

## Deutsche Akkreditierungsstelle GmbH

### Annex to the Accreditation Certificate D-K-12029-01-00 according to DIN EN ISO/IEC 17025:2018

**Valid from:** **17.06.2022**

Date of issue: 17.06.2022

Holder of certificate:

**Hottinger Brüel & Kjaer GmbH**  
**Im Tiefen See 45, 64293 Darmstadt**

Calibration in the fields:

**Mechanical quantities**

- **Torque**<sup>\*)</sup>
- **Force**<sup>\*)</sup>
- **Pressure**<sup>\*)</sup>

**Thermodynamic quantities**

- Temperature quantities**
- **Temperature indicators and simulators**<sup>a)\*</sup>

**Electrical quantities**

- DC and low frequency**
- **Voltage ratio**<sup>a)</sup>
- **DC voltage**<sup>a)</sup>
- **DC current**<sup>a)</sup>
- **DC resistance**<sup>a)</sup>

**Time and frequency**

- **Frequency**<sup>a)</sup>

<sup>a)</sup> also On-site calibration

Within the measurands/calibration items marked with with <sup>\*)</sup>, 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 DIN EN ISO/IEC 17025 are written in the language relevant to the operations of calibration 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 can be found in the directory of accredited bodies maintained by Deutsche Akkreditierungsstelle GmbH at <https://www.dakks.de/en/accredited-bodies-search.html>.*

Abbreviations used: see last page

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**Permanent Laboratory**

Measurement quantity / Calibration item	Calibration and Measurement Capabilities (CMC)			
	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
<b>Torque<sup>*)</sup></b>  torque transducer and torque measurement chain	2 N·m to 200 N·m	DIN 51309:2005 DKD-R 10-5:2020  VDI/VDE 2646:2019	$4 \cdot 10^{-4}$	200-N·m-T-RCM, correction 1.00025 right- and left hand torque
	5 N·m to 1000 N·m		$1 \cdot 10^{-4}$	1-kN·m- T-RCM
	5 N·m to 25 kN·m		$2 \cdot 10^{-4}$	Torque-reference RCM
	50 N·m to 200 N·m		$4 \cdot 10^{-4}$	20-kN·m- T-RCM
	250 N·m to 20 kN·m		$2 \cdot 10^{-4}$	
	100 N·m to 20 kN·m		$0.8 \cdot 10^{-4}$	25-kN·m- T-RCM
	> 20 kN·m to 25 kN·m		$1 \cdot 10^{-4}$	
	3 kN·m to 400 kN·m		$1 \cdot 10^{-3}$	400-kN·m- T-RCM
<b>Force<sup>*)</sup></b>	2.5 N to 200 N	DIN EN ISO 376:2011 DKD-R 3-3:2010	$5 \cdot 10^{-5}$	200-N-F-RCM compression force
			$8 \cdot 10^{-5}$	200-N- F-RCM tractive force
	50 N to 2.5 kN		$5 \cdot 10^{-5}$	2.5-kN- F-RCM compression force
			$8 \cdot 10^{-5}$	2.5-kN- F-RCM tractive force
	1 kN to 20 kN		$2 \cdot 10^{-4}$	20-kN- F-RCM tractive and compression force
			$5 \cdot 10^{-5}$	25-kN- F-RCM compression force
	500 N to 25 kN		$8 \cdot 10^{-5}$	25-kN- F-RCM tractive force
			$2 \cdot 10^{-4}$	100-kN- F-RCM tractive and compression force
	5 kN to 100 kN		$1 \cdot 10^{-4}$	240-kN- F-RCM tractive and compression force
			$1 \cdot 10^{-4}$	1-MN- F-RCM compression force
	50 kN to 1 MN		$2 \cdot 10^{-4}$	1-MN- F-RCM tractive force
			$2 \cdot 10^{-4}$	5-MN- F-RCM tractive and compression force
<b>Pressure<sup>*)</sup></b>  positive pressure $p_e$	0 bar;	DKD-R 6-1:2014		pressure medium: Oil
	50 bar to 3600 bar		$2 \cdot 10^{-4} \cdot p_e$ ; but not < 72 mbar	

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Calibration and Measurement Capabilities (CMC)				
Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
<b>Frequency</b> measuring devices	200 Hz to 2000 kHz		$12 \cdot 10^{-6} \cdot f$	<i>f</i> : actual measured value
<b>Temperature*</b> display devices for resistance thermometer PT 100	-100 °C to 200 °C	DKD-R 5-5:2018	0.025 K	sensor signal by electrical simulation characteristic according to DIN EN 60751:2009
	> 200 °C to 500 °C		0.04 K	
	> 500 °C to 800 °C		0.05 K	
display devices for resistance thermometer PT 500	-100 °C to 200 °C		0.025 K	
	> 200 °C to 500 °C		0.075 K	
	> 500 °C to 800 °C		0.18 K	
display devices for resistance thermometer PT 1000	-100 °C to 200 °C		0.035 K	
	> 200 °C to 500 °C		0.18 K	
	> 500 °C to 800 °C		0.24 K	
display devices for thermocouples type K	-100 °C to 800 °C		0.12 K	sensor signal by electrical simulation characteristic according to DIN EN 60584:2014
	> 800 °C to 1300 °C		0.3 K	
Anzeigegeräte für Thermoelemente type T	-200 °C to 400 °C		0.12 K	(referred to 0 °C)
<b>DC voltage</b> measuring devices	0 V		1 μV	<i>U</i> : actual measured value
	0.001 V to 0.22 V		$7 \cdot 10^{-6} \cdot U + 2 \mu\text{V}$	
	> 0.22 V to 2.2 V		$8 \cdot 10^{-6} \cdot U + 2 \mu\text{V}$	
	> 2.2 V to 11 V		$8 \cdot 10^{-6} \cdot U + 4 \mu\text{V}$	
	> 11 V to 22 V		$9 \cdot 10^{-6} \cdot U + 10 \mu\text{V}$	
	> 22 V to 220 V		$30 \cdot 10^{-6} \cdot U + 40 \mu\text{V}$	
sources	0.0 V to 0.1 V		$6 \cdot 10^{-6} \cdot U + 0.4 \mu\text{V}$	<i>U</i> : actual measured value
	> 0.1 V to 1 V		$5 \cdot 10^{-6} \cdot U + 0.4 \mu\text{V}$	
	> 1 V to 10 V		$5 \cdot 10^{-6} \cdot U + 0.4 \mu\text{V}$	
	> 10 V to 100 V		$50 \cdot 10^{-6} \cdot U + 1000 \mu\text{V}$	
<b>DC current</b> measuring devices	0.001 A to 0.022 A		$50 \cdot 10^{-6} \cdot I + 0.3 \mu\text{A}$	<i>I</i> : actual measured value
	> 0.022 A to 0.22 A		$60 \cdot 10^{-6} \cdot I + 2 \mu\text{A}$	

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Measurement quantity / Calibration item	Range	Calibration and Measurement Capabilities (CMC)		Remarks
		Measurement conditions / procedure	Expanded uncertainty of measurement	
<b>DC resistance</b> measuring devices	16 Ω to 400 Ω		40 · 10 <sup>-6</sup> · R + 3.5 mΩ	<i>R</i> : actual measured value
	> 400 Ω to 2 000 Ω		60 · 10 <sup>-6</sup> · R	
	> 2 000 Ω to 10 000 Ω		170 · 10 <sup>-6</sup> · R	
resistance	0.1 Ω to 10 Ω		18 · 10 <sup>-6</sup> · R + 0.05 mΩ	
	> 10 Ω to 100 Ω		15 · 10 <sup>-6</sup> · R + 0.5 mΩ	
	> 100 Ω to 1000 Ω		12 · 10 <sup>-6</sup> · R + 5 mΩ	
	> 1000 Ω to 10000 Ω		12 · 10 <sup>-6</sup> · R + 50 mΩ	
<b>Voltage ratio</b> bridge calibration unit	0 mV/V	DC voltage bridge voltage: 1.0 V	0.2 μV/V	calibration in any points between negativ und positiv value within the specified measuring range
	± 2 mV/V		0.25 μV/V	
	± 5 mV/V		0.3 μV/V	
	± 10 mV/V		0.3 μV/V	
	± 20 mV/V		0.4 μV/V	
	± 100 mV/V		1 μV/V	
	± 1 000 mV/V		10 μV/V	
	0 mV/V	DC voltage bridge voltage: > 1 V to 2.5 V	0.1 μV/V	
	± 2 mV/V		0.1 μV/V	
	± 5 mV/V		0.2 μV/V	
	± 10 mV/V		0.2 μV/V	
	± 20 mV/V		0.2 μV/V	
	± 100 mV/V		1 μV/V	
	± 1 000 mV/V		10 μV/V	
<b>Voltage ratio</b> bridge calibration unit	0 mV/V	DC voltage bridge voltage: > 2.5 V to 7.5 V	0.1 μV/V	calibration in any points between negativ und positiv value with the specified measuring range
	± 2 mV/V		0.1 μV/V	
	± 5 mV/V		0.1 μV/V	
	± 10 mV/V		0.1 μV/V	
	± 20 mV/V		0.2 μV/V	
	± 100 mV/V		1 μV/V	
	± 1 000 mV/V		10 μV/V	
	0 mV/V		0.1 μV/V	

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Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
<b>Voltage ratio</b> measuring devices	± 2 mV/V	DC voltage bridge voltage: 1.0 V	0.5 µV/V	calibration in any points between negativ und positiv value with the specified measuring range
	± 5 mV/V		0.5 µV/V	
	± 10 mV/V		1.0 µV/V	
	± 20 mV/V		1.5 µV/V	
	± 100 mV/V		15 µV/V	
	± 1 000 mV/V		150 µV/V	
	± 2 mV/V	DC voltage bridge voltage: > 1 V to 10 V	0.3 µV/V	
	± 5 mV/V		0.6 µV/V	
	± 10 mV/V		1.2 µV/V	
	± 20 mV/V		2.4 µV/V	
	± 100 mV/V		12 µV/V	
	± 1 000 mV/V		120 µV/V	
	± 2 mV/V	measuring frequency: 600 Hz to 1250 Hz square- bridge voltage: 1 V	0.5 µV/V	calibration in any points between negativ und positiv value with the specified measuring range
	± 5 mV/V		0.5 µV/V	
	± 10 mV/V		1 µV/V	
	± 20 mV/V		1.5 µV/V	
	± 100 mV/V		15 µV/V	
	± 2 mV/V	measuring frequency: 600 Hz to 1250 Hz square- bridge voltage: > 1 V to 5 V	0.3 µV/V	
	± 5 mV/V		0.6 µV/V	
	± 10 mV/V		1.2 µV/V	
	± 20 mV/V		2.4 µV/V	
<b>Voltage ratio</b> quarter and half bridge, measuring devices	± 2 mV/V	DC voltage and measuring frequency: 600 Hz to 1250 Hz square- bridge voltage:1.0 V	1 µV/V	
	± 5 mV/V		2 µV/V	
	± 10 mV/V		2 µV/V	
	± 20 mV/V		5 µV/V	
	± 100 mV/V		20 µV/V	
	± 2 mV/V	DC voltage and measuring frequency: 600 Hz to 1250 Hz square- bridge voltage: > 1 V to 2.5 V	1 µV/V	
	± 5 mV/V		2 µV/V	
	± 10 mV/V		2 µV/V	
	± 20 mV/V		5 µV/V	
	± 100 mV/V		20 µV/V	
	± 2 mV/V	DC voltage and measuring frequency: 600 Hz to 1250 Hz square- bridge voltage: > 2.5 V to 5.0 V	1 µV/V	
	± 5 mV/V		2 µV/V	
	± 10 mV/V		2 µV/V	

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Measurement quantity / Calibration item	Calibration and Measurement Capabilities (CMC)			
	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
<b>Voltage ratio</b>  350 Ω – bridge calibration unit and display devices	0 mV/V ± 0.5 mV/V ± 1 mV/V ± 2 mV/V ± 5 mV/V ± 10 mV/V	DC voltage bridge voltage: 5 V oder 10 V	0.2 µV/V 0.2 µV/V 0.2 µV/V 0.2 µV/V 1·10 <sup>-4</sup> · measured value 1·10 <sup>-4</sup> · measured value	resistive reference standard calibration in any points between negativ und positiv value with the specified measuring range
	± 2.5 mV/V ± 5 mV/V	measuring frequency 225 Hz bridge voltage: 2.5 V	0.03 µV/V 0.04 µV/V	inductive bridge reference standard calibration in any points between negativ und positiv value with the specified measuring range
	± 2.5 mV/V ± 5 mV/V	measuring frequency 225 Hz bridge voltage: 5 V	0.02 µV/V 0.03 µV/V	
	± 2.5 mV/V	measuring frequency 225 Hz bridge voltage: 10 V	0.02 µV/V	
	± 2.5 mV/V ± 5 mV/V ± 10 mV/V	measuring frequency 600 Hz bridge voltage 1 V	0.2 µV/V 0.2 µV/V 0.3 µV/V	
	± 2.5 mV/V ± 5 mV/V ± 10 mV/V	measuring frequency 600 Hz bridge voltage 2.5 V	0.06 µV/V 0.08 µV/V 0.2 µV/V	
	± 2.5 mV/V ± 5 mV/V ± 10 mV/V	measuring frequency 600 Hz bridge voltage 5 V	0.03 µV/V 0.06 µV/V 0.2 µV/V	
	± 2 mV/V ± 10 mV/V ± 100 mV/V ± 1000 mV/V	measuring frequency 4.8 kHz bridge voltage 1 V	0.4 µV/V 1.5 µV/V 10 µV/V 50 µV/V	resistive reference standard calibration in any points between negativ und positiv value with the specified measuring range
	± 2 mV/V ± 5 mV/V ± 10 mV/V ± 100 mV/V ± 1000 mV/V	measuring frequency 4.8 kHz bridge voltage 2.5 V	0.3 µV/V 0.6 µV/V 1.5 µV/V 10 µV/V 50 µV/V	
	± 2 mV/V ± 5 mV/V ± 10 mV/V ± 100 mV/V	measuring frequency 4.8 kHz bridge voltage 5 V	0.25 µV/V 0.6 µV/V 1.5 µV/V 10 µV/V	

**Annex to the accreditation certificate D-K-12029-01-00**

**On-site calibration**

Calibration and Measurement Capabilities (CMC)				
Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
<b>Frequency</b> measuring devices	200 Hz to 2000 kHz		$12 \cdot 10^{-6} \cdot f$	<i>f</i> : actual measured value
<b>Temperatur*</b> display devices for resistance thermometer PT 100	-100 °C to 200 °C	DKD-R 5-5:2018	0.025 K	sensor signal by electrical simulation characteristic according to DIN EN 60751:2009
	> 200 °C to 500 °C		0.04 K	
	> 500 °C to 800 °C		0.05 K	
display devices for resistance thermometer PT 500	-100 °C to 200 °C	DKD-R 5-5:2018	0.025 K	
	> 200 °C to 500 °C		0.075 K	
	> 500 °C to 800 °C		0.18 K	
display devices for resistance thermometer PT 1000	-100 °C to 200 °C	DKD-R 5-5:2018	0.035 K	
	> 200 °C to 500 °C		0.18 K	
	> 500 °C to 800 °C		0.24 K	
display devices for thermocouples type K	-100 °C to 800 °C	DKD-R 5-5:2018	0.12 K	sensor signal by electrical simulation characteristic according to DIN EN 60584:2014 (referred to 0 °C)
	> 800 °C to 1 300 °C		0.3 K	
display devices for thermocouples type T	-200 °C to 400 °C		0.12 K	
<b>DC voltage</b> measuring devices	0 V to 0.045 V	DKD-R 5-5:2018	$30 \cdot 10^{-6} \cdot U + 4 \mu\text{V}$	<i>U</i> : actual measured value
	> 0.045 V to 0.3 V		$35 \cdot 10^{-6} \cdot U + 13 \mu\text{V}$	
	> 0.3 V to 0.45 V		$35 \cdot 10^{-6} \cdot U + 22 \mu\text{V}$	
	> 0.45 V to 3 V		$35 \cdot 10^{-6} \cdot U + 125 \mu\text{V}$	
	> 3 V to 4.5 V		$35 \cdot 10^{-6} \cdot U + 215 \mu\text{V}$	
	> 4.5 V to 30 V		$35 \cdot 10^{-6} \cdot U + 1 300 \mu\text{V}$	
	> 30 V to 60 V		$35 \cdot 10^{-6} \cdot U + 2 500 \mu\text{V}$	
sources	0.001 V to 0.1 V	DKD-R 5-5:2018	$35 \cdot 10^{-6} \cdot U + 8 \mu\text{V}$	<i>U</i> : actual measured value
	> 0.1 V to 1 V		$35 \cdot 10^{-6} \cdot U + 11 \mu\text{V}$	
	> 1 V to 10 V		$35 \cdot 10^{-6} \cdot U + 60 \mu\text{V}$	
	> 10 V to 100 V		$50 \cdot 10^{-6} \cdot U + 1 000 \mu\text{V}$	

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Calibration and Measurement Capabilities (CMC)				
Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
<b>DC current</b> measuring devices	0.002 A to 0.0075 A		$90 \cdot 10^{-6} \cdot I + 0.9 \mu\text{A}$	<i>I</i> : actual measured value
	> 0.0075 A to 0.052 A		$90 \cdot 10^{-6} \cdot I + 4 \mu\text{A}$	
<b>DC resistace</b> measuring devices	16 Ω to 400 Ω		$40 \cdot 10^{-6} \cdot R + 3.5 \text{ m}\Omega$	<i>R</i> : actual measured value
	> 400 Ω to 2 000 Ω		$60 \cdot 10^{-6} \cdot R$	
	> 2 000 Ω to 10 000 Ω		$170 \cdot 10^{-6} \cdot R$	
<b>Voltage ratio</b> measuring devices	± 2 mV/V	DC voltage bridge voltage: 1.0 V	0.5 μV/V	calibration in any points between negativ und positiv value with the specified measuring range
	± 5 mV/V		0.5 μV/V	
	± 10 mV/V		1.0 μV/V	
	± 20 mV/V		1.5 μV/V	
	± 100 mV/V		15 μV/V	
	± 1 000 mV/V		150 μV/V	
	± 2 mV/V	DC voltage bridge voltage: > 1 V to 10 V	0.3 μV/V	
	± 5 mV/V		0.6 μV/V	
	± 10 mV/V		1.2 μV/V	
	± 20 mV/V		2.4 μV/V	
	± 100 mV/V		12 μV/V	
	± 1 000 mV/V		120 μV/V	
	± 2 mV/V	measuring frequency: 600 Hz to 1250 Hz square bridge voltage: 1 V	0.5 μV/V	
	± 5 mV/V		0.5 μV/V	
	± 10 mV/V		1 μV/V	
	± 20 mV/V		1.5 μV/V	
	± 100 mV/V		15 μV/V	
	± 2 mV/V	measuring frequency: 600 Hz to 1250 Hz square bridge voltage: > 1 V to 5 V	0.3 μV/V	
	± 5 mV/V		0.6 μV/V	
	± 10 mV/V		1.2 μV/V	
	± 20 mV/V		2.4 μV/V	
	± 2 mV/V	measuring frequency: 4.8 kHz bridge voltage: 1 V	0.5 μV/V	
	± 10 mV/V		2 μV/V	
	± 100 mV/V		15 μV/V	
	± 1 000 mV/V		120 μV/V	
	± 2 mV/V	measuring frequency: 4.8 kHz bridge voltage: 2.5 V	0.4 μV/V	
	± 5 mV/V		2 μV/V	
	± 10 mV/V		2 μV/V	
	± 100 mV/V		15 μV/V	
	± 2 mV/V	measuring frequency: 4.8 kHz bridge voltage: 5 V	0.4 μV/V	

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Measurement quantity / Calibration item	Range	Calibration and Measurement Capabilities (CMC)			Remarks
		Measurement conditions / procedure	Expanded uncertainty of measurement		
<b>Voltage ratio</b>  measuring devices	± 2 mV/V	measuring frequency: 600 Hz  bridge voltage: 2.5 V	0.1 µV/V	calibration in any points between negativ und positiv value with the specified measuring range	
	± 5 mV/V		0.2 µV/V		
	± 10 mV/V		1 µV/V		
	± 2 mV/V	measuring frequency: 600 Hz  bridge voltage: 5 V	0.1 µV/V		
	± 5 mV/V		0.2 µV/V		
	± 2.5 mV/V	measuring frequency: 225 Hz  bridge voltage: 2.5 V	0.06 µV/V		
	± 5 mV/V		0.08 µV/V		
	± 2.5 mV/V	measuring frequency: 225 Hz  bridge voltage: 5 V	0.04 µV/V		
	± 5 mV/V		0.06 µV/V		
<b>Voltage ratio</b>  quarter and half bridge, measuring devices	± 2 mV/V	DC voltage and measuring frequency: 600 Hz to 1250 Hz square  bridge voltage: 1.0 V	1 µV/V	calibration in any points between negativ und positiv value with the specified measuring range	
	± 5 mV/V		2 µV/V		
	± 10 mV/V		2 µV/V		
	± 20 mV/V		5 µV/V		
	± 100 mV/V		20 µV/V		
	± 2 mV/V	DC voltage and measuring frequency: 600 Hz to 1250 Hz square  bridge voltage: > 1 V to 2.5 V	1 µV/V		
	± 5 mV/V		2 µV/V		
	± 10 mV/V		2 µV/V		
	± 20 mV/V		5 µV/V		
	± 100 mV/V		20 µV/V		
	± 2 mV/V	DC voltage and measuring frequency: 600 Hz to 1250 Hz square  bridge voltage: > 2.5 V to 5.0 V	1 µV/V		
	± 5 mV/V		2 µV/V		
	± 10 mV/V		2 µV/V		

**Abbreviations used:**

CMC	Calibration and measurement capabilities (Kalibrier- und Messmöglichkeiten)
DKD-R	Calibration guide of Deutscher Kalibrierdienstes (DKD), published by Physikalisch-Technische Bundesanstalt
EURAMET	European Association of National Metrology Institutes