

Deutsche Akkreditierungsstelle GmbH

Annex to the Accreditation Certificate D-K-15101-01-00 according to ISO/IEC 17025:2017

Period of validity: 30.07.2020 to 01.08.2023 Date of issue: 30.07.2020

Holder of certificate:

**Kenya Bureau of Standards
Metrology Laboratories
P.O. Box 54974, Popo Road, off Mombasa Road, 00200 Nairobi, Kenya**

Calibrations in the fields:

Electrical quantities

DC and low frequency quantities

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

Mechanical quantities

- Force
- Pressure

Thermodynamic quantities

Temperature quantities

- Resistance thermometers
- Thermocouples
- Liquid-in-glass thermometers
- Mechanical thermometers
- Direct reading thermometers

Fluid quantities

- Volume of flowing liquids

Abbreviations used: see last page

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Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement ¹⁾	Remarks
DC voltage Voltage standards	1.018 V		$1.0 \cdot 10^{-6} \cdot U$	U: measured value
	10 V		$0.4 \cdot 10^{-6} \cdot U$	
Calibrators and voltage measuring instruments	0.002 V to 0.2 V		$7.0 \cdot 10^{-6} \cdot U + 1 \mu\text{V}$	
	> 0.2 V to 2 V		$3.6 \cdot 10^{-6} \cdot U + 1 \mu\text{V}$	
	> 2 V to 20 V		$3.6 \cdot 10^{-6} \cdot U$	
	> 20 V to 200 V		$5.6 \cdot 10^{-6} \cdot U$	
	> 200 V to 1000 V		$5.6 \cdot 10^{-6} \cdot U$	
DC current Current sources and measuring instruments	0.1 mA		$37 \cdot 10^{-6} \cdot I$	I: measured value
	1 mA		$32 \cdot 10^{-6} \cdot I$	
	10 mA		$30 \cdot 10^{-6} \cdot I$	
	100 mA		$18 \cdot 10^{-6} \cdot I$	
	1 A		$34 \cdot 10^{-6} \cdot I$	
DC resistance Current measuring shunts	1 Ω		$22 \cdot 10^{-6} \cdot R$	R: measured value
	10 Ω		$25 \cdot 10^{-6} \cdot R$	
	100 Ω		$25 \cdot 10^{-6} \cdot R$	
	1 k Ω		$35 \cdot 10^{-6} \cdot R$	
	10 k Ω		$35 \cdot 10^{-6} \cdot R$	
Standard resistors	1 Ω		$0.8 \cdot 10^{-6} \cdot R$	
	10 Ω		$0.8 \cdot 10^{-6} \cdot R$	
	100 Ω		$2.8 \cdot 10^{-6} \cdot R$	
	1 k Ω		$4.4 \cdot 10^{-6} \cdot R$	
	10 k Ω		$4.6 \cdot 10^{-6} \cdot R$	
AC voltage Calibrators and voltage measuring instruments	0.1 V	40 Hz, 1 kHz, 10 kHz	$22 \cdot 10^{-6} \cdot U$	U: measured value
	1 V		$9.2 \cdot 10^{-6} \cdot U$	
	10 V		$8.0 \cdot 10^{-6} \cdot U$	
	100 V		$14 \cdot 10^{-6} \cdot U$	
	1000 V		$22 \cdot 10^{-6} \cdot U$	
	0.1 V	100 kHz	$22 \cdot 10^{-6} \cdot U$	
	1 V		$13 \cdot 10^{-6} \cdot U$	
	10 V		$12 \cdot 10^{-6} \cdot U$	
	100 V		$18 \cdot 10^{-6} \cdot U$	
	1000 V		$46 \cdot 10^{-6} \cdot U$	
Fluid quantities Volume V of streaming water	5 L to 10 000 L	5 L to 200 L static start and stop temperature of $\theta = 10 \text{ }^\circ\text{C}$ to $30 \text{ }^\circ\text{C}$	$6.0 \cdot 10^{-3} \cdot V$	V: measured value
		200 L to 10000 L volumetric reference standard, standing-start-and-finish calibration mode temperature of $\theta = 10 \text{ }^\circ\text{C}$ to $30 \text{ }^\circ\text{C}$	$6.0 \cdot 10^{-3} \cdot V$	V: measured value
Volume flow dV/dt of streaming water	5 L/h to 600 000 L/h			V: measured value

¹⁾ The expanded uncertainties according to EA-4/02 M:2013 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	-40 °C to 30 °C	Alcohol bath DKD-R-5-1:2018	0.15 K	Comparison measurement with a standard resistance thermometer
	> 30 °C to 80 °C	Water bath DKD-R-5-1:2018	0.15 K	
	> 80 °C to 200 °C	Oil Bath DKD-R-5-1:2018	0.15 K	
	> 200 °C to 660 °C	Furnace DKD-R-5-1:2018	0.15 K	
Liquid in glass thermometers	-40 °C to 30 °C	Alcohol bath	0.3 K	Comparison measurement with a standard resistance thermometer
	> 30 °C to 80 °C	Water bath	0.3 K	
	> 80 °C to 200 °C	Oil Bath	0.3 K	
	> 200 °C to 300 °C	Fluidized bath	0.3 K	
Mechanical (Dial Gauge) thermometers	-40 °C to 30 °C	Alcohol bath	0.2 K	Comparison measurement with a standard resistance thermometer
	> 30 °C to 80 °C	Water bath	0.2 K	
	> 80 °C to 200 °C	Oil Bath	0.2 K	
	> 200 °C to 300 °C	Fluidized bath	0.2 K	
Direct reading electrical thermometers	-40 °C to 30 °C	Alcohol bath DKD-R-5-1:2018 DKD-R-5-3:2018	0.15 K	Comparison measurement with a standard resistance thermometer
	> 30 °C to 80 °C	Water bath DKD-R-5-1:2018 DKD-R-5-3:2018	0.15 K	
	> 80 °C to 200 °C	Oil Bath DKD-R-5-1:2018 DKD-R-5-3:2018	0.15 K	
	> 200 °C to 660 °C	Furnace DKD-R-5-1:2018 DKD-R-5-3:2018	0.15 K	
Noble metal thermocouples Type S / R	0 °C to 200 °C	Liquid bath DKD-R-5-3:2018	1.5 K	Comparison measurement with a standard resistance thermometer
	> 200 °C to 420 °C	Furnace DKD-R-5-3:2018	1.5 K	
	> 420 °C to 1200 °C	Furnace DKD-R-5-3:2018	2.5 K	Comparison measurement with a standard thermocouple
Base metal thermocouples Type J / K / N	0 °C to 1200 °C	Furnace DKD-R-5-3:2018	5 K	Comparison measurement with a standard thermocouples

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Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement ¹⁾	Remarks
Force Force transducers (tension and compression forces)	2 kN to 10 kN	ISO 376:2011	$2 \cdot 10^{-3}$	1 MN force lever multiplication machine
	2 kN to 20 kN		$1 \cdot 10^{-3}$	
	5 kN to 50 kN		$1 \cdot 10^{-3}$	
	10 kN to 100 kN		$5 \cdot 10^{-4}$	
	20 kN to 200 kN		$5 \cdot 10^{-4}$	
	50 kN to 500 kN		$5 \cdot 10^{-4}$	
	100 kN to 1 MN		$5 \cdot 10^{-4}$	
Pressure Absolute pressure p_{abs}	0.75 bar to 1.15 bar	DKD-R 6-1:2014 EURAMET Calibration Guide No. 17 Version 3.0 Principle of measurement $p_{abs}=p_e + p_{amb}$	0.08 mbar	Pressure medium: Gas The uncertainty of the measured Atmospheric pressure has to be taken into account
	> 1.15 bar to 1.25 bar		$25 \mu\text{bar} + 6.0 \cdot 10^{-5} \cdot p_{abs}$	
	> 1.25 bar to 8.0 bar		$25 \mu\text{bar} + 4.5 \cdot 10^{-5} \cdot p_{abs}$	
Absolute pressure p_{abs}	1 bar 2 bar to 6 bar	DKD-R 6-1:2014 EURAMET Calibration Guide No. 17 Version 3.0 Principle of measurement $p_{abs}=p_e + p_{amb}$	$70 \mu\text{bar} + 6.5 \cdot 10^{-5} \cdot p_{abs}$	Pressure medium: Oil The uncertainty of the measured Atmospheric pressure has to be taken into account
	> 6 bar to 251 bar		$75 \mu\text{bar} + 4.0 \cdot 10^{-5} \cdot p_{abs}$	
	> 251 bar to 501 bar		$0.25 \text{ mbar} + 4.0 \cdot 10^{-5} \cdot p_{abs}$	
	> 501 bar to 1001 bar		$0.30 \text{ mbar} + 5.5 \cdot 10^{-5} \cdot p_{abs}$	
Gauge pressure p_e	0.015 bar to 0.1 bar	DKD-R 6-1:2014 EURAMET Calibration Guide No. 17 Version 3.0 EURAMET cg-3 Version 1.0	$25 \mu\text{bar} + 6.0 \cdot 10^{-5} \cdot p_e$	Pressure medium: Gas
	> 0.1 bar to 7.0 bar		$25 \text{ mbar} + 4.5 \cdot 10^{-5} \cdot p_e$	
Gauge pressure p_e	0 bar 2 bar to 5 bar	DKD-R 6-1:2014 EURAMET Calibration Guide No. 17 Version 3.0 EURAMET cg-3 Version 1.0	$70 \mu\text{bar} + 6.5 \cdot 10^{-5} \cdot p_e$	Pressure medium: Oil
	> 5 bar to 250 bar		$75 \mu\text{bar} + 4.0 \cdot 10^{-5} \cdot p_e$	
	> 250 bar to 500 bar		$0.25 \text{ mbar} + 4.0 \cdot 10^{-5} \cdot p_e$	
	> 500 bar to 1000 bar		$0.30 \text{ mbar} + 5.5 \cdot 10^{-5} \cdot p_e$	

Abbreviations used:

DKD-R Calibration Guideline of Deutscher Kalibrierdienst (DKD), published by Physikalische Technische Bundesanstalt

EURAMET European Association of National Metrology Institutes

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