

**RT02B with calibrated nozzle**

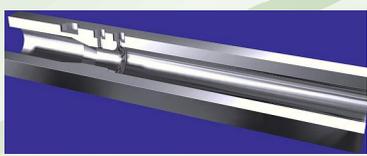
Microprocessor-controlled volume flow meter **RT02B** for gases and gas mixtures (selectable, nitrogen, argon, oxygen, **compressed air**, for instance) with colour-coded polyamide double measuring hoses (2 times 2 m) with quick connect couplings, temperature-sensor with 4 m cable, pressure sensors laid out for max. overpressure of **10 bar** (150 psi) (max. **16 bar** (240 psi) without measuring). Works with external power supply (included, 90V-240V AC / 12V DC). Power consumption < 5W. Normal measurement rate: 1.5 measurements per second, in the so called emulation mode (a feature of the included software for Windows) the flow meter can reach **240** measurements per second.

**Safety features:** the flow meter can be safely plugged in to fully pressurized measuring nozzles thanks to a built-in, electronically switched magnetic valve. Blinking display and automatic power-off on overload conditions.

The set includes one **measuring nozzle of your choice** which comes with a calibration certificate by an independent **DAkks** accredited laboratory. Material: nickel plated brass, measuring precision < **1 % of measured value** over the entire measuring range, dynamic range **1:30**.

With the exception of very small nozzles (in

the sub-mm-range), the nozzles **regain** about **two-thirds** of the pressure drop generated to measure the volume flow.



Therefore the effective pressure drop caused by the measuring nozzle varies from **0.0 to 0.02 bar** (0.0 to 0.29 psi, max.).



The set includes an elaborate **software** for Windows 10 / 8 / 7 / Vista / XP (built-in there: the complete instruction manuals for both the software and the flow meter (English)) on CD-ROM, PC-link-cable (RS-232) 5 m plus a cable to adapt RS232 to **USB**.



Flow meter with 4-mm-nozzle (the set can be ordered with other nozzles as well)

**Set Price: please ask**

**Equipment rental**

Lending of a RT02B set with one measuring nozzle **1 mm, 2 mm, 4 mm, 1/2", 1" or 2"** of your choice for 14 days

**Price: 320 €**

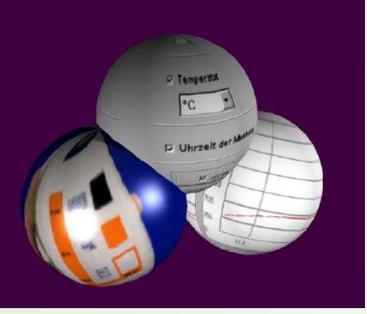
Extra week

**Price: 120 €**

The lended devices are used ones and usually have some scratches or other signs of past and intensive use. They are, as a matter of course, thoroughly tested and will deliver correct measuring results.

If a new RT02B set is **ordered** within 6 months after a used device was rented, the lending fees will be fully discounted from the invoice. In other words, the customer effectively did not pay **any** lending fees at all.

In cases of longer delivery times, we deliver a used device first, in order to bridge the delivery time. This service does not count as "lending" and is of course free of any charges.



**Contents**

RT02B set with measuring nozzle  
Equipment rental  
**Page 1**

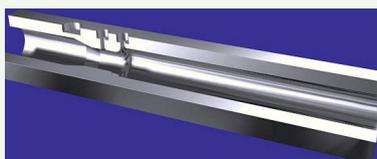
Measuring nozzles  
Calibration  
**Page 2**

Nozzle sets  
**Page 3**

## Measuring nozzles

Measuring nozzles can start with as little as **0.006** NI/min and end with more than **20000** NI/min. They are calibrated (together with the RT02 unit) in a **DAkkS**-accredited laboratory. A test engineer surveys the calibration process, advises control measurements and finally signs a test- and calibration certificate, which is of course independent from us.

This procedure ensures the most reliable quality certificates available and makes it easy to pass external or internal quality audits, as they become more and more mandatory in today's industry.



Example: cross sectional view of a 1/2" nozzle



The nozzle is equipped with colour coded quick connect couplings. To connect or disconnect a nozzle with the computational unit (RT02B) is therefore only a matter of seconds.

The nozzle is meant to remain mounted in the pipeline and to serve as a permanently available **measuring access point**.

However, if you don't think of "the pipeline" as something that is fixed and stationary, then you can take the RT02B and the nozzle in a quite **mobile manner** to all sorts of pneumatic machines or tools you want to examine.



The CD-ROM that contains the calibration data of the measuring nozzle. The data are protected, by means of a software security key, against voluntary or involuntary changes. Yet they remain readable for humans (perfect transparency).

## Test protocol (example)

Messergebnisse

Absolutdruck P<sub>ap</sub>, Temperatur T<sub>p</sub> und Feuchte H<sub>p</sub> wurden am Eingang des Prüflings gemessen.

Q <sub>s</sub>	Q <sub>p</sub>	P <sub>ap</sub>	T <sub>p</sub>	H <sub>p</sub>	ASW	MU
L/min	L/min	mbar	°C	%	L/min %M	L/min
0,000	0,000	953,4	22,86	3,1		
10,011	9,990	953,3	22,86	3,1	-0,021	-0,21
20,065	20,040	952,1	22,86	3,1	-0,025	-0,12
30,043	30,020	970,2	22,86	3,1	-0,023	-0,08
40,016	39,970	960,7	22,86	3,1	-0,046	-0,11
49,992	49,950	993,5	22,81	3,2	-0,042	-0,08
75,227	75,130	1037,7	22,70	3,3	-0,067	-0,13
95,984	94,900	1094,9	22,62	3,5	-0,164	-0,17
120,106	119,910	1162,9	22,50	3,7	-0,196	-0,16
140,091	139,920	1239,8	22,41	3,9	-0,171	-0,12

Verwendete Bezeichner und Referenznormale

Q<sub>s</sub> Normvolumenstrom des Normals für die folgenden Normbedingungen:  
 Absolutdruck: 1013,25 mbar; Temperatur: 20,00 °C; Feuchte: 0,0 % rF  
 Q<sub>p</sub> LFE 50M10-09-MS, SerNo: 100000-W1

Q<sub>p</sub> Normvolumenstrom des Prüflings

P<sub>ap</sub> Absolutdruck

T<sub>p</sub> Temperatur, max. erweiterte MU: 0,2 °C

H<sub>p</sub> Relative Feuchte

ASW Abweichung Q<sub>p</sub> - Q<sub>s</sub> absolut und in Prozent vom Messwert

MU Erweiterte Messunsicherheit

Die Volumenstromangabe Q<sub>p</sub> des Prüflings entspricht dem arithmetischen Mittelwert des Anzeigewertes über 60 Sekunden.

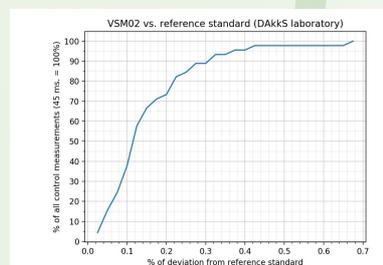
Messunsicherheit

Angaben ist die erweiterte Messunsicherheit, die sich aus der Standardmessunsicherheit durch Multiplikation mit dem Erweiterungsfaktor k = 2 ergibt und die Messunsicherheit des Normals und des Kalibrierverfahrens beinhaltet. Der Wert der Messgröße liegt mit einer Wahrscheinlichkeit von 95 % im zugeordneten Wertintervall.

The RT02B can store calibration data of up to 5 measuring nozzles at the same time. In setup mode the actually used nozzle can be easily selected.

Of course one can use an **arbitrary** number of nozzles in total. All that is needed is a short "refueling stop" at a computer running the software.

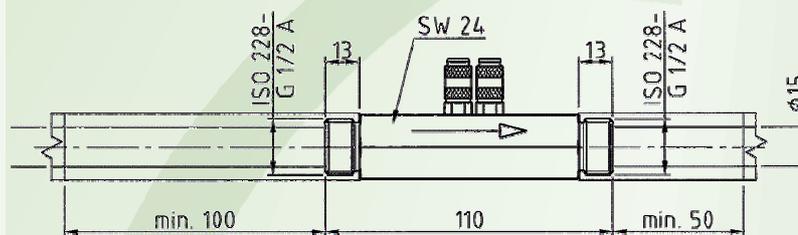
## Measuring precision < 1 % of MV.



The diagram above shows 45 flow measurements taken with the RT02 in comparison to 45 measurements made by the DAkkS accredited laboratory (a handful of different nozzles were used).

The **highest** deviation that occurred (in one point) reached **0.66 %** of the reference value.

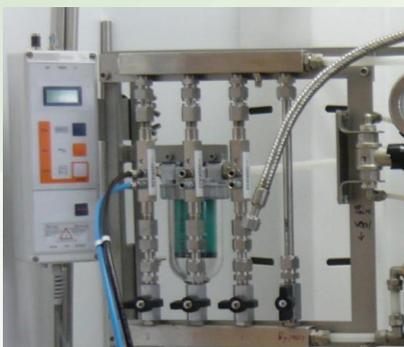
95 % of our measurements had an error of less than **0.37 %** of the reference value, for 70 % of our results the error was less than **0.165 %** and about **40 %** of our values even reached an error margin of less than **0.1 %** (< one thousandth) compared to the laboratory measurements.



Price: please ask

**Nozzle sets**

Using some nozzles of different sizes in, maybe, an array-like frame (please see the image below as an example) is a logical and very simple solution to meet the demand for extended measuring ranges.



In principle this works just like the range switch in a common household multimeter (microampere, milliampere, ampere: you already know this).

In the image above, the pressurized air enters the frame through the white plastic hose in the corner down right. The air is led through just one open valve to the appropriate nozzle (then the flow is measured) and it leaves the frame again through the white plastic hose in the upper right corner.

In this example there are only three nozzles used: 1-mm, 2-mm and 4-mm. Yet this allows (let's say at 6 bar) measurements from **0.39** NI/min to **214** NI/min.

*With the following combination of 5 nozzles (namely 0.2 mm, 1 mm, 4 mm, 1/2" and 2") the possible maximum range (at 6 bar) would be like this: **0.016**NI/min to **15450**NI/min.*

*This results in a continous measuring range of, believe it or not, not less than **1 : 965000**.*

The diagram to the right can help you to find suitable combinations of nozzles, if needed.

**Price: please ask**

