ALARMLINE ANALOGUE LINEAR TEMPERATURE DETECTION

MANUAL NO. 59812-212

December 2000

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AMENDMENT INCORPORATION RECORD		
Amendment Number	Brief Description of Content	Name of Person Incorporating Amendment
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CAUTION
ANTISTATIC PRECAUTIONS

WHEN HANDLING ANY ELECTRIC COMPONENTS OR CIRCUIT BOARDS ANTISTATIC PRECAUTIONS MUST BE CARRIED OUT. FAILURE TO DO SO MAY RESULT IN COMPONENT DAMAGE.

Static discharge can be reduced by adhering to the following guide lines.

1. Always use conductive or anti-static containers for transportation and storage, if returning any item.

2. Wear an earthed wrist strap while handling devices and ensure a good earth is maintained throughout.

3. Never subject a static sensitive device to sliding movement over an unearthed surface and avoid any direct contact with the pins or connections.

4. Avoid placing sensitive devices onto plastic or vinyl surfaces.

5. Minimise the handling of sensitive devices and PCB's.

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CHAPTER 1

INTRODUCTION

1.0 Introduction

Alarmline sensor cable provides a flexible durable and cost-effective form of fire detection, within a wide range of commercial and industrial fire and overheat risks.

Alarmline sensor cable can provide general space protection as well as detection at the point of risk. A wide range of coatings and installation fixings ensure system design and installation is specific to the risk. It is especially suitable for confined areas or harsh environments, which prohibit the use of other forms of detection.

Alarmline sensor cable and associated controls allow full integration with central fire control panels and extinguishing systems.

Alarmline sensor cable provides protection over a wide range of applications. The following application descriptions are typical installations to illustrate the diversification of the product range. Kidde Fire Protection or its agent would be pleased to advise on the suitability of Alarmline sensor cable for any other application.

1.1 Alarmline Analogue Linear Temperature Detection Specification

Design

Cable installation must be in accordance with manufacturers application and installation manuals according to the application being considered. As a variance exists on most applications it is recommended that the manufacturer's guidance is sought for each project.

Consideration shall be made of the following:

- nature of risk
- max. ambient temperature
- risk of mechanical damage
- location of display & controls
- requirement for Zener Barriers
- interface to other fire alarm or extinguishing systems

A range of cables to cover the specification temperature range from -65 to +150°C is available.

Analogue cable - rate of rise and point of risk. Coverings are available for wide range of applications.

- Standard coating
- Standard coating plus nylon
- Standard coating plus bronze braiding
- Standard coating plus nylon & stainless steel braiding

Shall operate -40 to +105°C. 4 core cable providing monitoring for open and short circuit. Alarm settings to match the environment.

Shall be recoverable providing continuous protection.

Shall interface to a range of control and output units.

Shall be capable of operating with interposing cable.

Shall be capable of operating within zone 0 applications via suitable Zener Barriers.

Control Equipment

Control equipment for analogue cable (Alarmline LHD unit) shall provide fire/fault conditions and setting of alarm conditions to match temperature condition for the environment.

The analogue cable control unit shall have the ability to be connected onto a standard detection zone of a fire alarm control panel.

The analogue cable control unit shall have the option for relay boards for the connection onto addressable fire alarm control panels.

Installation

The Installation method shall be as recommended in the manufacturer's installation manual and be in accordance with site and environmental requirements.

Clips and fittings shall be as recommended in the manufacturers installation manual and match site and environmental conditions.

Commissioning

Analogue cable shall be capable of controlled tests via a heat oven. This shall be applied to the sensor cable within a safe area.

Approvals

Analogue and Digital variants thereof shall be approved by:

- Factory Mutual
- Power Generation Authorities
- CEA European Approval Testing
- VNNIPO

1.2 Features and benefits

Flexibility:

Environmental -	Temp -40^{o}C to +90^{o}C
Mechanical -	Allows installation at the point of risk.
Electrical -	Able to work in conjunction with interposing cable and for hazardous installations through suitable Zener barriers. The interface module ensures that the system is compatible with central fire control panels.
Alarm Levels -	Adjustable to match site ambient conditions and different temperatures
Durable:	Extrusion options & braidings to match environmental conditions and project risk.
Recoverable:	Self restoring after fire event
Monitored:	Fault signalling for short and open circuit conditions.

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CHAPTER 2

ALARMLINE ANALOGUE HEAT DETECTION CABLE

2.0 Alarmline analogue heat detection cable

Alarmline analogue heat detection cable consists of four conductors protected by a high temperature PVC insulation as shown in Fig. 2-1.

Two of the four cores are insulated with a negative temperature coefficient material and two with normal PVC insulation. The cores are twisted together within the outer high temperature sheath. Termination of the cable is achieved with each temperature sensitive core connected to one of the standard cables. This provides for open circuit or short circuit protection throughout the cable length.

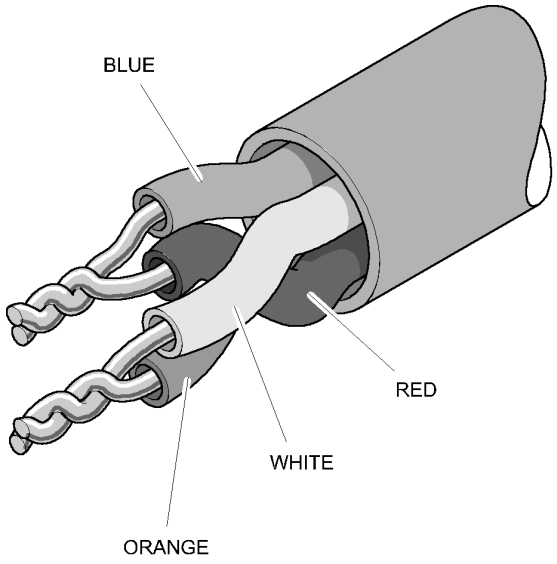

Fig. 2-1

2.1 Operation

Alarmline high resistance sensor cable senses temperature variations by way of continuous monitoring of the resistance of specially doped NTC polymeric insulation, by its associated electronic interface unit (LHD 4).

A change in temperature produces a relative change in resistance between the formed loops within the sensor cable - as temperature increases, resistance is lowered. This change is monitored by the associated electronic interface unit, which actuates an alarm signal at a predetermined level. The integrating effect of the Alarmline sensor cable enables detection of a localised hot spot or a lower level of temperature over its total length. Provided the sensor cable has not been directly subjected to temperatures greater than 120^{o}C for excessive periods, it will recover to its normal condition. Fig. 2-2 shows the four cores.

Alarmline analogue heat detection cable protects a wide range of applications. Additional coatings and braids ensure mechanical or environmental protection for the cable.

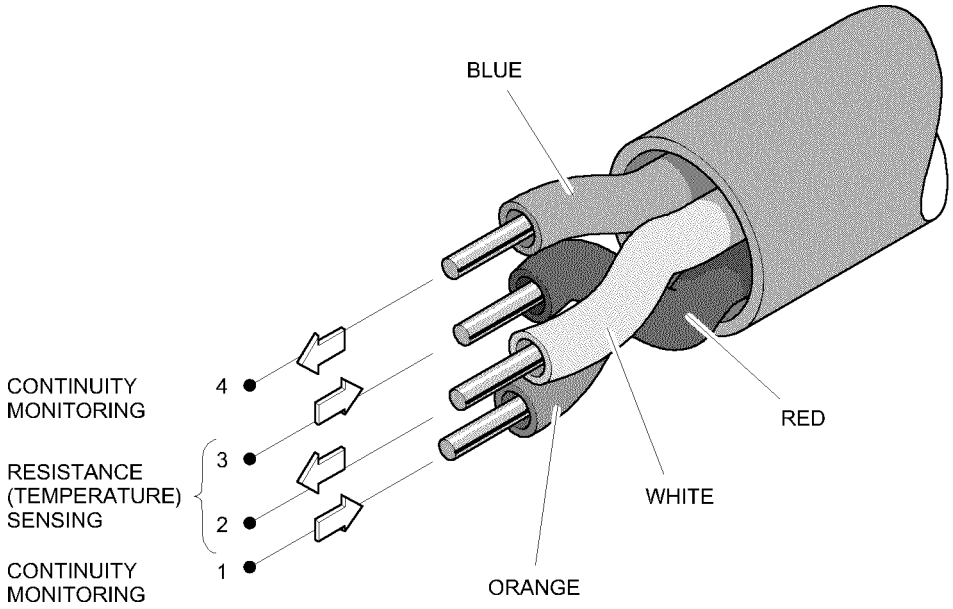

Fig. 2-2

2.2 Technical specification

Description	High Temperature PVC	+ Nylon (black)	+ Bronze braided	Nylon + stainless steel braid
Part numbers	K82017	K82021	K82078	K98166
External diameter (nominal)	3.25 mm	4.25 mm	4.25 mm	5-6 mm
Weight (200 metres)	3.2 Kg	4.3 Kg	8.3 Kg	10 Kg
Minimum tensile strength	100 N	+100 N	1000 N	1000 N
Conductor diameter	0.46 mm			
Dielectric thickness	0.34 mm			
Outer sheath thickness	0.25 mm			
Twist turns of inner conductors	82 +/-5 per metre			
Conductor material	Copper			
Dielectric material	Cores 1 and 3: specially doped NTC polymer Cores 2 and 4: PVC			
Core colours	1: Orange, 2: White, 3: Red, 4: Blue			
Service life	30 years up to 100°C			
Voltage insulation	10KV between outer sheath and a conductor			

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CHAPTER 3

SERIES 4 LHD INTERFACE UNIT

3.0 Series 4 LHD

K82012 Alarmline interface unit series 4 LHD provides control of the Alarmline sensor cable and interface to the relevant fire control panel. Two types are available, K82012 provides for two-wire wiring direct to conventional fire panels.

K82194 as K82012 with auxiliary relay PCB comprising of FIRE and FAULT relays. This can be used for stand alone operation or integration via a suitable interface to an analogue fire control panel. This unit also provides an optional analogue output for a chart recorder.

K82012 and K82194 are housed within polycarbonate enclosures to IP55 with a hinged lid.

The series 4 LHD continuously monitors the sensor cable for fire alarm conditions, and open or short circuit fault conditions. These conditions are displayed on the front panel as a continuous red FIRE LED, and a pulsing yellow FAULT LED respectively.

The FIRE and FAULT conditions latch, therefore a reset facility is required within the main fire alarm control panel circuit monitoring the series 4 LHD(s) operation and status. FIRE and FAULT require power down to reset. This may require a relay driver from the fire control panel.

The basic series 4 LHD K82012 operates on the supervisory current of the detection zone of the fire alarm control panel.

The K82194 series 4 LHD with relay boards are not suitable for direct connection to a two wire system and therefore will require a 24v dc input.

3.1 Specification

Series 4 LHD - K82012, K82194

Enclosure:	Polycarbonate to IP55 170H x 105W x 111D Colour grey (RAL 7035) Weight 0.55 Kg
Sensor cable compatibility:	Suitable for “T” type of Alarmline sensor cable.
Supply voltage:	8 to 30v dc
Current consumption:	
Quiescent	K82012 - 57µA K82194 - 77µA
Alarm	K82012 - 53mA K82194 - 82mA
Fault	K82012 - 160µA maximum K82194 - 15mA
Radio interference susceptibility:	Conducted interference of 10v between 150KHz and 100MHz. Radiated interference of 10v/m between 80MHz and 1GHz.
Indicators:	
FIRE	Panel mounted continuous RED LED Terminals for connection of remote LED.
FAULT	Panel mounted flashing YELLOW LED. Fault output may be wired in series for normal two-wire operation or connected separately.
Operating temperature:	-25^{o}C to +55^{o}C
Controls:	
Test switch	Fault and fire positions verify operation in both modes.

Alarm trip selector	12 position link setting internally mounted.
Outputs:	FIRE and FAULT relay outputs, volt free rated at 2A 24v dc. Optional 0 - 5v analogue output.

Notes: 1. In the FIRE alarm condition the minimum voltage across the detector should be not less than 5v.

2. When the fault output is used separately it must be referred to the 0v supply line.

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CHAPTER 4

APPLICATIONS

4.0 Applications

Alarmline sensor cable has been successfully installed in a wide range of applications from thatched roofs to power generation.

4.1 Typical applications

Electricity Generating Authorities:		Cable trays and risers (power control cables). Boiler front - burner protection. Conveyors - bearing overheat. Transformers. Control room and computer suites - floor voids. Cooling towers. Alternator pits.
Wire Manufacturers:		Control cubicle protection.
Ships and shipyards:		Construction - steelwork/wooden supports. Ducting and pipework. Control cubicles. Radar Installations. Missile storage.
Marine:		"Cocooned" ships. Engine bay protection - leisure craft.
Petro-chemical:	On-shore:	Ethylene "sphere" storage. Storage tanks - floating roofs. Cable trays and road tanker protection.
	Off -shore:	Well heads and cable trays.
Gas board:		Power units and pumps.
Supermarkets:		Cold storage wiring.
Hospitals:		Service ducts.
Rubber grinding plant:		Dust extraction duct.

Aluminium works:	Cable trays, mixers and conveyors.
Computer suites:	Ceiling, floor voids, control cubicles and power supplies (overheats).
Steel works:	Covered conveyor protection, cable trays and storage racks.
Grain driers and storage:	Silos and driers.
Water authorities:	Cable tunnel and switchgear.
Resin plant:	Storage tank.
Automatic pumping stations:	Transformer bay and cable ducts.
Coal mills:	Pipework carrying coal dust to boilers.
Local government authorities:	Road tunnels and refuse tips.
Dance halls:	Ceiling protection and decorative ornament protection (Artificial trees etc.).
Cottages:	Thatched roofs.
Motor part manufacturers:	Gas fired drying conveyor oven. Paint storage.
Chemical plants:	Reactor vessels.
Ducting manufacturers:	Extraction and ventilation systems.
Plastic coating process plant:	"Dip" tank protection.
Timber yards:	Bearings - machine shop.
Government departments:	High rack storage.
Airports:	Passenger walkways, hangars, duty free goods storage Baggage conveyors. Escalators (bearing overheats and dust collecting Trays). Service subways.

Cold storage plants:	Warehouse and power house - water boxes.
Forklift truck (overnight charging):	Battery box overheat protection.
Heating units:	Oil pipe temperature monitoring.
Power plant:	Conveyors.
Cereal plant:	Freezing chamber - high rack food storage.
Sugar refinery:	Sugar conveyors.
Electronic component manufacturers:	Storage racks.
Rail authorities:	Buildings: Underground railway tunnels, stations & escalators.
	Rolling stock: Flexible couplings and exhaust manifolds.
Industrial kitchens:	Canopy protection.
Royal mail:	Multi-storage car parks.
Nuclear power authority:	Laboratory test equipment - PCB component overheat.

4.2 Conveyor belt fire detection

Fig. 3 Shows Alarmline sensor cable installed directly at the support roller bearings location. This is to monitor what has been independently proven to be the greatest risk - an overheated condition generated by friction igniting the build up of material spilled from the belt. A wide range of clips and fastenings are available to match the environment and installation method.

Alarmline sensor cable can be installed directly over the conveyor to detect a fire/overheat on a stationary conveyor.

Bronze braided sensor cable is recommended as this provides greater protection against possible mechanical damage.

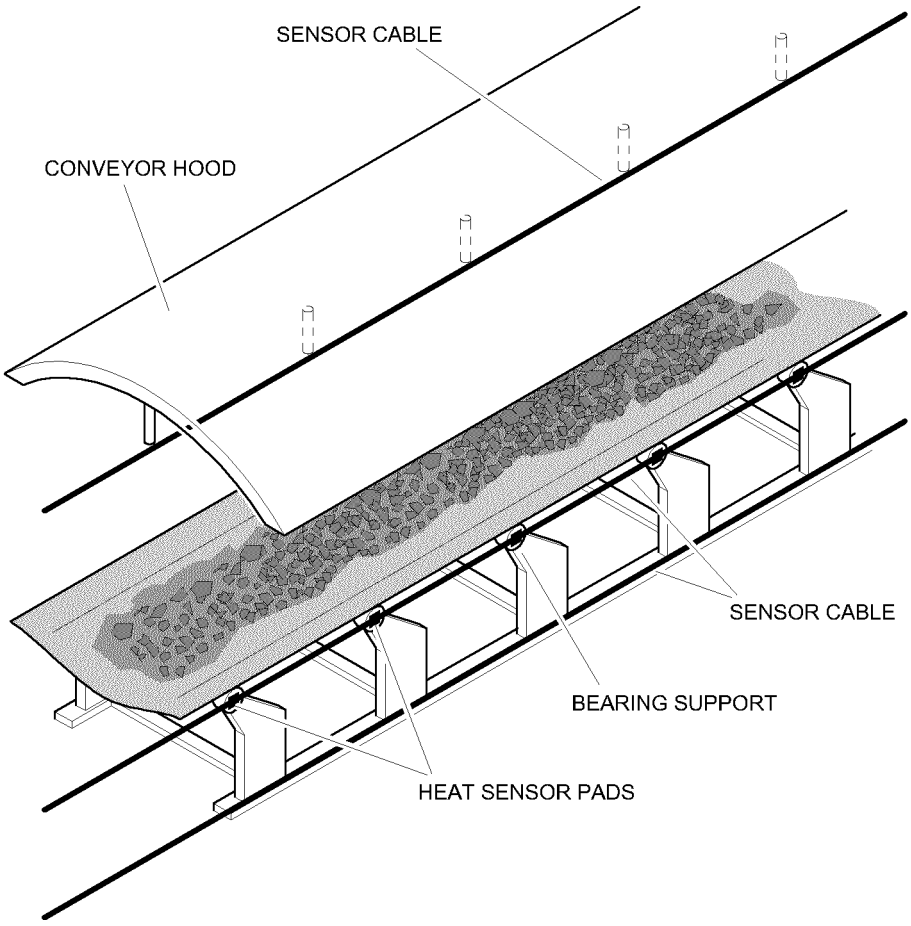


Fig. 4-1

The Alarmline sensor cable should be run down both sides of the conveyor belt. To give greater protection against build up of material under the bed of the conveyor Alarmline can be installed under the conveyor as shown in Fig. 4-1.

4.3 Cable trays and racks

In power generation plants and large industrial installations the general principle of applying Alarmline sensor cable follows the recommendations of the United Kingdom Electricity Generation Authorities. The requirement being to protect each individual tray and rack of electric cables depending on the width of tray. Fig. 4-2 and 4-3 show the recommended positioning of the sensor cable according to size, number and siting of trays and ladder racks:

a) Trays up to 600mm wide.

b) Trays over 600mm wide.

c) An "island" arrangement of trays.

The "standard" high resistance sensor cable is supported at up to 2m spacings at a height of between 150 and 250mm above each tray. This provides maximum operating sensitivity without obstructing access to power cables etc. mounted on tray work. A sensor cable is also installed on the underside of the bottom tray or rack to further protect against "rubbish" fires.

Cable ducts may have a small cross sectional area and being a relatively enclosed environment a single sensor may be all that is required. Where access to the duct is restricted, long unsupported lengths of sensor cable may be employed.

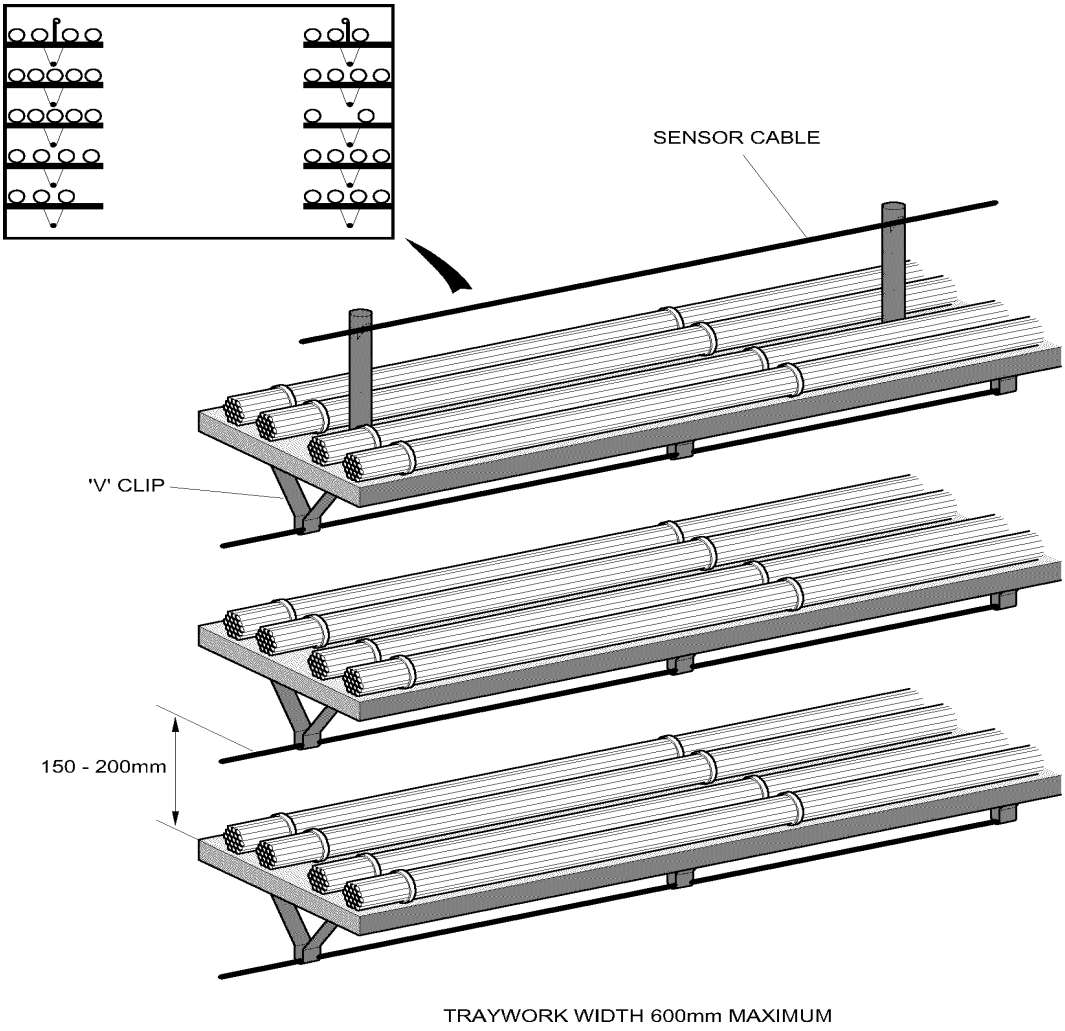
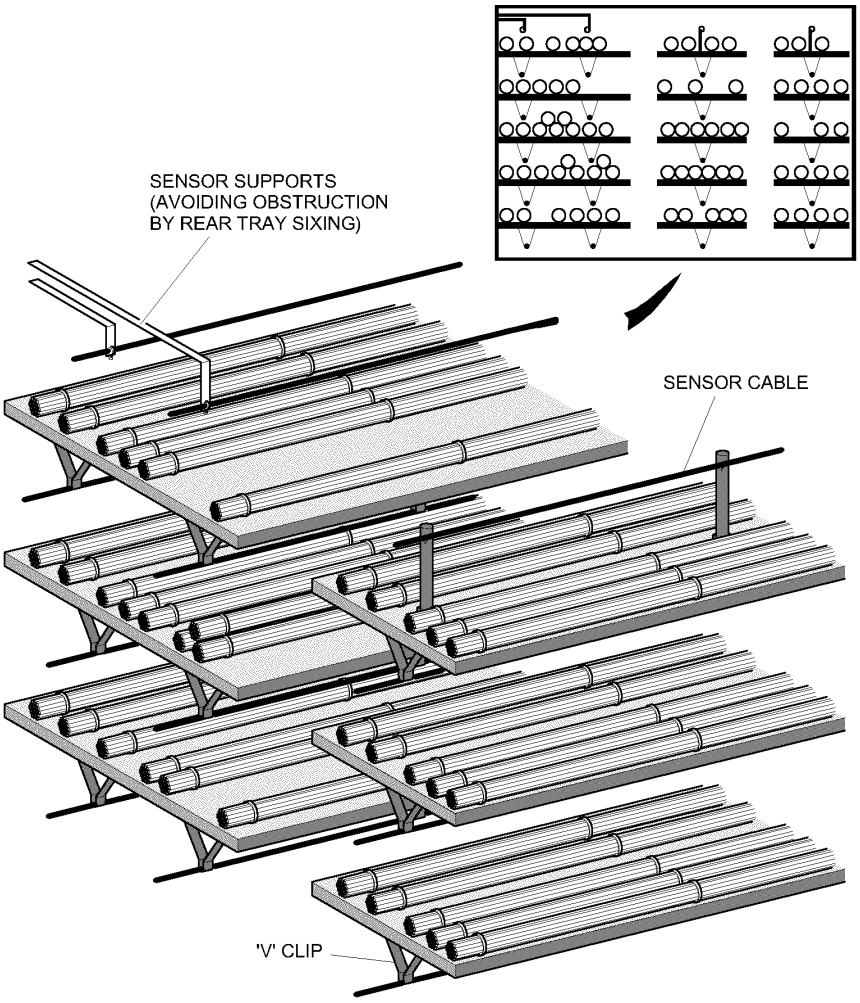


Fig. 4-2



TRAYWORK 600 - 900mm WIDTH AND
ISLAND TRAY ARRANGEMENT

Fig. 4-3

4.4 Floating roof fuel storage tanks

Fig's. 4-4, 4-5. and 4-6 show ALARMLINE sensor cable installed around the perimeter of the floating roof portion of a fuel storage tank.

Installation is close to the UPPER edge on the weather seal, using the roofs steel straps where provided as anchor points.

Alternatively, support clips may be provided to suit. Sensor cable (or its interconnection wire) should be installed with consideration of the rise and fall of the floating roof, preferably using an approved retractable cable. An option of a guide cable is available for installations where high winds are likely to lift the cable from the collector.

Approved Zener barriers need to be used wherever Alarmline sensor cable is used in hazardous areas. This will allow Alarmline sensor cable to be used in zone 0 group IIC applications.

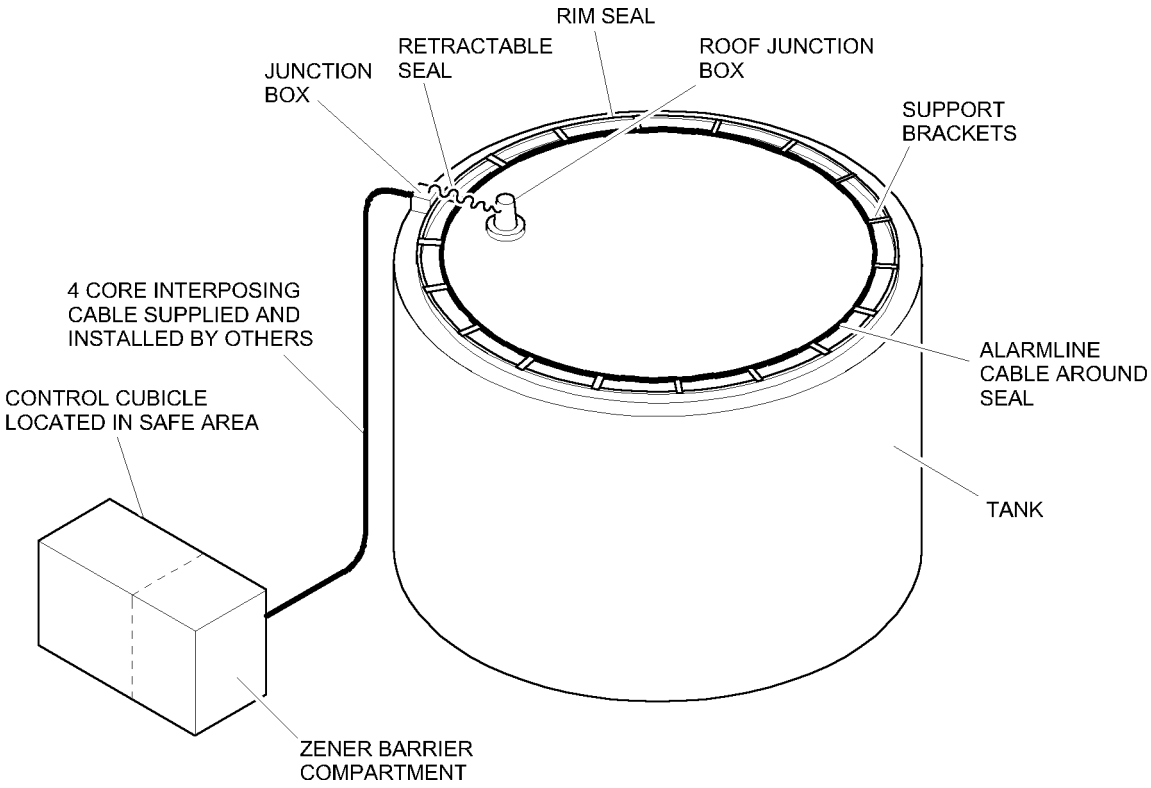

RIM SEAL
RETRACTABLE SEAL
ROOF JUNCTION BOX
JUNCTION BOX
SUPPORT BRACKETS
4 CORE INTERPOSING CABLE SUPPLIED AND INSTALLED BY OTHERS
ALARMLINE CABLE AROUND SEAL
CONTROL CUBICLE LOCATED IN SAFE AREA
TANK
ZENER BARRIER COMPARTMENT

Fig. 4-4

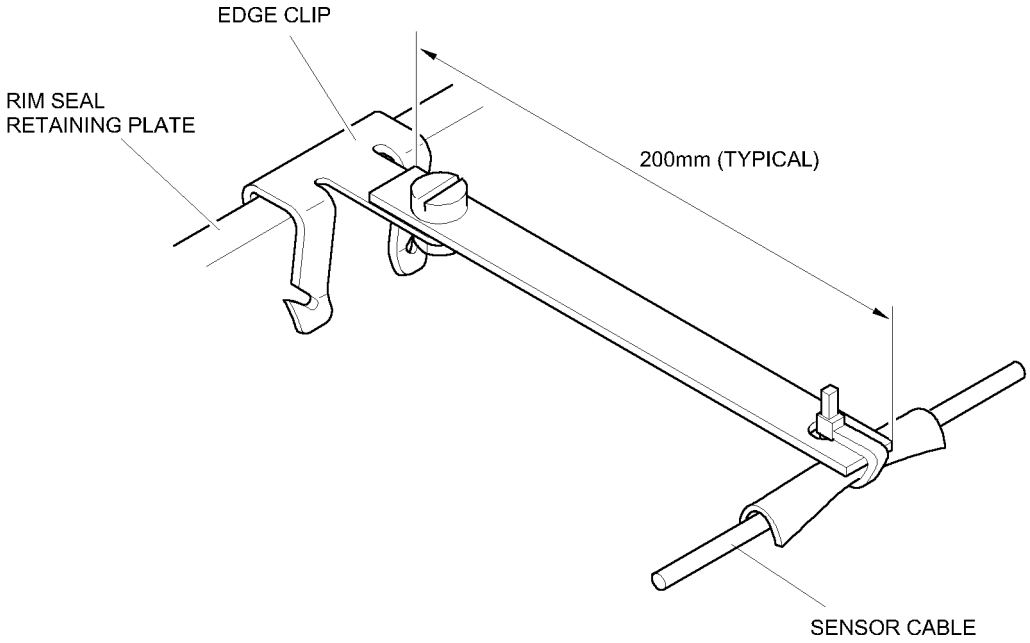

EDGE CLIP
RIM SEAL RETAINING PLATE
200mm (TYPICAL)
SENSOR CABLE

Fig. 4-5

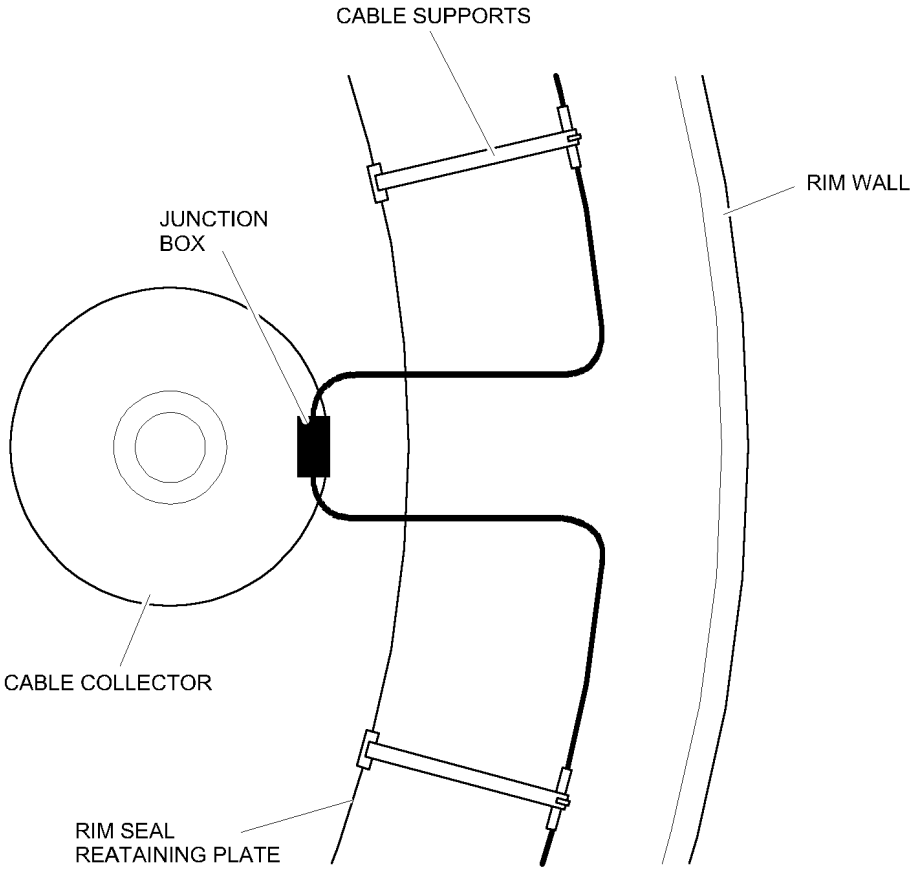

CABLE SUPPORTS
RIM WALL
JUNCTION
BOX
CABLE COLLECTOR
RIM SEAL
REATAINING PLATE

Fig. 4-6

4.5 Dust collector and heat driers

Fig. 4-7 shows Alarmline sensor cable installed at the top of a dust collector or filter bag (bag house). Nylon coated sensor cable should be installed in a continuous run from side to side with approximately 1 metre spacing. Sensor cable should be fastened to the filter bag by insulated loop stand-offs. Weather tight fittings should be used where the sensor cable penetrates the outside wall of the filter bag.

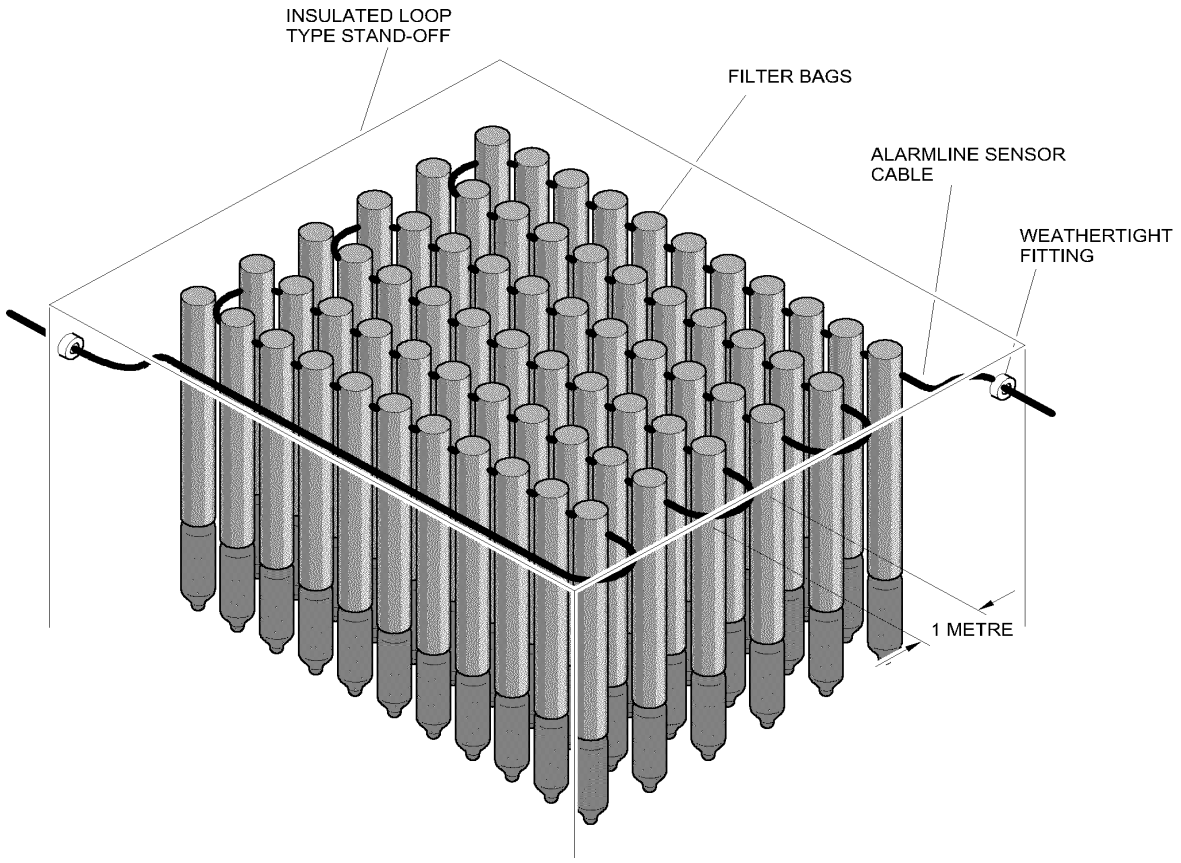


Fig. 4-7

4.6 Rack storage

Alarmline sensor cable can be used for general area coverage. Alarmline sensor cable works as a continuous heat detector therefore the same limitations apply as for point type heat detectors. Alarmline sensor cable is used effectively where, environmental conditions or access difficulty prevent the use of conventional fire detection methods. The advantage of Alarmline sensor cable is the flexibility to install at the point of risk, within the racks or the associated risk area.

Alarmline sensor cable can be installed to protect a high rack storage area by supporting the sensor cable from the ceiling, centred over the aisles, or fastened to the sprinkler system with cable ties or cable clamp stand-offs. Fig. 4-8 shows an example of rack protection.

For a typical rack storage system, up to 4.5 metres high, sensor cable should be installed at ceiling level and within the area between back to back racks. For racks between 4.5 metres and 10 metres high, sensor cable should be installed at two levels. Racks of over 10 metres high should have sensor cable installed at three levels.

In-rack level installations of sensor cable may use the rack construction for fixing using "universal" support brackets or edge clips. Careful positioning of the sensor cable is necessary to allow for uninterrupted system operation and prevent damage which may otherwise have resulted from incorrectly loaded pallets (or similar).

For racks containing high inflammables or other types of high risk products, response times may be further improved by protecting at each storage level using the rack steelwork for sensor cable support.

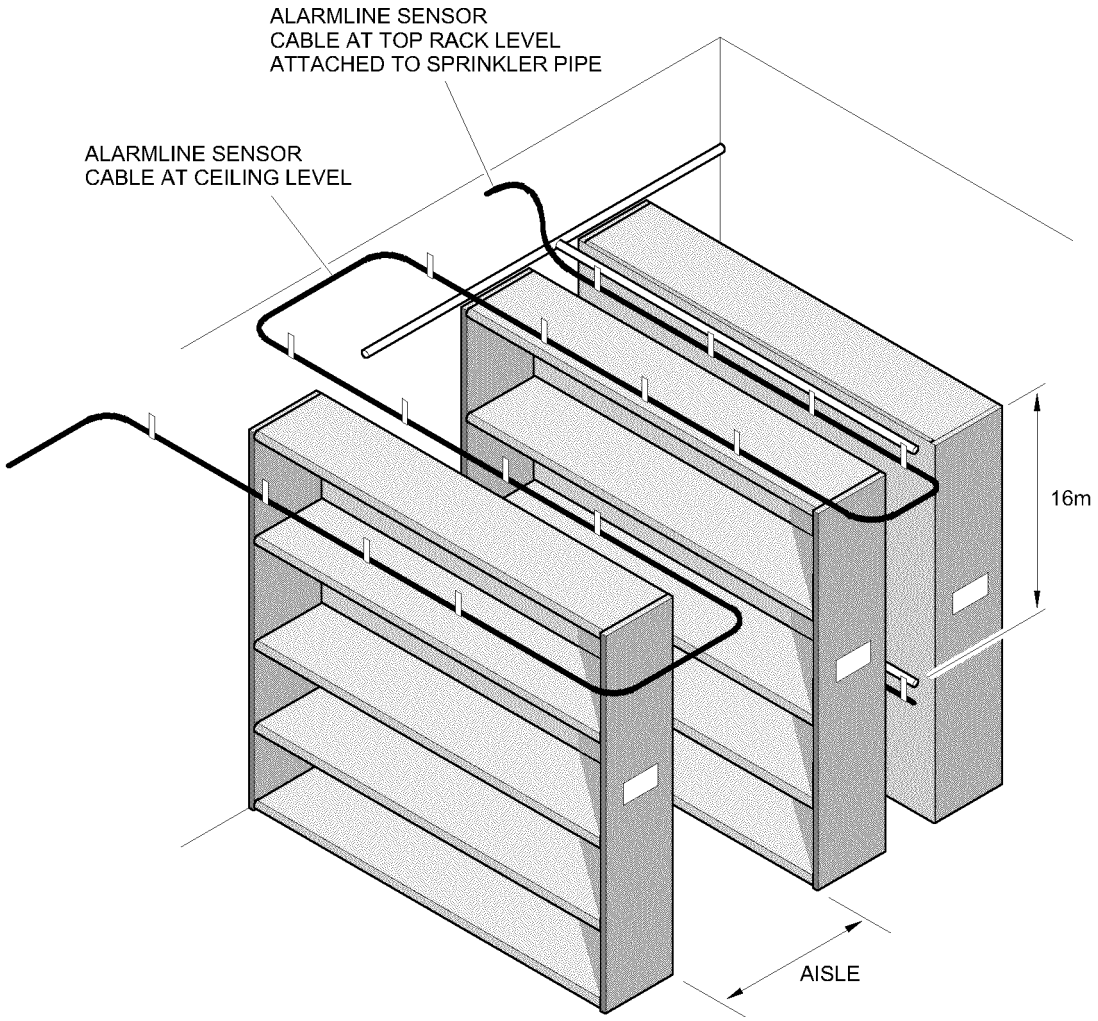

ALARMLINE SENSOR
CABLE AT TOP RACK LEVEL
ATTACHED TO SPRINKLER PIPE
ALARMLINE SENSOR
CABLE AT CEILING LEVEL
16m
AISLE

Fig. 4-8

4.7 Freezer warehouse

The installation for this application is similar to that for rack storage, however precautionary measures need to be taken to ensure trouble free installation and operation.

The Alarmline sensor cable that is used in this application is the nylon coated, Kidde Fire Protection part no. K82021.

Note: minimum operating level -40^{o}C

Installation should take place in temperatures no lower than -11^{o}C.

Bends within the sensor cable should not exceed 100mm. Fixing of the cable should be at 1 metre intervals and either side of all bends.

Use neoprene between clips and sensor cable to ensure the cable is not pinched by the clip and prevents the clip acting as a heatsink.

All sensor jointing and terminations must be made within waterproof boxes suitable for the temperatures to be encountered.

All electronic interfaces and display units should be installed outside of the low temperature area. Fig. 4-9 shows the Alarmline sensor cable routed within the racking providing protection close to the source of risk.

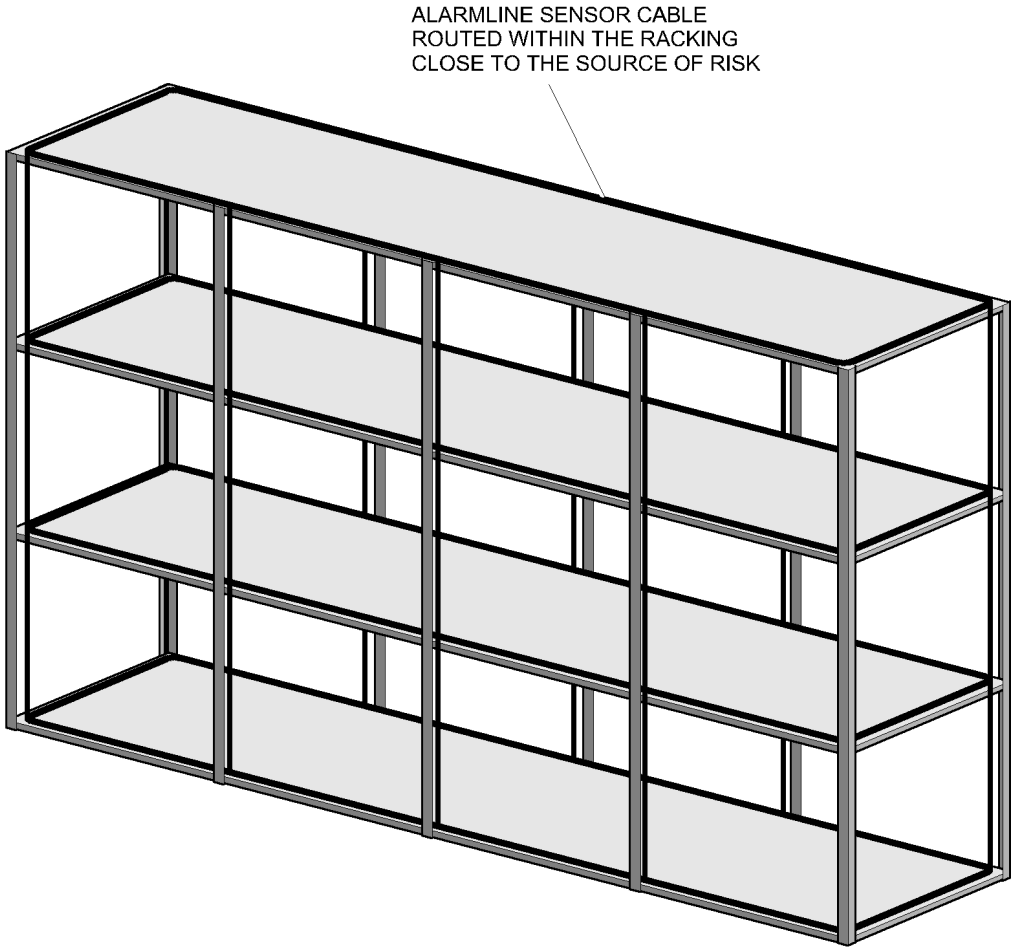

ALARMLINE SENSOR CABLE
ROUTED WITHIN THE RACKING
CLOSE TO THE SOURCE OF RISK

Fig. 4-9

4.8 Toxic or fuel waste drum storage

Fig.'s 4-10 and 4-11 show two methods of installing ALARMLINE sensor cable in a drum storage area.
Fig. 4-10 shows the sensor cable installed directly over a row of 50 gallon drums. Braided sensor cable should be used for increased tensile strength, pulled taut every 15m and held by strain relief fittings.
Fig. 4-11 shows the sensor cable laced in serpentine fashion through a row of drums. Installation should be repeated at every level of drums, stacked or palletised, to maximise response time to overheat or fire where low flammability products are stored.
To estimate the length of sensor cable needed, multiply 1.25 x length of drum rows to be protected in a serpentine fashion.

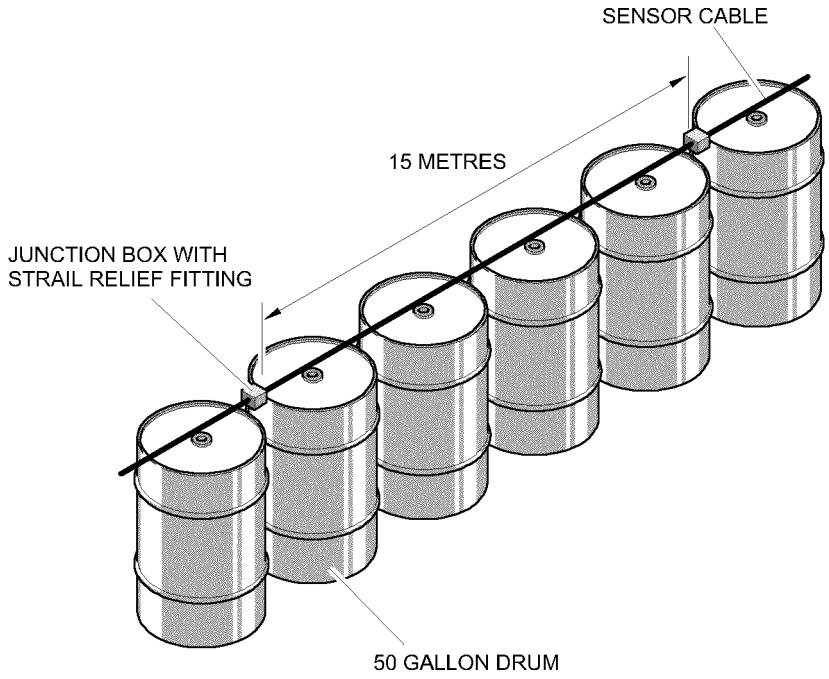


Fig. 4-10

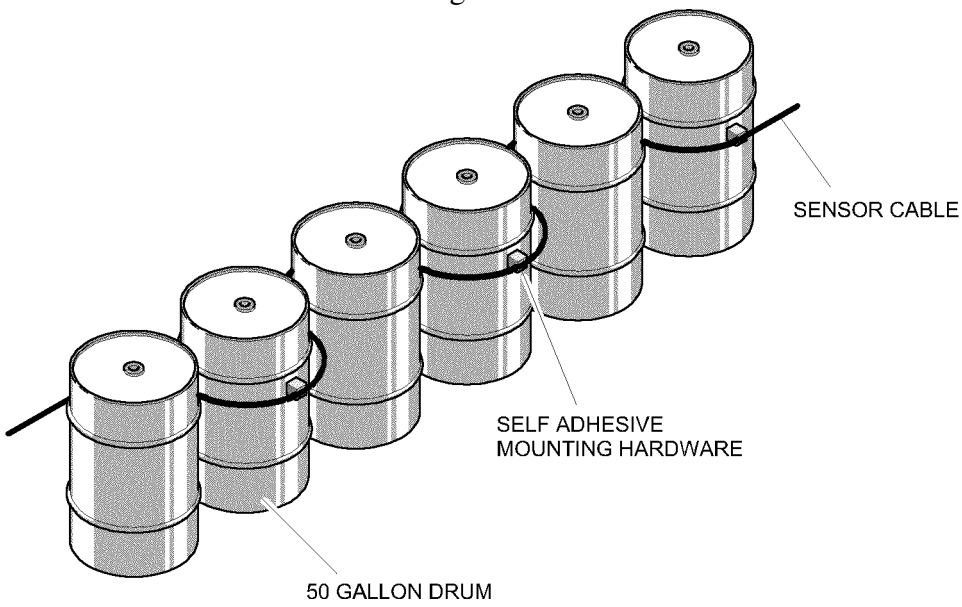


Fig. 4-11

4.9 Power distribution equipment

Alarmline sensor cable installed within a control panel. Sensor cable should be laced between components in a horizontal pattern, fastened to the panel using approved fixings.

Alarmline sensor cable can be installed in parallel with the wiring harness of an electronic switchgear panel. The sensor cable should be laced to the harness with cable ties throughout the panel.

Fig. 4-12 shows two examples of this type of installation.

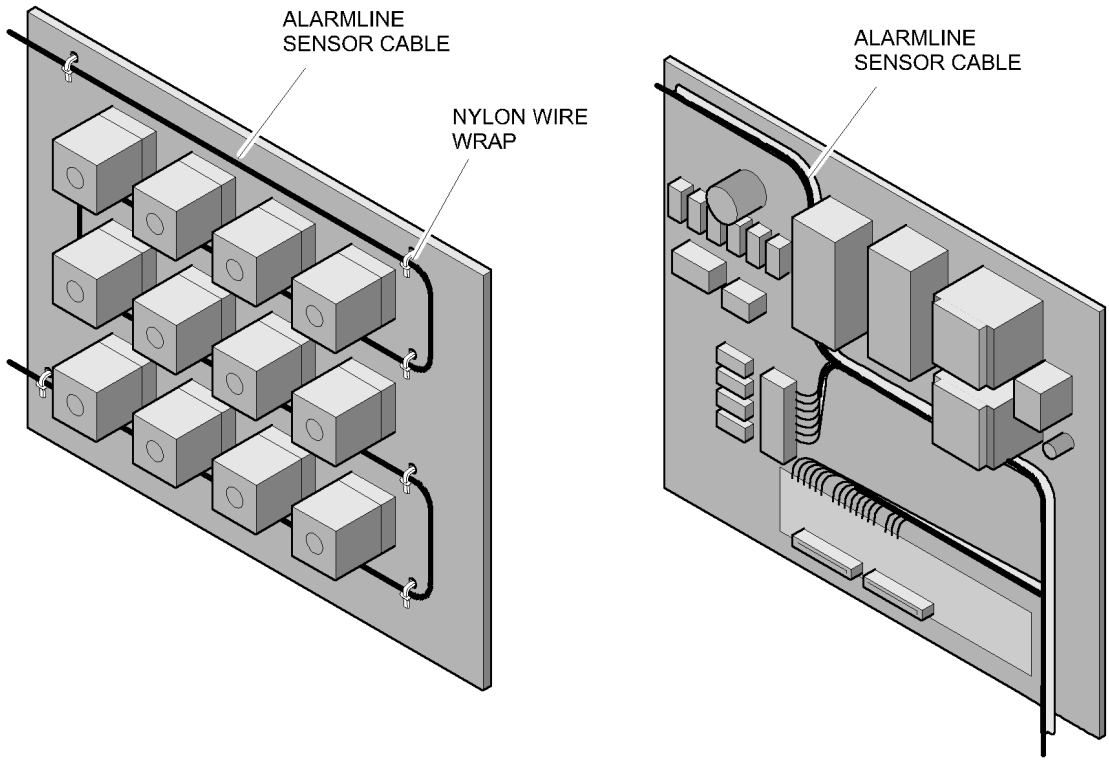


Fig. 4-12

4.10 Escalators

Alarmline sensor cable provides for the total protection of an escalator with coverage provided at all potential fire risk areas i.e. drive motor, return roller bearings, dust collection tray and truss rollers. The use of the bronze braided sensor cable option is recommended together with temperature sensor pads strategically located at primary risk locations.

Where protection is considered at an escalator retrofit rather than a new construction stage, restricted access to truss rollers may limit protection to the "electrical plant" at each end of the escalator. This will provide protection of high risk areas i.e. return roller, dust collection tray and drive motor.

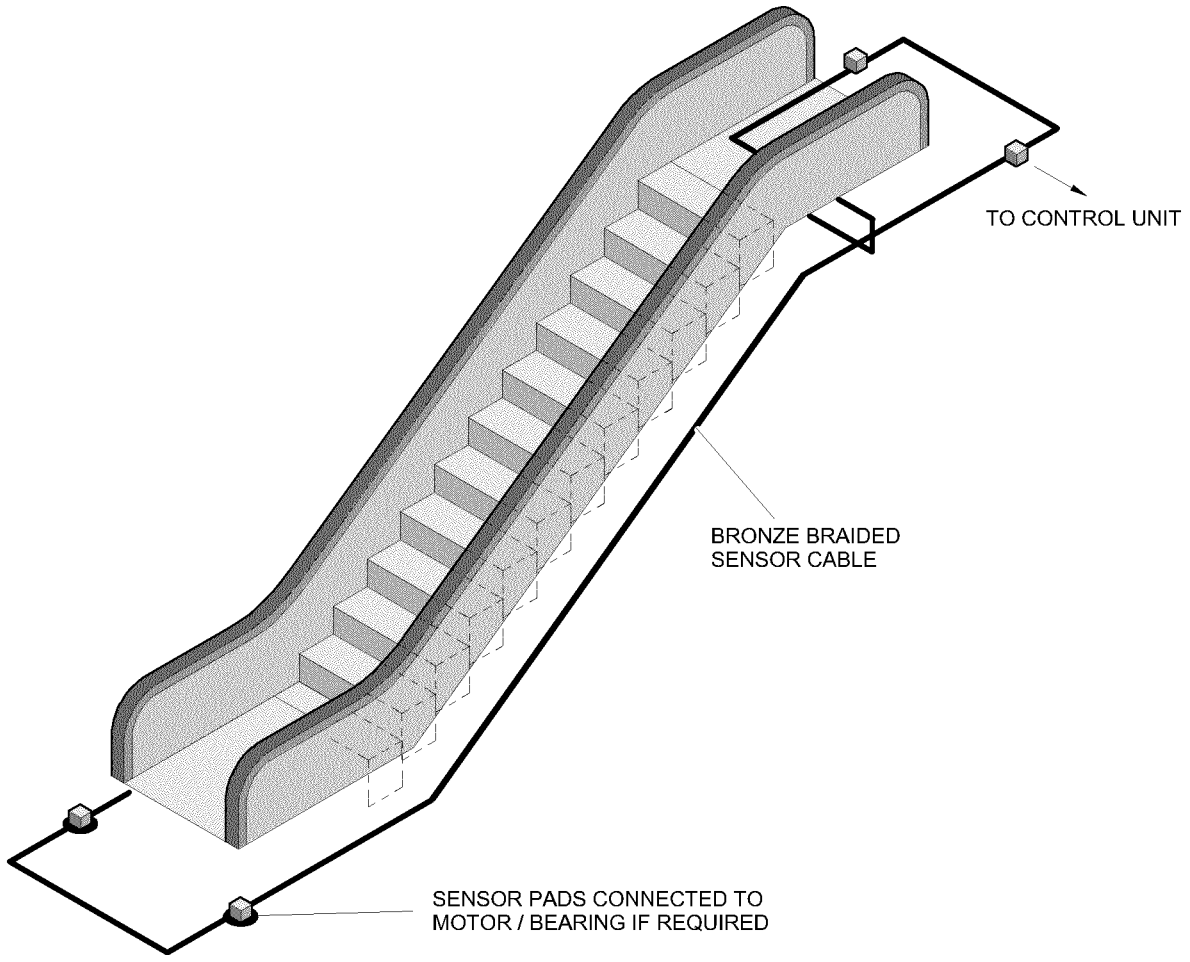


Fig. 4-13

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CHAPTER 5

DESIGN CONSIDERATIONS

5.0 Design considerations

5.1 Sensor cable selection

Standard sensor cable K82017

Recommended for environments ranging from clean and dry to moderate dust and moisture. Not for external use or for installations where corrosive agents or damage to the cable may occur.

Typical Installations :-

- Cable trays
- Voids
- Electrical switch gear
- Service ducts
- Car parks
- Tunnels
- Conveyors/Escalators where there is no risk of mechanical damage

Nylon coated sensor cable K82021

Recommended for hostile environments, Petrochemical, cold stores and external use in general. Can also be used in areas where the standard sensor cable is used if more rigidity or a discreet installation is required:-

Typical Installations:-

- Floating roof tanks
- Cold stores
- Silos & driers
- Tank storage areas
- Engine bays
- Paint spray areas
- Oil rig open area protection
- Areas subject to chemical contamination
- Car parks where unsupervised

Phosphor bronze braid K82078

Recommended for areas where friction or mechanical damage may occur. Same installations as the standard blue.

Nylon with stainless steel braid K98166

Recommended for areas where a high level of mechanical strength is required. Same installations as Nylon coated

5.2 Application considerations

The Alarmline Sensor cable will cover a wide and diverse range of applications. Cable selection can therefore be based upon the environmental conditions appertaining to the associated risk.

The Electrical interface series 4 LHD control unit is used to set the alarm setting required for the correct operation of the system. This will enable the system to be commissioned against the known environmental temperature of the installation. This will ensure best results for each installation.
If the environmental conditions fluctuate for example between seasons it is recommended that during routine service the settings are changed accordingly. This will maintain the optimum operation of the system whilst preventing and any spurious activation's.

The switch setting of the LHD4 interface unit is conditional upon the ambient temperature and the cable length. By varying the switch setting or cable length this enables desired alarm temperatures to be set.

The method of switch setting is by a Nomogram chart. (See Chapter 10). This indicates the cable length, ambient temperature, alarm temperature and the switch setting to which this will operate.

CHAPTER 6

SERIES 4 LHD INSTALLATION

6.0 Series 4 LHD installation

The following instructions detail the mounting of the Series 4 LHD enclosure.

1. Slacken the four retaining screws, ease the lid away from the base.

2. Remove the PCB by removing the four screws connecting it to the base.

3. Keep PCB and lid in a safe place, and protected from static damage.

4. The base can be mounted to the appropriate wall/structure via at least two of the four securing points. The enclosure should be mounted using 5mm screws/bolts a minimum of 25 mm long. Plastic washers on rear and under screw/bolt head must also be used.

5. Cable entry can either be top, bottom or side entry. Drill hole using correct size hole cutter for cable gland of interposing and or sensing cable as appropriate.

6. Cables should be fixed to the enclosure via suitable couplings to maintain IP55 rating of the enclosure.

7. Where Alarmline sensor cable is connected directly into the series 4 LHD unit a compression cable gland 10 mm in diameter should be used to accommodate the Alarmline sensor cable 3.25 - 6 mm. Compression seal to be none perishable such as neoprene. Metal compression of the sensor cable is not permissible.

8. Once connections are made as per the connection details then follow instructions 1 and 2 in reverse.

6.1 Series 4 LHD K82012 wiring details

6.1.1 Two wire zone

The basic version of the series 4 LHD, type K82012, has been designed for use with fire detection panels to British Standard BS5839, operating on conventional 2-wire detection zone.
This should be wired in the same way as conventional heat and smoke detectors.

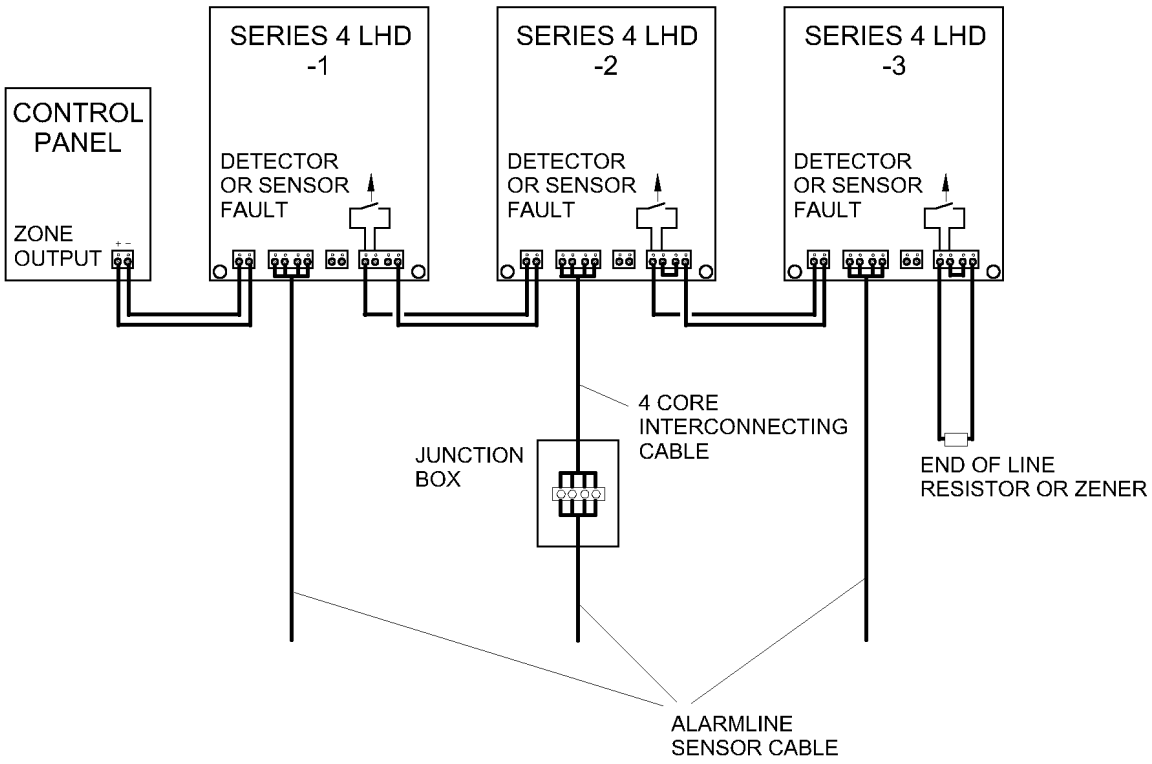

Fig. 6-1

The method of connecting more than one series 4 LHD units to a two-wire zone is shown in Fig. 6-1 above. A fault condition signalled by series 4 LHD - 1 will disconnect series 4 LHD - 2 and series 4 LHD - 3.

Boards can be supplied without the series 4 LHD enclosure. The installer will be responsible for compliance with CE requirements for boards installed in an enclosure other than the standard enclosure.

6.1.2 Terminal connections K82012/K82013

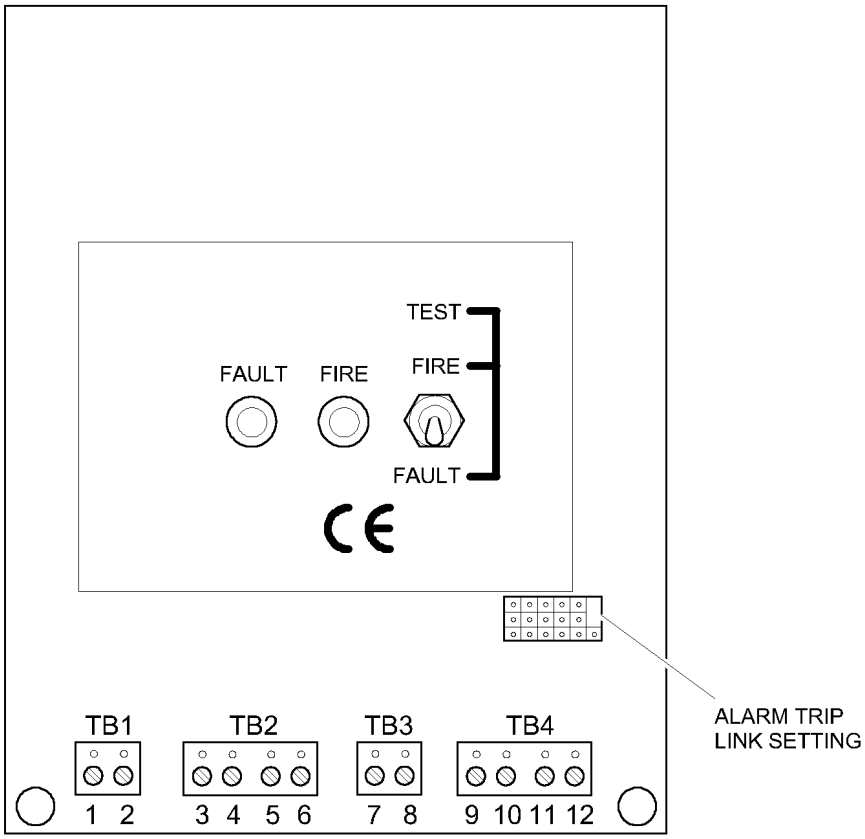

Fig. 6-2

Pin No.	Description
1	0 V supply input
2	+ 8 to + 30 V supply input (24v)
3	1 (ORANGE) sensor cable connection
4	2 (WHITE) sensor cable connection
5	3 (RED) sensor cable connection
6	4 (BLUE) sensor cable connection
7	Remote FIRE LED (+)
8	Remote FIRE LED (-)
9	FAULT contact (+)
10	FAULT contact (-)
11	0 V supply output
12	+ 8 to + 30 V supply output

Note: 1. Wiring of terminals 9, 10, 11 and 12 are dependent on the type of zone wiring used, e.g. 2 wire or 3-wire system.

2. The fault contacts, terminals 9 and 10 are an electronic switch and for correct operation must be used in the 0v line with terminal 10 being referenced to 0v - terminal 11.

6.1.3 Terminal connections K82194

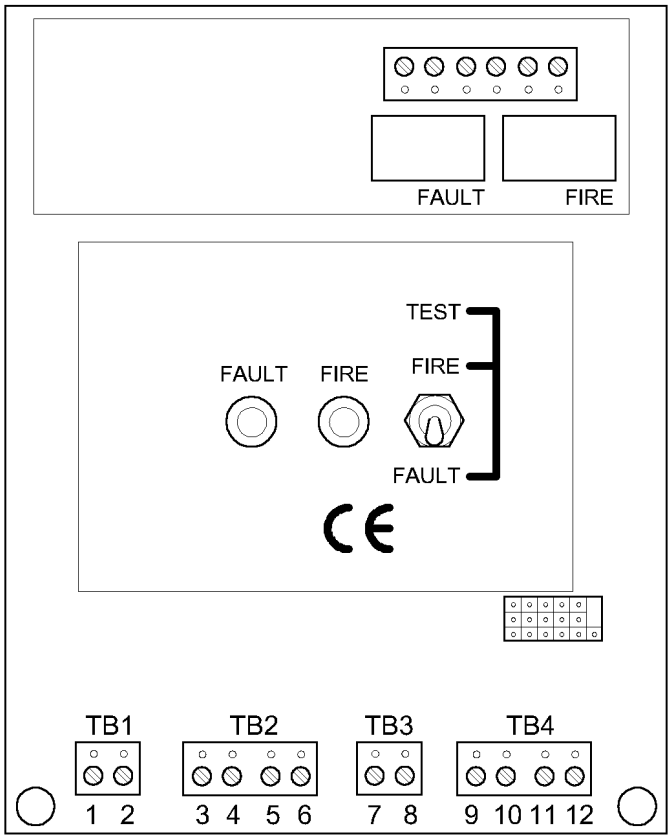

Fig 6-3

When a series 4 LHD has the optional auxiliary relay PCB fitted, the quiescent current will be increased and will not be suitable to operate on a 2-wire circuit from the detection zone of the fire alarm control panel. Therefore it is recommended that a 24v dc supply which incorporates reset facilities is taken from the control panel to the series 4 LHD. FIRE and FAULT signalling may then be taken over separate conductors from the relay contacts as shown above.

The table on the following page details the terminal connections for the K82194

Pin No.	
1	0v supply input
2	+8v to +30v supply input (24v nominal)
3	1 (Orange) sensor cable connection
4	2 (White) sensor cable connection
5	3 (Red) sensor cable connection
6	4 (Blue) sensor cable connection
7	Remote FIRE LED (+)
8	Remote FIRE LED (-)
9	FAULT contact (+)
10	FAULT contact (-)
11	0v supply output
12	+8v to +30v supply output
13	Analogue output 5 - 0v, load 10 K ohms
14	0v
15	24v
16	Not connected
17	FAULT relay contact - Normally Closed
18	FAULT relay contact - Normally Open
19	FAULT relay contact – Common
20	FIRE relay contact - Normally Closed
21	FIRE relay contact - Normally Open
22	FIRE relay contact – Common

Note: FIRE and FAULT relay contacts are volt free, maximum rating 24v dc at 2A.

6.2 Series 4 LHD K82194 wiring details

The auxiliary relay PCB may be ordered separately as part no. K82193. The PCB is fitted with FIRE and FAULT relays, and an optional analogue output for a chart recorder. The relay contacts are: volt free, 2A 24v dc and 60W.

If the K82193 is to be fitted on site then the removal of R49 - 560 ohms on the main PCB is necessary.

The series 4 LHD - K82194, is designed to operate from 24v dc and latch on FAULT and FIRE conditions. In order to reset it is necessary to interrupt the 24v dc supply.
Fig. 6-4 shows the typical electrical connection for the series 4 LHD.

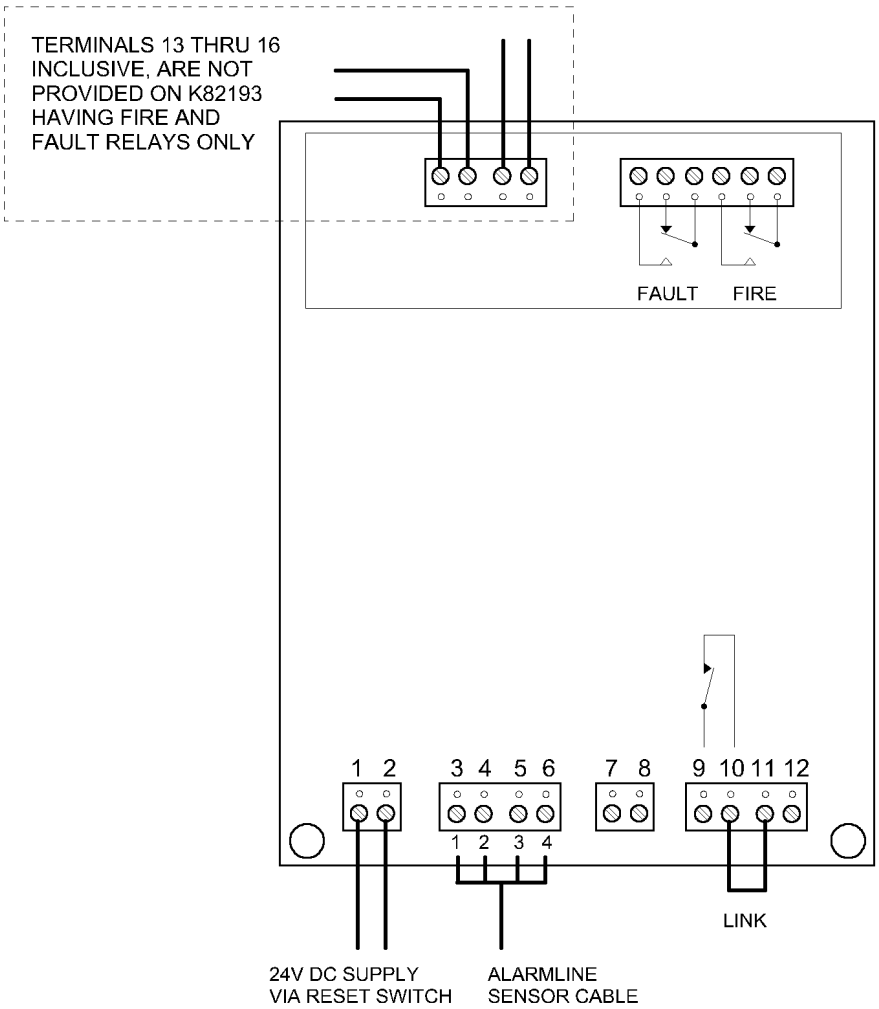

Fig. 6-4

6.3 Function of controls

Fig. 6-5 shows the front panel of the series 4 LHD, the function of each control and indicator is described below.

FIRE LED

Continuous operation, indicates an overheat or fire condition.

FAULT LED

When flashing indicates a sensor fault within the Alarmline system, either open or short circuit.

TEST: FIRE and FAULT switch

A three position, spring loaded, centre biased switch, which is left in the centre position for normal operation.

To test for a fire alarm indication**,** hold the test switch in the FIRE position (for up to 5 seconds) and ensure that the FIRE LED is lit, release the switch.
To test for a fault condition, hold the test switch in the FAULT position (for up to 5 seconds) and ensure that the FAULT LED is flashing, release the switch.

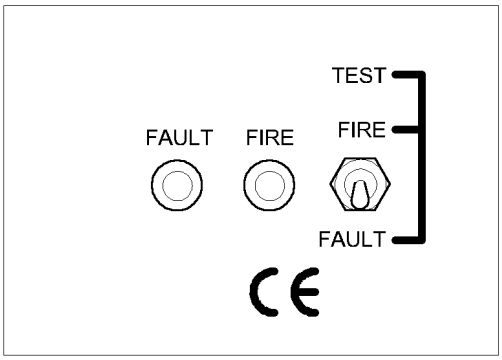

Fig. 6-5

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CHAPTER 7

INSTALLATION OF ALARMLINE LINEAR HEAT DETECTION CABLE

7.0 Installation of Alarmline Linear Heat Detection cable

Installation of Alarmline sensor cable is application and site specific. Unless the fire alarm company responsible for the system has specialist knowledge of this type of fire detection, design information and cable selection should be undertaken by the company supplying such equipment. In the event that Alarmline linear sensor cable is being used in place of point type heat detectors the relevant standards for spacing and height restrictions apply. Typical limitation in accordance with BS5839 Part 1 as detailed below

		Ceiling heights	
Heat detector	Temp	General	Rapid attendance
Grade 1	62^{O}C	9.0 metres	13.5 metres
Grade 2	70^{O}C	7.5 metres	12.0 metres
Grade 3	78^{O}C	6.0 metres	10.5 metres

Several examples of installation are shown within the applications section. This is not a complete range of possible applications for Alarmline sensor cable, but intended to show diversification of use. Kidde Fire Protection or its agents would be able to advise suitability of Alarmline sensor cable for any applications under consideration.

7.1 Installation overview

Positioning of units depends upon site requirements, although it can act as a stand alone unit (K82194) it is more likely to interface to a fire control panel either conventional or analogue. Mounting adjacent to the risk area is preferable although not essential. Interposing cable can be used and should be a four core 1.5mm^2 with a maximum distance of 2Km. Fig. 7-1 shows an example of the field wiring setup.

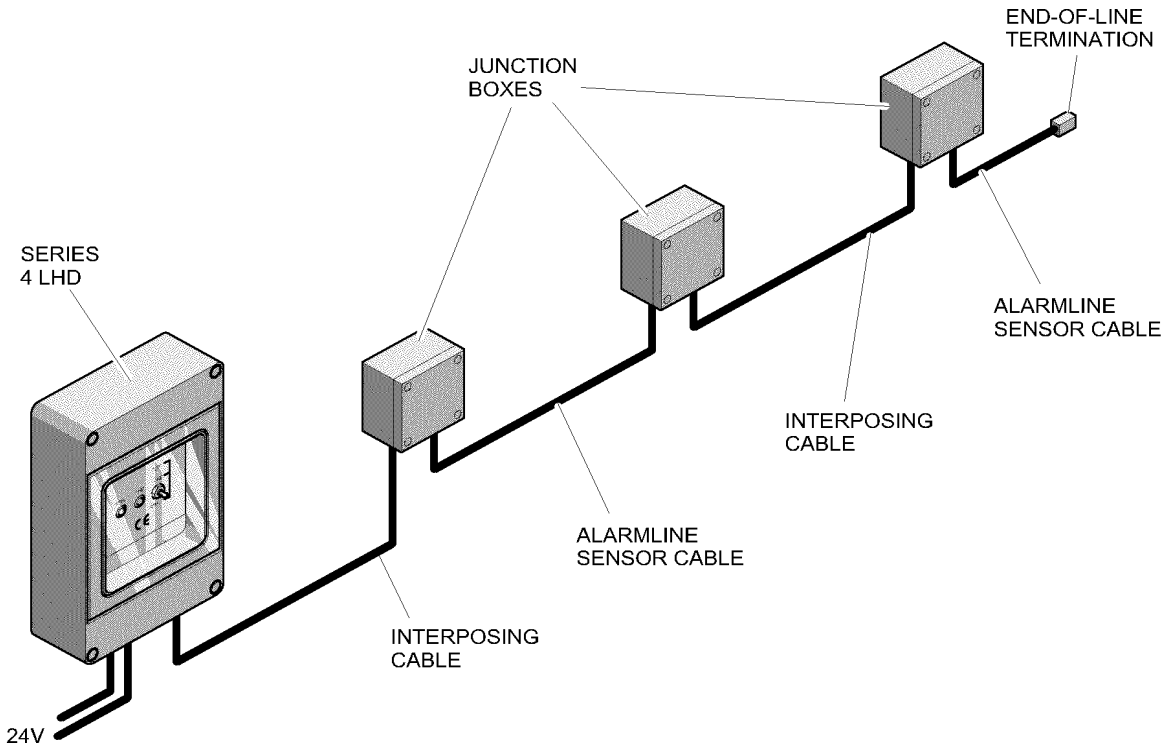
END-OF-LINE
TERMINATION
JUNCTION
BOXES
SERIES
4 LHD
ALARMLINE
SENSOR CABLE
INTERPOSING
CABLE
ALARMLINE
SENSOR CABLE
INTERPOSING
CABLE
24V

Fig. 7-1

7.2 Hazardous areas

Alarmline sensor cable is approved for use within installations up to zone 0 group IIC. It is essential that appropriate Zener barriers are installed within suitable enclosures for the environment. Approved barriers are:

a) Measurement Technology MTL761
b) Pepper and Fuchs 2361EX

Two dual barriers per sensor cable are required. For typical connection see Fig. 7-2 below.

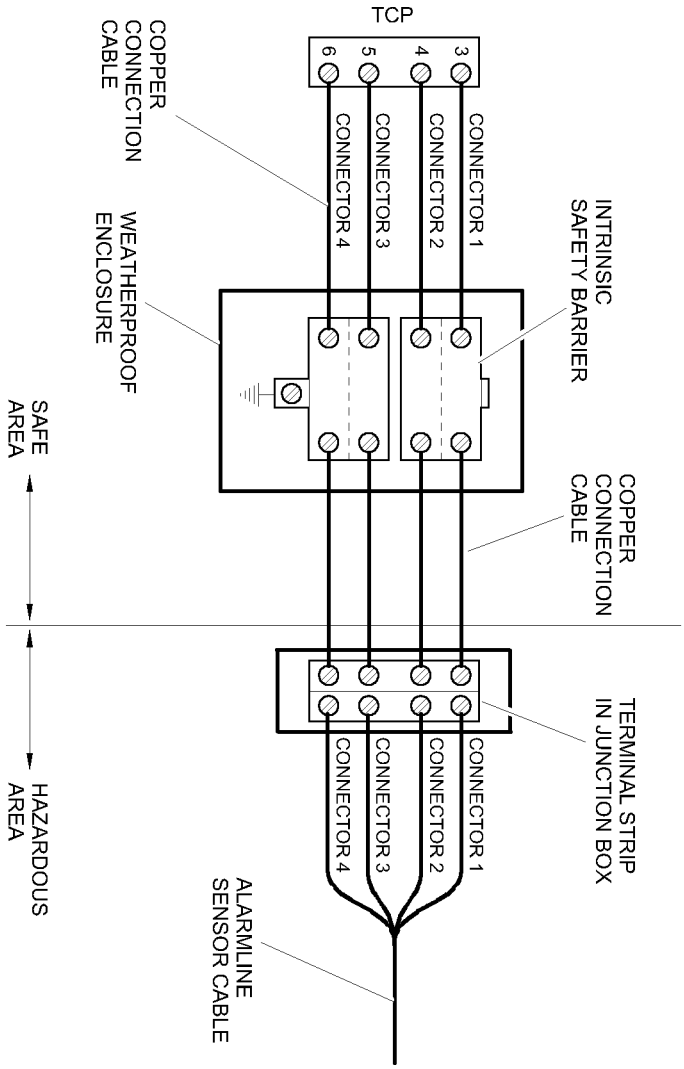

Fig. 7-2

7.3 Cable fixings

Fixing devices for the sensor cable are readily available for most applications. Owing to the nature of the sensor no special rules need to be followed, other than to ensure the fixing device does not damage the sensor cable as with any electrical installation clamping should not be excessive.
The sensor cable can be bent around a radius of 10mm. Should the bend be providing an anchor point in order to apply tension, the bend radius should be 20 to 25mm. The cable should be fixed at both sides of any bends.

A short length of neoprene sleeving provides protection at the fixing point and is recommended especially where sharp edges are likely to cut into the insulation, or where metal braided sensor can chafe against surround metal or where the clip may act as a heatsink.

The following samples are the most commonly used range of fixing clips. These will cover the majority of installations, Kidde Fire Protection or its distributors can advise on the best installation method for any particular installation.

7.3.1 Thermal spacer

The thermal spacer was adapted as a sensor cable support by the Electricity Central Generating Authority and provides a sturdy, quickly installed mounting. Fig. 7-3 shows the thermal spacer and how it is used.

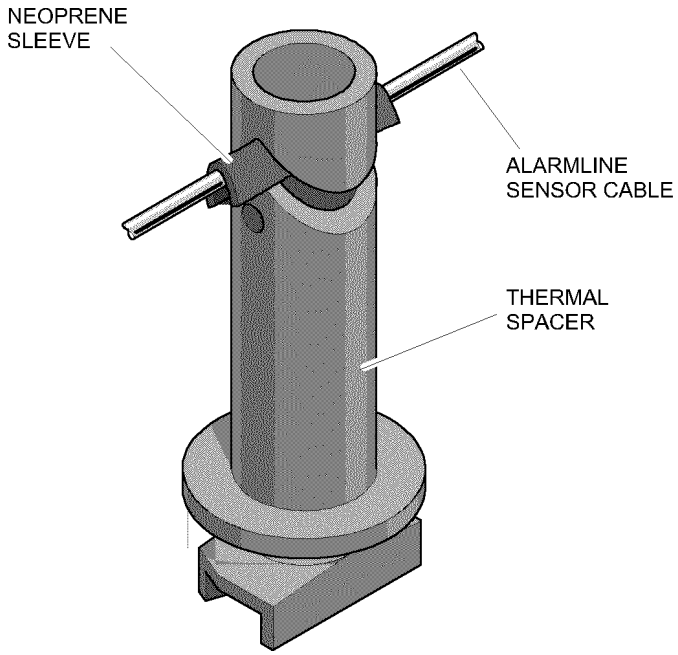

Fig. 7-3

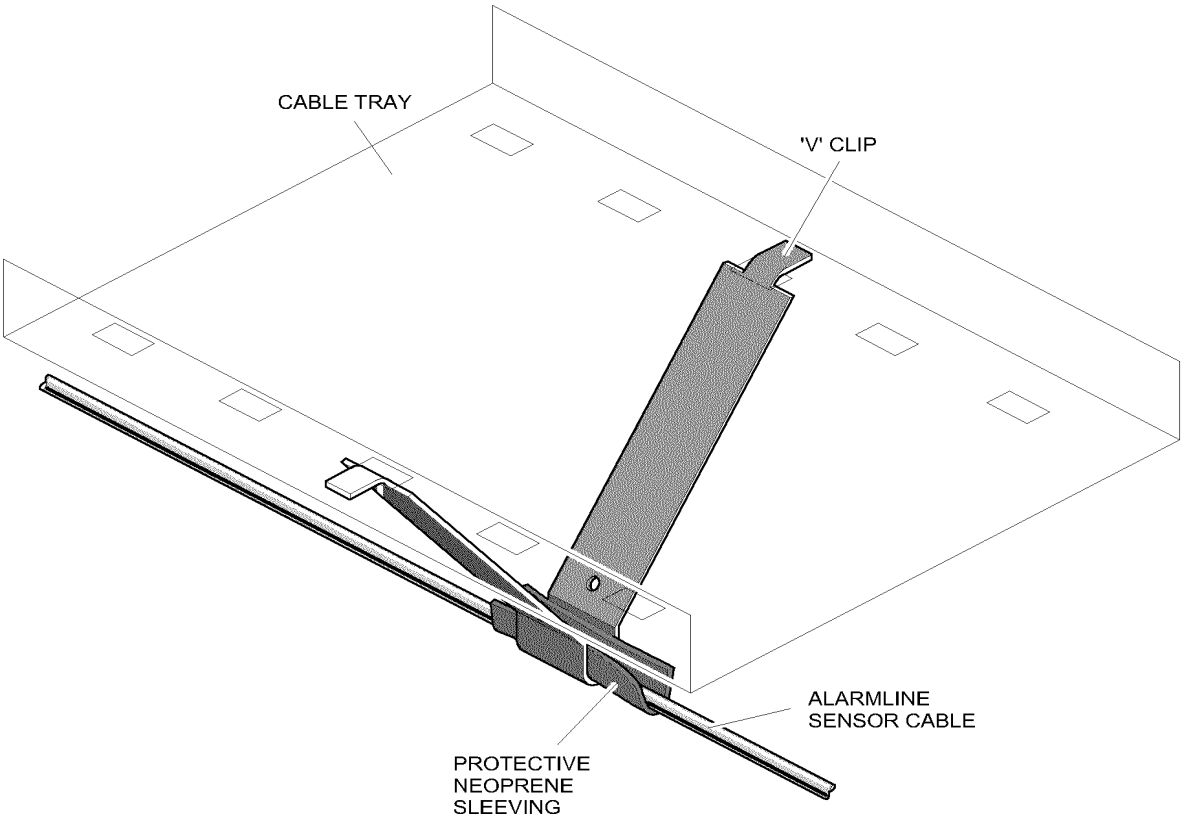

Fig. 7-4

7.3.2 “V” clip

The “V” clip is specifically designed for supporting Alarmline sensor beneath cable trays by fixing into the ready made slots on the cable tray. The installation of these clips is quick and easy. Fig. 7-4 shows an example of the “V” clip.

7.3.3 Pipe Clip

If the Alarmline sensor cable is covering the top cable tray then the “V” clip is not suitable, therefore a cable tray bracket can be used. The bracket can be fitted to the cable tray or reverse to ceiling slab via a suitable nut and bolt arrangement. A nylon bush is used to protect the cable and prevent the bracket acting as a heatsink as shown in the examples below.

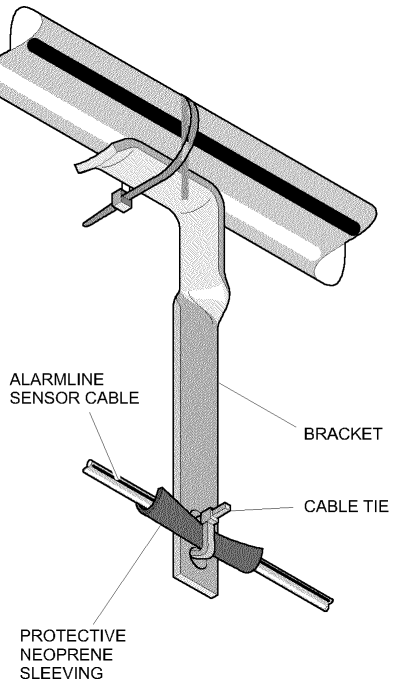

Fig. 7-6

7.3.4 “T” clip

The “T” clip is a general fixing clip which is used for installing Alarmline sensor cable onto flat surfaces i.e. walls or ceilings. This clip is generally used in area protection, or rack protection. The “T” clip is shown in Fig. 7-7 below.

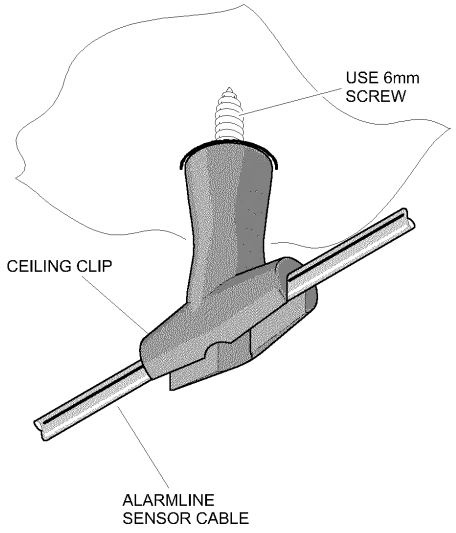

Fig. 7-7

7.3.5 Edge clip

The edge clip is suitable for fixing to structural beams of buildings, as shown in Fig. 7-8.

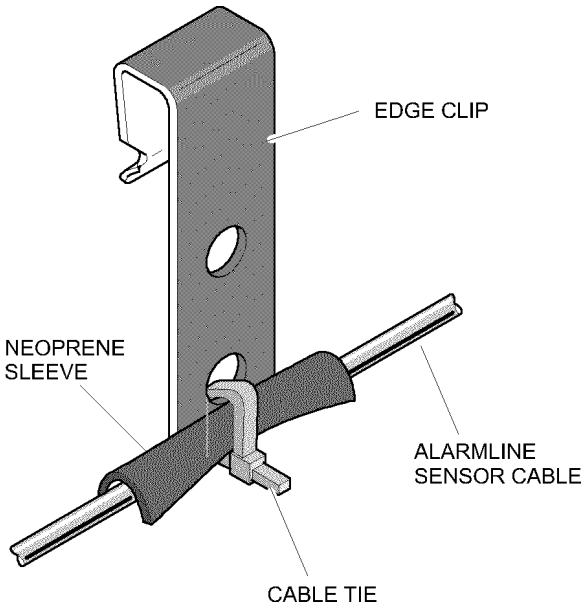

Fig. 7-8

7.3.6 Knock-on clip

The Knock-on clip can be used to fix to girders and metal edges, they are available in different sizes to accommodate different thickness of girder as shown below in Fig. 7-9.

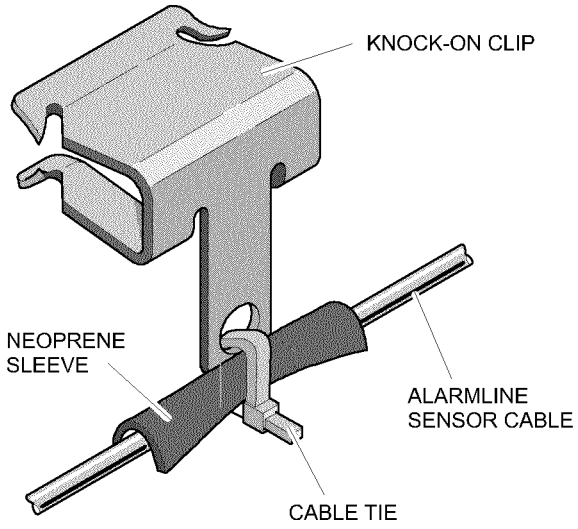

Fig. 7-9

7.4 Cable stripping

The following instructions detail the preparation of the Alarmline sensor cable prior to termination.

1. Place the end of the Alarmline sensor cable flat on a smooth and stable surface.

2. Starting 15mm from the end, make a straight slice through the outer insulation only, as shown in Fig. 7-10 below.

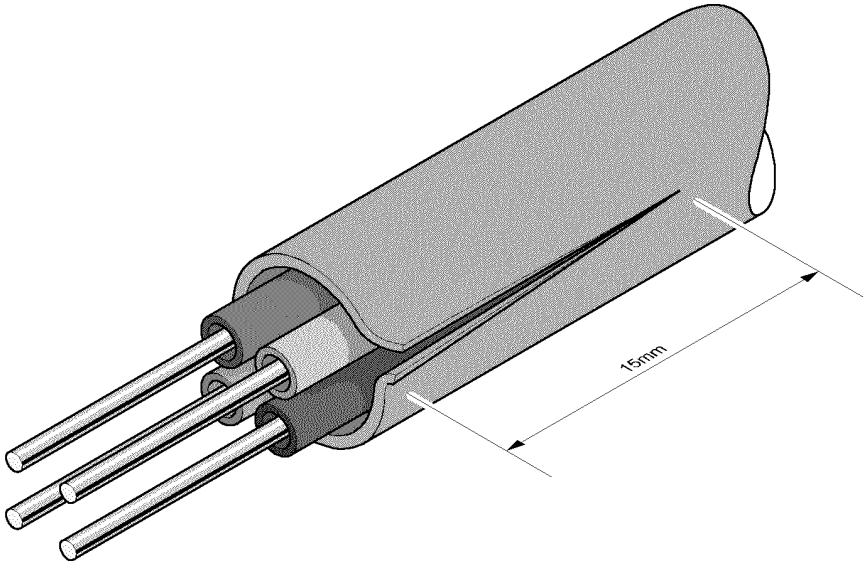

Fig. 7-10

3. Peel back the outer insulation, exposing the four colour coded inner conductors.

4. Remove up to 10mm of insulation from each of the four colour coded cores, as shown in Fig. 7-11.

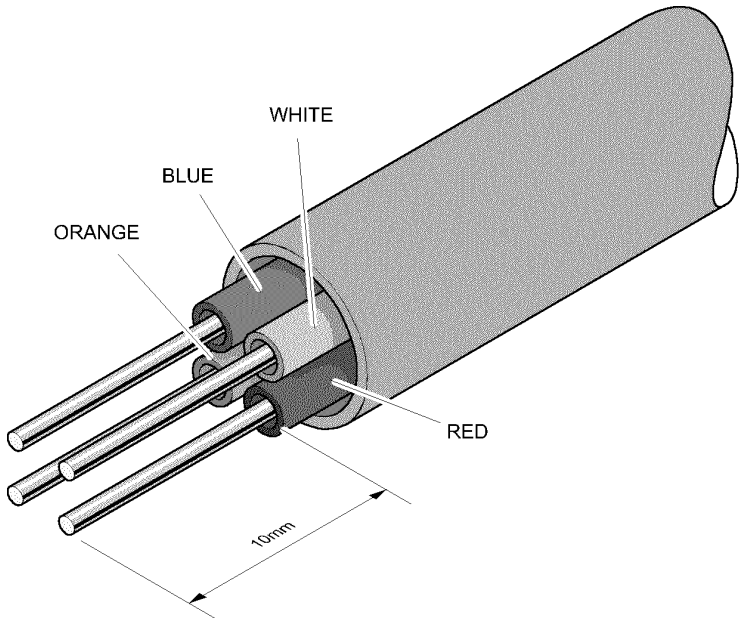

Fig. 7-11

5.	**Take the orange and red cores and clean off the polyester enamel coating on the central core, using a knife or a piece of fine emery cloth.**

6. Connect to terminal block of junction box or direct to series 4 LHD interface unit

7. Fit crimped connectors where required.

7.5 Cable end termination

The sensor cable can be supplied cut to 100 metre length increments with one end already terminated. The minimum length of cable that can be supplied is 100 metres with the maximum being 1000 metres.

Where the sensor cable is supplied in bulk or termination is to be carried out on site, the following procedure is to be adopted using an end of line termination kit, part no. K82023. Within hazardous areas termination must be with an approved junction box.

1. Prepare the end of the sensor cable as instructed in section 7.4, steps 1-5.

2. Take the WHITE and ORANGE cores and twist together and solder.

3. Take the BLUE and RED cores and twist together and solder.

4. Insulate both of the soldered joints with the small red shrink sleeves provided, apply temperature until sleeve shrinks into place (preferably via an industrial "heat gun" or similar device), see Fig. 7-12 below.

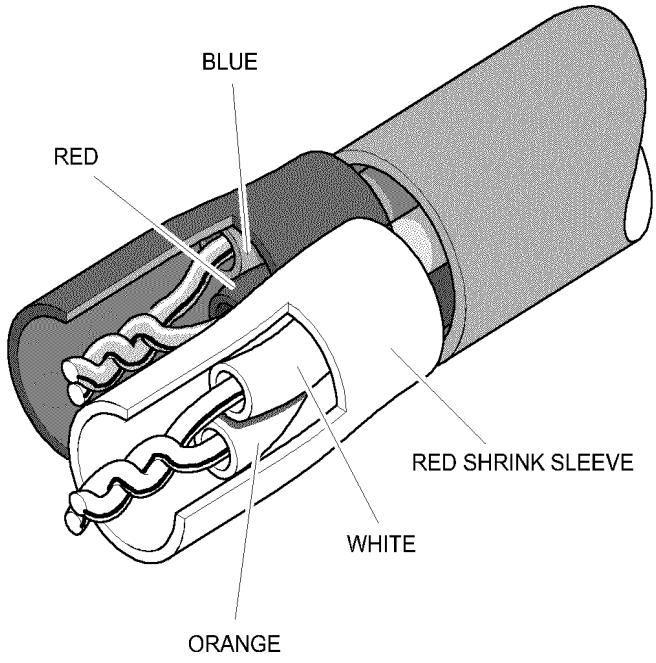

Fig. 7-12

5. Place the large clear shrink sleeve and then the black end cap over all four cable ends and shrink firmly into positioning applying the same temperature, refer to step 4. The end result is shown in Fig. 7-13.

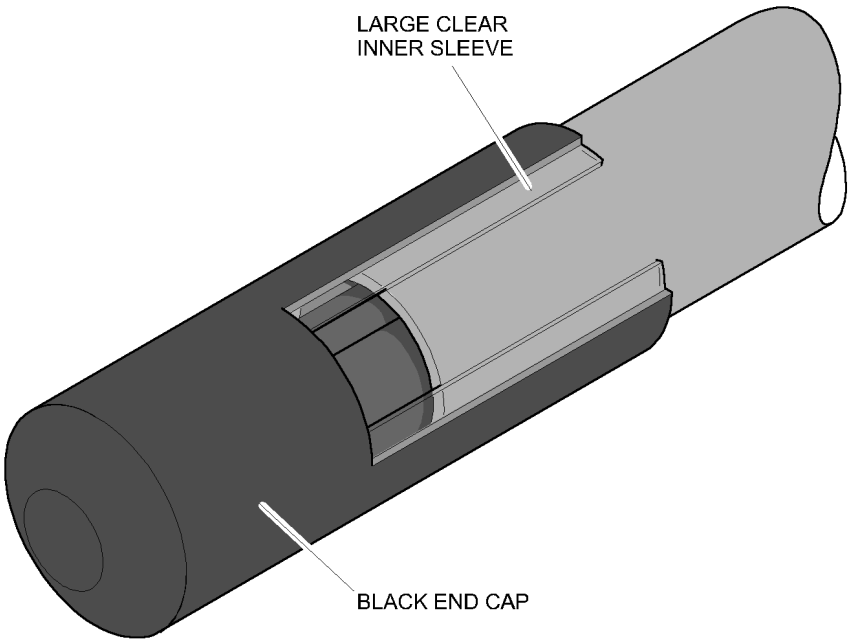

Fig. 7-13

7.6 Cable jointing

It is preferable to install sensor cable in continuous lengths, however in cases where it is necessary to join two sections of sensor cable together, or to insert an additional length, the following method is to be adopted using the in-line jointing kit, Kidde Fire Protection part no. K82024.

1. Remove the outer insulation to about 50mm from the two cables to be joined.

2. Take one of the cable ends and cut back the RED and BLUE inner cores to a length of 15mm.

3. Take the other cable end and cut back the ORANGE and WHITE inner cores to a length of 15mm.

4. Remove the inner cores insulation from both cable ends to 8mm. Ensure the polyester coating is fully removed from the RED and ORANGE cores on each of the cables.

5. Slide the WHITE shrink sleeve over one of the cables, and slide the BLACK shrink sleeve over the other cable.

6. Slide RED shrink sleeve over the ORANGE and WHITE cores of one of the cables and the BLUE and RED cores of the other cable, as shown in Fig. 7-14.

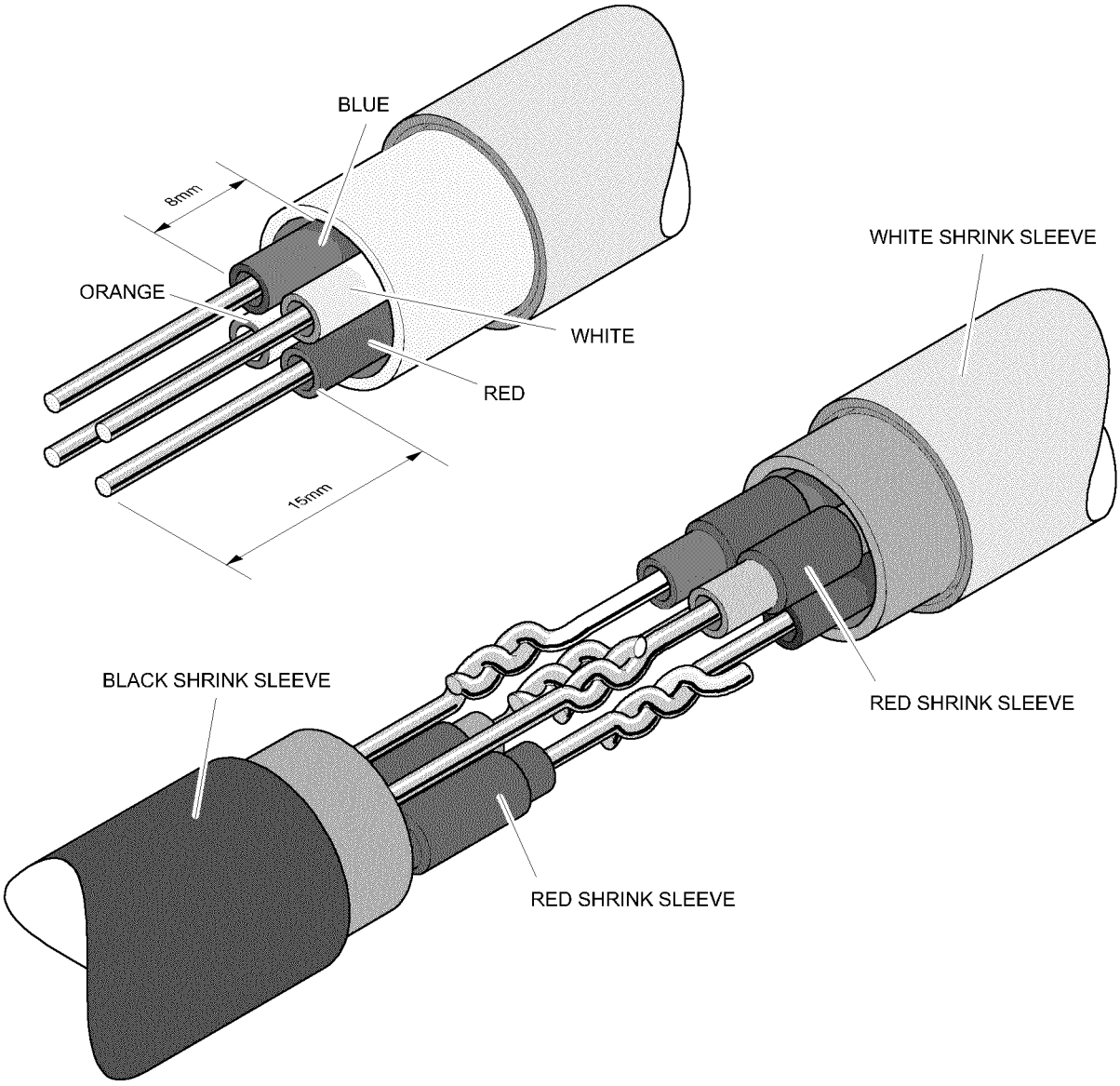

Fig. 7-14

7. Twist and solder the individual conductors of both cables. Ensure that the colour of the cables match i.e. RED to RED, BLUE to BLUE etc.

8. Slide the RED shrink sleeves over the soldered connections and shrink into position applying heat.

9. Slide the WHITE shrink sleeve over the four joints and shrink into position applying the same heat as in step 8.

Fig.7-15 below shows the completed joint.

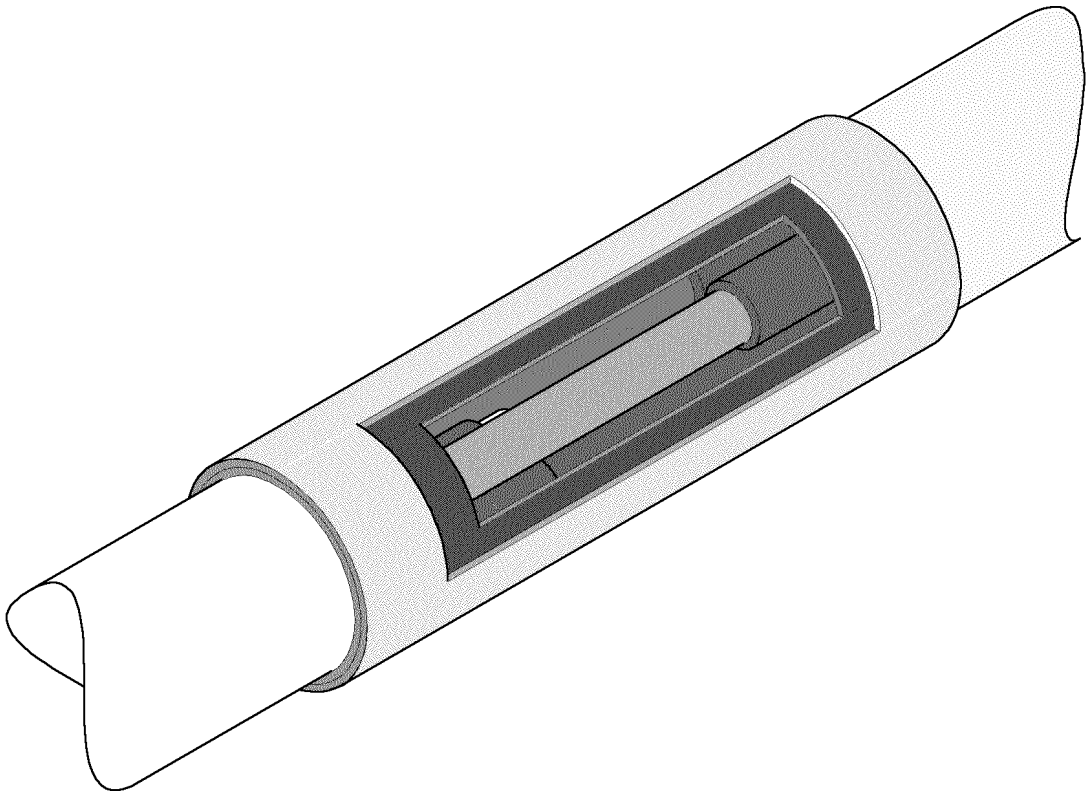

Fig. 7-15

7.7 Sensor pad

The construction of the sensor pad uses exactly 1 metre of Alarmline sensor cable mounted onto a steel backplate. The sensor cable is firmly held in position by four supporting arms, see Fig. 7-16.

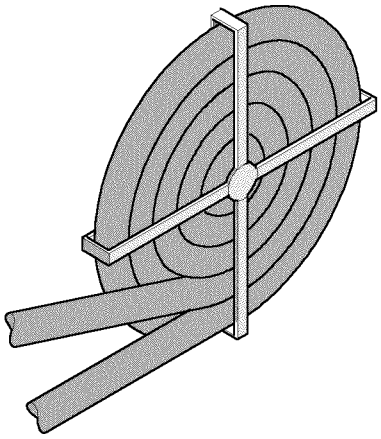

Fig. 7-16

1. Sensor cable wound onto the pad, should have 2 by 1 metre length tails, the end of which should be stripped (outer extrusion: 15mm, inner extrusion: 10mm).

2. The correct sensor cable option pad may be identified by the following part nos.

   51511-102 - High resistance sensor cable (blue).
   51511-104 - Bronze braided high resistance sensor cable.
   51511-105 - Nylon extrusion high resistance sensor cable.

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CHAPTER 8

COMMISSIONING SCHEDULE

8.0 Commissioning schedule

8.1 Scope and content

This document details the commissioning related only to the Alarmline element of the overall fire protection measures employed under the project in question.

As such the schedule covers the activities necessary to ensure the correct operation of each "satellite" detection unit embracing the following:

1. Series 4 Linear Heat Detection Unit (LHD)
2. Alarmline sensor cable

The interface modes between the Alarmline equipment and that of others is defined as:

1. The series 4 LHD unit terminal block carrying all incoming/outgoing electrical services and signals.
2. The Alarmline sensor cable zone runs and their termination either direct at the LHD unit or at an interposed zone junction box.

The commissioning procedure is to be conducted in two stages, passive checks and dynamic checks.

8.1.1 Passive checks

A visual examination is to be made of the following items in the manner specified with reference as necessary to appropriate associated drawings and documents. The purpose of the examination is to establish the extent of any damage, defect or omissions which may have arisen during installation, and to ensure that all work accords with accepted standards and codes of practice.
Each series 4 LHD unit is to be checked for the following:

1. Free from damage and mechanically secure.

2. Correct identity and termination of all cable cores.

3. Correct setting of the internally mounted Alarm trip setting link in relation to the Alarmline sensor cable length connected and the required temperature response criteria.

4. Correct polarisation (if appropriate) and secure fit of the central control panel end of line device between terminals TB4-9 and TB4-12.

5. Presence of a link between terminals TB4-10 and TB4-11.

Each Alarmline sensor cable run is to be examined to ensure that secure fixing and tensioning exists along its length, that it is free from mechanical damage and is so installed as to mitigate against future possible damage. It should be further checked to establish that the correct sensor option has been installed for the application.

Where terminated locally in a junction box, both the box and the Alarmline sensor cable terminations are to be checked for mechanical security, correct termination of the sensor cable cores and interconnecting cores.

8.1.2 Dynamic checks

Preliminaries:
If using a two-wire or four-wire system before energising the main control panel, check that the zone wiring at each series 4 LHD and the main control panel itself is the correct polarity.

The series 4 LHD will then be energised in its quiescent state. At this stage no indicators on the series 4 LHD should be illuminated. If this is not so, the condition should be investigated and cleared before proceeding with the self test functions.

8.1.3 Series 4 LHD self test functions

FAULT test: With the series 4 LHD in its energised quiescent state, operate the TEST switch on the series 4 LHD to the FAULT position and hold for 4 seconds. Ensure that the FAULT LED flashes and the FIRE LED remains extinguished. Release the TEST switch and observe that the FAULT LED remains flashing.

In order to reset the series 4 LHD unit to its quiescent state it must be de-energised. This may be achieved by either operating the "reset" switch facility on the main control panel (supplied by others), or if more convenient momentarily disconnecting and reconnecting one of the incoming zone wires at TB1 -1 and TB2 - 2. Either action resets the series 4 LHD to its quiescent state where all LED's are extinguished.

FIRE test: With the series 4 LHD in its energised quiescent state operate the TEST switch to the FIRE position and hold for 4 seconds. Ensure that the FIRE LED illuminates steady and the FAULT LED remains extinguished. Release the TEST switch and ensure that the FIRE LED remains illuminated.

Repeat the reset action already stated to restore the unit to its quiescent state and record the results against the series 4 LHD serial number on the record sheets.

Repeat the FIRE and FAULT test for any remaining series 4 LHD's on the system

8.1.4 System integration notes

When fully integrated with the fire control panel, zone signals will be annunciated over the zone wiring pair from a series 4 LHD which serve the dual purpose of supplying DC power to the series 4 LHD unit and signalling status back.

The following discretionary checks may be conducted. In addition to the test signals derived from the self test functions described, to verify correct operation.

8.1.5 Zone integrity - FAULT

With the system energised in the normal quiescent state disconnect the end of line device at terminal TB4 - 12 of the last series 4 LHD on the system.
Ensure that no signal appears locally on the series 4 LHD, but that a FAULT signal is registered at the main control panel for the relevant zone.
Reconnect the EOL device and the FAULT condition should clear from the main panel unless latched.

At one of the series 4 LHD units on the system link two of the sensor cable connections (Either TB2 - 1 and 3, or TB2 - 2 and 4) and observe that a short circuit FAULT signal may similarly be verified.

8.1.6 Zone integrity - FIRE

Alarmline sensor cable is manufactured and batch tested to accord with the requirements of CEGB specification GBCD 187. This document lays down the temperature response criteria, which must be met. Accordingly there is not normal requirement to expose the sensor cable to a heat source to prove its response. The nomogram will identify the alarm temperature activation point for the particular installation.

Discretionary heat tests may be conducted however to demonstrate the response of an LHD unit to a sensor cable temperature rise. If conducted with naked flame necessary precautions must be observed to mitigate the risk of mishap and permanent damage to the cable.

8.1.7 Alarmline sensor cable heat test

Commissioning and routine testing of the Alarmline linear detection system may be enhanced to the benefit of the end user by site verification of calibrated alarm temperature levels best achieved by use of the "one metre oven". This employs the most accurate method of testing a controlled and monitored exposure to high temperature without damage to the heat sensitive cable.

Where physical checking of alarm signalling is required, together with site verification of actual alarm temperatures selected (other than reference to system nomograms), the associated Alarmline recoverable analogue linear temperature sensor cable should be directly subjected to an increase in temperature equal to or above the specified alarm levels.

For many applications this would be involve one metre of sensor cable being exposed to an alarm temperature, i.e. generated by an industrial heat gun, or by the use of the one metre cable oven.

Where this proves impractical (restricted access to a high level installed sensor cable) or impossible (hazardous/intrinsically safe environments), the following procedure should be used.

An Alarmline heat sensor pad (see section 7.7), should be connected in series with the field mounted sensor cable and any interconnecting cable at the most convenient point within the designated "safe" area. This may be within a control room "hazardous" side of the MTL761 Zener barriers incorporated into the Alarmline "zone".

Heat may be applied directly to the sensor cable face of the "pad" to a level which generates an alarm FIRE condition at the associated electronic interface.

The temperature at which the alarm signal is generated may then be recorded from an acceptable temperature monitoring device (thermometer or heat sensitive tape) placed against the surface of the test pad, and checked against the alarm temperature level indicated on the Alarmline nomogram for the alarm trip switch position selected.

The test pad may be permanently installed in the zone run of the Alarmline sensor cable, for use when required, with no adverse effect on the operational characteristics of the risk area installed sensor cable length.

8.1.8 Alarmline noise reduction

The following procedure details the necessary steps required to eliminate the "pick up noise" problems that may be encountered at certain sites.

Procedures:

1. Ensure that the switch setting is correct for the required length of cable and temperature settings. Refer to the nomogram.

2. Monitor the voltage levels at each of the following terminals, TB2-3, 4, 5 and 6 with respect to terminal TB1-1.

3. If the system is healthy the voltage level at TB2-3, 4, 5 and 6 shall be between 4.7v and 5.3v.

4. If it is not within these levels connect a capacitor between that particular terminal and 0v. The value of the capacitor must fall between 10nF and 470nF (best suited capacitor has to be found by trying different capacitors).

5. If voltage levels are greater than 5.3v Zener diodes must be used.

CHAPTER 9

EUROCARD MODULE

9.0 Eurocard Module

9.1 Introduction

The 19 inch rack mounted eurocard module version of the ALARMLINE series 4 LHD has been designed to allow multi-zone protection by ALARMLINE in a central annunciation situation. It provides for a maximum of 16 single-channel eurocards within a 19 inch rack frame (supplied by others) and carries all the operational characteristics of the series 4 LID together with FIRE and FAULT output relays fitted as standard and an optional pre-alarm facility. If required, the pre-alarm level (5, 10 or 20 0C before the main alarm signal) must be specified at the time of ordering.

The eurocard module may be used as an integrated or stand-alone annunciation and monitoring device.

9.1.1 Integrated

Bach eurocard module may be separately wired to a detector card in a similar manner to that of a conventional smoke/heat detector. An increase in current drain being experienced when in the alarm state from micro-amps (when fault relay N/O) to mini-amps.

Alternatively, the selected number of eurocards modules installed within the same rack may be connected in parallel to a single detector card, also mounted in that same rack.

In both the above cases, the reset facilities of a latching alarm signal from the ALARMLINE system may be achieved from the detector or control card of the main fire system.

The fitting of R49 (fire resistor), 560 Ω, on the eurocard module provides an alarm current of 35 mA at a nominal 20 V d.c. For other required alarm currents within the range 20 to 70 mA, the value of P.49 may be varied to suit.

9.1.2 Stand-alone

When no other fire system exists or where ALARMLINE is to operate independently of a main fire system, the eurocard modules may be used as a “stand-alone” device(s) powered by a designated 24 V d.c. power supply. Selection of the FAULT relay in a normally energised mode provides indication of a loss of power supply when in this state.

The associated supply facility should include for a power interrupt or reset facility to allow resetting of the latching alarm signals from the eurocard modules.

9.2 Specification

Construction.
Standard epoxy bonded glass fibre laminate, 220 by 100 mm, carrying double-sided track with integral anodised aluminium facia plate (3U by 5TE) and handle.

32-way male edge connector to DIN 41612 and compatible with standard 3U/84HP sub-rack assemblies to DIN 41494 and IEC 297.

A base board assembly, Part No. K82031, may be provided on a per channel (rather than per rack assembly) basis to allow hard wire termination to the ALARMLINE eurocard module.

Supply Voltage.
Nominal 24 V d.c.
Limits 20 to 30 V d.c.

Current Consumption.

a) Quiescent (no alarm).

   (i) With FAULT relay normally energised: 20 mA.

   (ii) With FAULT relay normally de-energised: 100 to 200 ±A depending on alarm trip setting

b) FIRE alarm.

   (i) With FAULT relay normally energised: 60 mA.

   (ii) With FAULT relay normally de-energised: 40 mA.

c) FAULT alarm.

   (i) With FAULT relay normally energised: 100 to 200 pA depending on alarm trip setting.

   (ii) With FAULT relay normally de-energised: 20 mA.

Noise Performance.
Will withstand 1 V rms 50 Hz supply voltage and 1 V rms 50 Hz sensor noise with negligible performance change.

Outputs.

(a) Electonic, see Note 1.

(i) AUX FAULT drive facility nominal drain >200 mA, see Note 2.

(ii) AUX FIRE drive facility nominal drain > 50 mA.

(iii) AUX Pre-alarm (FIRE) drive facility latching/non-latching nominal drain > 200 mA.

(b) Relay. Volt-free contacts, linkable N/O or N/C, rating nominally 3 A, 24 V resistive.

(i) FAULT.

(ii) FIRE.

(iii) Pre-alarm - linkable latching/non-latching, see Note 3.

NOTES 1. Current consumptions quoted do not include AUX output facilities.

2. When used the AUX FAULT drive facility must be referred to the 0 V supply, i.e. terminal A30 to 0 V and terminal 18 to load. Load is normally returned to 24 V supply output. This signal is NOT available at the terminal block.

3. FAULT and FIRE signals are mutually exclusive. The pre-alarm (FIRE) facility is selected by a modification on the pcb to be either inhibited or enabled by a FAULT signal as required.

Intrinsically Safe.
Use of two dual Measurement Technology Ltd zener barriers, type nos. MTL76l, interposed between the 19 inch rack detector control (mounted within the safe area) and the associated ALARMLINE heat sensitive cable length (installed within the hazardous area) provides for suitable operation within intrinsically safe areas to group 11C (continuous presence of hydrogen). BASEEFA approval certificate no. EX 832469.

Special Feature.
Where a number of eurocard modules are used in a sub-rack system using identical links on all modules, then the modules are interchangeable. The values of resistors required for each monitored cable being provided by external connection to meet the individual alarm and pre-alarm conditions required.

Sensor Cable Characteristics.
Site adjustable alarm resistance settings are available via a 12-way selector switch. This enables the correct “trip” settings where sensor cable lengths and/or ambient temperatures have not been pre-specified. Refer to Chapter 10 and see Figure 10-1 for the ALARMLINE nomogram for the correct alarm trip switch position.

Edge Connector Schedule.

Table 9-1 32-way Edge Connector Schedule
Rear View

	Service	Row "C"	Row "A"	Service	
C2	O V-IN	1	2	24 V-IN	A2
C4	Sensor 1 (orange)	3	4	Sensor 2 (white)	A4
C6	Sensor 3 (red)	5	6	Sensor 4 (blue)	A6
C8	External Trip Facility	7	8	External Trip Facility	A8
C10	CM pcb Mon	9	10	CM pcb Mon	A10
C12	CM Fault	11	12	CM Fire	A12
C14	CM Fire Pulse	13	14	External Pre-alarm	A14
C16	External Pre-alarm	15	16	Facility (R66)	A16
C18	Facility (R65)	17	18	Aux Fault (drain)	A18
C20	Fault Output	19	20	Aux Fire Output	A20
C22	Pre-alarm Output	21	22	Fault Contact (COM)	A22
C24	Fault Contact (SEL)	23	24	Fire Contacts (COM)	A24
C26	Fire Contact (SEL)	25	26	Pre-alarm Contacts (COM)	A26
C28	Pre-alarm Contacts (SEL)	27	28	Pre-alarm Contacts (SEL)	A28
C30	Pre-alarm Contacts	29	30	Aux Fault (source)	A30
C32	O V-OUT	31	32	24V-OUT	A32

9.3 Function of Controls

Figure 9-1 shows the front panel of the eurocard module. The function of each control and indicator is described below.

FIRE LED.
When lit continuously red, indicates an alarm state.

FAULT LED.
When flashing yellow, indicates a trouble state.

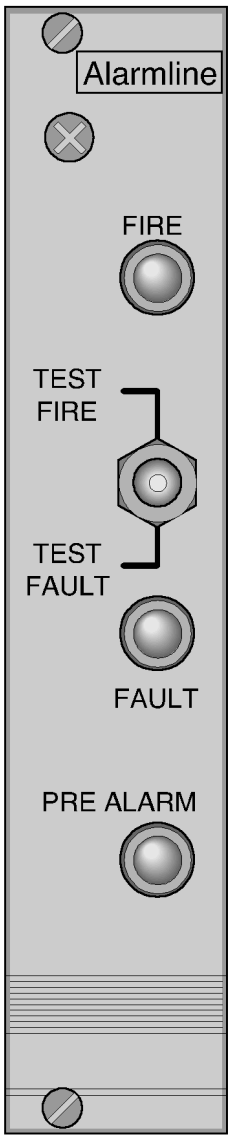
PRE ALARM LED.
If the pcb has been modified, it will be lit continuously red indicating a pre-alarm signal.

If the pcb has not been modified, there will be no signal.
TEST FIRE TEST FAULT switch.
A three-position, spring-loaded, centre-biased switch, which is left in the centre position for normal operation.
To test for a FIRE alarm indication, hold in the TEST FIRE position (for up to five seconds) and make sure that the FIRE LED is lit, release the switch.
To test for a FAULT alarm indication, hold in the TEST FAULT position (for up to five seconds) and make sure that the FAULT LED is lit, release the switch.

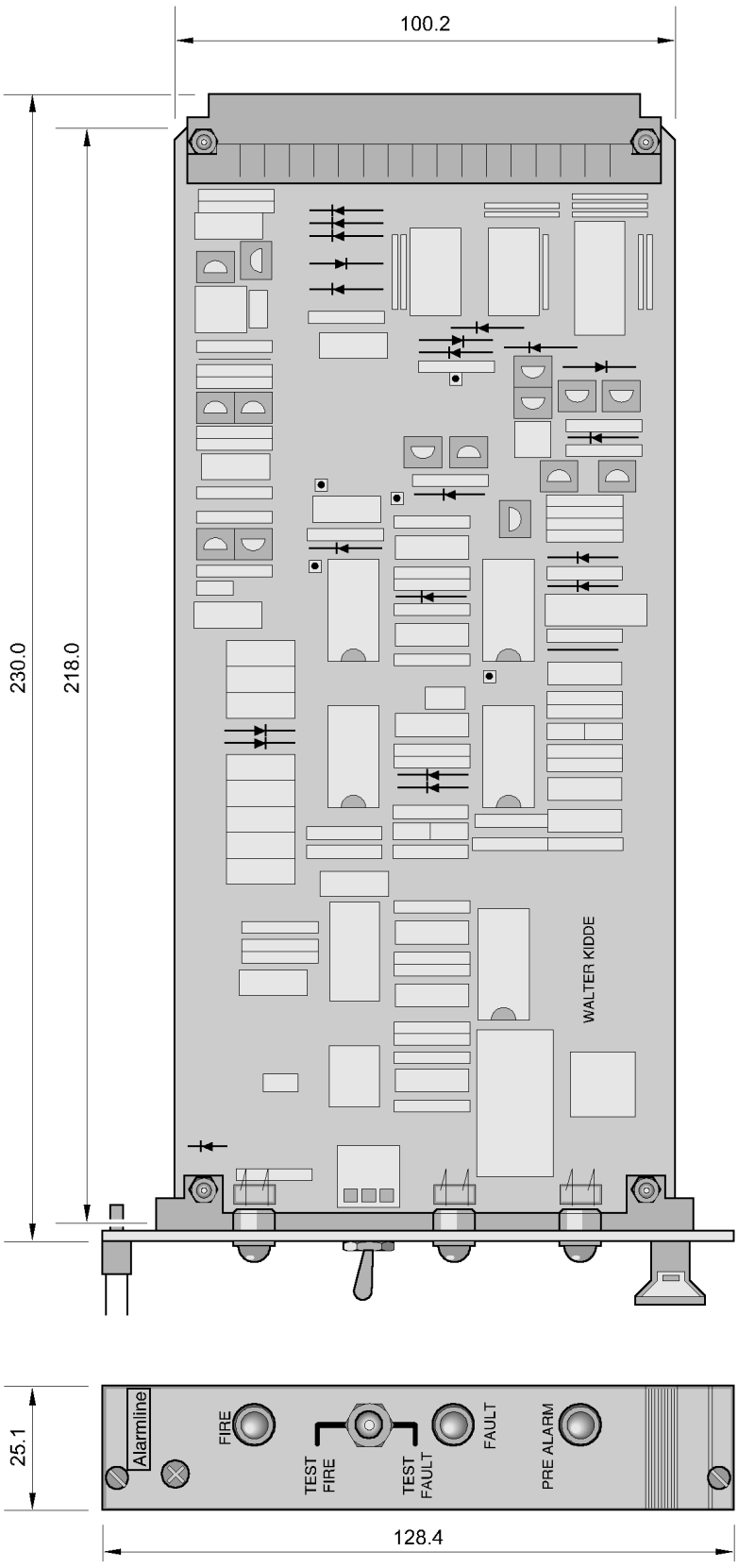
ALARM TRIP SWITCH.
12-position switch, to select the required stand-by current, see Table 9-2. The current is determined by a nomogram, refer to Chapter 10 and see Figure 10-1.

Table 9-2 Maximum Stand-by Current

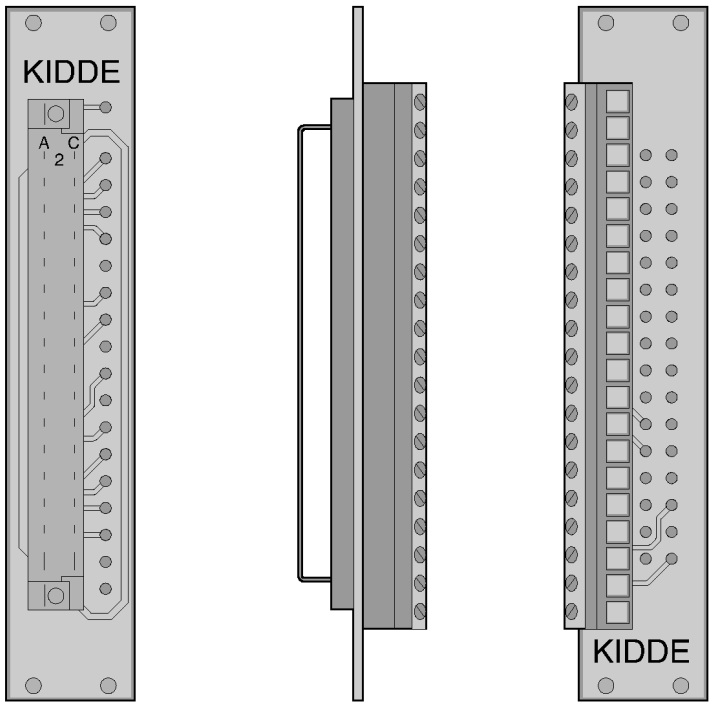
Alarm Trip Switch Position	Maximum Stand-by Current (pA)
12	62
1	63
2	64
3	66
4	68
5	73
6	78
7	87
8	100
9	116
10	145
11	180



Eurocard Front Panel
Fig. 9-1



Eurocard Assy
Fig. 9-2



Eurocard Motherboard
Fig. 9-3

CHAPTER 10

ALARMLINE NOMOGRAM

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10 Alarmline nomogram

The Alarmline nomogram is used to set the alarm trip link setting on the series 4 LHD.

The alarm trip link setting is a 12 position jumper link which the position of the link sets the alarm trip threshold in relation to the cable length.

The following example shows how to use the nomogram shown in Appendix A.

1) Select the sensor cable length being used (D) 100m

2) Mark the maximum temperature where an alarm MUST NOT BE GIVEN (B) 45 degrees

3) Draw a line from the sensor cable length (D) through the maximum alarm level (B) to the switch setting line (A). Switch setting 6.

This is the switch setting that will not give a false alarm at the maximum ambient temperature. Adjacent to the maximum alarm temperature setting column (C) indicates the temperature required on the entire cable to give an alarm condition in this case 57.5 degrees.

In the event that a “HOT” spot could occur it can be shown how hot this would need to be. Take a Line from 10m (D) to switch setting 6 (A). The temperature this would create an alarm condition can be read on column (C) 83 degrees.

This can be repeated for “HOT” spot 2.5m = 104 degrees

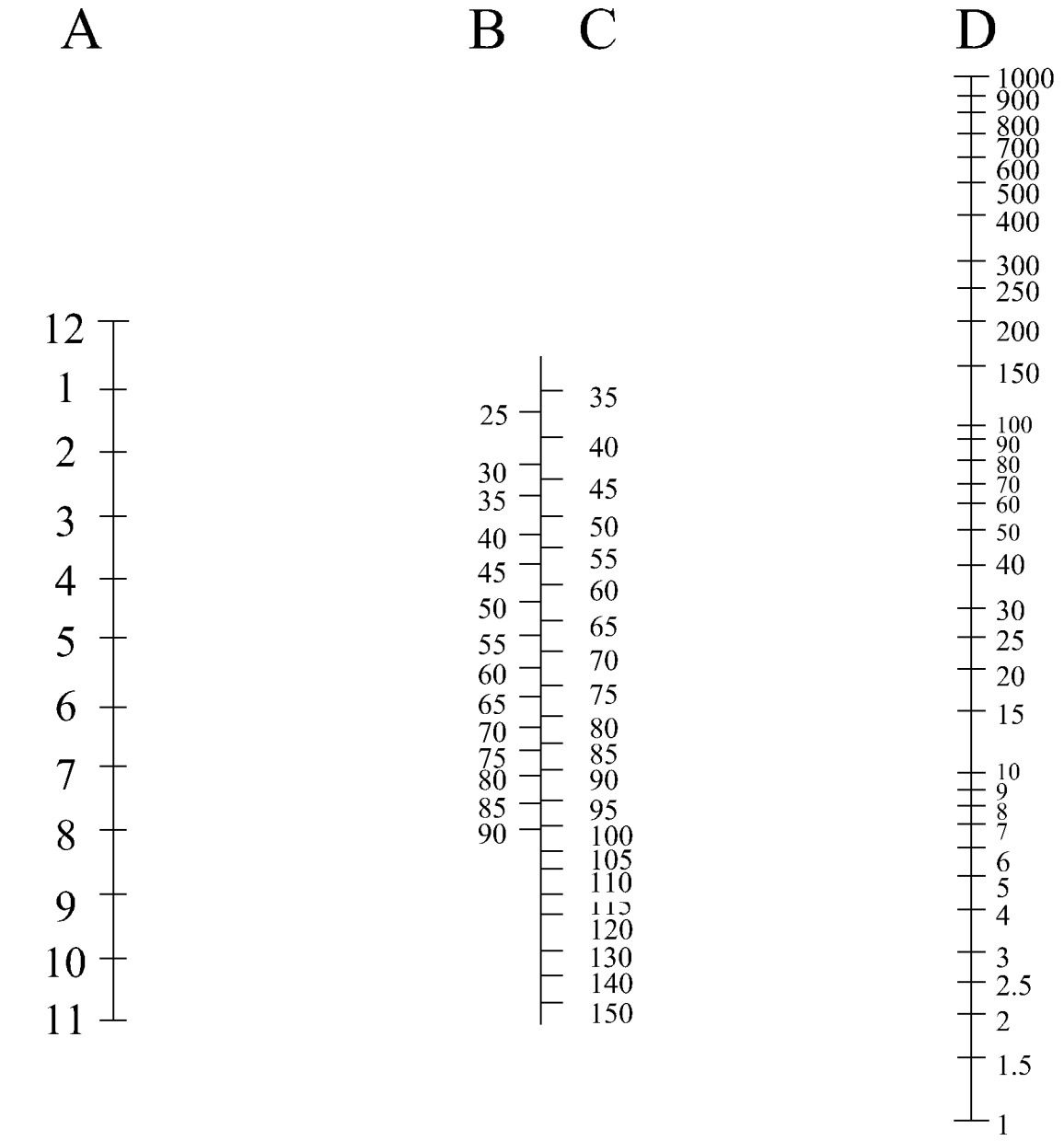
A
B
C
D
12
1
2
3
4
5
6
7
8
9
10
11
25
30
35
40
45
50
55
60
65
70
75
80
85
90
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
130
140
150
1000
900
800
700
600
500
400
300
250
200
150
100
90
80
70
60
50
40
30
25
20
15
10
9
8
7
6
5
4
3
2.5
2
1.5
1
Link setting
Max ambient temp (˚C) by which an alarm will not be given
Specified alarm temp (˚C) by which an alarm will be given
Length (m)

Fig. 10-1