

## VICOTEC320

# Air quality tunnel sensors to control ventilation in road tunnels

### Reliable air quality measurement in road tunnels

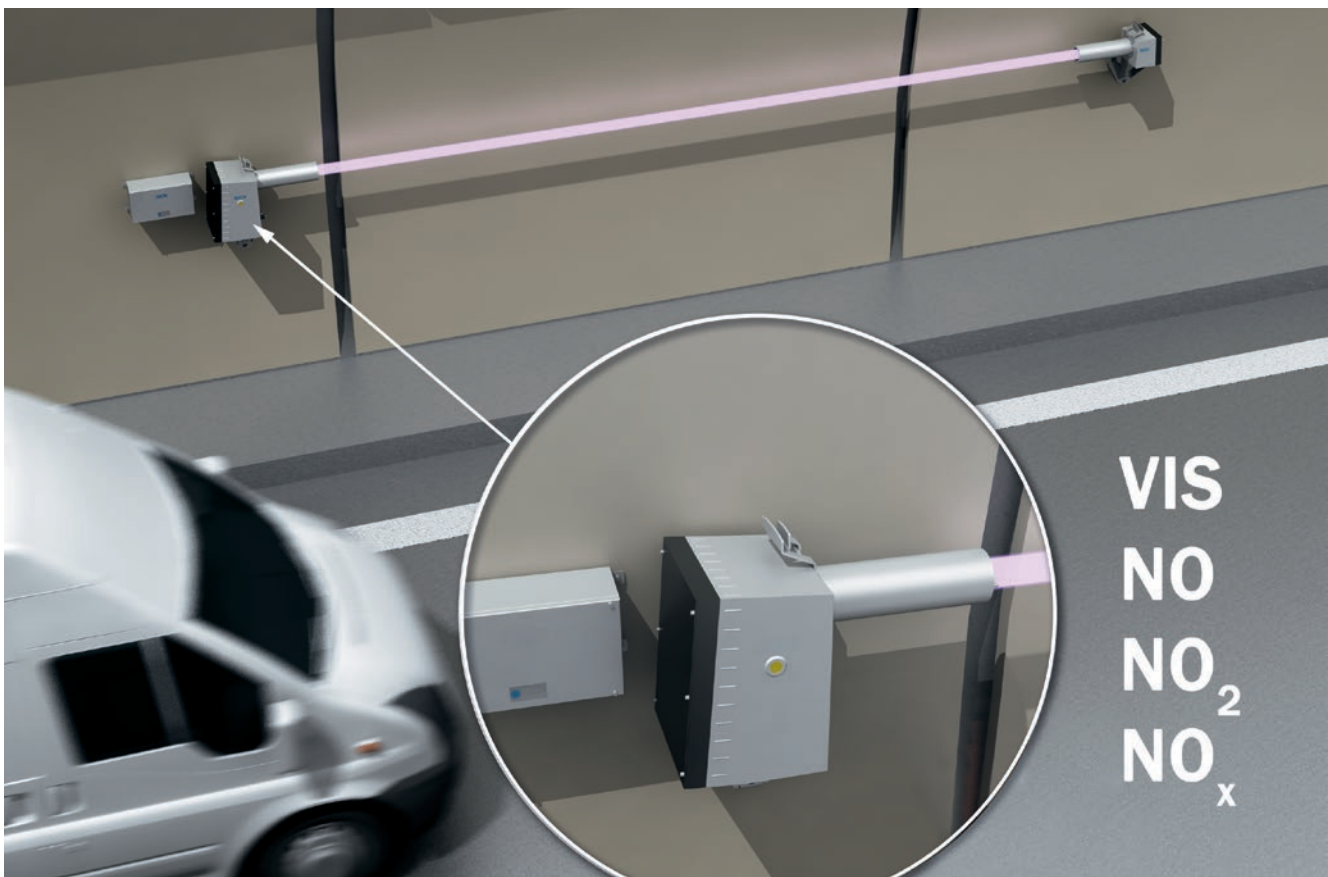
- Energy and cost savings for ventilation control due to very low zero offset and accurate measurement
- Low operational costs because no air aspiration system, no test gases and no ambient air required
- Low maintenance requirements due to long maintenance interval (approx. 1 year)



# Reliable air quality measurement in road tunnels

Continuously monitoring air quality and visibility in tunnels is a vital factor in ensuring road safety: It is becoming increasingly important to accurately monitor nitrogen dioxide ( $\text{NO}_2$ ), as even extremely low concentrations ( $\ll 1$  ppm) can be harmful. Particles of dust and soot, for example, as well as abrasion from tires and brakes, restrict visibility in tunnels. Plus, the concentration of nitrogen monoxide ( $\text{NO}$ ), produced by diesel-fueled vehicles which are growing in number, needs to be monitored reliably.

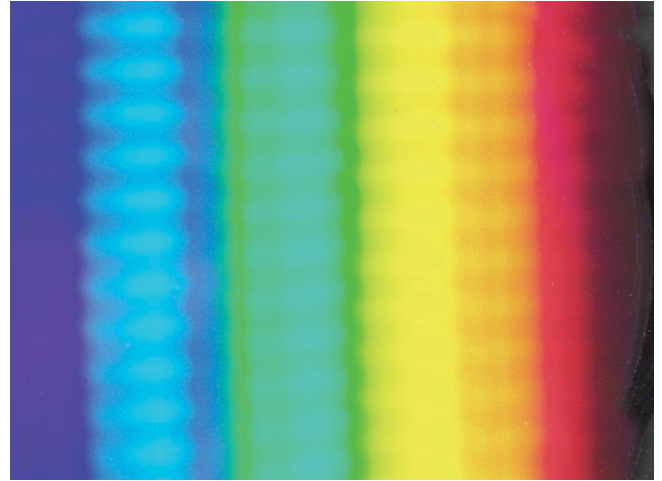
VICOTEC320 air quality tunnel sensors have long been renowned for accurately monitoring the limit values of  $\text{NO}_2$  and  $\text{NO}$ , and they also use direct, in-situ measurement technology to continuously measure visibility (VIS) in the tunnel atmosphere. These measured values are used to control ventilation in tunnels precisely and reliably. Maintenance-free operation of the VICOTEC320 is possible for more than a year, without compromising on the high level of accuracy and without drifts or cross sensitivities.



## DOAS<sup>1</sup> spectroscopy for reliable measurement of NO<sub>2</sub> and NO

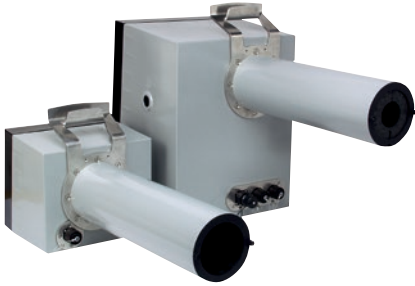
Gases absorb light with different wavelengths to varying extents. Plotting the intensity of the light beamed through the gas as a function of the wavelength gives a characteristic spectrum for each gas component, which more or less represents the fingerprint of the gas.

In the VICOTEC320, there is an optical grid that spectrally disperses the beam of light reflected by the reflector. A highly sensitive, stabilized line scan camera is used to determine the intensity of each wavelength and record the spectrum. This is then analyzed using the DOAS (Differential Optical Absorption Spectroscopy) principle, which makes it possible to determine the concentration of individual gases.



<sup>1</sup> DOAS = Differential Optical Absorption Spectroscopy

# VICOTEC320: For the control of ventilation and for filter monitoring in road tunnels



## Product description

The VICOTEC320 measures very small concentrations of NO<sub>2</sub> and NO as well as the visibility and temperature in road tunnels simultaneously and fast using proven components without test gases for zero and reference point. An automatic, cyclic adjustment ensures correct values. The robust enclosure withstands thorough tunnel cleanings without problems. Product requires minimal

upkeep: maintenance and cleaning once a year. The VICOTEC320 can be optionally equipped with an electrochemical cell for CO measurement. This is useful to perform the plausibility checks which some tunnel standards (e.g. German RABT2006) recommend – even when NO<sub>2</sub> is measured as lead gas component.

## At a glance

- Very low detection limits for NO and NO<sub>2</sub>
- Automatic function monitoring and self-adjustment
- Very sturdy design in stainless steel
- Automatic beam alignment between sender/receiver unit and reflector

## Your benefits

- Energy and cost savings for ventilation control due to very low zero offset and accurate measurement
- Low operational costs because no air aspiration system, no test gases and no ambient air required
- Low maintenance requirements due to long maintenance interval (approx. 1 year)

## Fields of application

- Monitoring of air quality in road tunnels
- Ventilation control and filter monitoring in tunnels



## More Information online

For more information, enter the link or scan the QR code to get direct access to technical data, operating instructions, software, application examples, and much more.

[www.endress.com/vicotec320](http://www.endress.com/vicotec320)



# Detailed technical data

The exact device specifications and performance data of the product may deviate from the information provided here, and depend on the application in which the product is being used and the relevant customer specifications.

## VICOTEC320

|                                  |  |
|----------------------------------|--|
| Measured values                  | Visibility (K-value), NO, NO <sub>2</sub> , NO <sub>x</sub> , CO, temperature  |
| Maximum number of measurands     | 6  |
| Measurement principles           | Differential optical absorption spectroscopy (DOAS), transmittance measurement, electrochemical cell, Resistance thermometer |
| Length of measuring path         | 10 m   |
| Measuring ranges                 |  |
| K-value                          | 0 ... 15 km <sup>-1</sup> / 0 ... 200 km <sup>-1</sup>   |
| NO                               | 0 ... 20 ppm / 0 ... 45 ppm  |
| NO <sub>2</sub>                  | 0 ... 1 ppm / 0 ... 5 ppm  |
| CO                               | 0 ... 100 ppm / 0 ... 300 ppm  |
| Temperature                      | -20 ... +55 °C / -25 ... +75 °C  |
| Response time (t <sub>90</sub> ) |  |
| Visibility (K-value)             | 5 s ... 360 s, adjustable (45 s pre-configured)  |
| NO, NO <sub>2</sub>              | 5 s ... 360 s, adjustable (45 s pre-configured)  |
| CO                               | ≤ 60 s   |
| Linearity                        |  |
| NO                               | ± 0.48 ppm   |
| NO <sub>2</sub>                  | ± 0.035 ppm  |
| CO                               | ± 2 ppm; < 60 ppm<br>± 5 ppm; 60 ppm < x < 150 ppm<br>± 9 ppm; 150 ppm < x < 300 ppm   |
| Detection limit                  |  |
| Visibility (K-value)             | 0.03 km <sup>-1</sup>  |
| NO                               | 0.002 ppm  |
| NO <sub>2</sub>                  | 0.007 ppm  |
| Repeatability                    |  |
| Visibility (K-value)             | 0.017 km <sup>-1</sup>   |
| NO                               | 0.031 ppm  |
| NO <sub>2</sub>                  | 0.007 ppm  |
| Ambient temperature              | -20 °C ... +55 °C  |
| CO sensor                        | -10 °C ... +40 °C  |
| Storage temperature              | -25 °C ... +75 °C  |
| CO sensor                        | 0 °C ... +20 °C  |
| Ambient pressure                 | 700 hPa ... 1,200 hPa  |
| Ambient humidity                 | 10 % ... 95 %, relative humidity; non-condensing   |

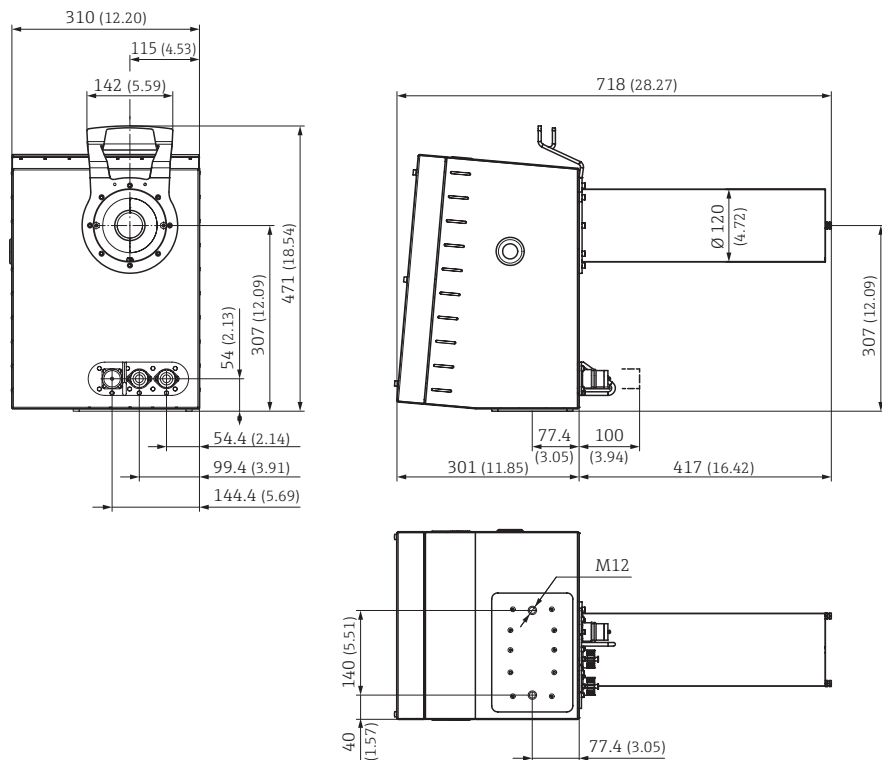
|                              |  |
|------------------------------|--|
| Conformities                 | ASTRA "Guideline - Ventilation of Road Tunnels" (2008)<br>RABT 2006<br>RVS 09.02.22            |
| Electrical safety            | CE   |
| Enclosure rating             | IP69K  |
| Analog outputs               | 6 outputs: 0 ... 20 mA, depending on device version  |
| Digital outputs              | 4 relay contacts: depending on device version  |
| Digital inputs               | 4 potential-free contacts  |
| Ethernet                     | <input type="checkbox"/>   |
| Function                     | Connection to SOPAS ET software or OPC server  |
| Modbus                       | <input type="checkbox"/>   |
| Type of fieldbus integration | TCP  |
| CAN bus                      | <input type="checkbox"/>   |
| Function                     | For connection of a SCU control unit   |
| Operation                    | Via software SOPAS ET  |
| Dimensions (W x H x D)       |  |
| Sender/receiver unit         | 718 mm x 470 mm x 310 mm (for details see dimensional drawings)                                |
| Reflector unit               | 617 mm x 278 mm x 245 mm (for details see dimensional drawings)                                |
| Connection unit              | 450 mm x 254 mm x 148 mm (for details see dimensional drawings)                                |
| Weight                       |  |
| Sender/receiver unit         | 20 kg  |
| Reflector unit               | 9 kg   |
| Connection unit              | 8 kg   |
| Material                     | Stainless steel 1.4571, powder-coated  |
| Power supply                 |  |
| Voltage                      | 115 V AC, ± 10 %<br>230 V AC, ± 10 %   |
| Frequency                    | 50 Hz / 60 Hz  |
| Power consumption            | ≤ 200 W  |
| Options                      | CO sensor  |
| Test functions               | Automatic check cycle for zero and span point<br>Contamination check<br>Manual linearity check |

## Ordering information

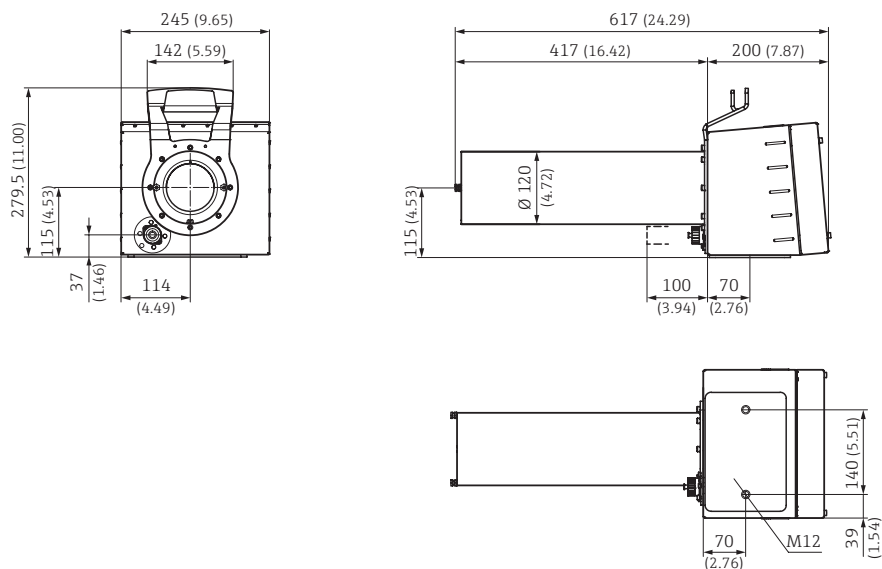
Our regional sales organization will help you to select the optimum device configuration.

# Dimensional drawings

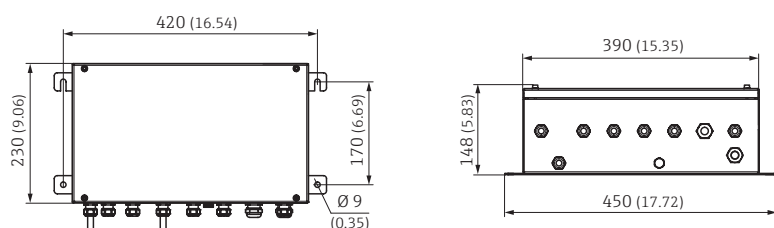
## VICOTEC320 sender/receiver unit (dimensions in mm (inch))



## VICOTEC320 reflector unit (dimensions in mm (inch))



## VICOTEC320 connection unit (dimensions in mm (inch))



[www.addresses.endress.com](http://www.addresses.endress.com)

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