

# JES t/FL-USP Air Flow Sensor

## Features

• Precise ultrasonic air flow measuring system based on different transition times of ultrasonic pulses
• Measurement of airflow at a single point
• Connection to tunnel control system either via analogue outputs or via RS 485 ASCII
• Optional, remote smart/HUB touch operating unit to
  ◦ display measured values
  ◦ modify parameters
  ◦ additional outputs

## System setup

• Single sensor for wall-mounting with system cable
• t/FL-USP-TBX Terminal box for analogue and RS-485 connections
• Alternative smart/BOX-S-FL-USP Terminal box for t/FL-USP air flow sensor with JES smart/CORE IoT gateway and operating unit
• Optional smart/HUB touch operating unit

## Operation

The air flow monitoring system measures the air flow based on different transmission times of ultrasonic pulses sent in one or the other direction.
The arms of this single point air flow sensor are directed in the longitudinal axis of the tunnel. Ultrasonic pulses are exchanged between the two sensor arms. Air flow in the tunnel influences the transition time of the pulses between sender and receiver. Based on the difference in transition times of ultrasonic pulses sent in one or the other direction the measured values are calculated.
Measured values are air speed, air flow rate, direction of air flow and air temperature

## Advantanges

• Specifically developed for application in tunnels
• No control unit required
• Easy configuration
• Corrosion resistant against aggressive tunnel atmosphere
• Sensors can be replaced quickly with no tools and no re-alignment required
• Minimised spare requirements
• Extremely low maintenance requirements

## 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 characteristics 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 detailed 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
• Visibility (extractive or in-situ)
• Toxic gases like CO, NO, NO2 (extractive or in-situ)
• Air velocity, direction and temperature
• Luminance (access, threshold and interior zone)
• Illuminance

# Technical Specifications

| Air flow measurement | | | |
|---|---|---|---|
| Type | JES t/FL-USP | | |
| Measuring method | Determination of direction dependant differential transition times of ultrasonic pulses | | |
| Measured values / ranges / resolution | Air velocity<br>Direction of air flow<br>Acoustic-virtual temperature | 0 .. 75 m/s<br>1° or 181°<br>-50 .. 70 °C | 0.1 m/s<br>n/a<br>0.1 °C |
| Accuracy | ≤ 5 m/s: ± 0.1 m/s (rms, mean over 360°)<br>> 5 m/s: ± 2 % (rms, mean over 360°) | | |
| Alignment | in tunnel longitudinal axis | | |

| Outputs | |
|---|---|
| Digital interface | 1 x RS-485 MODBUS ASCII with different telegrams |
| Analogue output | 2 x 4-20 mA, max. 400 Ω, assignable to air velocity, direction or acoustic-virtual temperature |
| Output range | configurable, typically: -20 to 20 m/s for air velocity |

## Ultrasonic sensor

| Ultrasonic Sensor | |
|---|---|
| Type | JES t/FL-USP-USS |
| Operating voltage | 8 .. 42 VDC or<br>12 .. 28V AC |
| Power consumption | typ. 1.5 VA, max. 2.5 VA |
| Heating | 24 VAC/DC ± 15 %; typ. 45VA, max. 60VA @ 24V |
| Appliance class | Class III |
| Material | Stainless steel 1.4404 (AISI 316L) |
| IP rating | IP 67 |
| Dimensions | 422 x 287 mm |
| Weight | Sensor 2.5 kg |
| Indoor/Outdoor use | Indoor use (tunnel) |
| Altitude | up to 2,000 m |
| Temperature range | -50 .. 80 °C (heated)<br>-30 .. 80 °C (unheated) |
| Humidity range | 0 .. 100% relative humidity (non-condensing) |
| Pollution degree | 4 (intended environment) |

## t/FL-USP-TBX Terminal box

| Terminal box t/FL-USP-TBX | |
|---|---|
| Type | t/FL-USP-TBX |
| System cable port | 1 (for t/FL-USP Sensor) |
| Power supply | 100 to 240 VAC, 50/60 Hz |
| Supply voltage fluctuations | ± 10 % |
| Overvoltage category | II |
| Power rating | 60 W |
| Appliance class | Class I |
| Material | Stainless steel 1.4404 (AISI 316L) |
| Mounting | incl. mounting clamp made from Stainless steel 1.4404 for wall mounting |
| IP rating | IP 69 |
| Dimensions | 250 x 160 x 110 mm |
| Weight | approx. 3.2 kg |
| Indoor/Outdoor use | Indoor use (tunnel) |
| Altitude | up to 2,000 m |
| Temperature range | -40 .. +60 °C |
| Humidity range | 0 .. 100% relative humidity (non-condensing) |
| Pollution degree | 4 (intended environment) / 2 (when cover removed) |

## smart/BOX-S-FL-USP gateway (instead of t/FL-USP-TBX for Ethernet connection)

| smart/Architecture gateway for t/FL-USP - smart/BOX-S-FL-USP | |
|---|---|
| Type | smart/BOX-S-FL-USP |
| System cable port | 1 (for t/FL-USP Sensor) |
| Power supply | 100 to 240 VAC, 50/60 Hz |
| Supply voltage fluctuations | ± 10 % |
| Overvoltage category | II |
| Power rating | 60 W |
| Appliance class | Class I |
| Digital interfaces | MODBUS RTU (RS-485)<br>MODBUS/TCP (Ethernet)<br>Webserver for configuration (Ethernet) |
| Material | Stainless steel 1.4404 (AISI 316L) |
| Mounting | incl. mounting clamp made from Stainless steel 1.4404 for wall mounting |
| IP rating | IP 69 |
| Dimensions | 250 x 160 x 110 mm |
| Weight | approx. 3.2 kg |
| Indoor/Outdoor use | Indoor use (tunnel) |
| Altitude | up to 2,000 m |
| Temperature range | -40 .. +60 °C |
| Humidity range | 0 .. 100% relative humidity (non-condensing) |
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## Conformities

| Conformities | |
|---|---|
| Markings | |
| Electrical standards | 2014/35/EU Low voltage directive (LVD)<br>2014/30/EU Electromagnetic compatibility (EMC)<br>2011/65/EU RoHS 1 directive 2012/19/EU WEEE Directive<br>EN IEC 61000-6-2:2019 Immunity standard for industrial environments<br>EN IEC 61000-6-3:2007 + A1: 2011 Emission standard for residential, commercial and light-industrial environments<br>EN 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use<br>EN IEC 63000:2019-05 Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances |
| Tunnel safety standards | AT: RVS 09.02.22<br>DE: RABT 2006<br>CH: ASTRA RL 13001, Fachhandbuch BSA<br>NO: Norwegian Public Roads Administration Handbook No. 021 Road Tunnels |