

Kalibrierschein / Calibration Certificate

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Deutschen Kalibrierdienst



DKD

Kalibrierschein
Calibration certificate

Kalibrierzeichen
Calibration mark

34958
D-K- 17589-01-00
2024-07

Gegenstand
Object **Mass Flow Controller in Gas Divider**

Hersteller
Manufacturer **IAS GmbH**

Typ
Type **HovaCAL digital 211-MF**

Fabrikat/Serien-Nr.
Serial number **11221801**

Auftraggeber
Customer **Protec Ambiente S.r.l.
60019 Senigallia, Italy**

Auftragsnummer
Order No. **PAB96**

Anzahl der Seiten des Kalibrierscheines
Number of pages of the certificate **3**

Datum der Kalibrierung
Date of calibration **08.07.2024**

Dieser Kalibrierschein dokumentiert die metrologische Rückführbarkeit auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).
Der DAkkS ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine. Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

This calibration certificate documents the metrological traceability to national standards, which realize the units of measurement according to the International System of Units (SI).

The DAkkS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates. The user is obliged to have the object recalibrated at appropriate intervals.

Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung des ausstellenden Kalibrierlaboratoriums. Kalibrierscheine ohne Unterschrift haben keine Gültigkeit.

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Ausstellungsdatum
Issue Date
08.07.2024

Leiter des Kalibrierlaboratoriums
Head of the calibration laboratory
Dr.rer.nat. Johannes Schubert

Bearbeiter
Person in charge
M.Sc. Jan Michael Bauer

Calibration item

Mass Flow Controller in Gas Divider

Type	HovaCAL digital 211-MF
Manufacturer	IAS GmbH
Serial number	11221801
Range	0 ... 10000 ml/min (standard volume flow)
Max. permissible deviation	2 %OR

Method of calibration

The calibration was carried out according to the internal calibration procedure VQ300: Mass flow meters. A comparison of the flow values between the unit under test and the flow standard is made. For units under test with an analog signal output, the analog signal is converted to a flow value.

Medium	Air compressed
Calculation method	Density: real gas calculation for air (CIPM)
Setup:	gas supply - unit under test (u.u.t.) - calibration standard - atmosphere
Site of Calibration:	Tetratec Instruments GmbH, 71144 Steinenbronn

Measurement conditions

The calibration set-up was leak-proofed before calibration.

The calibration object was energized about 24h before the calibration. Before taking measurements the calibration object did run about 30 min at max. flow. Measurements were taken at least 3 min after changing the flow. The calibration was performed after an adequate of thermal accomodation of the unit under test (uut) in the laboratory. The testing time at each measurement point was 60 s.

Environmental data

Air Pressure: $(964,3 \pm 1,0)$ mbar, Temperature: $(23,0 \pm 0,5)$ °C, Air Humidity: $(47,9 \pm 3,0)$ % r.h.

Measurement uncertainty

The measurement uncertainty is specified as extended measurement uncertainty, resulting from the standard measurement uncertainty by multiplication with factor $k = 2$. It was determined according to EA-4/02 M:2022. The value of the result will be within the associated interval with a probability close to 95 %. A part for the long-term stability of the device is not included.

Results

Absolute pressure P_{Ap} , temperature T_p and humidity H_p were taken at the inlet of the unit under test.

1. measurement: MFC1 - IN1

Q_s	Q_p	P_{Ap}	T_p	H_p	ABW		MU
ml/min	ml/min	mbar	°C	%	ml/min	%oR	ml/min
2004	1994	2500,6	23,68	7,8	-10	-0,48	7,7
4022	3995	2500,1	23,65	7,8	-27	-0,66	16
6002	5996	2500,4	23,63	7,8	-6	-0,09	23
7933	8005	2500,1	23,63	7,9	72	0,91	31
9976	10011	2500,2	23,63	7,9	35	0,35	38

2. measurement: MFC2 - IN2

Q_s	Q_p	P_{Ap}	T_p	H_p	ABW		MU
ml/min	ml/min	mbar	°C	%	ml/min	%oR	ml/min
1003	1000	2499,8	23,72	7,7	-2	-0,24	3,9
2004	1999	2499,8	23,69	7,8	-5	-0,25	7,7
3009	3001	2500,4	23,66	7,8	-8	-0,26	12
4004	3999	2500,1	23,62	7,8	-5	-0,13	16
5017	5005	2500,4	23,60	7,8	-12	-0,24	20

Identifier and Reference Standards

- Q_s Standard volume flow of the reference for the following standard conditions:
absolute static pressure: 1013,25 mbar, temperature: 0,00 °C, humidity: 0,0 % rH
Q Air, LFE 50MJ10-12, SerNo: 752050-J13
- Q_p Standard volume flow of the unit under test
- P_{Ap} Absolute pressure at the inlet of unit under test, max. extended MU: 1,8 mbar
- T_p Temperature at inlet of unit under test, max. extended MU: 0,2 °C
- H_p Relative humidity at inlet of unit under test, max. extended MU: 3 %
- ABW Deviation $Q_p - Q_s$ absolute and in percent of reading
- MU Extended measurement uncertainty ($k=2$)

These results only refer to the listed calibration item.

*** end of calibration certificate ***