Gas monitoring
Multi Gas Sensor smart/ECS

Gas monitoring to improve tunnel safety

Gas monitoring

Features

- Smart IoT enabled gas sensor
- Electrochemical measurement of gas concentration with up to 4 gas sensor modules
- Pre-calibrated gas sensor modules for different gases and measuring ranges, including CO, NO, NO_2, SO_2
- Installation in-situ in the tunnel's driving area or extractive with hose adapters
- Stainless steel housing 1.4404 (AISI 316L)
- Sensor protected against splashing of water and powerful water jets used for tunnel washing
- IP rating IP69K
- Optional LCD in housing cover
- Integrated web server for visualisation, configuration, data logging, remote maintenance
- Connection to tunnel control system by
  - MODBUS/TCP (Ethernet)
  - MODBUS RTU (RS-485)
  - Analogue and relay outputs (optional)
  - Web service (Ethernet)
- Optional smart/HUB IoT operating and control unit with touch display

System setup

- Smart IoT sensor for up to 4 gas sensor modules
- Exchangeable, pre-calibrated gas sensor modules
- Connection either to tunnel control system or optional operating and control unit smart/HUB

Operation

Gas monitoring during normal operation is used to control the tunnel ventilation at normal operation. If and with how much power artificial ventilation by jet fans is operated depends on the measured visibility and gas concentration.

Electrochemical gas sensor cells induce currents proportional to the prevailing gas concentration. With these currents and the measured temperature, the gas sensor modules calculate the gas concentrations.

The gas sensor modules can be re-calibrated with zero and reference gas to compensate long term drift.

Advantages

- Specifically designed for application in tunnels
- Pre-calibrated gas sensor modules for easy exchange
- Robust stainless steel housing for protection against corrosion and water jets
- Permanent condition monitoring
- Remote maintenance
- Low maintenance requirements, stable, accurate
- Flexible integration into tunnel control system
- Ethernet connection
- Smart IoT solution from sensor over hub to asset management

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 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 velocity, direction and temperature
- Luminance (access, threshold and interior zone)
- Illuminance

Gas monitoring

Technical Data

Sensor device	
Type	JES smart/ECS
Gas sensor ports	up to 3 (to be specified on order)
Power supply	24 VDC
Current consumption	max. 300 mA (@ 24 VDC)
Appliance class	Class III (PELV)
Material	Stainless steel 1.4404 (AISI 316L)
IP rating	IP 69K
Dimensions	160 x 160 x 100 mm
Weight	Approx. 2.5 Kg
Digital interfaces (standard)	MODBUS RTU (RS-485) MODBUS/TCP (Ethernet) Webserver for configuration (Ethernet)
Analogue/relay outputs (optional)	up to 2 analogue / relay output modules • 3 x 4 – 20 mA (2-wire, active) • 3 x relay
Temperature range	-40 .. +60 °C
Pressure range	900 .. 1100 hPa
Humidity range	15 .. 95% relative humidity (non-condensing)
Storage temperature	-40 .. +85 °C (without gas sensor modules)

Gas sensor module CO-500	
Type	JES smart/ECS-CO-500
Measuring method	Electrochemical cell
Measured value	Gas concentration in ppm
Measuring range	Configurable within 0 .. 500 ppm CO typically 0 .. 300 ppm CO (according draft of EN 50545-2)
Maximum overload	1,000 ppm CO
Lower detectable limit	3 ppm CO
Resolution	0.1 ppm CO
Accuracy	± 2 ppm or 2 % reading[1]
Temperature compensation	yes
T90 time	< 40 s
Long term drift	< 2 % signal loss per month
Expected operation life	3 years in air
Storage life	6 months in packaging
Storage temperature	5 .. 20 °C

Gas sensor module NO2-2	
Type	JES smart/ECS-NO2-2
Measuring method	Electrochemical cell
Measured value	Gas concentration in ppm
Measuring range	Configurable within 0 .. 2 ppm NO_2 typically 0 .. 2 ppm NO_2
Maximum overload	10 ppm NO_2
Lower detectable limit	0.05 ppm NO_2
Resolution	0.02 ppm NO_2
Accuracy	± 0.05 ppm or 5 % reading[1]
Temperature compensation	yes
T90 time	< 60 s
Long term drift	< 2 % signal loss per month
Expected operation life	2 years in air
Storage life	6 months in packaging
Storage temperature	5 .. 20 °C

Gas monitoring

Gas sensor module NO-100

Type	JES smart/ECS-NO-100
Measuring method	Electrochemical cell
Measured value	Gas concentration in ppm
Measuring range	Configurable within 0 .. 100 ppm NO typically 0 .. 30 ppm NO (see EN 50545-2 and ISO 23431)
Maximum overload	200 ppm NO
Lower detectable limit	1 ppm NO
Resolution	0.05 ppm NO
Accuracy	± 0.5 ppm or 2 % reading[1]
Temperature compensation	yes
T90 time	< 10 s
Long term drift	< 2 % signal loss per month
Expected operation life	3 years in air
Storage life	6 months in packaging
Storage temperature	5 .. 20 °C

Analogue / relay output module ARO

Type	JES smart/CORE-ARO
Analogue outputs	3 x 4 - 20 mA
Analogue output type	2-wire, active
Relay outputs	3 x SPST-NO
Max. contact rating	60 W (30 VDC, 2 A)

Conformities

Electrical standards	2014/35/EU Low Voltage Directive (LVD) 2014/30/EU Electromagnetic compatibility (EMC) 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 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
Gas monitoring	EN 50545-1 AT: ÖNORM M9418, ÖNORM M9419 DE: VDI 2053

Contact

JES Elektrotechnik GmbH
Wiestal Landesstraße 37
5400 Hallein
Austria

Phone +43 (6245) 81785
Fax +43 (6245) 81785-600
Email info@tunnelsafety.at
Web www.tunnelsafety.at