The Advantages of Relative Sensitivity Smoke Detection Systems over 'Fixed' sensitivity types

ClassiFire®
Perceptive Artificial Intelligence

Introduction

Several Aspirating Smoke Detection (ASD) systems are capable of operating at very high levels of sensitivity. However, only the Stratos family of detectors can continuously maintain an appropriate level of sensitivity in the face of normal fluctuations in environmental smoke density. Such fluctuations may be significant, and they may occur due to a number of factors, such as building occupancy, manufacturing processes and detector air filter clogging.

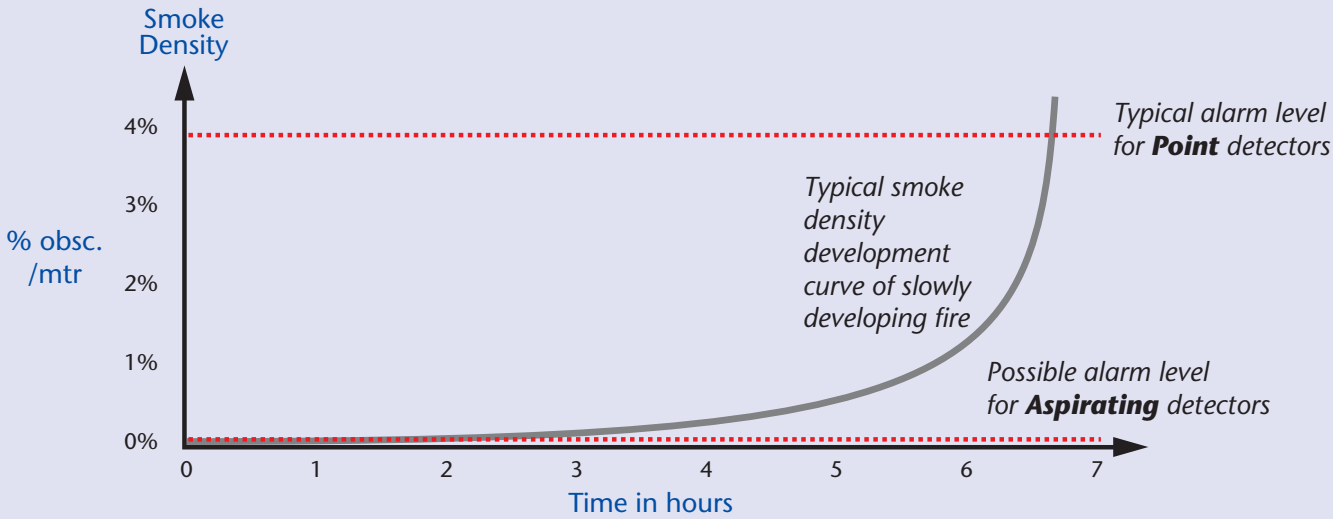
The unique technology used in the Stratos-HSSD® range is known as 'Relative Sensitivity'. This patented process is given the name ClassiFire®, and is able to establish and maintain optimum alarm thresholds, irrespective of normal background smoke fluctuations. Only AirSense Technology's Stratos products employ this patented and award winning 'perceptive Artificial Intelligence' (AI) technology. All other manufacturers of aspirating systems rely on the 'Fixed Sensitivity' method of determination of alarm thresholds, which is discussed below.

The purpose of this document is to clarify the fundamental and important differences in the different ASD technologies available to the customer, and to explain how these different technologies respond to normal variations in background smoke density.

Fixed Sensitivity Aspirating Smoke Detectors

'Fixed Sensitivity' refers to a smoke detector which produces an alarm output when the ambient smoke level rises above a predetermined and fixed threshold. ***All detectors apart from Stratos-HSSD and its derivatives use this technology.*** Figure 1 shows how smoke density typically progresses throughout the development of a fire before an alarm signal is generated in fixed sensitivity detectors.

Fig. 1 Fixed Alarm Thresholds



Fixed Sensitivity aspirating systems (continued)

These systems typically incorporate a moving bargraph display that indicates ambient smoke density against predefined alarm thresholds. The bargraph scale starts at 0% obscuration per metre (obs/m) - that is, absolutely clean air. Such a clean, stable atmosphere is typically only found within tightly controlled environments such as semiconductor manufacturing clean rooms. In normal working environments there will always be a certain amount of smoke present from production processes, external activities, vehicle exhausts etc. and this ambient smoke level will tend to vary over time. ***The performance of fixed sensitivity detectors is significantly affected by these fluctuating background smoke levels, which are displayed on the bargraph. The significance of this is that the amount of additional smoke required for an alarm is dependent upon the 'normal' fluctuations of smoke density in the protected environment.***

Fig. 2 The effect of Varying Ambient Smoke on Fixed Sensitivity Detectors

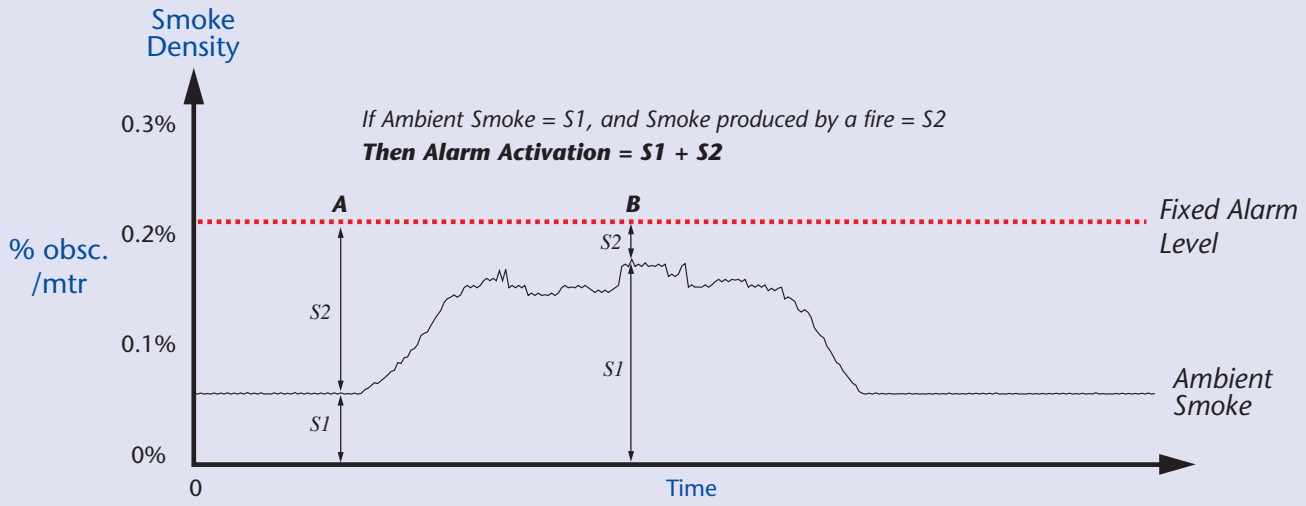


Figure 2 shows that alarm activation occurs when the combined smoke density of background smoke and fire smoke reaches the alarm threshold. At time 'A', ambient smoke density (S1) is low, so a relatively large amount of smoke (S2) is required from the fire to generate an alarm. At time 'B', S1 (ambient smoke density) is much higher, it now takes only the small additional amount of smoke (S2) to generate an alarm. The detector's bargraph conveys little useful information at either time, since all it is registering is the varying background smoke. At time B, it is possible that a random fluctuation in background could be sufficient to generate a nuisance alarm. The detector has no means of distinguishing between a fire and the normal background, and the actual detector sensitivity to fire at any time depends on the background smoke level.

This means that so-called 'Fixed Sensitivity' detectors actually have a VARIABLE sensitivity to fire!

The Stratos range of high sensitivity Smoke Detectors

Stratos-HSSD
General area incipient fire detection

Stratos-Micra 25
Localised incipient fire detection

Stratos-Micra 100
Localised incipient fire detection

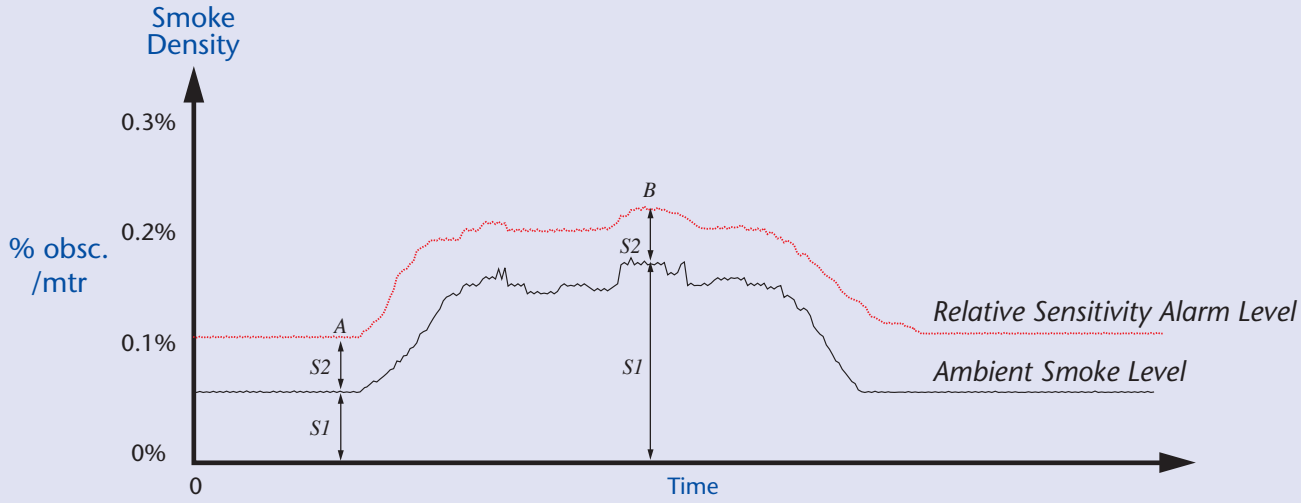
Stratos-Ex
Explosive environment aspirating smoke detector

Relative Sensitivity (as used ONLY in Stratos-HSSD)

Stratos-HSSD continuously adapts its sensitivity to the environment in which it is installed, providing alarm thresholds which are 'relative' to the background smoke levels in the protected area, instead of placing the alarm threshold at a fixed level relative to perfectly clean air. At any time, the detector's sensitivity remains constant, regardless of fluctuations in the normal background smoke level, as can be seen in Figure 3 below. Stratos-HSSD's bargraph display only shows smoke levels significantly above the expected background level, such as from a genuine fire situation.

The philosophy of relative sensitivity is to continuously calibrate the detector relative to the fluctuating background smoke level, so that the thresholds only take into account the increase in smoke caused by a fire. This means that as the background level changes, the threshold must change too.

Fig. 3 Relative Sensitivity - shows how the value S2 is 'Relative' to the variable ambient value S1



Frequently Asked Questions

- **Can Stratos-HSSD desensitise itself to the point where it cannot react to a real fire?** No. The exponential increase in smoke density in a real fire is far faster than the detector's learning ability. Stratos-HSSD easily complies with LPCB and EN54 part 20 requirements regarding slowly growing fires, a test which simulates a **linear** rise in smoke far slower than any real fire.
- **Does this mean that Stratos-HSSD is less sensitive than the competition?** No. Since the alarm threshold is maintained at a level relative to the background smoke level, Stratos-HSSD can approach the background level far closer than would be practical in a fixed sensitivity detector, where even a small change in background smoke over a long period of time could generate a nuisance alarm. ***This means that the Stratos-HSSD range can provide higher practical sensitivity and so substantially earlier warning of a real fire, while simultaneously reducing the likelihood of nuisance alarms.***
- **Can the Stratos-HSSD react to lower background smoke levels during shutdown periods such as evenings, weekends and holidays?** Yes. Over the course of the initial 24-hour period after installation, ClassiFire automatically establishes separate sensitivity settings for 'Day' and 'Night'. When the pre-programmed change-over time is approached, it compares the background smoke levels with the stored values and switches over to the appropriate sensitivity if the background level rises or falls as expected. If the background level does not change, the detector maintains the currently selected sensitivity. This automatically compensates for occasional 24 hour operation of a factory or holidays where the night-time sensitivity should be used all day. The hours of day/night changeover can be user-specified, or the detector can be configured to switch manually, such as with a key-switch. 'Day' and 'Night' sensitivity levels are both controlled and updated by the ClassiFire Artificial Intelligence process.
- **Isn't the Stratos-HSSD really a 'single sensitivity' detector, only suitable for clean environments?** No. Adjusting the detector's 'ClassiFire Alarm factor' parameter decreases or increases the nominal value of S2 as required, enabling it to be used in environments ranging from semiconductor clean rooms to domestic refuse processing environments, flourmills etc. The detector's ClassiFire Artificial Intelligence ensures that its true sensitivity is always maintained at the optimum level.
- **Don't other brands of detector automatically learn their environment too?** Some fixed sensitivity detectors incorporate an 'Auto-Learning' facility, but this is a commissioning tool used only during initial installation. It works on a simple 'ratchet' system, whereby the detector assesses the ambient smoke level and selects a sensitivity level that is compatible with the highest background level encountered during the commissioning period only. Since this level is not updated after commissioning it cannot be compared to the patented Stratos-HSSD ClassiFire Artificial Intelligence process.

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