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JES smart/FLOW-DP Air flow measurement system - Differential pressure

Features

• Robust air flow measurement system according to the differential pressure method
• n-point net measurement
• Periodic automatic zeroing (Autozero)
• Integration into the JES smart/Architecture
• IoT-enabled
• smart/HUB Touch evaluation and operating unit for measured value and status display
  ◦ Standard interfaces:
    ■ MODBUS RTU (RS-485)
    ■ MODBUS/TCP (Ethernet)
    ■ Webdienst (Ethernet)
  ◦ Inputs and outputs on the evaluation and operating unit:
    ■ 1 x Ethernet
    ■ 1 x USB
    ■ 1 x RS-485
    ■ 2 x digital in
    ■ 2 x relay contact (NO/NC)
    ■ 1 x HDMI
  ◦ Extension modules with DIN rail connectors
    ■ 4 x RS-485 galvanically isolated
  ◦ Optional integrated 2.4″ touch display (configuration code D2)
  ◦ Optional external 7″ smart/CORE-D7 touch display

System setup

• One or more differential pressure pitot tubes with wall brackets and terminal boxes for installation on the tunnel wall
• smart/HUB evaluation and operating unit, IoT gateway and data logger for DIN rail mounting
• Optional: Analogue outputs and relay contacts via DIN rail mounted devices
• Optional: smart/HUB-D2 sensor display to show status and current measured values
• Optional: smart/HUB-D7 7“ touch display connected via HDMI

Operation

When measuring air flow using the differential pressure method, the air flow is measured at 2 points in the tunnel cross-section. The method allows the electronic components to be optionally removed from the tunnel in order to maintain the measurement even at high temperatures. Two differential pressure pitot tubes are mounted opposite each other on the tunnel walls. The measurement at 2 points enables representative averaging of the flow over the tunnel cross-section. An air flow in the tunnel increases the dynamic pressure on the flow side of a differential pressure pitot tube. The static pressure is present on the opposite side. The air velocity is calculated from the pressure difference, taking the temperature into account. The calculated air velocities of several pitot tubes are averaged.
The measured variables output are air velocity, flow direction and air temperature.
smart/HUB is a universal data acquisition device for recording and storing sensor data in IP networks or forwarding it to a server. Various interfaces are available on the basic device or via extensions to connect the sensors. Extensions are connected to the base unit via a bus connector integrated into the DIN rail.

Advantages

• Specially developed for use in tunnels
• Automatic zeroing
• Corrosion-resistant against tunnel atmosphere
• Measurement also possible under high temperatures
• Permanent condition monitoring
• Centralised administration
• Remote maintenance
• Flexible integration into the control system

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 smart/FLOW-DP
Measuring method	Determination of the average air velocity by n-point network measurement with differential pressure pitot tubes
Measured values	Air velocity Flow direction Air temperature
Measuring range	-20 ... 20 m/s
Resolution	0.1 m/s
Alignment	Differential pressure pitot tubes mounted on opposite tunnel walls

Differential pressure pitot tube

Sensor	
Type	JES smartFLOW-DP-SR
Operating voltage	24 VDC ± 10 %.
Appliance class	Class III
Material	Stainless steel 1.4404 (AISI 316L) or 1.4571 (AISI 316Ti)
IP rating	IP 66
Dimensions	609 x 160 x 400 mm
Weight	Sensor 5.5 kg
Indoor/Outdoor use	Indoor (Tunnel)
Altitude	up to 2,000 m
Operating temperature	-40 .. +70 °C
Humidity range	0 .. 100% relative humidity (non-condensing)
Pollution degree	4 (intended environment)

smart/HUB Evaluation and operating unit, IoT gateway and data logger

IoT gateway, data logger and control unit smart/HUB	
Type	smart/HUB
Ethernet	1 x RJ-45
Field bus	1 x RS-485 half-duplex (2-wire)
Relays	2 x SPDT, 60 W (30 VDC, 2 A)
Digital inputs	2 x 24 V input (optically isolated)
Video output	1 x HDMI for connecting a 7” smart/CORE-D7 touch display
Power supply	24 VDC ± 10 %
Power consumption	max. 12 W
Material	Polycarbonate (UL94 V-0)
IP rating	IP 20
Dimensions	107.6 x 89.7 x 60.7 mm
Weight	180 g
Temperature range	-40 .. +60 °C
Humidity range	0 .. 100% relative humidity, non-condensing
Pollution degree	2

IoT gateway, data logger and control unit smart/HUB-D2	
Type	smart/HUB
Configuration Code	D2
Ethernet	1 x RJ-45
Field bus	1 x RS-485 half-duplex (2-wire)
Relays	2 x SPDT, 60 W (30 VDC, 2 A)
Digital inputs	2 x 24 V input (optically isolated)
Video output	1 x HDMI for connecting a 7“ smart/CORE-D7 touch display
Integrated display	2.4” touch display, 320 x 240 px
Power supply	24 VDC ± 10 %
Power consumption	max. 12 W
Material	Polycarbonate (UL94 V-0)
IP rating	IP 20
Dimensions	107.6 x 89.7 x 60.7 mm
Weight	200 g
Temperature range	-20 .. +60 °C
Humidity range	0 .. 100% relative humidity, non-condensing
Pollution degree	2

Accessories

smart/HUB-485 4 x RS-485 Extension

4 x RS-485 extension	
Type	smart/HUB-485
Power supply	via smart/HUB bus extender
Field bus	4 x RS-485 half-duplex (2-wire), all galvanically isolated
Material	Polycarbonate (UL94 V-0)
IP rating	IP 20
Dimensions	17.8 x 89.7 x 60.7 mm
Weight	200 g
Temperature range	-40 .. +60 °C
Humidity range	0 .. 100% relative humidity, non-condensing
Pollution degree	2

smart/CORE-D7 7" Touch Display

7“ External touch display smart/CORE-D7	
Type	smart/CORE-D7
Display type	Super Fine TFT (SFT)
Diagonal screen size	7” (177.8 mm)
Display area	149.76 x 93.60 mm
Resolution	1280 x 800 px
Luminance	500cd/m^2
Touch type	capacitive
Backlight	LED - white
Operating voltage	24 VDC ± 10 %
Currrent consumption	180 mA
Connections	1 x HDMI, 1 x USB
Operating temperature	-20 .. +60°C
Humidity range	0 .. 100% relative humidity, non-condensing
Pollution degree	2
Dimensions	approx. 202 x 146 mm
Weight	725 g