PROTECTOWIRE® FireSystems


# Digital Linear Heat Detection: A Practical User Guide for Fire Protection Professionals

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# Forward

Since 1938, The Protectowire Company has manufactured linear heat detectors for the special hazard fire detection industry. As the originator of this technology, Protectowire continues to set the standard for quality and reliability worldwide from its headquarters in the United States.

The current edition of NFPA 72, National Fire Alarm and Signaling Code, provides foundational guidance on the application of linear heat detectors, including location and spacing requirements for area protection. This guide is intended to help the reader select the correct Protectowire linear heat detector for a given environment and ensure that protected areas are covered in accordance with accepted fire protection principles. Where two or more procedures are possible, always follow the one that results in greater protection.

The Protectowire Company, Inc. is the manufacturer only — not an application design or approval agency. Questions regarding site requirements, system design, and approvals should be directed to the Authority Having Jurisdiction (AHJ) and resolved in accordance with applicable codes and standards.

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## Product Description

Protectowire linear heat detectors (LHD) are designed to respond to heat at any point along their entire length. Each detector consists of two spring metal conductors individually encased in a heat-sensitive polymer. The conductors are twisted together under spring tension, then spirally wrapped with a protective tape and finished with an outer jacket. When the temperature at any point along the detector exceeds its rated activation temperature, the polymer softens and allows the conductors to make contact — creating an electrical short that initiates an alarm signal.

The current Protectowire digital product line includes two detector types:

- **PHSC & PLR Series** - operate in shorting mode
- **CTI™ Series (Confirmed Temperature Initiation™)** - operate in shorting mode with additional thermal confirmation.

Because each series has distinct installation requirements, PHSC/PLR and CTI™ detectors are addressed separately throughout this guide.

## PHSC & PLR Series Linear Heat Detectors

PHSC and PLR detectors are available in multiple temperature ratings to account for differences in normal ambient conditions. The same guidelines used to select temperature ratings for automatic sprinklers and other heat-actuated devices apply here. Refer to the Temperature Chart in this guide to select the appropriate model.

- **PHSC (Protectowire Heat Sensitive Cable)** — manufactured with two steel conductors
- **PLR (Protectowire Low Resistance)** — manufactured with special low-resistance conductors

PHSC (Protectowire Heat Sensitive Cable) models are manufactured with two steel conductors.


PLR (Protectowire Low Resistance) models are manufactured with special low resistance conductors.


## Temperature & Environmental Guidelines

Every linear heat detector has both a fixed initiation temperature and a maximum rated ambient temperature. Selecting the correct detector for the installation environment is critical.

When evaluating initiation temperature, consider all heat sources that may affect the detector — including ambient maximums, heat from machinery, periodic processes, vents, ducts, defrost cycles, and seasonal temperature increases.

*Table 1*

| | | |
|---|---|---|
| Ordinary | 135°F | 57°C |
| | 155°F | 68°C |
| Intermediate | 172°F | 78°C |
| | 190°F | 88°C |
| | 220°F | 105°C |
| High | 280°F | 138°C |
| Extra High | 356°F | 180°C |
| Ultra High | 500°F | 260°C |

Factors such as interior versus exterior installation, UV exposure, moisture, chemicals, cleaning or wash down cycles, vibration, and abrasion must be considered when selecting jacketing material suitable for the application.

All Protectowire linear heat detectors are rated to a minimum of -40°F (-40°C), with exception: the XLT and LSZH series, designed specifically for refrigerated storage and freezer environments, is rated to -60°F (-51°C).

For a complete listing of PHSC and PLR initiation temperatures and corresponding maximum ambient temperatures, refer to DS-6592.

**Jacket Materials:**

The installation environment determines which outer jacket is appropriate. Available options are:

**EPC** – (Extruded Polyvinyl Chloride) — A durable, flame-retardant vinyl jacket for interior commercial and industrial use. Offers low moisture absorption, resistance to common chemicals, and excellent flexibility at low temperatures.

**XCR** – (Extreme Corrosion Resistance) — A high-performance fluoropolymer jacket for exterior environments and harsh interior applications. Provides excellent chemical, abrasion, and weather resistance along with high-temperature performance. XCR is the only digital linear heat detector that is FM Approved for corrosive environments. Contact factory for details.

**XLT** – (Extreme Low Temperature) — Designed specifically for cold storage and freezer applications. Features low moisture absorption and reliable performance down to -60°F (-51°C), as tested by both UL and FM.

**LSZH** –(Low Smoke Zero Halogen) — A durable jacket for interior commercial and industrial use. Shares many characteristics with EPC, including low moisture absorption, chemical resistance, and low-temperature flexibility, with the added benefit of reduced smoke and no halogen emissions.

**EPR** – (Extruded Polypropylene Rubber) — Suitable for both interior and exterior installations. Offers good abrasion and chemical resistance along with weather durability across a wide temperature range.

## PHSC & PLR Integration

Protectowire must be installed in continuous runs. T-Taps prevent proper detector supervision and invalidate Protectowire's third-party listings; consequently, they are not permitted under NFPA 72.

The maximum length of each linear heat detector run is determined by the electrical characteristics of the supervising control equipment.

**When using Protectowire control equipment:** Refer to the appropriate operations manual for maximum detector length per Initiating Device Circuit (IDC).

**When using third-party control equipment**, the following must be verified:

- Protectowire operates as a normally open contact device which closes (shorts) upon activation. Protectowire LHD must be utilized only on initiating circuits, which can detect a contact closure (short) as an alarm condition.
- Protectowire is a resistive contact device. When Protectowire is installed on another manufacturer's control equipment the maximum length of Protectowire per IDC is determined by the electrical characteristics of that manufacturer's equipment. Consult third party manufacturers for compatibility.

*Table 2*

| PHSC & PLR Electrical Characteristics (twisted pair, typical) | | | |
|---|---|---|---|
| **Model** | **Resistance** | **Inductance** | **Capacitance** |
| PHSC | 0.185 Ω/ft (0.607 Ω/m) | 2.5uH/ft (8.2 uH/m) | 35pF/ft (115 pF/m) |
| PLR | 0.058 Ω/ft (0.191 Ω/m) | 2.5uH/ft (8.2 uH/m) | 35pF/ft (115 pF/m) |

# PHSC & PLR Temperature Chart

(Refer to the printed temperature chart for the full model matrix. A representative selection is shown below.)

## Outer Jackets Materials

**EPC:** PVC
**EPR:** Thermoplastic Elastomer
**XCR:** Fluoropolyer
**XLT:** Proprietary Polymer
**LSZH:** Low Smoke Zero Halogen

***Note: Colors shown are for illustrative purposes only. Actual jacket colors may vary.***


**PHSC–135–XLT | ALARM TEMP. 135°F (57°C)**
Ambient Temp. Max. 100°F (38°C) – Min. –60°F (–51°C)


**PHSC–135–LSZH | ALARM TEMP. 135°F (57°C)**
Ambient Temp. Max. 100°F (38°C) – Min. –60°F (–51°C)


**PLR–155–EPR | ALARM TEMP. 155°F (68°C)**
Ambient Temp. Max. 115°F (46°C) – Min. –40°F (–40°C)


**PHSC–155–EPC | ALARM TEMP. 155°F (68°C)**
Ambient Temp. Max. 115°F (46°C) – Min. –40°F (–40°C)


**PHSC–155–XCR | ALARM TEMP. 155°F (68°C)**
Ambient Temp. Max. 115°F (46°C) – Min. –40°F (–40°C)


**PHSC–155–LSZH | ALARM TEMP. 155°F (68°C)**
Ambient Temp. Max. 115°F (46°C) – Min. –40°F (–40°C)


**PHSC–172–EPC | ALARM TEMP. 172°F (78°C)**
Ambient Temp. Max. 130°F (54°C) – Min. –40°F (–40°C)


**PHSC–172–XCR | ALARM TEMP. 172°F (78°C)**
Ambient Temp. Max. 130°F (54°C) – Min. –40°F (–40°C)


**PLR–172–EPR | ALARM TEMP. 172°F (78°C)**
Ambient Temp. Max. 130°F (54°C) – Min. –40°F (–40°C)


**PHSC–172–LSZH | ALARM TEMP. 172°F (78°C)**
Ambient Temp. Max. 130°F (54°C) – Min. –40°F (–40°C)


**PHSC–190–EPC | ALARM TEMP. 190°F (88°C)**
Ambient Temp. Max. 150°F (66°C) – Min. –40°F (–40°C)


**PHSC–190–XCR | ALARM TEMP. 190°F (88°C)**
Ambient Temp. Max. 150°F (66°C) – Min. –40°F (–40°C)


**PLR–190–EPR | ALARM TEMP. 190°F (88°C)**
Ambient Temp. Max. 150°F (66°C) – Min. –40°F (–40°C)


**PHSC–190–LSZH | ALARM TEMP. 190°F (88°C)**
Ambient Temp. Max. 150°F (66°C) – Min. –40°F (–40°C)


**PHSC–220–EPC | ALARM TEMP. 220°F (105°C)**
Ambient Temp. Max. 175°F (79°C) – Min. –40°F (–40°C)


**PHSC–220–XCR | ALARM TEMP. 220°F (105°C)**
Ambient Temp. Max. 175°F (79°C) – Min. –40°F (–40°C)


**PHSC–220–LSZH | ALARM TEMP. 220°F (105°C)**
Ambient Temp. Max. 175°F (79°C) – Min. –40°F (–40°C)


**PHSC–280–EPC | ALARM TEMP. 280°F (138°C)**
Ambient Temp. Max. 200°F (93°C) – Min. –40°F (–40°C)


**PHSC–280–XCR | ALARM TEMP. 280°F (138°C)**
Ambient Temp. Max. 200°F (93°C) – Min. –40°F (–40°C)


**PHSC–280–LSZH | ALARM TEMP. 280°F (138°C)**
Ambient Temp. Max. 200°F (93°C) – Min. –40°F (–40°C)


**PHSC–356–EPC | ALARM TEMP. 356°F (180°C)**
Ambient Temp. Max. 221°F (105°C) – Min. –40°F (–40°C)


**PHSC–356–XCR | ALARM TEMP. 356°F (180°C)**
Ambient Temp. Max. 250°F (121°C) – Min. –40°F (–40°C)


**PHSC–356–LSZH | ALARM TEMP. 356°F (180°C)**
Ambient Temp. Max. 221°F (105°C) – Min. –40°F (–40°C)


**PLR–500–XCR | ALARM TEMP. 500°F (260°C)**
Ambient Temp. Max. 392°F (200°C) – Min. –40°F (–40°C)

# PHSC & PLR Maximum Ambient Temperature and Maximum Listed Spacing

| Product Type | Model Number | Alarm Temperature | Max. Ambient Temperature | UL/cUL Approval/ Max. Listed Spacing | FM Approval/ Max. Listed Spacing |
|---|---|---|---|---|---|
| **PHSC-EPC** Multi-Purpose/ Commercial & Industrial Applications | PHSC-155-EPC | 155°F (68°C) | 115°F (46°C)* | 50 ft. / 15.2m | 30 ft. / 9.1m |
| | PHSC-172-EPC | 172°F (78°C) | 130°F (54°C) | 50 ft. / 15.2m | 30 ft. / 9.1m |
| | PHSC-190-EPC | 190°F (88°C) | 150°F (66°C) | 50 ft. / 15.2m | 30 ft. / 9.1m |
| | PHSC-220-EPC | 220°F (105°C) | 175°F (79°C)* | 50 ft. / 15.2m | 25 ft. / 7.6m |
| | PHSC-280-EPC | 280°F (138°C) | 200°F (93°C) | 50 ft. / 15.2m | 25 ft. / 7.6m |
| | PHSC-356-EPC | 356°F (180°C) | 221°F (105°C) | 50 ft. / 15.2m | See Note 1 |
| **PHSC-XCR** High Performance/ Industrial Applications Excellent Abrasion & Chemical Resistance | PHSC-155-XCR | 155°F (68°C) | 115°F (46°C)* | 50 ft. / 15.2m | 30 ft. / 9.1m |
| | PHSC-172-XCR | 172°F (78°C) | 130°F (54°C) | 50 ft. / 15.2m | 30 ft. / 9.1m |
| | PHSC-190-XCR | 190°F (88°C) | 150°F (66°C) | 50 ft. / 15.2m | 30 ft. / 9.1m |
| | PHSC-220-XCR | 220°F (105°C) | 175°F (79°C)* | 50 ft. / 15.2m | 25 ft. / 7.6m |
| | PHSC-280-XCR | 280°F (138°C) | 200°F (93°C) | 50 ft. / 15.2m | 25 ft. / 7.6m |
| | PHSC-356-XCR | 356°F (180°C) | 250°F (121°C) | 50 ft. / 15.2m | See Note 1 |
| **PHSC- LSZH** Multi-Purpose/Low Smoke Zero Halogen | PHSC-135-LSZH | 135°F (57°C) | 100°F (38°C) | 50 ft. / 15.2m | 30 ft. / 9.1m |
| | PHSC-155-LSZH | 155°F (68°C) | 115°F (46°C)* | 50 ft. / 15.2m | 30 ft. / 9.1m |
| | PHSC-172-LSZH | 172°F (78°C) | 130°F (54°C) | 50 ft. / 15.2m | 30 ft. / 9.1m |
| | PHSC-190-LSZH | 190°F (88°C) | 150°F (66°C) | 50 ft. / 15.2m | 30 ft. / 9.1m |
| | PHSC-220-LSZH | 220°F (105°C) | 175°F (79°C)* | 50 ft. / 15.2m | 25 ft. / 7.6m |
| | PHSC-280-LSZH | 280°F (138°C) | 200°F (93°C) | 50 ft. / 15.2m | 25 ft. / 7.6m |
| | PHSC-356-LSZH | 356°F (180°C) | 221°F (121°C) | 50 ft. / 15.2m | See Note 1 |
| **PHSC- XLT** Multi-Purpose/Excellent Low Temp. Properties | PHSC-135-XLT | 135°F (57°C) | 100°F (38°C) | 50 ft. / 15.2m | 30 ft. / 9.1m |
| **PLR-EPR** Good Weathering Properties & Flexibility Over a Wide Temperature Range | PLR-155-EPR | 155°F (68°C) | 115°F (46°C)* | 50 ft. / 15.2m | 30 ft. / 9.1m |
| | PLR-172-EPR | 172°F (78°C) | 130°F (54°C) | 50 ft. / 15.2m | 30 ft. / 9.1m |
| | PLR-190-EPR | 190°F (88°C) | 150°F (66°C) | 50 ft. / 15.2m | 30 ft. / 9.1m |
| **PLR-XCR** High Performance/ Industrial Applications Excellent Abrasion & Chemical Resistance | PLR-500-XCR | 500°F (260°C) | 392°F (200°C) | 50 ft. / 15.2m | See Note 1 |

* For open area applications, the UL 521 recommended maximum ambient is 100°F (38°C) for PHSC-155 models and 150°F (66°C) for PHSC-220 models. Values in the table are acceptable for UL Special Application use.

Note 1: FM Approved for special application use only.

Polarity must be maintained: Copper conductor = (+)Positive; Silver/Gray conductor = (–) Negative.

All PHSC models are available on Messenger Wire; add suffix “-M” to the model number.

All detectors are rated to -40°F (-40°C) except PHSC-135-XLT and PHSC-135-LSZH, which are rated to -60°F (-51°C).

## Class A and Class B Configurations

Protectowire PHSC and PLR detectors are approved as heat-actuated automatic fire detectors for use on supervised initiating circuits of an approved fire protection signaling control unit. The detector must be installed in continuous runs — no T-taps or branches — in accordance with NFPA 70, NFPA 72, and any local regulations.

Initiating Device Circuits (IDCs) are designated Class A or Class B based on their ability to transmit alarm and trouble signals during a single circuit fault condition.

*The following descriptions are paraphrased. Refer to the noted sections of NFPA 72 (2025) for exact language.*

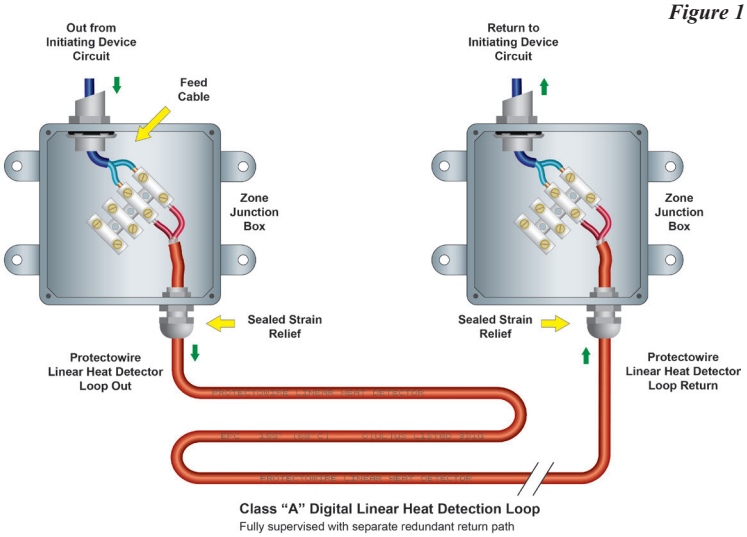
### CLASS A CONFIGURATION

*NFPA72 (2025) Standard reference 12.3.1*

**Class A.** A pathway designated as Class A will perform as follows:

1. A redundant path is included.
2. Operation will continue past a single open, and a single open results in a trouble signal.
3. Any condition that affects the intended operation of the path results in a trouble signal.
4. Operation is maintained during a single ground fault to either conductor.

*Figure 1*



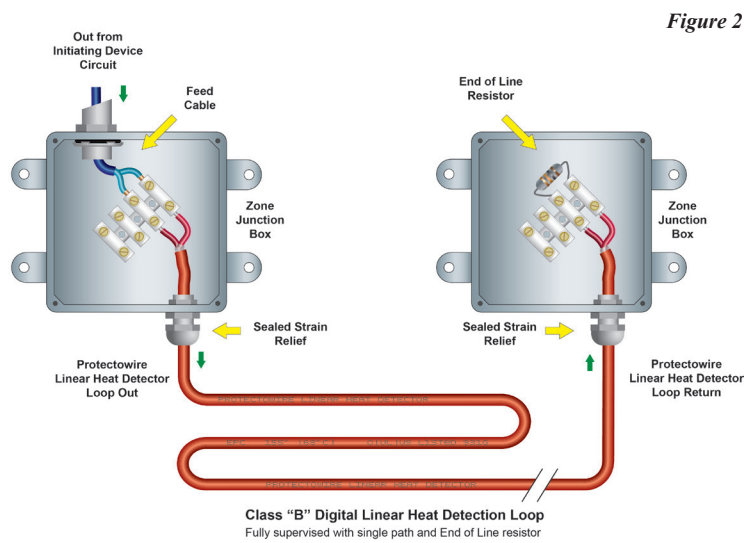

### CLASS B CONFIGURATION

*NFPA72 (2025) Standard reference 12.3.2*

**Class B.** A pathway designated as Class B will perform as follows:

1. No redundant path is included.
2. Operation will stop at a single open.
3. Conditions that affect the intended operation of the path are annunciated as a trouble signal.

*Figure 2*



## Copper Feed Cable

Regardless of circuit class, basic wiring practices for PHSC and PLR installations remain the same.

All electrical connections within each zone box — between the detector and the circuit's interconnecting copper wire or end-of-line device — must be made using compression terminals. Protectowire PHSC and PLR zone boxes include a PWSC compression terminal that accepts direct connection of Protectowire conductors. Wire nuts and similar devices are prohibited.

**Important:** All Protectowire linear heat detectors require a minimum bend radius of 2.5 inches (6.4 cm).Exceeding this minimum may permanently damage the detector.

*Figure 3*

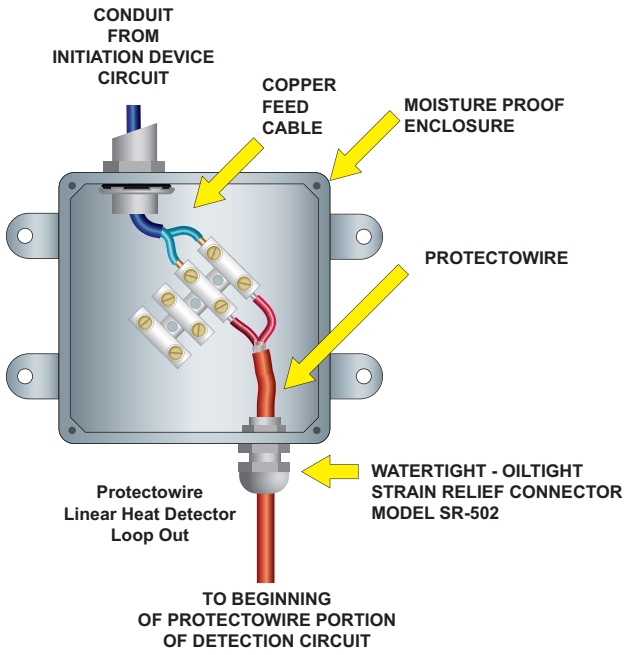



*Table 3*

**Maximum Copper Feed Cable Length**
**Protectowire Control Equipment IDCs**
(Max. Resistance 100 ohms)

| American Wire Gauge | Diameter | Max length of 2 conductor cable |
|---|---|---|
| #18 | 1.02mm | 7,600ft (2,316m) |
| #16 | 1.27mm | 12,200ft (3,719m) |
| #14 | 1.63mm | 19,400ft (5,913m) |
| #12 | 2.05mm | 30,800ft (9,388m) |

## Classified Hazard Information:

Protectowire uses intrinsically safe (IS) circuitry for classified hazard installations. An IS circuit limits electrical energy under normal operating conditions to prevent ignition of vapors, gases, or dust. Protectowire linear heat detection cable is not explosion-proof and does not employ explosion-proof methods for initiating device circuits in classified hazards.

For classified hazard installations, Protectowire offers solutions using the PHSC and PLR series in conjunction with an Intrinsically Safe Barrier (ISB) and Protectowire control equipment.

- FM-Approved IS installations: The applicable FM-Approved Protectowire control drawing must be followed.
- Third-party IS installations: Consult the third-party manufacturer for listings, approvals, calculations, and compatibility.

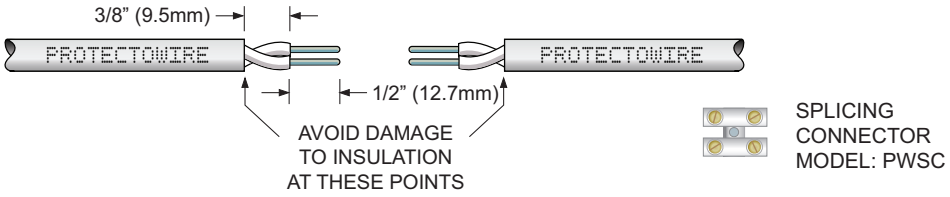
Wiring methods must comply with all applicable local codes and standards for the classified location. Refer to NEC NFPA 70, Article 500; ISA Standards and Recommended Practices (ISARPs) 12.6; and any locally adopted codes. Bonding and sealing requirements are addressed in NFPA 70 Articles 504.6 and 504.7. Obtain AHJ approval prior to installation.

## Splicing PHSC and PLR series.

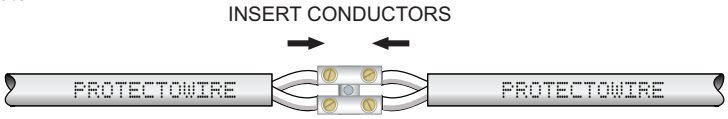
PHSC and PLR detectors can be field spliced. Splicing method selection depends on the installation environment. Splices should be kept to a minimum and must maintain moisture-free connections.

# PWSC Splicing Instructions
# Protectowire PHSC and PLR Linear Heat Detectors

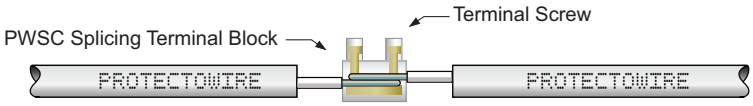
1.) Remove outer jacket insulation from each wire leaving 1/2" (12.7mm) of bare conductor and preserving 3/8" (10mm) of inner conductor insulation as shown.



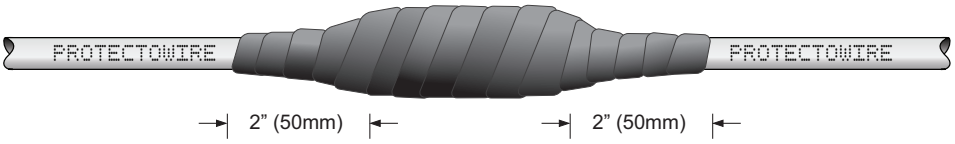

2.) Connect wires as shown below making sure the entire 1/2" (12.7mm) of the bare conductors is embeded within the connector.



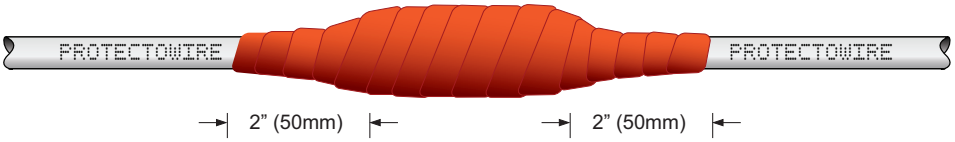

3.) Secure the "PROTECTOWIRE" by tightening the connector screws. Plastic screw turrets may be trimmed with snips or utility knife for easier taping in the next step.




4.) Using SFTS sealant tape, wrap the splice terminal starting 2" (50mm) before the terminal and ending 2" (50mm) after. Stretch the sealant tape while applying and overlap the tape by approximately 1/2 the width of the tape.

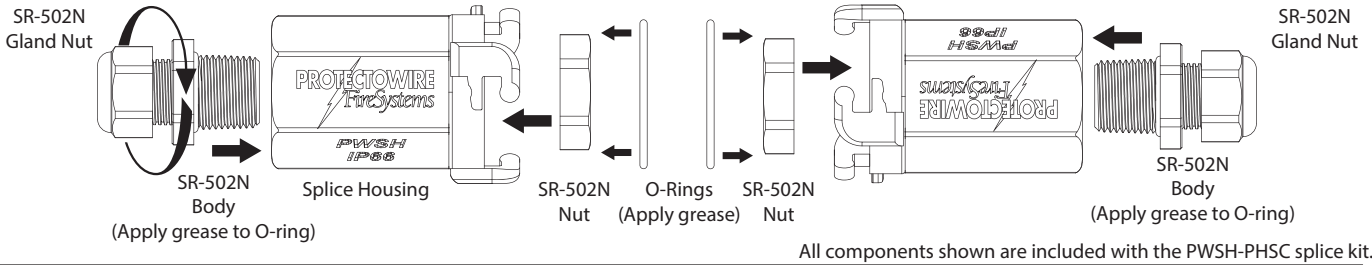



5.) Overwrap the SFTS sealant tape with 1/2" (12.7mm) electrical tape. Scotch brand Super 33+, 35 or equivalent tape suitable for the environment.



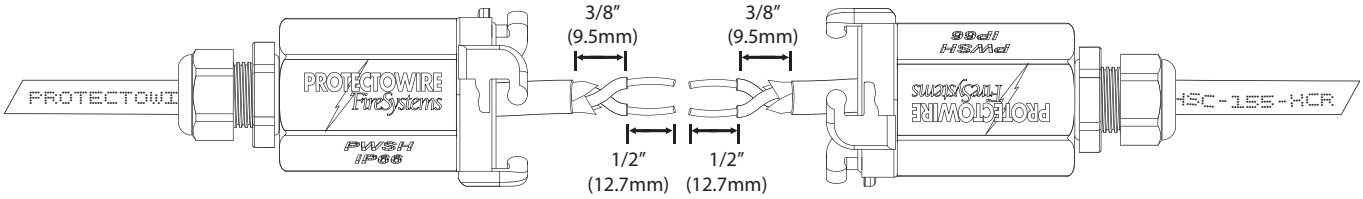
# PWSH-PHSC Splicing Instructions
# Protectowire PHSC and PLR Linear Heat Detectors

**Step 1.** - Assemble the PWSH connector housing by inserting the SR-502N cable glands into each housing as shown then insert the cable gland nut and tighten to 33.2 in-lbs. (3.75 Nm). Insert the included PWSH O-rings within the connector housings O-ring seat.
*Note: It is recommended that all o-rings are lubricated with a silicone grease before tightening.*

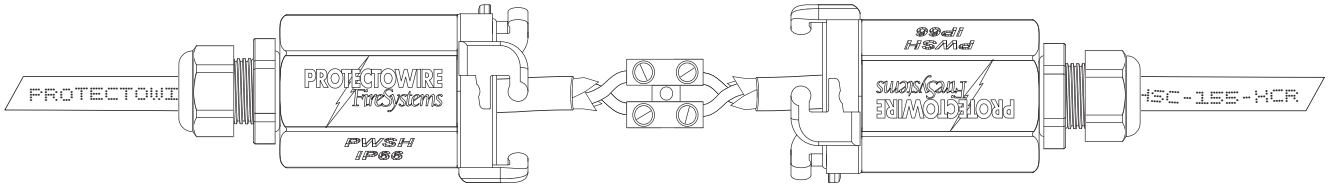



All components shown are included with the PWSH-PHSC splice kit.

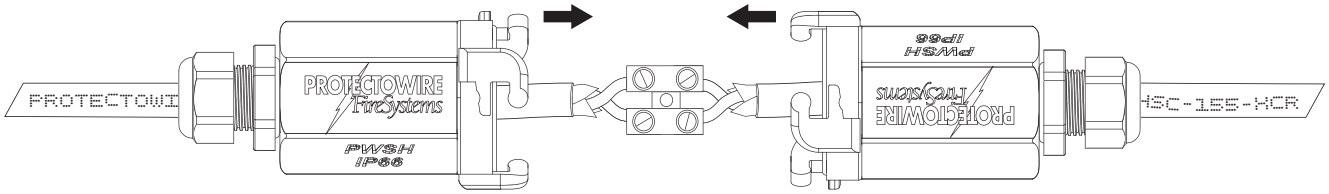
**Step 2.** - Insert each end of the Protectowire linear heat detector through the SR-502N cable gland. Strip each end of the detector to the dimensions shown.



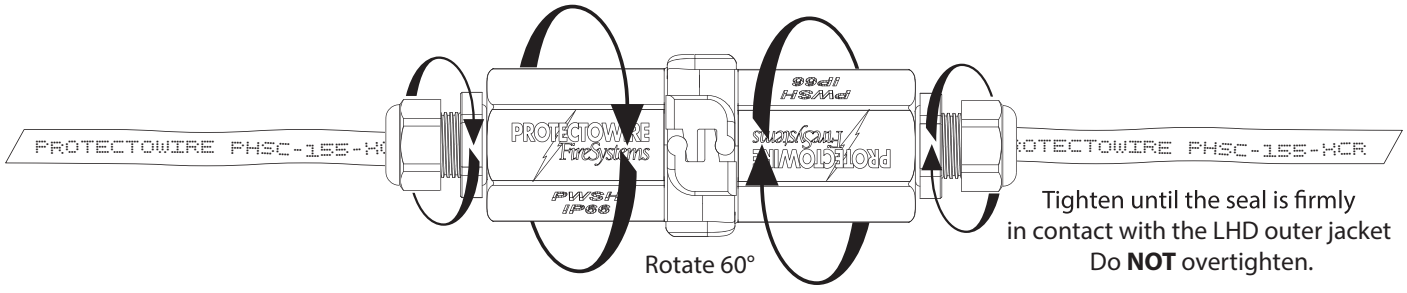

**Step 3.** - Insert each conductor of the Protectowire linear heat detector into the PWSC terminals. Be sure each conductor is below two compression terminals. Tighten each of the four screw terminals and confirm each conductor is compressed below both terminals.



**Step 4.** - Slide each PWSH housing over the PWSC connector. The PWSH housings should be rotated 60° counter clockwise to allow the locking tabs to bypass each other.



**Step 5.** - Rotate the PWSH housings clockwise 60° while pressing them together to compress the O-rings and interlock the locking tabs. Rotate the SR-502N cable gland nuts to 22.1in-lbs (2.5 Nm) until the gland seals make firm contact with the outer jacket of the linear heat detector.
*Note: It is recommended that all o-rings are lubricated with a silicone grease before tightening.*



## CTI™ Series Linear Heat Detectors

**Confirmed Temperature Initiation™ (CTI™)**

The Protectowire CTI™ Series uses Confirmed Temperature Initiation™ technology — a multi-criteria approach that distinguishes between a heat-initiated alarm and a mechanical short or wiring fault. This short-circuit discrimination capability significantly reduces nuisance alarms and is a feature unique to the CTI™ series.

CTI™ technology requires both the CTI™ linear heat detection cable and a CTM interface module. The two components must be used together; CTI™ detectors are not compatible with standard shorting-mode control equipment.

As with PHSC and PLR series detectors, T-Taps are strictly prohibited on CTI™ installations. T-Taps prevent proper detector supervision and invalidate Protectowire's third-party listings; consequently, they are not permitted under NFPA 72.


## Temperature & Environmental Guidelines

Selection guidelines for CTI™ series detectors follow the same principles as the PHSC and PLR series. Evaluate both the initiation temperature and the jacketing material relative to the installation environment. All factors —ambient temperature, added heat sources, moisture, chemicals, UV exposure, mechanical stress, and vibration— must be considered.

*Table 4*

| | | |
|---|---|---|
| Ordinary | 135°F | 57°C |
| | 155°F | 68°C |
| Intermediate | 190°F | 88°C |
| | 220°F | 105°C |
| High | 280°F | 138°C |
| Extra High | 356°F | 180°C |

All CTI™ detectors are rated to a minimum of -40°F (-40°C), with the exception: the XLT and LSZH series, which is rated to -60°F(-51°C) for refrigerated and controlled-temperature applications. Refer to DS-9246 for complete CTI™ temperature and ambient specifications.

**Jacket Materials:**

Protectowire linear heat detectors are manufactured with multiple outer jacket options. The installation environment dictates which outer jacket is most suitable for the application. Below is a description of available outer jackets:

**EPC** – (Extruded Polyvinyl Chloride) – is a durable flame-retardant vinyl outer jacket and is designed for interior commercial and industrial applications. Features of this jacket include low moisture absorption, resistance to many common chemicals, and excellent flexibility at low temperatures.

**XCR** – (Extreme Corrosion Resistance) – is a high-performance fluoropolymer jacket and is designed for exterior environments as well as harsh interior applications. Features of this low smoke jacket include excellent chemical, abrasion, and weather resistance, as well as high-temperature performance. XCR is the only detector that is FM Approved for corrosive environments. Contact factory for details.

**XLT** – (Extreme Low Temperature) – is an outer jacket that is specifically designed for cold storage and freezers. Features of this jacket include low moisture absorption and excellent performance in extremely low temperatures. This detector has been UL and FM tested to –60°F (–51°C).

**LSZH** – (Low Smoke Zero Halogen) – is a durable low smoke zero halogen outer jacket and is designed for interior commercial and industrial applications. Features of this jacket include low moisture absorption, resistance to many common chemicals, and excellent flexibility at low temperatures.

## CTI™ Integration

CTI™ linear heat detectors work in conjunction with either the CTM-530 or CTM-230 interface module. The CTM module monitors the detector and classifies events accordingly:

- Break in the detector » Open Fault condition
- Mechanical damage to the detector » Short Fault condition
- Thermal event at or above rated alarm temperature » Alarm condition

Each CTM interface module is compatible with both conventional and addressable fire alarm control panel IDCs via provided relay contacts. Refer to the CTM-530 (MAN-2006) or CTM-230 (MAN-2009) manual for full integration details.

## CTI™ Temperature Chart

**Outer Jacket Materials**

**EPC:** PVC
**XCR:** Fluoropolyer
**XLT:** Proprietary Polymer
**LSZH:** Low Smoke Zero Halogen


**CTI–135–XLT | ALARM TEMP. 135°F (57°C)**
Ambient Temp. Max. 100°F (38°C) – Min. –60°F (–51°C)


**CTI–135–LSZH | ALARM TEMP. 135°F (57°C)**
Ambient Temp. Max. 100°F (38°C) – Min. –60°F (–51°C)


**CTI–155–EPC | ALARM TEMP. 155°F (68°C)**
Ambient Temp. Max. 115°F (46°C) – Min. –40°F (–40°C)


**CTI–155–XCR | ALARM TEMP. 155°F (68°C)**
Ambient Temp. Max. 115°F (46°C) – Min. –40°F (–40°C)

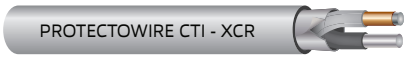

**CTI–155–LSZH | ALARM TEMP. 155°F (68°C)**
Ambient Temp. Max. 115°F (46°C) – Min. –40°F (–40°C)


**CTI–190–EPC | ALARM TEMP. 190°F (88°C)**
Ambient Temp. Max. 150°F (66°C) – Min. –40°F (–40°C)


**CTI–190–XCR | ALARM TEMP. 190°F (88°C)**
Ambient Temp. Max. 150°F (66°C) – Min. –40°F (–40°C)


**CTI–190–LSZH | ALARM TEMP. 190°F (88°C)**
Ambient Temp. Max. 150°F (66°C) – Min. –40°F (–40°C)


**CTI–220–EPC | ALARM TEMP. 220°F (105°C)**
Ambient Temp. Max. 175°F (79°C) – Min. –40°F (–40°C)




**CTI–220–XCR | ALARM TEMP. 220°F (105°C)**
Ambient Temp. Max. 175°F (79°C) – Min. –40°F (–40°C)


**CTI–220–LSZH | ALARM TEMP. 220°F (105°C)**
Ambient Temp. Max. 175°F (79°C) – Min. –40°F (–40°C)


**CTI–280–EPC | ALARM TEMP. 280°F (138°C)**
Ambient Temp. Max. 200°F (93°C) – Min. –40°F (–40°C)


**CTI–280–XCR | ALARM TEMP. 280°F (138°C)**
Ambient Temp. Max. 200°F (93°C) – Min. –40°F (–40°C)


**CTI–280–LSZH | ALARM TEMP. 280°F (138°C)**
Ambient Temp. Max. 200°F (93°C) – Min. –40°F (–40°C)


**CTI–356–EPC | ALARM TEMP. 356°F (180°C)**
Ambient Temp. Max. 221°F (105°C) – Min. –40°F (–40°C)


**CTI–356–XCR | ALARM TEMP. 356°F (180°C)**
Ambient Temp. Max. 250°F (121°C) – Min. –40°F (–40°C)


**CTI–356–LSZH | ALARM TEMP. 356°F (180°C)**
Ambient Temp. Max. 221°F (105°C) – Min. –40°F (–40°C)

***Note: Colors shown are for illustrative purposes only. Actual jacket colors may vary***

## CTI™ Maximum Ambient Temperature and Maximum Listed Spacing

| Product Type | Model Number | Alarm Temperature | Max. Ambient Temperature | UL/cUL Approval/ Max. Listed Spacing | FM Approval/ Max. Listed Spacing |
|---|---|---|---|---|---|
| **CTI-EPC** Multi-Purpose/ Commercial & Industrial Applications | CTI-155-EPC | 155°F (68°C) | 115°F (46°C)* | 50 ft. / 15.2m | 30 ft. / 9.1m |
| | CTI-190-EPC | 190°F (88°C) | 150°F (66°C) | 50 ft. / 15.2m | 30 ft. / 9.1m |
| | CTI-220-EPC | 220°F (105°C) | 175°F (79°C)* | 50 ft. / 15.2m | 25 ft. / 7.6m |
| | CTI-280-EPC | 280°F (138°C) | 200°F (93°C) | 50 ft. / 15.2m | 25 ft. / 7.6m |
| | CTI-356-EPC | 356°F (180°C) | 221°F (105°C) | 50 ft. / 15.2m | See Note 1 |
| **CTI-XCR** High Performance/ Industrial Applications Excellent Abrasion & Chemical Resistance | CTI-155-XCR | 155°F (68°C) | 115°F (46°C)* | 50 ft. / 15.2m | 30 ft. / 9.1m |
| | CTI-190-XCR | 190°F (88°C) | 150°F (66°C) | 50 ft. / 15.2m | 30 ft. / 9.1m |
| | CTI-220-XCR | 220°F (105°C) | 175°F (79°C)* | 50 ft. / 15.2m | 25 ft. / 7.6m |
| | CTI-280-XCR | 280°F (138°C) | 200°F (93°C) | 50 ft. / 15.2m | 25 ft. / 7.6m |
| | CTI-356-XCR | 356°F (180°C) | 250°F (121°C) | 50 ft. / 15.2m | See Note 1 |
| **CTI-LSZH** Multi-Purpose/Low Smoke Zero Halogen | CTI-135-LSZH | 135°F (57°C) | 100°F (38°C) | 50 ft. / 15.2m | 30 ft. / 9.1m |
| | CTI-155-LSZH | 155°F (68°C) | 115°F (46°C)* | 50 ft. / 15.2m | 30 ft. / 9.1m |
| | CTI-190-LSZH | 190°F (88°C) | 150°F (66°C) | 50 ft. / 15.2m | 30 ft. / 9.1m |
| | CTI-220-LSZH | 220°F (105°C) | 175°F (79°C)* | 50 ft. / 15.2m | 25 ft. / 7.6m |
| | CTI-280-LSZH | 280°F (138°C) | 200°F (93°C) | 50 ft. / 15.2m | 25 ft. / 7.6m |
| | CTI-356-LSZH | 356°F (180°C) | 221°F (105°C) | 50 ft. / 15.2m | See Note 1 |
| **CTI-XLT** Multi-Purpose/Excellent Low Temp. Properties | CTI-135-XLT | 135°F (57°C) | 100°F (38°C) | 50 ft. / 15.2m | 30 ft. / 9.1m |

* For open area applications, the UL 521 recommended maximum ambient is 100°F (38°C) for CTI-155 models and 150°F (66°C) for CTI-220 models. Values in the table are acceptable for UL Special Application use.

Note 1: FM Approved for special application use only.

Polarity must be maintained: Copper conductor = (+)Positive; Silver/Gray conductor = (–) Negative.

All CTI™ models are available on Messenger Wire; add suffix "-M" to the model number.

All detectors are rated to -40°F (-40°C) except CTI-135-XLT and CTI-135-LSZH, which are rated to -60°F (-51°C).

## CTM Series Interface Modules

The CTM series interface module allows the CTI™ detector to be connected to a main fire alarm panel (or addressable node) and the CTI™ linear heat detector.

Each module provides one supervised detection circuit, field-configurable for either Class A or Class B wiring. The CTM IDC can supervise a maximum combined length of 4,000 feet (1,220 m) of CTI™ detector and Type T thermocouple feed cable.

**Important:** The CTM IDC is designed exclusively for use with Protectowire CTI™ series detectors. It does not support other normally-open contact alarm initiating devices.

## CTI™ Class A and Class B Configurations

CTI™ detectors and CTM modules must be installed in continuous runs — no T-taps or branches — in accordance with NFPA 70, NFPA 72, and local AHJ requirements. Class A and Class B circuit definitions are the same as described in the PHSC/PLR section.

For CTI™ Class A installations, the Type TX thermocouple feed cable routes both the outgoing and return legs of the circuit through the CTI™ zone junction boxes.

For CTI™ Class B installations, the circuit terminates at an end-of-line resistor box at the far end of the detection run.

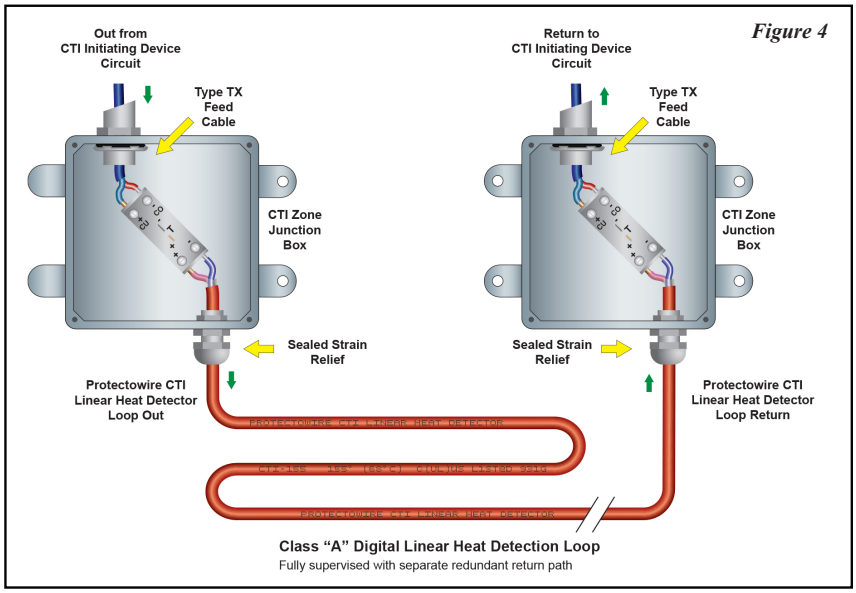
### CLASS A CONFIGURATION

*NFPA72 (2025) Standard reference 12.3.1*

**Class A.** A pathway designated as Class A will perform as follows:

1. A redundant path is included.
2. Operation will continue past a single open, and a single open results in a trouble signal.
3. Any condition that affects the intended operation of the path results in a trouble signal.
4. Operation is maintained during a single ground fault to either conductor.

*Figure 4*



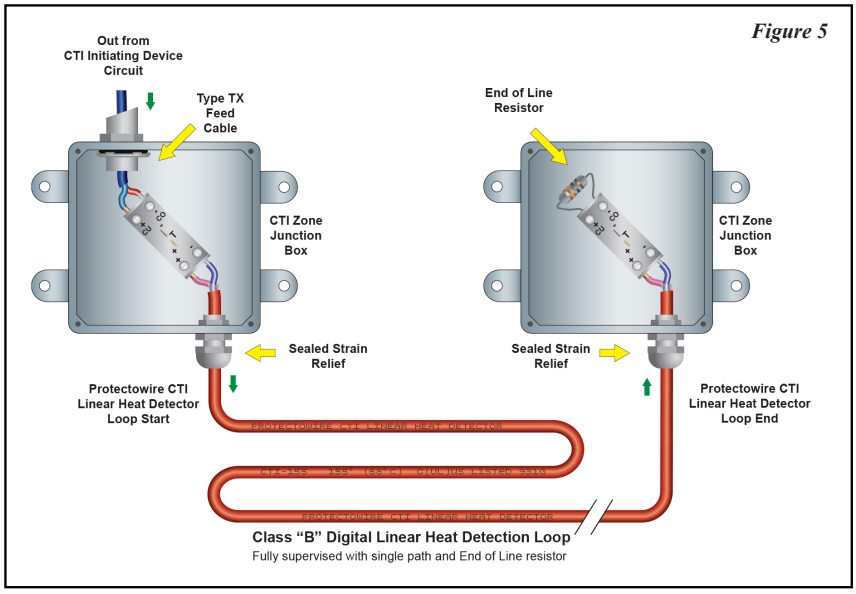

### CLASS B CONFIGURATION

*NFPA72 (2025) Standard reference 12.3.2*

**Class B.** A pathway designated as Class B will perform as follows:

1. No redundant path is included.
2. Operation will stop at a single open.
3. Conditions that affect the intended operation of the path are annunciated as a trouble signal.

*Figure 5*



## TYPE T THERMOCOUPLE EXTENSION CABLE:

Standard copper wire cannot be used as feed cable on CTM IDC circuits. Using copper feed cable creates a parasitic junction that degrades temperature accuracy. Protectowire offers Type T thermocouple-grade extension cable in two configurations:

PWTX-200 — 200ft (60m) spool

PWTX-500 — 500ft (152m) spool

**Note:** PWTX thermocouple cable is not approved for classified hazard installations.

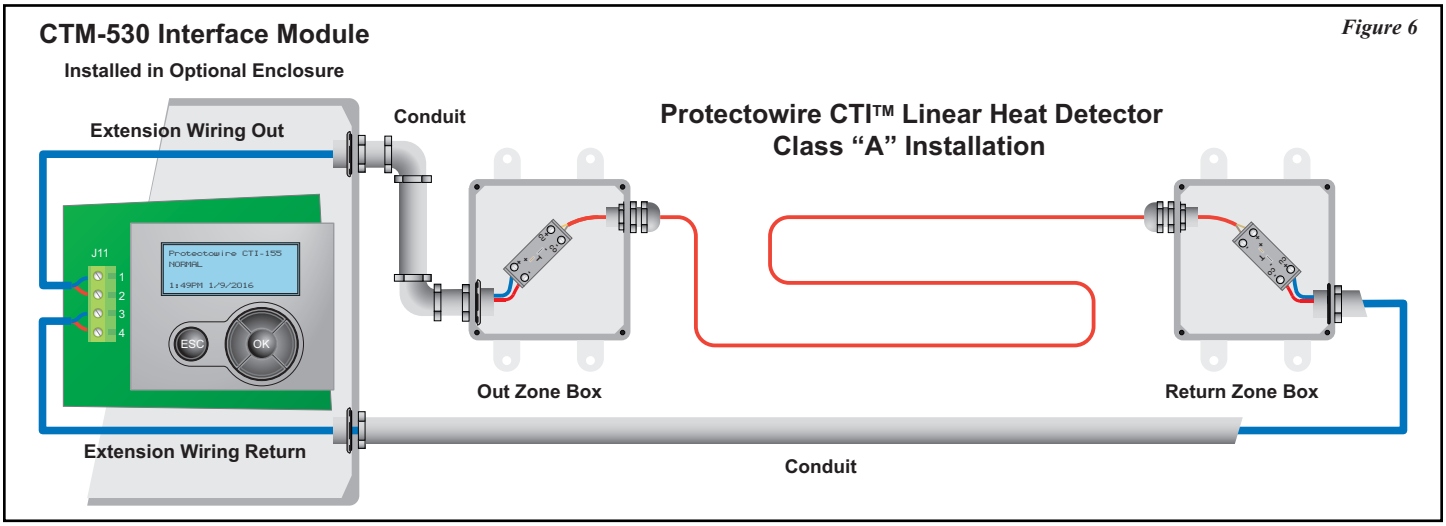



*Figure 6*

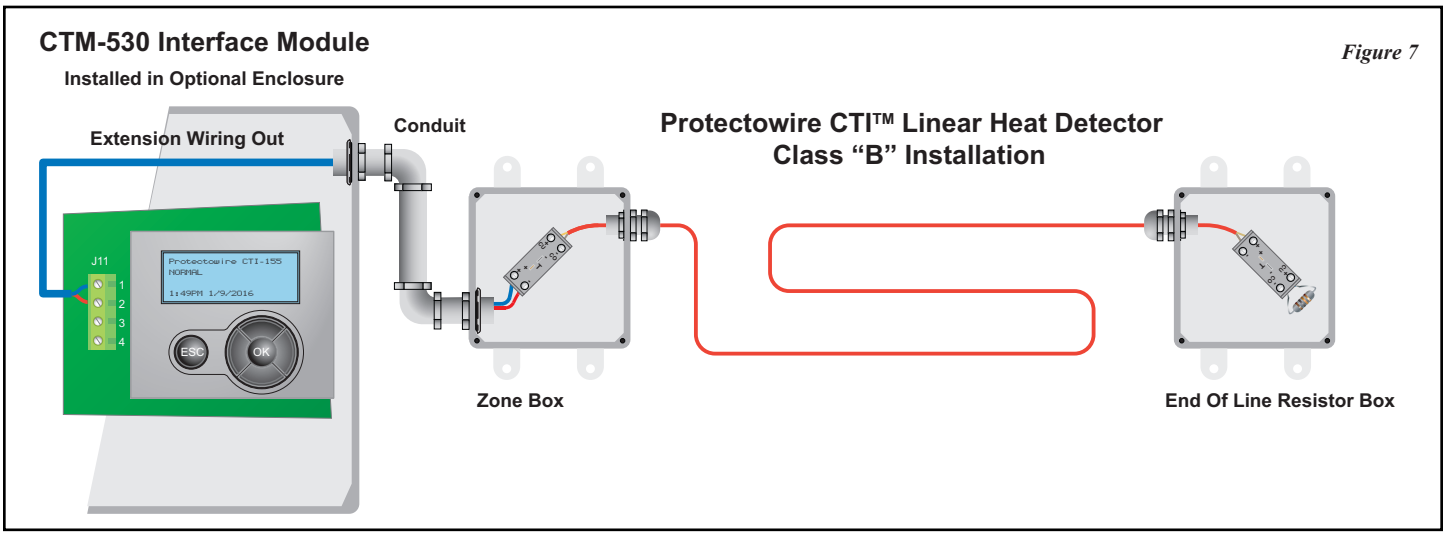



*Figure 7*

## CLASSIFIED HAZARD INFORMATION FOR CTI™

CTI™ series detectors use the same intrinsically safe approach to classified hazard installations as the PHSC/PLR series, with one difference: the CTI™ classified hazard solution uses an ISB with the Protectowire CTM interface module. When installing an FM-Approved IS Protectowire solution with CTI™ detectors, follow control drawing IL-1622.

All other classified hazard requirements — wiring methods, NEC Article 500, NFPA 70 Articles 504.6/504.7, and AHJ consultation — are the same as described in the PHSC/PLR Classified Hazard section.

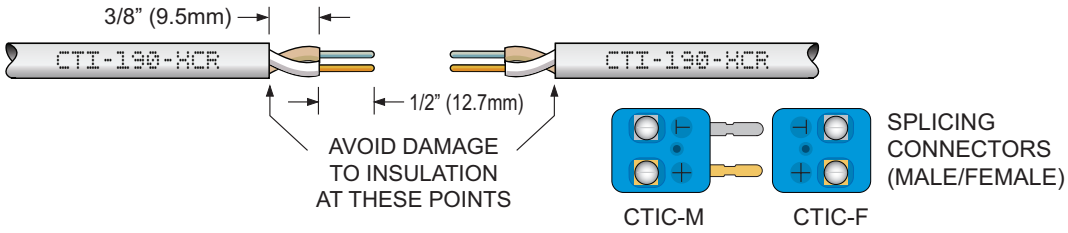
## Splicing CTI™ series

CTI™detectors can be field spliced using either the CTIC tape-and-terminal method or the PWSH-CTI weatherproof housing method.

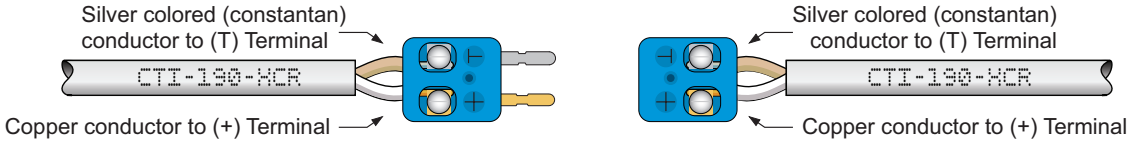
**Important:** CTI™ conductors are polarity-sensitive. The copper conductor always connects to the (+) terminal; the silver-colored (constantan) conductor always connects to the (T) terminal. Reversing polarity will prevent proper CTI™ operation.

# CTIC Splicing Instructions
# Protectowire CTI™ Linear Heat Detectors

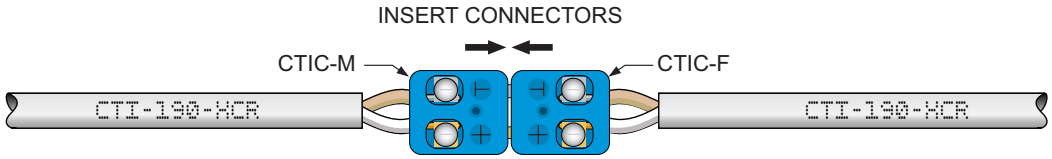
1.) Remove outer jacket insulation from each wire leaving 1/2" (12.7mm) of bare conductor and preserving 3/8" (9.5mm) of inner conductor insulation as shown.



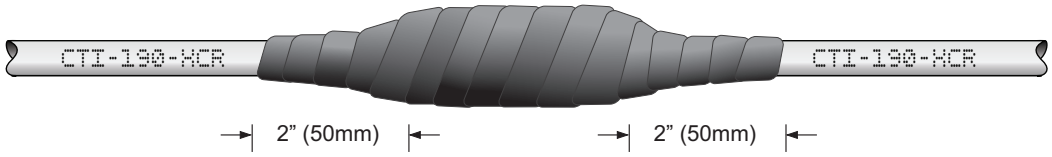

2.) Connect wires as shown below making sure the entire 1/2" (12.7mm) of the bare conductors is embeded within the connector and secured tightly below the screw head of the compression terminal.



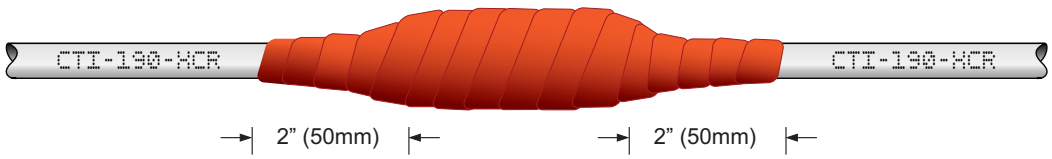

3.) Insert the male connector into the female connector.




4.) Using SFTS sealant tape, wrap the splice terminal starting 2" (50mm) before the terminal and ending 2" (50mm) after. Stretch the sealant tape while applying and overlap the tape by approximately 1/2 the width of the tape.

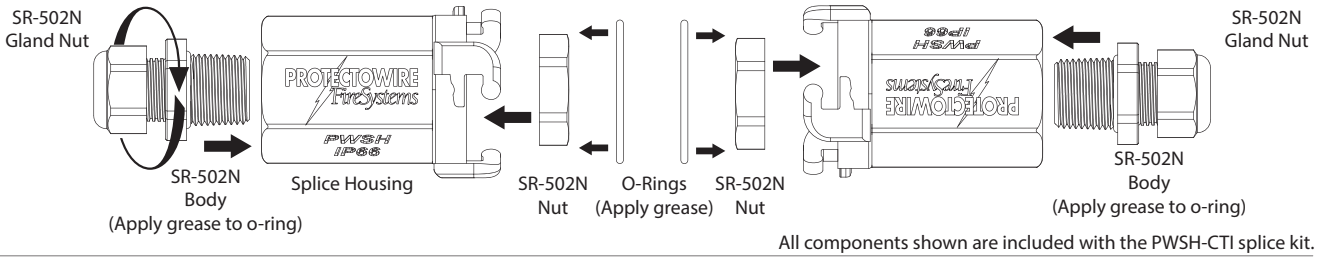



5.) Overwrap the SFTS sealant tape with 1/2" (12.7mm) electrical tape. Scotch brand Super 33+, 35 or equivalent tape suitable for the environment.



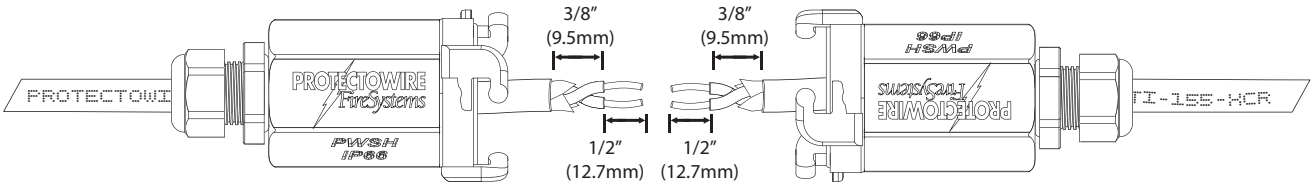
# PWSH-CTI Splicing Instructions
# Protectowire CTI™ Linear Heat Detectors

**Step 1.** - Assemble the PWSH connector housing by inserting the SR-502N cable glands into each housing as shown then insert the cable gland nut and tighten to 33.2 in-lbs. (3.75 Nm). Insert the included PWSH O-rings within the connector housings O-ring seat.
*Note: It is recommended that all o-rings are lubricated with a silicone grease before tightening.*

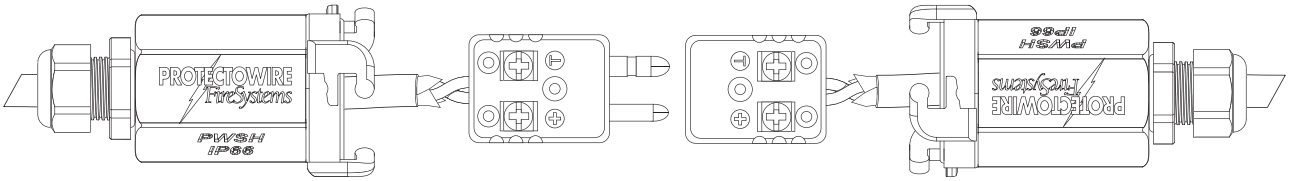



All components shown are included with the PWSH-CTI splice kit.

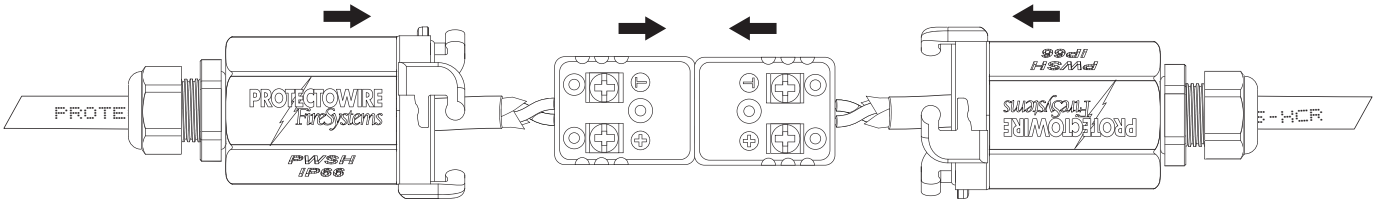
**Step 2.** - Insert each end of the CTI™ linear heat detector through the SR-502N cable gland. Strip each end of the detector to the dimensions shown.



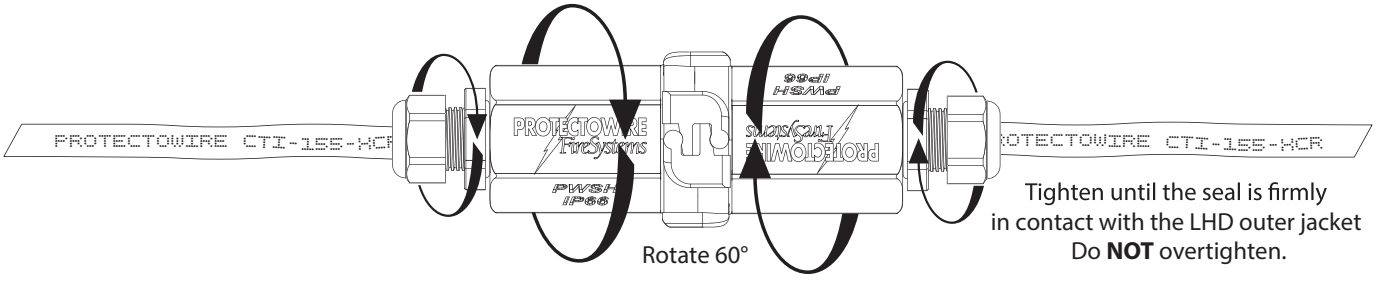

**Step 3.** - Insert each conductor of the CTI™ linear heat detector into the CTIC terminals being sure to observe the correct polarity. The copper conductor is always positive and the silver conductor is always negative. Ensure each screw is well tightend and captures each conductor.



**Step 4.** - Plug the male and female CTIC connectors together then slide each PWSH housing over the connectors. The PWSH housings should be rotated 60° counter clockwise to allow the locking tabs to bypass each other.



**Step 5.** - Rotate the PWSH housings clockwise 60° while pressing them together to compress the O-rings and interlock the locking tabs. Rotate the SR-502N cable gland nuts to 22.1in-lbs (2.5 Nm) until the gland seals make firm contact with the outer jacket of the Linear Heat Detector.
*Note: It is recommended that all o-rings are lubricated with a silicone grease before tightening.*



***The following sections apply to both PHSC/PLR and CTI™ series detectors.***

## Linear Heat Detection Location & Spacing

Protectowire detectors can be installed for either open area detection or proximity detection.

### SPACING

All Protectowire detectors have been tested to UL 521 and/or FM 3210 standards. Spacing values reflect open area protection at a reference ceiling height of 10 ft (3 m). As ceiling height increases, spacing must be reduced in accordance with NFPA 72 or site-specific standards.

**NOTE:** FM approval for open area spacing is not available for our 356°F (180°C) or 500°F (260°C) detectors. These detectors are FM approved for proximity detection and special application only.

### LOCATION

For open area protection, detectors are typically located on the ceiling or on sidewalls within 20 inches (500mm) of the ceiling. Detectors may also be mounted on the underside of solid joists or beams, provided the beams are less than 12 inches (300 mm) in depth and spaced less than 8 feet (2.4 m) on center.

For proximity detection, the detector is placed on or as close to the hazard as possible. In these applications, assess all environmental conditions — additional heat sources, chemicals, moisture, and similar factors — before finalizing detector type and placement.

Final detector spacing must be accepted and approved by the AHJ.

## Installation Guidelines

### DO NOT:

- Paint the detector — prohibited by UL and FM requirements
- Make 90° bends — all bends must be smooth, rounded turns with a minimum 2.5-inch (6.4 cm) radius, made with the fingers (not pliers)
- Over tighten fasteners — damage to the outer jacket or internal insulation may not be immediately visible but can cause false alarms; fasteners must allow the detector to expand and contract with temperature changes
- Overstretch the detector — some sag between fasteners is normal and expected
- Walk on the detector or set ladders on the detector during installation
- Use third-party fasteners unless specifically recommended by Protectowire
- Place the detector where it may be subject to mechanical damage from equipment or processes
- Use wire nuts or unauthorized termination devices — all connections must be made via compression terminals or Protectowire recommended splicing components

*Store Protectowire in a controlled environment, away from heat sources and potential physical damage, prior to installation.*

## HIGH CEILING CONSIDERATIONS

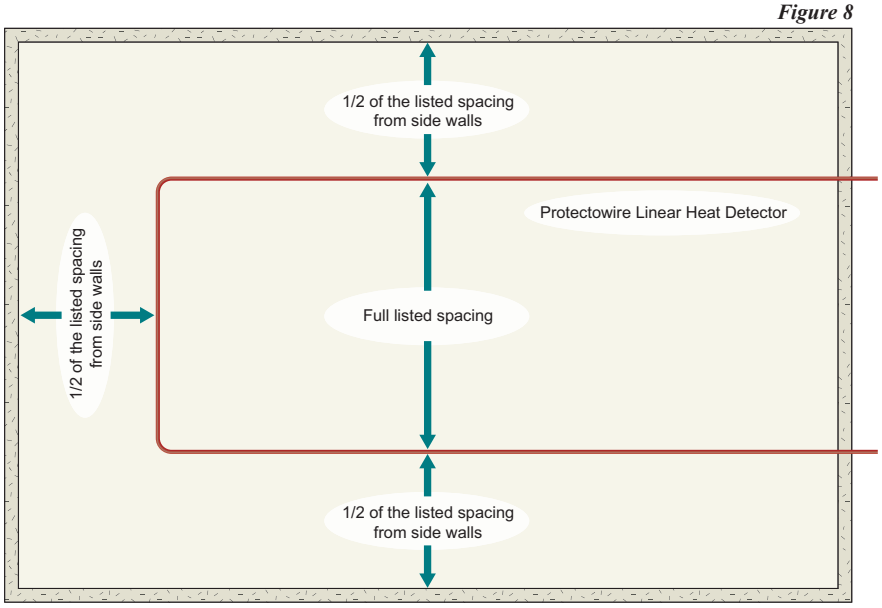
NFPA 72 provides derating factors for ceilings between 10 and 30 feet (3 to 9.1 m) in height. These factors are expressed as a percentage of listed spacing and are available in the NFPA 72 High Ceiling Reduced Spacing Table. For ceilings above 30 feet (9.1 m), refer to the NFPA 72 High Ceiling Spacing Minimum requirements.

The NFPA 72 provisions for "line-type electrical conductivity detectors" (analog LHDs) do not apply to Protectowire detectors. All high ceiling reduced spacing requirements are applicable.

## SMOOTH CEILING SPACING

A ceiling is considered smooth when its surface has no projections extending more than 4 inches (100 mm) below it. On smooth ceilings, the detector is located at half the listed spacing from all walls and partitions, with full listed spacing between detector runs.

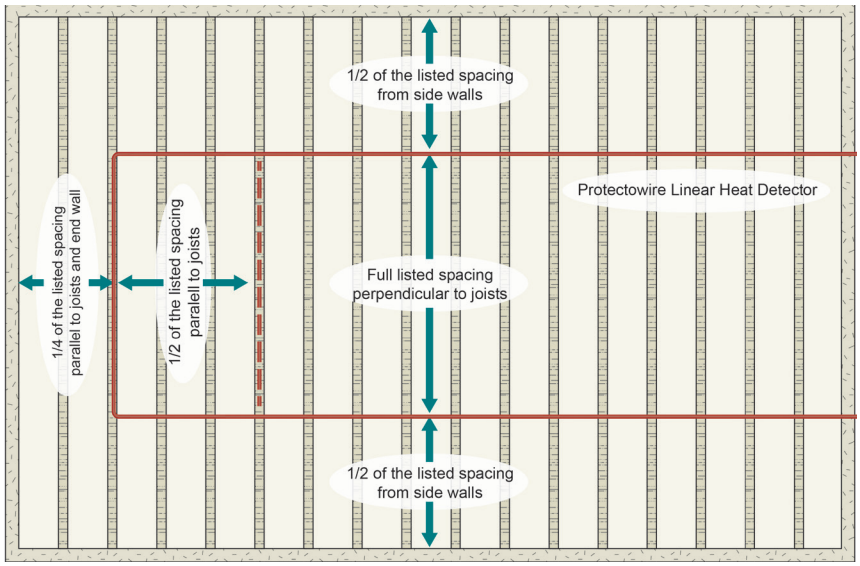
*Figure 8*




## SOLID JOIST CONSTRUCTION

A ceiling with solid structural or non-structural members projecting more than 4 inches (100 mm) below the surface and spaced less than 36 inches (910 mm) center-to-center is considered solid joist construction. Detectors must be mounted on the bottom of the joists. Spacing at right angles to the joists shall not exceed half the listed spacing.

*Figure 9*

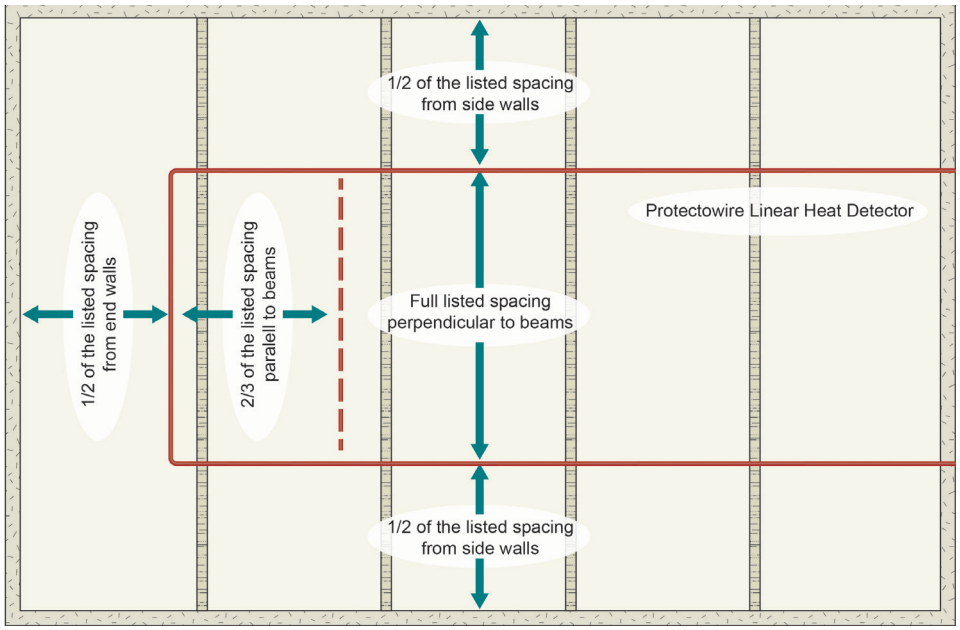


## BEAM CONSTRUCTION

Beams projecting less than 12 inches (300 mm):

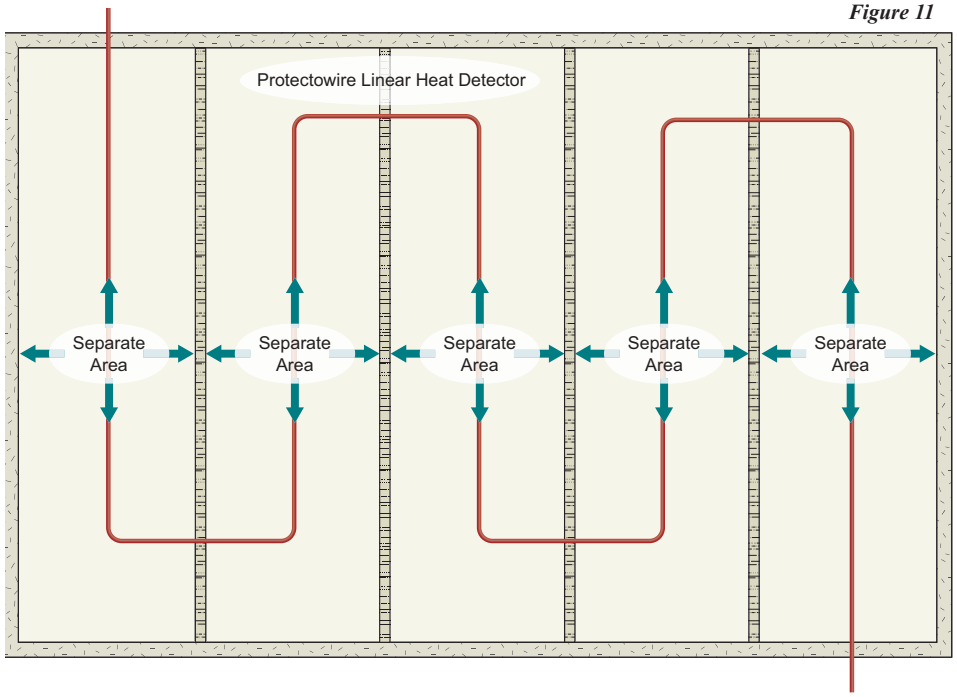
If beams are spaced less than 8 feet (2.4 m) apart, the detector may be mounted on the bottom of the beams. Spacing at right angles to the beams shall not exceed half the listed spacing.

*Figure 10*




Beams projecting more than 18 inches (460 mm): When beams project more than 18 inches (460 mm) and are spaced more than 8 feet (2.4 m) apart, each beam bay is treated as a separate detection pocket. The detector must be placed within each pocket at the required spacing.

*Figure 11*

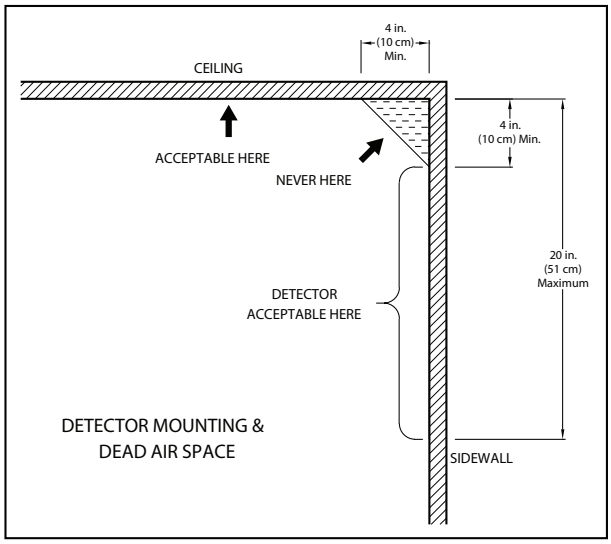


## DEAD AIR SPACE

*Figure 12*

The corner where a ceiling and wall meet creates a “dead air space” — typically a triangular area extending 4inches (100 mm) out from the corner along the ceiling and 4 inches (100 mm) down the wall. Protectowire must not be located in this zone.

On sidewall mounting, the acceptable zone extends from 4 inches (100 mm) to 20 inches (500 mm) below the ceiling.




## SLOPED & PEAKED CEILINGS

**Sloped ceilings:** At least one detector run must be located within 3 feet (0.9 m) horizontally from the peak, but no closer than 4 inches (100 mm) vertically to it. Additional runs should be spaced based on the horizontal distance projected down from the slope.

**Peaked ceilings:**

The same 3-foot horizontal / 4-inch vertical rule applies at the peak, with additional runs spaced based on the horizontal projection on both sides.

*Figure 13*

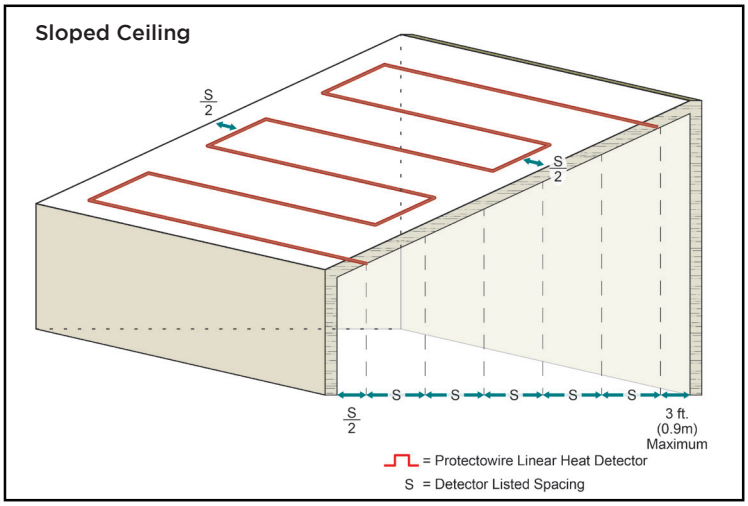
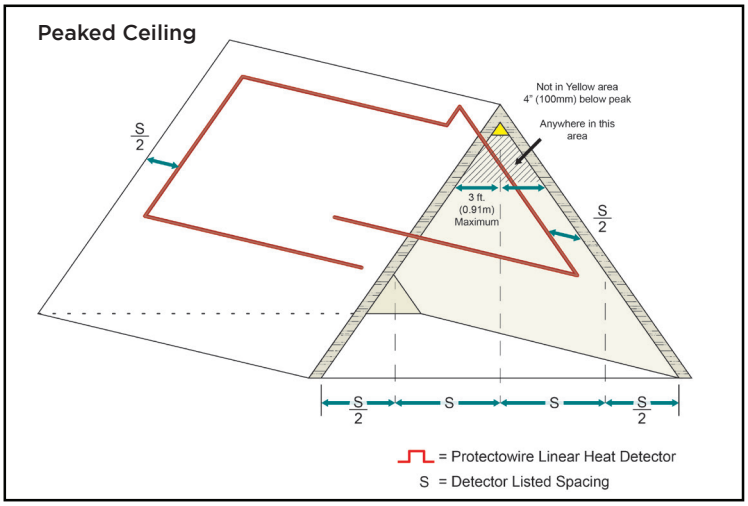



*Figure 14*




## Environmental Considerations

Protectowire offers the broadest linear heat detection portfolio in the industry. Every installation environment is unique, and selecting the right detector — the right initiation temperature and the right jacket — is essential for reliable performance. If environmental conditions are unclear or unusual, contact the factory for guidance.

## Installation Considerations

Before installing the detector, read all installation guidelines. Improper handling or mounting is one of the most common causes of false alarms and premature failure.

Do not paint Protectowire linear heat detectors per UL and FM requirements. Store the Protectowire linear heat detectors in a controlled environment away from heat sources and potential physical damage. Do not place it where it will be subject to mechanical damage by equipment processes.

Do not make ninety-degree (90°) bends, a minimum 2.5-inch (6.4 cm) bend radius is required. All bends should be made using the fingers without holding the detector with pliers and consist of rounded turns.

Do not over tighten the fasteners, physical damage to the detector may or may not be apparent during the installation process. Damage to the outer jacket or unnecessary mechanical stress applied to the detector during installation may result in "false" alarms. All fasteners must allow the detector to expand and contract with temperature changes.

Do not use wire nuts, all connections should be made via compression terminals and follow Protectowire splicing instructions. Do not over stretch the detector, some detector "sag" between fasteners is normal.

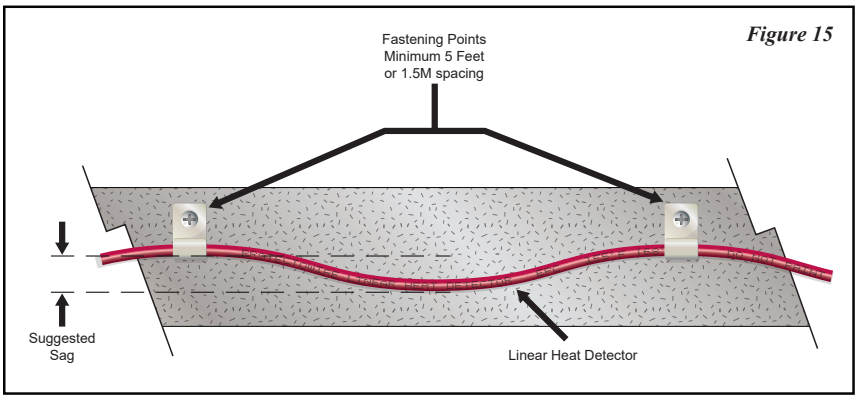



*Figure 15*

*Table 5*

| TEMPERATURE | FASTENER SPACING | MINIMUM SAG |
|---|---|---|
| -40°F (-40°C) | 5ft (1.5M) | 1 1/8 in (2.8cm) |
| -20°F (-28.8°C) | 5ft (1.5M) | 1 in (2.5cm) |
| 0°F (-17.7°C) | 5ft (1.5M) | 7/8 in (2.25cm) |
| 20°F (6.7°C) | 5ft (1.5M) | 3/4 in (1.9cm) |

## Fasteners & Mounting Hardware

Protectowire linear heat detector fasteners and mounting hardware are typically spaced every 5-10 feet (1.5-3m), or as the installation requires. Improper installation and fastening may subject the detector to physical damage. Protectowire fasteners are designed to lightly clamp the detector.

Only Protectowire recommended fasteners should be used. The use of non-recommended fasteners may physically damage the detector thereby causing "false alarms" and potentially void the detector's warranty.

Recommended fasteners and mounting hardware categories include:

- **General Purpose** - commonly used in area detection applications where the detector will be installed on the ceiling, roof, or side walls.
- **Specialty Applications** - intended to mount the detector to a variety of cable tray configurations, but can also be used for conveyors, angle irons, I- beams, bar joists, etc.
- **Double Loop Straps** – allow the detector to be mounted directly to piping.
- **Messenger Wire** – used for spanning large open areas or where mounting support structures are limited.

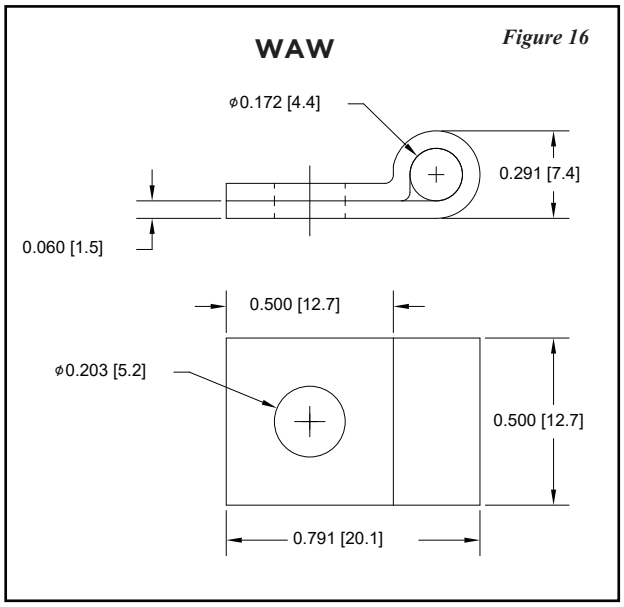
All fasteners and mounting hardware data sheets are available at www.protectowire.com

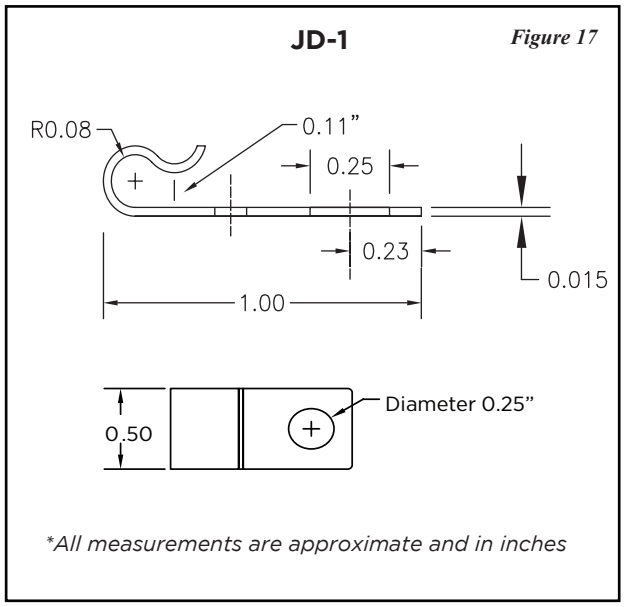
## General Purpose Fasteners

WAW and JD-1 may be used for ceiling, corner, and wall mount installations.

WAW-N fasteners have better low temperature performance, and the WAW-P has better high temperature performance. WAW-SS fasteners are for use in harsh and exterior environments. The WAW fastener is a P-clip which wraps around the detector and is available in either nylon (WAW-N), polypropylene (WAW-P), or 316SS (WAW-SS).

JD-1 fastener is a 304SS J-clip where the linear heat detector is placed in the "J" portion of the clip.

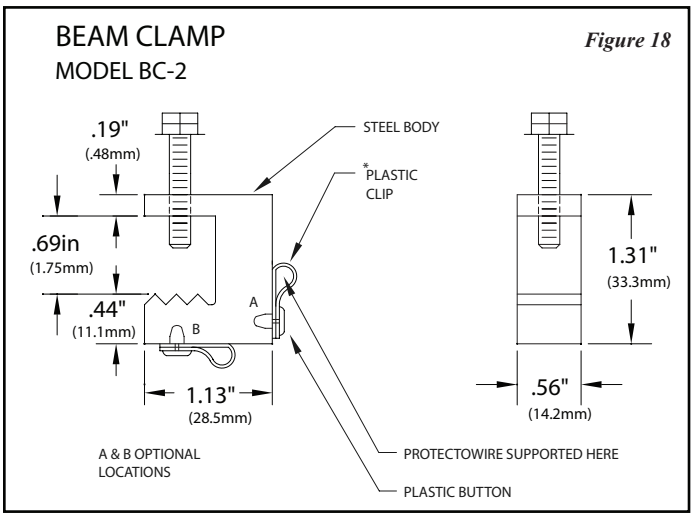


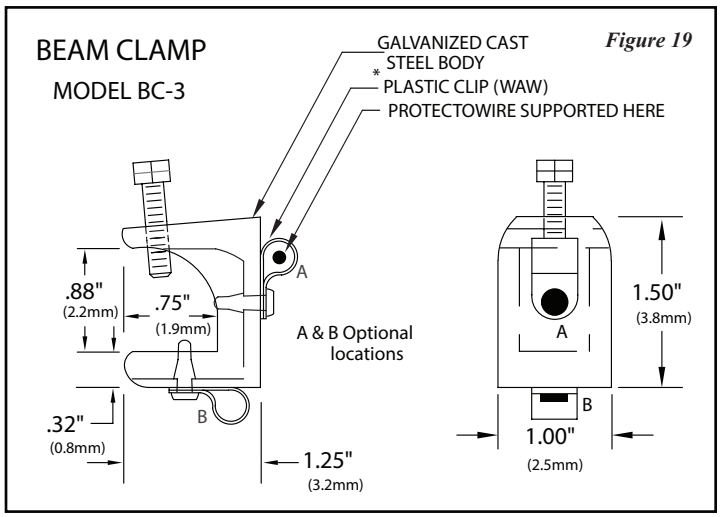




Clips may be held in place by any suitable mechanical fastener such as a wood screw, nut and bolt, or sheet metal screw.

## Specialty Applications Fasteners

BC series beam clamps are supplied with a WAW clip and snap button. The BC-2 is a plated steel clamp and is recommended for general indoor use. The BC-3 is a heavy-duty zinc plated clamp suitable for both indoor and outdoor use. These versatile fasteners may be used for mounting Protectowire on cable trays, conveyors, angle irons, I-beams, bar joists, etc.

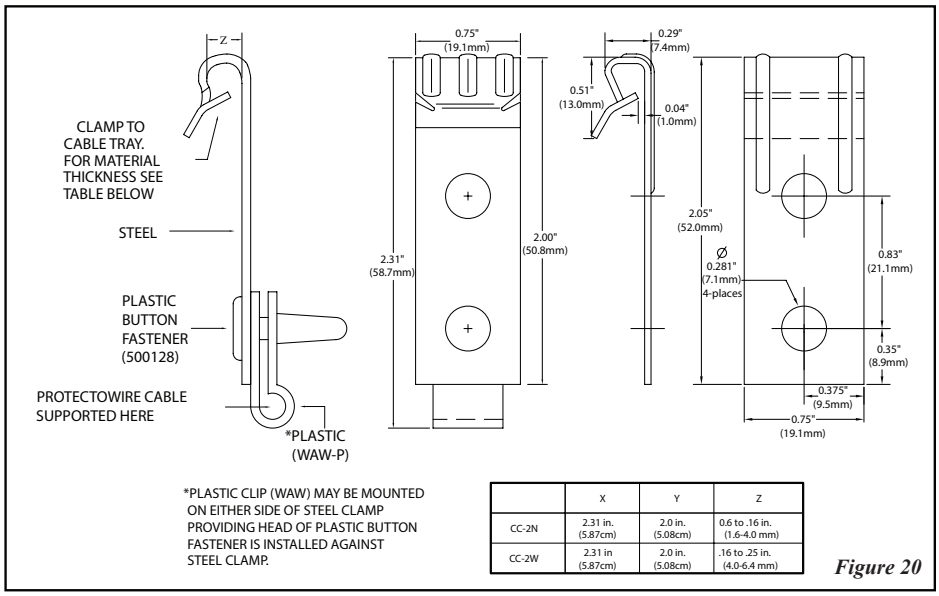


## Cable Tray Clips

The CC-2N (narrow) and the CC-2W (wide) are supplied with a WAW-P and snap button. The clips are made of carbon steel and finished with zinc phosphate. They are designed to attach to cable tray side rails.

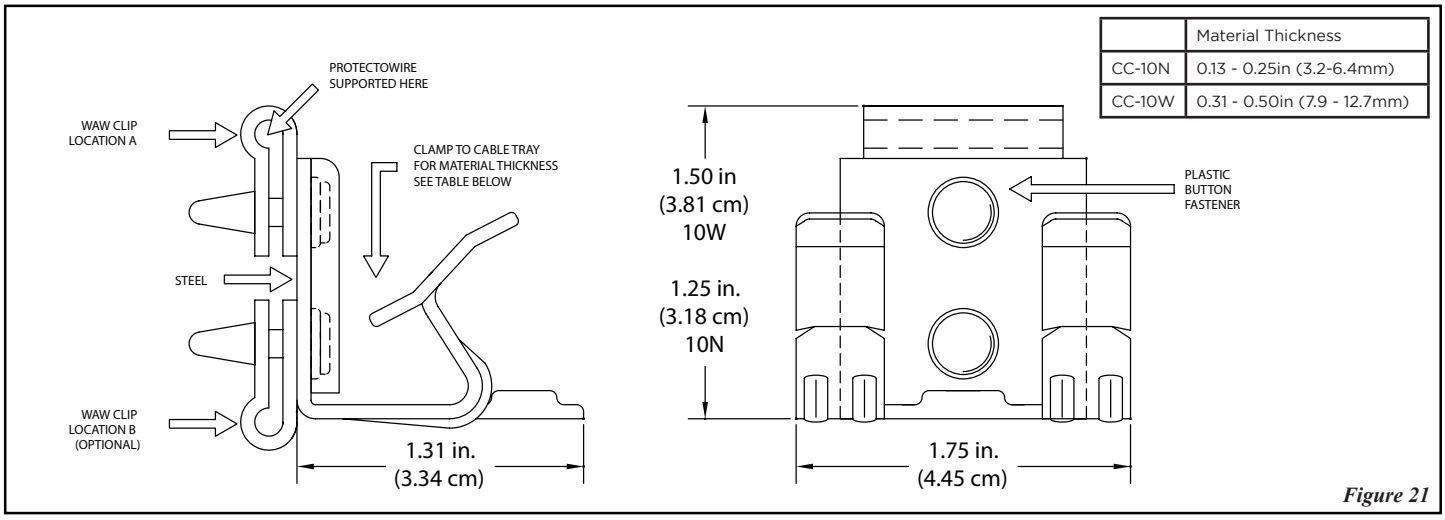
The CC-10N (narrow) is supplied with a WAW-N and snap button while the CC-10W (wide) is supplied with a WAW-P and snap button. The clips are made of carbon steel and finished with zinc phosphate. These are also designed to attach to cable tray side rails but with the ability to secure the fastener in place via threaded mounting holes.




| | X | Y | Z |
|---|---|---|---|
| CC-2N | 2.31 in. (5.87cm) | 2.0 in. (5.08cm) | 0.6 to .16 in. (1.6-4.0 mm) |
| CC-2W | 2.31 in (5.87cm) | 2.0 in. (5.08cm) | .16 to .25 in. (4.0-6.4 mm) |

*Figure 20*

The CC-10N-S is supplied with a WAW-N, snap button, 304SS hex nut, and a 304SS hex screw while the CC-10W-S is supplied with a WAW-P, snap button, 304SS hex nut, and a 304SS hex screw. The clips are made of carbon steel and finished with zinc phosphate. These clips are designed to accommodate installations with excessive vibration.




| | Material Thickness |
|---|---|
| CC-10N | 0.13 - 0.25in (3.2-6.4mm) |
| CC-10W | 0.31 - 0.50in (7.9 - 12.7mm) |

*Figure 21*

## Spring Clip

HPC-2 is a UV resistant nylon clip with a snap lock design. This allows for easy installation and removal of the detector from the fastener. This clip has a tensioned spring grip allowing installation in a wide range of applications such as cable trays, storage racks, and ceiling joists.

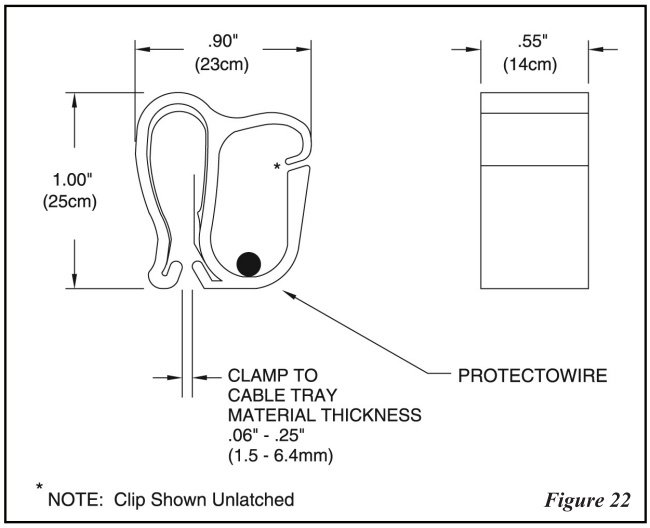



*Figure 22*

## Double Loop Mounting Straps

PM-3 series double loop mounting straps are made of black weather resistant 6/6 Nylon and may be used in temperatures ranging from -40°F (-40°C) to 185°F (85°C). The double loop strap is recommended when the detector is approved for mounting to pipes. The larger loop attaches to the support pipe while the smaller loop supports the linear heat detector without damaging the detector. The use of single zip tie is not recommended. Using a single zip tiemay not allow for the detectors expansion and contraction due to temperature changes, potentially damaging the linear heat detector.

**PM-3 series is available in 3 sizes:**

- PM-3A is a single piece for 0.75in to 2in (19mm to 51mm) pipe.
- PM-3B is a single piece for 2.5in to 3.5in (64mm to 89mm) pipe.
- PM-3C is a two piece strap for 4in to 6in (102mm to 152mm) to pipe.

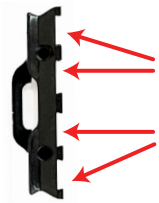
## Adhesive Cable Mount System

An adhesive cable mount system allows non invasive mounting for applications such as transformer casings or any surfaces where penetration is prohibited.

The adhesive mounting system consists of TM-M cable mounts, TM-T cable ties and TM-A industrial adhesive. The cable mounts and cable ties are constructed of black weather resistant nylon and suitable for outdoor use when used with an approved adhesive. This mounting system is not recommended for chemically harsh environments or areas where temperatures may be less than 0°F (-17°C) or can exceed 180°F (82°C).

For additional information reference Protectowire data sheet DS-9397.

TM-M



Grooves to grip adhesive (TM-A)

*SIDE VIEW*

TM-A

TM-T

## Messenger Wire

Messenger wire is a high tensile strength 316 stainless steel support wire that is wound around the linear heat detector at approximately one turn per foot (0.3m). Messenger wire is designed to simplify the installation of the detector in areas where mounting is difficult due to the lack of appropriate support structures or mounting surfaces.

When using messenger wire to support the detector, turnbuckles and eyebolts must be employed at each end of a straight run to place tension on the support wire. The maximum detector length between turnbuckles should not exceed 250 feet (76m). The detector and messenger wire must also be supported with a recommended intermediate fastener every 15 feet (4.5m) to 50 feet (15m). Intermediate fastener spacing should never exceed 50 feet (15m). Outdoor messenger wire installations present additional challenges due to environmental factors such as snow loads, ice build-up or wind. Increased detector support must be provided by using additional intermediate fasteners with closer spacing in all outdoor installations.

Messenger wire is a special-order item, consult factory for availability.

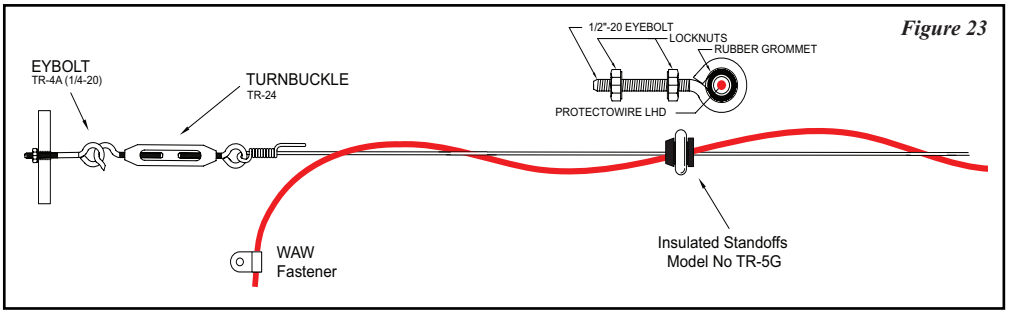



*Figure 23*

## Inspection & Testing of Protectowire PHSC/PLR, & CTI™ Series linear heat detectors

**Visual Inspection**

Visual inspections of the installed system shall be made to ensure that there have been no changes to the installation site, building structure, or environmental factors that can affect equipment performance. Visual inspections shall be performed upon initial installation and on an annual basis thereafter, unless a more frequent schedule is required by specific codes or the local authority having jurisdiction (AHJ).

**Testing Frequency**

As an initiating device, testing Protectowire linear heat detectors should be an integral part of a complete inspection and test program designed to ensure reliable operation and service of the entire fire detection/suppression system. Classified as a heat detector, Protectowire shall be tested upon initial installation and on an annual basis thereafter, unless a more frequent schedule is required by specific codes or the local authority having jurisdiction.

This section covers the minimum recommended requirements for inspection, and testing of Protectowire linear heat detector. In general, these requirements follow those recommended in NFPA 72 for fixed-temperature, non-restorable line type heat detectors. This guide does not cover inspection, testing or maintenance of other related devices or components of the fire alarm system.

## PHSC & PLR Specific Test Procedures

Inspection, testing and maintenance of all fire detection/releasing systems shall be performed only by experienced and qualified personnel. All people and facilities that receive alarm, trouble or supervisory signals shall be properly notified prior to the start of testing and again after the testing has been concluded. Suppression systems shall be secured from inadvertent actuation by disconnecting electric actuators or releasing solenoids, closing valves or taking other actions as appropriate for the specific system for the duration of the test.

All system devices and releasing components must be returned to their normal condition after completion of the system testing. Classified as a fixed-temperature, non-restorable line type heat detector, Protectowire is subject to the following test method as described in NFPA 72: “Do not heat test. Test mechanically and electrically for function. Measure and record loop resistance. Investigate changes from acceptance test.”

**Class A Configurations:**

In a Class A initiating circuit, the recommended procedure is to remove the plus and minus return legs of the circuit at the IDC terminals. This action should cause a trouble signal at the control panel. To create an alarm condition on the circuit (alarm overrides trouble), place a jumper across the disconnected return leads. This action will cause the necessary alarm condition to activate the circuit and complete the test. To measure loop resistance, place each circuit in alarm and leave the short across the detection circuit as described above. Disconnect each detection circuit’s wires from the terminals of the initiating device circuit. Place an ohm meter across the disconnected zone wires (out + and out –) and record the resistance measured. Compare these values at each annual testing. If there is any change in loop resistance all electrical connections should be investigated.

**Class B Configurations:**

In a Class B initiating circuit the recommended procedure is to remove the end of line resistor at the end of the linear heat detector. This action should cause a trouble signal at the control panel. To create an alarm condition on the circuit (alarm overrides trouble), place a jumper across the conductors at the end of the linear heat detector. This action will cause the necessary alarm condition to activate the circuit and complete the test. To measure loop resistance, place each circuit in alarm and leave the short across the detection circuit as described above. Disconnect each detection circuit’s wires from the terminals of the initiating device circuit. Place an ohm meter across the disconnected zone wires (out + and out –) and record the resistance measured. Compare these values at each annual testing. If there is any change in loop resistance all electrical connections should be investigated. In Class B configurations it is necessary to test the end-of-line box. Use a jumper wire to apply a short across the end-of-line resistor to create an alarm. For ease of testing, Protectowire offers a universal end-of-line box with a built-in test button.

**Heat Testing for PHSC & PLR**

Protectowire PHSC & PLR linear heat detectors are defined in NFPA 72 as non-restorable line type heat detectors. Per NFPA 72 non-restorable line type heat detectors do not require heat testing. However, some local codes or the authority having jurisdiction may require a heat test in lieu of the recommended electrical test procedure.

If heat testing is required during installation a service loop (coiled spare detector) should be installed. The service loop can be heat tested as needed to limit field splices. If a service loop is not available, select a convenient location as close to a field termination/splice as possible to install a small test length of linear detector. The small test length may be heated as necessary to satisfy the test requirements. When finished, remove and replace the heat actuated test length with new linear heat detector.

## CTI™ Series Specific Test Procedures

The CTI™ series linear heat detector works in conjunction with the required CTM interface module and series components. CTM interface modules require commissioning. The CTI™ Series requires the CTI™ Cal Kit for calibration and testing. The CTI™ Cal Kit includes type "T" thermocouple probe and thermocouple jumper. For details reference Protectowire data sheet DS-9406.

The test probe is used when testing the alarm operation of CTI™ linear heat detectors terminated with DRTB-T-2 terminal blocks. The probe can be inserted into the DRTB-T-2 test jack at each location within a CTI™ detector zone. When inserted, the probe will introduce a "Short Fault" condition on the CTM interface module. If the probe tip is heated to the alarm temperature of the CTI™ linear heat detector cable an "Alarm" will be initialized on the CTM interface module. When testing is completed at each point the probe is removed for future use and the CTM interface module can be reset to normal operation.

The thermocouple jumper is used when calibrating CTM interface modules that include the Alarm Point Location feature. The jumper ensures the lowest resistance is introduced at each point in the calibration process for optimal accuracy. The jumper is compatible with the DRTB-T-2 terminal blocks. The jumper is inserted into the first DRTB-T-2 test jack of a CTI™ linear heat detector run and the Alarm Point Location "Zero" calibration is performed. Once completed the jumper is moved to the final DRTB-T-2 location of a CTI™ linear heat detector run and the Alarm Point Location "End" calibration is performed. Once calibration is completed the jumper is removed and stored for future use.

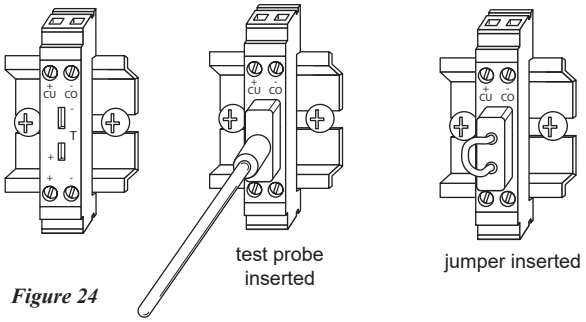
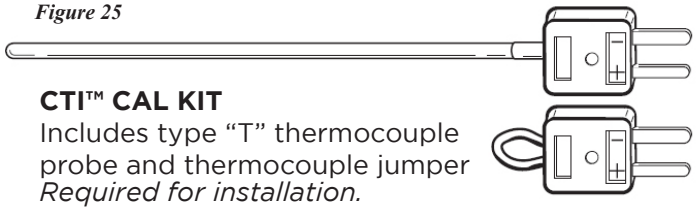



*Figure 24*

*Figure 25*



**CTI™ CAL KIT**
Includes type "T" thermocouple probe and thermocouple jumper
*Required for installation.*

**MFL-92 Fault Locator**

The Manual Fault Locator is a service tool designed to locate a short on PHSC & PLR and CTI™ series linear heat detectors. The tool includes a tone generator and receiver to verify the exact location of a short using an audio signaling. The MFL has remarkable accuracy and is an asset for any technician.

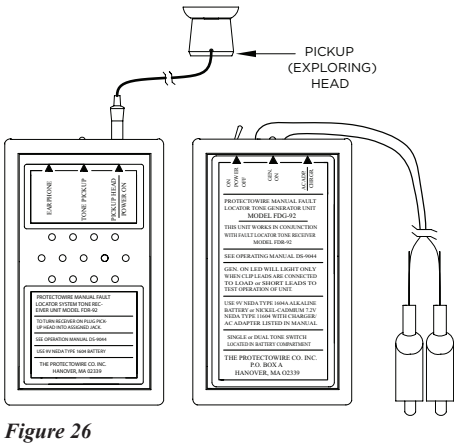



*Figure 26*

## Chemical Resistance Chart for Protectowire Jacket Materials

*Table 6*

| Material Code | Full Descriptive Name | Max. Temp | Min. Temp | Abrasion | Moisture | UV | Chemical | Radiation |
|---|---|---|---|---|---|---|---|---|
| EPC | Polyvinyl Chloride | 221°F (105°C) | -40°F (-40°C) | Good | Excellent | Fair | Fair | Poor |
| XLT | Low Temp Polyvinyl Chloride | 100°F (38°C) | -60°F (-51°C) | Good | Excellent | Poor | Fair | Poor |
| XCR | Flouropolymer (General Use) | 250°F (121°C) | -40°F (-40°C) | Excellent | Excellent | Excellent | Excellent | Good |
| PLR-500-XCR | Flouropolymer (High Temp) | 392°F (200°C) | -94°F (-70°C) | Excellent | Excellent | Excellent | Excellent | Good |
| EPR | Thermoplastic Vulcanizate | 194°F (90°C) | -40°F (-40°C) | Very Good | Excellent | Good | Good | NA |
| LSZH | Low Smoke Zero Halogen (Olefin) | 221°F (105°C) | -40°F (-40°C) | Very Good | Excellent | Fair | Fair | NA |

*All information supplied in the Chemical Resistance Chart by The Protectowire Company in relation to its products and their application is intended for general reference only. The information is not a guarantee of product performance or a recommendation for product use in the environments indicated. The Protectowire Company, assumes no liability whatsoever in respect to application, or use made of the aforementioned information or products, or any consequence thereof.*