Traffic Sensors

Traffic and Tunnel Safety Solutions

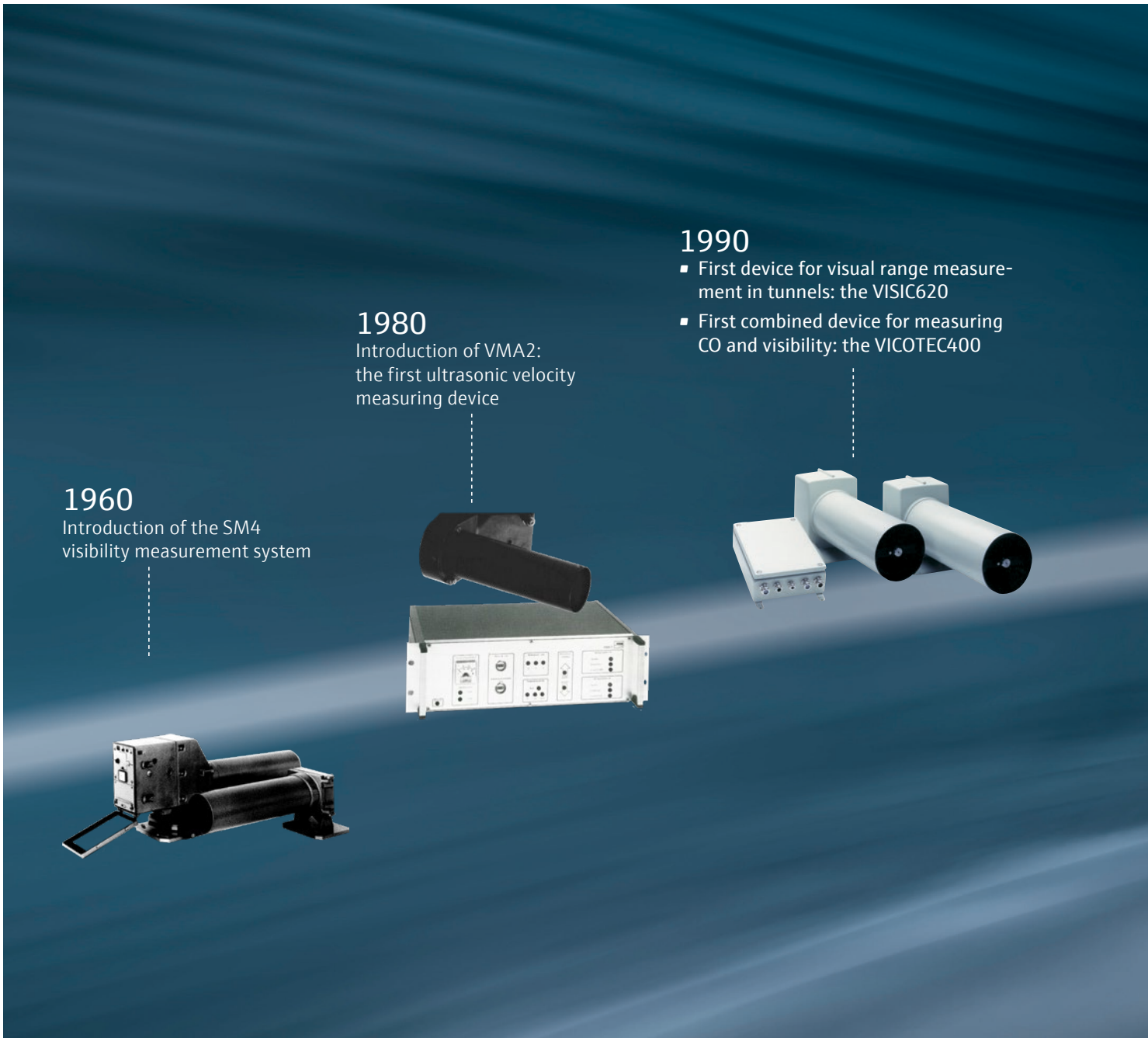
Fog monitoring, air quality and flow measurement

Endress+Hauser

People for Process Automation

60 years of tunnel expertise – and setting its sights on the future

As the density of the traffic on our roads increases, the future is all about finding ways to increase the availability of tunnels while at the same time improving safety for road and tunnel users. For 60 years, we has been helping road and tunnel operators to take on this challenge, offering innovative products not only for measuring visibility and air quality in routine operation but also for air flow measurement and smoke detection in emergency situations.



Let the innovation leader help you ensure tunnel safety

As a leading provider of tunnel sensor technology, we are setting its sights on the future. And as the first manufacturer, we offer standard product families for both routine operation and emergency situations in tunnels. The VISIC100SF is a compact all-in-one solution for measuring visibility and carbon monoxide (CO) as well as nitrogen monoxide (NO) or nitrogen dioxide (NO_2) in tunnels. The VISIC50SF smoke detector is our reliable and extremely fast solution for early fire detection. Thanks to their plug-and-measure capability, both sensors are very easy to commission.

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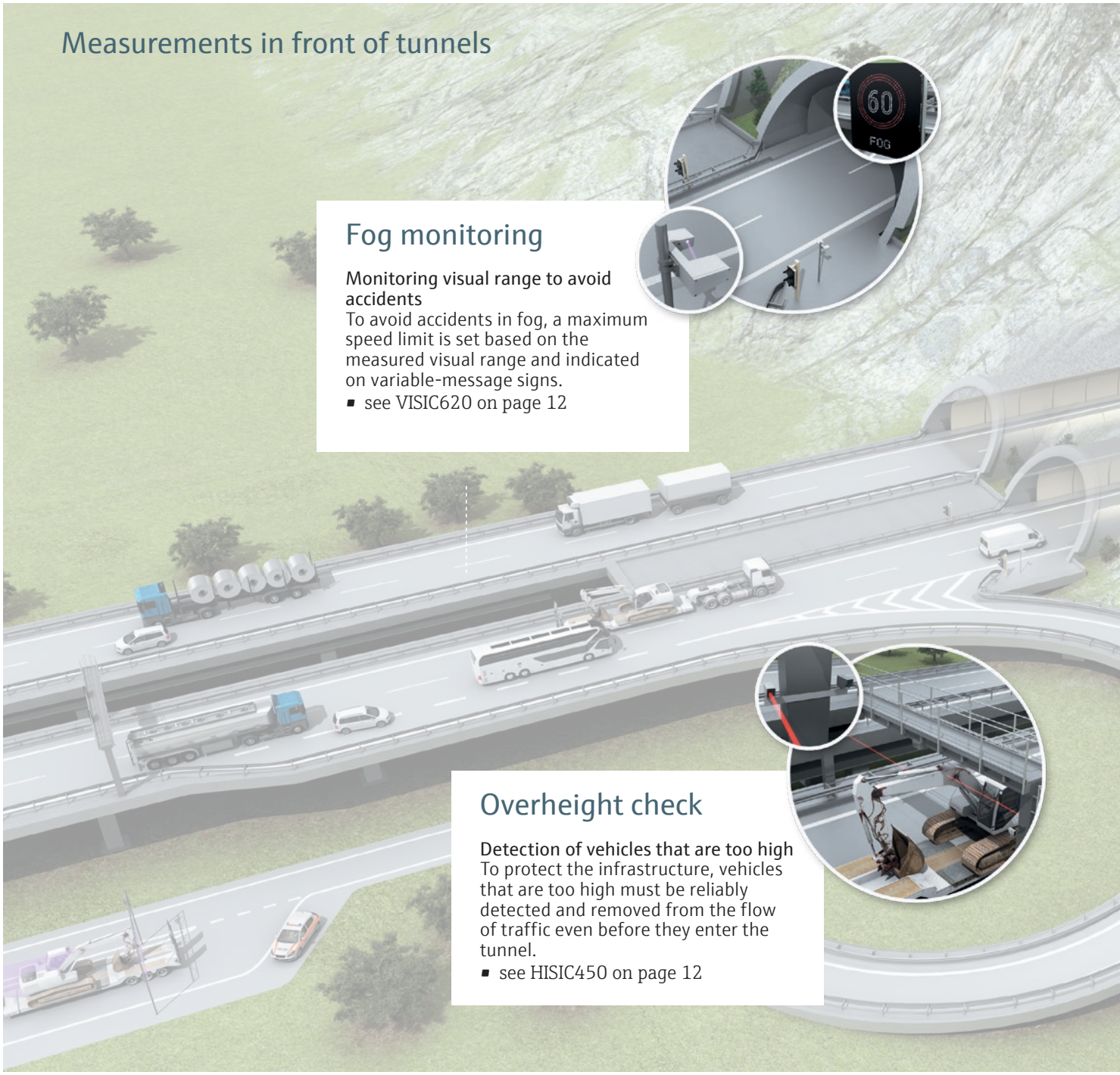
Safe driving in tunnels – from start to finish

This portfolio of tunnel sensors is designed for urban tunnels, overland tunnels, and tunnels in rail and subway systems. Whether it be routine operation or emergency situations, we are your one-stop-shop for virtually all tunnel monitoring applications..

We measure

- Air flow: velocity and direction
- Air quality: carbon monoxide CO, nitrogen monoxide NO, nitrogen dioxide NO_2
- Fog monitoring: visual range
- Visibility: K value
- Traffic safety: overheight detection
- Early fire detection: smoke



Fog monitoring

Monitoring visual range to avoid accidents
To avoid accidents in fog, a maximum speed limit is set based on the measured visual range and indicated on variable-message signs.

- see VISIC620 on page 12

Overheight check

Detection of vehicles that are too high
To protect the infrastructure, vehicles that are too high must be reliably detected and removed from the flow of traffic even before they enter the tunnel.

- see HISIC450 on page 12

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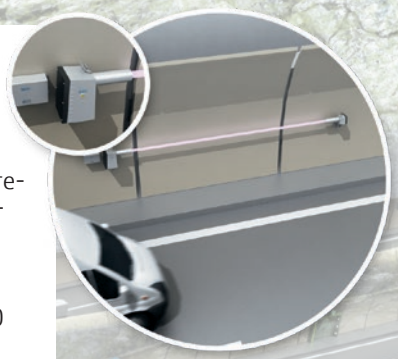
Measurements inside the tunnel

Air quality

NO_2 measurement in ppb

Continuous and precise measurement of minute NO_2 concentrations provides the basis for ventilation control inside the tunnel.

- see VICOTEC320 on page 10

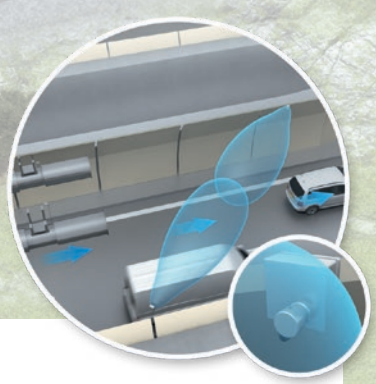


Air quality

Measurement of CO, NO, NO_2 and visibility for ventilation control

By capturing exact measured values, monitoring the atmosphere inside the tunnel provides the basis for effective ventilation control.

- see VISIC100SF on page 10
- see VICOTEC410 on page 10



Air flow

Monitoring of the air speed and direction for ventilation

The speed and direction of the air flow inside the tunnel have to be measured to control ventilation. In the event of an emergency, this is the most important measurement to enable the fans to be controlled.

- see FLOWSIC 200 on page 15

Early fire detection

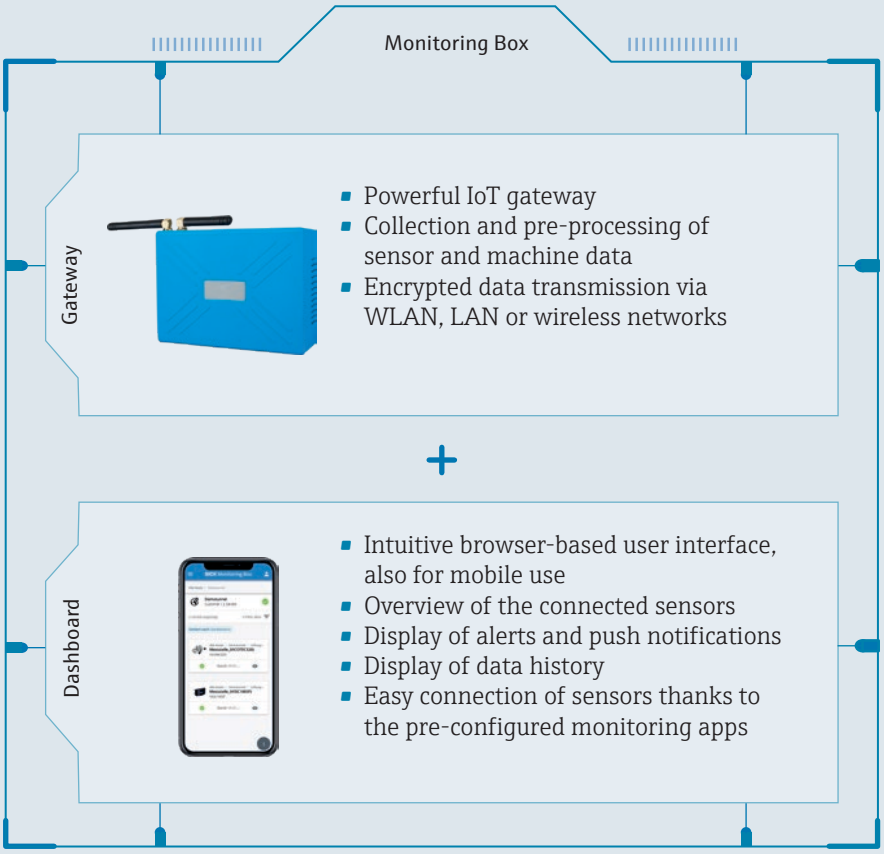
Smoke detection for early fire detection

In the event of a fire inside a tunnel, every second counts: As fires manifest themselves in the form of smoke much earlier than heat, smoke detectors are able to detect fires in the very early stages of their development.

- see VISIC50SF on page 10

Condition monitoring for tunnel sensors

The Monitoring Box provides an effective solution for monitoring and maintaining devices and sensors in tunnels. Device and sensor states can be monitored in real time, and undesired operational states predicted ahead of time. If required, every significant change to the device states is visualized concisely and clearly in a browser-based dashboard, thereby enabling the operating staff to intervene in a timely manner. This ensures the availability of critical device components.

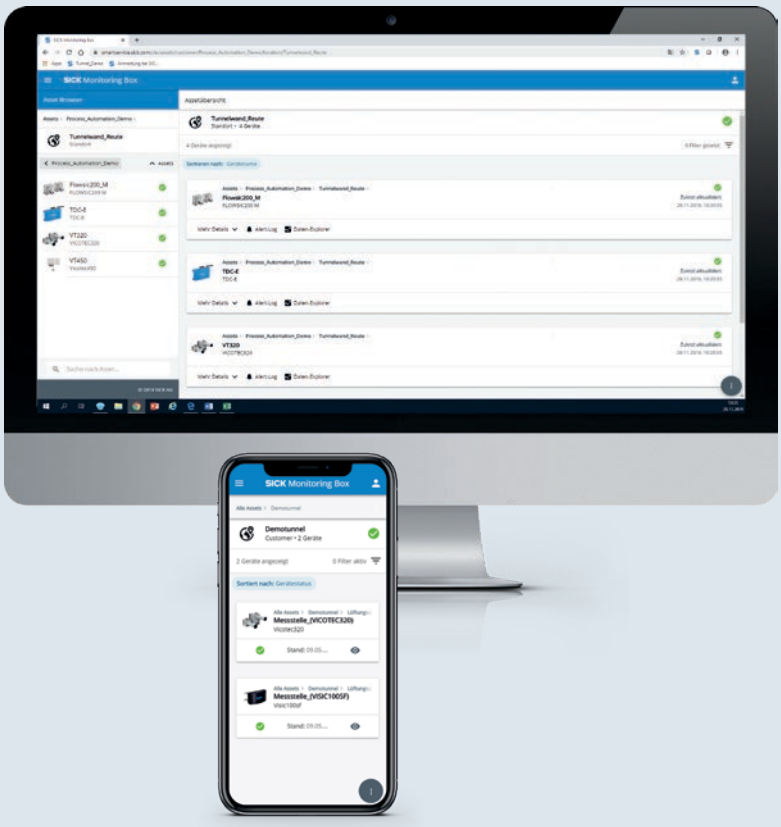


The benefits

The Monitoring Box contributes significantly to the trouble-free utilization of tunnels. The intelligent remote diagnostics feature significantly improves the planning of maintenance and servicing tasks. It reduces the number of service interventions, and allows for better and more efficient preparation of the necessary service deployments. This increases the availability of measuring devices, thereby leading to lower costs.

Optimized maintenance through data analysis
By continuously monitoring the device state, it is possible to plan the maintenance deployments much more efficiently, e.g. grouping maintenance tasks. State-dependent maintenance also eliminates unnecessary servicing. The fault causes are known before an on-site service deployment needs to be carried out.

Predictive maintenance
Changes in the tunnel devices during a particular time period can be monitored and informative prognoses made. By processing and analyzing historical data, it is possible to predict the device state and the required maintenance tasks.



Features

- Easy integration thanks to pre-configured monitoring apps
- Can be used on mobile end devices
- Clearly organized event log including evaluation
- Collection and saving of diagnostic data
- Data history
- E-mail alarms

Evidence of compliance with standards and requirements

The states of the devices before and after interventions are documented thereby making it easier to prove or document compliance with standards or requirements.

High availability

With the Monitoring Box, you can take timely action before a device failure occurs. This significantly increases the availability of the devices in the tunnel.

Efficient use of resources

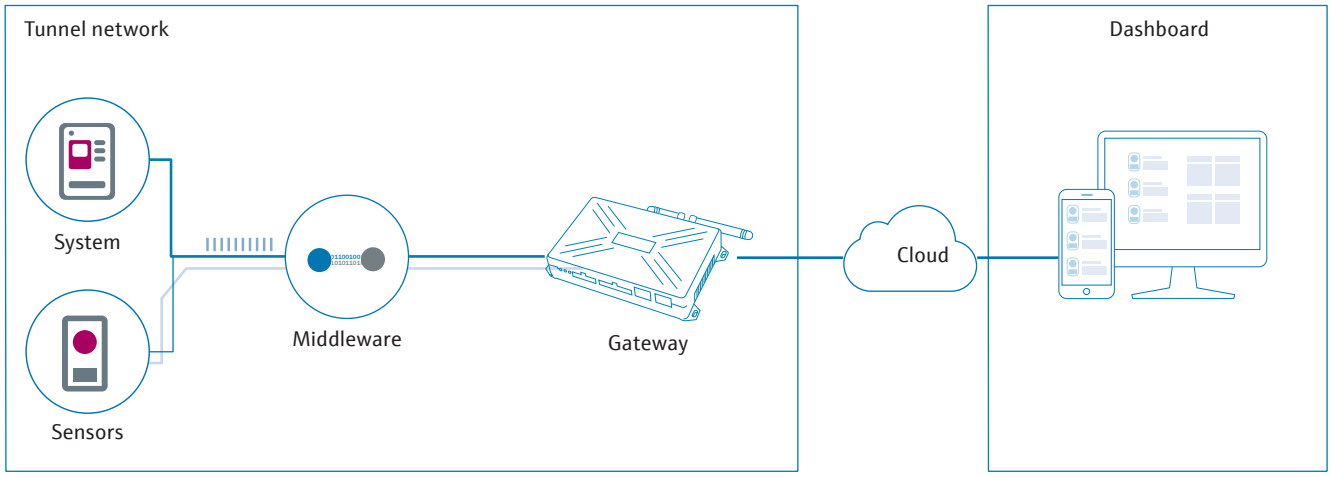
Different maintenance tasks can be grouped depending on the status. You know which servicing tasks are required for which devices before you get to the device in the tunnel.

Increase in performance

You always operate your devices in the optimal performance range.

Secure data system

We provide gateways for the encrypted transmission of data to a server. Either the existing network structure in the tunnel can be used for this, or a method of transmission independent of the tunnel network can be selected. In either case, a number of different IT security standards are employed to ensure a secure data transmission.



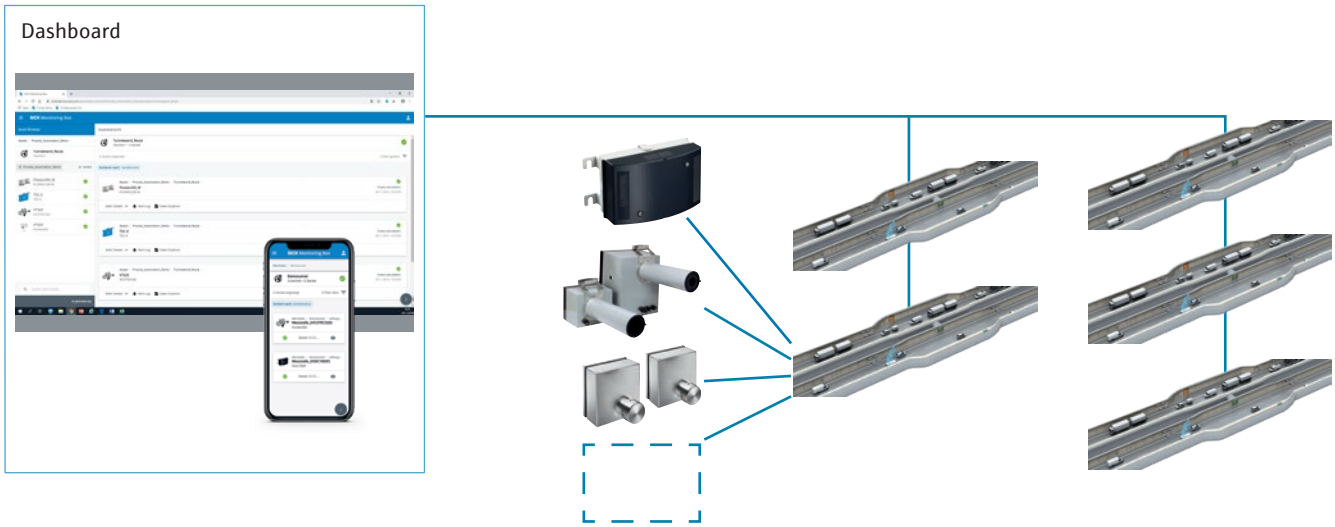
Data security
If you choose the cloud solution, you can count on safety and transparency.

- Encrypted connection between the TDC-E gateway and our cloud via HTTPS
- Role based access control (RBAC) through registration with password-protected ID
- System components tested by an external testing body
- Server hosting in Germany

Use and scalability

The Monitoring Box allows several tunnels in an area to be grouped together in a clear manner. The devices in a tunnel can be subdivided by ventilation sections.

The current tunnel measurement devices come with a data app and can be integrated with ease. The Monitoring Box also provides the ability to very easily add further sensors.



Just a few steps to a digital overview

1

You register with your SICK ID* and select the appropriate SensorApps according to the base device to start condition monitoring.

2

3

You get e-mail alerts if there are error messages, status changes or overshooting of limit values, meaning you can react quicker and easier.

Monitoring Service – device monitoring

The monitoring of your devices can, if you wish, be completely taken care of by us. We will perform all monitoring tasks for you as a part of your service contract. We not only monitor devices from our product range, but also integrate third-party devices. .

Forecasts for predictive maintenance

As soon as you have collected sufficient data using the Monitoring Box, you can analyze that data and use it for prediction purposes. .

* Please continue to use your SICK ID for registration as usual.
At some point in 2025 we will transition to using an Endress+Hauser ID.

Tunnel sensors

VICOTEC320

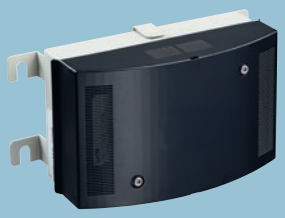
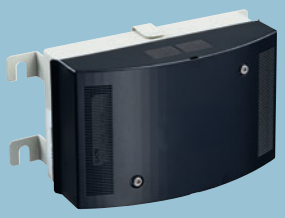
For ventilation control and nitric oxide monitoring in road tunnels

VICOTEC410

For ventilation control in road tunnels

Technical data overview		
Measurement principles	Differential optical absorption spectroscopy (DOAS), transmittance measurement, electrochemical cell, resistance thermometer	Transmittance measurement, gas filter correlation
Measuring components	Visibility (K value), NO, NO_2, NO_x, CO, temperature	Visibility (K value), CO
Measuring ranges	K value: 0 … 15 km^{-1} / 0 … 200 km^{-1} NO: 0 … 20 ppm / 0 … 45 ppm NO_2: 0 … 1 ppm / 0 … 5 ppm CO: 0 … 100 ppm / 0 … 300 ppm Temperature: −25 … +55 °C / −25 … +75 °C	Visibility (K value): 0 … 15 km^{-1} CO: 0 … 300 ppm
Ambient temperature	−20 °C … +55 °C CO sensor: −10 °C … +40 °C	−30 °C … +60 °C
Enclosure rating	IP69K	IP65
Options	CO sensor	–

At a glance		
	▪ Very low detection limits for NO and NO2 ▪ Automated function monitoring and self-adjustment ▪ Very rugged design in stainless steel ▪ Automated beam alignment between sender/receiver unit and reflector	▪ AutoAdjust (automated adjustment function) ▪ Contamination check ▪ Menu-guided operation via control unit
Detailed information	www.endress.com/vicotec320	www.endress.com/ vicotec410

			
	VICOTEC450	**VISIC50SF**	**VISIC100SF**
	Extractive visibility measurement for increased safety in tunnels	Early and reliable fire detection in tunnels	Modernizes the tunnel air quality measurement process
	Light scattering forward	Light scattering forward	Light scattering forward, electrochemical cell
	Visibility (K value)	Visibility (K value)	Visibility (K value), CO, NO, NO_2
	K value: 0 … 15 km^{-1} / 0 … 5,000 km^{-1} Temperature: −50 … +250 °C	Visibility (K value): 0 … 150 km^{-1} Temperature measurement (option): −30 … +70 °C	Visibility (K value): 0 … 15 km^{-1} CO: 0 … 300 ppm NO: 0 … 100 ppm NO_2: 0 … 5 ppm
	−30 °C … +55 °C	−20 °C … +55 °C	−20 °C … +55 °C
	IP66	IP6K9K / IP66	IP6K9K / IP66
	Temperature measurement Interface module(s) I/O module(s)	Internal heating element Connection unit TAD Tunnel Adapter Device Temperature sensor	CO sensor NO sensor NO_2 sensor Internal heating element TAD Tunnel Adapter Device Connection unit
	▪ Regular function test with contamination measurement ▪ Linearity test can be carried out with filter set ▪ Internal purge air for long intervals between cleaning ▪ Maintenance signal (filter and cleaning) ▪ Logbook function ▪ Can be expanded with the addition of various interfaces or I/O modules (e. g., PROFIBUS, Ethernet, analog module, etc.)	▪ Visibility (K value) measured according to the scattered light measurement principle ▪ Highly available – no moving parts ▪ Quick and reliable smoke detection ▪ Software developed in accordance with EN 61508 (SIL1) ▪ Low faulty alarm rate ▪ IP 6K9K enclosure rating due to rugged stainless-steel housing ▪ Fog evaporation through integrated heating element (optional)	▪ Visibility (K value) measured according to the scattered light measurement principle ▪ CO, NO, and NO2 concentration measured using electrochemical sensors in accordance with EN 50545 ▪ Software developed in accordance with EN 61508 (SIL1) ▪ Highly reliable – no moving parts ▪ Combines visibility measurement with two different gas measurements ▪ IP 6K9K enclosure rating due to rugged stainless-steel housing ▪ Fog compensation through integrated heating (option)
	www.endress.com/ vicotec450	www.endress.com/visic50sf	www.endress.com/visic100sf

Overheight detector

HISIC450

Overheight detection for vehicles

Technical data overview	
Measurement principles	Dual photoelectric sensor
Measuring components	Overheight
Measuring ranges	
Ambient temperature	–25 °C ... +55 °C
Enclosure rating	IP67
Options	–

At a glance

- Aluminum housing with anti-corrosion coating and high enclosure rating
- Built-in lens heaters to prevent condensation/icing
- Weather protection against snow, rain, and dust
- Accessories (weather hood, mounting bracket) made of stainless steel
- Adjustable sensitivity
- Ambient light immunity

Detailed information www.endress.com/hisic450

Visual range measuring device

VISIC620

Visual range measurement for roads, tunnels, sea routes, and in weather stations

Light scattering forward	
Standard visual range	
Standard visual range: 10 ... 500 m / 10 ... 16,000 m Freely configurable output range	
–30 °C ... +55 °C	
IP69K	

- Large measuring range for visibility
- Precipitation detector as an option
- Contamination check
- Minimum space requirements and low weight
- Self-sufficient design possible with solar panel and battery
- Rugged housing, even for salty air

www.endress.com/visic620

Gas flow measuring intruments

FLOWSIC200

The tunnel flow measuring device for long-term operation

VM400

The compact device solution for non-contact flow measurement in tunnels

Technical data overview		
Measurement principles	Flow velocity, flow direction, temperature	Air velocity, flow direction, temperature
Measuring components	Ultrasonic transit time difference measurement	Ultrasonic transit time difference measurement
Measuring ranges	Flow velocity: 0 ... ± 20 m/s	Air velocity: −20 ... 20 m/s
Ambient temperature	−40 °C ... +60 °C	−30 °C ... +60 °C
Enclosure rating	IP66	IP66 / IP67
Options	900 ... 1.100 hPa	850 ... 1.100 hPa

At a glance		
	▪ Very large measuring distances possible ▪ Non-contact measurement ▪ Extremely rugged components made of titanium, stainless steel, or die cast ▪ Versions for very corrosive tunnel atmospheres ▪ Determination of flow direction ▪ No mechanical moving parts	▪ Modern ultrasonic technology for non-contact measurement ▪ Large measuring range ▪ Compact device design ▪ Very easy mounting and commissioning ▪ Immune to contamination
Detailed information	www.endress.com/flowsic200	www.endress.com/vm400

Monitoring box

Monitoring Box

Continuous state monitoring
for measuring devices and sensors

Description	The Monitoring Box is a browser application and enables visualization of sensor and machine data as well as diagnosis and monitoring of error states.
	Condition monitoring for measuring devices and sensors with Ethernet-based communication interfaces.
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	▪ Visualization and evaluation of status data ▪ Logbook for a clear overview and documentation of events ▪ Configurable alarms ▪ Presentation of limit value deviations ▪ Can be done in our Monitoring Box cloud or at the customer's site. ▪ Can be used on mobile end devices ▪ Password-protected access
Detailed information	www.endress.com/monitoring-box

www.addresses.endress.com

CP 802997 / EHS / EN / 02.00

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