Air flow measurement
Differential pressure

Measurement of air speed and direction
to control the tunnel ventilation

Air flow measurement

Features

- Robust air flow monitoring system based on high-precision differential pressure measurment
- 2-point mesh
- Automatic zeroing of differential pressure transducers
- Touch evaluation and control unit to display measured values, status and set parameters
- Connection to tunnel control system by RS-485 MODBUS RTU, optionally by analogue outputs and relay contacts

System setup

- Two differential pressure pitot tubes mounted on opposite tunnel walls; pneumatically connected to the terminal boxes
- Terminal boxes with differential pressure transducers to be mounted in the tunnel or remotely outside of the driving area (high temperature variant); either
  - 1 terminal box: pneumatic connection to opposite side
  - 2 terminal boxes: electric connection to opposite side
- Touch evaluation and control unit to be mounted in closet outside the tunnel's driving area (niche, cross-cut, etc.); Connection to terminal box by RS-485 MODBUS RTU; Connection to tunnel control system by RS-485 MODBUS RTU
- Optional analogue outputs and relay contacts by DIN rail mounted devices

Operation

The air flow monitoring system measures the longitudinal air flow at 2 points in a tunnel cross section. The method allows to optionally remove all electronic components from the tunnels driving area to maintain a measurement also under high temperatures.

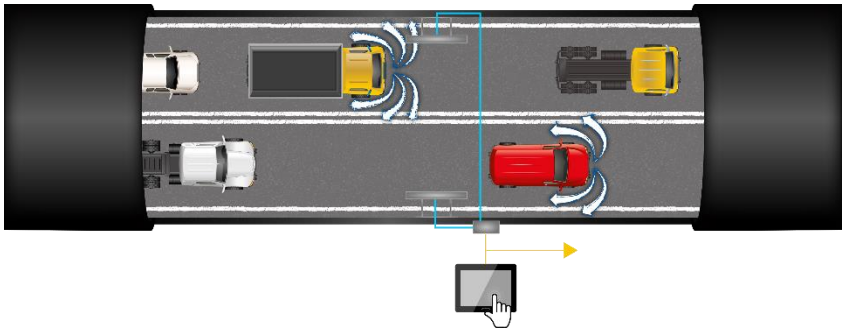
Two differential pressure pitot tubes are mounted on opposite tunnel walls. Measuring the air flow at 2 points allows to calculate a representative average air flow over the tunnel cross section.

An air flow in the tunnel generates a dynamic pressure on the side of the pitot tube facing the flow of air while on the other side only the static pressure is present. The measured differential pressure is used to calculate the air velocity under consideration of the also measured temperature. The values of the 2 measuring points are then averaged.

Following outputs are available: air velocity, direction of air flow, air temperature.

Advantages

- Specifically designed for tunnels
- Easy installation and setup
- Long term stability by automatic zeroing
- Measurement possible at high temperatures
- Corrosion resistant against aggressive tunnel atmosphere
- Minimised spare requirements
- Extremely low maintenance requirements



Air flow measurement by differential pressure method
Variant with pressure transducers mounted outside tunnel's driving area

Application

Tunnels are important infrastructure elements in road networks and facilitate the connection of regions.

Environmental conditions in tunnels are influenced by fog, particles and emissions and need to be monitored to protect people on their passage through the tunnel from danger and impacts on their health. Accidents in tunnels, and particularly fires, can have dramatic consequences and can prove extremely costly in terms of human life, increased congestion, pollution and repair costs.

At every time people in the tunnel need to be supplied with breathable air and sufficient visibility.

Since 1990 JES Elektrotechnik GmbH develops, installs and maintains systems to monitor air quality and lighting conditions in tunnels. Our systems are robust, durable and resistant against the corrosive atmosphere in a tunnel. They operate reliably and have a high accuracy in measurement.

All systems fulfil the requirements of the EC guideline 2004/54/EC (Minimum safety requirements for tunnels in the trans-European road network) and the more precise national guidelines and provisions:

- Austria: RVS 09.02 Tunnelausrüstung
- Germany: RABT Richtlinien für die Ausstattung und den Betrieb von Straßentunneln
- Switzerland: ASTRA Richtlinien und Fachhandbuch Betriebs- und Sicherheitsausrüstungen (BSA)

Our range of products for tunnel covers systems for monitoring of

- Toxic gases like CO, NO, NO_2 (extractive or in-situ)
- Visibility (extractive or in-situ)
- Air speed, direction and temperature
- Luminance (access, threshold and interior zone)
- Illuminance

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Air flow measurement

Technical Data

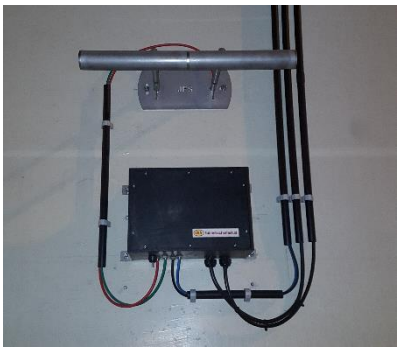
Air flow measurement	
Measuring method	Determination of average air flow through 2 point mesh measurement by differential pressure pitot tubes
Measured values	Air velocity Air flow direction Temperature
Measuring range	-20 .. 20 m/s
Resolution	0.1 m/s, Accuracy depending on: installation, flow profile, typ. <±0.2 m/s at 3 m/s
Response time	1s..180 s, parametrierbar
Alignment	Differential pressure pitot tubes mounted on opposite tunnel walls

Outputs	
Digital interface	1 x RS-485 MODBUS RTU to tunnel control system (other interfaces on request)
Analogue outputs (optional)	Up to 4 x 4-20 mA, 500 Ω
Relay contacts (optional)	1 x fault indication (NC) 1 x direction of air flow (NC) max. 2 A @ 30 VDC oder 2 A @ 250 VAC

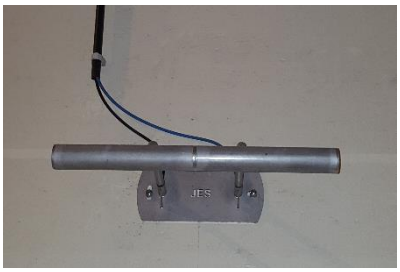
Differential pressure pitot tube	
Type	JES t/FL-DP SR
Temperature range	-30 .. 400 °C
Dimensions	609 x h x 400 mm (b x h x t)
Weight	5,5 kg
Material	Stainless steel 1.4571/316Ti oder 1.4404/316L

Terminal box	
Type	JES t/FL-DP TB
Operating voltage	85 .. 264 VAC, 47 .. 63 Hz
IP rating	IP65
Temperature range	-30 .. 80 °C
Dimensions	360 x 250 x 173 mm
Weight	11 kg
Material	Solid rubber self-extinguishing, halogen and silicon free or Stainless steel 1.4404 or 1.4571 (at surcharge)

Conformities	
Electrical standards	2006/95/EC Low voltage directive (LVD) 2004/108/EC Electromagnetic compatibility (EMC)
Tunnel safety standards	AT: RVS 09.02.22 2010 & ASFiNAG PlaPB DE: RABT 2006 CH: ASTRA RL 13001 & FHB BSA



Pitot tube and terminal box
Variant with differential pressure transducers in tunnel and one terminal box (pneumatic connection to both pitot tubes)



Pitot tube on opposite side and pneumatic connection to terminal box

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