



Connecting Continents: Eurasia Tunnel

Istanbul, Turkey

The Eurasia Tunnel connects the European section of Istanbul in Kumkapi with the Asian section in Kosuyolu. The 5 km tunnel is an engineering marvel, with its double-deck construction that **crosses the Bosphorus Strait undersea**, reaching a maximum depth of 106 m.



Tunnel segment

The tunnel **decreases the travel time** compared to the Bosphorus Bridge from about 100 minutes to 15 minutes, and reduces the traffic load on streets in Istanbul.

The operators selected **2 AP Sensing Linear Heat Series devices**, each with 4 channel capabilities, to establish a **completely redundant installation** to monitor 3 decks within the tunnel (2 for cars, 1 for power cables).



Tunnel cross section

The fiber-optic sensor cable selected has an FRNC outer sheath, which is installed along the tunnel ceiling. The robust AP Sensing “Steel” and “Safety” cables were selected for their fast response times and durable construction.

The continuous monitoring data uses the Modbus interface to the local SCADA control system.

The outside diameter of the tube is 13.2 m, with a total length of 5000 m, reaching a maximum subsea depth of 106 m.



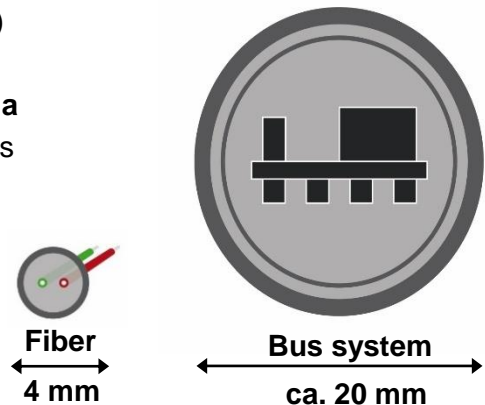
Cross Section



Tunnel route crossing the Bosphorus strait

Why is the fiber optic system so much faster and more precise?

Electrical bus systems (also called 'point systems') use a sensor cable with a diameter that is ca. 5x greater than the fiber optic solution. This results in a **total mass that is 30x greater than the fiber**. This results in a much slower response time.



Fiber optic sensor cable:

- **15 kg/km**
- No active components in the cable (**100% passive**)
- **Very fast reaction times**

Typical electrical sensor cable

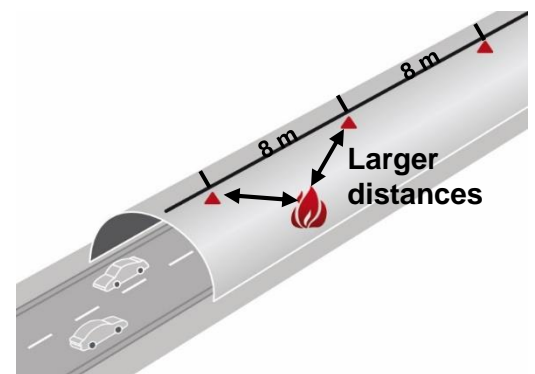
- **450 kg/km**
- Active sensors every 4 – 8 m
- 30x more mass – **slower reaction times**

Point systems typically have their active sensor points spaced 4 to 8 m apart. A fiber optic cable operates like one very long sensor along the entire length of the cable.

In case of a fire, a point system needs a longer amount of time (because of the distance from the fire to the sensor, which can be up to 4m) before the heat has reached the sensor. Considering that the heat is also dissipating within the tunnel space and through wind effects, this amount of distance can make a significant difference.



- Alarms triggered fast and reliably, even with smaller fires



- Larger fires and/or more time needed to trigger an alarm

Conclusion

The Eurasia Tunnel was opened in December, 2016, and the AP Sensing Linear Heat Detection (LHD) system has been operating with **no issues** ever since.

According to Emrah Ilteray, the Deputy Electromechanical Construction Manager at Yapi Merkezi, “AP Sensing’s fully redundant DTS installation provides a **secure and reliable fire detection system. We feel safe with this technology.**”

For tunnel operators the speed and reliability of the AP Sensing system is a major advantage, when even smaller fires can be detected and countermeasures (closing the tunnel, activating smoke exhaust systems, rapid deployment of the fire department) can be quickly initiated.

