

Gas flow validation of a KF Oven or Oven Sample Processor

Prerequisites

Certified gas flowmeter, measuring mode for mL/min or L/h

Measuring principle

The built-in pump generates an adjustable air stream. The flow rate is measured using a calibrated flow meter. If the flowmeter does not consider standard temperature and pressure, the output has to be recalculated to get the flow rate under normal ambient conditions (273 K, 1013 mbar). The resulting flow rate is compared to the flow rate displayed by the instrument or software.

The built-in flowmeter's measuring uncertainty is expected to be $\pm 20\%$.

Installation

The calibrated flowmeter is to be attached to the gas outlet of the KF Oven or Oven Sample Processor using a suitable tubing (M6 connector).

Gas inlet and outlet for the drying flask have to be bypassed using a suitable tubing (M6 connector).

Measurement

- Use the manual PUMP or FLOW function to switch on the pump. Adjust the gas flow to a desired value. Apply a commonly used flow rate e.g. 50 mL/min (at least 10 mL/min).
- After 1 to 2 minutes read the gas flow from the calibrated flowmeter. Compare to the reading on the instrument's display or the software.
- If the calibrated flow meter does not consider normal conditions, the flow rate has to be recalculated according to the following formula:

$$Vol_0 = \frac{Vol_{act} \times p_{act} \times 273 K}{T_{act} \times 1013 mbar}$$

where Vol_0 : normal volume (mL/min or L/h resp.)
 Vol_{act} : actual volume (mL/min or L/h resp.)
 p_{act} : actual ambient pressure
 T_{act} : actual ambient temperature in Kelvin

Example of calculation:

Flow rate meas.: 46.5 mL/min
Ambient temperature: 24 °C
Air pressure: 982 mbar

Conversion for 0 °C and 1013 mbar:

$$\text{Flow rate eff.} : \frac{46.5 \text{ mL/min} \times 982 \text{ mbar} \times 273 \text{ K}}{297 \text{ K} \times 1013 \text{ mbar}} = 41.4 \text{ mL/min}$$

Technical description of the built-in flowmeter

Operating principle	Hot wire thermo-anemometer, heat dissipation principle (Microbridge mass air flow sensor) The measured value is corrected to standard temperature and pressure.
Measuring range	0 ... 200 mL/min or 0 ... 12 L/h resp.
Measuring uncertainty	± 20 % of the nominal value