SAO

Technical Datasheet



Short Description

Inlet Venturi nozzle (Smooth Approach Orifice) for measuring high air flow rates with free intake from the atmosphere. The SAO sits at the inlet of a pipe and therefore needs *no* straight inlet section – only $5 \times D$ of straight outlet length. Thanks to the pressure recovery in the outlet cone, the permanent pressure loss is limited to 10 to 25 % of the differential pressure. According to Bernoulli, the mass flow rate follows a square-root relationship with differential pressure and density.

Identification

Product name	SAO
Type	Inlet Venturi nozzle
Design basis	VDI/VDE 2041, based on DIN EN ISO 5167-3
Document status	12.11.2026

Design Data and Measuring Range

Nominal pressure	PN 6 to PN 16
Nominal diameter	DN 10 to DN 500
Throat diameter d	5 to 500 mm
Diameter ratio	$\beta = d/D$, should be between 0.4 and 0.8
Turndown	approx. 1:3 at a differential pressure ratio of 1:10
Flow range	approx. 0.1 L/min up to approx. 10,000 m^3/h, individual design possible
Differential pressure range	standard approx. 1 to 20 mbar, individual design possible
Permanent pressure loss	10 to 25 % of the differential pressure, depending on the diameter ratio and the opening angle of the diffuser

The throat diameter d is calculated from the specified operating data in accordance with the applicable standards and regulations (DIN EN ISO 5167, VDI/VDE 2041) and is documented in the calculation data sheet.

Construction and Design

Structure	turned and polished body with a connection flange welded on at the outlet
Geometry	radiused inlet, cylindrical throat, outlet formed as a cone
Surface	machined and polished as standard to achieve the required surface roughness and manufacturing tolerances
Opening angle	of the outlet cone fixed at 6 ° and 12 °
High-pressure tap (DP+)	measured against atmosphere
Low-pressure tap (DP–)	in the wall of the throat, through one or more tapping holes. These should be interconnected (ring chamber)
Tapping sockets	12 mm socket with G1/8" female thread or according to customer specification
Identification	name plate on the upstream side with +, tag number, PN, D, d and material

Installation

Mounting location	directly at the inlet of a pipe, free intake from the atmosphere
Connection	flange at the outlet, preferably according to DIN; other flange and gasket types according to customer specification
Straight inlet length	not required – the nozzle draws in freely
Straight outlet length	minimum $5 \times D$
Installation length	normally between 200 and 1200 mm

Due to the fixed opening angles of the outlet cone, the overall length depends mainly on the throat diameter d and on the connection diameter D at the outlet. The binding installation length is given in the calculation data sheet for your design.

Materials and Material Testing

Nozzle body and flanges	aluminium or stainless steel
Special materials	other common materials and special materials on request
Material testing	inspection certificates for the materials used, e. g. according to EN 10204, on request

Calibration

Every SAO nozzle should be calibrated from 10 to 100 % of the differential pressure range of the nominal flow rate. We issue a factory or a DAkkS calibration certificate for it – accredited according to DIN EN ISO/IEC 17025, registration no. D-K-17589-01-00.

Standards and Regulations

Design basis	VDI/VDE 2041, based on DIN EN ISO 5167-3
Flanges	preferably according to DIN
Material certificates	EN 10204
Calibration	DIN EN ISO/IEC 17025 (DAkkS) or factory calibration

Options and Variants

- Material aluminium or stainless steel
- Flange and gasket type according to customer specification
- Tapping sockets according to customer specification
- Ring chamber for the low-pressure tap
- Factory or DAkkS calibration certificate

Ordering Information

Every inlet nozzle is calculated for the individual measuring task. For design and quotation we require:

- Flow range(s)
- Pipe nominal diameter(s)
- Material
- Operating conditions (pressure and temperature)
- Permissible pressure drop
- Measurement accuracy
- Ambient conditions

DESIGN AND ADVICE

For the design of your measuring point please contact us at **+49 7157 5387-0** or **info@tetratec.de**.