Deutsche Akkreditierungsstelle

Annex to the Accreditation Certificate D-K-21444-01-00 according to DIN EN ISO/IEC 17025:2018

Valid from: **02.05.2024**

Date of issue: 02.05.2024

Holder of accreditation certificate:

EP EHRLER PRÜFTECHNIK ENGINEERING GMBH
Wilhelm-Hachtel-Straße 8, 97996 Niederstetten

with the location

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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.

Calibration in the fields:

Mechanical Quantities

- **Pressure** [a)]

Fluid Quantities

- **Gas flow rate** [a)]
- **Volume of flowing gases** [a)]
- **Mass of flowing gases** [a)]

Thermodynamic Quantities

Temperature Quantities

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

Humidity Quantities

- **Devices for relative humidity** [a)]

[a)] also on-site calibrations

Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range			Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Pressure	0.15 bar	to	2 bar	DKD-R 6-1:2014	$16\ \text{Pa} + 1 \cdot 10^{-4} \cdot p_{abs}$	Pressure medium: air or nitrogen
Absolute pressure p_{abs}	> 2 bar	to	10 bar		$30\ \text{Pa} + 2 \cdot 10^{-4} \cdot p_{abs}$	
Differential pressure Δp	0 hPa	to	60 hPa	DKD-R 6-1:2014	$0.3\ \text{Pa} + 2 \cdot 10^{-4} \cdot \Delta p$	Pressure medium: air or nitrogen at atmospheric pressure
	> 60 hPa	to	600 hPa		$3\ \text{Pa} + 2 \cdot 10^{-4} \cdot \Delta p$	
Negative and positive gauge pressure p_e	−0.85 bar	to	−0.6 bar	DKD-R 6-1:2014	27 Pa	Pressure medium: air or nitrogen
	> −0.6 bar	to	−0.06 bar		$3\ \text{Pa} + 2 \cdot 10^{-4} \cdot p_e$	
	> −0.06 bar	to	0.06 bar		$0.3\ \text{Pa} + 2 \cdot 10^{-4} \cdot p_e$	
	> 0.06 bar	to	0.6 bar		$3\ \text{Pa} + 2 \cdot 10^{-4} \cdot p_e$	
	> 0.6 bar	to	10 bar		$40\ \text{Pa} + 2 \cdot 10^{-4} \cdot p_e$	
	> 10 bar	to	30 bar		$4\ \text{mbar} + 2 \cdot 10^{-4} \cdot p_e$	
	> 30 bar	to	600 bar		$40\ \text{mbar} + 2 \cdot 10^{-4} \cdot p_e$	Pressure medium: oil
Fluid Quantities Volume flow rate Q_V or volume of flowing gases	5.7 L/h	to	80 L/h	4-fold nozzle system EP.LAB.VA.01.01: 2024-01, chap. 2.4.1	$4.2 \cdot 10^{-3} \cdot Q_V + 0.05$ L/h	Calibration medium: atmospheric air at room temperature and atmospheric pressure or compressed air at room temperature up to max. 8 bar overpressure and max. 800 kg/h standards at atmospheric pressure (0.85 bar < $p_{N,abs}$ < 1.05 bar)
	5.7 L/h	to	80 m³/h	7-fold nozzle system EP.LAB.VA.01.01: 2024-01, chap. 2.4.1	$3.7 \cdot 10^{-3} \cdot Q_V + 0.065$ L/h	
	2 L/h	to	21 m³/h	16-fold nozzle system EP.LAB.VA.01.01: 2024-01, chap. 2.4.1	$4.15 \cdot 10^{-3} \cdot Q_V + 0.066$ L/h	
	1.5 m³/h	to	1 600 m³/h	10-fold nozzle system EP.LAB.VA.01.01: 2024-01, chap. 2.4.1	$5.0 \cdot 10^{-3} \cdot Q_V + 7$ L/h	
	2.5 m³/h	to	4 000 m³/h	13-fold nozzle system EP.LAB.VA.01.01: 2024-01, chap. 2.4.1	$3.8 \cdot 10^{-3} \cdot Q_V + 2.8$ L/h	
	0.6 m³/h	to	100 m³/h	Low pulsation rotary gas meter EP.LAB.VA.01.01: 2024-01, chap. 2.4.2	$3.8 \cdot 10^{-3} \cdot Q_V$	
	> 100 m³/h	to	1 600 m³/h		$4.1 \cdot 10^{-3} \cdot Q_V$	

Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range			Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Volume flow rate Q_V or volume of flowing gases	130 m³/h	to	3 750 m³/h	Turbine gas meter EP.LAB.VA.01.01: 2024-01, chap. 2.4.2	$3.85 \cdot 10^{-3} \cdot Q_V + 0.27$ m³/h	Calibration medium: atmospheric air at room temperature and atmospheric pressure or compressed air at room temperature up to max. 8 bar overpressure and max. 800 kg/h standards at atmospheric pressure (0.85 bar < $p_{N,abs}$ < 1.05 bar)
	100 mL/h	to	3 L/h	Laminar flow elements EP.LAB.VA.01.01: 2024-01, chap. 2.4.3	$5.0 \cdot 10^{-3} \cdot Q_V + 2.4$ mL/h	
	> 3 L/h	to	17 L/h		$5.5 \cdot 10^{-3} \cdot Q_V + 15$ mL/h	
	> 17 L/h	to	0.16 m³/h		$5.35 \cdot 10^{-3} \cdot Q_V + 0.16$ L/h	
	> 0.16 m³/h	to	0.68 m³/h		$5.9 \cdot 10^{-3} \cdot Q_V + 0.65$ L/h	
	> 0.68 m³/h	to	3 m³/h		$6.1 \cdot 10^{-3} \cdot Q_V + 3$ L/h	
	> 3 m³/h	to	5.5 m³/h		$7.0 \cdot 10^{-3} \cdot Q_V + 5.2$ L/h	
	> 5.5 m³/h	to	13 m³/h		$6.0 \cdot 10^{-3} \cdot Q_V + 13$ L/h	
	8.7 m³/h	to	275 m³/h		$6.5 \cdot 10^{-3} \cdot Q_V + 0.55$ m³/h	Test bench for fans with calibration medium: atmospheric air at room temperature and atmospheric pressure
	> 275 m³/h	to	1 848 m³/h		$5.3 \cdot 10^{-3} \cdot Q_V + 1.9$ m³/h	
	> 1 848 m³/h	to	10 000 m³/h	Prandtl probe EP.LAB.VA.01.01: 2024-01, chap. 2.4.4	$5.0 \cdot 10^{-3} \cdot Q_V + 10.0$ m³/h	
Mass flow rate Q_m or mass of flowing gases	6.3 g/h	to	90 g/h	4-fold nozzle system EP.LAB.VA.01.01: 2024-01, chap. 2.4.1	$3.0 \cdot 10^{-3} \cdot Q_m + 0.065$ g/h	Calibration medium: atmospheric air at room temperature and atmospheric pressure or compressed air at room temperature up to max. 8 bar overpressure and max. 800 kg/h standards at atmospheric pressure (0.85 bar < $p_{N,abs}$ < 1.05 bar)
	6.3 g/h	to	90 kg/h	7-fold nozzle system EP.LAB.VA.01.01: 2024-01, chap. 2.4.1	$3.0 \cdot 10^{-3} \cdot Q_m + 0.09$ g/h	
	2 g/h	to	24 kg/h	16-fold nozzle system EP.LAB.VA.01.01: 2024-01, chap. 2.4.1	$3.5 \cdot 10^{-3} \cdot Q_m + 0.1$ g/h	
	1.7 kg/h	to	1 800 kg/h	10-fold nozzle system EP.LAB.VA.01.01: 2024-01, chap. 2.4.1	$3.0 \cdot 10^{-3} \cdot Q_m + 8$ g/h	
	3 kg/h	to	4 500 kg/h	13-fold nozzle system EP.LAB.VA.01.01: 2024-01, chap. 2.4.1	$3.0 \cdot 10^{-3} \cdot Q_m + 4$ g/h	
	0.7 kg/h	to	120 kg/h	Low pulsation rotary gas meter EP.LAB.VA.01.01: 2024-01, chap. 2.4.2	$3.0 \cdot 10^{-3} \cdot Q_m$	
	> 120 kg/h	to	1 800 kg/h		$3.3 \cdot 10^{-3} \cdot Q_m$	
	140 kg/h	to	4 300 kg/h	Turbine gas meter EP.LAB.VA.01.01: 2024-01, chap. 2.4.2	$3.0 \cdot 10^{-3} \cdot Q_m + 0.35$ kg/h	

Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range			Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Mass flow rate Q_m or mass of flowing gases	100 mg/h	to	3 g/h	Laminar flow elements EP.LAB.VA.01.01: 2024-01, chap. 2.4.3	$5.0 \cdot 10^{-3} \cdot Q_m + 2.6$ mg/h	Calibration medium: atmospheric air at room temperature and atmospheric pressure or compressed air at room temperature up to max. 8 bar overpressure and max. 800 kg/h standards at atmospheric pressure (0.85 bar < $p_{N,abs}$ < 1.05 bar)
	> 3 g/h	to	17 g/h		$5.0 \cdot 10^{-3} \cdot Q_m + 20$ mg/h	
	> 17 g/h	to	0.23 kg/h		$4.9 \cdot 10^{-3} \cdot Q_m + 0.18$ g/h	
	> 0.23 kg/h	to	0.93 kg/h		$4.8 \cdot 10^{-3} \cdot Q_m + 1$ g/h	
	> 0.93 kg/h	to	3.95 kg/h		$5.6 \cdot 10^{-3} \cdot Q_m + 3.4$ g/h	
	> 3.95 kg/h	to	7.1 kg/h		$6.6 \cdot 10^{-3} \cdot Q_m + 6$ g/h	
	> 7.1 kg/h	to	17.3 kg/h		$6.0 \cdot 10^{-3} \cdot Q_m + 14$ g/h	
	9.8 kg/h	to	310 kg/h		$7.0 \cdot 10^{-3} \cdot Q_m + 0.6$ kg/h	Test bench for fans with calibration medium: atmospheric air at room temperature and atmospheric pressure
	> 310 kg/h	to	2 080 kg/h		$4.8 \cdot 10^{-3} \cdot Q_m + 2.105$ kg/h	
	> 2 080 kg/h	to	11 500 kg/h	Prandtl probe EP.LAB.VA.01.01: 2024-01, chap. 2.4.4	$5.0 \cdot 10^{-3} \cdot Q_m + 10$ kg/h	
Temperature Quantities Direct reading thermometers and temperature transmitters with resistance sensor	−20 °C	to	175 °C	DKD-R 5-1:2018 in thermostatic bath	0.1 K	Comparison with standard resistance thermometer
Humidity Quantities Direct reading measuring devices for relative humidity with capacitive humidity sensors (no psychrometers)	10 %	to	90 %	DKD-R 5-8:2019 in humidity generator air temperature 21 °C to 25 °C	1.5 %	Comparison with standard thermometer and 2 standard humidity sensors Measurement uncertainty expressed in relative humidity

On-site Calibration

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range			Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Pressure Absolute pressure p_{abs}	0.15 bar	to	2 bar	DKD-R 6-1:2014	$18\ \text{Pa} + 1 \cdot 10^{-4} \cdot p_{abs}$	Pressure medium: air or nitrogen
	> 2 bar	to	10 bar		$40\ \text{Pa} + 2.3 \cdot 10^{-4} \cdot p_{abs}$	
Differential pressure Δp	0 bar	to	0.06 bar	DKD-R 6-1:2014	$0.3\ \text{Pa} + 3 \cdot 10^{-4} \cdot \Delta p$	Pressure medium: air or nitrogen at atmospheric pressure
	> 0.06 bar	to	0.6 bar		$3\ \text{Pa} + 3 \cdot 10^{-4} \cdot \Delta p$	
Negative and positive gauge pressure p_e	−0.85 bar	to	−0.6 bar	DKD-R 6-1:2014	29 Pa	Pressure medium: air or nitrogen
	> −0.6 bar	to	−0.06 bar		$3\ \text{Pa} + 3 \cdot 10^{-4} \cdot p_e$	
	> −0.06 bar	to	0.06 bar		$0.3\ \text{Pa} + 3 \cdot 10^{-4} \cdot p_e$	
	> 0.06 bar	to	0.6 bar		$3\ \text{Pa} + 3 \cdot 10^{-4} \cdot p_e$	
	> 0.6 bar	to	10 bar		$50\ \text{Pa} + 2 \cdot 10^{-4} \cdot p_e$	
	> 10 bar	to	30 bar		$4.3\ \text{mbar} + 2 \cdot 10^{-4} \cdot p_e$	
	> 30 bar	to	600 bar		$42\ \text{mbar} + 2 \cdot 10^{-4} \cdot p_e$	Pressure medium: oil

On-site Calibration

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range			Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Fluid Quantities Volume flow rate Q_V or volume of flowing gases	5.7 L/h	to	80 m³/h	Critically operated nozzles EP.LAB.VA.01.01: 2024-01, chap. 2.4.1	$4.07 \cdot 10^{-3} \cdot Q_V + 0.078$ L/h	Calibration medium: atmospheric air at room temperature and atmospheric pressure or compressed air at room temperature up to max. 8 bar overpressure, maximum flow rate within the limits of on-site availability standards at atmospheric pressure (0.85 bar < $p_{N,abs}$ < 1.05 bar)
	0.6 m³/h	to	100 m³/h	Low pulsation rotary gas meter EP.LAB.VA.01.01: 2024-01, chap. 2.4.2	$4.56 \cdot 10^{-3} \cdot Q_V$	
	> 100 m³/h	to	1 600 m³/h		$4.92 \cdot 10^{-3} \cdot Q_V$	
	130 m³/h	to	3 750 m³/h	Turbine gas meter EP.LAB.VA.01.01: 2024-01, chap. 2.4.2	$4.62 \cdot 10^{-3} \cdot Q_V + 0.297$ m³/h	
	100 mL/h	to	3 L/h	Laminar flow elements EP.LAB.VA.01.01: 2024-01, chap. 2.4.3	$5.5 \cdot 10^{-3} \cdot Q_V + 2.88$ mL/h	
	> 3 L/h	to	17 L/h		$6.05 \cdot 10^{-3} \cdot Q_V + 18$ mL/h	
	> 17 L/h	to	0.16 m³/h		$5.885 \cdot 10^{-3} \cdot Q_V + 0.192$ L/h	
	> 0.16 m³/h	to	0.68 m³/h		$6.49 \cdot 10^{-3} \cdot Q_V + 0.78$ L/h	
	> 0.68 m³/h	to	3 m³/h		$6.71 \cdot 10^{-3} \cdot Q_V + 3.6$ L/h	
	> 3 m³/h	to	5.5 m³/h		$7.7 \cdot 10^{-3} \cdot Q_V + 6.24$ L/h	
	> 5.5 m³/h	to	13 m³/h		$6.6 \cdot 10^{-3} \cdot Q_V + 15$ L/h	
Mass flow rate Q_m or mass of flowing gases	6.3 g/h	to	90 kg/h	Critically operated nozzles EP.LAB.VA.01.01: 2024-01, chap. 2.4.1	$3.3 \cdot 10^{-3} \cdot Q_m + 0.108$ g/h	
	0.7 kg/h	to	120 kg/h	Low pulsation rotary gas meter EP.LAB.VA.01.01: 2024-01, chap. 2.4.2	$3.3 \cdot 10^{-3} \cdot Q_m$	
	> 120 kg/h	to	1800 kg/h		$3.63 \cdot 10^{-3} \cdot Q_m$	
	140 kg/h	to	4 300 kg/h	Turbine gas meter EP.LAB.VA.01.01: 2024-01, chap. 2.4.2	$3.3 \cdot 10^{-3} \cdot Q_m + 0.42$ kg/h	
	100 mg/h	to	3 g/h	Laminar flow elements EP.LAB.VA.01.01: 2024-01, chap. 2.4.3	$5.5 \cdot 10^{-3} \cdot Q_m + 3.12$ mg/h	
	> 3 g/h	to	17 g/h		$5.5 \cdot 10^{-3} \cdot Q_m + 24$ mg/h	
	> 17 g/h	to	0.23 kg/h		$5.39 \cdot 10^{-3} \cdot Q_m + 0.216$ g/h	
	> 0.23 kg/h	to	0.93 kg/h		$5.28 \cdot 10^{-3} \cdot Q_m + 1.2$ g/h	
	> 0.93 kg/h	to	3.95 kg/h		$6.16 \cdot 10^{-3} \cdot Q_m + 4.08$ g/h	
	> 3.95 kg/h	to	7.1 kg/h		$7.26 \cdot 10^{-3} \cdot Q_m + 7.2$ g/h	
	> 7.1 kg/h	to	15 kg/h		$6.6 \cdot 10^{-3} \cdot Q_m + 16.8$ g/h	
Temperature Quantities Direct reading thermometers and temperature transmitters with resistance sensor	−20 °C	to	175 °C	DKD-R 5-1:2018 in thermostatic bath	0.1 K	Comparison with standard resistance thermometer
Humidity Quantities Direct reading measuring devices for relative humidity with capacitive humidity sensors (no psychrometers)	10 %	to	90 %	DKD-R 5-8:2019 in humidity generator air temperature 21 °C to 25 °C	1.5 %	Comparison with standard thermometer and 2 standard humidity sensors Measurement uncertainty expressed in relative humidity

Abbreviations used:

CMC	Calibration and measurement capabilities
DIN	Deutsches Institut für Normung e.V. – German institute for standardization
DKD-R	Calibration Guideline of Deutscher Kalibrierdienst (DKD), published by Physikalisch-Technische Bundesanstalt (PTB)
EN	Europäische Norm – European Standard
IEC	International Electrotechnical Commission
ISO	International Organization for Standardisation
EP.LAB.VA	In house method of EP EHRLER PRÜFTECHNIK ENGINEERING GMBH