

Safety in Tunnels

Early fire and smoke detection in road tunnels

Fire incidents in tunnels are more common than is generally realized. They are usually only consciously noticed when people lose their lives and major material damage with tunnel closures are the consequences. What are effective instruments for preventing such a catastrophe?

The evaluation of various incidents shows that in the majority of cases, people lose their lives due to the toxic smoke gases produced by a fire and not primarily due to the fire. Rapid and reliable early smoke detection with the FireGuard is therefore of central importance, as the first few minutes count in the event of a fire.



The FireGuard

The Solution

The FireGuard has been used successfully in Switzerland since 2007 for early fire and smoke detection in road tunnels. The device works according to the scattered light principle and has no moving parts. The sensor uses the natural air flow in the tunnel to detect fires at an early stage (cold smoke). It therefore reacts faster than a fire alarm cable. The influence of fog is eliminated by the optional heating elements. Another advantage: unlike video detection, the measurement is not falsified by extraneous light, reflections and other influences.

Various installation and communication options allow flexible integration into any new or existing tunnel construction. Fire tests with simulated and real events as well as the evaluation of incidents in tunnels with installed devices confirm the rapid response to smoke development. Optionally, the temperature measurement integrated in the FireGuard can also be used for more precise localization of a subsequent fire.

The Customer Benefit

Early and reliable detection of smoke makes it possible to activate the installed safety and rescue scenarios to enable self-rescue of the people affected. The exact localization of the event is important for controlling the ventilation and the fire dampers in order to keep the affected tunnel section as small as possible and to enable a targeted deployment of the rescue services.



Finally, early smoke detection helps to prevent possible major damage to the infrastructure, the direct and indirect cost consequences of which bear no comparison to the investment in such a system.

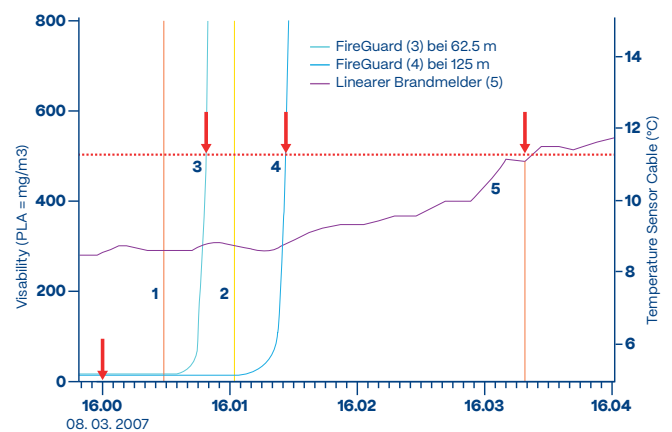
Typical Applications

Most incidents are caused by smouldering fires that occur due to technical problems with the vehicles. These include overheated engines and turbochargers, blocked brakes, defective tires, etc. A characteristic feature is that visibility deteriorates rapidly.

Experience shows that the linear fire alarm cables that are usually already installed in the tunnels cannot detect such events. These systems only react when there is an open fire and a corresponding temperature change occurs. Video surveillance systems are also unable to cope with these tasks, as too many false alarms due to light reflections in windscreens, changes in contrast, etc. make clear detection impossible.

Practical Measurement Taks (Examples)

The diagram shows the results of a real fire test with a passenger car. The fire started (first arrow, bottom left) at 4 pm. The next two vertical lines (1&2) mark the earliest possible alarm calculated on the basis of the wind speed and the distance to the FireGuard sensors, which were installed 62.5 and 125 m respectively after the source of the fire. The horizontal dashed line marks the set alarm threshold. The blue lines (3&4) show the increase in the FireGuard signals. The set limit value (arrows at the alarm threshold) was exceeded after around 20 seconds. For comparison: the linear fire alarm cable (5) only reacted (right arrow) after the flames shot out of the vehicle. The delay compared to the smoke sensors was more than 3 minutes!



Product and Configuration for this Application

- FireGuard (various configuration)
- Optional WLAN module
- Connection box SIPOINT 2 with module PowerRel, Modbus RTU or Profibus DP
- Checking rod
- Mounting set (various configuration)
- Optional: sample heaters, cable

Advantages of the Sigrist FireGuard

- Compact design, no moving parts
- Mounting on the wall, on the ceiling, in the intermediate ceiling or incorporated into the ventilation dampers
- Flexible system integration
- LED light source, very low power consumption
- Continuous monitoring of the instrument status in the background
- Simple calibration using a checking rod
- No false alarms
- Extremely low maintenance cost