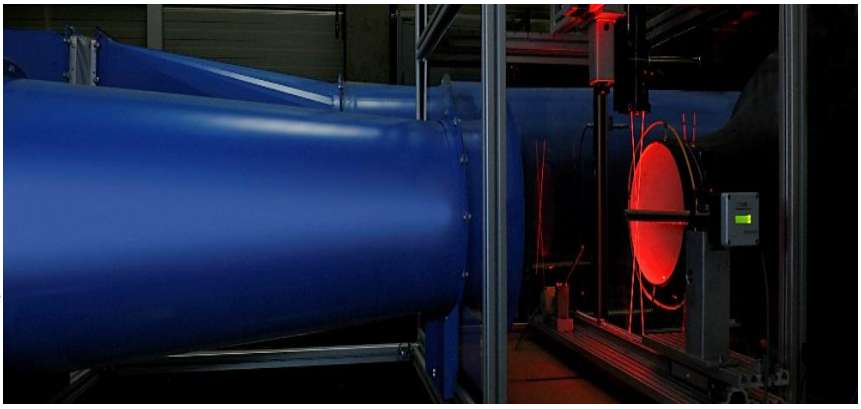
Calibration of flow velocity, flow rate and mass flow



Free jet wind tunnel WK320 with Laser Doppler Anemometer (LDA)

The Höntzsch calibration laboratory

The Höntzsch calibration process is subject to the Quality Management Systems ISO 9001 and is accredited according to DIN EN ISO/IEC 17025 by the German Accreditation Body (DAkkS). The DAkkS accreditation of our calibration laboratory for the field of gas flow velocity, volume of flowing gases and mass of flowing gases is a confirmation by the German Accreditation Body (DAkkS) about the traceability to national standards of the Physikalisch-Technische Bundesanstalt (PTB) and the accuracy of the references used. Naturally the calibration of all sensors and flow meters outside of the scope of accreditation is also based on references traced to national standards of the Physikalisch-Technische Bundesanstalt (PTB).

Ensuring global uniformity of dimensions, Höntzsch GmbH & Co. KG works closely together with other national and international metrological institutes.
This goal is achieved through an intensive exchange of research results within the framework of Höntzsch GmbH & Co. KG's membership in the German calibration service (DKD) in technical committee 11, Flow Measurands, and through extensive international comparative measurements.
Here, the calibration procedures are consistently promoted and developed further to reduce measurement uncertainties.

Atmospheric flow rate test bench AVP

High pressure flow rate test bench HdVP

DAkkS-accredited calibrations according to DIN EN ISO/IEC 17025:

Measuring unit	Calibration medium	Measuring range	Best measurement uncertainty in relation to the measured value
Flow velocity	air	0.1 m/s to 70 m/s	0.5 % but not less than 0.01 m/s
Flow rate or volume of flowing gases	air at atmospheric conditions	22 l/h to < 400 l/h	0.39 %
		≥ 0.4 m³/h to 57.9 m³/h	0.36 %
		5 m³/h < 400 m³/h	0.30 %
		≥ 400 m³/h to 10000 m³/h	0.25 %
Mass flow or mass of flowing gases	air at atmospheric conditions	26 g/h to < 480 g/h	0.39 %
		≥ 0.48 kg/h to 69.5 kg/h	0.36 %
		6 kg/h to < 500 kg/h	0.30 %
		≥ 500 kg/h to 12000 kg/h	0.25 %

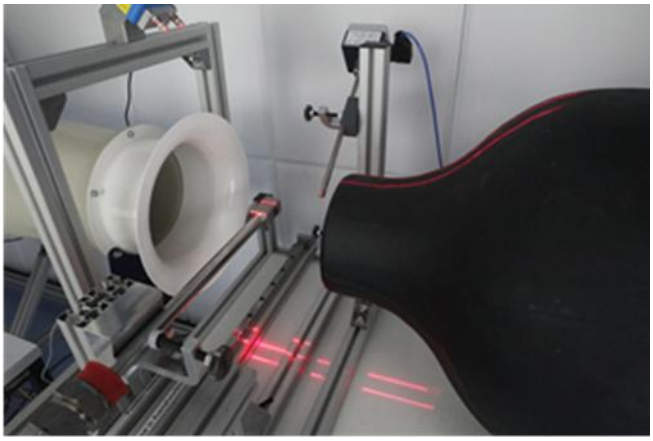
Nozzle flow rate test bench DVP

ISO calibrations / factory calibrations:

Measuring unit	Calibration medium	Measuring range	Best measurement uncertainty in relation to the measured value
Flow velocity	air at atmospheric conditions	0.1 m/s to 70 m/s	0.5 % but not less than 0.01 m/s
Flow velocity at high temperatures (HTP)	air in temperature range: up to **400 °C**	0.5 m/s to 70 m/s	2-3 % but not less than 0.02 m/s
Flow rate	air at atmospheric conditions	22 l/h < 400 l/h	0.39 %
		≥ 0.4 m³/h to 61 m³/h	0.36 %
		1.5 m³/h < 400 m³/h	0.30 %
		≥ 400 m³/h to 10000 m³/h	0.25 %
Flow rate	up to **10 bar** absolute pressure for air and other inert gases	0.2 m³/h to 4000 m³/h	up to 1.0 %
Flow rate	various gases: argon, propane, hydrogen, natural gas, landfill gas, helium, air, butane, oxygen, noble gases, non-aggressive gases	0.06 m³/h to 100 m³/h	0.8 %
Flow velocity	water	0.02 m/s to 3.5 m/s (in DN100-pipe)	0.7 % + 0.002 m/s
Flow rate	water	0.5 m³/h to 100 m³/h	0.7 % + 0.057 m³/h
Flow rate	numerous liquids	0.02 l/min to 9 l/min	1.0 %
Temperature	silicone oil	-30 °C to +160 °C	0.1 K
	water	+4 °C to +95 °C	0.1 K
Absolute pressure	air	300 hPa to 1600 hPa	0.008 % of meas. value but not less than 0.04224 hPa
Relative pressure	air	-30 hPa to +30 hPa -160 hPa to +160 hPa -670 hPa to +670 hPa	±0.0048 hPa ±0.0256 hPa ±0.1072 hPa

WK320	Göttinger free jet wind tunnel
Reference	Laser-Doppler-Anemometer (LDA)
Calibration range	0.1 m/s to 70 m/s
Calibration medium	air at atmospheric conditions

WK180	Free jet wind tunnel
Reference	differential pressure system with DAkkS-calibrated transfer measurement standards
Calibration range	0.1 m/s to 70 m/s
Calibration medium	air at atmospheric conditions



Free jet wind tunnel WK180

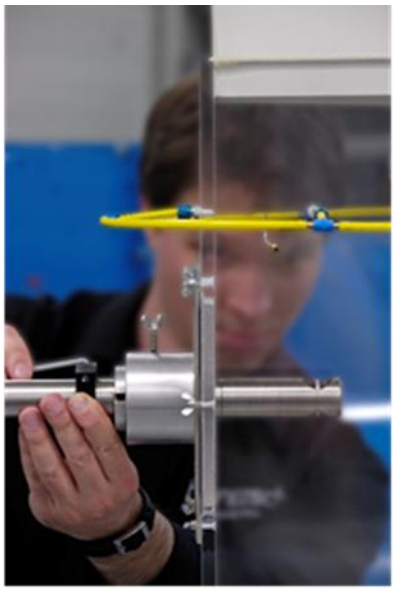
AVP	Atmospheric flow rate test bench
Reference	PTB-calibrated transfer measurement standards
Calibration range	1.5 m³/h to 10000 m³/h
Calibration medium	air at atmospheric conditions

DVP	Nozzle flow rate test bench
Reference	DAkkS-calibrated, supercritically operated venturi nozzles / laval nozzles
Calibration range	0.022 m³/h to 61 m³/h (0.367 l/min to 1016.67 l/min)
Calibration medium	air at atmospheric conditions

NWK	Low velocity wind tunnel with closed test section
Reference	DAkkS-calibrated transfer measurement standards
Calibration range	0.25 m/s to 5.0 m/s
Calibration medium	air at atmospheric conditions

HTP	High temperature flow test bench in closed construction 'University of Stuttgart'
Reference	LDA-calibrated transfer measurement standards
Calibration range	0.5 m/s to 70 m/s
Temperature range	+20 °C to 400 °C
Calibration medium	air

High temperature flow test bench HTP in closed construction 'University of Stuttgart'



NWK Low velocity wind tunnel

HdVP	High pressure flow rate test bench in closed construction
Reference	PTB-calibrated transfer measurement standards
Calibration range	0.2 m³/h to 4000 m³/h (0.02 Norm-m/s to 350 Norm-m/s)*
Pressure range	1000 hPa to 10000 hPa
Temperature range	+20 °C to +45 °C
Calibration medium	air (optional numerous inert gases)

* calculated from flow rate and average flow velocity with the respective profile factor in DN200 pipe

RVP	Real gas flow rate test bench
Reference	DAkkS-calibrated transfer measurement standards
Calibration range	0.06 m³/h to 100 m³/h (0.08 Norm-m/s to 150 Norm-m/s)*
Calibration medium	various gases

* calculated from flow rate and average flow velocity in DN16 pipe

WVP	Water flow rate test bench
Reference	DAkkS-calibrated electromagnetic flow rate meter
Calibration range	0.5 m³/h to 100 m³/h (0.02 m/s to 3.5 m/s)*
Calibration medium	water

*calculated from flow rate and average flow velocity in DN100 pipe

Water flow rate test bench

Calibration / Measurement uncertainty / Recalibration

The Höntzsch calibration laboratory is able to carry out an optimally tailored calibration for every type of operation. As close an approximation as possible to the real conditions is achieved using a variation of pressure, temperature and type of calibration medium.

This ideal choice of calibration conditions means that measurement uncertainties in practical applications are reduced to a minimum. Höntzsch calibration certificates document the set value and actual value and provide the user with proof and reliability that faultless and accurate measuring equipment is in use for solving measuring problems.

The measurement uncertainties shown on the accredited calibration certificate (commonly known as DAkkS-certificate) are determined according to *EA-4/02 M:2022 Evaluation of the Uncertainty of Measurement in Calibration*. The expanded measurement uncertainties result from the standard measurement uncertainties being multiplied with the coverage factor $k = 2$. The value of the measurable variable lies as a rule with a probability of approx. 95 % within the respective value interval.

Unless noted otherwise in the accredited calibration certificate, the measurement result and the statement of conformity derived from it for as left calibrations are always within the specification limit using the measurement uncertainty (U) as Guard Band (w). This corresponds to the binary conformance statement according to *4.2.2 Binary Statement with Guard Band* from *ILAC-G8:09/2019*.. With this approach, the probability of false acceptance (PFA) is 2.5%. For as found calibrations, a non-binary statement of conformity using the Guard Band (w = U) with 50% probability of false acceptance is used.

According to the European Co-operation for Accreditation's (EA) Rule EA-3/01 M: 2025, an ISO/factory calibration cannot claim presumption of conformity neither with the standards required for accreditation nor with the regulations of EA's Multilateral Agreement (EA MLA). For this, an accredited calibration certificate is mandatory.

It must be pointed out that additional measurement uncertainties can arise from modified application conditions. Influencing factors are, for example, pressure, temperature, flow profile and the degree of turbulence of the flow to be measured. Details regarding measurement uncertainty of each measuring system can be found in the relevant data specification.

It is the responsibility of the user to determine the recalibration interval. The intervals should be chosen so that the re-calibration takes place before a significant change in the medium for the measurement problem. Please take into account the specific application conditions, environmental influences and the extent of potential secondary damage caused by values outside the specified tolerance.

Standards, directives or legal requirements can also determine the right time for a recalibration.

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Subject to alteration