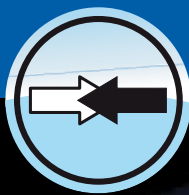
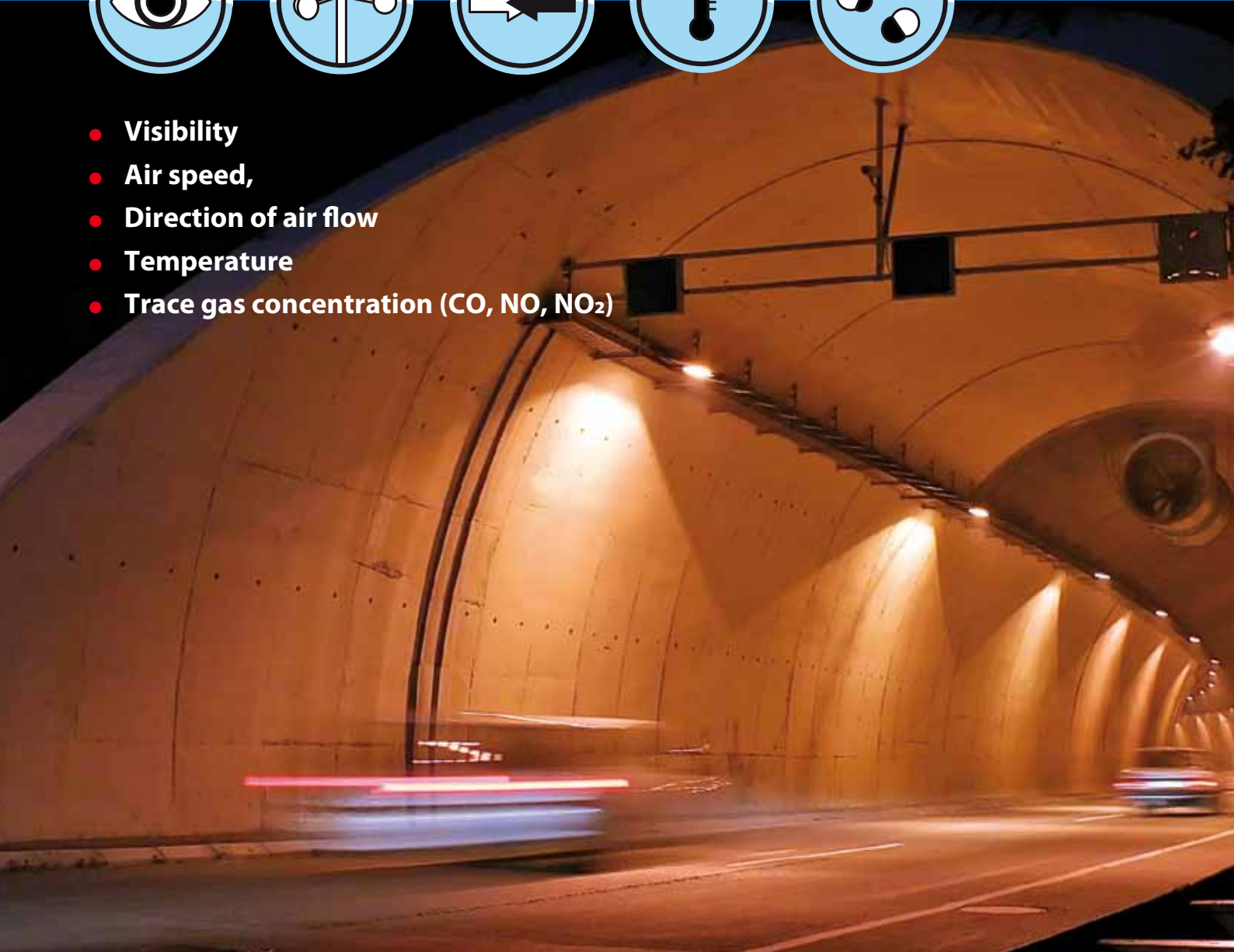


Tunnel Monitoring



- **Visibility**
- **Air speed,**
- **Direction of air flow**
- **Temperature**
- **Trace gas concentration (CO, NO, NO₂)**



Application

Ventilation in tunnels shall provide for adequate breathing air for drivers and maintenance staff in tunnels as well as for sufficient visibility in the tunnel atmosphere which is contaminated with exhaust and dust. Also emission of pollutants to the environment shall be minimized and in case of fire it shall reduce the effect of heat and smoke.

DURAG produces service reduced sensors and analysers, which precisely and reliably transmit the data of tunnel atmosphere to the ventilation control system.

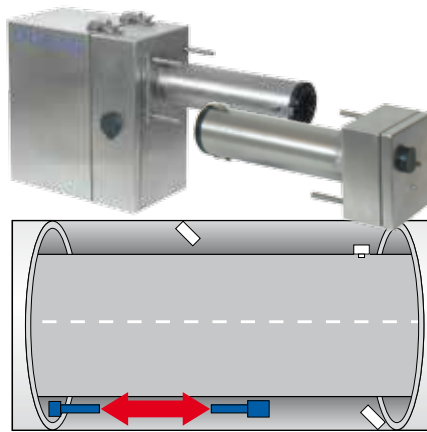
2004/54/EC "tunnel" guideline as well as the national specifications for installations in tunnels are included in the design of DURAG sensors.

Redundancy and system stability are essential. Therefore DURAG offers separated sensors. This allows the ventilation control system to effectively perform the mandatory plausibility checks of the sensor signals. Separated sensors can be placed at the ideal mounting positions.

The sensors are rugged and will withstand corrosive tunnel atmosphere as well as tunnel cleaning procedures. The units can be mounted quickly. Maintenance is minimized and units can be exchanged in case of malfunction immediately.

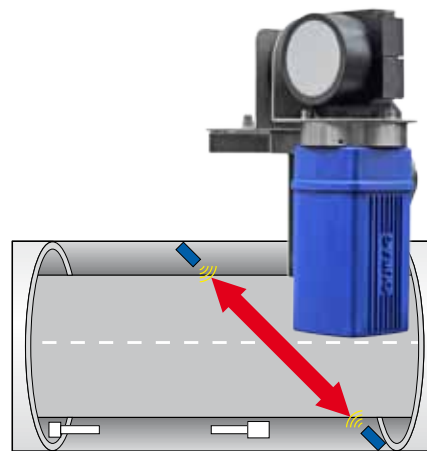
The DURAG delivery program includes sensors and analysers for

- Visibility
- Air speed and direction of air flow
- Trace gas concentration (CO, NO, NO₂)
- Particulate measurement (PM 2.5 and PM 10).



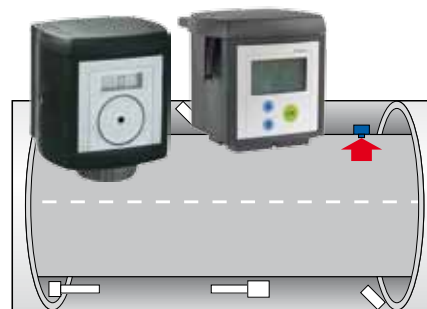
D-RV 290 Visibility Monitor

- Continuous measurement of visibility parallel to tunnel axis
- Representative measurement along a 10-12m measuring path
- Suitable for early fire detection
- Easy installation and menu-driven operation
- Window contamination correction performed automatically
- Long maintenance intervals
- Rugged SS316Ti stainless steel housing, IP65 enclosure rating



D-FL 220T Ultrasonic Air Flow Monitor

- Continuous measurement of flow velocity, direction and temperature
- Representative measurement across the tunnel profile
- Principle follows the evaluation of differential transition times of ultrasonic pulses
- Automatic zero-point and span test
- No separate control unit required
- Minimized maintenance requirements
- Corrosion resistant
- No influence of smoke on the system in case of fire.



D-G 102 PM / D-G 105 PA Trace Gas Sensor Systems

- Modular stationary system for local measurement of trace gases CO or NO or NO₂
- System consists of docking station, transmitter electronics and a sensor as consumable item
- The docking station is mounted and wired
- No wiring work is required when the transmitter is mounted or dismantled to the docking station
- Transmitter available for signal transfer as 4-20mA signal (D-G 102 PM) or via Profibus PA (D-G 105 PA)
- Electrochemical sensors include memory with sensor data and are plugged to transmitter
- Electrochemical sensors are available for CO or NO or NO₂.

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