



Thermocable ~~~~~

Solar PV Application Guide

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Fire Detection in Solar Photovoltaic Applications

The rapid growth of solar photovoltaic (PV) installations has transformed the way commercial, industrial and public buildings generate electricity. From rooftop systems on warehouses and manufacturing facilities to large-scale solar farms, PV technology now forms an important part of modern infrastructure.

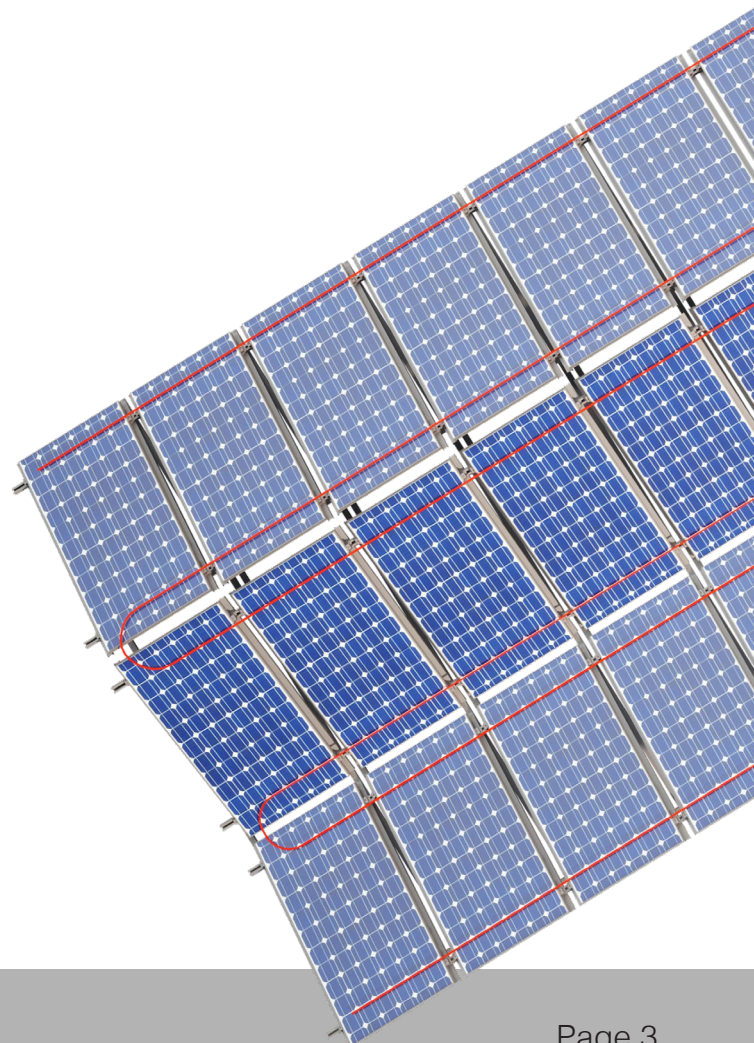
While solar energy delivers significant environmental and financial benefits, it also introduces new fire safety challenges. Unlike conventional electrical installations, PV systems remain energised whenever exposed to daylight. This creates unique hazards for building owners, fire engineers, insurers and emergency responders.

Electrical faults within modules, connectors, inverters or cabling can develop gradually through overheating before progressing into arcing, ignition and fire. Many of these faults occur beneath the solar array where they remain hidden from view and are difficult to detect using conventional fire detection technologies.

For fire engineers and specification consultants, selecting the correct fire detection solution during the design stage is essential. Early detection allows faults to be identified before they escalate into significant fire events, helping to protect people, buildings, business continuity and valuable renewable energy assets.

Linear Heat Detection (LHD) provides continuous temperature monitoring across the entire protected area, making it particularly suited to photovoltaic installations where point heat detectors often cannot provide sufficient coverage.

This guide explains the fire risks associated with PV systems, the most common causes of ignition, and why Linear Heat Detection has become one of the most effective methods of protecting modern solar installations.



Why Solar PV Applications Require Fire Protection

The global adoption of solar photovoltaic (PV) systems continues to grow as organisations invest in renewable energy to reduce operating costs and meet sustainability targets. From commercial rooftops and industrial facilities to ground-mounted solar farms, PV systems are now a common feature across a wide range of applications.

While these systems are designed to provide reliable, long-term energy generation, they also introduce fire safety considerations that differ

The physical layout of a solar array also presents unique protection challenges. Large rooftop installations, long cable runs, hidden voids beneath panels and remote locations can make faults difficult to identify during their early stages. Once installed, many components are not easily accessible for routine inspection, making it important to detect abnormal conditions before they develop into a fire.

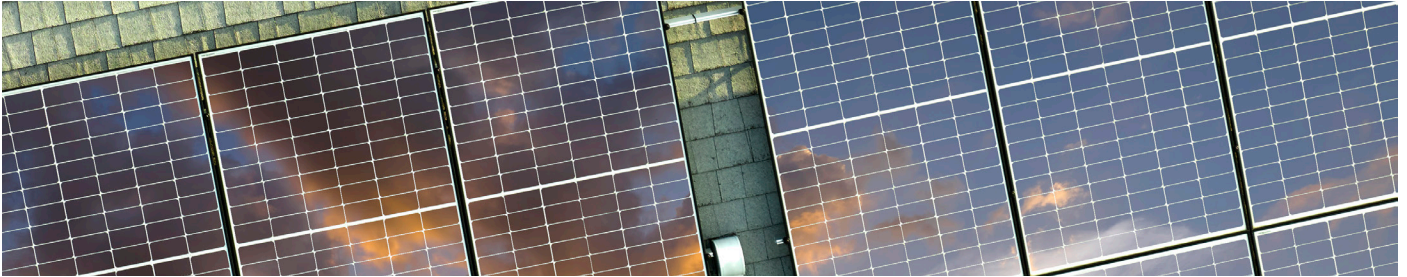
As solar installations become larger and more widespread, specifying effective fire detection



from those of conventional electrical installations. Unlike traditional electrical systems, solar panels continue to generate electricity whenever they are exposed to daylight. This means that parts of the installation remain energised even when the building's main electrical supply has been isolated, creating additional challenges during maintenance and emergency response.

during the design stage is an important part of protecting people, property and business continuity.

Fire Risks Associated with Solar PV Systems



Although photovoltaic (PV) systems are designed to operate safely for many years, they are continuously exposed to environmental conditions that can affect their long-term performance. High temperatures, ultraviolet radiation, wind, moisture, dirt and repeated thermal expansion and contraction can all contribute to the gradual ageing of electrical components, cable insulation and electrical connections.

Over time, environmental exposure, normal wear or inadequate installation and maintenance can lead to overheating faults that develop unnoticed beneath the solar array. Because these faults often occur in concealed areas, abnormal temperatures can build long before there are any visible signs of a developing fire.

Fire incidents involving solar PV systems present further challenges due to their location. Rooftop installations place potential ignition sources above occupied buildings and valuable assets, while restricted access beneath the panels can make inspection, fault diagnosis and firefighting more difficult. As the panels continue to generate electricity during daylight hours, isolating the system can also be more complex than with conventional electrical installations.

Without effective early detection, overheating faults can escalate into fires that damage the PV installation, disrupt business operations and threaten the wider building. Detecting abnormal temperature rises at the earliest opportunity allows corrective action to be taken before a developing fault becomes a significant fire event.



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Installation Risks

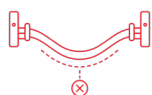
Many PV fires originate from installation defects rather than product failures.

Common issues include:



Incorrect Cable Routing

Poor cable management allows cables to rub against mounting systems, creating insulation damage over time.



Poor Mechanical Support

Unsupported cables move in wind conditions, increasing wear and the likelihood of insulation failure.



Inadequate Maintenance

Without periodic inspection, developing faults often remain unnoticed until temperatures have reached dangerous levels.



Loose Electrical Connections

Improperly terminated connectors create increased electrical resistance, producing heat that may eventually ignite surrounding materials.



Damaged Connectors

Using incompatible connector brands or poorly crimped connections significantly increases failure rates.

Main Causes of Fires in Solar PV Applications

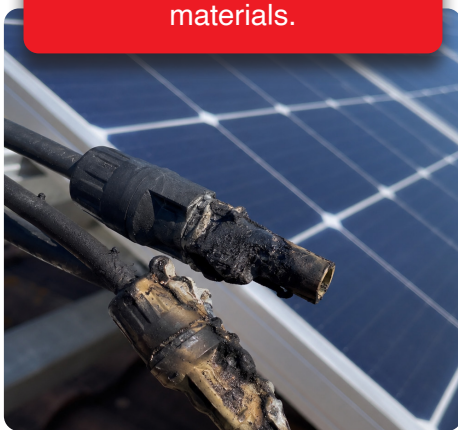
DC Arc Faults

Electrical arcing caused by damaged conductors or loose connections remains one of the leading causes of PV fires.



Overheated Connectors

Faulty or incompatible connectors generate excessive heat which can ignite nearby combustible materials.



Damaged Cabling

Mechanical damage, UV degradation and rodent attack can expose conductors and increase fire risk.



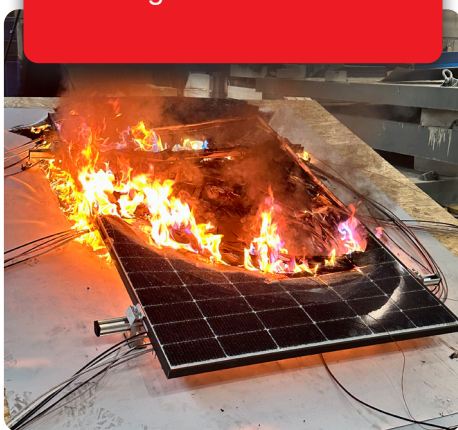
Inverter Malfunctions

Electronic component failures or overheating can ignite surrounding equipment.



Panel Defects

Manufacturing defects or ageing modules can develop hotspots which spread through the installation.



Battery Failures

Where energy storage is installed, thermal runaway may rapidly escalate into a significant fire event.



Why Linear Heat Detection is the Preferred Fire Detection Solution

Conventional point heat detectors are designed to monitor a single location. They rely on heat reaching the detector before an alarm activates.

Solar arrays create long and narrow, often inaccessible spaces beneath the panels where heat may not reach ceiling-mounted detectors quickly enough.

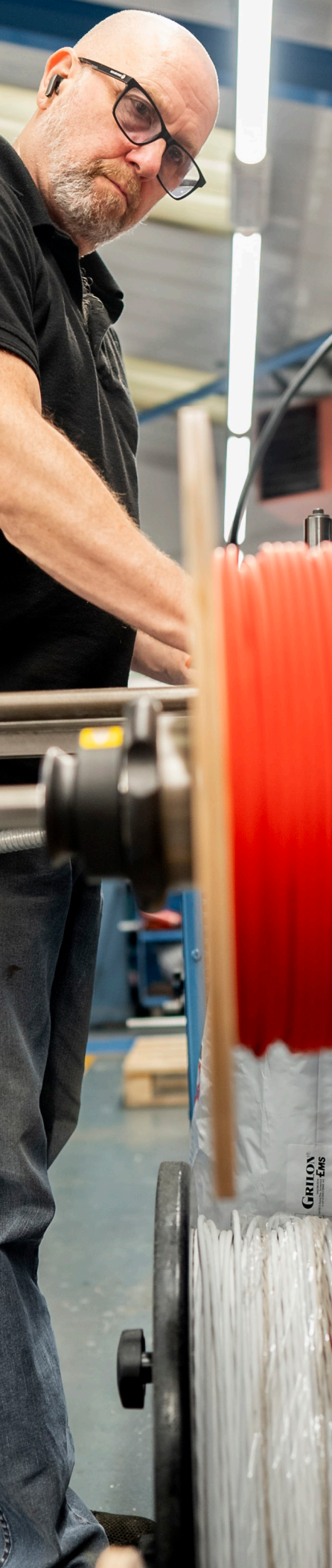
Linear Heat Detection works differently.



Instead of monitoring one point, the sensing cable itself acts as the detector. Installed throughout the array, it continuously monitors temperature along its entire length. This provides much earlier detection of overheating beneath panels, along cable routes, around inverters and adjacent to battery systems. Because the cable follows the protected asset, detection occurs much closer to the source of ignition.

Independent fire testing referenced by Thermocable demonstrated Linear Heat Detection detecting photovoltaic fires in under one minute, with the fastest activation occurring in just 11 seconds.





Benefits of LHD for Solar Installations

Continuous Detection Along the Entire Cable

The entire length of cable is the detector, eliminating gaps between individual devices and providing continuous coverage.

Earlier Fire Detection in Hidden Spaces

The cable can be installed directly beneath solar panels, close to potential ignition sources where conventional detectors cannot provide effective coverage, enabling earlier heat detection before flames start and spread.

Scalable and Cost-Effective Protection

Large rooftop systems and solar farms can be protected using long detection zones with fewer detection devices, reducing installation time, simplifying cable routing and minimising infrastructure.

Reliable Performance with Low Maintenance

With no moving parts, the system requires significantly less maintenance than multiple point detectors while performing reliably in harsh outdoor environments. Sleeving options, including stainless steel braiding and Low Smoke Zero Halogen coatings, provide additional protection.

Easy Integration

The system integrates with both conventional and addressable fire alarm systems using standard interfaces.

Certified Performance

Thermocable products are available with internationally recognised approvals, including EN54, UL and other global certifications, supporting specification across a wide range of projects.

How Linear Heat Detection Reduces Solar Fire Risk

Linear Heat Detection directly addresses the most common fire hazards found in photovoltaic installations.

Fire Risk	How LHD Helps
Loose electrical connections	Detects abnormal temperature rise before ignition
Cable overheating	Monitors cable routes continuously
Panel hotspots	Detects heat eneath affected modules
Inverter overheating	Protects equipment with dedicated cable routing
Battery storage systems	Provides early warning of abnormal heat development
Hidden fires beneath panels	Detects heat where conventional detectors cannot

By identifying abnormal temperature rises during the earliest stages of fault development, Linear Heat Detection enables faster investigation and intervention before overheating develops into a significant fire.

For fire engineers and consultants, this provides a practical, standards-compliant solution that improves life safety, protects valuable assets and supports resilient building design.

