

# Gas flow validation of the 774 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 774 Oven Sample Processors's keyboard.

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 on top of the 774's tower using a suitable tubing (M6 connector).

Gas inlet and outlet for the drying flask on the left-hand side of the 774's tower have to be bypassed using a suitable tubing (M6 connector).

## Measurement

- Use the manual PUMP command to switch on the pump. The knob on the left-hand side of the tower to adjust the gas flow to a desired value. Apply a commonly used flow rate e.g. 60 mL/min (at least 10 mL/min). The 774 keyboard's display allows precise adjustment of the flow rate.
- After 1 to 2 minutes read the gas flow from the calibrated flowmeter. Compare to the reading on the keyboard's display.
- 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**

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