LHS™ Linear Heat Sensor

Installation Instructions

73-202

Effective: June 2006

DESCRIPTION

The LHS™ Linear Heat Sensor cable is a flexible, durable and cost-effective fixed-temperature fire detector, suitable for protecting a wide range of commercial and industrial fire applications.

LHS is a small diameter cable capable of detecting heat from a fire over its entire length. The sensor cable consists of a twisted pair of 19 AWG copper coated steel conductors covered by a temperature sensitive insulation, and protected by either a plastic braid or jacket for various environmental applications (see Figure 1).

LHS is designed for open area as well as proximity detection. A wide range of jackets and operating temperatures (see Table 1) are available for proper system design, including confined areas or harsh environments which prohibit the use of other forms of detection. LHS cable is compatible with any Fire Control Panel that is capable of accepting contact closure type initiating devices.

The LHS linear heat detector is Factory Mutual Approved. An FM Approved installation requires the LHS cable to be connected to an FM Approved Fire Control Panel.

OPERATION

The heat from a fire causes the LHS cable's special insulation to melt at a specific temperature, allowing the two conductors to short together, thus creating an alarm condition on the Fire Control Panel. The LHS cable may also be used as a stand-alone contact device. The LHS normal operating state is an open circuit.

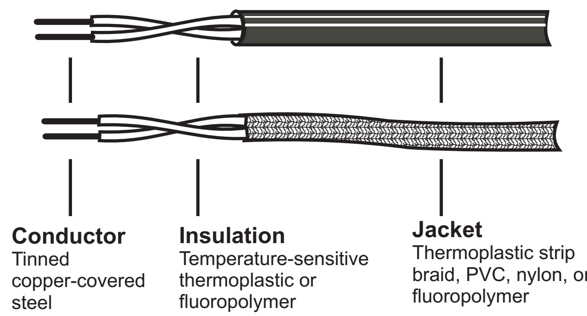

Figure 1. Cable Construction

Table 1. LHS Sensor Cable Specification

Part Number: **656 ft (200 m) length roll** **3,280 ft (1000 m) length roll**	**73-200000-001** **73-201000-001**	**73-200000-011** **73-201000-011**	**73-200000-002** **73-201000-002**	**73-200000-012** **73-201000-012**	**73-200000-003** **73-201000-003**	**73-200000-004** **73-201000-004**	**73-200000-005** **73-201000-005**
Alarm Temperature	155°F (68°C)	155°F (68°C)	185°F (85°C)	185°F (85°C)	220°F (105°C)	350°F (176°C)	465°F (240°C)
Ambient Storage Temp. *	Up to 113°F (45°C)	Up to 113°F (45°C)	Up to 113°F (45°C)	Up to 113°F (45°C)	Up to 158°F (70°C)	Up to 221°F (105°C)	Up to 392°F (200°C)
Min. Installation Temp.	5°F (-15°C)	5°F (-15°C)	5°F (-15°C)	5°F (-15°C)	32°F (0°C)	32°F (0°C)	-4°F (-20°C)
Min. Operating Temp. **	-40°F (-40°C)	-40°F (-40°C)	-40°F (-40°C)	-40°F (-40°C)	-22°F (-30°C)	-40°F (-40°C)	-58°F (-50°C)
Application	Indoor Only	Indoor/Outdoor	Indoor Only	Indoor/Outdoor	Indoor/Outdoor	Indoor/Outdoor	Indoor/Outdoor
Approved Spacing	20 ft. (6 m) maximum	20 ft. (6 m) maximum	20 ft. (6 m) maximum	20 ft. (6 m) maximum	20 ft. (6 m) maximum	Proximity Detection	Proximity Detection
Flame Detection	5 seconds (max)	5 seconds (max)	5 seconds (max)	5 seconds (max)	12 seconds (max)	20 seconds (max)	20 seconds (max)
Outer Jacket Material	Polypropylene Braid	Nylon	Polypropylene Braid	Nylon	PVC	PVC	FEP
Outer Jacket Color	Red/Green Tracer	Black Marked H8040N	Red/Black Tracer	Black Marked H8045N	Black	Red	White
Conductor Insulation	EVA	EVA	EVA	EVA	Polythene	Polypropylene	FEP
Conductor Color	1 Black 1 Red	1 Black 1 Red	1 Black 1 Red	1 Black 1 Red	1 Black 1 Red	1 Black 1 Black/White	1 Black 1 White
External Diameter	0.146 inch (3.7 mm)	0.132 inch (3.35 mm)	0.146 inch (3.7 mm)	0.132 inch (3.35 mm)	0.167 inch (4.25 mm)	0.171 inch (4.35 mm)	0.138 inch (3.5 mm)
Electrical Rating	1 Amp maximum, 110 Vdc maximum						
Conductor Resistance	30.48 ohms/1000 ft. @ 68°F (100 ohms/1000 m) @ 20°C						
Conductor Capacitance	20.21 pF/ft. (66.32 pF/m)	20.21 pF/ft. (66.32 pF/m)	25.42 pF/ft. (83.41 pF/m)	25.42 pF/ft. (83.41 pF/m)	19.96 pF/ft. (65.48 pF/m)	17.52 pF/ft. (57.48 pF/m)	19.22 pF/ft. (63.07 pF/m)
Insulation Rating	1000 megohm per 3280 ft. (1000 m) after 1 minute @ 500 Vdc Minimum						
Weight	11.29 lb./1000 ft. (16.8 kg/km)	10.65 lb./1000 ft. (15.85 kg/km)	11.29 lb./1000 ft. (16.8 kg/km)	10.65 lb./1000 ft. (15.85 kg/km)	15.25 lb./1000 ft. (22.7 kg/km)	12.67 lb./1000 ft. (18.85 kg/km)	14.65 lb./1000 ft. (21.8 kg/km)

*** Do not store in direct sunlight. ** When not subjected to vibration.**

DESIGN CONSIDERATIONS

The system design and installation must follow accepted principles of fire protection engineering, as well as comply with applicable codes and standards:

- NFPA-72, National Fire Alarm Code
- NEC 760, National Electric Code
- Any local installation requirements
- Requirements of the Authority Having Jurisdiction (AHJ)

1. Selection of the appropriate part number for a specific application must take into consideration the temperature of the hazard, the ambient temperature, and the environment where the sensor is installed.
2. For open area protection, LHS must be mounted at the ceiling, using the FM Approved spacing between parallel runs. Distances from walls are half the spacing shown. The thermal path to the LHS sensor must not be obstructed. Maintain a 1" (25 mm) distance from the ceiling for fastest detection.
3. For proximity detection, the LHS sensor must be tight against the object being protected, to insure good thermal transfer. Exercise care to insure that vibration and sharp edges do not cause abrasions to the cable, which could result in a false activation.
4. Outdoor applications may need to be shielded from direct sunlight to prevent the LHS sensor's operating temperature and/or maximum ambient temperature from being exceeded, which may cause a false activation.
5. To use LHS sensor in hazardous locations (Class 1 Groups A,B,C,D; and Class 2 Groups E,F,G), FM Approved intrinsic safety barriers must be used to isolate the sensor from the control panel.

INITIATING CIRCUIT WIRING

The LHS sensor connects to any Fire Control Panel (FCP) as a dry-contact initiating device. Follow the installation instructions of the FCP for specific electrical requirements of the initiating circuit (see figure 2).

1. The LHS sensor can be run as a Class B or Class A circuit loop, with no T-taps.
2. The maximum LHS sensor zone length is determined by the electrical characteristics of the FCP initiating circuit. Use the LHS resistance and capacitance as shown in Table 1 to calculate the maximum length. For example, a FCP with input loop resistance of 50 ohms will allow 820 feet (=50/(2 x 0.03048)) of LHS sensor.
3. If the FCP is some distance away from the protected space, install LHS sensor only in the protected space, and use lead-in cable to connect the LHS sensor to the FCP. The lead-in cable can be any copper wiring approved for fire alarm use.
4. The LHS sensor in the protected space does not need to be contiguous. Copper wiring approved for fire alarm use may be used to connect the separate lengths of LHS sensor.
5. If the initiating circuit is run as Class B (2 wire), then an end-of-line device compatible with the FCP must be installed at the end of the LHS sensor cable.
6. If allowed by the AHJ, other initiating devices (smoke detectors, manual stations, etc.) may be installed on the same zone as the LHS sensor. The LHS sensor cable can be wired directly between these other devices.

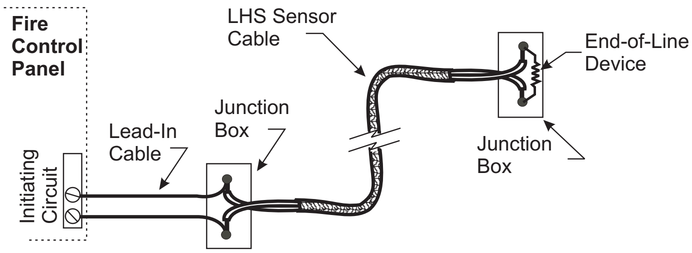

Figure 2. FCP with LHS Sensor Cable

SENSOR CABLE MOUNTING

The LHS sensor cable must be mounted in a professional manner, in accordance with any applicable codes and requirements. The recommended mounting techniques described below do not preclude the use of alternate means that are more suitable for a specific installation so long as such means are acceptable to the local AHJ.

⚠ CAUTION

Where subject to mechanical damage, the sensor cable should be protected to prevent damage which could result in false activation.

> When designing the LHS layout, sensor cables should be located where they will not be subject to physical damage.

> If metal fasteners are used, non-metallic bushings must be used to prevent chafing or crushing of the sensor cables.

1. The cable should be adequately supported to prevent sagging. It is not necessary to tension the cable, however on straight runs it is recommended that the cable is supported every 3 feet (1 m). Reduced spacing may be employed to suit local codes or conditions such as around corners and transition points. Tension on the sensor cable cannot exceed 50 Newtons. The sensor cable can be bent around a radius no smaller than 2" (50 mm)
2. Wherever possible, the sensor cable should be installed in a continuous run with as few splices as possible.
3. The sensor cable should be the last item installed on a project. If not installed last, it should be temporarily supported by cable ties to minimize the risk of damage. Care should be taken to prevent damage due to foot traffic, mechanical impact, kinking or any external heat sources.

4. Weather-Tight Connector, **P/N 73-117068-027** is used to provide appropriate strain-relief where the sensor cable enters an electrical box or enclosure. It is recommended to secure tension on the end of a long sensor cable run. The connector is designed to thread into a standard 3/4" cast electrical box opening (3/4” NPT).

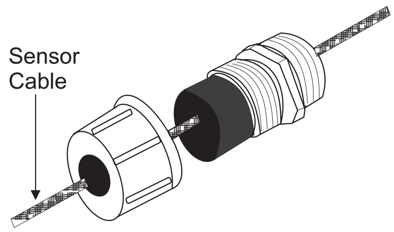

Figure 3. Weather-Tight Connector

5. The sensor cable should be protected from mechanical damage in non-detecting exposed areas by running it in electrical metallic tubing (EMT). The sensor cable should also be run in short pieces of EMT where the sensor cable must pass through walls or partitions. The ends of the EMT must have non-metallic bushings to prevent damage to the sensor cable.
6. Selection of the mounting hardware that best suits the application will depend upon the equipment or support structures in the area being protected. Environmental conditions and the practicality of mounting the clips needs to be taken into consideration. The sensor cable should always be attached to a support that permits the least amount of movement, without crushing the cable insulation. Three types of standard mounting hardware (master clamp, flange clamp, nylon cable tie) permit safe, secure sensor cable installation in most applications.
7. The Master Clamp, **P/N 73-117068-022** (box of 100), is a multi-purpose fastener that fits all beam flanges up to ½” (13 mm) thick and resists vibration. Use the Nylon Cable Clamp, **P/N 73-117068-025** (box of 100) to fasten the sensor cable to the master clamp.

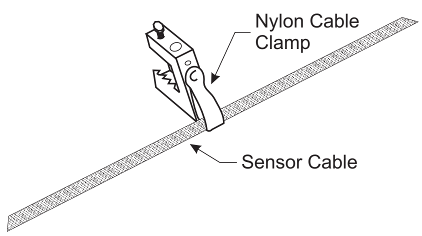

Figure 4. Master Clamp

8. The Flange Clip is available in two sizes. **P/N 73-117068-023** (box of 100) fits up to 3/16" (4 mm) thick metal. **P/N 73-117068-024** (box of 100) fits 3/16" (4 mm) to ¼” (6 mm) thick metal. They are easily hammered onto metal flanges on roof trusses and shelving for secure mounting which resists vibration. Use the Nylon Cable Clamp, **P/N 73-117068-025** (box of 100) to fasten the sensor cable to both sizes of flange clips.

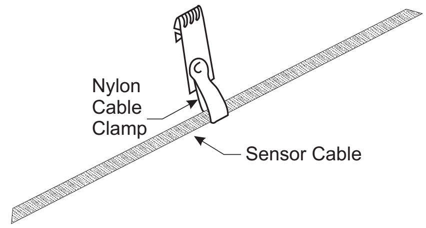

Figure 5. Flange Clip

9. The Nylon Cable Tie, **P/N 73-117068-020** (box of 100), is a heavy duty mounting tab cable tie that is strapped to sprinkler or other fire protection pipes up to 8" (20 cm) in diameter. This method of mounting the LHS sensor may be used if acceptable to the local AHJ. Use the Nylon Cable Clamp, **P/N 73-117068-025** (box of 100) to fasten the sensor cable to nylon cable tie.

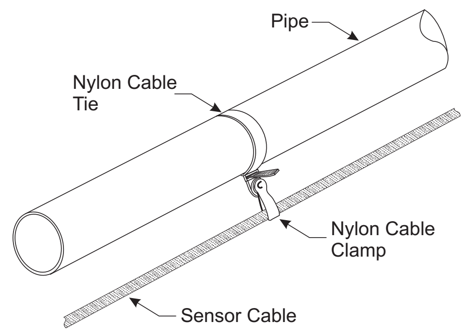

Figure 6. Nylon Cable Tie

⚠ CAUTION

When the LHS sensor cable is installed in below freezing environments, special precautions should be taken to avoid contact with or movement of the sensor cable. At temperatures below 32°F (0°C), the Nylon Cable Tie may break as a result of jarring or physical contact.

10. Messenger cable must be used if the LHS sensor cable needs to be suspended for some distance over an object or an area, without a ceiling to attach the cable to. Commercially available stainless steel cable of a suitable size should be used as messenger cable, tensioned appropriately. The sensor cable can be attached to the messenger cable using cable ties, approximately every 3 feet (1 m).

SENSOR CABLE SPLICING

The LHS sensor cable must be spliced or electrically connected in a professional manner, in accordance with any applicable codes or requirements. The recommended splicing techniques described below do not preclude the use of alternate means that are more suitable for a specific installation. Because of the heat-sensitive nature of the sensor cable insulation, soldering or heat-shrink tubing should never be used when splicing LHS sensor cable.

Preferred Method - Using a junction box:

The preferred method for joining two lengths of sensor cable, or for connecting sensor cable to copper lead-in wire, interconnecting cable, or an end-of-line device, is to make the connection inside a junction box.

1. The sensor cable can be joined using any industry standard method for connecting copper conductors. Positive, compression type connectors must be used, such as wire nuts (3M/Highland H-30 or equal), butt splices (Panduit BSN18 or equal), or a 2-position terminal block (Molex/Beau C1502-151 or equal), following the manufacturer's installation instructions.
2. Any standard electrical junction box with a cover may be used. In wet or damp locations, a waterproof box must be used. The P/N 73-117068-027 Weather-Tight Connector (or equivalent) must be used to provide strain relief on the sensor cable where it enters the box. Do not use "Romex" style cable clamps, as they may crush the cable, possibly causing a false alarm.

Alternate Method – In-line Splice:

Where permitted by the AHJ, in-line splicing of two lengths of sensor cable may be permitted. In-line splicing <u>is not recommended</u> for connecting sensor cable to copper lead-in wire, interconnecting cable, or an end-of-line device. In-line splicing is also not recommended if the sensor cable is under any significant tension.

When used for proximity detection, loop the sensor cable, as the splice area does not provide detection coverage.

1. The sensor cable must be joined using nylon insulated compression butt splices (Panduit BSN18 or equal). Offset the two butt splices from each other.
2. Strip the jacket and insulation from each cable as shown in figure 7.Trim the two conductors with the offset as shown.

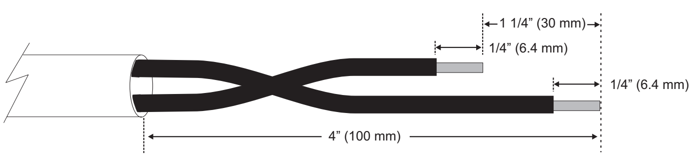

Figure 7. Strip the Sensor Cable

3. Crimp on the two butt splices as shown in figure 8, using an approved crimp tool (Panduit CT-1550 or equal).

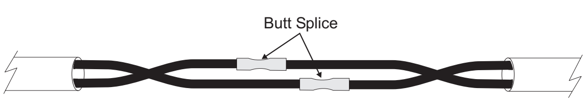

Figure 8. Crimp the Sensor Cable

4. For dry locations, seal the splice by wrapping electrical tape (3M/Scotch Super 33+ or equal) around the splice, following the manufacturer's instructions. Stretch and overlap each turn of the tape by about 1/2 its width. The tape should extend 2" (50 mm) beyond the ends where the sensor cable jacket was cut. See figure 9.

Figure 9. Seal the Splice

5. For damp or wet locations, seal the splice by wrapping silicon fusion tape (Tyco Electronics/Amp 608036-1 or equal) around the splice, following the manufacturer's instructions. The tape should extend 2" (50 mm) beyond the ends where the sensor cable jacket was cut. See figure 9.

TESTING

Functional testing of the LHS sensor cable should follow the guidelines for fixed-temperature non-restorable line type heat detectors in Chapter 7 of NFPA-72, National Fire Alarm Code. Consult with the AHJ for additional testing requirements that may apply to your specific installation. Functional testing verifies the electrical operation of the sensor cable and does not require a heat source.

1. Place a short across the end-of-line (EOL) device for an LHS zone, and verify that the zone goes into alarm.
2. (If required by the AHJ) Remove one leg of the EOL for an LHS zone, and verify that the zone goes into trouble.
3. (If required by the AHJ) Disconnect both conductors of the LHS zone from the FCP. Place a short across the EOL. At the FCP end of the zone, measure and record the total loop resistance of the sensor cable. Compare it to the acceptance test value.

MAINTENANCE

The LHS sensor cable requires no maintenance, other than visual inspection to insure the integrity of the installation.

Damage To The Sensor Cable:

If the sensor cable is physically damaged, the conductors may short together, causing an alarm. Locate the short circuit by visual inspection, by using an ohmmeter (comparing to the value obtained during the acceptance test), or by using a tone generator & probe set. Splice in a new piece of sensor cable. Replace at least 3 ft. (1 m) of the sensor cable on both sides of the damaged piece.

After A Fire Event:

As the LHS sensor cable is non-restoring, it must be replaced after detecting a fire. If the entire zone is not being replaced, splice in a new piece of sensor cable, <u>extending at least 10 ft. (3 m) beyond the affected section</u>.

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