

Deutsche Akkreditierungsstelle GmbH

Annex to the Accreditation Certificate D-K-15149-01-00 according to DIN EN ISO/IEC 17025:2018

Valid from: 12.02.2021

Date of issue: 12.02.2021

Holder of certificate:

Trigas FI GmbH
Erdinger Str. 2b, 85375 Neufahrn

Calibration in the fields:

Fluid quantities

- Liquid flow rate ^{a)}
- Volume of flowing liquids
- Mass of flowing liquids
- Gas flow rate ^{a)}
- Volume of flowing gases
- Mass of flowing gases

^{a)} also on-site calibration

The management system requirements in DIN EN ISO/IEC 17025 are written in language relevant to operations of calibration laboratories and operate generally in accordance with the principles of DIN EN ISO 9001.

*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)

Measured quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement ¹⁾	Remarks
Liquid flow rate Volume flow rate dV/dt and volume V of flowing liquids	0.05 mL/min to 2000 L/min	Volumetric measurement (piston prover), Measured fluid: liquids with densities of 700 kg/m ³ to 1100 kg/m ³ CAL 10247 / 16.01.2019	0.04 %	Measuring instrument with frequency or analogue output or visual display
	10 L/min to 5000 L/min	Volumetric measurement (water flow calibrator) Measured fluid: water with density of 1000 kg/m ³ CAL 10247 / 16.01.2019	0.09 %	Measuring instrument with frequency output
			0.12 %	Measuring instrument with analogue output or visual display
Mass flow rate dm/dt and mass m of flowing liquids	0.04 g/min to 2000 kg/min	Volumetric measurement (piston prover), Unit conversion via density, Viscosities of 0,3 mm ² /s to 1600 mm ² /s CAL 10247 / 16.01.2019	0.05 %	Measuring instrument with frequency or analogue output or visual display
	10 kg/min to 5000 kg/min	Volumetric measurement (water flow calibrator) Unit conversion via density of 1,0 mm ² /s CAL 10247 / 16.01.2019	0.11 %	Measuring instrument with frequency output
			0.13 %	Measuring instrument with analogue output or visual display
Gas flow rate Volume flow rate dV/dt and volume V of flowing gases	Measuring range stated in standard conditions 293,15 K; 1013,25 hPa			Measuring instrument with display of flow rate under actual condition or under standard condition
	1 mL/min to 85 L/min	Laminar flow elements Calibration gas: dry air (dew point < -15 °C) CAL 10292 / 25.03.2007	0.34 %	Standard density in according to international accepted normative documents
	10 L/min to 20000 L/min	critical nozzle Calibration gas: dry air (dew point < -15 °C) CAL 10269 / 04.03.2016	0.27 %	Measuring instrument with frequency or analogue output or visual display
	1 L/min to 1500 L/min	Bell prover Calibration gas: dry air (dew point < -15 °C) CAL 10248 / 22.05.2014	0.26 %	
	20 mL/min To 4000 mL/min	Seal free piston prover, Calibration gas: dry air (dew point < -15 °C) CAL 10251 / 08.02.2012	0.3 %	

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.

Annex to the accreditation certificate D-K-15149-01-00

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Calibration and Measurement Capabilities (CMC)

Measured quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement ¹⁾	Remarks
Gas flow rate Volume flow rate dV/dt and volume V of flowing gases	Measuring range stated in standard conditions 293,15 K; 1013,25 hPa			Measuring instrument with display of flow rate under actual condition or under standard condition Standard density in according to international accepted normative documents Measuring instrument with frequency or analogue output or visual display technically pure gases or mixtures with traced composition
	1 L/min to 700 L/min	Bell prover Calibration gases: - nitrogen N_2 - argon Ar - helium He and their mixtures CAL 10248 / 22.05.2014	0,26 %	
	20 mL/min to 4000 mL/min	Seal free piston prover, Calibration gases: - nitrogen N_2 - argon Ar - helium He and their mixtures CAL 10251 / 08.02.2012	0,35 %	
	1 L/min to 300 L/min	Bell prover Calibration gases: - methane CH_4 - carbon dioxide CO_2 - propane C_3H_8 and their mixtures - hydrogen H_2 CAL 10248 / 22.05.2014	0,26 %	
	20 mL/min to 4000 mL/min	Seal free piston prover, Calibration gases: - methane CH_4 - carbon dioxide CO_2 - propane C_3H_8 and their mixtures - hydrogen H_2 CAL 10251 / 08.02.2012	0,35 %	
Mass flow rate dm/dt and mass m of flowing gases	1.3 mg/min to 110 g/min	Laminar flow elements Calibration gas: dry air (dew point < -15 °C) CAL 10292 / 25.03.2007	0,36 %	Measuring instrument with frequency or analogue output or visual display
	12 g/min to 1440 kg/h	critical nozzle Calibration gas: dry air (dew point < -15 °C) CAL 10269 / 04.03.2016	0,24 %	
	1290 mg/min to 1939 g/min	Bell prover Calibration gas: dry air (dew point < -15 °C) CAL 10248 / 22.05.2014	0,27 %	
	25.8 mg/min to 5.17 g/min	Seal free piston prover, Calibration gas: dry air (dew point < -15 °C) CAL 10251 / 08.02.2012	0,3 %	

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Calibration and Measurement Capabilities (CMC)

Measured quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement ¹⁾	Remarks
Gas flow rate Mass flow rate dm/dt and mass m of flowing gases	1250 mg/min to 875 g/min	Bell prover Calibration gases: - nitrogen N ₂	0,27 %	Measuring instrument with frequency or analogue output or visual display technically pure gases or mixtures with traced composition
	1784 mg/min to 1249 g/min	- argon Ar		
	178 mg/min to 125 g/min	- helium He and their mixtures CAL 10248 / 22.05.2014		
	25 mg/min to 5,0 g/min	seal free piston prover Calibration gases: - nitrogen N ₂		
	35 mg/min to 7,14 g/min	- argon Ar	0,35%	
	3,57 mg/min to 714 mg/min	- helium He and their mixtures CAL 10251 / 08.02.2012		
	717 mg/min to 215 g/min	Bell prover Calibration gases: - methane CH ₄	0,26 %	
	1970 mg/min to 593 g/min	- carbon dioxide CO ₂		
	2010 mg/min to 603 g/min	- propane C ₃ H ₈ and their mixtures		
	90 mg/min to 27 g/min	- hydrogen H ₂ CAL 10248 / 22.05.2014		
	14,3 mg/min to 2,870 g/min	seal free piston prover Calibration gases: - methane CH ₄	0,35 %	
	39,5 mg/min to 7,907 g/min	- carbon dioxide CO ₂		
	40 mg/min to 8,042 g/min	- propane C ₃ H ₈ and their mixtures		
	1,8 mg/min to 360 mg/min	- hydrogen H ₂ CAL 10251 / 08.02.2012		

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On-site Calibration
Calibration and Measurement Capabilities (CMC)

Measured quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement ¹⁾	Remarks
Liquid flow rate Volume flow rate dV/dt of flowing liquids	0.03 L/min to 2000 L/min	Volumetric measurement (Transfer standard) Reference turbines, coriolis, gear meter CAL 10247 / 16.01.2019	0.09 %	DN 4 - DN 65
	10 L/min to 5000 L/min		0.12 %	DN 20 - DN 150
Mass flow rate dm/dt of flowing liquids	0.025 kg/min to 2000 kg/min	Volumetric measurement (Transfer standard) Reference turbines, coriolis, gear meter	0.09 %	DN 4 - DN 65
	10 kg/min to 5000 kg/min	Conversion by using density CAL 10247 / 16.01.2019	0.12 %	DN 20 - DN 150
Gas flow rate Volume flow rate dV/dt and volume V of flowing gases	Measuring range stated in standard conditions 293,15 K; 1013,25 hPa			Ambient air temperature and medium temperature: 23 °C ± 5 °C
	1 mL/min to 1200 L/min	Laminar flow elements Calibration gas: dry air (dew point < -15 °C) CAL 10292 / 25.03.2007	1.05 %	Temperature difference between ambient air and medium: < 5 °C
	10 L/min to 10000 L/min	critical nozzle Calibration gas: dry air (dew point < -15 °C) CAL 10269 / 04.03.2016	1.06 %	Temperature difference between standard input and standard output : < 5 °C
	5 mL/min to 1000 L/min	Alicat Laminar flow elements Calibration gas: dry air (dew point < -15 °C) CAL 10430 / 13.01.2021	1.29 %	Stability criteria: PRC 10419 Rev D: 17.09.2019
Mass flow rate dm/dt and mass m of flowing gases	1.29 mg/min to 1551 g/min	Laminar flow elements Calibration gas: dry air (dew point < -15 °C) CAL 10292 / 25.03.2007	1.05 %	
	12.9 g/min to 12900 g/min	critical nozzle Calibration gas: dry air (dew point < -15 °C) CAL 10269 / 04.03.2016	1.06 %	
	6.46 g/min to 1293 g/min	Alicat Laminar flow elements Calibration gas: dry air (dew point < -15 °C) CAL 10430 / 13.01.2021	1.29 %	

Abbreviations used:

CAL	In house procedure of Trigas FI GmbH
CMC	Calibration and measurement capabilities
DN	Nominal diameter

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