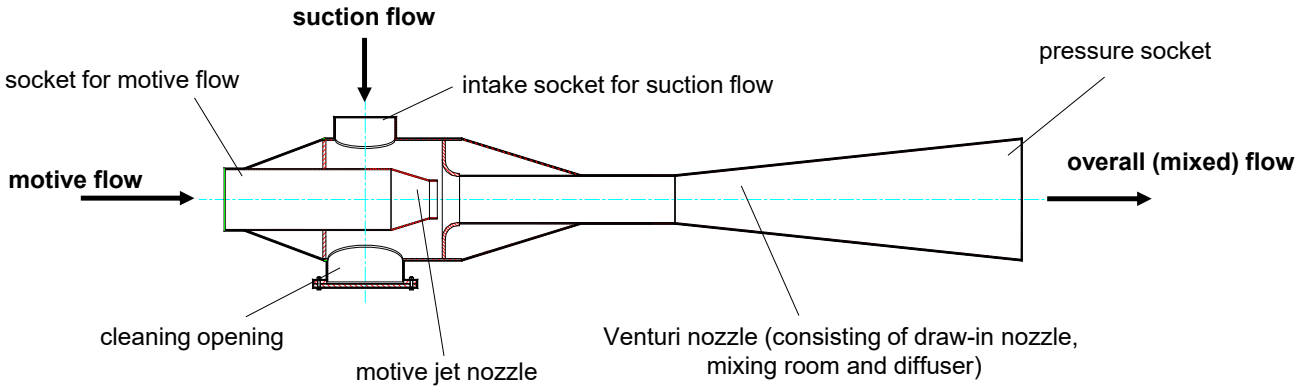
Gas jet fan (Venturi nozzle) of plastic material
Type VTD



APPLICATION

Usual axial, radial and roof fans of synthetic material have turned out to be very useful in solving the most different ventilation problems. They are used successfully for ventilation in laboratories, battery rooms, scouring and washing units, in the galvanic and chemical industries.

There are, however, applications in chemical and process engineering, especially in the field of microelectronics, in which usual synthetic materials such as PVC, PP or PE are failing or customary fan designs are not applicable. Such special properties can be:

high aggressiveness, especially of substances causing stress cracking in synthetics,
heavy soiling, especially by sticky substances or particles clinging to the components,
hot gases by which fan propellers would exceed their strength limits,
gases with high risk of explosions,
high toxicity.

The use of materials with higher quality for fan components leads to very high cost which are hardly justifiable especially in cases of small volume flows.
These applications permit gas transport by means of a Venturi nozzle. Its mode of action is utilized e.g. in water jet pumps, also known as water jet ejectors, and offers the following advantages:

high reliability and almost unlimited service life,
good labour safety because there are no moving and electrical elements,
absolute tightness,
no mechanical wear and, consequently, almost no maintenance,
vibration-free operation,
relatively low initial cost.

An additional fan required for the motive flow is a disadvantage but an exhaust air fan existing already can often by used for this purpose.

TECHNICAL DESCRIPTION

The main components are shown in the sectional drawing above. The motive flow coming from an additional fan flows into the motive jet nozzle where it is accelerated to high speed. It encounters the suction flow (arriving with slower flow velocity) and entrains it. Energy transfer in the mixing room is by exchange between the two media. The resultant intense mixing is an important side effect because pollutant concentration in the outlet air is lowered in cases of suction flow with high pollutant concentration.

Flow velocity is reduced with low losses in the following diffuser with optimized flow properties. The entire energy balance shows high losses; efficiency of the Venturi nozzle is hardly better than 25 %.
All components of the unit are made of thermoplastic synthetic materials such as PVC, PPs or PE. Conductive synthetics can be used for explosive gases.
Design details such as layout of connections, fastening elements etc. will be specified for the corresponding application.

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CONDITIONS OF APPLICATION

Permissible temperature: -30 ... +40 °C
Higher temperature can be allowed after consultation with the manufacturers.

Applied materials are characterized by good **chemical resistance** to many substances. It should be considered, however, that even synthetic materials are attacked by certain chemicals.
Inquiries and orders should always inform about the intended purpose of use of the fan and the type of medium to be conveyed so that suitable materials can be chosen correspondingly.

Explosion protection
The Venturi nozzle is no igniting agent so that it is not subject to regulations 2014/34/EU (ATEX). If, however, dangerous ignition sparks can be generated by possible electrostatic charges (in dust conveyance, for instance), the unit can also be made of conductive synthetics.

ACCESSORIES

Motive flow fan, air guide elements

DIMENSIONING

Due to the wide variety of applications, there is no model series with specified dimensioning. The complete unit will be calculated and dimensioned corresponding to the desired performance parameters for suction flow and the motive flow fan to be used. Dimensioning of flow parameters requires the following details to be specified:

- suction flow
- total pressure increase $\Delta p_{ges\text{-}S}$

  (pressure loss in suction flow line)

A typical field of characteristics is shown in the diagram on the right. The particular characteristic depends on the motive flow size. It is obvious that the suction flow can amount to up to 50 % of the motive flow, provided that pressure losses in the suction line are not too high.
Dimensioning means calculation of the necessary motive flow and motive flow pressure loss. These data permits the motive flow fan to be dimensioned.

DESIGN EXAMPLE

The drawing on the right shows an example of machine exhaust in a manufacturing line for micro-electronic components.
Performance parameters:

suction flow	400 m³/h
suction flow pressure increase	780 Pa
motive flow	1,400 m³/h
pressure loss for motive flow	1,040 Pa

PERFORMANCE DIAGRAM (typical example)