Fact File

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Fire Industry Association

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Video Fire Detection Systems: ISO/TS 7240-30

Contents

1. SCOPE:

This FIA Fact File introduces ISO/TS 7240-30, the international Technical Specification published in July 2022 on the requirements for the design, installation and verification of fire detection systems utilising video fire detectors. It gives an analysis of the content of the standard and emphasizes specific areas of importance to attaining acceptable performance of such systems throughout their life.

Where relevant an expert commentary is provided in italics to clarify aspects of the standard – whether that be a contradiction to the UK codes, omission of important considerations or clarification of the requirements provided by the TS.

Note: This Fact File is to be used in conjunction with Fact File 90 which introduced ISO/TS 7240-29, the international Technical Specification published in 2017, specifying product requirements and test methods for video fire detectors. This TS has now been published as an ISO standard (2024) but like the TS it is unlikely to be published as a British Standard (BS ISO) as the UK voted against the latest revision. Further details on this are presented at the end of this Fact File. More generally, FIA Guidance for Video Smoke Detection Technology (Version 1, December 2009) remains relevant to the understanding of video fire detection technology and may also be read in conjunction with this Fact File.

2. INTRODUCTION:

When developing product requirements and associated validation test methods to ensure adequate performance of fire detectors it is essential to consider the environment in which they have to operate as this can have an influence on the manner they will perform once installed.

For Video Fire Detectors (VFD) the installed environment is fundamental to their operation as the image analysis they employ is fundamentally based on observing visual changes to the area under surveillance. It is therefore very difficult to assess in a pre-deterministic way the performance of a VFD detection system in isolation from its intended operational environment.

With this in mind, ISO/TC21/SC3 decided to launch a new project to develop essential rules and requirements for the design, installation, commissioning and service of these new type of detection systems and allocated the project to WG24, the working group that had just completed the development of ISO/TS 7240-29, a product standard for video fire detection systems.

Given that the installation of VSD systems is so fundamental to their operation, it was deemed appropriate that these requirements should be kept separate from the existing installation standard for FDAS (ISO 7240-14:2013).

3. OVERVIEW OF ISO/TS 7240-30

ISO/TS 7240-30 is structured in a similar way to a BS Code of Practice or EN installation guideline documents, providing recommendations for best design and installation practice. However, it is written using the 'shall' form that indicate mandatory requirements and does not have a formal provision for offering approved variations. The TS is restricted to the installation and functionality of equipment related to the use of video fire detection technology only within an overall Fire detection and Alarm System.

Reviewing the different sections of the document in turn, the following points are worthy of attention and, possibly, further expansion:

3.1 Section 1: Scope

The Scope of the TS is principally in the domain of application in fire detection and fire alarm systems in which VFDS are one of the means of detecting and warning of fires, it also extends to cover the protection of specific items of equipment which, by themselves, present a special risk within or outside buildings, for example large electricity transformers or heavy-duty diesel generators

Commentary:

The use of VFD as a primary or as a secondary detector is not addressed in the scope. To ensure adequate safety in case of fire, it is important that careful consideration be given to system features that affect the reliable and continuous operation of the detector when it is the sole means of detection.

3.2 Section 2: Normative references

The TS includes a short section on Normative references that apply to the design, installation, commissioning and service of VFD systems.

Commentary:

The section does not list ISO/TS 7240-29. However, it is referred to and included in the bibliography. There should also be reference to ISO/IEC 17025 which is cited in clause 4.2.

3.3 Section 3: Terms and definitions

In addition to defining a number of commonly used terms, this section specifically defines a number of terms highly relevant to the technology involved, including **active field of view, monitored volume, video fire detector and video fire detector system.**

active field of view (aFoV) is defined as that part of the Field of view (FoV) of the VFD sensor in which the image sensing device and associated analytical process can effectively generate a reliable fire detection decision. This takes into consideration any borders to the FoV where detection is not effective and areas within the FoV deliberately masked to avoid nuisance alarms.

monitored volume is defined as that part of the protected space visible in the aFoV of the VFD in which flame or smoke within, or around that space can be detected. The **monitored volume** takes into consideration the aFoV, the declared range for the VFD and any obstacles within the space which may obscure the direct view.

In the definitions of **video fire detector (VFD)** and **video fire detector system (VFDS)**, a distinction is made between a video fire detector (whether it be provided by self-contained device operating on their own, or a number of distributed components monitoring one active field of view) providing for the detection of smoke or fire in the images being analysed, and a **video fire detector system** made up of one or more VFDs to provide full coverage of the area(s) to be protected.

3.4 Section 4: Equipment and materials

The section specifies requirements on equipment and materials used in the design and installation of VFDSs. It places a duty on those responsible for maintaining their correct operational performance throughout their life on ensuring:

a) the quality of equipment and material employed, including ancillary equipment and installation accessories, and

b) their compatibility with the environment into which they are installed, including EMC, extremes of temperatures and humidity and resistance to corrosive atmospheres.

Commentary:

Although the TS alludes to the need for compliance with EN/TS 7240-29 and other applicable standards in the ISO 7240 series (or if not available, existing local standards), it does not give details of which standard must be used for specific piece of equipment designed in the system, as would be expected in a BS Code of Practice (like BS 5839-1).

3.5 Section 5: System functionality

In this section, the TS specifies that a performance test shall be conducted on site, i.e. after installation and commissioning of the VDFS to verify that it operates according to the manufacturer's specification. It also places a responsibility on the system designer to ensure that:

- the propagation of smoke from spaces outside the field of view of the sensing device

is assured and is able to be detected,

- areas of the space masked to prevent nuisance alarm from specific sources do effectively achieve their purpose,
- all equipment used in the VDFS have been independently assessed as compatible with the Fire detection control equipment as in accordance with ISO 7240-13,
- any equipment that may have a detrimental effect on the operation of the VFD, for example illuminators, are sited so as not to compromise performance,
- documentation is available listing all components used in the VFDS and identifying their inter-compatibility with the other components,
- certification of compatibility of equipment is included in the design documentation or, when such assessment was not done, the reasons for this, giving any measure taken to ensure that the equipment in question will not affect the correct operation of the VDFS.

Commentary:

This section of the TS is set out as a separate, independent section and needs to be read in the context of section 8 on commissioning.

3.6 Section 6: Design

This section requires that a responsible person (with suitable qualifications or experience) clearly identifies the scope/extent of the VFD system. It provides a list of the information that must be made available to the designer and included in the design documentation.

It makes it clear that (where local regulations do not stipulate otherwise) the power supply must conform to ISO 7240-4 “or equivalent” and requires that the standby source must provide at least 24 hours standby followed by an alarm period of at least 30 mins.

More specific to VFDS, clause 6.5 requires that illumination is provided to the minimum level needed, at all times – but this is only for systems which provide “primary” *and* “sole” protection. These terms are not defined (and this is the only instance where they are used) and appear to be contradictory because “primary” implies there is a second means of detection which will operate when the illumination is insufficient – but “sole” contradicts this implication. Essentially, the clause is intended to ensure that where the VFDS is the only means of detection the illumination must be sufficient at all times and supplied from a power supply that maintains illumination – with a maximum 30s interruption. Significantly, this clause means that there are no illumination requirements for VFDS which provide secondary or redundant detection.

Confusingly, clause 6.5 effectively makes a concession (by using the words “at least one of the following”) that illumination powered from an ISO 7240-4 power supply is sufficient (and may provide much shorter standby times than those specified in 6.4.3) and the reference to 6.4.3 allows for the illumination to be powered from an “equivalent” power supply with 24-hour backup (unless local regulations stipulate otherwise).

Commentary:

The intention of this section is that VFD system, including the illumination needed for them to operate effectively, should be able to operate for 24 hours without mains and that the ideal is to use an ISO 7240-4 power supply where possible.

In the UK, BS 5839-1:2017 introduced new commentary (21.1.7) addressing video fire detectors in 2017 but the recommendations relating to design and inspection of VFD (clauses 21.2j & 45.4s quoted below) remained unchanged. These cover the requirements for power support of illumination

> Clause 21.2 j) When video fire detectors are used as the sole means of detection, the recommendations of the product manufacturer and/or suppliers in terms of detection performance and application limitations should be followed and, wherever required, specialist knowledge should be sought.
>
> *NOTE 8 It is important that video fire detectors are capable of detecting flame and/or smoke reliably in the absence of the normal lighting in the building and the absence of a mains power supply to any lighting provided specifically to aid the detection of flame and/or smoke.*
>
> Clause 45.4 s) Video fire detectors should be subject to the manufacturer's guidelines in relation to annual test and inspection. Any lighting provided specifically to aid the detection of flame or smoke should be regarded as an integral part of the video fire detection system. As such, its correct operation should be confirmed, both in the presence of any mains supply to the lighting and the absence of such a supply.
>
> Source BS 5839-1:2017

Clause 6.6 notes that for smoke detection it is not necessary to that the entire area is directly within the Field of View (FoV) – only that "sufficient proportion" is visible and within the range of the VFD. Further guidance on the sufficient portion is provided in clause 6.9.

Clause 6.7 notes that for flame detection all potential sources should be within the Field of View (direct line of sight) of the detector. This clause also draws attention to the challenges of detecting moving flames and could be mis-interpreted to mean that they "can" remain undetected.

Commentary:

Users of this of this CoP are advised to consider this clause to be a warning of the challenges rather than a recommendation that such moving flames can be ignored.

Clause 6.8 draws attention to the need to consider false alarms and utilise features available to mitigate them.

Clause 6.9 provides some more detailed recommendations on the coverage.

As stated in sub-clause 6.9.1, this section is about ensuring that a sufficient number of cameras are used to ensure that a fire anywhere within the zone will be detected. It refers to Annex A which provides some clarity on the coverage of a VFD by illustrating that the field of view is a 2D representation of 3D space and that there may be portions of that space which are not within the active field of view. Despite this, as long as smoke is very likely to move into the monitored volume (covered by the active field of view) within a reasonable time period then the VFDS can be deemed to have sufficient coverage.

The recommendations given in sub-clause 6.9.3 reflect this logic and allow for "obscured space"

(outside the active FoV of the VFDS) to be covered as long as there is ample space above the obscured space. Figure 1 illustrates the recommendation very clearly.

Sub-clause 6.9.4 adds a 10m limit to the height of the obscured space.

Sub-clause 6.9.5 considers the likely horizontal movement of smoke into the monitored volume when there is a wall. Essentially, for spaces with heights exceeding 20m, the monitored volume does not have to extend to the walls but must be within 5m. For lower ceiling heights this limit is reduced as there is less opportunity for the smoke to move horizontally as it rises.

Sub-clauses 6.9.7 and 6.9.8 appear to be repetitions of earlier sub-clauses relating to smoke detection but without the details.

Sub-clauses 6.9.6 and 6.9.9 recommend that video flame detectors should have a clean line of sight to every potential point of ignition within the protected volume.

Clause 6.10 recommends that a VFD can only cover one detection zone. Clearly adequate detection within the whole zone may require several VFD cameras – and many VFD systems can indicate the source of any triggering event in the video image. This is akin to addressable point detectors providing supplementary location information beyond the zone as represented on the fire panel / zone plan.

Clause 6.11 concerns miscellaneous other considerations. It draws specific attention to situations where VFDs are used to provide supplementary protection and where they are used to protect special hazards. It states that in such cases, the installation owner's specification should apply as well as that of any authority having jurisdiction. It also states that, where special hazards are protected, potential sources of false alarms specific to the hazard being protected must be considered.

Commentary:

The recommendations within this section are useful when considering the coverage of a VFD system. The two specific recommendations relating to the movement and detection of smoke emanating from spaces obscured by obstacles and from spaces near walls are somewhat arbitrary but useful.

3.7 Section 7: Installation

In this section the TS specifies requirements for the installation of VFD systems. It addresses the need to use a "suitable installer" working to a predetermined design plan and that employs personnel with qualifications and experience relevant to the scope of the system being installed. It requires that conformity to the design plan is assessed (preferably by an independent third party) and it refers to the availability of locally approved certification schemes.

Commentary:

ISO/TS 7240-30 lacks the more detailed information which would be expected in a standard aimed at guiding installers on the various technical aspects that applies to the installation process. In particular it does not specify requirements applicable to the routing, interconnection, screening, and physical protection which need to be afforded to cables and there is no mention in the TS of testing the integrity of the installed cables. To fill this gap, reference can be made to Section 4 of BS 5839-1.

3.8 Section 8: Commissioning

In this section the TS specifies the requirements for the commissioning of VFD systems. It addresses the need to use a "suitable commissioner" that has competence in commissioning VFDS and employs suitably qualified persons with relevant experience. It implies that the installation company may indeed undertake the commissioning procedures providing they have engineers or technicians with proven experience in the field of putting to work and testing VDFS. It also recommends that, where available, formal recognition and registration of individual qualifications should be used.

In particular, the TS requires that a commissioning plan is made available to, and followed by, the commissioner and that this plan also incorporates any amendments incorporated as part of the design plan. This plan must include the verification by inspection or testing of the following:

- Location and identification of detectors,
- Correct type and operation of cameras,
- Correct placement and functionality of illuminators and other devices,
- Correct information at the VFDS when fire images are detected,
- Transmission paths to any Fire alarm control and indicating equipment (FACIE),
- Power consumption within the design parameters for compliance with standby requirements,
- Correct operation of all ancillary functions.

A specific mention is made in the TS that "where a VFDS is operating with a security system for such functions as video surveillance, facial recognition or people tracking, verification by test that the operation of the security system does not interfere or impair the operation of the VFDS". In such cases, the correct operation of each VFD to confirm its ability to detect fire within the entire FoV is verified.

Commentary:

This section doesn't cover the essential commissioning procedure of conducting a comprehensive test of the system to ensure its correct functional operation as intended by the design and no reference to section 5, where this is covered, is given. Similarly, documentation of the system as installed and commissioned is covered under a separate section, section 10. Also, the essential processes of formal customer acceptance during a handover procedure is not covered.

3.9 Section 9: Approvals

This section simply states "The VFDS shall be certified for conformance to this document and other International Standards as appropriate by an independent party acceptable to the regulatory authority."

Commentary:

This implies that 3rd party certification of the installed system is expected which is not really appropriate to the UK market where various schemes for installation company competence (e.g. LPS or BAFE) exist and they effectively self-certificate individual installations. Such companies should be used for the installation of VFDS and a certificate of conformance to this standard should be issued by them – supported by their 3rd party competency credentials.

3.10 Section 10: Service

This section provides some general recommendations for having a service plan covering preventative maintenance. Some particular points such as inspection of all wiring and "battery ventilation and protection against corrosion" are provided but these would be covered under BS 5839-1 recommendations.

Annual routine testing is recommended which is in line with BS 5839-1 for all fire detectors. Details and examples of how to initiate an alarm condition are quite vague and default to an expectation that test are "carried out per the manufacturer's recommended method".

Specific to the VFD there is a recommendation in 10.6 to "verify a clear sharp image and it shall be compared to the image at installation" every quarter – plus an annual verification in 10.4 that "each VFD FoV is pointing at its intended target".

Commentary:

The apparent contradiction/repetition for checking the consistency of the camera's FoV reflects the lack of a specific requirement in ISO 7240-29 for monitoring of the FoV against major movement/misalignment. However, many systems do provide this protection/monitoring against misalignment such that annual checking would be reasonable. Where a system lacks such protection/monitoring, more regular verification that the camera has not moved is needed – potentially more frequently than quarterly and this should be defined in the service plan.

4. FURTHER RELEVANT PUBLICATIONS AND ONGOING WORK

As noted in the scope, ISO/TS 7240-29:2017 has been revised and published as ISO 7240-29:2024. A review of FIA Fact File 90 is under consideration to identify the changes introduced in the 2024 standard. In the meantime, the main changes are described as:

- Additional detail was added to the requirements for the RTV test for video smoke detectors Type A and AB.
- RTV test was eliminated for Type B detectors.
- Provided requirements for controllers that are and are not in the same environment as the cameras.
- The dark and light background during fire tests can now be replaced with high and low illumination of the background.
- The non-uniform illumination test was corrected to remove references to alternate background screens and diagrams were corrected.
- Removed the requirement to operationally test the detector during hot and cold conditioning tests.
- The operational impact test was modified to reference IEC 62262.
- The operational vibration test was eliminated.
- A vibration endurance test was added for the controller.

The changes mentioned in the 2nd bullet mean that there is no longer a requirement to assess the sensitivity (Response Threshold Value) of a Type B (flame) detector and how it changes as a result of the environmental tests thus undermining all the environmental tests specified in the standard. and 4th bullets were resisted by UK experts. Also, the challenging requirement to detect whitish smoke against a light/white background (and blackish smoke against a dark/black background) have been omitted.

Other publicly available documents having relevance to the use and installation of video fire detection technology include:

- FIA guidance document on video fire detection technology (VFD) - Version 1 (December 2009), (<LINK>)
- FIA Fact File 90, Video Fire Detectors and Detection Systems, giving an overview of the current ISO/TS 7240-29:2017, (<LINK>)
- BRE Briefing paper: The development of test methods to assess video flame and video smoke detector. (<LINK>)

5. SUMMARY

ISO/TS 7240-30 has been published as an international Test Specification with the possibility that, eventually, it may be re-published as a full ISO standard specifying the requirements for the design, installation, commissioning of fire protection systems using video fire detectors. The rules and guidelines included in this TS are to be taken as current thinking for a technology still under development.

Commentary:

When installing video fire detection systems, the rules, recommendations and guidelines of ISO/TS 7240-30 should be considered as guidelines. However, the design and installation of the system adhere to the rules given in national codes and regulations, e.g. BS 5839-1, and the requirements of the owner and any authorities having jurisdiction.

6. BIBLIOGRAPHY

ISO 7240-13, Compatibility assessment of system components

ISO 7240-14, Design, installation, commissioning and service of fire detection and fire alarm systems in and around buildings

ISO 7240-29, Video fire detectors

ISO/TS 7240-30, Design, installation, commissioning and service of video fire detector systems

BS 5839-1, Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises

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