

Deutsche Akkreditierungsstelle GmbH

Annex to the Accreditation Certificate D-K-19500-01-00 according to DIN EN ISO/IEC 17025:2018

Valid from: 30.04.2019

Date of issue: 30.04.2019

Holder of certificate:

**Isabellenhütte Heusler GmbH & Co. KG
Eibacher Weg 3-5, 35683 Dillenburg**

Calibration in the fields:

Electrical quantities

DC and low frequency quantities

- DC voltage
- DC current
- DC resistance

Thermodynamic quantities

Temperature quantities

- Resistance thermometers
- Thermocouples
- Direct reading thermometers

Abbreviations used: see last page

Annex to the accreditation certificate D-K-19500-01-00

Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement ¹⁾	Remarks
DC and low frequency quantities DC voltage	1 μ V to < 10 mV	direct measuring with reference digital voltmeter and reversing polarity	$0.1 \cdot 10^{-3} \cdot U + 0.2 \mu\text{V}$	<i>U</i> : measured value
	10 mV to < 1 V		$20 \cdot 10^{-6} \cdot U$	
	1 V to 10 V		$3.0 \cdot 10^{-6} \cdot U$	
	> 10 V to 1000 V		$5.0 \cdot 10^{-6} \cdot U$	
DC current	1 μ A to < 1 mA	reference resistor	$30 \cdot 10^{-6} \cdot I$	<i>I</i> : measured value
	1 mA to < 10 A		$15 \cdot 10^{-6} \cdot I$	
	10 A to < 100 A		$30 \cdot 10^{-6} \cdot I$	
	100 A to 2000 A	transducer	$50 \cdot 10^{-6} \cdot I$	
DC resistance Resistors	1 Ω , 10 k Ω	direct comparison with standard resistors of same magnitude	$3.0 \cdot 10^{-6} \cdot R$	<i>R</i> : measured value
	10 $\mu\Omega$		$0.1 \cdot 10^{-3} \cdot R$	
	0.1 m Ω , 1 m Ω , 10 m Ω		$50 \cdot 10^{-6} \cdot R$	
	0.1 Ω , 10 Ω , 100 Ω , 1 k Ω		$10 \cdot 10^{-6} \cdot R$	
Ranges	10 $\mu\Omega$ to < 100 $\mu\Omega$	comparison with standard resistors by use of digital voltmeter	$0.1 \cdot 10^{-3} \cdot R$	
	0.1 m Ω to < 1 m Ω		$0.1 \cdot 10^{-3} \cdot R$	
	1 m Ω to < 10 m Ω		$50 \cdot 10^{-6} \cdot R$	
	10 m Ω to < 100 m Ω		$20 \cdot 10^{-6} \cdot R$	
	0,1 Ω to 100 k Ω		$10 \cdot 10^{-6} \cdot R$	
Temperature Resistance thermometers and Direct reading thermometers with resistance sensor	-40 $^{\circ}\text{C}$ to < 0 $^{\circ}\text{C}$	in liquid bath	0.10 K	Comparison with standard platin resistance thermometer
	0 $^{\circ}\text{C}$ to 250 $^{\circ}\text{C}$	DKD-R 5-1:2018	0.05 K	
	> 250 $^{\circ}\text{C}$ to 630 $^{\circ}\text{C}$	in fluidizing solid bath DKD-R 5-1:2018	0.25 K	
Direct reading thermometers with thermocouple sensor	-40 $^{\circ}\text{C}$ to < 0 $^{\circ}\text{C}$	in liquid bath	0.5 K	
	0 $^{\circ}\text{C}$ to 250 $^{\circ}\text{C}$	DKD-R 5-3:2018	0.3 K	
	> 250 $^{\circ}\text{C}$ to 630 $^{\circ}\text{C}$	in fluidizing solid bath DKD-R 5-3:2018	0.5 K	
	> 630 $^{\circ}\text{C}$ to 1100 $^{\circ}\text{C}$	in tube furnaces DKD-R 5-3:2018	1.0 K	
	> 1100 $^{\circ}\text{C}$ to 1200 $^{\circ}\text{C}$		1.5 K	

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.

Annex to the accreditation certificate D-K-19500-01-00

Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement ¹⁾	Remarks
Noble metal thermocouples	0 °C to 1100 °C	in liquid bath or tube furnaces	1.0 K	Comparison with standard thermocouples type S
	> 1100 °C to 1200 °C	DKD-R 5-3:2018	1.5 K	
Base metal thermocouples Type K, Type N	-40 °C to 0 °C	in liquid bath DKD-R 5-3:2018	1.8 K	Comparison with standard platin resistance thermometer
	> 0 °C to 300 °C	in liquid bath or tube furnaces DKD-R 5-3:2018	1,8 K	Comparison with standard thermocouples type S
	> 300 °C to 1000 °C		3,0 K	
	> 1000 °C to 1200 °C		4,0 K	
Type J	0 °C to 300 °C	in liquid bath or tube furnaces DKD-R 5-3:2018	1.1 K	
	> 300 °C to 500 °C		2.0 K	
	> 500 °C to 760 °C		3.0 K	
Type T	-40 °C to 0 °C	in liquid bath DKD-R 5-3:2018	1.5 K	Comparison with standard platin resistance thermometer
	> 0 °C to 400 °C	in liquid bath or tube furnaces DKD-R 5-3:2018	1,5 K	Comparison with standard thermocouples type S

Abbreviations used:

DKD-R Calibration Guide of Deutscher Kalibrierdienst (DKD), published by the Physikalisch-Technischen Bundesanstalt

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.