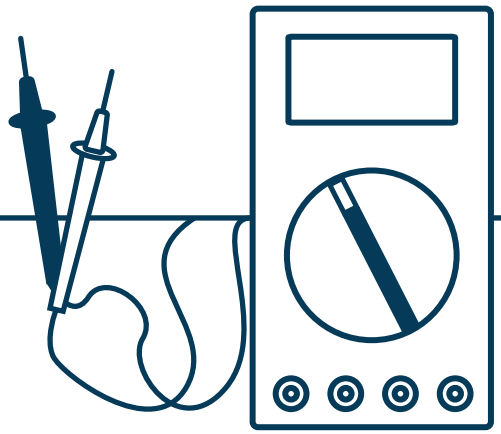
Guidance Note

Fire Industry Association



Guidance Document on Best Practice for Fire Detector Testing/Test Equipment

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1. SCOPE OF THIS DOCUMENT

The guidance in this document covers the field testing of point fire detectors only, ie heat, smoke, combustion gas (eg CO) and multi-sensor detectors.

The document does not cover ASD, beam, flame or duct smoke detectors, nor point heat detectors above Class C or linear heat detectors.

Guidance on the use of some of these is included in existing FIA documents.

Fire detection in hazardous areas is not covered in this document.

2. COMPETENCY REQUIREMENT OF SERVICE TECHNICIANS

BS 5839 Part 1 states that the maintenance of a fire detection and fire alarm system should be carried out by a competent person, and is defined in that standard as:

> *'3.12 competent person: Person with the relevant current training and experience, and with access to the requisite tools, equipment and information, and capable of carrying out a defined task.'*

In practice this means:

Capability and experience of doing the task, although experience alone is not sufficient; keeping up to date with training through FIA training courses, for example. Outdated training (eg on older versions of the standard) is not considered 'current'.

Appropriate information concerning the fire alarm system for the site needs to be made available, in order for a competent person to be able to carry out their maintenance task.

Using the correct tools and equipment for the task concerned.

3. REQUIREMENT FOR THE TESTING OF FIRE DETECTION DEVICES

3.1 What requires testing

Based on the recommendations within BS 5839 Part 1 for the testing of a fire detection and fire alarm system, the requirements for testing may be sub-divided into three sections;

a) All fire detection and alarm devices functionally tested annually.

b) A sample of fire detection devices to be tested periodically (typically six monthly) as part of the CIE response requirements.

c) Prescribed detection devices should be tested after modification of the system.

3.2 Functional testing

The functional testing of individual detection device types should be in accordance with the recommendations detailed in BS 5839 Part 1, Clause 45.4.

3.3 General testing procedure

Before commencing any functional testing of the fire alarm system, it should be verified if it is connected to a remote alarm receiving centre (ARC). Should this be found to be the case, the ARC must be notified that a functional test of the fire alarm system is to be conducted and an estimated completion time given. Contact with the ARC may need to be made by the site or the attending service technician. The relevant site staff must be aware that the response from the ARC has been suspended. On completion of all testing, the ARC should be requested to confirm that the test fire signals were successfully received. They can then be notified that all testing is completed, such that any subsequent fire signals the ARC may receive should be treated as 'real'.

3.4 Test methodology

The test equipment used must be appropriate for the detector type(s) on test. Where access equipment is employed (eg poles, ladders, platforms), a suitable location should be assessed first to ensure the test equipment can reach the detector easily, be positioned on/over the detector correctly, and the equipment manipulated safely and effectively. The test equipment should be activated for no longer than is necessary and the response of the detector observed. It should be noted that, where test smoke is deployed by certain test equipment, it may take a few minutes after the test for the detector to clear, such that it can be reset without going back into alarm mode.

Some detectors may respond more slowly than others and the response time should not be taken as an indication of detector performance. Typically, however, for smoke detectors and rate-of-rise heat detectors, response time is within seconds. Longer response times may be encountered when testing fixed temperature heat detectors and smoke or multi-sensor detectors, which have internal delays/ other measures to help avoid false alarms. Always follow the instructions given by the detector manufacturer.

3.5 Examples of bad practice

Examples of bad practice are, but not limited to:

- Not using dispenser;
- poor positioning of dispenser;
- impatience – leading to over-application of aerosol.

4. TEST MEDIUM AND FIRE DETECTOR TYPE

4.1 General

Tools and equipment used in the service and maintenance of fire alarm systems (whether BS 5839-1 or BS 5839-6 type systems) should be designed for the task, and used by those who are properly trained and qualified to carry out such tasks.

It is recommended that a risk assessment is carried out when working with tools at height and/or using pressurised aerosol canisters, which may also be flammable.

There are some test scenarios where standard test products are not usable due to circumstances. Any improvised or novel test methods should always be accompanied by an appropriate risk assessment and method statement acceptable to all interested parties.

Functional testing of fire detectors should be carried out as described in section 45 of BS5839-1. This involves using external stimuli to act upon the detector under test in order to demonstrate proper functioning of the detector, including its ability to sample the surrounding atmosphere successfully.

45.3 states:

> *'…In the case of detectors (all types), tests should ensure that products of combustion are capable of passing unhindered from the protected area to the sensing chamber/elements of the detector, and not simply test the ability of the detector to sample/verify the status of the atmosphere already in the sensing chamber.'*

Prior to conducting a functional test on a fire detector, the fire panel should be set to a 'test' condition and any connection/notification to the ARC temporarily disabled. The type of the detector should be determined in order that the correct equipment and procedure can be adopted.

After completion of the test, the test should be properly documented in the premises fire log book and any connection/notification to the ARC re-instated.

4.2 Smoke detectors and test medium

Smoke detectors should be functionally tested in accordance with BS 5839 Part 1 2017 Clause 45.4 d) which states:

'Point smoke detectors should be functionally tested by a method which confirms that smoke can enter the detector chamber and produce a fire alarm signal (eg by use of apparatus that generates simulated smoke or suitable aerosols around the detector). It should be ensured that the material used does not cause damage to, or affect, the subsequent performance of the detector; the manufacturer's guidance on suitable materials should be followed.'

4.2.1 Types of 'smoke'

It should be remembered that smoke detection technologies have advanced to an extent that some older styles of test equipment may no longer be suitable to test all detectors and/or operational modes.

The main types are:

- Aerosol canisters.
- non-canister simulated smoke;
- real smoke test products.

4.2.2 Usage of smoke types

- Aerosol canisters.

  o Avoid excessive use of aerosol smoke
  When an aerosol canister test product is used to test a smoke detector, it is important to follow the instructions given by the test product manufacturer, in order to prevent potential contamination of the detector through inappropriate use. It is not necessary to exceed the dosage specified in order to obtain efficient detector activation.

  o Aerosol canister smoke applicators/dispensers
  Always use the appropriate aerosol applicator/dispenser mechanism for the aerosol canister. This helps to prevent contamination due to over-application. Some smoke detector test aerosols are supplied with an applicator attached (eg telescopic). If provided, such an applicator should remain attached to the aerosol canister as it is intended to provide the most efficient mode of application, as well as helping to prevent over-application by keeping a minimum distance between the aerosol nozzle and the detector under test. Other smoke detector test aerosols utilise a separate aerosol dispensing tool into which the aerosol canister is inserted. This also helps to prevent misuse due to the aerosol not being directed at the detector under test. Instead, the cloud of simulated smoke is allowed to collect around the detector and enter through the vents to activate it.

• Non-canister simulated smoke.

Use of non-canister products for generating a simulated smoke provides the easiest method of test and ensures consistent test results. Generation of the simulated smoke is usually automatically regulated and the risk of potential impairment of the detector under test is much reduced.

• Real smoke test products.

Some smoke detector test equipment utilises actual combustion (eg a smouldering josstick) to produce real smoke for a test. Any use of a naked flame to ignite the test source should always be accompanied by an appropriate risk assessment and method statement, acceptable to all interested parties.

4.3 Heat detectors and test medium

4.3.1 Legacy heat detectors (pre May 2003)

The specification for heat detectors used to be BS 5445 (and then earlier versions of EN54 parts 5 and 8) which classified them according to their response times and fixed upper temperature limits in these ranges: Grade 1, Grade 2 and Grade 3 for most applications and then Range 1 and Range 2 for high temperature environments. The fixed upper temperature for Grades 1, 2 and 3 were 60°C, 65°C and 75°C respectively. For Ranges 1 and 2, it was 80°C and 100°C respectively. All of them had a rate-of-rise element, but the response time differed according to categorisation, with Grade 1 being the fastest responding.

Furthermore, the rate-of-rise response had upper and lower response limits, ie there is a range over which the time to alarm may vary, which can be considerable yet remain within the specification. Also, the fixed temperature threshold may vary by plus/minus several degrees Centigrade and still remain within specification. This means that a Grade 3 detector, for example, would still be considered to be in specification if it only alarmed at about 90°C due to the fixed element, but that would normally be overridden in a field test by the rapidly increasing temperature triggering the rate-of-rise element well before that temperature was reached.

4.3.2 Current heat detectors (post May 2003)

EN54-5 categorises heat detectors as follows:

Detectors shall conform to one or more of the following Classes: A1, A2, B, C, D, E, F or G according to the requirements of the tests specified in clause 5 (see Table 1).

Detector Class	Typical Application Temperature °C	Maximum Application Temperature °C	Minimum Static Response Temperature °C	Maximum Static Response Temperature °C
A1	25	50	54	65
A2	25	50	54	70
B	40	65	69	85
C	55	80	84	100
D	70	95	99	115
E	85	110	114	130
F	100	125	129	145
G	115	140	144	160

Table 1: Detector classification temperatures.

[1)] Detectors with a suffix S to their Class do not respond below the minimum static response temperature applicable to their classification (see Table 1 above), even at high rates-of-rise of air temperature. Detectors with suffix R to their Class incorporate a rate-of-rise characteristic, which meets the response time requirements (see Table 1) for high rates-of-rise of air temperature, even when starting at air temperatures substantially below the typical application temperature.

Manufacturers may optionally give additional information concerning the type of response exhibited by the detector, by adding the suffix S or R to the above Classes (refer to note [1)] below Table 1). Detectors which are marked with the letter S or R as a suffix to the Class marking, shall be tested in accordance with the applicable test, specified in Clause 6, and shall meet the requirements of that test, in addition to the tests of Clause 5.

This is not only different in referring to Classes of detector as opposed to Grades or Ranges, but also in the temperature 'bands' of performance. These changes took effect at the introduction of EN54-5 in May 2003 and since then, there have been numerous heat detectors with this newer classification installed. However, there are still a significant number of heat detectors in the field still in service which are specified to the older standards.

The other differential between legacy and current heat detectors is the inclusion of the rate-of-rise element, ie within legacy detectors this was automatically included and in the current detectors it is an option (refer to note [1)] below Table 1, above). Class D, E and F detectors are associated with high-temperature applications and will require specialist test equipment suitable for these higher temperatures. Class A1, A2, B and C detectors are associated with normal fire alarm point detector applications and may be tested with equipment which can reach temperatures of up to 90°C.

When testing a heat detector which incorporates both a rate-of-rise element and a static response, it is not usually possible to determine whether the activation of the detector has been due to one or other of these elements. Using field test equipment, the rise in temperature during a test will inevitably be rapid and therefore will activate the rate-of-rise element prior to any static temperature response activation.

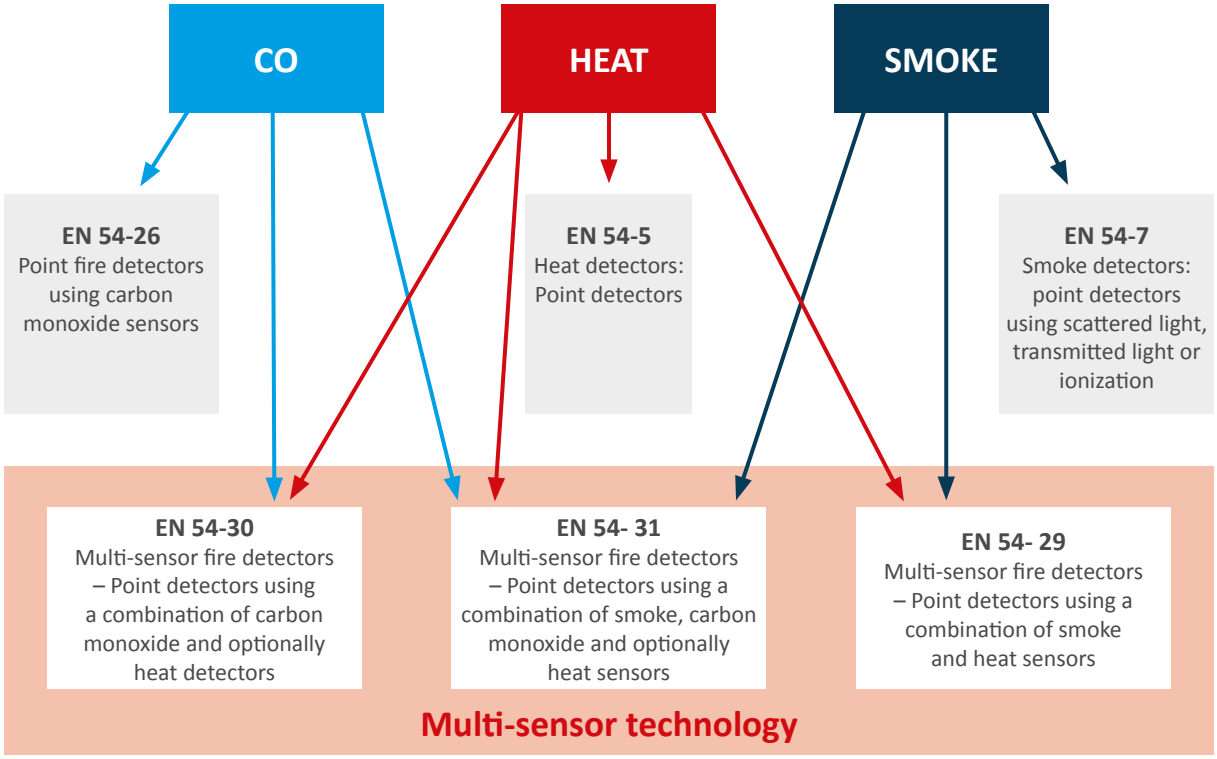
4.3.3 Special requirements for correct testing of heat detectors

Since heat detectors may have different responses, the application of heat using heat-generating test equipment should be done intelligently, with the response of the given detector in mind. Detectors with a rate-of-rise response only, will generally respond much quicker to a given heat stimulus than a detector with a fixed temperature response, particularly if the fixed temperature rating of that detector is relatively high.

Applying heat for excessive periods of time can result in distortion of the detector plastics, especially in the case of detectors which have only rate-of-rise response or a low temperature, fixed temperature response.

In the case of heat detectors with a fusible element (fusible link), care should be taken not to activate this fusible component if carrying out a test on another sensor within the detector (such as a rate-of-rise sensor). If the detector only has a fusible element, a functional test should not be carried out.

4.4 Multi-sensor detectors and test medium



4.4.1 Testing of multi-sensor detectors

When testing multi-sensor detectors, it is important for the test technician to know how the detector has been configured before conducting a functional test. The detectors may also have different parameters related to timers (day/night) set up by the control and indication equipment (CIE) and this must also be taken into consideration. Before the appropriate functional test can be selected, it would be necessary to identify the type of multi-sensor (see table above) and the mode setting(s) that have been configured. Some multi-sensor detectors may have special functional test modes, which are designed to confirm that all sensors within the detector have been tested. When using any functional test modes, it is important to follow the manufacturer's instructions.

Guidelines for specific applications, eg testing in corridors, should be carried out assuming smoke detection, so using a smoke stimulus only; the non-response to smoke stimulus might indicate a non-operational detector or a misconfigured multi-sensor.

Testing of a multi-sensor detector which is configured as a smoke detector might not be possible with some aerosol/smoke products.

Function and technology are different things and should be understood, eg a smoke detector versus a multi-sensor configured to detect smoke. Test approach might be different for these two.

5. HEALTH AND SAFETY

5.1 Specialist test equipment/alternative arrangements

The service technician may encounter applications where detectors are not readily accessible, due to restricted access (eg radioactive, high voltage, high temperature risks), however the correct functioning of such detectors still has to be verified. The use of specialist remote test devices may be required and may have been incorporated in the system design from the outset. Where this is the case, the specialist remote equipment must be used. Some such applications may have maintenance outages where access is then possible – maintenance activates may need to be coordinated to ensure completion during any outages.

The service technician may also encounter situations where detectors are not readily accessible. This may be due to the height of the detectors above the nearest floor level, or within a congested floor void or in a lift shaft. Where access to the detector cannot be physically achieved, this shall be reported to the site contact and recorded on the service documentation as a variation. Where such instances occur, alternative methods of testing should be devised, whether this is by the temporary disruption of the normal process (which may require testing to be conducted out of hours, or during maintenance outages), or by the use of alternative test equipment or techniques. Where this is encountered, the end user should record this to avoid replication on future service visits.

5.2 Health and safety checks/procedures

Appropriate health and safety checks should be considered, including your own organisation and on site, these may include but are not limited to:

- Observe all health and safety guidance when working at heights or in confined spaces.
- Be aware of any members of the public that may be in the area where you are working.
- Observe all safe handling guidance when operating or using test equipment such as long poles etc.
- Ensure that all test equipment is, where necessary, PAT tested, calibrated and in all certificates etc are in date.

DISCLAIMER

The information set out in this document is believed to be correct in the light of information currently available but it is not guaranteed and neither the Fire Industry Association nor its officers can accept any responsibility in respect of the contents or any events arising from use of the information contained within this document.

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