

Deutsche Akkreditierungsstelle

Annex to the Partial Accreditation Certificate D-K-15183-01-01 according to DIN EN ISO/IEC 17025:2018

Valid from: 07.03.2024

Date of issue: 07.03.2024

This annex is a part of the accreditation certificate D-K-15183-01-00.

Holder of partial accreditation certificate:

**SPEKTRA Schwingungstechnik und Akustik GmbH Dresden
Heidelberger Straße 12, 01189 Dresden**

with the location

**SPEKTRA Schwingungstechnik und Akustik GmbH Dresden
Heidelberger Straße 12, 01189 Dresden**

The calibration laboratory meets the requirements of DIN EN ISO/IEC 17025:2018 to carry out the conformity assessment activities listed in this annex. The calibration laboratory meets additional legal and normative requirements, if applicable, including those in relevant sectoral schemes, provided that these are explicitly confirmed below.

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

This certificate annex is only valid together with the written accreditation certificate and 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>.

Abbreviations used: see last page

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Calibration in the fields:

Electrical quantities

DC and low frequency

- DC voltage
- AC voltage
- DC current
- Capacitance
- Charge
- Voltage ratio

Time and frequency

- Frequency ^{a)}

^{a)} also On-site-calibration

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Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
DC voltage Measuring instruments	0.1 V to 25 V		$50 \cdot 10^{-6} \cdot U$	U = measured value
DC voltage Sources	0.1 V to 25 V		$50 \cdot 10^{-6} \cdot U$	U = measured value
	200 V		$1.5 \cdot 10^{-3} \cdot U$	
DC current Measuring instruments	20 μ A to < 12 mA		$0.10 \cdot 10^{-3} \cdot I$	I = measured value
	12 mA to < 120mA		$0.10 \cdot 10^{-3} \cdot I$	
	120 mA to 1000 mA		$0.30 \cdot 10^{-3} \cdot I$	
Sources	20 μ A to < 12 mA		$0.10 \cdot 10^{-3} \cdot I$	I = measured value
	12 mA to < 120mA		$0.10 \cdot 10^{-3} \cdot I$	
	120 mA to 1000 mA		$0.30 \cdot 10^{-3} \cdot I$	
AC voltage Measuring instruments, sources	3.4 mV to 7000 mV	0.1 Hz to < 10 Hz	$1.3 \cdot 10^{-3} \cdot U$	U = measured value
	0.012 V to 12 V	10 Hz to 40 Hz	$0.60 \cdot 10^{-3} \cdot U$	
		> 40 Hz to 1 kHz	$0.40 \cdot 10^{-3} \cdot U$	
		> 1 kHz to 20 kHz	$0.50 \cdot 10^{-3} \cdot U$	
		> 20 kHz to 50 kHz	$0.80 \cdot 10^{-3} \cdot U$	
> 50 kHz to 100 kHz	$1.5 \cdot 10^{-3} \cdot U$			
Charge Measuring instruments	1.37 pC to 7000 pC	1.0 Hz to < 10 Hz	$1.3 \cdot 10^{-3} \cdot Q$	Q = measured value
		10 Hz to 40 Hz	$0.6 \cdot 10^{-3} \cdot Q$	
		> 40 Hz to 1 kHz	$0.4 \cdot 10^{-3} \cdot Q$	
		> 1 kHz to 20 kHz	$0.5 \cdot 10^{-3} \cdot Q$	
		> 20 kHz to 50 kHz	$0.8 \cdot 10^{-3} \cdot Q$	
		> 50 kHz to 100 kHz	$1.5 \cdot 10^{-3} \cdot Q$	
Capacitance	100 pF, 1000 pF	E-C-01.C_V1 Substitution measurement with reference capacitor		C = measured value
		1000 Hz	$0.3 \cdot 10^{-3} \cdot C$	
AC voltage ratio Amount Measuring amplifier with AC voltage output	$\frac{1}{4}$ V/V to $\frac{2048}{1}$ V/V	DKD-R 3-2:2019		G = measured value $\frac{1}{4}$ V/V indicates the adjustable transfer coefficient
		0.1 Hz to < 10 Hz	$1.0 \cdot 10^{-3} \cdot G$	
		10 Hz to 40 Hz	$0.7 \cdot 10^{-3} \cdot G$	
		> 40 Hz to 1 kHz	$0.5 \cdot 10^{-3} \cdot G$	
		> 1 kHz to 20 kHz	$0.6 \cdot 10^{-3} \cdot G$	
		> 20 kHz to 50 kHz	$0.8 \cdot 10^{-3} \cdot G$	
		> 50 kHz to 100 kHz	$1.6 \cdot 10^{-3} \cdot G$	

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Voltage buffer with AC voltage output	$\frac{4}{1} \text{ V/V}$ to $\frac{1}{128} \text{ V/V}$	DKD-R 3-2:2019 0.1 Hz to < 10 Hz 10 Hz to 40 Hz > 40 Hz to 1 kHz > 1 kHz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz	$1.0 \cdot 10^{-3} \cdot G$ $0.4 \cdot 10^{-3} \cdot G$ $0.3 \cdot 10^{-3} \cdot G$ $0.4 \cdot 10^{-3} \cdot G$ $0.8 \cdot 10^{-3} \cdot G$ $1.5 \cdot 10^{-3} \cdot G$	G = measured value
		DKD-R 3-2:2019 0.1 Hz to < 10 Hz 10 Hz to 40 Hz > 40 Hz to 1 kHz > 1 kHz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz	$1.0 \cdot 10^{-3} \cdot G$ $0.6 \cdot 10^{-3} \cdot G$ $0.4 \cdot 10^{-3} \cdot G$ $0.5 \cdot 10^{-3} \cdot G$ $0.8 \cdot 10^{-3} \cdot G$ $2.0 \cdot 10^{-3} \cdot G$	
AC voltage ratio Phase Measuring amplifier with AC voltage output	$\frac{1}{4} \text{ V/V}$ to $\frac{1}{2048} \text{ V/V}$	DKD-R 3-2:2019 0.1 Hz to < 10 Hz 10 Hz to 315 Hz > 315 Hz to 1 kHz > 1 kHz to 5 kHz > 5 kHz to 12.5 kHz	0.10° 0.08° 0.14° 0.15° 0.30°	
Voltage buffer with AC voltage output	$\frac{1}{1} \text{ V/V}$ to $\frac{1}{512} \text{ V/V}$	DKD-R 3-2:2019 0.1 Hz to < 10 Hz 10 Hz to 1 kHz > 1 kHz to 5 kHz > 5 kHz to 10 kHz > 10 kHz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz	0.08° 0.02° 0.05° 0.05° 0.10° 0.30° 0.50°	
AC charge ratio Amount Charge amplifier with AC voltage output	1.25 mV/pC to 5120 mV/pC	DKD-R 3-2:2019 1.0 Hz to < 10 Hz 10 Hz to 40 Hz > 40 Hz to 1 kHz > 1 kHz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz	$1.3 \cdot 10^{-3} \cdot G$ $0.7 \cdot 10^{-3} \cdot G$ $0.4 \cdot 10^{-3} \cdot G$ $0.5 \cdot 10^{-3} \cdot G$ $0.8 \cdot 10^{-3} \cdot G$ $1.6 \cdot 10^{-3} \cdot G$	G = measured value

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Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
AC charge ratio Phase Charge amplifier with AC voltage output	1.25 mV/pC to 5120 mV/pC	DKD-R 3-2:2019 1.0 Hz to < 10 Hz 10 Hz to 315 Hz > 315 Hz to 1 kHz > 1 kHz to 5 kHz > 5 kHz to 12.5 kHz	0.20° 0.08° 0.14° 0.15° 0.30°	
Frequency Signal generator	0.1 Hz to 1 MHz		$\sqrt{(1 \cdot 10^{-8})^2 + W(K_{TRG})^2} \cdot f$	$f =$ measured value $W(K_{TRG}) =$ trigger uncertainty
Frequency measuring device	0.1 Hz to 1 MHz		$\sqrt{(1 \cdot 10^{-7})^2 + W(K_{TRG})^2} \cdot f$	

On-Site Calibration

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Frequency vibration controller (signal generator)	1 Hz to 20 kHz		$\sqrt{(1 \cdot 10^{-4})^2 + W(K_{TRG})^2} \cdot f$	$f =$ measured value $W(K_{TRG}) =$ trigger uncertainty

Abbreviations used:

- CMC Calibration and measurement capabilities (Kalibrier- und Messmöglichkeiten)
- DKD-R Guideline of Deutscher Kalibrierdienst (DKD), published by Physikalisch-Technische Bundesanstalt

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