

Deutsche Akkreditierungsstelle GmbH

Annex to the Accreditation Certificate D-K-15102-01-00 according to ISO/IEC 17025:2017

Period of validity: 27.06.2022 to 26.06.2027

Date of issue: 27.06.2022

Holder of certificate:

Ethiopian Metrology Institute (EMI), Calibration Laboratories
B 67, Street 1405, Woreda 06, Bole Sub city,
P.O. Box 5722, Addis Ababa, Ethiopia

Calibration in the fields:

Mechanical quantities

- Mass (mass standards class E₂ and worse)^{b)}
- Weighing instruments^{a)}
- Pressure^{c)}

Electrical quantities

DC and low frequency quantities

- DC voltage
- DC current
- DC resistance
- AC voltage
- AC current

Chemical and Medical Quantities

Chemical analysis, reference materials

- Volume of liquids^{b)}

Thermodynamic quantities

Temperature quantities

- Resistance thermometers
- Thermocouples
- Liquid-in glass thermometers^{b)}
- Direct reading thermometers^{b)}
- Mechanical thermometers^{b)}
- Climatic chambers (temperature)^{a)}

a) on-site calibration only

b) permanent laboratory and mobile laboratory

c) mobile laboratory only

The management system requirements in DIN EN ISO/IEC 17025 are written in language relevant to operations of calibration laboratories and operate generally in accordance with the principles of DIN EN ISO 9001.

*The certificate together with its annex reflects the status at the time of the date of issue. The current status of the scope of accreditation can be found in the database of accredited bodies of Deutsche Akkreditierungsstelle GmbH.
<https://www.dakks.de/en/content/accredited-bodies-dakks>*

Annex to the accreditation certificate D-K-15102-01-00

Within the measurands/calibration items marked with ^{*}), the calibration laboratory is permitted, without being required to inform and obtain prior approval from DAkkS, to use calibration standards or equivalent calibration procedures listed here with different issue dates. The calibration laboratory maintains a current list of all calibration standards / equivalent calibration procedures within the flexible scope of accreditation.

Permanent Laboratory
Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement ¹⁾	Remarks			
Mass standard Conventional mass [*])	1 mg, 2 mg, 5 mg	OIML R 111-1:2004	0.006 mg	For weight pieces according to OIML recommendation R 111-1:2004, Class F ₁			
	10 mg		0.008 mg				
	20 mg		0.010 mg				
	50 mg		0.012 mg				
	100 mg		0.016 mg				
	200 mg		0.020 mg				
	500 mg		0.025 mg				
	1 g		0.03 mg				
	2 g		0.04 mg				
	5 g		0.05 mg				
	10 g		0.06 mg				
	20 g		0.08 mg				
	50 g		0.10 mg				
	100 g		0.16 mg				
	200 g		0.3 mg				
	500 g		0.8 mg				
	1 kg		1.6 mg				
	2 kg		3.0 mg				
	5 kg		8.0 mg				
	10 kg		16 mg				
	20 kg		30 mg				
			1 mg to 100 mg		OIML R 111-1:2004	0.05 mg	For free nominal values <i>m_c</i> : conventional mass
			> 100 mg to 200 mg			0.06 mg	
			> 200 mg to 500 mg			0.08 mg	
			> 500 mg to 1 g			0.10 mg	
	> 1 g to 2 g	0.12 mg					
	> 2 g to 5 g	0.16 mg					
	> 5 g to 10 g	0.20 mg					
	> 10 g to 20 g	0.25 mg					
	> 20 g to 50 g	0.30 mg					
	> 50 g to 100 g	0.5 mg					
	> 100 g to 10 kg	$5 \cdot 10^{-6} \cdot m_c$					

¹⁾ The expanded uncertainties according to EA-4/02 M:2022 are part of CMC and are the best measurement uncertainties within accreditation. They have a coverage probability of approximately 95 % and have a coverage factor of $k = 2$ unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

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Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement ¹⁾	Remarks
Temperature quantities Resistance thermometers *)	-80 °C to 30 °C	Alcohol bath DKD-R 5-1:2018	20 mK	Comparison with standard resistance thermometer
	> 30 °C to 80 °C	Water bath DKD-R 5-1:2018	30 mK	
	> 80 °C to 200 °C	Oil bath DKD-R 5-1:2018	0.10 K	
	> 200 °C to 660 °C	Fluidized bath DKD-R 5-1:2018	0.30 K	
Thermocouples, noble metal *)	0 °C to 200 °C	in liquid bath DKD-R 5-3:2018, EURAMET Calibration Guide No. 8, Version 3.1	0.5 K	Comparison with resistance thermometer
	> 200 °C to 600 °C	in fluidized bath DKD-R 5-3:2018, EURAMET Calibration Guide No. 8, Version 3.1	0.7 K	
	> 600 °C to 900 °C	in furnace DKD-R 5-3:2018, EURAMET Calibration Guide No. 8, Version 3.1	1.1 K	Comparison with thermocouple
	> 900 °C to 1200 °C		1.5 K	
Thermocouples, base metal *)	0 °C to 200 °C	in furnace EURAMET Calibration Guide No. 8, Version 3.1	1.0 K	Comparison with thermocouple
	> 200 °C to 600 °C		1.0 K	
	> 600 °C to 900 °C		1.5 K	
	> 900 °C to 1200 °C		2.0 K	

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Liquid-in-glass thermometers *)	-80 °C to 30 °C	in alcohol bath PTB testing instruction Volume 2, 2 nd edition	25 mK	Comparison with standard resistance thermometer
	> 30 °C to 80 °C	in water bath PTB testing instruction Volume 2, 2 nd edition	30 mK	
	> 80 °C to 200 °C	in oil bath PTB testing instruction Volume 2, 2 nd edition	0.10 K	
	> 200 °C to 360 °C	in fluidized bath PTB testing instruction Volume 2, 2 nd edition	0.30 K	
Direct reading electrical thermometers with resistance sensor *)	-80 °C to 30 °C	in alcohol bath DKD-R 5-1:2018	20 mK	Comparison with standard resistance thermometer
	> 30 °C to 80 °C	in water bath DKD-R 5-1:2018	30 mK	
	> 80 °C to 200 °C	in oil bath DKD-R 5-1:2018	0.10 K	
	> 200 °C to 660 °C	in fluidized bath DKD-R 5-1:2018	0.30 K	
	-30 °C to 150 °C	in climatic chamber DKD-R 5-1: 2018	0.5 K	
Direct reading electrical thermometers with thermocouples sensor *)	-80 °C to 30 °C	in alcohol bath DKD-R 5-3:2018, EURAMET Calibration Guide No. 8, Version 3.1	0.20 K	Comparison with standard resistance thermometer
	> 30 °C to 80 °C	in water bath DKD-R 5-3:2018, EURAMET Calibration Guide No. 8, Version 3.1	0.30 K	
	> 80 °C to 200 °C	in oil bath DKD-R 5-3:2018, EURAMET Calibration Guide No. 8, Version 3.1	0.50 K	
	> 200 °C to 660 °C	in fluidized bath DKD-R 5-3:2018, EURAMET Calibration Guide No. 8, Version 3.1	0.60 K	
	0 °C to 150 °C	in climatic chamber DKD-R 5-3: 2018 EURAMET Calibration Guide No. 8, Version 3.1	0.6 K	

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Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement ¹⁾	Remarks
Mechanical (dial) thermometers	-80 °C to 80 °C	in alcohol or water bath PRO-PMT/TH-005 Revision 10A	30 mK	Comparison with standard resistance thermometer
	> 80 °C to 200 °C	in oil bath PRO-PMT/TH-005 Revision 10A	0.10 K	
	> 200 °C to 400 °C	in fluidized bath PRO-PMT/TH-005 Revision 10A	0.30 K	
Volume of liquids Piston operated pipettes *)	5 µL	ISO 8655:2002	0.026 µL	
	10 µL		0.04 µL	
	20 µL		0.08 µL	
	50 µL		0.14 µL	
	100 µL		0.3 µL	
	200 µL		0.6 µL	
	500 µL		1.2 µL	
	1000 µL		2.4 µL	
Volumetric burettes *)	1 mL	ISO 4787:2021	2.8 µL	
	2 mL		2.9 µL	
	5 mL		4.3 µL	
	10 mL		8.1 µL	
	25 mL		22 µL	
	50 mL		38 µL	
	100 mL		70 µL	
	Volumetric pipettes *)		0.5 mL	
1 mL		4.4 µL		
2 mL		5.6 µL		
5 mL		7.4 µL		
10 mL		8.7 µL		
20 mL		12 µL		
25 mL		16 µL		
50 mL		17 µL		
100 mL		39 µL		
200 mL		46 µL		

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Volumetric flask *)	1 mL, 2 mL, 5 mL, 10 mL	ISO 4787:2021	11 µL	
	20 mL, 25 mL		19 µL	
	50 mL		30 µL	
	100 mL		41 µL	
	200 mL		59 µL	
	250 mL		59 µL	
	500 mL		85 µL	
	1000 mL		0.13 mL	
	2000 mL		0.22 mL	
	5000 mL		0.39 mL	
Measuring cylinders *)	5 mL	ISO 4787:2021	35 µL	
	10 mL		61 µL	
	25 mL		93 µL	
	50 mL		0.13 mL	
	100 mL		0.20 mL	
	250 mL		0.36 mL	
	500 mL		0.58 mL	
	1000 mL		0.93 mL	
	2000 mL		1.5 mL	
Provers *)	5 L	ISO 4787:2021	2.1 mL	
	10 L		3.4 mL	
	20 L		3.8 mL	

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Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement ¹⁾	Remarks
DC and low frequency quantities DC voltage Zener standards	10 V	Direct comparison with Zener standard PRO-PMT/EL-001, version 4A	30 μ V	
Sources, fixed values	0.1 V	PRO-PMT/EL-002 & 003, version 4A	1.2 μ V	
	1 V		3.0 μ V	
	10 V		45 μ V	
	100 V		0.50 mV	
	1000 V		12 mV	
Measuring instruments	10 mV to 11 V	PRO-PMT/EL-006, version 4A	$8.0 \cdot 10^{-6} \cdot U + 6.0 \mu$ V	U: measured value
	> 11 V to 22 V		$9.0 \cdot 10^{-6} \cdot U + 4.0 \mu$ V	
	> 22 V to 275 V		$10 \cdot 10^{-6} \cdot U + 90 \mu$ V	
	> 275 V to 1 kV		$16 \cdot 10^{-6} \cdot U + 0.17$ mV	
DC current Sources, fixed values	0.1 A	PRO-PMT/EL-005, version 4A	$0.65 \cdot 10^{-3} \cdot I$	I: measured value
	2 A		$0.60 \cdot 10^{-3} \cdot I$	
	4 A, 6 A, 8 A, 10 A, 12 A, 14 A, 16 A, 18 A, 20 A		$0.50 \cdot 10^{-3} \cdot I$	
Measuring instruments	3.3 mA to 33 mA	PRO-PMT/EL-006, version 4A	$7.0 \cdot 10^{-6} \cdot I + 40 \mu$ A	
	> 33 mA to 330 mA		$60 \cdot 10^{-6} \cdot I + 40 \mu$ A	
	> 330 mA to 1 A		$0.23 \cdot 10^{-3} \cdot I + 60 \mu$ A	
	> 1 A to 3 A		$0.45 \cdot 10^{-3} \cdot I + 50 \mu$ A	
	> 3 A to 11 A		$0.58 \cdot 10^{-3} \cdot I + 0.58$ mA	
	> 11 A to 20 A		$1.1 \cdot 10^{-3} \cdot I + 0.90$ mA	
DC resistance Resistors, fixed values	1 m Ω	PRO-PMT/EL-005, version 4A	$72 \cdot 10^{-6} \cdot R$	R: measured value
	10 m Ω		$28 \cdot 10^{-6} \cdot R$	
	100 m Ω		$22 \cdot 10^{-6} \cdot R$	
	1 Ω		$13 \cdot 10^{-6} \cdot R$	
	10 Ω		$13 \cdot 10^{-6} \cdot R$	
	100 Ω		$13 \cdot 10^{-6} \cdot R$	
	1 k Ω		$10 \cdot 10^{-6} \cdot R$	
	10 k Ω		$10 \cdot 10^{-6} \cdot R$	
	100 k Ω		$12 \cdot 10^{-6} \cdot R$	
	1 M Ω		$20 \cdot 10^{-6} \cdot R$	

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DC resistance Measuring instruments	0.10 Ω to 11 Ω	PRO-PMT/EL-005, version 4A	$15 \cdot 10^{-6} \cdot R + 1.2 \text{ m}\Omega$	R: measured value
	> 11 Ω to 33 Ω		$41 \cdot 10^{-6} \cdot R + 20 \text{ m}\Omega$	
	> 33 Ω to 110 Ω		$13 \cdot 10^{-6} \cdot R + 20 \text{ m}\Omega$	
	> 110 Ω to 330 Ω		$13 \cdot 10^{-6} \cdot R + 20 \text{ m}\Omega$	
	> 330 Ω to 1.1 kΩ		$13 \cdot 10^{-6} \cdot R + 20 \text{ m}\Omega$	
	> 1.1 kΩ to 3.3 kΩ		$7.0 \cdot 10^{-6} \cdot R + 0.10 \Omega$	
	> 3.3 kΩ to 11 kΩ		$1.0 \cdot 10^{-6} \cdot R + 12 \text{ m}\Omega$	
	> 11 kΩ to 33 kΩ		$15 \cdot 10^{-6} \cdot R + 0.80 \Omega$	
	> 33 kΩ to 110 kΩ		$7.0 \cdot 10^{-6} \cdot R + 0.60 \Omega$	
	> 110 kΩ to 330 kΩ		$10 \cdot 10^{-6} \cdot R + 1.5 \Omega$	
	> 330 kΩ to 1.1 MΩ		$7.0 \cdot 10^{-6} \cdot R + 12 \Omega$	
	> 1.1 MΩ to 3.3 MΩ		$70 \cdot 10^{-6} \cdot R + 0.17 \text{ k}\Omega$	
	> 3.3 MΩ to 11 MΩ		$0.20 \cdot 10^{-3} \cdot R + 0.24 \text{ k}\Omega$	
	> 11 MΩ to 33 MΩ		$0.37 \cdot 10^{-3} \cdot R + 2.6 \text{ k}\Omega$	
	> 33 MΩ to 110 MΩ		$0.93 \cdot 10^{-3} \cdot R + 2.3 \text{ k}\Omega$	
> 110 MΩ to 330 MΩ	$3.5 \cdot 10^{-3} \cdot R + 0.12 \text{ M}\Omega$			
> 330 MΩ to 1.1 GΩ	$18 \cdot 10^{-3} \cdot R + 0.58 \text{ M}\Omega$			
AC voltage Measuring instruments	10 mV to 33 mV	40 Hz to 10 kHz PRO-PMT/EL-004, version 4A	$4.0 \cdot 10^{-6} \cdot U + 0.50 \text{ mV}$	U: measured value
	> 33 mV to 0.33 V		$16 \cdot 10^{-6} \cdot U + 0.50 \text{ mV}$	
	> 0.33 V to 3.3 V		$0.12 \cdot 10^{-3} \cdot U + 0.50 \text{ mV}$	
	> 3.3 V to 33 V		$0.20 \cdot 10^{-3} \cdot U + 1.2 \text{ mV}$	
	> 33 V to 330 V	45 Hz to 10 kHz PRO-PMT/EL-007, version 4A	$0.24 \cdot 10^{-3} \cdot U + 8.0 \text{ mV}$	
	> 330 V to 1000 V	$0.33 \cdot 10^{-3} \cdot U + 70 \text{ mV}$		
AC current Measuring instruments	3.3 mA to 33 mA	45 Hz to 1 kHz PRO-PMT/EL-007, version 4A	$20 \cdot 10^{-6} \cdot I + 0.24 \text{ mA}$	I: measured value
	> 33 mA to 330 mA		$0.25 \cdot 10^{-3} \cdot I + 0.16 \text{ mA}$	
	> 330 mA to 1 A		$0.60 \cdot 10^{-3} \cdot I + 0.12 \text{ mA}$	
	> 1 A to 3 A		$0.70 \cdot 10^{-3} \cdot I + 0.12 \text{ mA}$	
	> 3 A to 11 A		$0.70 \cdot 10^{-3} \cdot I + 3.0 \text{ mA}$	
	> 11 A to 20 A		$1.5 \cdot 10^{-3} \cdot I + 6.0 \text{ mA}$	
	> 20 A to 120 A		$2.5 \cdot 10^{-3} \cdot I + 6.0 \text{ mA}$	

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On-site Calibration

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement ¹⁾	Remarks
Weighing instruments Non-automatic electronic weighing instruments with digital indicator ^{*)}	up to 1000 g	EURAMET Calibration Guide No. 18, Version 4.0	$2 \cdot 10^{-6}$	with weights according to OIML R 111-1:2004, Class E ₂
	up to 60 kg		$1 \cdot 10^{-5}$	with weights according to OIML R 111-1:2004, Class F ₁
	up to 300 kg		$1 \cdot 10^{-4}$	with weights according to OIML R 111-1:2004, Class M ₁
Temperature quantities Climatic chambers and autoclaves (with air circulation) ^{*)}	25 °C to 400 °C	DKD-R 5-7:2018, Method C EURAMET cg-20, Version 5.0	0.60 K	comparison with resistance thermometers or thermocouples
	-70 °C to 150 °C		0.50 K	
	Calibration baths ^{*)}	PRO-OS/TH-002, version 1A	0.15 K	
	Calibration baths ^{*)}		0.50 K	

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Annex to the accreditation certificate D-K-15102-01-00

Mobile Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement ¹⁾	Remarks
Mass standard Conventional mass *)	1 g	OIML R 111-1:2004	0.1 mg	For weight pieces according to OIML recommendation R 111-1:2004, Class F ₂
	2 g		0.12 mg	
	5 g		0.16 mg	
	10 g		0.2 mg	
	20 g		0.25 mg	
	50 g		0.3 mg	
	100 g		0.5 mg	
	200 g		1.0 mg	
	500 g		2.5 mg	
	1 kg		5.0 mg	
	2 kg		10 mg	
	5 kg		25 mg	
	10 kg		50 mg	
	20 kg		100 mg	
Pressure Gauge pressure p_e *)	0 kPa to 400 kPa	DKD-R 6-1:2014 <u>only</u> sequence B and C	0.5 kPa	Pressure medium: Oil
	> 400 kPa to 1 MPa		1.5 kPa	
	> 1MPa to 10 MPa		20 kPa	
	> 10 MPa to 25 MPa		45 kPa	
	> 25 MPa to 60 MPa		200 kPa	
Temperature quantities Liquid-in-glass thermometers *)	-20 °C to 360 °C	in dry block calibrator PTB testing instruction Volume 2, 2 nd edition	0.20 K	comparison with a standard resistance thermometer
Direct reading thermometers with resistance sensor *)	-20 °C to 660 °C	in dry block calibrator DKD-R 5-1:2018	0.20 K	
Direct reading thermometers with thermocouple sensor *)	-20 °C to 660 °C	in dry block calibrator DKD-R 5-3:2018, EURAMET Calibration Guide No. 8, Version 3.1	0.20 K	
Mechanical (dial) thermometers	-20 °C to 660 °C	in dry block calibrator PRO-MOB/TH-001, Version 2A	0.25 K	
Volume of liquids Volumetric burettes *)	10 mL	Gravimetric method ISO 4787:2021	7 µL	
	25 mL		10 µL	
	50 mL		22 µL	
	100 mL		37 µL	

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Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement ¹⁾	Remarks
Volumetric pipettes *)	10 mL	ISO 4787:2021	10 µL	
	20 mL		13 µL	
	25 mL		15 µL	
	50 mL		17 µL	
	100 mL		27 µL	
	200 mL		34 µL	
Volumetric flask *)	10 mL	ISO 4787:2021	22 µL	
	20 mL		37 µL	
	25 mL		37 µL	
	50 mL		55 µL	
	100 mL		78 µL	
	200 mL		0.14 mL	
	250 mL		0.14 mL	
	500 mL		0.21 mL	
	1000 mL		0.29 mL	
	2000 mL		0.40 mL	
	5000 mL		0.79 mL	
Measuring cylinders *)	10 mL	ISO 4787:2021	89 µL	
	25 mL		0.17 mL	
	50 mL		0.27 mL	
	100 mL		0.41 mL	
	250 mL		0.73 mL	
	500 mL		1.2 mL	
	1000 mL		1.9 mL	
	2000 mL		3.1 mL	
Provers *)	5 L		1.5 mL	
	10 L		2.0 mL	
	20 L		4.1 mL	

Abbreviations used:

OIML	International Organization of Legal Metrology
EURAMET	European Association of National Metrology Institutes
DKD-R	Guideline of Deutscher Kalibrierdienst (DKD)
PRO-xxx	In house method of Ethiopian Metrology Institute

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