28 EURAMET cg-7 v1.0, 2011-06	Generiranje/Generating
		10 kHz do/to 100 kHz		$1,0 \cdot 10^{-2} \cdot f + 0,2 \text{ Hz}$		
		0,1 kHz do/to 1 MHz		$1,0 \cdot 10^{-2} \cdot f + 2 \text{ Hz}$		
		1 MHz do/to 10 MHz		$1,0 \cdot 10^{-2} \cdot f + 20 \text{ Hz}$		
		10 MHz do/to 100 MHz	Frekvencijski raspon Frequency bandwidth	$1,0 \cdot 10^{-2} \cdot f + 10 \text{ Hz}$		
		0,1 GHz do/to 1 GHz		$1,0 \cdot 10^{-2} \cdot f + 20 \text{ Hz}$		
		10 ns do/to 1 ms	Horizontalni otklon - Vremenska baza Horizontal deflection – Time Base	$1,0 \cdot 10^{-4} \cdot t + 5 \text{ ns}$		
		1 ms do/to 100 ms		$1,0 \cdot 10^{-4} \cdot t + 10 \text{ ns}$		
		0,1 s do/to 20 s		$1,0 \cdot 10^{-4} \cdot t + 1 \mu\text{s}$		
		10 ns do/to 100 ns	Vrijeme porasta/Rise Time	$1,0 \cdot 10^{-3} \cdot t + 5 \text{ ns}$		
		0,1 μs do/to 1 μs		$1,0 \cdot 10^{-3} \cdot t + 10 \text{ ns}$		
		1 μs do/to 10 μs		$1,0 \cdot 10^{-3} \cdot t + 0,1 \mu\text{s}$		
		10 μs do/to 100 μs		$1,0 \cdot 10^{-3} \cdot t + 0,5 \mu\text{s}$		
		0,1 ms do/to 1 ms		$1,0 \cdot 10^{-3} \cdot t + 10 \mu\text{s}$		
		1 ms do/to 10 ms		$1,0 \cdot 10^{-3} \cdot t + 50 \mu\text{s}$		
		10 ms do/to 100 ms		$1,0 \cdot 10^{-3} \cdot t + 0,1 \text{ ms}$		
		0,1 s do/to 1 s		$1,0 \cdot 10^{-3} \cdot t + 20 \text{ ms}$		

Umjeravanje u laboratoriju/Calibration performed in a laboratory						
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded Uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks
13.	Tlak (podtlak, pretlak)/ Opružni manometri, digitalni manometri s pokazivanjem, pretvornici tlaka s električnim izlazom Gauge pressure/ Pressure gauges, digital pressure gauges, pressure transducers with electrical output	-800 mbar do/to 0 mbar	Generiranje, mjerenje Generating, measurement Tlačni medij: plin Pressure medium: gas	2 mbar	TP-MEH-01-P Izdanje/Issue 02 2023-12-28; DKD-R 6-1 2014-03 EURAMET cg-17 v.4.1, 2022-09	
		0 mbar do/to 400 mbar		1,5 mbar		
		0,4 bar do/to 10 bar		15 mbar		
		10 bar do/to 35 bar		20 mbar		
		0 bar do/to 60 bar	Generiranje, mjerenje Generating, measurement Tlačni medij: ulje Pressure medium: oil	25 mbar		
		60 bar do/to 250 bar		0,15 bar		
		250 bar do/to 600 bar		0,3 bar		
		600 bar do/to 1000 bar		0,45 bar		
14.	Apsolutni tlak, visina/ Pitostatik kalibratori Absolute pressure, altitude Pitostatic calibrators	(1050,41 do/to 300,89) mbar		0,14 mbar	TP-MEH-03-PIT Izdanje/Issue 02 2023-12-28	
		(-304,8 do/to 9144) m		3,048 m		
		(-1000 do/to 30000) ft		10 ft		
		(300,89 do/to 115,97) mbar		0,15 mbar		
		(9144 do/to 15240) m		10,668 m		
		(30000 do/to 55000) ft		35 ft		

Umjeravanje u laboratoriju/Calibration performed in a laboratory						
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded Uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks
15.	Diferencijalni tlak, brzina/ Pitostatik kalibratori Differential pressure, airspeed/ Pitostatic calibrators	(0,65 do/to 105) mbar (dif)		0,774 mbar	TP-MEH-03-PIT Izdanje/Issue 02 2023-12-28	
		(10,29 do/to 128,61) m/s		0,412 m/s		
		(37,04 do/to 463) km/h		1,482 km/h		
		(0 do/to 250) kt		0,8 kt		
16.	Temperatura/ Termometri s direktnim pokazivanjem, termometri s ugrađenim pretvornikom temperature Temperature/Thermometers with direct display, thermometers with built-in temperature transmitter	-30 °C do/to 155 °C	Otpornički/Resistance	0,3 °C	TP-THD-01-TDP Izdanje/Issue 02 2023-12-28	U laboratoriju, usporedba s etalonskim otporničkim termometrom u suhom blok kalibratoru In laboratory, comparison with standard resistance thermometer in dry block calibrator Promjeri sonde/Sensor diameters: D = Ø 3 mm, Ø 4 mm, Ø 6 mm, Ø 6,35 mm, Ø 8 mm, Ø 10 mm Uronjenje/Immersion > 20 × D
			Termopar/ Thermocouple	0,9 °C		
		155 °C do/to 425 °C	Otpornički/Resistance	1 °C		
			Termopar/ Thermocouple	1,4 °C		
		425 °C do/to 600 °C	Otpornički/Resistance	1,1 °C		
			Termopar/ Thermocouple	1,9 °C		

Umjeravanje u laboratoriju/Calibration performed in a laboratory						
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded Uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks
17.	Temperatura, temperatura okoliša/ Termometri s direktnim pokazivanjem, termometri s ugrađenim pretvornikom temperature Temperature, environmental temperature/ Thermometers with direct display, thermometers with built-in temperature transmitter	-20 °C do/to 60 °C		1 °C	TP-THD-05-TAIR Izdanje/Issue 02 2023-12-28	Usporedba s etalonskim termometrom u klima komori Comparison with standard thermometer in climatic chamber
18.	Temperatura/ Indikatori i simulatori za otporničke termometre i termoparove Temperature/ Indicators and simulators for resistance thermometers and thermocouples	-200 °C do/to 350 °C	Pt 25,5	0,02 °C	TP-THD-02-TIS Izdanje/Issue 02 2023-12-28; EURAMET cg-11 v.2.0, 2011-03	Mjerenje + generiranje Measurement + generating
		350 °C do/to 630 °C		0,03 °C		
		-200 °C do/to 750 °C	Pt 100	0,02 °C		
		750 °C do/to 850 °C		0,03 °C		
		-200 °C do/to 630 °C	Pt 500, Pt 1000	0,02 °C		
		-200 °C do/to 600 °C	Pt 10000	0,02 °C		

Umjeravanje u laboratoriju/Calibration performed in a laboratory						
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded Uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks
18.	Temperatura/ Indikatori i simulatori za otporničke termometre i termoparove Temperature/ Indicators and simulators for resistance thermometers and thermocouples	20 °C do/to 50 °C	termopar tip B thermocouple type B	6,5 °C	TP-THD-02-TIS Izdanje/Issue 02 2023-12-28; EURAMET cg-11 v.2.0, 2011-03	Mjerenje + generiranje, Rjoff Measurement + generating, Rjoff
		50 °C do/to 100 °C		2,3 °C		
		100 °C do/to 200 °C		1,4 °C		
		200 °C do/to 350 °C		1 °C		
		350 °C do/to 650 °C		0,5 °C		
		650 °C do/to 1150 °C		0,3 °C		
		1150 °C do/to 1800 °C		0,2 °C		
		-250 °C do/to -200 °C	termopar tip E thermocouple type E	0,2 °C		
		-200 °C do/to -150 °C		0,1 °C		
		-150 °C do/to 1000 °C		0,05 °C		
		-200 °C do/to -150 °C	termopar tip J thermocouple type J	0,1 °C		
		-150 °C do/to 1200 °C		0,05 °C		
		-250 °C do/to -200 °C	termopar tip K thermocouple type K	0,5 °C		
		-200 °C do/to -150 °C		0,2 °C		
		-150 °C do/to -50 °C		0,1 °C		
		-50 °C do/to 1050 °C		0,05 °C		
		1050 °C do/to 1350 °C		0,1 °C		

Umjeravanje u laboratoriju/Calibration performed in a laboratory						
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded Uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks
18.	Temperatura/ Indikatori i simulatori za otporničke termometre i termoparove Temperature/ Indicators and simulators for resistance thermometers and thermocouples	-250 °C do/to -200 °C	termopar tip N thermocouple type N	1 °C	TP-THD-02-TIS Izdanje/Issue 02 2023-12-28; EURAMET cg-11 v.2.0, 2011-03	Mjerenje + generiranje, Rjoff Measurement + generating, Rjoff
		-200 °C do/to -150 °C		0,2 °C		
		-150 °C do/to 1300 °C		0,1 °C		
		-50 °C do/to 50 °C	termopar tip R thermocouple type R	0,5 °C		
		50 °C do/to 300 °C		0,3 °C		
		300 °C do/to 1750 °C		0,2 °C		
		-50 °C do/to 50 °C	termopar tip S thermocouple type S	0,5 °C		
		50 °C do/to 450 °C		0,3 °C		
		450 °C do/to 1750 °C		0,2 °C		
		-250 °C do/to -200 °C	termopar tip T thermocouple type T	0,5 °C		
		-200 °C do/to -150 °C		0,2 °C		
		-150 °C do/to -50 °C		0,1 °C		
		-50 °C do/to 400 °C		0,05 °C		
19.	Temperatura/ IC termometri Temperature/ IR thermometers	-30 °C do/to 10 °C		2,3 °C	TP-THD-04-TIC Izdanje/Issue 02 2023-12-28	Promjer mete Target diameter Ø 57 mm ε=0,95
		10 °C do/to 40 °C		0,8 °C		
		40 °C do/to 100 °C		1,7 °C		
		100 °C do/to 150 °C		2,4 °C		

Umjeravanje u laboratoriju/Calibration performed in a laboratory						
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded Uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks
19.	Temperatura/ IC termometri Temperature/ IR thermometers	150 °C do/to 200 °C		4 °C	TP-THD-04-TIC Izdanje/Issue 02 2023-12-28	Promjer mete Target diameter Ø 58 mm ε=0,95
		200 °C do/to 300 °C		6 °C		
		300 °C do/to 400 °C		7,4 °C		
		400 °C do/to 500 °C		9 °C		
20.	Relativna vlažnost zraka/ Higrometri Relative air humidity/ Hygrometers	10 % do/to 90 %	Temperatura (u kalibratoru) Temperature (in calibrator) 24,5 °C ± 3,5 °C	3,1 %	TP-THD-06-RH Izdanje/Issue 02 2023-12-28	Mjerenje + generiranje Measurement + generating
		30 % do/to 90 %	Temperatura (u klima komori) Temperature (in climatic chamber) 0 °C do/to 60 °C	4,0 %		
21.	Osvjetljenje/ Mjerila osvjetljenja Illuminance/ Lux-meters	1 do/to 9,9 lx		± 7 %	TP-OPT-01-LUX Izdanje/Issue 05 2024-07-19	Mjerenje/Measurement
		10 lx do/to 99 lx		± 3,5 %		
		100 lx do/to 1600 lx		± 3 %		
		8600 lx do/to 16000 lx		± 6,5 %		

Umjeravanje u laboratoriju/Calibration performed in a laboratory						
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded Uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks
22.	Brzina protoka zraka/ Krilni anemometri (promjer ≤ 25 mm) i termoanemometri Airflow velocity/ Rotating vane anemometers (diameter ≤ 25 mm) and thermal anemometers	0,5 m/s do/to 2 m/s		± 4,2 % ± 0,28 m/s	TP-FLU-02-ANE Izdanje/Issue 02 2023-12-28	Mjerenje/Measurement
		2 m/s do/to 5 m/s		± 4,2 % ± 0,37 m/s		
		5 m/s do/to 10 m/s		± 4,2 % ± 0,33 m/s		
		10 m/s do/to 20 m/s		± 4,2 % ± 0,57 m/s		
		20 m/s do/to 30 m/s		± 4,2 % ± 0,72 m/s		

Umjeravanje na terenu/On-site calibration						
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded measurement uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks
1.	Istosmjerni napon DC Voltage	1 kV do/to 7,5 kV		$2,1 \cdot 10^{-2} \cdot U$	TP-ELQ-01-U Izdanje/Issue 02 2023-12-28; TP-ELQ-07-DMM Izdanje/Issue 02 2023-12-28;	Mjerenje/Measurement
		7,5 kV do/to 15 kV		$2,1 \cdot 10^{-2} \cdot U$		
		15 kV do/to 30 kV		$2,1 \cdot 10^{-2} \cdot U$		
		30 kV do/to 40 kV		$2,4 \cdot 10^{-2} \cdot U$		
2.	Izmjenični napon AC Voltage	1 kV do/to 7,5 kV	50 Hz	$2,0 \cdot 10^{-2} \cdot U$	EURAMET cg-15 v.3.0, 2015-02	
		7,5 kV do/to 15 kV		$2,0 \cdot 10^{-2} \cdot U$		
		15 kV do/to 30 kV		$2,0 \cdot 10^{-2} \cdot U$		
3.	Tlak (podtlak, pretlak)/ Opružni manometri, digitalni manometri s pokazivanjem, pretvornici tlaka s električnim izlazom Gauge pressure/ Pressure gauges, digital pressure gauges, pressure transducers with electrical output	-800 mbar do/to 0 mbar	Tlačni medij: plin Pressure medium: gas	2 mbar	TP-MEH-01-P Izdanje/Issue 02 2023-12-28; DKD-R 6-1 2014-03	Mjerenje/Generiranje Measurement/Generating
		0 mbar do/to 400 mbar		1,5 mbar		
		0,4 bar do/to 10 bar		15 mbar		
		10 bar do/to 35 bar		20 mbar		
		0 bar do/to 60 bar	Tlačni medij: ulje Pressure medium: oil	25 mbar	EURAMET cg-17 v.4.1, 2022-09	Mjerenje/Generiranje Measurement/Generating
		60 bar do/to 250 bar		0,15 bar		
		250 bar do/to 600 bar		0,3 bar		
		600 bar do/to 1000 bar		0,45 bar		

Umjeravanje na terenu/On-site calibration						
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded measurement uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks
4.	Temperatura/ Termometri s direktnim pokazivanjem, termometri s ugrađenim pretvornikom temperature Temperature/Thermomet ers with direct display, thermometers with built- in temperature transmitter	-30 °C do/to 155 °C	Otpornički/Resistance	0,6 °C	TP-THD-01-TDP Izdanje/Issue 02 2023-12-28	U suhom blok kalibratoru In dry block calibrator Promjeri sonde Sensor diameters: D = Ø 3 mm, Ø 4 mm, Ø 6 mm, Ø 6,35 mm, Ø 8 mm, Ø 10 mm Uronjenje/Immersion > 20 × D
			Termopar/Thermocouple	2 °C		
		155 °C do/to 425 °C	Otpornički/Resistance	2 °C		
			Termopar/Thermocouple	2,6 °C		
		425 °C do/to 600 °C	Otpornički/Resistance	2,6 °C		
			Termopar/Thermocouple	3,2 °C		
5.	Temperatura/ Indikatori i simulatori za otporničke termometre i termoparove Temperature/ Indicators and simulators for resistance thermometers and thermocouples	-200 °C do/to 750 °C	Indikatori/Indicators Pt 100	0,3 °C	TP-THD-02-TIS Izdanje/Issue 02 2023-12-28; EURAMET cg-11 v.2.0, 2011-03	Mjerenje + generiranje Measurement + generating
		750 °C do/to 850 °C		0,1 °C		
		200 °C do/to 530 °C	Indikatori/Indicators Pt 500	0,2 °C		
		-200 °C do/to 850 °C	Indikatori/Indicators Pt 1000	0,2 °C		
		-200 °C do/to 600 °C	Simulatori/Simulators Pt 100	0,2 °C		
		600 °C do/to 850 °C		0,1 °C		

Umjeravanje na terenu/On-site calibration						
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded measurement uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks
5.	Temperatura/ Indikatori i simulatori za otporničke termometre i termoparove Temperature/ Indicators and simulators for resistance thermometers and thermocouples	-200 °C do/to 530 °C	Simulatori/Simulators Pt 500	0,2 °C	TP-THD-02-TIS Izdanje/Issue 02 2023-12-28; EURAMET cg-11 v.2.0, 2011-03	Mjerenje + generiranje Measurement + generating
		-200 °C do/to 850 °C	Simulatori/Simulators Pt 1000	0,2 °C		Mjerenje + generiranje, Rjoff Measurement + generating, Rjoff
		920 °C do/to 1800 °C	Termopartip B Thermocouple type	0,2 °C		
		-200 °C do/to 1000 °C	Termopar tip E Thermocouple type	0,6 °C		
		-190 °C do/to -1200 °C	Termopar tip J Thermocouple type	0,25 °C		
		-160 °C do/to 1260 °C	Termopar tip K Thermocouple type	0,25 °C		
		0 °C do/to 1300 °C	Termopar tip N Thermocouple type	0,25 °C		
		150 °C do/to 1750 °C	Termopar tip R Thermocouple type	0,25 °C		
		170 °C do/to 1750 °C	Termopar tip S Thermocouple type	0,4 °C		
		-130 °C do/to 400 °C	Termopar tip T Thermocouple type	0,4 °C		
		-200 °C do/to 750 °C	Simulatori/Simulators Pt 500	0,25 °C		

Umjeravanje na terenu/On-site calibration						
Br. No.	Mjerna veličina/ Mjerilo Measurand/ Calibration item	Mjerno područje Measurand range	Uvjeti mjerenja Measurement Conditions	Proširena mjerna nesigurnost Expanded measurement uncertainty	Metoda umjeravanja Calibration method	Napomene Remarks
6.	Temperatura/ IC termometri Temperature/ IR thermometers	-30 °C do/to 10 °C		3,2 °C	TP-THD-04-TIC Izdanje/Issue 02 2023-12-28	Promjer mete Target diameter: Ø 57 mm $\varepsilon=0,95$
		10 °C do/to 40 °C		1,5 °C		
		40 °C do/to 100 °C		1,9 °C		
		100 °C do/to 150 °C		2,5 °C		
		150 °C do/to 200 °C		4 °C		Promjer mete Target diameter: Ø 58 mm $\varepsilon=0,95$
		200 °C do/to 300 °C		6 °C		
		300 °C do/to 400 °C		7,4 °C		
		400 °C do/to 500 °C		9 °C		

* Proširena mjerna nesigurnost je izračunata u skladu s postupkom opisanim u EA 4/02 M, s razinom povjerenja 95 %, što uobičajeno i ako nije drugačije navedeno, znači množenje standardne nesigurnosti faktorom pokrivanja $k=2$. Laboratorij ne smije u potvrdama o umjeravanju koje izdaje u statusu akreditiranog laboratorija izražavati manju mjernu nesigurnost od objavljene CMC.

Expanded measurement uncertainty has been calculated according to the procedures given in EA 4/02 M, at a coverage probability of 95 %, which usually and if not stated otherwise, means by multiplying standard uncertainty by a coverage factor of $k = 2$. An accredited laboratory is not permitted to quote an uncertainty that is smaller than the published CMC in certificates issued under its accreditation.