Deutsche Akkreditierungsstelle GmbH

Annex to the Accreditation Certificate D-K-15076-01-00 according to DIN EN ISO/IEC 17025:2018

Valid from: **16.12.2020**

Date of issue 20.06.2022

Holder of certificate:

Helmut Fischer GmbH
Institut für Elektronik und Messtechnik
Industriestraße 21, 71069 Sindelfingen

Calibration in the fields:

Mechanical quantities

- **Mass of unit area**

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

Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement [1)]	Remarks
Mass per unit area m_A A) Mean value of mass per unit area of foils	0.2 mg/cm² to 100 mg/cm²	Gravimetric method OVA-DAkkS-02 (Version 13) Measurement of: - edge length of foils 5 mm to 51 mm - mass of foil 100 µg to 5,1 g (gravimetric method)	$3.4 \cdot 10^{-5}$ mg/cm² $+1.9 \cdot 10^{-4} \cdot m_A$	m_A Measured mean value of mass per unit area Best measurement capability U (m_A) for foils having a size of about 50 mm x 50 mm
B) Mass per unit area of single element layers (also multiple layers), as foils or on plane substrates	Single element layers: 0.002 mg/cm² to 100 mg/cm²	X-ray fluorescence method OVA-DAkkS-02 (Version 13)	$5 \cdot 10^{-3} \cdot m_A$	The determination of mass per unit area of single element layers, multiple layers and alloy layers refers to elements detectable with X-ray fluorescence analysis. The uncertainty of measurements depends on both the layer material an the alloy composition. The measurement range depends on both the layer material and the substrates. The homogeneity is additionally measured and has to be taken into account for the uncertainty budget.
	Multiple layers: 0.01 mg/cm² to 100 mg/cm²		$3.5 \cdot 10^{-2} \cdot m_A$	
C) Mass per unit area of alloy layers and its mass fraction , as foils or deposited on flat substrates	0.01 mg/cm² to 100 mg/cm² (Mass per unit area) 1 g/kg to 1000 g/kg (Mass fraction)		$3.5 \cdot 10^{-2} \cdot m_A$ 0.7 g/kg	
D) Mass fraction of all detectable elements of alloys with arbitrary thickness (flat, plane-parallel, homogeneous bulk samples)	1 g/kg to 1000 g/kg	X-ray fluorescence method OVA-DAkkS-02 (Version 13)	0.14 g/kg	

Abbreviations used:

CMC	Calibration and measurement capabilities (Kalibrier- und Messmöglichkeiten)
OVA	Organisation and procedure Instruction of the Helmut Fischer GmbH

[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.

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