LISTEC® GmbH
Lineare Sensor Technik

TEMPERATURE MONITORING TUNNEL SYSTEMS

Isen, September 2025
Early warning with the LIST and d-LIST system

This white paper describes the challenges of fire protection in tunnel systems and shows how the d-LIST and LIST linear heat detection systems from LISTEC GmbH locate fires and initiate further measures to protect people, tunnel structures, goods, and vehicles.

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1. Introduction & Press Reports

Fires in tunnel systems represent one of the greatest safety challenges in infrastructure operations. Restricted escape and rescue routes, rapid smoke spread, and extreme heat development can lead to life-threatening situations in a very short time. Media reports about tunnel fires repeatedly highlight the importance of detection systems that reliably detect events, locate them precisely, and thus enable targeted intervention.

Fires in tunnel systems.
Examples from press reports:

August 14, 2025, Stuttgart
Emergency doctor on major operation at Engelberg Tunnel: “Smoke is the greatest danger”

https://www.swr.de/swraktuell/baden-wuerttemberg/stuttgart/brand-tunnel-engelbergtunnel-a81-arzt-100.html

May 30, 2025, Zederhaus (Lungau)
Car caught fire in the Tauern Tunnel

https://salzburg.orf.at/stories/3307509/

2. Fire hazards & triggers

If a vehicle catches fire in a tunnel, the situation can quickly become critical: thick smoke, trapped people, significant traffic disruptions, and increased risk for emergency responders.

Typical triggers

- Vehicle fires caused by collisions, overheating of the engine/exhaust system, overheating of tyres or brakes (especially trucks).
- Electrical malfunctions, cable and transformer fires in operating rooms and cable trays.
- Hot work, external influences, arson.
- Lithium-ion batteries (electric vehicles) with rapid heat release.

Special risks

- Rapid spread of smoke in the tunnels; restricted escape and rescue routes.
- High thermal stress on the structure and operating equipment.
- Loss of visibility and traffic jams with rear-end collisions.

Between January 1, 2012, and October 31, 2019, 271 incidents were recorded in road and rail tunnels in Switzerland, Germany, and Austria. This corresponds to approximately 3.3 recorded incidents per month. Compared to other types of operations, this frequency of incidents is low, but still high enough that tunnel firefighting operations can hardly be considered a rarity. [1]

[1] Source: Tunnel fire statistics https://www.ifa-swiss.ch/magazin/detail/tunnelbrand-statistik

3. LISTEC solutions

LISTEC GmbH has been developing, manufacturing, and distributing a sensor cable system for early fire detection and temperature measurement for over 30 years. The company is located near Munich, from where we distribute our products worldwide – **“Made in Germany”**. The robust, enclosed design of our cable makes it ideal for the most adverse conditions, such as dust, dirt, moisture, or temperature fluctuations.

A particular focus is on use in tunnel systems. Here, our sensor cable ensures reliable early fire detection along the entire length of the tunnel. The latest generation of temperature sensors are integrated at defined intervals, enabling the precise localisation of temperature increases. This allows incipient fires to be detected at an early stage and targeted countermeasures to be initiated.

The LISTEC systems **LIST** (SEC 20) and **d-LIST** (SEC 15) are among the leading electronic sensor cable technologies and have been installed for decades in tunnel systems, conveyor belt systems, PV systems, and other industries/applications.

Advantages of the LIST and d-LIST systems

- Constant and permanent temperature monitoring with temperature rise warning
- Precise fire detection and localisation thanks to individually addressed sensors
- Permanent temperature measurement from -40ºC to +85ºC
- Warning in case of temperature rise
- Exact localisation through individual sensor address
  (mandatory in tunnels, especially in combination with smoke extraction dampers)
- Detection of danger zones
- In case of a fire in the tunnel: Detection also in other parts of the tunnel, e.g., cross passages
- Detection of simultaneous fires at different locations
- Differential and maximum temperature evaluation
- Resistant to dust/dirt/gases/vibrations
- Installation in single-branch operation or with multiple branches is possible
- Installation as a completely redundant system with multiple controllers is possible
- Measurement resolution (always 0.1 °C, internally 0.0625 °C for d-LIST)
- Repeatability (always ± 0.1 K along the entire cable length)
- Sensor distances freely selectable and combinable, individual identification possible at any time via cable markings
- Systems are generally maintenance-free, resulting in long-term cost savings
- Low commissioning and maintenance costs
- Calibration-free and location-specific resolution in the event of a fire over the entire service life

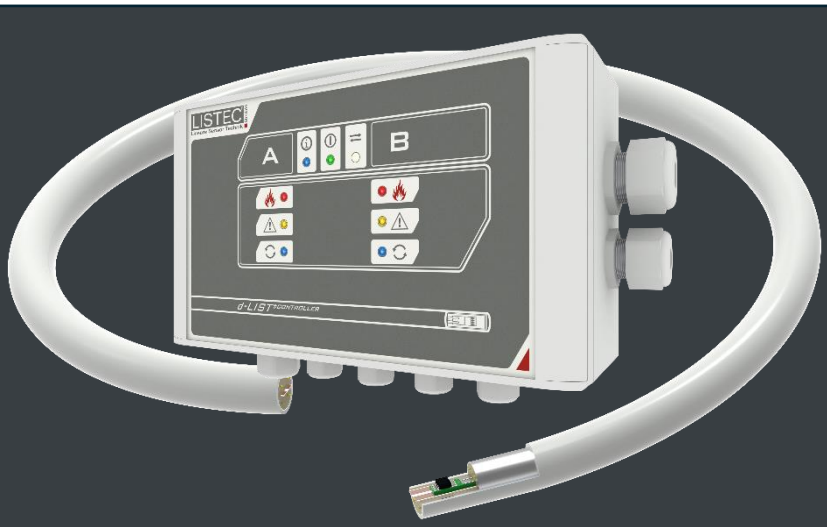
Two systems ...unlimited possibilities

LISTcontroller SEC 20 sensor cable

- Installed in over 700 tunnel systems
- Additional monitoring with individual sensors and for branched routes
- Long distances in adverse environmental conditions
- Versatile networking
- Open protocols
- Flexible branching

d-LISTcontroller SEC 15 sensor cable

- Installed in numerous applications
- Additional monitoring with individual sensors and for branched routes
- Quick and easy installation
- Pre-assembly



Only through the reliable detection of our linear heat detectors are further processes automatically triggered in the tunnel: ventilation systems, displays, tunnel closures, and alarms.

MADE IN GERMANY

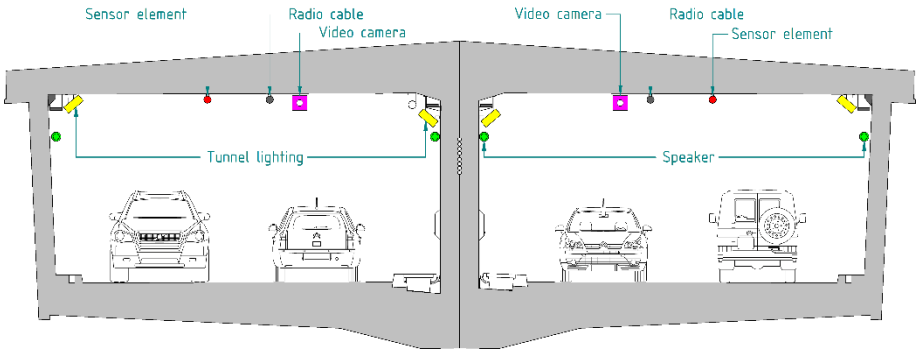
4. Application/ Installation /Monitoring

With the LIST / SEC 20 and d-LIST / SEC 20 systems, LISTEC offers innovative solutions for precise temperature monitoring and recording. These systems are already being used successfully in more than **700** tunnel facilities worldwide and have been in operation for up to 30 years, in some cases with modifications. Our systems thus make a significant contribution to ensuring safe and efficient tunnel operation.

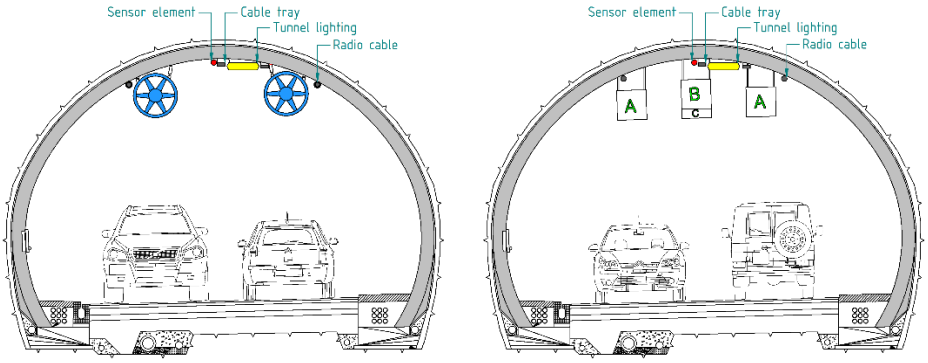
Examples of use:

Different tunnel construction methods require the plans to be reviewed during the planning stage in order to determine the positioning of the sensor element. Here are two examples.

Rectangular cross-section:



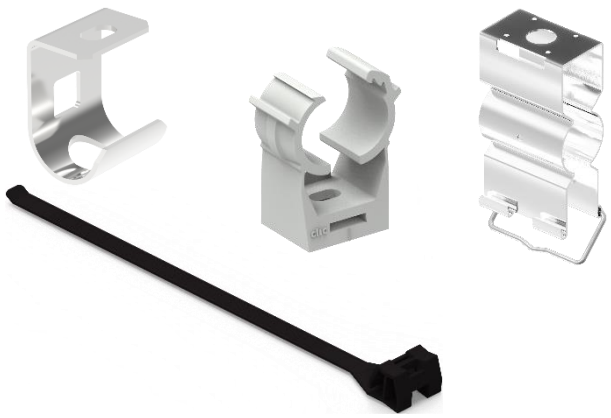
circular cross-section:



Mounting options:

The sensor element can be attached either to the tunnel ceiling or to the side of the cable tray.

All standard fastening options are available for installing the LISTEC sensor cable in tunnel systems. Depending on the structural conditions, technical requirements, and applicable regulations, all of our various cable clamps and cable ties can be used. It should be noted that the selection and design of the fastening is regulated nationally and must comply with the respective standards, guidelines, and safety regulations.



5. Certificate excerpt

The **LIST / SEC 20 system** and **d-LIST / SEC 15 system** is, among other things, a system recognised by IBS Linz (Austria) and VdS (Germany) in accordance with EN 54-22:2015+A1:2020 and meets the requirements of RABT-2006 and EABT-80/10 :2019.

Anerkennung
Approval

VdS

von Bauteilen und Systemen
of Components and Systems

Inhaber der Anerkennung / Holder of the Approval:

LISTEC GmbH
Am Sandberg 34
DE-84424 Isen

Anerkennungs-Nr. / Approval No.	Anzahl der Seiten / No. of pages	gültig vom (TT.MM.JJJJ) / valid from (dd.mm.yyyy)	gültig bis (TT.MM.JJJJ) / valid until (dd.mm.yyyy)
G 221004	14	26.06.2023	25.06.2027

Gegenstand der Anerkennung / Subject of the Approval:

Rücksetzbarer linienförmiger Wärmemelder /
Resettable line-type heat detector
d-LIST

Verwendung / Use:

in automatischen Brandmeldeanlagen /
in automatic fire detection and fire alarm systems

Anerkennungsgrundlagen / Basis of the Approval:

VdS 2344:2014-07
VdS 2543:2021-03
EN 54-17:2005 + AC:2007
EN 54-22:2015 + A1:2020

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G 213072	14	31.10.2024	30.10.2028

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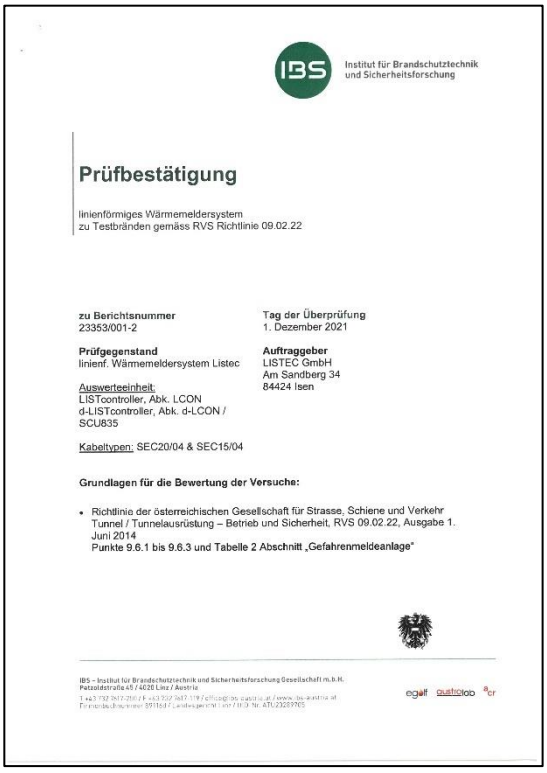

IBS Institut für Brandschutztechnik und Sicherheitsforschung

Prüfbestätigung

linienförmiges Wärmemeldersystem
zu Testbränden gemäss RVS Richtlinie 09.02.22

zu Berichtsnummer
23353/001-2

Tag der Überprüfung
1. Dezember 2021

Prüfgegenstand
linienf. Wärmemeldersystem Listec

Auftraggeber
LISTEC GmbH
Am Sandberg 34
84424 Isen

Auswerteeinheit:
LISTcontroller, Abk. LCON
d-LISTcontroller, Abk. d-LCON /
SCU835

Kabeltypen: SEC20/04 & SEC15/04

Grundlagen für die Bewertung der Versuche:

- Richtlinie der österreichischen Gesellschaft für Strasse, Schiene und Verkehr
  Tunnel / Tunnelausrüstung – Betrieb und Sicherheit, RVS 09.02.22, Ausgabe 1. Juni 2014
  Punkte 9.6.1 bis 9.6.3 und Tabelle 2 Abschnitt „Gefahrenmeldeanlage"

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