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JES t/FL-USP Ultrasonic Point 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 Direction of air flow Acoustic-virtual temperature	0 .. 75 m/s 1° or 181° -50 .. 70 °C	0.1 m/s n/a 0.1 °C
Accuracy	≤ 5 m/s: ± 0.1 m/s (rms, mean over 360°) > 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 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) -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) MODBUS/TCP (Ethernet) 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)
Pollution degree	4 (intended environment) / 2 (when cover removed)

Conformities

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Markings	
Electrical standards	2014/35/EU Low voltage directive (LVD) 2014/30/EU Electromagnetic compatibility (EMC) 2011/65/EU RoHS 1 directive 2012/19/EU WEEE Directive EN IEC 61000-6-2:2019 Immunity standard for industrial environments EN IEC 61000-6-3:2007 + A1: 2011 Emission standard for residential, commercial and light-industrial environments EN 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use 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	Austria: RVS 09.02.22 Germany: RABT 2006 Switzerland: ASTRA RL 13001, Fachhandbuch BSA Norway: Norwegian Public Roads Administration Handbook No. 021 Road Tunnels International: ISO 23431 Measurement of road tunnel air quality