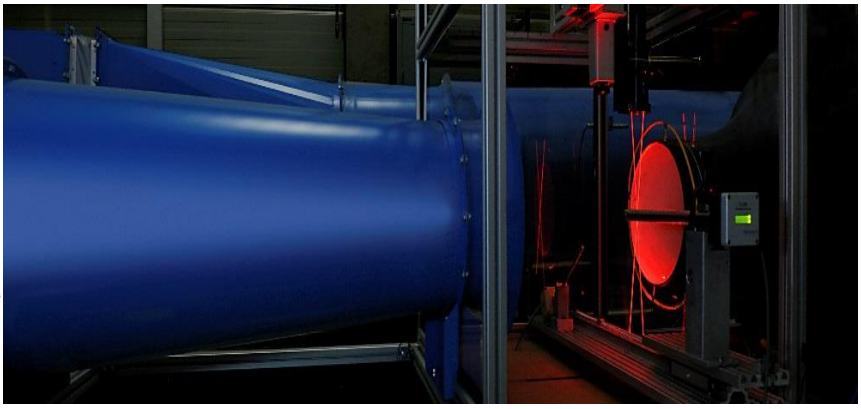
## Calibration of flow velocity, flow rate and mass flow

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.
Höntzsch works resolutely and in close collaboration with national and international accredited laboratories to further develop calibration methods and reduce measurement uncertainties.

Atmospheric flow rate test bench AVP


High pressure flow rate test bench HDVP

**DAkkS-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 5500 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 6600 kg/h | 0.25 % |

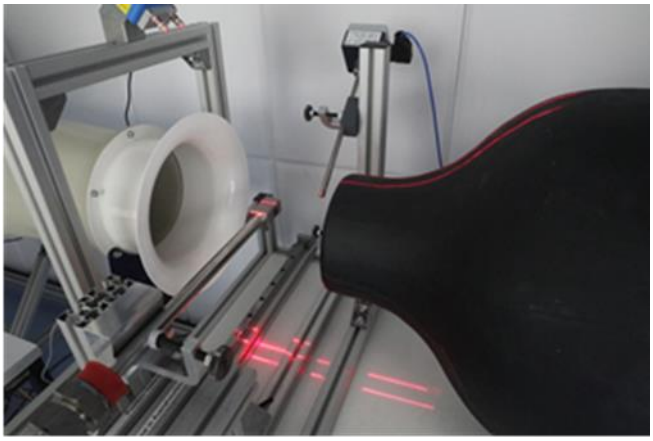
Nozzle flow rate test bench DVP

**ISO-/Werkskalibrierungen:**

| Measuring unit | Calibration medium | Measuring range | Best measurement uncertainty in relation to the measured value |
|---|---|---|---|
| **Flow velocity** | air at atmospheric conditi-ons | 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 conditi-ons | 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 11000 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:<br>argon, propane, hydrogen, natural gas, landfill gas, helium, air, butane, oxy-gen, 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** | water | 20 °C to 100 °C | 0.1 K |

| 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

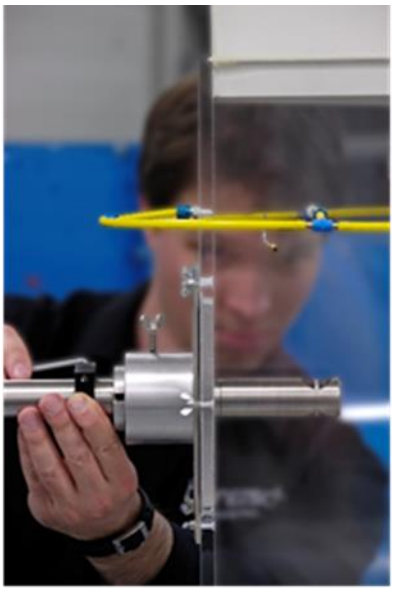
| AVP | Atmospheric flow rate test bench |
|---|---|
| Reference | PTB-calibrated transfer measurement standards |
| Calibration range | 1.5 m³/h to 11000 m³/h |
| Calibration medium | air at atmospheric conditions |

| 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

| 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 | 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**

Höntzsch calibration 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 calibration certificate are determined according to the "GUIDE OF EXPRESSION OF UNCERTAINTY IN MEASUREMENT". 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 DAkkS calibration certificate, the measurement result and the statement of conformity derived from it are always within the specification limit, taking into account the measurement uncertainty as a guard band.

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.

**Höntzsch GmbH & Co. KG**
Gottlieb-Daimler-Straße 37
D-71334 Waiblingen
Tel: +49 7151 / 17 16-0
E-Mail info@hoentzsch.com
Internet www.hoentzsch.com

Subject to alteration