



# Extractive visibility and gas monitoring

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Air quality monitoring to improve safety in tunnels

## Features

- Extraction of air to be analysed from the tunnel's driving area through an intake system
- Sensor located in an enclosure outside the driving area, e.g. in a niche, a crosscut, an operating room inside or outside the tunnel
- Control and evaluation unit to display measured values and with signal outputs to the tunnel control system
- Electrochemical gas analyser with automatic calibration of zero and reference value
- Visibility measurement using scattered light method with integrated fog compensation
- Intake tube length up to 400 m
- Monitoring of up to 4 measuring points through one monitoring system
- Delivered in an enclosure with all wiring, pumps and tubes ready for operation incl. zero and reference gas

## System setup

- Electrochemical gas analyser with automatic calibration
- Visibility sensor based on scattered light method
- Operating unit
- Zero and reference gas
- Intake fan
- All components above installed in an enclosure ready for operation
- Intake system consisting of intake point to be mounted in the tunnel and intake tube system to connect with the monitoring system in the enclosure

## Operation

Visibility and gas monitoring are 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.

The extractive monitoring system extracts air from the tunnel through an intake system and feeds it into the visibility sensor and gas analyser.

The electrochemical CO gas analyser measures the concentration of CO gas in the inducted air and periodically performs an automatic calibration with zero and reference gas to ensure long term stability and accuracy.

The visibility sensor measures the intensity of light scattered at an angle of 30° by the inducted air and sets it into relation with the light passing through. The scattered light intensity is then multiplied by a factor to obtain the extinction coefficient.

## Advantages

- Specifically designed for application in tunnels
- Highest availability of tunnel as all important components of the monitoring system are located in accessible rooms (no need to close the tunnel for traffic)
- No electronic components in the tunnel's driving area
- Robust, corrosion-free intake cowls with protection against ingress of water
- Automatic calibration and high accuracy of measurement
- Flexible integration into the tunnel 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.

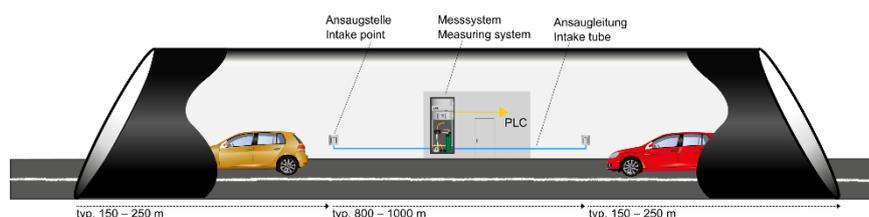
Since 1990 JES Elektrotechnik GmbH develops, installs and maintains systems to monitor air quality and lighting conditions in tunnels. Our systems are robust, durable and resistant against the corrosive atmosphere in a tunnel. They operate reliably and have a high accuracy in measurement.

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<sub>2</sub> (extractive or in-situ)
- Visibility (extractive or in-situ)
- Air speed, direction and temperature
- Luminance (access, threshold and interior zone)
- Illuminance



Extractive, combined visibility and gas monitoring

## Technical Data

CO measurement	
Measuring method	Electrochemical gas analysis
Measured value	Gas concentration in ppm CO
Measuring range	0 .. 200 ppm CO (according RVS 09.02.22) Other gases and measuring ranges on request
Accuracy	± 2 % of end of measuring range
T90 response time	45 s

Visibility measurement	
Measuring method	30° scattered light intensity
Measured value	0 .. 100 PLA
Measuring range	0 .. 0,015 E/m
Resolution	< ± 0,25 % of end of measuring range
Air flow	25 to 30 l/min
Temperature	-20 °C to +50 °C

Power supply	
Operating voltage	230 VAC, 50 Hz
Power consumption	Depends on individual system (Number of measuring points, length of intake system)

Outputs	
Analogue outputs	2 x 4 – 20 mA (CO and visibility) per measuring point
Digital interface	RS-485 MODBUS RTU
Isolated contacts	1 x Operation/Fault indication 1 x Calibration active

Conformities	
Electrical standards	2006/95/EC Low Voltage Directive (LVD) 2004/108/EC Electromagnetic compatibility(EMC) IEC 61326-1:2012 IEC 61010-1:2010
Road safety standards	AT: RVS 09.02.22 DE: RABT 2006 CH: ASTRA RL 13001, Fachhandbuch BSA
Gas measurement	AT: ÖNORM M9418, ÖNORM M9419 DE: VDI 2053



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