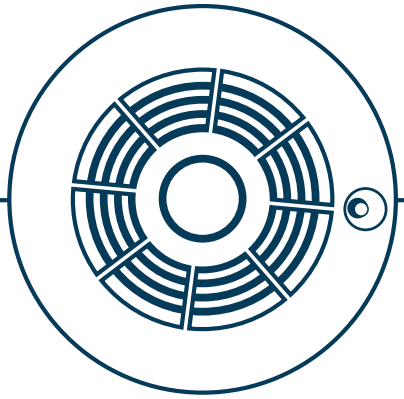
Guidance Note

Fire Industry Association



Fire Alarm Detector Applications and Documentation of the Selection

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INTRODUCTION

During the design of a fire system, consideration is given to the fire risk(s) and the false alarm risk(s). Fire detectors are selected depending on the nature of the protected area and the risks associated with it. Often, this involves utilising different fire detector technologies in order to meet the diverse needs of both fire detection and false alarm rejection in each scenario.

Single-sensor detectors (eg optical smoke detector, heat detector) are suited to the detection of certain fire risks. Selection choices need to be made carefully to optimise the detection of fire but minimise the occurrence of false alarms. The deployment of multi-sensor detectors means that the system could potentially detect fires earlier and yet avoid troublesome false alarms to a greater extent too.

The choices and decisions concerning which detector types to use, are initially made during fire system design but are also sometimes re-visited, and even modified, during commissioning and/or maintenance. They are not always well recorded nor is the rationale behind them. At a later time, for example during a maintenance visit, this can give rise to confusion. A clear understanding of the original reasons behind the choice of detectors and how they are configured is needed, in order to verify continued suitability.

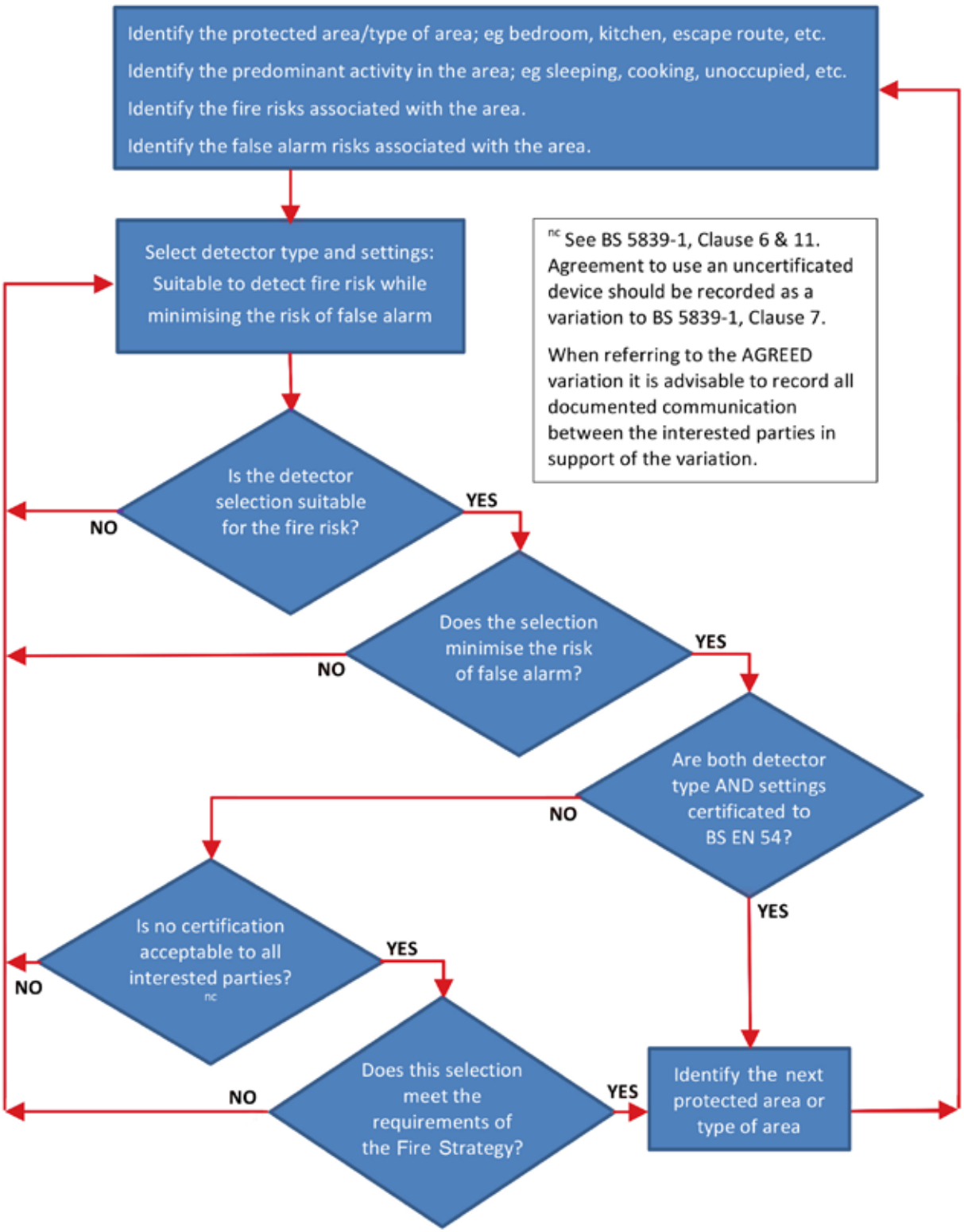
Aside from multi-sensor detectors, a visual inspection of a fire detector can often provide sufficient information to a maintenance technician, to allow in-situ functional testing to be undertaken (eg in the case of a smoke detector or a heat detector). However, in the case of multi-sensors, the type of detection employed within it and its settings, modes or specific configuration which govern its detection performance to the risk, are not apparent from a visual inspection. This information may not even be available from the CIE. In all cases, however, there remains the need to know the detection principles and to understand the reason for the choice of that detection, relative to the risks perceived in the protected area.

This document is intended to assist with the task of selecting and clearly recording the type, sensitivity and settings selected for all detectors, including multi-sensor detectors, relating to the perceived risks.

A Detector Selection Table is shown below in this document. It is a template to allow the documentation of the main risks and all decisions and reasoning behind the detection choices made, either during system design or at the time of any subsequent change to the fire detection. It is intended to assist designers, commissioning engineers and service/maintenance technicians, to keep good records of their detection choice decisions and rationale.

A flowchart is also provided below, which demonstrates the process of detector choice and is provided as a guide for completing the Detector Selection Table. The notes shown after the table give further guidance on its completion, including reference to relevant recommendations within BS 5839-1.

FLOW CHART FOR THE SELECTION OF DETECTOR AND APPLICATION VERIFICATION



Record the responses to the questions in the flowchart in this Detector Selection Table (for guidance on completion of this table, see notes 1-11 below):

DETECTOR SELECTION TABLE

Protected area/ type of area[1]	Predominant use of area[2]	Fire risk(s)[3]	False alarm risk(s)[4]	Detector type[5]	Detector setting[6]	Certificated mode(s) chosen?[7]	Acceptable to interested parties?[8]	Fire strategy met?[9]	Detector type/ setting choice rationale[10]	Comments/ action[11]
Choose from: Hotel bedroom en-suite Hotel bedroom non en-suite Hotel suite Bedroom dormitory style Office cellular Office open plan Kitchen (main) Kitchenette Restaurant/ Canteen Corridor Escape route Reception area Lobby Workshop (clean) Workshop (moderate) Workshop (dirty) Warehouse/ storage Other: please specify	**Choose from:** Sleeping Cooking Unoccupied Storage non-flammable Storage flammable General office work Meetings Circulation route Escape route Manufacturing Manufacturing (hot works) Assembly Other: please specify	**Choose from:** Smouldering white smoke Smouldering dark smoke Smouldering changing to flaming Flaming (clean burn) Flaming (dirty) Other: please specify	**Choose from:** None Steam Toaster Oven usage Cooking Dust Smoking Aerosol spray Hot works Other: please specify	**Choose from:** Optical Heat (static) Heat (RoR) Ionisation Multisensor: Optical/heat Heat/CO Optical/CO Optical/heat/ CO Other: please specify Optical beam Linear heat ASD Class C ASD Class B ASD Class A Flame Video CO Other: please specify	**Please specify detail of detector setting(s)**	**Choose from:** Yes No	**Choose from:** Yes No – then specify	**Choose from:** Yes No – then specify	**Please specify in detail**	**Details as appropriate**

NOTES FOR ASSISTANCE WITH COMPLETION OF THE DETECTOR SELECTION TABLE

1. Protected area should be related to the system category as defined in BS 5839-1:2017, clause 5. In the case of time-related settings (eg day/night mode), a new selection process should be undertaken and recorded for each setting.

2. Anticipated use(s) of the protected area – does not need to be an exhaustive list but should cover the main use(s).

3. Risks anticipated in the protected area. This can either be described as the fire type or in terms of the expected causes of fire. Only the main fire risks need to be identified in the Detector Selection Table – this need not be an exhaustive list.

To assist in completion of the fire risks column in the Detector Selection Table, the following summary of individual sensor detection performance (as found within point type fire detectors) is provided. It also shows some indication of how a typical multi-sensor detector can be used to improve detection.

EXAMPLE FIRE RISKS

Fire risk detection key: very good = ★★★★★ good = ★★★★ moderate = ★★★ poor = ★★ very poor = ★

Fire risk	Example fire(s)	Ionisation detection	Optical (scatter) detection	CO detection	Heat detection	Flame detection	Typical multisensor detection, eg optical-heat*	Typical multisensor detection, eg optical-heat-CO*
Smouldering white smoke	Electrical fire	★★	★★★★★	★	★	★	★★★★★	★★★★★
	Smouldering wood	★★★	★★★★★	★★★★	★	★	★★★★★	★★★★★
Smouldering dark smoke	Smouldering furnishings	★★	★★★★	★★★★★	★	★	★★★★	★★★★★
Smouldering changing to flaming	Waste paper bin fire	★★★★	★★★★	★★	★★	★★★	★★★★	★★★★
Flaming (clean burn)	Burning solvents	★	★	★	★★★	★★★★★	★★★	★★★★
Flaming (dirty)	Burning oils	★★	★★★	★★	★★★	★★★★★	★★★★	★★★★

The performances indicated in the above table apply to single-sensor detectors unless otherwise stated.

*Multi-sensor detector responses could be a combination of the single-sensor responses, but the behaviour of a multi-sensor will be dependent on the manner in which the sensors are combined within the detector. The combination of sensors within a multi-sensor detector could provide an enhancement to performance overall and cannot be considered to be the linear sum of the individual sensor responses. The response of multi-sensors will not be common across all detector manufacturers, due to differences in construction and internal algorithms. The response of a chosen multi-sensor, including its mode and settings, should be properly understood to ensure that the risks are adequately covered. This table shows some typical examples of multi-sensor responses and does not represent an exhaustive list of all possible sensor combinations and algorithms.

4. Only the predominant false alarm risks need to be identified in the Detector Selection Table – this does not need to be an exhaustive list. These should be described in terms of the expected causes of false alarms. See clause 35 of BS 5839-1:2017 for assistance with selection of detector types for the minimisation of false alarms.

To assist in completion of the false alarm risks column in the Detector Selection Table, the following summary of typical causes of false alarms and how individual sensors respond to them is provided. It also shows some indication of how a typical multi-sensor detector can be used to improve false alarm rejection.

EXAMPLE FALSE ALARM RISKS

False alarm risk rejection key: very good = ★★★★★ good = ★★★★ moderate = ★★★ poor = ★★ very poor = ★

False alarm risk	Example false alarm cause	Ionisation	Optical (scatter) rejection	CO rejection	Heat rejection	Flame rejection	Typical multisensor rejection, eg optical-heat**	Typical multisensor rejection eg optical-heat-CO**
Steam	Shower or bathroom	★★★★	★★	★★★★★	★★★★	★★★★★	★★★	★★★
Smoke	Smoking, kitchen/ cooking fumes	★	★★★	★★★★	★★★★★	★★★★★	★★★	★★★★
Dust	Warehouse	★★★	★★	★★★★★	★★★★★	★★★★★	★★★	★★★
Other particulate	Aerosol canister products, artificial smoke	★	★	★★★★★	★★★★★	★★★★★	★★★	★★★★
Sparks/naked flames	Welding	★★	★★	★★★	★★★	★	★★★★	★★★★★
Substance ingress	Insects	★★★	★★★	★★★★★	★★★★★	★★★★★	★★★★	★★★★★
High ambient airflow	Air-conditioning, open doors/ windows	★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Rapid thermal change	Opening of ovens	★★	★★★★★	★★★★★	★	★★★★★	★★★★	★★★★

**Multi-sensor detector responses could be a combination of the single-sensor responses, but the behaviour of a multi-sensor will be dependent on the manner in which the sensors are combined within the detector. The combination of sensors within a multi-sensor detector could provide an enhancement to performance overall and cannot be considered to be the linear sum of the individual sensor responses. The response of multi-sensors will not be common across all detector manufacturers due to differences in construction and internal algorithms. The response of a chosen multi-sensor, including its mode and settings, should be properly understood to ensure that the risks are adequately covered. This table shows some typical examples of multi-sensor responses and does not represent an exhaustive list of all possible sensor combinations and algorithms.

5. See BS 5839-1:2017, clause 21, for further information on detection types and their selection.

6. Different detector settings may include various response speeds, delays, variations of sensor performance, sensitivity of alarm level, etc. Other risks (eg evacuation strategy/timescales) should be considered when choosing these settings.

7. Some detectors may have modes of operation which are not certificated to the relevant EN 54 standards. These modes should be avoided if at all possible but where such modes are used, that decision should be agreed in writing by all interested parties following a fire risk assessment, noted here and explained in the rationale in the Detector Selection Table. Information concerning non-compliance of a specific mode has to be provided by the manufacturer, by clearly marking the detector or within the associated data (as per EN 54 standards, On-site adjustment of response behaviour).

8. Refer to BS 5839-1, clause 6, for the definition of relevant interested parties.

9. The implications of future changes to the detection type or setting must be understood and continue to support the Fire Strategy.

10. The reasoning behind decisions concerning the choice of detector technology, type, setting, sensitivity, etc should be given here.

11. Any additional, relevant information concerning the detector selection should be given here, including required or agreed actions.

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Tudor House, Kingsway Business Park, Oldfield Road, Hampton, Middlesex TW12 2HD
Tel: +44 (0)20 3166 5002 • www.fia.uk.com