

Perfection in fluids.

The right *flow*
by German engineering.



EP SMF[®] - SonicMasterFlow[®]

High-precision flow measurement of gases and air

Brochure EPE-170509



Made in
GERMANY



EPE-170509

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Similar to figure

Flow measurement with sonic nozzles

Modular construction: wide range of options

Highest measurement accuracy

Comfortable and safe operation

Description

The series of SMF[®] - SonicMasterFlow[®] are calibration systems for high-precision flow measurement of air and other gases (optional) (volume and mass flows) by means of critically operated Laval nozzles.

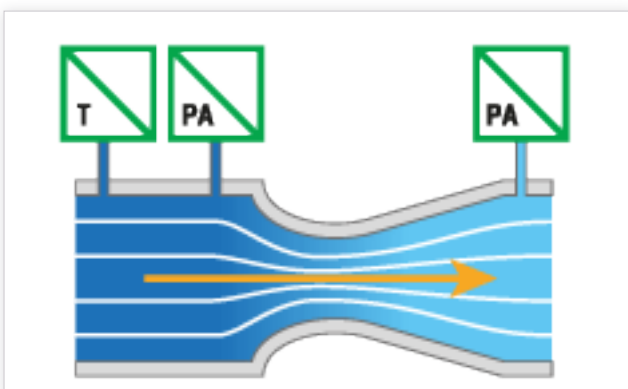
The modular design for different flow ranges with a variety of options makes the nozzle test benches ideally suited for several applications. Operation is easy and safe thanks to an intuitive user interface, automatic nozzle combination and internal system checks.

Features & benefits

- ✓ Secondary standard with highest measurement accuracy: *e.g. for calibration laboratories*
- ✓ Modular construction: *For a wide variety of measurement ranges from 0.0025 to 10,000 m³/h*
- ✓ Easy to use: *With automatic nozzle combination and system checks*
- ✓ Various options: *For a wide variety of applications*
- ✓ Fast response times: *Stable flow within 500 msec*
- ✓ Recognized internationally: *Approved by PTB as a calibration standard*
- ✓ Best long-term stability: *Recalibration period up to 10 years for Laval nozzles*

Technical scheme

EP SMF[®] - SonicMasterFlow[®] System



Sonic flow through Laval nozzle

Application examples

- ✓ Calibration of various flow sensors (gas meters, air mass flowmeters, HFM, MID, LFEs, orifices, venturis, ultrasonic gas meters, etc.)
- ✓ Calibration as an end-of-line or development test at the manufacturer
- ✓ Calibration as a service in the calibration laboratory



Top-Innovator
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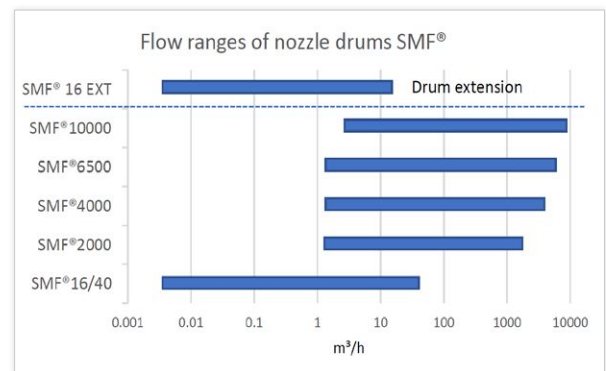
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Modular construction

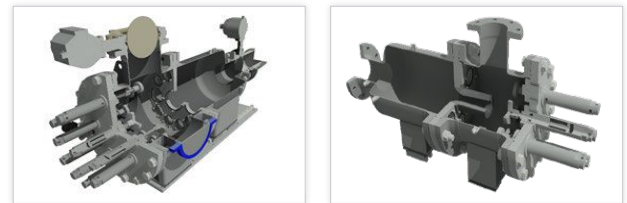
SMF® - SonicMasterFlow® systems are complete nozzle test benches that operate with automatically controlled nozzle systems in drum design. The modular construction allows you to choose the optimal combination for your own application from different drum sizes and different nozzle sets. The range of applications is from low flow rates from 0.0025 up to 10,000 m³/h.



Flow ranges

Nozzle combination

With the sonic flow through Laval nozzles, a constant volume flow can be set very precisely and quickly. A wide variety of flow rates can be generated by combining different sonic nozzles. With 8 sonic nozzles, e.g. $2^8 = 256$ different flow rates can be generated. A binary staggering of the nozzles is recommended to cover the flow area evenly. However, if other nozzle sizes make more sense due to the application, a customer-specific adaptation of the nozzle set is possible.



Nozzle drum

DAkKS & PTB Version

SMF® nozzle test benches are offered in two different accuracy classes. The DAkKS version achieves a system accuracy of 0.3% MV, the PTB version achieves a system accuracy of 0.2% MV.

Further details on these two versions can be found in the table. Nozzle test benches with a system accuracy of 0.15% MV can also be offered on request.

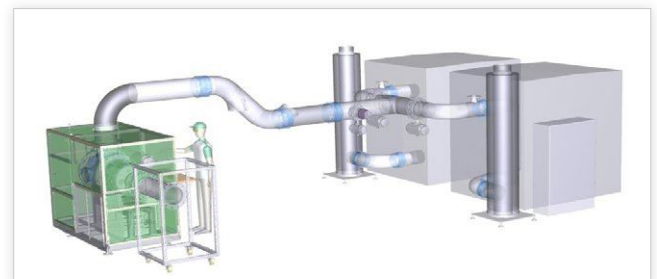
	DAkKS version	PTB version
System accuracy	0.3 % MV	0.2 % MV
Nozzle calibration	DAkKS calibration	PTB calibration
Nozzle accuracy	0.25 % MV	0.15 % MV
Sensor calibration (p, T, rH)	Factory calibration	DAkKS-calibration
Sensor quality (p, T, rH)	High quality sensors	High-end Premium-sensors

SMF® versions

Options

The system construction provides for atmospheric suction through the device under test (DUT) and the corresponding nozzle drum. A vacuum pump or the connection to the in-house vacuum network ensures that the necessary critical pressure ratio is generated downstream of the nozzles. A vacuum pump is optionally available.

In addition, other options are available, such as DUT data acquisition and evaluation that perfectly complement the test bench for the desired application.



Construction nozzle test bench



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Ordering information



You can't find the right nozzle set for your application? Describe your application to us and we will make a customer-specific design for a nozzle set at no extra charge.

Test bench	Possible Flow range [m ³ /h]	DAkks - 0.3 %	PTB - 0.2 %
SMF [®] 16	0.0025...16	170074	170075
SMF [®] 40	0.0025...40	169538	169540
SMF [®] 2000	1...2000	162620	162630
SMF [®] 4000	1...4000	130712	130751
SMF [®] 6500	1...6500	130173	130752
SMF [®] 10,000	2...10,000	155458	155459

Nozzle set	Flow range [m ³ /h]	Standard S		Standard M		Standard L			
		DAkks 0.3 %	PTB 0.2 %	DAkks 0.3 %	PTB 0.2 %	DAkks 0.3 %	PTB 0.2 %		
SMF [®] 16	---	---	---	---	---	0.063...16	170080	170082	
SMF [®] 40	---	---	---	---	---	0.016...40	169577	169578	
SMF [®] 2000	2...1000	170587	170591	---	---	4...2000	169423	169424	
SMF [®] 4000	---	---	---	1...2500	167528	167529	2...4000	170083	170085
SMF [®] 6500	---	---	---	---	---	---	2...6500	162884	162885
SMF [®] 10,000	---	---	---	---	---	---	2...10,000	164369	164370

Nozzle set EXT	Flow range [m ³ /h]	Standard S EXT		Standard M EXT		Standard L EXT			
		DAkks 0.3 %	PTB 0.2 %	DAkks 0.3 %	PTB 0.2 %	DAkks 0.3 %	PTB 0.2 %		
SMF [®] 2000	16...1000	172152	172160	16...1600	170365	170366	16...2000	170343	170344
SMF [®] 4000	---	---	---	16...2500	172130	172131	---	---	---



Brochure critical/sonic nozzle (EPE-167590)

Options

- Suitable blower
- Extension of the measurement range downwards with an additional small sonic nozzle drum SMF[®]16 EXT (possible flow range 0.01...16 m³/h)
- DUT signal acquisition and evaluation
- Measurement of environmental conditions
- Adapter set, spare parts, etc.

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