



Potvrda o akreditaciji Accreditation Certificate

Ovime se utvrđuje da je

This is to recognize that

LABORING d.o.o. za mjeriteljstvo i ispitivanje

Virjanska 22, HR-10000 Zagreb

osposobljen prema zahtjevima norme

is competent according to

HRN EN ISO/IEC 17025:2007

(ISO/IEC 17025:2005+Cor.1:2006;

EN ISO/IEC 17025:2005+AC:2006)

za/to carry out

Umjeravanje mjerila: duljine, temperature, vlažnosti, tlaka, gustoće, obujma, frekvencije, momenta sile i sile

Calibration of length, temperature, humidity, pressure, density, volume, frequency, torque and force gauges

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.: 2091

Klasa/Ref.No.: 383-02/16-80/002

Urbroj/Id.No.: 569-02/4-16-51

Zagreb, 2016-09-30

Akreditacija istječe/Accreditation expiry: 2021-09-29

Prva akreditacija/Initial accreditation: 2006-09-05

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

Ravnatelj:

Director General:

Tihomir Babić, dipl. ing.



Hrvatska akreditacijska agencija
Croatian Accreditation Agency



HAA

Hrvatska akreditacijska agencija
Croatian Accreditation Agency

PRILOG POTVRDI O AKREDITACIJI br.: 2091

Annex to the Accreditation Certificate No.:

Klasa/Ref. No.: 383-02/16-80/002

Urbroj/Id. No.: 569-02/4-19-36

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Urbroj/Id. No.: 569-02/4-19-2

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Norma: HRN EN ISO/IEC 17025:2007

Standard:(ISO/IEC 17025:2005+Cor.1:2006; EN ISO/IEC 17025:2005+AC:2006)

Akreditacija istječe: 2021-09-29

Accreditation expiry:

Prva akreditacija: 2006-09-05

Initial accreditation:

Akreditirani laboratorij

Accredited laboratory

LABORING d.o.o. za mjeriteljstvo i ispitivanje

Virjanska 22, HR-10000 Zagreb

Područje akreditacije:

Scope of Accreditation:

**Umjeravanje mjerila: duljine, temperature, vlažnosti, tlaka, gustoće, obujma, frekvencije,
momenta sile i sile**

*Calibration of length, temperature, humidity, pressure, density, volume, frequency, torque
and force gauges*

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

v.d. ravnatelja:

Acting Director:

Tihomir Babić, dipl. ing.

PODRUČJE AKREDITACIJE / SCOPE OF ACCREDITATION

Umjeravanje u laboratoriju / Calibration performed in a laboratory					
Br. No.	Mjerna veličina/ Mjerilo <i>Measurand / Calibration item</i>	Mjerno područje <i>Measurement range</i>	Mjerna sposobnost* <i>Calibration and measurement capability* (CMC)</i>	Metode umjeravanja <i>Calibration methods</i>	Napomene <i>Remarks</i>
1.	Duljina/ Pomična mjerila <i>Length/ Calibration of Vernier-callipers</i>	0 do/to 700 mm	$r = 0,01 \text{ mm:}$ $U = (8 + 22 \cdot l) \text{ }\mu\text{m,}$ $l \text{ u/in m}$	Vlastiti postupak <i>In-house procedure</i> LAB-PO-0051, izdanje /datum <i>edition/date</i> 7/2019-02-26	r – rezolucija mjerila/ <i>resolution of the instrument</i>
		$r = 0,02 \text{ mm:}$ $U = (13 + 22 \cdot l) \text{ }\mu\text{m,}$ $l \text{ u/in m}$			
		$r = 0,05 \text{ mm:}$ $U = (30 + 22 \cdot l) \text{ }\mu\text{m,}$ $l \text{ u/in m}$			
		$r = 0,1 \text{ mm:}$ $U = (58 + 22 \cdot l) \text{ }\mu\text{m,}$ $l \text{ u/in m}$			
2.	Duljina/ Mikrometri za vanjska mjerenja <i>Length / Micrometers for outside measurements</i>	0 do/to 200 mm	$r = 0,001 \text{ mm}$ (digit. mikrometri/digital <i>micrometers</i>) $U = (1,3 + 22 \cdot l) \text{ }\mu\text{m,}$ $l \text{ u/in m}$	Vlastiti postupak <i>In-house procedure</i> LAB-PO-0052, izdanje/datum <i>edition/date</i> 7/2019-02-27	r – rezolucija mjerila/ <i>resolution of the instrument</i>
		$r = 0,01 \text{ mm}$ (analog. mikrometri/analog <i>micrometers</i>) $U = (5,8 + 22 \cdot l) \text{ }\mu\text{m,}$ $l \text{ u/in m}$			
		$r = 0,001 \text{ mm}$ (analog. mikrometri/ <i>analog micrometers</i>) $U = (0,8 + 22 \cdot l) \text{ }\mu\text{m,}$ $l \text{ u/in m}$			
3.	Duljina/ Trokraki mikrometri <i>Length/ Three points internal micrometers</i>	6 mm do/to 100 mm	$r = 0,001 \text{ mm}$ $U = 1,9 \text{ }\mu\text{m}$	Vlastiti postupak <i>In-house procedure</i> LAB-PO-0058, izdanje/datum <i>edition/date</i> 3/2019-02-27	r – rezolucija mjerila/ <i>resolution of the instrument</i>
		$r = 0,01 \text{ mm}$ $U = 2,5 \text{ }\mu\text{m}$			
4.	Duljina/ Mjerne ure <i>Length / Dial gauges</i>	0 do/to 25 mm	$r = 0,01 \text{ mm}$ $U = 7 \text{ }\mu\text{m}$	Vlastiti postupak <i>In-house procedure</i> LAB-PO-0059, izdanje/datum <i>edition/date</i> 3/2019-02-27	r – rezolucija mjerila/ <i>resolution of the instrument</i>

Umjeravanje u laboratoriju / Calibration performed in a laboratory					
Br. No.	Mjerna veličina/ Mjerilo Measurand / Calibration item	Mjerno područje Measurement range	Mjerna sposobnost* Calibration and measurement capability* (CMC)	Metode umjeravanja Calibration methods	Napomene Remarks
4.	Duljina/ Mjerne ure <i>Length / Dial gauges</i>	25 do/to 100 mm	$r = 0,01 \text{ mm}$ $U = 8 \text{ }\mu\text{m}$	Vlastiti postupak <i>In-house procedure</i> LAB-PO-0059, izdanje/datum <i>edition/date</i> 3/2019-02-28	r – rezolucija mjerila/ <i>resolution of the instrument</i>
5.	Duljina/ Visinomjeri <i>Length / Height gauges</i>	0 do/to 1000 mm	$r = 0,01 \text{ mm}$ $U = (6,8 + 48 \cdot l) \text{ }\mu\text{m},$ $l \text{ u/in m}$	Vlastiti postupak <i>In-house procedure</i> LAB-PO-0060, izdanje/datum <i>edition/date</i> 3/2019-02-28	r – rezolucija mjerila/ <i>resolution of the instrument</i>
			$r = 0,02 \text{ mm}$ $U = (12 + 48 \cdot l) \text{ }\mu\text{m},$ $l \text{ u/in m}$		
			$r = 0,05 \text{ mm}$ $U = (29 + 48 \cdot l) \text{ }\mu\text{m},$ $l \text{ u/in m}$		
6.	Duljina/ Dubinomjeri <i>Length/ Depth gauges</i>	0 do/to 700 mm	$r = 0,01 \text{ mm}$ $U = (6,8 + 48 \cdot l) \text{ }\mu\text{m},$ $l \text{ u/in m}$	Vlastiti postupak <i>In-house procedure</i> LAB-PO-0061, izdanje/datum <i>edition/date</i> 3/2019-02-28	r – rezolucija mjerila/ <i>resolution of the instrument</i>
			$r = 0,02 \text{ mm}$ $U = (12 + 48 \cdot l) \text{ }\mu\text{m},$ $l \text{ u/in m}$		
			$r = 0,05 \text{ mm}$ $U = (29 + 48 \cdot l) \text{ }\mu\text{m},$ $l \text{ u/in m}$		
			$r = 0,1 \text{ mm}$ $U = (58 + 48 \cdot l) \text{ }\mu\text{m},$ $l \text{ u/in m}$		
7.	Temperatura/ Stakleni termometri rastezanja <i>Temperature/ Liquid-in-glass thermometers</i>	$-20 \text{ }^\circ\text{C}$ do/to $0 \text{ }^\circ\text{C}$	$(0,04 - 0,0045 \cdot t) \text{ }^\circ\text{C}$	Vlastiti postupak <i>In-house procedure</i> LAB-PO-0020, izdanje/datum <i>edition/date</i> 09/2016-07-06 LAB-PO-0021, izdanje/datum <i>edition/date</i> 08/2016-07-06;	Vodena/glikolna kupelj/Dubina uranjanja 125 mm. <i>Water/glycol bath Immersion depth 125 mm.</i>
		$0 \text{ }^\circ\text{C}$ do/to $100 \text{ }^\circ\text{C}$	$(0,04 + 0,0004 \cdot t) \text{ }^\circ\text{C}$		Kupka sa silikonskim uljem <i>Bath with silicon oil</i>
		$100 \text{ }^\circ\text{C}$ do/to $275 \text{ }^\circ\text{C}$	$0,07 \text{ }^\circ\text{C}$		
		$> 275 \text{ }^\circ\text{C}$ do/to $400 \text{ }^\circ\text{C}$	$1,4 \text{ }^\circ\text{C}$		Suhi kalibrator. Dubina uranjanja 125 mm/Dry block. <i>Immersion depth 125 mm</i>

Umjeravanje u laboratoriju / Calibration performed in a laboratory					
Br. No.	Mjerna veličina/ Mjerilo Measurand / Calibration item	Mjerno područje Measurement range	Mjerna sposobnost* Calibration and measurement capability* (CMC)	Metode umjeravanja Calibration methods	Napomene Remarks
8.	Temperatura/ Termometri s direktnim očitanjem, s platinskim otporničkim osjetnicima Temperature/ Direct reading thermometers which have resistance thermometers as sensors	-20 °C do/to 0 °C	$(0,04 - 0,0045 \cdot t) \text{ °C}$ uronjenje/immersion > $20 \cdot D$	Vlastiti postupak In-house procedure LAB-PO-0023, izdanje/datum edition/date 12/2017-03-20	Vodena /glikolna kupelj dubina = 125 mm/Water- glycol bath Immersion = 125 mm. D- promjer termometra/ thermometer diameter
		> 0 °C do/to +100 °C	$(0,04 + 0,0004 \cdot t) \text{ °C}$ uronjenje/immersion > $20 \cdot D$		Kupka sa silikonskim uljem Bath with silicon oil
		> 100 °C do/to 275 °C	0,07 °C uronjenje/immersion > $20 \cdot D$		Suhi kalibrator. Dubina uranjanja 125 mm. Dry block. Immersion depth 125 mm.
		> 275 °C do/to 650 °C	1,4 °C uronjenje/immersion > $20 \cdot D$		
		50°C do/to 650 °C	1,6 °C uronjenje/immersion > $20 \cdot D$		
9.	Temperatura/ Termometri s direktnim očitanjem s termoparovima kao osjetnicima Temperature/ Direct reading thermometers which have thermocouples as sensors	-20 °C do/to 100 °C	0,6 °C uronjenje/immersion > $20 \cdot D$	Vlastiti postupak In-house procedure LAB-PO-0023, izdanje/datum edition/date 12/ 2017-03-20	Vodena /glikolna kupelj dubina = 125 mm. Water- glycol bath Immersion = 125 mm
		100 °C do/to 275 °C	0,7 °C uronjenje/immersion > $20 \cdot D$		Kupka sa silikonskim uljem Bath with silicon oil
		> 275 °C do/to 650 °C	1,6 °C uronjenje/immersion > $20 \cdot D$		Suhi kalibrator. Dubina uranjanja 125 mm. Dry block. Immersion depth 125 mm
10.	Temperatura/ Termometri s direktnim očitanjem s termoparovima kao osjetnicima Temperature/ Direct reading thermometers which have thermocouples as sensors	50°C do/to 650 °C	1,8 °C uronjenje/immersion > $20 \cdot D$	Vlastiti postupak In-house procedure LAB-PO-0023 izdanje/datum edition/date 12/ 2017-03-20	Suhi kalibrator. Dubina uranjanja 125 mm. Dry block. Immersion depth 125 mm

Umjeravanje u laboratoriju / Calibration performed in a laboratory					
Br. No.	Mjerna veličina/ Mjerilo Measurand / Calibration item	Mjerno područje Measurement range	Mjerna sposobnost* Calibration and measurement capability* (CMC)	Metode umjeravanja Calibration methods	Napomene Remarks
11.	Temperatura/ termostatirane komore i peći Temperature/ Thermostatic chambers and furnaces	-20 °C do/to 250 °C	1,0 °C	DakKS-DKD-R 5-7; 2010 Vlastiti postupak In-house procedure LAB-PO-0053 izdanje/datum edition/date 02/2015-03-11	Podmetoda A i B za V < 2000 l; Methods A and B for V < 2000 l Podmetoda C za sve obujme Method C for all volumes
		> 250 °C do/to 1000 °C	5 °C		Podmetoda C za sve obujme Method C for all volumes
12.	Temperatura/ Termostatirane kupelji Temperature/ Thermostatic baths	-20 °C do/to 300 °C	0,05 °C	Vlastiti postupak In-house procedure LAB-PO-0050 izdanje/datum edition/date 02/ 2013-10-21	Određivanje odstupanja, horizontalnog i vertikalnog gradijenta, te stabilnosti u kupelji Determination of deviation, horizontal and vertical gradient and stability in baths
13.	Obujam/ Klipna mjerila obujma (klipne pipete) Volume/ Piston operated volumetric apparatus (piston pipette)	20 µL do/to 40 µL	1 %	HRN EN ISO 8655-6:2008 (ISO 8655-6:2002; EN ISO 8655-6:2002)	
		41 µL do/to 100 µL	0,5 %		
		101 µL do/to 20 mL	0,2 %		
14.	Obujam/ Piknometri Volume/ pycnometers	1 mL do/to 100 mL	0,13 %	HRN EN ISO 8655-6:2008/Isp.1: 2013 (ISO 8655-6:2002/Cor 1:2008; EN ISO 8655-6:2002/AC:2009)	

Umjeravanje u laboratoriju / Calibration performed in a laboratory					
Br. No.	Mjerna veličina/ Mjerilo Measurand / Calibration item	Mjerno područje Measurement range	Mjerna sposobnost* Calibration and measurement capability* (CMC)	Metode umjeravanja Calibration methods	Napomene Remarks
15.	Obujam/ Klipna mjerila obujma (dispenzeri, klipne birete) Volume/ Piston operated volumetric apparatus (dispenser, piston burettes)	20 µL do/to 200 mL	0,2 %	HRN EN ISO 8655-6:2008 (ISO 8655-6:2002; EN ISO 8655-6:2002) HRN EN ISO 8655-6:2008/Isp.1: 2013 (ISO 8655-6:2002/Cor 1:2008; EN ISO 8655-6:2002/AC:2009)	
16.	Obujam/ Laboratorijsko stakleno posuđe (pipete sa jednom crtom, graduirane pipete, birete, tikvice, graduirani cilindri) Volume/ Laboratory glassware (single-volume pipettes, graduated pipettes, burettes, volumetric flasks, graduated measuring cylinders)	Od/from 1 mL do/to 5000 mL	0,13 %	HRN EN ISO 4787:2012 (ISO 4787:2010; Ispr. Ver/Corr.ver. 2010-06-15; EN ISO:2011)	
17.	Moment sile/ Moment ključevi Torque/ Torque wrenches	Od/from 7 Nm do/to 20 Nm	1,0 %	HRN EN ISO 6789-2:2017 (ISO 6789-2:2017; EN ISO 6789-2:2017)	
		Od/from 21 Nm do/to 2000 Nm	0,5 %		
18.	Moment sile/Testeri za moment ključeve Torque/ Torque wrench testers	Od/from 5 Nm do/to 2000 Nm	0,2 %	EURAMET/ cg-14/ v. 2.0, 03/2011	Za tester s podjelom skale 0,1 Nm For torque wrench tester with scale division of 0,1 Nm

Umjeravanje u laboratoriju/ Calibration in laboratory					
Br. No.	Mjerna veličina/ Mjerilo Measurand / Calibration item	Mjerno područje Measurement range	Mjerna sposobnost* Calibration and measurement capability* (CMC)	Metode umjeravanja Calibration methods	Napomene Remarks
19.	Sila/ Tenziometri Force/ Cable tensiometers	Od/from 5 N do/to 2750 N	0,1 %	Vlastiti postupak In-house procedure LAB-PO-0034:2006 izdanje/datum edition/date 05/ 2011-02-17	Upotreba etalonskih utega i određene čelične užadi Use of standard weights and specific steel cables
20.	Tlak/ Mjerila tlaka Pressure/ Pressure gauges	-0,95 bar do/to 1 bar	0,5 mbar	DKD-R 6-1:2014 (EURAMET/ cg-17/ v.3.0; 04/2017)	Tlačni medij: plin(dušik, zrak)/Pressure medium: gas (nitrogen, air)
		1 bar do/to 100 bar	0,07 bar		Tlačni medij: voda Pressure medium: water
		100 bar do/to 690 bar	0,5 bar		
21.	Gustoća/Areometri Density/Hydrometers	0,65 g cm ⁻³ do/to 1,15 g cm ⁻³	0,0003 gcm ⁻³	Vlastiti postupak In-house procedure LAB-PO-0043 izdanje/datum edition/date 08/ 2018-05-24	
22.	Relativna vlažnost/ mjerila relativne vlažnosti Humidity/relativa humidity gauges	10 % do/to 90 % (19 °C do/to 25 °C)	5 %	Vlastiti postupak In-house procedure LAB-PO-0055 izdanje/datum edition/date 02/2015-03-12	
23.	Frekvencija/ Centrifuge s mjernim sustavom Frequency/ Centrifuges with measuring system	100 o/min do/to 9000 o/min	11,0 o/min	Vlastiti postupak In-house procedure LAB-PO-0057 izdanje/datum edition/date 03/2016-07-05	
		9000 o/min do/to 30000 o/min	11,0 o/min		

Umjeravanje na terenu / On-site calibration					
Br. No.	Mjerna veličina/ Mjerilo <i>Measurand / Calibration item</i>	Mjerno područje <i>Measurement range</i>	Mjerna sposobnost* <i>Calibration and measurement capability* (CMC)</i>	Metode umjeravanja <i>Calibration methods</i>	Napomene <i>Remarks</i>
1.	Temperatura/ Termometri s direktnim očitanjem, s platinskim otporničkim osjetnicima <i>Temperature/ Direct reading thermometers which have resistance thermometers as sensors</i>	50 °C do/to 650 °C	1,6 °C uronjenje/immersion > 20 · D	Vlastiti postupak <i>In-house procedure</i> LAB-PO-0023 izdanje/datum <i>edition/date</i> 12/2017-03-20	Suhi kalibrator. Dubina uranjanja 125 mm. <i>Dry block.</i> Immercion <i>depth</i> 125 mm D- promjer termometra/ thermometer diameter
2.	Temperatura/ Termometri s direktnim očitanjem s termoparovima kao osjetnicima <i>Temperature/ Direct reading thermometers which have thermocouples as sensors</i>	50 °C do/to 650 °C	1,8 °C uronjenje/immersion > 20 · D	Vlastiti postupak <i>In-house procedure</i> LAB-PO-0023 izdanje/datum <i>edition/date</i> 12/ 2017-03-20	Suhi kalibrator. Dubina uranjanja 125 mm. <i>Dry block.</i> Immercion <i>depth</i> 125 mm
3.	Temperatura/ termostatirane komore i peći <i>Temperature/ Thermostatic chambers and furnaces</i>	-20 °C do/to 250 °C	1,0 °C	DakS-DKD-R 5-7 2010 Vlastiti postupak <i>In-house procedure</i> LAB-PO-0053 izdanje/datum <i>edition/date</i> 02/2015-03-11	Podmetoda A i B za V < 2000 l; <i>Methods A and B for V < 2000 l</i> Podmetoda C za sve obujme <i>Method C for all volumes</i>
		> 250 °C do/to 1000 °C	5 °C		Podmetoda C za sve obujme <i>Method C for all volumes</i>
4.	Temperatura/ Termostatirane kupelji <i>Temperature/ Thermostatic baths</i>	-20 °C do/to 300 °C	0,05 °C	Vlastiti postupak <i>In-house procedure</i> LAB-PO-0050 izdanje/datum <i>edition/date</i> 02/ 2013-10-21	Određivanje odstupanja, horizontalnog i vertikalnog gradijenta, te stabilnosti u kupelji <i>Determination of deviation, horizontal and vertical gradient and stability in baths</i>

Umjeravanje na terenu / On-site calibration					
Br. No.	Mjerna veličina/ Mjerilo <i>Measurand / Calibration item</i>	Mjerno područje <i>Measurement range</i>	Mjerna sposobnost* <i>Calibration and measurement capability* (CMC)</i>	Metode umjeravanja <i>Calibration methods</i>	Napomene <i>Remarks</i>
5.	Tlak/ Mjerila tlaka <i>Pressure/ Pressure gauges</i>	-0,95 bar do/to 1 bar	0,5 mbar	DKD-R 6-1:2014 (EURAMET/ cg-17/ v.3.0; 04/2017)	Tlačni medij: plin(dušik, zrak)/ <i>Pressure medium: gas (nitrogen, air)</i>
		1 bar do/to 100 bar	0,07 bar		
		100 bar do/to 690 bar	0,5 bar		Tlačni medij:voda <i>Pressure medium: water</i>
6.	Frekvencija/ Centrifuge s mjernim sustavom <i>Frequency/ Centrifuges with measuring system</i>	100 o/min do/to 9000 o/min	11,0 o/min	Vlastiti postupak <i>In-house procedure</i> LAB-PO-0057 izdanje/datum <i>edition/date</i> 03/2016-07-05	
		9000 o/min do/to 30000 o/min	11,0 o/min		

* CMC (*Calibration and Measurement Capability*) je procijenjena kao proširena mjerna nesigurnost dobivena množenjem standardne nesigurnosti s faktorom pokrivanja k , koji odgovara razini povjerenja od oko 95%. Uobičajeno i ako nije drugačije navedeno, faktor k iznosi 2.
CMC je izračunata u skladu s EA 4/02 M:2013 *Evaluation of the Uncertainty of measurement in Calibration*.

*The CMC (Calibration and Measurement Capability) has been estimated as an expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor k corresponding to confidence level of about 95 %. Normally and unless stated otherwise, this factor k is 2.
The CMC has been determined according to the EA 4/02 M:2013 Evaluation of the Uncertainty of measurement in Calibration.*