



## AP Sensing Performs Successfully in Tunnel Fire Tests

Karlsruhe, Germany

### Project Overview

Fires in road tunnels pose an enormous risk to human life and cause costly damage to infrastructure. Additionally, vehicle fires are not entirely uncommon, and enclosed tunnels provide the perfect conditions for the spread of a fire that is difficult to extinguish. Therefore, it is extremely important to detect tunnel fires quickly and precisely. On this occasion, AP Sensing was selected to participate in multiple fire safety tests prior to the opening of the Kriegsstraßentunnel in Karlsruhe, Germany.

The real-life case of a car fire was simulated in eleven tests at three different locations inside the tunnel. The duration of fire detection, functionality of the safety installations, and smoke exhaust inside the tunnel were investigated and tested.

By analyzing the load data of the power cable and the temperature traces collected by the DTS system, such exposed sections can be localized, and possible additional protection can be planned precisely in order to perform better predictive maintenance.

### Solution

To precisely detect the fires, two Linear Heat Detection (LHD) systems were commissioned in a single

ended configuration, with one channel each and a four km range. The sensor cable is installed on the ceiling of each tunnel tube and both fibers are connected to one LHD unit each. This fully redundant configuration allows for continuous monitoring, even in the case of system outage or fiber break.



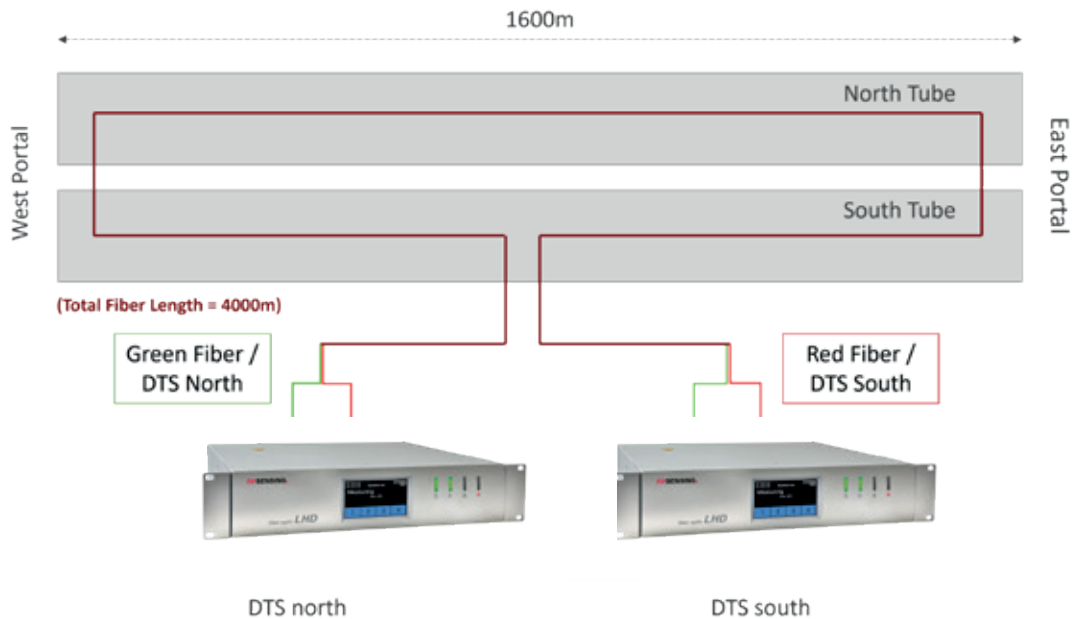
### Background

- 1.6 km underground road tunnel with two tunnel tubes
- RABT conform fire safety test scenarios conducted to prevent costly and dangerous fire outbreaks
- Multiple tests simulating a burning vehicle in order to measure fire detection times outbreaks



### Solution & Benefits

- Two one-channel Linear Heat Detection (LHD) units
- Fully redundant configuration
- 24/7 real-time data, enabling continuous monitoring and precise fire detection



This solution for fire detection is highly suitable for longer tunnels, as the LHD system can monitor the tunnel along the entire length of the sensor cable and the fiber is more cost effective compared to alternative methods. Furthermore, the LHD enables greater flexibility, as individual zones in the tunnel can be defined which trigger alarms based on different alarm parameters. In this tunnel, 25 different alarm zones were configured and one output relay was assigned to each zone.

## Fire Tests

In the first two out of eleven tests, a burning vehicle coming to a standstill was simulated. Therefore, four steel tubes filled with benzene were ignited and burned for two to three minutes, and the duration of fire detection was measured according to the RABT standard 2006. To comply with the RABT directive, the fires must be detected within 60 seconds with a localization accuracy of 50 meters. Initial airflow at the time of the fire ignition must be 6 meters per second.

In the following nine tests, a traffic jam was simulated. Burner circuits were ignited in a car fire simulator with different heat releases and flow conditions in multiple runs.

Temperatures at the ceiling in the vicinity of the fire above the car fire simulator and directly at the fire alarm cable were measured, and the effectiveness of the smoke removal system was also tested.

## Conclusion

The fire safety tests inside the tunnel in Karlsruhe with the two LHD units were conducted successfully with all fires under various conditions detected early and accurately. The LHD systems detected the fire in the first test scenario in only half of the time required to attain the RABT standard.

AP Sensing's LHD attained fast detection times in the second test scenario as well. Despite a significantly reduced heat release in comparison to the previous test, the LHD units detected the fire quicker than the smoke detectors mounted on the tunnel ceiling in every individual test run.

The LHD system installation conducted by AP Sensing demonstrated our commitment to customer service and quick response times. Due to our comprehensive service and the results of the fire detection tests, the client's expectations were exceeded.

