LINEAR HEAT SENSING DETECTION

VJ
System Sensor India
2014
Introduction to System Sensor

Linear Heat Sensing Cable:

- LINEAR - Across the Length
- HEAT - Heating of Cable
- SENSOR - Detector
- LHS Cable - Cable capable of detecting heating of cable over its entire length.
Codes / Regulations for Linear Heat Sensing Cable
NFPA Clause 3.3.43.10

- Line-Type Detector - A device in which detection is continuous along a path. Typical examples are rate-of-rise pneumatic tubing detectors, projected beam smoke detectors, and heat-sensitive cable. (SIG-IDS)

NFPA Clause A 3.3.43.7

- Fixed-Temperature Detector.

- Electrical Conductivity. A line-type or spot-type sensing element in which resistance varies as a function of temperature.

- Heat-Sensitive Cable. A line-type device in which the sensing element comprises, in one type, two current-carrying wires separated by heat-sensitive insulation that softens at the rated temperature, thus allowing the wires to make electrical contact. In another type, a single wire is centred in a metallic tube, and the intervening space is filled with a substance that becomes conductive at a critical temperature, thus establishing electrical contact between the tube and the wire.
NFPA Clause A3.3.43.18

- **Rate-of-Rise Detector**: A line-type or spot-type sensing element in which resistance changes due to a change in temperature. The rate of change of resistance is monitored by associated control equipment, and an alarm is initiated when the rate of temperature increase exceeds a preset value.
### Type of Detector
- Linear Heat Sensing Cables

### Suitability & Merits
- Cables Tunnels,
- Trays & Vaults,
- Material Conveyors,
- Bulk Storage,
- Multi-Racked Areas,
- Rim seals of floating roof tanks storing hazardous chemicals & a few other special occupancies

### Unsuitability & Demerits
- Not suitable at all applications other than what is specified
5 AUTOMATIC FIRE DETECTORS

5.1 The types of detectors covered in the standard are given in 5.1.1 and 5.1.2.

5.1.1 Heat Detectors

See IS 2175.

5.1.1.1 Fixed temperature

The fixed temperature heat detectors are designed to operate when the temperature of the detector exceeds a predetermined value.

5.1.1.2 Rate-of-rise temperature-cum-fixed temperature detector

The detectors are designed to operate within a given time:

a) when the rate of temperature rise at the detector exceeds a predetermined value regardless of the actual temperature; and

b) when temperature at the detector exceeds a predetermined value.

5.1.1.3 Probe type high temperature bi-metal heat detector

Bi-metal heat detectors are resettable and highly suitable to use above 80°C where electronic components cannot be used. The following are type of application for which probe type high temperature heat detectors are suitable.

Generator enclosure, turbine enclosure, oven and furnace area, kitchen wood and other places as per the requirement where automatic fire extinguishing suppression systems are used.

5.1.1.4 Linear heat sensing cables

Linear heat sensing cables can be broadly divided into two categories. Digital or analogue, depending upon the principle by which the sensing cable registers a change in temperature.

Digital sensor consists of two core cable in which the conductors are separated by a heat sensitive insulator. When a specified temperature is reached, the cable insulation breaks down and an alarm is indicated. In the case of analogue sensor, cores are separated by a negative temperature co-efficient polymer whose resistance will reduce in proportion to the temperature increase.

These cables are used for detecting fire and overheating in certain specific occupancies such as:

a) cables tunnels, trays and vaults;
b) material conveyors;
c) bulk storage multi-racked areas;
d) rim seals of floating roof tanks storing hazardous chemicals; and
e) a few other special occupancies.

5.1.1.5 Heat detectors application

These are suitable for use in situation where sufficient heat is likely to be generated and damage caused by heat generated by the fire constitutes main hazard. This is to be minimized through early detection. In many buildings, especially non-air-conditioned buildings, these conditions prevail where heat detectors can be advantageously used. Heat detectors are however, not suitable for protection of places where larger losses can be caused by small fires and where safety of life is involved.

5.1.2 Smoke Detectors

See IS 11360.

5.1.2.1 Ionization smoke detectors

Detectors employing ionization chamber(s) as sensing means for detecting aerosols given-off by fires.
Design Guidelines/Standards for Linear Heat Sensing Cable
Distance between Peak to Peak for Linear Sensing Cable as per the standards

![Diagram showing distance between peaks at 1.8 Mtr.]

**ESTIMATION CHART FOR CALCULATING LENGTH OF LHS CABLE**

<table>
<thead>
<tr>
<th>Width of the Cable Tray</th>
<th>Multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2 Mtr.</td>
<td>1.75</td>
</tr>
<tr>
<td>0.9 Mtr.</td>
<td>1.50</td>
</tr>
<tr>
<td>0.6 Mtr.</td>
<td>1.25</td>
</tr>
<tr>
<td>0.5 Mtr.</td>
<td>1.15</td>
</tr>
</tbody>
</table>

Length of Cable Tray X Multiplier = Length of System Sensor LHS Cable
Technical Specification for Linear Heat Sensing Cable
**Digital:** A small diameter cable which consist of sensing elements which respond to a specific temperature at any point along their length. The inner conductors are coated with a polymer that melts at a predetermined temperature which allows the conductors to make contact with one another and thereby signal an alarm condition at fire alarm panel.

**Analogue:** A co-axial cable which exerts a defined change in electrical resistance of internal polymers when subjected to changes in surface temperatures. System monitoring through an associated electronic interface unit provides fault indication of open and short circuit conditions on the sensor cable.
Digital Series - UK

- SD – LD – 68 - 155
- SD – LD – 78 - 172
- SD – LD – 88 - 190
- SD – LD – 105 -220

Approved by UL AND FM

900 Analogue Series - China

- JTW-LD-997
- JTW-LCD-998

Approved by UL
Introduction to System Sensor

800 Series Digital Linear Heat Detector

Introduction

• Digital Linear Heat Detector (68°C)
  SD – LD – 68 - 155
• Digital Linear Heat Detector (78°C)
  SD – LD – 78 - 172
• Digital Linear Heat Detector (88°C)
  SD – LD -88 - 190
• Digital Linear Heat Detector (105°C)
  SD – LD – 105 - 220

Features

1. Fixed alarm temperature
2. Melts at alarm temperature to trigger the alarm signal

Pros: Reasonable price
Cons: Non-restorable after alarm
➢ Upto 3000 mtr. of Cable per zone.
➢ Multiple Alarm Temp. 68 / 78 / 88 / 105 Degree C
➢ Multiple alarm temperatures combined in one zone.
➢ Three different type of Sheathing options: PVC, Nylon, Polypropylene.
Introduction to System Sensor
Digital Linear Heat Sensing Cable – UL/FM Approved
Introduction to System Sensor
Digital Linear Heat Sensing Cable – UL/FM Approved
Typical System Design

Distance Locating Module

Addressable Contact Monitor Module

J-Box

Strain Relief Connector

Screw Terminal

Leader Wires Run in Conduit
Min. 18 AWG
Max. 8,000’ (2.4 km)

10,000 ft. (3,000 m) max.

Strain Relief Connector

ELR-Box

End of Line Resistor
Introduction

- Fixed Temperature Analogue Linear Heat Detector (Restorable)
  JTW-LD-997
- Rate-Of-Rise and Fixed Temperature Analogue Linear Heat Detector (Restorable)
  JTW-LCD-998

Features

1. Alarm Temp can be set between 70-130°C with PC Modulator
2. Dual stage alarm settings (Pre-alarm & alarm)
3. Open and short circuit watch
4. Reusable coaxial cable (if not damaged in the fire)
5. System Reset with PC modulator
6. Cable cover protects from wearing-out and EMI
The product includes the heat-detecting cable, the PC Modulator, the EOL box and connecting box.

Cable is connected with a Start Point PC Modulator and with End Point EOL Box. The Control Module continuously monitors the detecting cable and/or alarms for the temperature rate of rise signal and open or short circuit faults.
• PC Modulator is a microprocessor based start point device between LHS Cable and FAP.
• Modulator is a intelligent device that monitors LHS cable for continuity and over temperature fire signatures.
• Alarm Temperatures between 70 – 130 Degree C can be set thru PC Modulator.
• PC Modulator monitors the resistance of the sensor cable, and generate an alarm.
• System automatically resets after alarming at a temperature <= 120 Degree C with PC Modulator.
• Dual Alarm Setting ( Pre – alarm and Alarm)
• Compatible with any Fire Control Panel
Design Consideration – Digital Cable

- Digital - Max Zone Length – 3000 Mtr.
- Digital – Std. Roll Length – 100 Mtr / 500 Mtr / 1000 Mtr.
- For every Zone – 1 No. EOL Box.
- For every zone length exceeding std. roll length but within max. zone length Connecting Box is required.
• Analogue - Max Zone Length – 200 Mtr.
• Analogue – Std. Roll Length – 200 Mtr.
• For every Zone – 1 No. PC Modulator and 1 No. EOL Box.
Application Notes for Linear Heat Sensing Cable
Multiple applications across Various Verticals:

- Cable tray system
- Conveyor System
- Refrigerated Storage Facilities
- Transportation Tunnels
- Cooling Towers
- Electrical Equipment and Switch Gear
- Transformers and Substations
- Warehouse Protection
- Refinery and Petrochemical Works
In power generation plants Linear Heat Sensing Cables senses the overheat condition in a plant’s cable tray system. Linear heat sensing cable shall be installed in cable trays in a sinusoidal pattern across the tray. The total amount of linear heat sensing cable per tray is determined by the width of the cable tray and a multiplier calculated specifically for the width of the tray. Each zone shall be terminated with an appropriate end-of-line resistor.
Fire in a typical coal conveyor is usually caused by friction due to belt slippage, bearing problems, static electricity, welding, or spontaneous combustion. Due to the relatively severe environment in coal conveyors, fire detection systems used in such applications must be engineered for this type of service. The SS Linear Heat Sensing Cable meet these requirements. They are specifically engineered to withstand abrasive coal dust, moisture, and highly corrosive atmospheres.
Railway tunnels contain system power cables, communication and auxiliary operating cables, running the full length of the tunnel. Overheat and fire caused by catenary arcing, trackside sparks, under car mechanical failures and electrical short circuits are but a few of the potentially dangerous sources of fire within this aggressive environment. The application of Analogue linear heat detection cable in tunnels is the most suitable method of fire detection in view of its high reliability, low maintenance, and long monitoring lengths available.
Thank You