

Deutsche Akkreditierungsstelle GmbH

Annex to the Accreditation Certificate D-K-15209-01-00 according to ISO/IEC 17025:2017

Period of validity: 11.02.2021 to 15.05.2023 Date of issue: 11.02.2021

Holder of certificate:

Ghana Standards Authority – Metrology Directorate
Shiashie Legon Road, near Gulf House, P. O. Box MB 245, Accra, GHANA

Calibrations in the fields:

Mechanical quantities

- Mass (mass standards)
- Weighing instruments ^{a)}
- Pressure ^{a)}

Chemical analysis, reference materials

- Volume of liquids

Thermodynamic quantities

Temperature quantities

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

Humidity quantities

- Devices for relative humidity
- Climatic chambers (humidity) ^{b)}

^{a)} Permanent laboratory and on-site calibration

^{b)} on-site calibration only

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.

The management system requirements of ISO/IEC 17025 are written in language relevant to operations of testing laboratories. Laboratories that conform to the requirements of this standard, operate generally in accordance with the principles of DIN EN ISO 9001.

The certificate together with the annex reflects the status as indicated by the date of issue.

The current status of any given scope of accreditation may be found respectively in the database of accredited bodies of Deutsche Akkreditierungsstelle GmbH <https://www.dakks.de/en/content/accredited-bodies-dakks>

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 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			
Mass and conventional mass *)	1 mg to 100 mg	OIML R 111-1:2004	0.016 mg	For free nominal values <i>m</i> : measured value
	> 100 mg to 200 mg		0.020 mg	
	> 200 mg to 500 mg		0.025 mg	
	> 500 mg to 1 g		0.03 mg	
	> 1 g to 2 g		0.04 mg	
	> 2 g to 5 g		0.05 mg	
	> 5 g to 10 g		0.06 mg	
	> 10 g to 20 g		0.08 mg	
	> 20 g to 50 g		0.10 mg	
	> 50 g to 100 g		0.16 mg	
	> 100 g to 20 kg		$1.6 \cdot 10^{-6} \cdot m$	

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.

Permanent Laboratory

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 *) and Non-automatic self-indicating mechanical weighing instruments *)	up to 2000 g	EURAMET Calibration Guide No. 18 Version 4.0 (11/2015)	$2 \cdot 10^{-6}$	For weight pieces according to OIML R 111-1:2004, Class E ₂
	up to 1000 kg		$7 \cdot 10^{-6}$	For weight pieces according to OIML R 111-1:2004, Class F ₁
	up to 60 kg		$3 \cdot 10^{-5}$	For weight pieces according to OIML R 111-1:2004, Class F ₂
	up to 2000 kg		$1 \cdot 10^{-4}$	For weight pieces according to OIML R 111-1:2004, Class M ₁
Volume of liquids Piston pipettes and hand dispensers *)	1 µL to < 10 µL	Gravimetric method	2.5 %	
	10 µL to < 100 µL	ISO 8655:2009	0.60 %	
	100 µL to 10 mL	DKD-R 8-1:2011	0.50 %	
Laboratory glassware *)	0.1 mL to < 1 mL	Gravimetric method ISO 4787:2010	1.6 %	adjusted as to deliver "Ex"
	1 mL to < 10 mL		0.20 %	
	10 mL to 100 mL		0.08 %	
	1 mL to < 10 mL		1.5 %	adjusted as to contain "In"
	10 mL to < 100 mL		0.18 %	
	100 mL to < 1 L		0.06 %	
	1 L to 10 L		0.05 %	
Standard measuring cans	1 L, 2 L	Gravimetric method	0.10 %	
	5 L, 10 L, 20 L	GSA-OP-C14-B	0.06 %	

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Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement ¹⁾	Remarks
Pressure Absolute pressure p_{abs} *)	0.8 bar to 1.1 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 in connection with a gas/ oil volume
	> 1.1 bar to 61.0 bar		$8.0 \cdot 10^{-5} \cdot p_{abs} + 0.09$ mbar	
	> 61 bar to 201 bar		25 mbar	Pressure medium: Oil. The uncertainty of the measured atmospheric pressure has to be taken into account.
	1 bar to 51 bar		$7.5 \cdot 10^{-5} \cdot p_{abs} + 0.09$ mbar	
	> 51 bar to 1001 bar		$6.0 \cdot 10^{-5} \cdot p_{abs} + 0.60$ mbar	
	> 1001 bar to 2001 bar		$1.0 \cdot 10^{-4} \cdot p_{abs} + 1.0$ mbar	
Gauge pressure p_e *)	-1bar to 0 bar	DKD-R 6-1:2014 EURAMET Calibration Guide No. 17 Version 3.0	0.75 mbar	Pressure medium: Gas in connection with a gas/ oil volume
	> 0 bar to 0.7 bar		0.08 mbar	
	> 0.7 bar to 1 bar		0.35 mbar	
	> 1 bar to 60 bar		$8.0 \cdot 10^{-5} \cdot p_e + 0.09$ mbar	
	> 60 bar to 200 bar	0.25 mbar	Pressure medium: Oil	
	0 bar; 1 bar to 50 bar	$7.5 \cdot 10^{-5} \cdot p_e + 0.09$ mbar		
	> 50 bar to 1000 bar	$6.0 \cdot 10^{-5} \cdot p_e + 0.60$ mbar		
	> 1000 bar to 2000 bar	$1.0 \cdot 10^{-4} \cdot p_e + 1.0$ mbar		
Temperature quantities Direct reading thermometers with resistance sensor *)	-80 °C to -30 °C	Methanol Bath DKD-R 5-1:2018	40 mK	Comparison with standard resistance thermometers
	> -30 °C to 10 °C	Ethanol Bath	30 mK	
	> 10 °C to 30 °C	DKD-R 5-1:2018	25 mK	
	> 30 °C to 70 °C	Water Bath DKD-R 5-1:2018	25 mK	
	> 70 °C to 200 °C	Oil Bath DKD-R 5-1:2018	80 mK	
	> 200 °C to 600 °C	Dry block calibrator DKD-R 5-1:2018	0.25 K	

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement ¹⁾	Remarks
Direct reading thermometers with thermocouple sensor *)	-80 °C to -30 °C	Methanol Bath DKD-R 5-3:2018	0.15 K	Comparison with standard resistance thermometers
	> -30 °C to 10 °C	Ethanol Bath DKD-R 5-3:2018	0.10 K	
	> 10 °C to 30 °C		0.10 K	
	> 30 °C to 70 °C	Water Bath DKD-R 5-3:2018	0.15 K	
	> 70 °C to 200 °C	Oil Bath DKD-R 5-3:2018	0,20 K	
	> 200 °C to 400 °C	Dry block calibrator DKD-R 5-3:2018	0.50 K	
	> 400 °C to 600 °C		0.75 K	
	> 600 °C to 1000 °C	High temperature furnace DKD-R 5-3:2018	1.25 K	Comparison with thermocouples
Resistance thermometers *)	-80 °C to -30 °C	Methanol Bath DKD-R 5-1:2018	40 mK	Comparison with standard resistance thermometers
	> -30 °C to 10 °C	Ethanol Bath DKD-R 5-1:2018	30 mK	
	> 10 °C to 30 °C	Ethanol Bath DKD-R 5-1:2018	25 mK	
	> 30 °C to 70 °C	Water Bath DKD-R 5-1:2018	25 mK	
	> 70 °C to 200 °C	Oil Bath DKD-R 5-1:2018	80 mK	
	> 200 °C to 600 °C	Dry block calibrator DKD-R 5-1:2018	0.30 K	
Liquid-in-glass thermometers *)	> -30 °C to 30 °C	Ethanol Bath PTB testing instruction Volume 2, 2 nd edition	50 mK	Comparison with standard resistance thermometers
	> 30 °C to 70 °C	Water Bath PTB testing instruction Volume 2, 2 nd edition	60 mK	
	> 70 °C to 200 °C	Oil Bath PTB testing instruction Volume 2, 2 nd edition	80 mK	

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Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement ¹⁾	Remarks
Noble metal thermocouples *)	-80 °C to -30 °C	Methanol Bath DKD-R 5-3:2018	0.8 K	Comparison with standard resistance thermometers
	> -30 °C to 30 °C	Ethanol Bath DKD-R 5-3:2018	0.6 K	
	> 30 °C to 70 °C	Water Bath DKD-R 5-3:2018	0.6 K	
	> 70 °C to 200 °C	Oil Bath DKD-R 5-3:2018	0.6 K	
	> 200 °C to 600 °C	Dry block calibrator DKD-R 5-3:2018	0.8 K	
	> 600 °C to 1000 °C	High temperature furnace DKD-R 5-3:2018	2.6 K	Comparison with thermocouples
Base metal thermocouples *)	-80 °C to -30 °C	Methanol Bath DKD-R 5-3:2018	1.2 K	Comparison with standard resistance thermometers
	> -30 °C to 30 °C	Ethanol Bath DKD-R 5-3:2018	1.0 K	
	> 30 °C to 70 °C	Water Bath DKD-R 5-3:2018	1.0 K	
	> 70 °C to 200 °C	Oil Bath DKD-R 5-3:2018	1.0 K	
	> 200 °C to 600 °C	Dry block calibrator DKD-R 5-3:2018	1.2 K	
	> 600 °C to 1000 °C	High temperature furnace DKD-R 5-3:2018	4 K	Comparison with thermocouples
Humidity quantities Hygrometers/Thermohygrometers (except psychrometers) for relative humidity	10 % to 90 %	Climatic chamber measuring temperature 10° C to 90 °C (dew point not lower than -12 °C) GSA-OP-C53-A	1.6 %	Comparison with standard humidity sensors Measurement uncertainty is an absolute value of the relative humidity
Air temperature sensors/Thermohygrometers (no thermocouples) for relative humidity	-40 °C to 10 °C	GSA-OP-C52-A	0.3 K	Comparison with standard resistance thermometers
	> 10 °C to 90 °C		0.2 K	
	> 90 °C to 150 °C		0.3 K	

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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
Temperature quantities Direct Reading Thermometers with resistance sensor *)	-80 °C to -30 °C	Dry block calibrator DKD-R 5-1:2018	0.25 K	Comparison with standard resistance thermometers
	-30 °C to 40 °C		0.15 K	
	40 °C to 600 °C		0.25 K	
Direct Reading Thermometers with thermocouple sensor *)	-80 °C to 150 °C	Dry block calibrator DKD-R 5-3:2018	0,35 K	Comparison with standard resistance thermometers
	> 150 °C to 400 °C		0.50 K	
	> 400 °C to 600 °C		0.75 K	
Climatic chambers with air circulation in empty or defined loaded useful volume *)	-80 °C to -40 °C	DKD-R 5-7:2018 Method A or B	1.3 K	Comparison with resistance thermometers and thermocouples
	> -40 °C to 10 °C		0.8 K	
	> 10 °C to 50 °C		0.5 K	
	> 50 °C to 150 °C		0.8 K	
	> 150 °C to 400 °C		1.5 K	
Climatic chambers without air circulation in empty or defined loaded useful volume *)	-80 °C to -40 °C	DKD-R 5-7:2018 Method A or B	1.6 K	If loaded, type and arrangement of the load are to be precisely stated in the calibration certificate.
	> -40 °C to 10 °C		1.2 K	
	> 10 °C to 50 °C		0.9 K	
	> 50 °C to 150 °C		1.2 K	
	> 150 °C to 350 °C		1.8 K	
Measuring locations in climatic chambers with air circulation, in empty or defined loaded useful volume *)	-80 °C to -40 °C	DKD-R 5-7:2018 Method C	1.3 K	
	> -40 °C to 10 °C		0.6 K	
	> 10 °C to 50 °C		0.4 K	
	> 50 °C to 150 °C		0.6 K	
	> 150 °C to 400 °C		1.4 K	
Measuring locations in climatic chambers without air circulation, in empty or defined loaded useful volume *)	-80 °C to -40 °C	DKD-R 5-7:2018 Method C	1.5 K	
	> -40 °C to 10 °C		1.0 K	
	> 10 °C to 50 °C		0.8 K	
	>50 °C to 150 °C		1.0 K	
	> 150 °C to 350 °C		1.6 K	

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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
Humidity quantities Climatic chambers with air circulation in empty or defined loaded useful volume *)	10 % to 30 %	DKD-R 5-7:2018 Method A or B Temperature range 10 °C to 90 °C	2.1 %	Comparison with capacitive sensor for relative humidity If loaded, type and arrangement of the load are to be precisely stated in the calibration certificate. Uncertainty value is an absolute value
	> 30 % to 60 %		2.3 %	
	> 60 % to 90 %		2.7 %	
Measuring locations in climatic chamber with air circulation, in empty or defined loaded useful volume *)	10 % to 30 %	DKD-R 5-7:2018 Method C Temperature range 10 °C to 90 °C	2.1 %	If loaded, type and arrangement of the load are to be precisely stated in the calibration certificate. Uncertainty value is an absolute value
	> 30 % to 60 %		2.2 %	
	> 60 % to 90 %		2.5 %	
Weighing instruments Non-automatic electronic weighing instruments *) and Non-automatic self-indicating mechanical weighing instruments *)	up to 2000 g	EURAMET Calibration Guide No. 18 Version 4.0 (11/2015)	$2 \cdot 10^{-6}$	For weight pieces according to OIML R 111-1:2004, Class E ₂
	up to 1000 kg		$7 \cdot 10^{-6}$	For weight pieces according to OIML R 111-1:2004, Class F ₁
	up to 60 kg		$3 \cdot 10^{-5}$	For weight pieces according to OIML R 111-1:2004, Class F ₂
	up to 2000 kg		$1 \cdot 10^{-4}$	For weight pieces according to OIML R 111-1:2004, Class M ₁
Pressure Gauge pressure p_e *)	-1000 mbar to 0 mbar	DKD-R 6-1:2014, EURAMET Calibration Guide No. 17 Version 3.0 (04/2017)	1.0 mbar	Pressure medium: Gas
	0 mbar to 700 mbar		0.50 mbar	
	> 0.7 bar to 2.0 bar		1.0 mbar	
	> 2 bar to 20 bar		3.0 mbar	
	> 20 bar to 200 bar		50 mbar	
	0 bar to 700 bar		0.40 bar	Pressure medium: Oil

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Abbreviations used:

DKD-R	Guideline of Deutscher Kalibrierdienst (DKD), published by Physikalisch-Technische Bundesanstalt (PTB)
EURAMET	European Association of National Metrology Institutes
GSA-OP	In house method of Ghana Standards Authority
OIML	International Organization of Legal Metrology

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