Deutsche Akkreditierungsstelle GmbH

Annex to the Accreditation Certificate D-K-20427-01-00 according to DIN EN ISO/IEC 17025:2018

Valid from: 18.03.2020

Date of issue: 18.03.2020

Holder of certificate:

OPTOLUTION Messtechnik GmbH
Gewerbestraße 18, 79539 Lörrach

Calibration in the fields:

Thermodynamic quantities
Thermal energy
– **Heat meters** [a)]

Fluid quantities
– **Liquid flow rate** [a)]

[a)] only on-site calibration

Abbreviations used: see last page

The certificate together with its annex reflects the status at the time of the date of issue. The current status of the scope of accreditation can be found in the database of accredited bodies of Deutsche Akkreditierungsstelle GmbH.
https://www.dakks.de/en/content/accredited-bodies-dakks

On-site Calibration

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement [1)]	Remarks
Heat meters Flow sensors as part of heat meters and cooling meters: volume flow rate	20 m³/h to 30000 m³/h	LDV segment method Profile class „fully developed“ Profile coefficient: $0 \le K_P \le 1.0$ Asymmetry coefficient: $0 \le K_A \le 0.2$ Turbulence coefficient: $0.5 \le K_{Tu} \le 1.5$ Level of profile overlap: $K_D \ge 80$ %	0.7 %	Provision of optical access in empty unpressurised pipes or filled pressurised pipes Fluid temperature: 5 °C to 150 °C volumetric flow velocity of fluid: ≥ 0.3 m/s
	20 m³/h to 30000 m³/h	LDV segment method Profile class „symmetric“ (Profile coefficient · Asymmetry coefficient): $0 \le (K_P \cdot K_A) \le 1.0$ Turbulence coefficient: $0.5 \le K_{Tu} \le 1.5$ Level of profile overlap: $K_D \ge 85$ %	1.4 %	
	20 m³/h to 30000 m³/h	LDV segment method Profil class „slightly disturbed“ Profile coefficient: $0 \le K_P \le 9$ Asymmetry coefficient: $0 \le K_A \le 0.5$ Turbulence coefficient: $1.2 \le K_{Tu} \le 3.5$ Level of profile overlap: $K_D \ge 90$ %	2.3 %	
	20 m³/h to 30000 m³/h	LDV segment method Profil class „highly turbulent“ Profile coefficient: $1 \le K_P \le 12$ Asymmetry coefficient: $0 \le K_A \le 0.5$ Turbulence coefficient: $1.4 \le K_{Tu} \le 5.8$ Level of profile overlap: $K_D \ge 95$ %	2.7 %	
	20 m³/h to 30000 m³/h	LDV segment method Profil class „highly asymmetric“ Profile coefficient: $2 \le K_P \le 11$ Asymmetry coefficient: $0.5 \le K_A \le 5$ Turbulence coefficient: $1.4 \le K_{Tu} \le 6$ Level of profile overlap: $K_D \ge 95$ %	4.2 %	

[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.

On-site Calibration

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement [1)]	Remarks
Liquid flow rate volume flow rate of flowing water	20 m³/h to 30000 m³/h	LDV segment method Profil class „fully developed“ Profile coefficient: $0 \le K_P \le 1.0$ Asymmetry coefficient: $0 \le K_A \le 0.2$ Turbulence coefficient: $0.5 \le K_{Tu} \le 1.5$ Level of profile overlap: $K_D \ge 80$ %	0.7 %	Provision of optical access in empty unpressurised pipes or filled pressurised pipes Fluid temperature: 5 °C to 150 °C volumetric flow velocity of fluid: ≥ 0.3 m/s
	20 m³/h to 30000 m³/h	LDV segment method Profil class „symmetric“ (Profile coefficient · Asymmetry coefficient): $0 \le K_P \cdot K_A \le 1.0$ Turbulence coefficient: $0.5 \le K_{Tu} \le 1.5$ Level of profile overlap: $K_D \ge 85$ %	1.4 %	
	20 m³/h to 30000 m³/h	LDV segment method Profil class „slightly disturbed“ Profile coefficient: $0 \le K_P \le 9$ Asymmetry coefficient: $0 \le K_A \le 0.5$ Turbulence coefficient: $1.2 \le K_{Tu} \le 3.5$ Level of profile overlap: $K_D \ge 90$ %	2.3 %	
	20 m³/h to 30000 m³/h	LDV segment method Profil class „highly turbulent“ Profile coefficient: $1 \le K_P \le 12$ Asymmetry coefficient: $0 \le K_A \le 0.5$ Turbulence coefficient: $1.4 \le K_{Tu} \le 5.8$ Level of profile overlap: $K_D \ge 95$ %	2.7 %	
	20 m³/h to 30000 m³/h	LDV segment method Profil class „highly asymmetric“ Profile coefficient: $2 \le K_P \le 11$ Asymmetry coefficient: $0.5 \le K_A \le 5$ Turbulence coefficient: $1.4 \le K_{Tu} \le 6$ Level of profile overlap: $K_D \ge 95$ %	4.2 %	

Abbreviations used:

CMC	Calibration and measurement capabilities
LDV	Laser doppler velocimetry

[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.