Deutsche Akkreditierungsstelle GmbH

Annex to the Accreditation Certificate D-K-18446-01-00 according to DIN EN ISO/IEC 17025:2018

Valid from: 03.03.2020

Date of issue: 03.03.2020

Holder of certificate:

mg-sensor GmbH

with the locations:

Airport Boulevard B 210, 77836 Rheinmünster
Knorrstraße 147, EG-351, 80788 München

Calibration in the fields:

Mechanical quantities
- **Force**
- **Torque**
- **Acceleration**

Thermodynamic quantities
Temperature quantities
- **Resistance thermometers**
- **Direct reading thermometers**
- **Temperature transmitters, transducers, data loggers**

Humidity quantities
- **Devices for relative humidity**

Electrical quantities
DC and low frequency quantities
- **DC voltage**
- **DC current**

Dimensional quantities
Length
- **Length measuring instruments**

Angle
- **Angle of rotation**
- **Inclination**

Within the measurands/calibration items marked with 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.

Abbreviations used: see last page

Permanent laboratory, Rheinmünster location

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement [1)]	Remarks
Force* Force sensors	2 kN to 20 kN	DKD-R 3-3:2018	0.2 %	Compressive force reference standard measuring device with reference transducer
Multi-component force and moment Multi-component transducer (ATD)	0.05 kN to < 0.5 kN	KW-F05001:2017	2.0 %	
	0.5 kN to 25 kN		0.5 %	
	3 N·m to < 30 N·m		2.0 %	
	30 N·m to 1200 N·m		0.5 %	
Force transducer	0.5 kN to 600 kN		0.5 %	
Angular velocity Angular velocity sensors	150°/s to 3500°/s	KW-AV0002:2014	0.5 %	Rotational via incremental encoder for left and right rotation
Acceleration* Acceleration sensors	200 m/s² to 20000 m/s²	Shock excitation DKD-R 3-1 page 2:2018	1.2 %	
	5 m/s² to 200 m/s²	Sinusoidal excitation DKD-R 3-1 page 3:2018 10 Hz to 5 kHz > 5 kHz to 10 kHz	 1.2 % / 1.0 ° 2.5 % / 1.5 °	Calibration result: Amplitude and phase of the transfer coefficient
Length Displacement sensor (ATD))	0 mm to 200 mm	KW-DS0001:2017	20 µm	
Angle* Angle of rotation Direct rotary encoder systems	0° to 360°	VDI/VDE 2648 page 1:2009* KW-AN0002:2018	0.2°	Rotation angle sensors
Inclinometers	-90° to 90°	KW-AN0001:2018	0.2°	Inclination angle sensors

[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, Rheinmünster location

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement [1)]	Remarks
Temperature* Resistance thermometers, direct reading thermometers, temperature transmitters, transducers and data loggers with resistance sensor (also PTC/NTC)	10 °C to 50 °C	In the temperature / humidity generator DKD-R 5-1:2018* KW-TE0002:2017	0.15 K	Comparative measurement against display of the temperature / humidity generator
Temperature display devices and simulators, temperature transmitters, transducers and data loggers for base thermocouples (K, N, J)	-50 °C to 500 °C	DKD-R 5-5:2018* KW-TE0001:2018	0.2 K	Using electrical simulation of the sensor signal Characteristic curve according to DIN EN 60584:2014
Relative humidity Direct reading electric hygrometers (also data loggers) No psychrometers	10 % to 80 %	In the temperature / humidity generator Measurement medium air Air temperature: 20 °C to 25 °C KW-HU0001:2017	3 %	Comparative measurement against display of the temperature / humidity generator Measurement uncertainty expressed in relative humidity
Electrical quantities DC voltage	0 V	KW-VO0001:2017	2 µV	*U*: measured value
	10 mV to 1000 V		$1.0 \cdot 10^{-4}\ U$	
DC current	0 A to 10 A	KW-CU0001:2017	$2.0 \cdot 10^{-4}\ I + 5$ nA	*I*: measured value
DC current current clamps	0 A to 1000 A	KW-CU0002:2017 1 to *N* windings	$1.0 \cdot 10^{-2}\ I + 5$ nA	

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Permanent laboratory, München location

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement [1)]	Remarks
Acceleration* Acceleration sensors, accelerometer measurement chains	200 m/s² to 2000 m/s²	Shock excitation DKD-R 3-1 page 2: 2018	1.5 %	
Force* Force sensors and measurement chains	1 kN to 100 kN	DKD-R 3-3:2018	0.2 %	

Abbreviations used:

CMC	Calibration and measurement capabilities (Kalibrier- und Messmöglichkeiten)
DKD-R	Richtlinie des Deutschen Kalibrierdienstes (DKD), herausgegeben von der Physikalisch-Technischen Bundesanstalt
KW-	calibration procedure of the mg-sensor GmbH
VDE	Verband der Elektrotechnik, Elektronik und Informationstechnik
VDI	Verein Deutscher Ingenieure

[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.