

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 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	
Analogue output	1 x 4-20 mA, 400 Ω, isolated can be assigned any measured value and output range
Output range	configurable, typically: -20 to 20 m/s
Relay contacts	1 x fault indication (NC) 1 x direction of air flow (NC) (max. 48 V / 0.5 A)
Digital interfaces	1x RS 485 MODBUS RTU to control system, bidirectional 1x Intercom RS 485 master-slave

Ultrasonic transceiver (sensor)

Sensor	
Type	DURAG D-FL 220T M
Operating voltage	24 VDC ± 10 %
Current consumption	1 A
Appliance class	Class III
Service interface	USB 1.1
MTBF	> 170.000 h within service life if used within specifications
Material	Sensor housing: Polyamide RAL5017, Flammability rating: B1 (UL 94 V0) Wall bracket: Stainless steel 1.4404 (AISI 316L) or 1.4571 (AISI 316Ti)
IP rating	IP 69
Dimensions	270 x 130 x 95 mm
Weight	Sensor 2.2 kg Wall bracket 1.6 kg
Indoor/Outdoor use	Indoor use (tunnel)
Altitude	up to 2,000 m
Temperature range	-40 .. +70 °C
Humidity range	0 .. 100% relative humidity (non-condensing)
Pollution degree	4 (intended environment)

t/FL-USX-TBX terminal boxes

Terminal box A - JES t/FL-USX-TBX-A	
Type	t/FL-USX-TBX-A
System cable port	1 (for D-FL 220 T M Sensor A)
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)

Terminal box B - t/FL-USX-TBX-B	
Type	t/FL-USX-TBX-B
System cable port	1 (for D-FL 220 T M Sensor B)
Power supply	24 VDC ±10 %
Current rating	1 A
Appliance class	Class III
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	160 x 160 x 110 mm
Weight	approx. 1.9 kg
Indoor/Outdoor use	Indoor use (tunnel)
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-USX gateway (instead of t/FL-USX-TBX-A for Ethernet connection)

smart/Architecture gateway for t/FL-USX - smart/BOX-S-FL-USX	
Type	smart/BOX-S-FL-USX
System cable port	1 (for D-FL 220 T M 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) EN 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use EN 61326-1 Electrical equipment for measurement, control and laboratory use - EMC requirements
Tunnel safety standards	AT: RVS 09.02.22 DE: RABT 2006 CH: ASTRA RL 13001, Fachhandbuch BSA NO: Norwegian Public Roads Administration Handbook No. 021 Road Tunnels