Deutsche Akkreditierungsstelle GmbH

Annex to the Accreditation Certificate D-K-19095-01-00 according to DIN EN ISO/IEC 17025:2018

Valid from: 31.08.2020

Date of issue: 31.08.2020

Holder of certificate:

Endress+Hauser (Deutschland) GmbH+Co. KG
Colmarer Straße 6, 79576 Weil am Rhein

Calibration in the fields:

Mechanical quantities

- **Pressure** [a)]

Fluid quantities

- **Liquid flow rate** [a)]
- **Volume of flowing liquids** [a)]
- **Mass of flowing liquids** [a)]

Thermodynamic quantities

Temperature quantities

- **Direct reading thermometers** [b)]
- **Temperature transmitters, data loggers** [b)]

[a)] also on-site calibration
[b)] only on-site calibration

Within the measurands/calibration items marked 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

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

Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range			Measurement conditions / procedure	Expanded uncertainty of measurement [1)]	Remarks
Pressure * Absolute pressure p_{abs}	50 mbar	to	40 bar	DKD-R 6-1: 2014	0.04 %, but not lower than 0.3 mbar	Pressure medium: gas
Positive and negative gauge pressure p_e	-1.0 bar	to	1.0 bar		0.04 %, but not lower than 0.02 mbar	Pressure medium: gas
	> 1.0 bar	to	39.0 bar	Calibration method: $p_e = p_{abs} - p_{amb}$	0.05 %	The uncertainty of the barometer has to be taken into account.
Liquid flow rate Volume flow d*V*/d*t* of flowing water	0.01 L/s	to	40 m³/h		0.05 %	gravimetric: static weighing + diverter
Mass flow d*m*/d*t* of flowing water	0.01 kg/s	to	40 t/h			
Volume flow d*V*/d*t* of flowing water	0.01 L/s	to	100 m³/h		0.08 %	Master meter method
Mass flow d*m*/d*t* of flowing water	0.01 kg/s	to	100 t/h			
Volume of flowing liquids Volume *V* of flowing water	20 L	to	400 L		0.05 %	gravimetric: static weighing + diverter
Volume *V* of flowing water	0.3 L	to	2000 L		0.08 %	Master meter method
Mass of flowing liquids Mass *m* of flowing water	20 kg	to	400 kg		0.05 %	gravimetric: static weighing + diverter
Mass *m* of flowing water	0.3 kg	to	2000 kg		0.08 %	Master meter method

[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 *dV/dt* of flowing water	10 L/h to 35 m³/h		0.3 %	Master meter method
Mass flow *dm/dt* of flowing water	10 kg/h to 35 t/h			
Mass of flowing liquids Mass *m* of flowing water	0.16 kg to 3000 kg		0.3 %	Master meter method at mass flow 10 kg/h to 35 t/h
Volume of flowing liquids Volume *V* of flowing water	0.16 L to 3000 L			Master meter method at volume flow 10 L/h to 35 m³/h
Temperature * Direct reading thermometers with resistance sensors, temperature transmitters with resistance sensors	-20 °C to 155 °C	DKD-R 5-1:2018 in block calibrator or micro bath	0.1 K	Comparison with standard thermometer
Pressure * Absolute pressure p_{abs}	0.1 bar to 41 bar	DKD-R 6-1:2014	0.1 %, but not lower than 0.2 mbar	Pressure medium: gas Pressure source: pneumatic pressure pump or automatic pressure calibrator
Positive and negative gauge pressure p_e	-1 bar to 40 bar			

Abbreviations used:

CMC	Calibration and measurement capabilities (Kalibrier- und Messmöglichkeiten)
DKD-R	Calibration guideline by Deutscher Kalibrierdienst (DKD)

[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.