800Ex SERIES INTRINSICALLY SAFE ADDRESSABLE DETECTORS PRODUCT APPLICATION & DESIGN INFORMATION

1. INTRODUCTION

The 800Ex Intrinsically Safe Detector Series comprises four types of detector:

- 801PHEx Optical Smoke and Heat Detector
- 801CHEx Carbon Monoxide and Heat Detector
- 801HEx Heat Detector
- 801FEx Flame Detector (811FEx Flame Detector Marine)

1.1 INTRINSIC SAFETY

The detectors are for use in potentially explosive gas and dust atmospheres (zone 0 gas, zone 20 dust).

The 801PHEx, 801CHEx and 801HEx are designed to comply with EN/IEC 60079-0:2006, EN/IEC 60079-11:2007 and EN/IEC61241-11:2006 for Intrinsically Safe apparatus. The 801PHEx, 801CHEx and 801HEx are certified:

ATEX code: Ex **II 1 GD**
Certificate: **BAS01ATEX1394X**

IECEx/Cenelec code: **Ex iaD 20 T100°C**
Certificate: **IECEx BAS 07.0063X**

The 801FEx/811FEx are designed to comply with EN/IEC 60079-0:2006, EN/IEC 60079-11:2007 and EN/IEC61241-11:2006 for Intrinsically Safe apparatus. They are certified:

ATEX code: Ex **II 1 GD**
Certificate: **Baseefa03ATEX0422X**

IECEx/Cenelec code: **Ex iaD 20 T135°C (-20°C ⩽ Ta ⩽ +70C)**
Certificate: **IECEx BAS 07.0056X**

These detectors are designed and manufactured to protect against other hazards as defined in paragraph 1.2.7 of Annex II of the ATEX Directive 94/9/EC.

1.2 DETECTOR USE

The detectors may only be used in conjunction with an IF800Ex Interface Module and a Pepperl+Fuchs KFD0-CS-Ex1.54 galvanic isolator.

1.3 SPECIAL CONDITIONS OF SAFE USE

The apparatus has a plastic enclosure which constitutes a potential electrostatic hazard. The enclosure must be cleaned only with a damp cloth.

1.4 FIRE PHENOMENA

There are several types of phenomena associated with fires, some which contribute to its destructive nature and others which are simply by-products generated by the fire. Destructive effects such as charring, distortion and cracking of materials, very high temperatures and superheated poisonous smoke tend to occur too late in a fire to be of use in preventing loss of life or property.

The intention of all fire detection is to sense the early products of fire, before the destructive force of the fire prevents any remedial action. Unfortunately, there is no unique fire product that is common to the early stages of all types of fire that could be used as a target for a ‘universal’ fire detector. Each type of fire will generate different initial products. The fire products that can be produced at early stages of fires are aerosol combustion products, flames (burning vaporized fuel), smoke particulates, poisonous gasses and heat, mostly as convected hot gasses, but with an increasing radiated element.

1.5 FIRE TYPES

It is possible to categorise types of fire that are likely to occur in each environment and from this to determine the fire products that will provide the earliest detection. Fires can be divided into two main types - Fast burning, which are characterised by a flaming phase very soon after ignition and Slow burning. These are characterised by an initial phase which may not flame at all but is likely to be very smoky. These main types of fire can be further subdivided by the type of ignition, combustibility of material ignited and relative availability of oxygen and fuel.

Not all of the early fire products are present in all fire types, but fast burning fires are typically rich in aerosol combustion products, flames and heat. The smoke will tend to be less visible and may appear as a “haze” above the fire, where it is visible it will often be dark in colour, especially with liquid hydrocarbon or plastic foam free fuels.

Slow burning fires tend to have higher levels of visible smoke particulates and poisonous gasses and much lower levels of hot gas and radiant heat. The smoke may vary in colour, but for most solid hydrocarbon fires it is likely to be a white colour initially.

The description of fires as fast and slow burning can be misleading as some 'slow' burning fires may reach a hazardous scale faster than some 'fast' burning fires and they can often be more life threatening due to high levels of toxic fumes. It should be noted that unwanted fires are usually complex systems combining elements of both fire types and although there are situations where the early stages of a fire are purely slow burning, it is more unusual for a fast burning fire not to spread quickly to adjacent material that yields visible and toxic smoke products as it burns.

Chemical fires that are restricted to a single fuel type will often contradict these general patterns, for example, phosphorus is extremely fast burning, but generates a very dense visible white smoke. In these cases there may be need to take specialist advice in choosing the most appropriate detector type.

2. SMOKE DETECTION PRINCIPLES

2.1 OPTICAL

Optical smoke detectors may operate by using several of the optical scattering or obscuration properties of smoke, however, by far the most common principle used is that of Rayleigh (forward) scattering of light from smoke particulates. This effect is the most useful as it detects light that has been scattered from its original path by a fairly small angle, which is considerably higher in intensity than light that has been scattered through a large angle, with the result that detectors are sensitive to very low levels of smoke particulates.

The design of Rayleigh scatter optical smoke detectors is to have a fairly narrow band light source and a receiver filtered to only see that light band. The optics are arranged so that there is no direct path of light from the source to the receiver and only scattered light can be detected. The optics have to be enclosed within a chamber (often known as a labyrinth) where smoke can enter, but stray external light cannot. In addition, the chamber has to be designed such that internal reflections of light from the source cannot reflect from the walls into the receiver as this would lead to false alarms.

This type of detector is very effective in detecting very low levels of visible smoke particulates often at levels where they are not visible to the naked eye. Invisible smoke aerosol products cannot, however, be detected using current optical smoke detectors as these aerosols do not scatter or obscure light. This means that optical detectors favour the type of fire that we have described as slow burning.

Although this is true, some smouldering materials such as rubber will produce a predominantly black smoke, which has less scattering properties than white smoke and will be detected later than an equivalent density of white smoke.

2.2 HIGH PERFORMANCE OPTICAL (HPO)

The high performance optical detector operates by sensing the optical scatter from smoke particles generated in a fire. While the optical scatter detector can give good detection performance for the majority of fires, some fast burning fires produce little visible smoke and some produce very black smoke, neither of which are easily detected by the optical scatter detector. (Such fires are represented in EN54-7 by Polyurethane and Heptane type fires respectively). These fires do, however, produce high heat outputs with an associated rise in air temperature.

The HPO detector has been designed to offer improved detection of such fires by detecting the rapid rate-of-rise of air temperature and under these conditions increasing the smoke detection sensitivity. This gives an earlier detection of such fires and a broader detection capability than a standard detector.

The HPO detector has two sensing systems as follows:

- An optical chamber with associated electronics to measure the presence of smoke by light scatter.
- A thermistor bridge with its associated electronics to detect the presence of hot air draughts.

2.3 HEAT

Heat detectors fall into two main categories: Those that go into alarm once a certain detector temperature has been reached and those that go into alarm if the rate of temperature increase is above a certain level.

Usually the design of heat detectors uses a combination of rate of rise and fixed temperature sensing elements. This allows fire detection from low temperatures, where rate of rise sensing would give an earlier alarm than a fixed temperature, but the fixed element provides a backstop for fires where the temperature builds up gradually.

Heat detection is not as fast as smoke detection in most fires as early stages of a fire tend to burn less hot than the later stages. However, hostile environments where aerosols, dust, smoke or even extremes of temperature are normally present, preclude the use of smoke detectors as a fire indicator. In these cases, a heat detector may provide an acceptable, though less sensitive alternative. Heat detection is also often used where the risk of fires or the consequences of fire are considered low, as heat detection is generally cheaper than smoke detection.

2.4 CARBON MONOXIDE

Carbon monoxide detectors operate on the principle of the oxidising of carbon monoxide gas to carbon dioxide. This oxidation reaction involves several chemical steps that occur on catalytic surfaces within a sensing cell. The reactions require exchange of electrons in order to proceed and this flow of electrons generates a small electrical current within the cell.

The gas entry to the sensing cell is restricted in order to ensure that all carbon monoxide adjacent the catalyst surface is continuously oxidised. This means that the rate of transportation of carbon monoxide to the catalytic surface is determined by the concentration gradient between there and the external environment. This results in the cell output being a function of concentration in the surrounding atmosphere, rather than rate of gas movement past the detector.

Although carbon monoxide can be used for most types of hydrocarbon fire, the greatest advantage can be seen in slow burning fires, where thermal uplift carrying smoke products to the detector is low. Under these conditions conventional smoke detection will happen after levels of poison gas are dangerously high. Due to the high gas mobility, carbon monoxide detectors do not require a similar thermal uplift to transport the fire products to the detector.

Carbon monoxide fire detection is resilient towards false alarms and effective for most hydrocarbon fires. It is unsuitable in areas where the main risk is electrical fire. Although carbon monoxide is produced in fires involving electrical equipment, the visible decomposition products produced prior to combustion make this risk best suited to optical or high sensitivity smoke detection. Included in this category are areas where battery powered equipment such as fork lift trucks or milk floats are charged as charging gives rise to high levels of hydrogen which may cause false alarms.

In areas where the main risk is from highly flammable chemicals, especially liquid fuels, a fire is likely to generate high temperatures, a strong smoke plume and initially only moderate levels of carbon monoxide. These risks are usually better suited to smoke detection or heat detection if the environment is unsuitable for smoke detectors.

<u>It is envisaged that the CO detector will not be used in environmental conditions where an unusually high concentration of Hydrogen or Hydrocarbon vapours are present. It is recommended that where there is likely to be long term or high level exposure to a particular chemical agent, correct operation is verified before fitting the detector.</u>

2.5 COMPENSATED CARBON MONOXIDE

Carbon monoxide detection alone provides the best fire indicator for fires that start from smouldering. Fires that start with a fast burning flaming phase will not be detected as well using carbon monoxide detection. For this type of risk enhanced carbon monoxide detection can be used. This operates by increasing the sensitivity to carbon monoxide if a temperature increase is also detected. This gives a broader capability than carbon monoxide alone.

3. FLAME DETECTION

Flame detectors are able to detect the flickering infra-red radiation that is given off by a flame, within a carefully controlled frequency range. This, together with the narrow optical bandwidth used, makes the sensor particularly immune to interfering sources of infra-red.

4. OPERATION

Detectors can be configured to operate in two different modes or sensitivities, ie, ‘normal’ mode = night time operation or ‘day’ operation where the detector can be switched to either a different mode of operation or a different sensitivity. Switching can be achieved by either user action or event/time driven eg, day/night switching.

The mode of operation and sensitivity of a detector are selected during controller configuration.

4.1 MODE SWITCHING

For all dual sensing detectors all available modes and sensitivities can be configured independently. The default configuration for the day mode is the same as for normal mode.

4.2 SENSITIVITY SWITCHING

In addition to mode switching, the sensitivity can be switched within the mode and is achieved by shifting the sensitivity by one level up or down.

The following letters refer to sensitivity selection of the detectors:

H = High
N = Normal
L = Low

4.3 ADDRESSABLE HEAT DETECTORS

The 801HEx Intrinsically Safe Addressable Heat Detectors may be configured to operate in the following modes:

Fixed Temperature 60^{o}C (A2S)
Normal Ambient Temperature Rate-of-Rise (A1R)
High Ambient Temperature Rate-of Rise (CR)

Note:

1) *The heat detection grades are to EN54-5.*
2) *No sensitivity selection is available for heat only detectors.*

4.4 ADDRESSABLE OPTICAL SMOKE & HEAT DETECTOR

The 801PHEx Intrinsically Safe Addressable Optical Smoke & Heat Detectors may be configured to operate in the following modes:

Optical only (**H/N/L)**

High Performance Optical (**H/N/L)**

Optical (**H/N/L)** and Fixed Temperature 60°C (A2S)

High Performance Optical (**H/N/L)** and Fixed Temperature 60°C (A2S)

Fixed Temperature 60°C (A2S)

Normal Ambient Temperature Rate-of-Rise (A1R)

Note:

1) *The heat detection grades are to EN54-5.*
2) *Normal and High sensitivity settings meet the requirements of EN54-7.*

4.4.1 FAST LOGIC MODES

In addition to the above modes, on some controllers, the Optical Smoke and Heat detector can be configured to use Fastlogic. Fastlogic offers the same operating modes as above, but the signal processing is performed using an expert system designed to minimise the number of false alarms (see Section 5.5).

4.5 ADDRESSABLE CO & HEAT DETECTOR

The 801CHEx Intrinsically Safe Addressable CO & Heat Detectors may be configured to operate in the following modes:

CO only (**H/N/L)**

Compensated CO (**H/N/L)**

Fixed Temperature 60°C (A2S)

Normal Ambient Temperature Rate-of-Rise (A1R)

Compensated CO (**H/N**) and Normal Ambient Temperature Rate-of-Rise (A1R)

Note:

1) *The heat detection grades are to EN54-5.*
2) *Normal and High sensitivity settings have been approved by the Loss Prevention Council Board.*

4.6 ADDRESSABLE FLAME DETECTOR

The 801FEx/811FEx only has a single range setting but may be configured to operate in 2 modes, ‘Instant Response’ and ‘Verified Response’.

When set to ‘Instant Response’, an alarm is raised immediately an interrupt has been sent and the analogue value is seen to be above the threshold.

When set to ‘Verified Response’, the analogue value is confirmed by a second poll from the panel 5 seconds later before an alarm is raised.

5. DETECTOR SUITABILITY

Within an addressable detection system, the detectors are acting as transducers relaying information on the parameter or combination of parameters that they are measuring to the control unit. The control unit then processes this information either in isolation, or in conjunction with information from other detectors to determine the appropriate response and ultimately makes the decision whether or not to raise an alarm.

The choice of **Alarm** level and any **Time Delay** which may be deliberately introduced, will determine the overall system response to fires.

5.1 DETECTOR OUTPUT

The 800Ex series detectors provide a ‘raw output’ that consists a normal pedestal value with a smoke level superimposed. The pedestal value is normally the initial ‘no-smoke’ value presented by the detector on commissioning. Although this will be modified by the controller over time as a long term average of the pedestal level is established.

The smoke output value for a given smoke level varies from detector to detector. This variation is measured during production and correction values are stored within each detector. The controller will read these correction values and modify the ‘raw output’ to generate a ‘working output’. The ‘working output’ is then used to determine what the smoke level is, as this will be the same for all detectors.

5.2 ALARM THRESHOLD COMPENSATION

As detectors age and become contaminated with dust and dirt, their performance begins to deteriorate, such that their propensity to go into an alarm condition is much higher, thus resulting in false alarms. The nuisance factor caused by false alarms is a serious problem for users and Fire Brigade services alike.

Since the analogue value of each detector is checked by the controller over 12 times a minute, the slow build-up of contaminants in the detector is reflected by a slow increase in the analogue value. As this occurs, the controller can alter the alarm (and pre-alarm) threshold in order to compensate for the change in pedestal level (see Fig. 1). This feature maintains the system at an optimum performance level and extends the life of each analogue addressable detector.

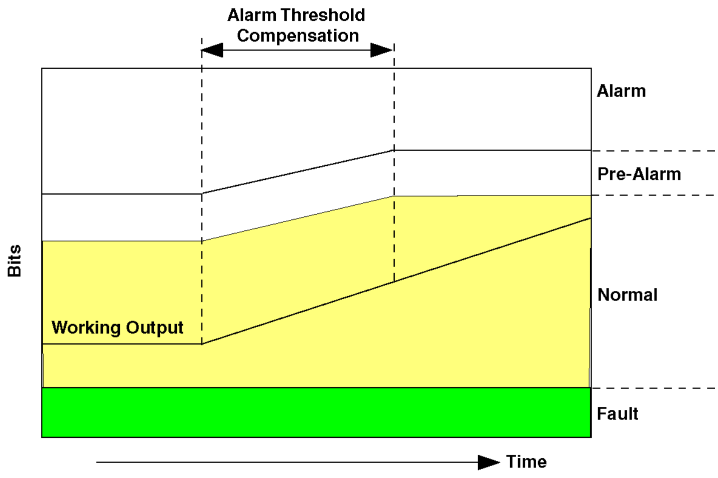


Fig. 1 Detector Alarm Threshold Compensation

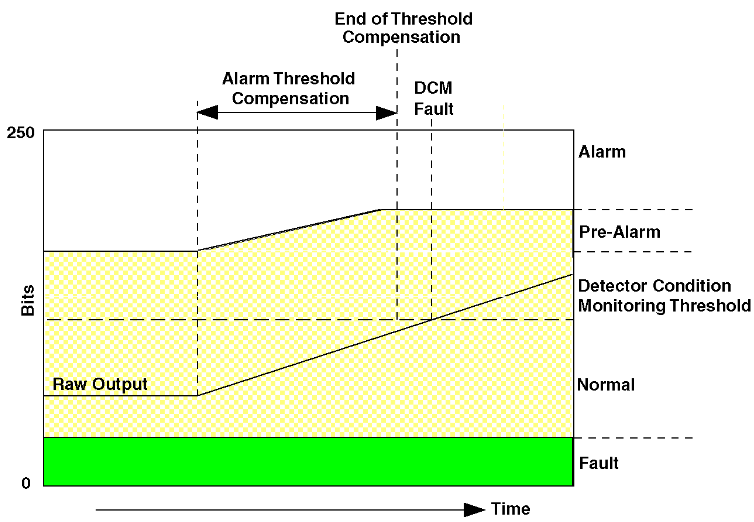


Fig. 2 Detector Condition Monitoring

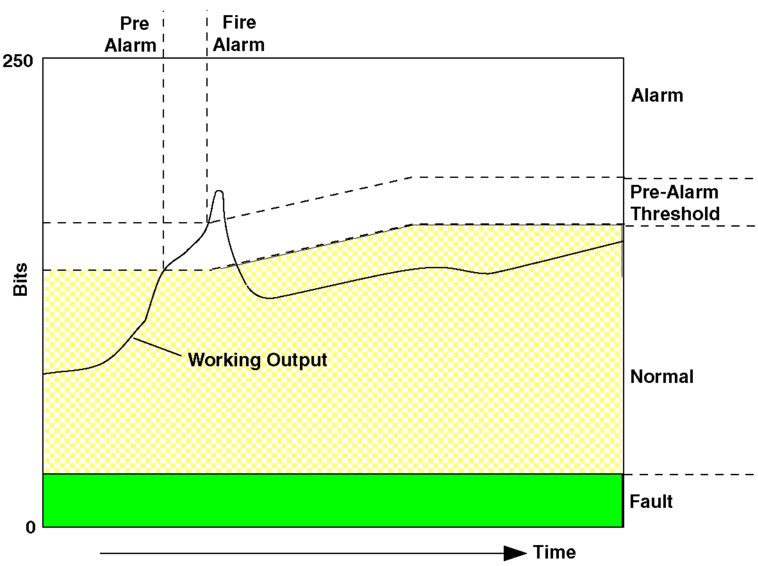


Fig. 3 Pre-Alarm Threshold

The threshold compensation is not adjusted every time there is a minor fluctuation in the detector's analogue output, however, the controller does take an average of the value over the preceding hour and alters the threshold accordingly.

Alarm threshold compensation only applies to smoke detectors.

5.3 DETECTOR CONDITION MONITORING

See Fig. 2. In accordance with the threshold compensation, there comes a time in the life of a detector when it would be unwise to raise the alarm threshold any further as doing so would desensitise the detector too much and cause it to operate incorrectly. When this occurs, the controller senses the detector has reached the end of its operational life, and indicates a detector condition monitoring fault.

When the normal pedestal level becomes to high, a detector condition monitoring fault is indicated, the detector must be replaced by a new one and the threshold compensation for the detectors address must be reset. Typically, this point will only be reached after several years of operation.

5.4 PRE-ALARM

Quite often in the early stages of a fire there is a slow build-up of smoke before open burning takes place. With addressable smoke detectors, the value rises as the smoke builds-up in the detector's sampling chamber. At a certain threshold level, that is the pre-alarm level (see Fig. 3), the controller can give a visual indication and audible warning of this pre-alarm condition before a full-scale evacuation of the premises is required and before the Fire Brigade is called. This situation allows the possible cause of the pre-alarm to be investigated prior to a full alarm condition. It also allows for primary fire fighting procedures (using portable extinguishers) to be put into effect.

5.5 FASTLOGIC

With the 801PHEx Optical Smoke and Heat detectors, an alternative to the alarm threshold detection mechanism (see Section 4.4.1) is available. This is known as Fastlogic and operates using a system that looks at both the output level and the pattern of the signals. Using information gathered from many different fire and false alarm situations, a fuzzylogic expert system has been created. This determines the likelihood of fire based on a combination of change in output level with time and the absolute output values. It differs from the earlier Zetfas® fuzzylogic system, in that it has accelerated detection of rapid increase in signal levels.

6. SPACING AND SITING OF DETECTORS

The spacing, siting and zoning of detectors should be in accordance with the recommendations of BS5839: Pt 1: 1988. The main points are summarised below.

6.1 HAZARDOUS AREAS

Detectors are made from the following materials:

Body, cover, and closure: FR110 'BAYBLEND' flame retardant.

The detectors must not be mounted into environments where:

- the detector material would react to cause explosions or affect the protection concept
- the detector could be damaged by aggressive substances

6.2 SPACING

The floor area which lies below a flat roof and which is covered by a single smoke detector, should not exceed $100m^2$; the floor area beneath a flat roof, and which is covered by a single heat detector, should not exceed $50m^2$.

Refer to BS 5839 Pt 1 Sections 12 & 13 for details of the maximum permissible horizontal distances between detectors and/or between detectors and walls etc. These will vary depending whether the installation is for life or property protection.

No detector should be mounted where it may be subjected to adverse environmental conditions.

6.3 SITING OF DETECTORS

6.3.1 HEAT DETECTORS IN NORMAL MOUNTING CONDITIONS

Note: If Hot Work Permits are not available on site, facilities must be made available outside the Hazardous Area for testing Heat detectors.

Under normal conditions, the base should be mounted directly to the ceiling of the protected area. This will place the detection element within the limits of 25mm and 150mm given in BS 5839 Pt 1. Special arrangements must be made for mounting detectors to sloping roofs. Detectors should ideally be mounted with the base in a horizontal position with the detector below the base to allow for fast detection and ease of maintenance.

ENVIRONMENT	VERY CLEAN AND DRY			BENIGN MODERATELY CLEAN REGULATED TEMPERATURE			DIRTY - SMOKY DURING THE DAY			DUSTY AND/OR HUMID			HOT AND SMOKY WHEN IN USE			OPEN AREAS		
FOR EXAMPLE	CLEAN ROOM DATA PROCESSING SUITE			OFFICES, HOSPITALS, LIGHT INDUSTRIAL, RESIDENTIAL, PASSENGER CABIN			WAREHOUSE WITH DIESEL FORK-LIFTS etc. HEAVY INDUSTRIAL FERRY (CAR DECK)			LIVESTOCK PEN MILL, LAUNDRY, CHANGING ROOM			KITCHEN, ENGINE ROOM, TEST BEDS			ATRIUM, THEATRE, HANGER, OIL RIGS, TURBINE HALL		
FIRE LOADING	TYPE	MODE		TYPE	MODE		TYPE	MODE		TYPE	MODE		TYPE	MODE		TYPE	MODE	
		NIGHT	DAY		NIGHT	DAY		NIGHT	DAY		NIGHT	DAY		NIGHT	DAY		NIGHT	DAY
ELECTRONIC EQUIPMENT ELECTRICAL SWITCHGEAR ELECTRIC MOTORS CABLE CONDUIT	**ASPIRATED** **OPTICAL**	 **E+H(H)**	 **E(H)**	**OPTICAL**	**E(H)**	**(N)**	OPTICAL	E(N)	H				OPTICAL	E+H(N)	X	**FLAME**		
FABRICS, CLOTHES SOFT FURNISHINGS PAPER, CARDBOARD PLASTIC FOAMS ANIMAL BEDDING WOOD SHAVINGS etc.				**CO** OPTICAL	**E(N)** E(H)	**(N)** (N)	**CO** OPTICAL	**(N)** E(H)	(L)[#] (L)[#]	**CO** OPTICAL	**(N)** E(L)[#]	(N) (L)[#]	CO	(N)	H	**CO** BEAM	**(H)**	**(H)**
FLAMMABLE LIQUIDS PAINTS, SOLVENTS FLAMMABLE GASSES UNSTABLE CHEMICALS	**FLAME** **OPTICAL** CO	 **E+H(H)** E+H(H)	 **E+H(H)** E+H(H)	**OPTICAL** **FLAME** CO	**E+H(H)** E+H(H)	**E+H(N)** E+H(N)	**FLAME** CO HEAT	 E+H(N) A1R	 E+H(L)* A1R	CO HEAT FLAME	E+H(N) A1R	E+H(L)[#] A2S	FLAME **CO** HEAT	 **E+H(N)** A1R	 **H** CR	**FLAME**		
FOODSTUFFS GENERAL ORGANIC WASTE ANIMAL FODDER WOODEN STRUCTURES SOLID FUELS				**CO** **OPTICAL**	**E+H(N)** **E+H(N)**	**(N)** **(N)**	**CO** **OPTICAL** HEAT	**E(N)** **E+H(N)** A1R	**(L)[#]** **(L)[#]** A2S	**CO** OPTICAL HEAT	**(N)** (L)[#] A2S	**(N)** (L)[#] A2S	**CO** HEAT	**E(N)** A1R	**(H)** CR	**CO** **FLAME**	**E+H(H)**	**E+H(H)**
PLASTIC CHEMICALS MACHINERY BUILDING MATERIALS UNKNOWN CONTENTS	ASPIRATED CO OPTICAL	 E+H(H) E+H(H)	 E+H(N) E+H(N)	OPTICAL CO HEAT ASPIRATED	E+H(H) E+H(H) A1R	E+H(N) E+H(N) A1R	**CO** **OPTICAL** HEAT FLAME	**E(N)** **E(N)** A1R	**(L)[#]** **(L)[#]** A1R	**CO** **OPTICAL** FLAME	**E(N)** **(N)**	**(N)** **(L)[#]**	**CO** HEAT FLAME	**E(N)** A1R	**(H)** CR	**CO** **FLAME** BEAM	**E+H(H)**	**E+H(H)**

E= Temperature enhanced
E+H= Temperature enhanced and heat detector together
H= Heat only part of combined detector
X= Callpoint protection alone

Bold text indicates most likely detector/mode to meet user's requirements.
Letters in brackets represent recommended sensitivity settings.
Not LPCB approved.

Table is for guidelines only and specific situations are likely to require variations on the suggested detector types. Real situations may require detector combinations to cover all likely risks.
Night and Day columns represent low false alarm risk and high false alarm risk, although this usually follows a day/ night pattern, it may be configured for any time. For example the car deck of a ferry would be configured for Day during vehicle loading and Night once all the passengers had left the car deck, thus achieving optimum protection for that area.
If Fastlogic operation is selected for optical detectors the same table applies. The chief difference being a higher resistance to false alarms, and slower response to aerosol test gas.

Table. 1

The threshold setting chosen will depend on the ceiling height and the environmental conditions which surround the detector. In general, 9m is the maximum ceiling height for an 801HEx set to A1R, 7.5m when set to A2S or CR. Provided that the detection system is automatically connected to the fire brigade or to a Central Station (Remote Manned Centre) and that the fire brigade can guarantee attendance within 5 minutes, heat detectors may be fitted to ceilings with maximum heights of 13.5m for A1R and 12m for A2S and CR.

6.3.2 HEAT DETECTORS FITTED INTO AREAS OF RAPID HEAT VARIATION OR HIGH AMBIENT TEMPERATURE

In some applications such as kitchens, furnace and boiler houses, rapid increases in temperature may be considered to be normal. (Heat detectors fitted into lantern lights must be protected from direct sunlight, but even then they fall into this category). In these cases, false alarms can usually be eliminated by using detectors set to:

- A2S during periods when rapid increases in temperature are likely to occur.
- CR during periods when high ambient temperatures are the normal conditions.

6.3.3 SMOKE DETECTORS

The greatest concentration of smoke from fires is usually lifted by thermal convection currents to the highest point of an enclosed area. It follows therefore, that a smoke detector should normally be sited in that position.

Under normal conditions, the base should be mounted so that the detection element of the detector is within the limits of 25mm and 600mm below the appropriate ceiling height given in BS5839 Pt. 1. As with heat detectors special arrangements must be made for mounting detectors to sloping roofs. Detectors should ideally be mounted with the bases in a horizontal position for best performance and ease of maintenance.

It is not recommended that the 801PHEx (HPO mode) be installed in areas where it is likely to be regularly enhanced, since in this condition the detector is extra sensitive and there is a possibility of unwanted alarms from low ambient smoke levels.

The 801PHEx (HPO mode) enhancement becomes operational by detecting a rapid temperature rise in air moving across the detector. Siting detectors in positions where air is being blown through the detector should therefore be avoided where possible, eg, close to ceiling ducts or ceiling mounted industrial heaters; or areas of forced ventilation, such as ducts and underfloor voids of computer suites.

Also, not recommended are areas open to the outdoors, such as cargo loading bays, or areas where the detector may become contaminated, or in applications where a heater jacket is required. In effect the 801PHEx when selected as an HPO is primarily aimed at benign environments and if there is some question of the site an 801PHEx optical should be chosen in preference.

6.3.4 CARBON MONOXIDE DETECTORS

These detectors are less sensitive to mounting position than other detectors. The spacing on a ceiling should be similar to that used with smoke detectors. However, restrictions to airflow across ceilings do not present a barrier to carbon monoxide. These detectors may also be mounted in positions where thermal barriers to smoke plume propagation could exist.

6.3.5 LANTERN LIGHTS AND AREAS BELOW FLAT ROOVES

On sunny days, a hot layer of air may be trapped just below the ceiling, forming a thermal barrier to smoke transport. Under these conditions smoke transport to detectors is hindered and the fire may need to be considerably larger in size before the thermal lift is sufficient to get fire products to the detector. These situations favour the use of 801CHEx detector as the carbon monoxide gas is able to penetrate through this barrier where smoke cannot. (Detectors should, however, be sited out of direct sunlight and away from places where temperature is likely to exceed operating limits).

6.4 FLAME DETECTION

In contrast to smoke sensors, which have to wait until the products of combustion reach them by air movement, a flame sensor responds to radiation from a fire within a few seconds, regardless of distance - provided a direct line of sight exists to all parts of the protected area.

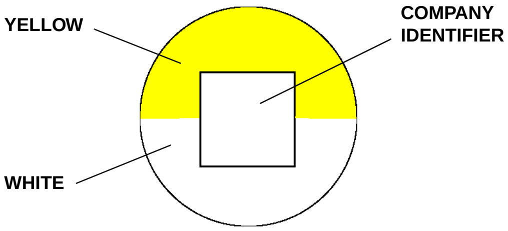
These flame sensors will respond rapidly to most flaming fires, but have a special advantage in responding to fires that involve clean burning fuels such as alcohol or methane, ie, fires which would not be detected by smoke sensors.

The flame detectors by virtue of their operating principle are insensitive to normal environmental influences. For high ceilings, outdoor use or in the presence of strong infra-red sources a more rugged detector (eg, S271+) should be used.

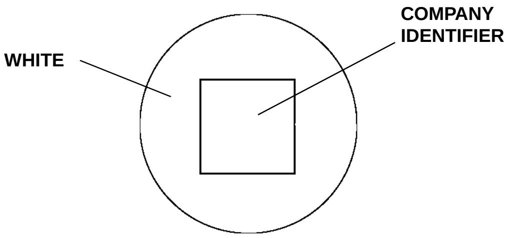
The angle of view of the 801FEx/811FEx sensor is 100 degrees, therefore, the area covered will be dependant upon the height at which it is installed. On a 5m ceiling this will give 110m^2 area coverage. The 801FEx/811FEx may be used with ceiling heights of up to 8m.

7. DETECTOR IDENTIFICATION

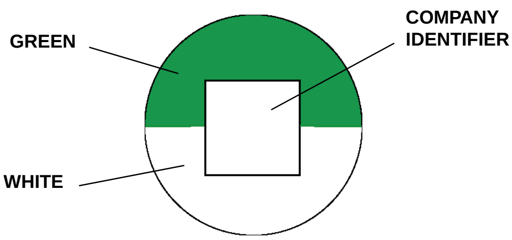
The detectors are identified by a unique colour coded logo label in the centre of the detector cover the label also shows the company identifier. The colour codes are as follows:



801CHEx



801HEx



801PHEx

The 801FEx/811FEx have no logo label.

JM/an

4th September 2008

8. ORDERING INFORMATION

MUBEx Base for use with Ex Detectors:	517.050.610
5BEx 5" Universal Base for use with Ex Detectors:	517.050.023
801HEx Intrinsically Safe Heat Detector:	516.800.532
801PHEx Intrinsically Safe Optical + Heat Detector:	516.800.530
801CHEx Intrinsically Safe Carbon Monoxide + Heat Detector:	516.800.531
801FEx Intrinsically Safe Infra-red Flame Detector:	516.800.066
811FEx Intrinsically Safe Infra-red Flame Detector (Marine):	516.800.067
Detector Locking Device (Packed in 100s):	517.050.005
Detector Removal Tool:	516.800.917
DHM69 Deckhead Mounting Kit:	517.001.231
CW-5B Detector Cage:	517.050.614
EM800 European Mounting Box:	516.800.921
Lock Release Tool:	Local Manufacture