Guideline No.: F-03(201605)

# F-03 FIXED FIRE DETECTION AND FIRE ALARM SYSTEM

Issued date: May 31,2016

Foreword:

This Guideline is a part of CCS Rules, which contains technical requirements, inspection and testing criteria related to classification and statutory survey of marine products.

This Guideline is published and updated by CCS and can be found through http://www.ccs.org.cn . Comments or suggestions can be sent by email to ps@ccs.org.cn .

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Main changes and effective date:

Adjusted the description of Article 1.1 " application".

Quote standards and rules in the guideline , collect article 1.2 " Normative references " table 1.2.1

Added and incorporated into the MSC.339 (91) and related requirements

Applicable requirements of EN54-4

Replace the GD01-2006 with the new effective GD22-2015

The type approval test item of the fire alarm controller is adjusted and refined.

In the guideline, make out version and year number in reference to the standard

Editorial changes and corrections

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# FIXED FIRE DETECTION AND FIRE ALARM SYSTEM

## 1 General

1.1 Application

1.1.1 This guideline applies to the type approval and inspection of the fixed fire detection and fire alarm system installed onboard ships engaged on international voyages of SOLAS on or after 1 July 2012.

1.1.2 The fixed fire detection and fire alarm system install on non-convention ship , domestic ship or shore installation. The system can refer to this guideline.

1.1.3 For the fixed fire detection and fire alarm system①, this chapter applies to the followings:

(1) Control and indicating equipment;

(2) Power supply equipment;

(3) Heat detectors – point detectors;

(4) Smoke detectors – point detectors using scattered light, transmitted light or ionization;

(5) Flame detectors – point detectors;

(6) Manual call points.

1.2 Normative references

1.2.1 For the purpose of this guideline, the following documents apply:

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| IMO Res.MSC.311(88) | The revised Chapter 9 of the International Code for Fire Safety Systems (FSS Code) — Fixed fire detection and fire alarm system |
| IMO Res.MSC.339(91) Annex3 | The revised Chapter 9 of the International Code for Fire Safety Systems (FSS Code) — Fixed fire detection and fire alarm system |
| IMO MSC.1/Circ.1242 | Guidelines for the Approval of Fixed Fire Detection and Fire Alarm Systems for Cabin Balconies |
| IMO A. 1021(26) | Code on Alerts and Indicators, 2009 |
| EN54-1(1996) | Fire Detection and Alarm Systems – Part 1: Introduction |
| EN 54-2(1997) including AC(1999) and A1(2006) | Fire Detection and Alarm Systems-<br>Part 2: Control and Indicating Equipment |
| EN 54-4(1997) including AC(1999), A1(2002) and A2(2006) | Fire Detection and Alarm Systems-<br>Part 4: Power Supply Equipment |

① Note: See figure 1 of EN54-1 for the composition of the fixed fire detection and fire alarm system.

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| EN 54-5(2000) including A1(2002) | Fire Detection and Alarm Systems –<br>Part 5:Heat Detectors - Point Detectors |
| EN 54-7(2000) including A1(2002) and A2(2006) | Fire Detection and Alarm Systems-<br>Part 7: Smoke Detectors - Point Detectors Using Scattered Light, Transmitted Light or Ionization |
| EN54-10(2002) including A1(2005) | Fire Detection and Alarm Systems –<br>Part 10: Flame Detectors - Point Detectors |
| EN54-11(2001) including A1(2005) | Fire Detection and Alarm Systems - Part 11: Manual Call Points |
| IEC60092-101:1994+A1 :1995 | Electrical installations in ships - Part 101: Definitions and general requirements |
| IEC60092-504(2001-03) | Electrical Installations in Ships –<br>Part 504: Special Features - Control and Instrumentation |
| IEC60068-2-l:2007 | Environmental testing Part 2-1： Tests-Test A:Cold |
| IEC60068-2-2:2007 | Environmental testing - Part 2-2: Tests - Test B: Dry heat |
| IEC60068-2-6:2007 | Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal) |
| IEC60068-2-30:2005 | Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle) |
| IEC60068-2-75:2014 | Environmental testing - Part 2-75: Tests - Test Eh: Hammer tests |
| IEC 60068-2-78:2012 | Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state |
| CISPR 16-2-1:2014 | Specification for radio disturbance and immunity measuring apparatus and methods - Part 2-1: Methods of measurement of disturbances and immunity - Conducted disturbance measurements |
| CISPR16-2-3:2010+A1: 2010+A2:2014 | Specification for radio disturbance and immunity measuring apparatus and methods - Part 2-3: Methods of measurement of disturbances and immunity - Radiated disturbance measurements |
| IEC 61000-4-2:2008 | Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test |
| IEC61000-4-3:2006+A1: 2007+A2:2010 | Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test |
| IEC 61000-4-4:2012 | Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test |
| IEC 61000-4-5:2014 | Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test |
| IEC 61000-4-6:2013 | Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, |

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| | induced by radio-frequency fields |
| IEC60695-11-5:2004 | Fire hazard testing - Part 11-5: Test flames - Needle-flame test method - Apparatus, confirmatory test arrangement and guidance |
| IEC60529:1989+A1:1999+A2:2013 | Degrees of protection provided by enclosures (IP Code) |
| IEC60079-0:2011 | Explosive atmospheres – Part 0: Equipment – General requirements |
| IEC60079-1:2014 | Explosive atmospheres – Part 1: Equipment protection by flameproof enclosures "d" |
| IEC60079-11:2011 | Explosive atmospheres – Part 1: Equipment protection by flameproof enclosures "d" |
| ISO2859 Series | Sampling procedures for inspection by attributes |
| IEC60533 2015 RLV | Electrical and electronic installations in ships - Electromagnetic compatibility—(EMC) - Ships with a metallic hull |
| GD22-2015 | CCS Guidelines for Type Approval Test of Electric and Electronic Products |
| | China Classification Society Rules for Classification of Sea-Going Steel Ships |

1.3 Definitions

The terms and definitions of the standards listed in 1.2 apply to this Chapter. To facilitate the compilation of the Chapter and the understanding of relevant requirements, the following items and definitions are added or quoted:

(1) Section means a group of fire detectors and manually operated call points as reported in the indicating unit(s).

(2) Section identification capability means a system with the capability of identifying the section in which a detector and/or manually operated call point has activated.

(3) Individually identifiable means a system with the capability to identify the exact location and type of detector or manually activated call point which has activated, and which can differentiate the signal of that device from all others.

The capability to identify means individually showing and editing relevant data on the control and indicating equipment. Individual identification is achieved by the controller together with the detector. Information of the location of the detector is generally to be prepared by technicians of the manufacturer during the equipment commissioning at site and can be modified afterwards by operator with appropriate authority.

(4) Power supply equipment (component) of fixed fire detection and fire alarm system means an equipment or component is used for power supply to the control and indicating equipment, which is powered by main/emergency power sources of the ship and is also called as power supply unit. Power supply unit is generally integrated a part of the controller of alarm or is an independent equipment.

**2 Plans and documents**

2.1 The general principle:

The scope and detail of plans and documents to be submitted are such that the product can be checked for the compliance with this Guidelines and relevant standards, and that mechanical and electrical design of the product can be checked generally.

2.2 The following documents are to be submitted to CCS:

(1) General descriptions of the product (product specifications)

Product specifications are to specify the general performance and design requirements of the product, including at least the following:

- provisions for the product environmental conditions;

- provisions for power supply to the product;

- consisting of the system (product);

- detailed descriptions of product functions and performance.

(2) Hardware and interface

Documents for hardware and interface are to include at least the followings:

- specifications for hardware configuration of the major parts of the product;

- mechanical drawings (structure and outline), electrical drawings (schematic diagram, wiring diagrams and functional block diagram) and explanatory documents necessary for describing the functions, mechanical and electric characteristics of the product and its components;

- detailed description of interfaces between the main units of the equipment as well as between other equipment (or systems), including physical and electric characteristics, data protocol, format or protocol converters I/O configuration, etc.;

- schematic diagram or block diagram of power supply unit arrangement of power supply;

- wiring connection diagram of system describing the maximum application (the maximum number of sections and circuits, the maximum number and type of detectors connected, the maximum number and type of other external equipment connected).

(3) Software

The technical documentation submitted is to comply with the requirements of PART SEVEN of the Rules for the Classification of Sea-going Steel Ships of CCS for computer system of category II as well as the following requirements for products: EN54-2:1997+AC:1999+A1:2006(13.2)、EN54-5:2000+A1:2002(4.11)、EN54-7:2000+A1:2002+A2:2006(4.11)、EN54-10:2002+A1:2005(4.11)、EN54-4:1997+AC:1999+A1:2002+A2:2006 and EN54-11:2001+A1:2005(4.8).

(4) User interface

To include at least the followings:

- function allocation of each working station operation station as well as description of switching control of each station (if applicable);
- description of user interface, menu and illustrative pictures (if necessary).

(5) Type test program and delivery inspection program

At least the following descriptions are to be included: sampling principles of type tests or batch sampling principles of delivery inspection, requirements for test equipment, test methods, and acceptance criteria.

(6) Description of product identification and photos.

(7) Installation, operation and maintenance manuals of the product.

The above is the common requirements for the submission of technical documents, which can be added or deleted according to different products. The contents under each item do not mean that they should be submitted individually.

**3 Design and technical requirements**

3.1 General requirements

(1) The fixed fire detection and fire alarm system and equipment are to be suitably designed to withstand supply voltage variation and transients, ambient temperature changes, vibration, humidity, shock, impact and corrosion normally encountered in ships. The equipment is to be tested for electromagnetic compatibility specified in GD22-2015. Degree of protection of the enclosure of the equipment is to be suitable for the intended installation environment.

(2) All detectors are to be of a type such that they can be tested for correct operation and restored to normal surveillance without the renewal of any component.

(3) The maximum spacing of detectors is to comply with Table 9.1 of Chapter 9 of the International Code for Fire Safety Systems (FSS Code). If the installation spacing recommended by the manufacturer exceeds those specified by the table, relevant test data is to be submitted.

(4) In principle, detectors of which the response behavior can be adjusted on site as specified in EN54-5:2000+A1:2002 (4.8), EN54-7:2000+A1:2002+A2:2006 (4.6) and EN54-10:2002+A1:2005 (4.7) are not recommended. If such detectors need to be approved, detailed adjustment methods are to be given in the documentation submitted and means are to be provided to guarantee effective control of the on-site adjustment by users. For such types of detectors, associated type test is to be carried out for each operating characteristic obtained by adjustment which is stated by manufacturer.

(5) The manufacturer is to provide suitable instructions and component spares for testing and maintenance of detectors. Detectors are to be periodically tested using equipment suitable for the types of fires to which the detector is designed to respond.

(6) Detectors fitted in hazardous areas are to be tested and approved for such service. All fire detectors fitted in vehicle spaces, special category spaces and ro-ro spaces, dangerous goods spaces of ships carrying dangerous goods are to comply with relevant requirements in Chapter 2, PART FOUR of the Rules for the Classification of Sea-going Steel Ships of CCS, taking into

account of applicable requirements of the International Maritime Dangerous Goods (IMDG) Code and the International Maritime Solid Bulk Cargoes (IMSBC) Code.

(7) In passenger ships, the fixed fire detection and fire alarm system is to have individual identification capability. Once activated, fire detectors installed in the cabins of passenger ships are to initiate a visual and audible alarm through visual and audible alarms or other external systems in the installation space. The characteristics and sound pressure levels of alarm are to comply with relevant requirements of IMO A.1021(26).

In cargo ships and on passenger cabin balconies, the fixed fire detection and fire alarm system is, as a minimum, to have section identification capability.

3.2 Control and indicating equipment

Control and indicating equipment is to be designed, manufactured and tested in compliance with the following requirements in addition to the provisions of EN54-2:1997+AC:1999+A1:2006.

(1) The fixed fire detection and fire alarm system is to be capable of immediate operation.

(2) If detectors installed in particular spaces can be disconnected by design, the means for disconnecting the detectors is to be designed to automatically restore the system to normal surveillance after a predetermined time that is appropriate for the operation in question. Disconnection of one detector is not to affect the normal operation of other detectors connected.

(3) The control and indicating equipment is to be so designed as to provide output signals to other alarm systems (e.g. general alarm system, public address system, etc.) and other fire safety systems.

(4) The control and indicating equipment is to be capable of providing information about system status to VDR.

(5) The fire detection system may be connected to other compatible systems (e.g. decision management system), provided that other systems can be disconnected without losing any of the functions of the fire detection system, and that any malfunction of the interfaced and connected equipment is not to propagate under any circumstance to the fire detection system.

(6) Control and indicating equipment with individually identifiable fire detectors is to be so arranged that: means are provided to ensure that any fault (e.g., power break, short circuit, earth, etc.) occurring in the section will not prevent the continued individual identification of the remainder of the connected detectors in the section; all arrangements are made to enable the initial configuration of the system to be restored in the event of failure (e.g., electrical, electronic, informatics, etc.);

(7) The activation of any detector or manually operated call point is to initiate a visual and audible fire detection alarm signal at the control panel and indicating units (if any). The sound pressure levels of alarm are to comply with relevant requirements of IMO A.1021(26). If the signals have not been acknowledged within 2 min, an audible fire alarm is to be automatically sounded throughout the crew accommodation and service spaces, control stations and machinery spaces of category A. This alarm sounder system need not be an integral part of the fixed fire detection and

fire alarm system.

(8) When the fixed fire detection and fire alarm system is designed to sound a local audible alarm within the cabins where the detectors are located (e.g. as required by 3.1(6)), a means to silence the local audible alarms from the control panel is not to be permitted.

(9) To satisfy the provisional requirements of the ship, the fixed fire detection and fire alarm system may be provided with indicating units in addition to the control and indicating equipment. The function of such unit(s) is for indicating and no other function of the control and indicating equipment are permitted. Any special arrangements, if used, are to be approved by CCS.

(10) The fixed fire detection and fire alarm system is to be divided into several physical sections by the control and indicating equipment so as to comply with the specific requirements for ships and offshore installations.

(11) The control and indicating equipment is to monitor power supplies and electric circuits necessary for the operation of the system for loss of power and fault conditions and initiate a visual and audible fault signal distinct from a fire signal at the occurrence of a fault condition, including:

① a single open or power break fault caused by a broken wire;

② a single ground fault caused by the contact of a wiring conductor to a metal component; and

③ a single wire to wire fault caused by the contact of two or more wiring conductors.

3.3 Power supply equipment (component) of fixed fire detection and fire alarm system

Power supply unit is to be designed, manufactured and tested in compliance with the following requirements in addition to the provisions of EN54-4: 1997+AC:1999+A1:2002+A2:2006.

(1) Power supply unit may be independent equipment or integrated in the control and indicating equipment as a component.

(2) There shall be not less than two sources of power supply for the electrical equipment used in the operation of the fixed fire detection and fire alarm system,one of which shall be an emergency source of power. The supply shall be provided by separate feeders reserved solely for that purpose. Such feeders shall run to an automatic change-over switch situated in or adjacent to the control panel for the fire detection system. The main(respective emergency) feeder shall run from the main(respective emergency) switchboard to the change-over switch without passing through any other distributing switchboard.The changeover switch shall be arranged such that a fault will not result in the loss of both power supplies. The operation of the automatic changeover switch or a failure of one of the power supplies shall not result in loss of fire detection capability. Where a momentary loss of power would cause degradation of the system, a battery of adequate capacity shall be provided to ensure continuous operation during changeover. (3) The main source of power is to be sufficient to permit the continued operation of the system with all detectors activated, but not more than 100 if the total exceeds this figure.

(4) The emergency source of power specified in paragraph (2) above may be supplied by accumulator batteries or from the emergency switchboard. The power source shall be sufficient to

maintain the operation of the fire detection and fire alarm system for the periods required under chapter II-1, regulations 42 and 43,of the Convention and, at the end of that period, shall be capable of operating all connected visual and audible fire alarm signals for a period of at least 30 min. (5) The system is supplied from accumulator batteries, they shall be located in or adjacent to the control panel for the fire detection system, or in another location suitable for use in an emergency.The rating of the battery charge unit shall be sufficient to maintain the normal output power supply to the fire detection system while recharging the batteries from a fully discharged condition.

(6) Power supply device of automatic transfer switch conversion function: when the main power supply, emergency power not supplied to the system; when the failure of the main source, the system will automatically switch to emergency power supply, when the main power recovery, the system automatically transfer to the main power supply. In the main tranfer to emergency power each other, in addition to the power supply indicator, the other state of the system should not be changed. Such as the main power supply and emergency power supply conversion process in a brief power outage will lead to reduced ability to system, the main source of the requirements in (2) battery supply immediately to the power supply system, until the emergency power supply to normal power supply system to automatically switch to by emergency power supply state.

(7) Batteries are to meet the requirements of Chapter 2, PART FOUR of the Rules for Classification of Sea-going Steel Ships of CCS;

(8) If the system comes with the battery as an emergency power supply and the power supply of the above (2), the following requirements should be :

① The battery shall

a) be rechargeable;

b) be suitable to be maintained in a fully charged state;

c) be constructed for stationary use ;

d) be marked with the type designation and date of manufadure;

e)If the battery is mounted in a cabinet which houses other fire detection and fire alarm equipment, it shall be of the sealed type and shall be mounted in accordance with the manufacturer's data.

②The charger shall be designed and rated so that:

a)the battery can be charged automatically;

b)a battery discharged to its final voltage can be recharged to at least 80% of its rated capacity within 24 hours and to its rated capacity within another 48 hours;

c)the charging characteristics are within the battery manufacturer's specification over the ambient temperature range of the battery.

③it shall be capable ofrecognizing and signalling the following faults:

a)fault of battery and power supply (suggestion within 15 minutes ofthe occurrence )

b)a single high resistance and related circuit (such as terminals, fuse etc.) fault(suggestion within 4 hours ofthe occurrence );;

d)fault of the battery charger(suggestion within 30 minutes ofthe occurrence )

3.4 Point-type heat detectors

Point-type heat detectors are to be designed, manufactured and tested in compliance with the following requirements in addition to the provisions of EN54-5:2000+A1:2002

(1) Heat detectors are to be certified to operate before the temperature exceeds 78$^{o}$ C but not until the temperature exceeds 54$^{o}$ C, when the temperature is raised to those limits at a rate less than 1$^{o}$ C per min, when tested according to standards EN 54-5:2000+A1:2002. In general, class A1 or A2 detectors specified in EN54-5:2000+A1:2002 are to be used.

(2) The operation temperature of heat detectors in drying rooms and similar spaces of a normal high ambient temperature may be up to 130$^{o}$ C, and up to 140$^{o}$ C in saunas. Class E or F detectors specified in EN54-5:2000+A1:2002 may be used and detailed description is to be given in the documentation submitted.

(3) Heat detectors installed in low temperature places (such as cold storage tanks) shall be tested according to IEC60068-2-1 requirements;

(4) The heat detector installed in the explosive dangerous gas places (such as the storage battery, paint room, etc.) shall also be tested according to the requirements of IEC60079.

3.5 Point-type smoke detectors

Point-type smoke detectors are to be designed, manufactured and tested in compliance with the following requirements in addition to the provisions of EN54-7: 2000+A1:2002+A2:2006

(1)Smoke detectors are to be certified to operate before the smoke density exceeds 12.5% obscuration per meter, but not until the smoke density exceeds 2% obscuration per meter, when tested according to standards EN 54-7:2000+A1:2002+A2:2006.

(2) Heat detectors installed in low temperature places (such as cold storage tanks) shall be tested according to IEC60068-2-1 requirements;

(3) The heat detector installed in the explosive dangerous gas places (such as the storage battery, paint room, etc.) shall also be tested according to the requirements of IEC60079.

3.6 Point-type flame detectors The design, manufacture and test of point-type flame detector shall meet the requirements of EN54-10:2002+A1:2005, t the following requirements:

(1) Heat detectors installed in low temperature places (such as cold storage tanks) shall be tested according to IEC60068-2-1 requirements;

(2) The heat detector installed in the explosive dangerous gas places (such as the storage battery, paint room, etc.) shall also be tested according to the requirements of IEC60079.

3.7 Manual call points are to be designed, manufactured and tested in compliance with the requirements of EN54-11:2001+A1:2005. The heat detector installed in the explosive dangerous gas places (such as the storage battery, paint room, etc.) shall also be tested according to the

requirements of IEC60079.

**4 Type approval and unit/batch inspection**

4.1 General

(1) The fixed fire detection and fire alarm system is to be type approved by CCS. The issue, maintenance, change, renewal and cancellation of the type approval certificate are to be in compliance with the relevant requirements in Chapter 3, PART ONE of the China Classification Society Rules for Classification of Sea-Going Steel Ships.

(2) EN54 series standards ,IEC60092-504 and GD22-2015 provide the environmental tests and electromagnetic compatibility tests, the same requirements of test items are to be carried out in accordance with strict item.

(3) For some test items, if the manufacturer has already carried out tests in authoritative and impartial test organizations accepted by CCS, and products have not undergone any changes after tests, these items may be exempted with upon the application of the manufacturer after the CCS surveyor has checked relevant technical documents and test reports.

4.2 Sampling of typical specimens and test arrangements

The types and specifications of test specimens are to be technically representative and cover the product ranges applying for type approval. Test specimens are to be taken on site of the manufacturer by the CCS surveyor.

(1) Control and indicating equipment and power supply unit

For control and indicating equipment of the same type, one may be chosen to be tested according to the maximum configuration of the system which includes, but is not limited to the following: the maximum section number, the maximum number arrangement of the detectors, the maximum type arrangement of the detectors, the maximum power supply capacity, etc.

The detectors and manual call points are to be verified for compatibility with the control and indicating equipment through type tests and vice versa.

For detectors with different installation types, considerations are to be given to the impacts of different enclosures and electromagnetic compatibility.

(2) Sampling of and test arrangements for point-type heat detectors are to be carried out according to 5.1.6 and 5.1.7 of EN54-5:2000+A1:2002.

(3) Sampling of and test arrangements for point-type smoke detectors are to be carried out according to 5.1.6 and 5.1.7 of EN54-7:2000+A1:2002+A2:2006.

(4) Sampling of and test arrangements for point-type flame detectors are to be carried out according to 5.1.8 and 5.1.9 of EN54-10:2002+A1:2005.

(5) Sampling of and test arrangements for manual call points are to be carried out according to 5.1.6 and 5.1.7 of EN54-11:2001+A1:2005.

4.3 Test organizations

In principle,type approval tests are to be carried out in authoritative and impartial test organizations accepted by CCS. Such organizations are to be subject to international or domestic certification,and test scope of certification include upper standards.4.4 Items and requirement for type approval tests

(1) Refer to Table 4.4.1 for control and indicating equipment and power supply unit.

(2) Refer to Table 4.4.2 for point-type heat detectors.

(3) Refer to Table 4.4.3 for point-type smoke detectors.

(4) Refer to Table 4.4.4 for point-type flame detectors.

(5) Refer to Table 4.4.5 for manual call points.

(6) Comes with the battery system of 3.3 (2) requirements with additional tests need satisfy this guideline table 4.4.6 and EN54-4:1997+AC:1999+A1:2002+A2:2006 item 9.

4.5 Unit/batch inspection

Before delivery of the equipment, unit/batch inspection is required by CCS and the certificate of marine products is to be issued after inspection.

(1) After type approved, the manufacturer is to control the manufacturing and testing processes according to the quality control documents submitted for approval, and carry out tests specified in the procedures of delivery tests in 2.2(5).

(2) Control and indicating equipment and power supply unit

The manufacturer is to carry out delivery test for each marine product and provide the delivery test report. The CCS surveyor is to inspect the product according to the product inspection plan. The unit/batch inspection is to include at least the following tests:

- Check of documentation of main components (parts); confirmation of software edition;

- Visual inspection and internal winding inspection;

- Measurement of insulation resistance;

- High voltage tests;

- Confirmation of function tests.

The surveyor may add test items and the number of specimens as deemed necessary.

(3) Fire detectors and manual call points

According to the widely adopted sampling inspection standards (e.g. ISO 2859 series standards), based on the process features and controlled quality level, the manufacturer is to develop the sampling inspection plan and submit it to CCS for review. The sampling arrangement is to be listed in the product inspection plan. The surveyor is to check the implementation record of the sampling inspection plan when carrying out unit/batch inspection. Verification of product performance may be carried out if deemed necessary.

**Type test items of control and indicating equipment and power supply unit** **Table 4.4.1**

| No. | **Test items** | **Technical requirements and test methods** |
|---|---|---|
| 1 | General | Paragraph 15.1 of EN54-2:1997+AC:1999+A1:2006 |
| 2 | Function test | |
| 2.1 | General requirements for indications | IMO A.1021(26) ;<br>Paragraph 5,6,7,8,9,10,11,15 of EN54-2:1997+AC:1999+A1:2006 |
| 2.2 | Disconnecting the detectors automatically restore test | Paragraph 2.1.1 of Resolution chapter 9 MSC.311(88) FSS code<br>Paragraph 9.1.3.3. of IEC60092-504:2001 |
| 2.3 | Fire alarm signals output function test | Paragraph 2.1.2, 2.5.1.1 of Resolution chapter 9 MSC.311(88) FSS code<br>Paragraph 9.1.3.3.8 of IEC60092-504:2001 |
| 2.4 | Power supplies and circuits fault alarm function test(short circuit, power break,earth) | Paragraph 2.1.2.3, 2.5.1.5 of Resolution chapter 9 MSC.311(88) FSS code<br>Paragraph 9.1.3.3.1of IEC60092-504:2001 |
| 2.5 | Alarm response function test | Paragraph 2.5.1.6 of Resolution chapter 9 MSC.311(88) FSS code |
| 2.6 | State indicating function test | Paragraph 2.5.1.6 of Resolution chapter 9 MSC.311(88) FSS code |
| 2.7 | Automatic reset function test of the system after the clear of the response of the alarm source | Paragraph 2.5.1.7 of Resolution chapter 9 MSC.311(88) FSS code |
| 2.8 | Sources of power supply confirmation | Paragraph 2.2 of Resolution chapter 9 MSC.311(88) FSS code<br>Paragraph 12,13,14 of Resolution MSC.339(91) annex<br>Paragraph 3.3 of this guideline<br>Paragraph 9.1.3.2.1 of IEC60092-504:2001 |
| 2.9 | Detector identification function test(System suitable for detector identification function) | Paragraph 2.1.6.1 of Resolution chapter 9 MSC.311(88) FSS code<br>Paragraph 9.1.3.3.15 of IEC60092-504:2001 |
| 2.10 | Failure recovery function test(System suitable for detector identification function) | Paragraph 2.1.6.2 of Resolution chapter 9 MSC.311(88) FSS code<br>Paragraph 9.1.3.3.15 of IEC60092-504:2001 |
| 2.11 | Alarm function test(System suitable for detector identification function) | Paragraph 2.1.6.3 of Resolution chapter 9 MSC.311(88) FSS code<br>Paragraph 9.1.3.3.15 of IEC60092-504:2001 |
| 3 | Design requirements validation | IMO A.1021(26) ; |

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| | | Paragraph 9.1.3.3,9.1.2.3 of IEC60092-504:2001<br>Paragraph 12,13 of EN54-2:1997+AC:1999+A1:2006 |
| 4 | Marking validation | Paragraph 14 of EN54-2:1997+AC:1999+A1:2006 |
| 5 | High temperature test(operational) | Paragraph 2.8 of GD22-2015(temperature/duration:55℃±2℃/16h)<br>Item 7 table1 of IEC60092-504 :2001<br>IEC60068-2-2 |
| 6 | Low temperature test (operational) | Test temperature: -5℃<br>Duration:16h<br>Test program(procedure):<br>Paragraph 15.4 of EN54-2:1997+AC:1999+A1:200<br>Item 6 table1 of IEC60092-504 :2001<br>IEC60068-2-1 |
| 7 | Damp heat test (cyclic) | Paragraph 2.10 of GD22-2015 [55℃， Relative humidity:95％， 2×（12+12hours）]；<br>Item 8 table1 of IEC60092-504 :2001;<br>IEC60068-2-30 |
| 8 | Damp heat, steady state (endurance) test | Paragraph 15.14 of EN54-2:1997+AC:1999+A1:2006<br>IEC60068-2-78 |
| 9 | Impact test | Paragraph 15.6 of EN54-2:1997+AC:1999+A1:2006<br>IEC60068-2-75 |
| 10 | Vibration test(sine)( operational) | Paragraph 2.7 of GD22-2015[(frequency 2(+3/0)～13.2Hz，Amplitude±1.0 mm；frequency 13.2～100，acceleration ±6.9 m/s2) ]；<br>Item 10 table1 of IEC60092-504<br>IEC60068-2-6 |
| 11 | Measurement of conducted emissions | Paragraph 3.2 of GD22-2015;<br>CISPR16-2-1 |
| 12 | Measurement of radiated emissions from enclosure port | Paragraph 3.3 of GD22-2015;<br>CISPR16-2-3 |
| 13 | Electrostatic discharge immunity test | Paragraph 3.4 of GD22-2015;<br>Item 13 table1 of IEC60092-504:2001;<br>IEC61000-4-2 |
| 14 | Test of Immunity to radiated, radiofrequency, electromagnetic field | Paragraph 3.5 of GD22-2015;<br>Item 14 table1 of IEC60092-504:2001;<br>IEC61000-4-3 |
| 15 | Electrical fast transients/burst immunity test | Paragraph 3.6 of GD22-2015;<br>Item 17 table1 of IEC60092-504:2001；<br>IEC61000-4-4 |
| 16 | Surge immunity test | Paragraph 3.7 of GD22-2015; |

| | | |
|---|---|---|
| | | Item 18 table1 of IEC60092-504:2001；<br>IEC61000-4-5 |
| 17 | Test of immunity to conducted low frequency interference | Paragraph 3.8 of GD22-2015;<br>Item 15 table1 of IEC60092-504:2001；<br>IEC60533 |
| 18 | Test of immunity to conducted disturbances induced by radio-frequency fields | Paragraph 3.9 of GD22-2015;<br>Item 16 table1 of IEC60092-504:2001 ；<br>IEC60068-4-6 |
| 19 | Voltage variation test | Paragraph 15.13 of EN54-2:1997+AC:1999+A1:2006; |
| 20 | Power supply variation test | Paragraph 2.4 of GD22-2015;<br>Item 4a table1 of IEC60092-504:2001； |
| 21 | Power supply failure test | Paragraph 2.5 of GD22-2015;<br>Item 4b table1 of IEC60092-504:2001； |
| 22 | Insulation resistance test | Paragraph 2.3 of GD22-2015;<br>Item 5 table1 of IEC60092-504:2001； |
| 23 | High voltage test | Paragraph 2.14 of GD22-2015;<br>Item 3 table1 of IEC60092-504:2001； |
| 24 | Enclosure degree of protection test | IEC60529 |
| 25 | Flame retarding test | IEC60092-101；<br>IEC60695-11-5 |

**Type test items of point-type heat detectors** **Table 4.4.2**

| **Test procedure** | | |
|---|---|---|
| **No.** | **Test items** | **Technical requirements and test method** |
| 1 | Directional dependence | Paragraph 5.2 of EN 54-5:2000+A1:2002 |
| 2 | Static response temperature | Paragraph 5.3 of EN 54-5:2000+A1:2002 |
| 3 | Response times from typical application temperature | Paragraph 5.4 of EN 54-5:2000+A1:2002 |
| 4 | Response times from 25℃ | Paragraph 5.5 of EN 54-5:2000+A1:2002 |
| 5 | Response times from high ambient temperature | Paragraph 5.6 of EN 54-5:2000+A1:2002<br>Paragraph 2.3.1.3, 2.3.1.4 of Resolution chapter 9 MSC.311(88) FSS code |
| 6 | Variation in supply parameters | Paragraph 5.7 of EN 54-5:2000+A1:2002 |
| 7 | Reproducibility | Paragraph 5.8 of EN 54-5:2000+A1:2002 |

| | | |
|---|---|---|
| 8 | Cold (operational) | Paragraph 5.9 of EN 54-5:2000+A1:2002<br>Paragraph 2.9 of GD22-2015 (-25℃， 2h)<br>(detector fix in cabin balconies on passenger ships on open deck,it need comply with Paragraph 2.4 of MSC.1/Circ.1242 ) |
| 9 | Low temperature test(apply paragraph 3.4(3)) | IEC60068-2-1 |
| 10 | Dry heat (endurance) | Paragraph 5.10 of EN 54-5:2000+A1:2002 |
| 11 | Damp heat, cyclic (operational) | Paragraph 2.10 of GD22-2015; IEC60068-2-30 |
| 12 | Damp heat, steady state (endurance) | Paragraph 5.12 of EN 54-5:2000+A1:2002 |
| 13 | $SO_2$ corrosion (endurance) | Paragraph 5.13 of EN 54-5:2000+A1:2002 |
| 14 | Shock (operational) | Paragraph 5.14 of EN 54-5:2000+A1:2002 |
| 15 | Impact (operational) | Paragraph 5.15 of EN 54-5:2000+A1:2002 |
| 16 | Vibration, sinusoidal, (operational) | Paragraph 2.7 of GD22-2015; IEC60068-2-6 |
| 17 | Vibration, sinusoidal, (endurance) | Paragraph 5.17 of EN 54-5:2000+A1:2002 |
| 18 | Radiated emissions from enclosure port | Paragraph 3.3 of GD22-2015; CISPR16-1, CISPR16-2 |
| 19 | Electrostatic discharge | Paragraph 3.4 of GD22-2015; IEC61000-4-2 |
| 20 | Radiated electromagnetic fields | Paragraph 3.5 of GD22-2015; IEC61000-4-3 |
| 21 | Fast transient bursts | Paragraph 3.6 of GD22-2015; IEC61000-4-4 |
| 22 | Slow high-energy voltage surge | Paragraph 3.7 of GD22-2015; IEC61000-4-5 |
| 23 | Immunity to conducted disturbances induced by radio-frequency fields | Paragraph 3.9 of GD22-2015; IEC61000-4-6 |
| 24 | Additional test for S-type detectors | Paragraph 6.1 of EN 54-5:2000+A1:2002 |
| 25 | Additional test for R-type detectors | Paragraph 6.2 of EN 54-5:2000+A1:2002 |
| 26 | Enclosure | IEC60529 |
| 27 | Flame retardant | IEC60092-101; IEC60695-11-5 |

**Type test items of point-type smoke detectors** **Table 4.4.3**

| **No.** | **Test items** | **Technical requirements and test method** |
|---|---|---|
| 1 | Repeatability | Paragraph 5.2 of EN 54-7:2000+A1:2002+A2:2006 |
| 2 | Directional dependence | Paragraph 5.3 of EN 54-7:2000+A1:2002+A2:2006 |
| 3 | Reproducibility | Paragraph 5.4 of EN 54-7:2000+A1:2002+A2:2006 |
| 4 | Variation of supply parameters | Paragraph 5.5 of EN 54-7:2000+A1:2002+A2:2006 |
| 5 | Air movement | Paragraph 5.6 of EN 54-7:2000+A1:2002+A2:2006 |

| | | |
|---|---|---|
| 6 | Dazzling (applicable to detector using a scattered or transmitted light principle of operation) | Paragraph 5.7 of EN 54-7:2000+A1:2002+A2:2006 |
| 7 | Dry heat (operational) | Paragraph 5.8 of EN 54-7:2000+A1:2002+A2:2006 (test temperature 70℃， 16h) |
| 8 | Cold (operational) | Paragraph 5.9 of EN 54-7:2000+A1:2002+A2:2006 Paragraph 2.9 of GD22-2015 (-25℃， 2h) (detector fix in cabin balconies on passenger ships on open deck,it need comply with Paragraph 2.4 of MSC.1/Circ.1242 ) |
| 9 | Low temperature test(apply paragraph 3.4(3)) | IEC60068-2-1 |
| 10 | Damp heat , steady state (operational) | Paragraph 2.10 of GD22-2015; IEC60068-2-30 |
| 11 | Damp heat, steady state (endurance) | Paragraph 5.11 of EN 54-7:2000+A1:2002+A2:2006 |
| 12 | $SO_2$ corrosion (endurance) | Paragraph 5.12 of EN 54-7:2000+A1:2002+A2:2006 |
| 13 | Shock (operational) | Paragraph 5.13 of EN 54-7:2000+A1:2002+A2:2006 |
| 14 | Impact (operational) | Paragraph 5.14 of EN 54-7:2000+A1:2002+A2:2006 |
| 15 | Vibration, sinusoidal, (operational) | Paragraph 2.7 of GD22-2015; IEC60068-2-6 |
| 16 | Vibration, sinusoidal, (endurance) | Paragraph 5.16 of EN 54-7:2000+A1:2002+A2:2006 |
| 17 | Radiated emissions from enclosure port | Paragraph 3.3 of GD22-2015; CISPR16-2-3, |
| 18 | Electrostatic discharge | Paragraph 3.4 of GD22-2015; IEC61000-4-2 |
| 19 | Radiated electromagnetic fields | Paragraph 3.5 of GD22-2015; IEC61000-4-3 |
| 20 | Fast transient bursts | Paragraph 3.6 of GD22-2015; IEC61000-4-4 |
| 21 | Slow high-energy voltage surge | Paragraph 3.7 of GD22-2015; IEC61000-4-5 |
| 22 | Immunity to conducted disturbances induced by radio-frequency fields | Paragraph 3.9 of GD22-2015; IEC61000-4-6 |
| 23 | Fire sensitivity | Paragraph 5.18 of EN 54-7:2000+A1:2002+A2:2006 Paragraph 2.3.1.2 of Resolution chapter 9 MSC.311(88) FSS code |
| 24 | Enclosure | IEC60529 |
| 25 | Flame retardant | IEC60092-101; IEC60695-11-5 |

**Type test items of point-type flame detectors Table 4.4.4**

| No. | Test items | Technical requirements and test method |
|---|---|---|
| 1 | Reproducibility | Paragraph 5.2 of EN 54-10:2002+A1:2005 |
| 2 | Repeatability | Paragraph 5.3 of EN 54-10:2002+A1:2005 |
| 3 | Directional dependence | Paragraph 5.4 of EN 54-10:2002+A1:2005 |
| 4 | Fire sensitivity | Paragraph 5.5 of EN 54-10:2002+A1:2005 |
| 5 | Dazzling (operational) | Paragraph 5.6 of EN 54-10:2002+A1:2005 |
| 6 | Dry heat (operational) | Paragraph 5.7 of EN 54-10:2002+A1:2005 |
| 7 | Cold (operational) | Paragraph 5.8 of EN 54-10:2002+A1:2005 Paragraph 2.9 of GD22-2015 (-25℃， 2h) (detector fix in cabin balconies on passenger ships on open deck ,it need comply with Paragraph 2.4 of MSC.1/Circ.1242 ) |

| | | |
|---|---|---|
| 8 | Low temperature test(apply paragraph 3.4(3)) | IEC60068-2-1 |
| 9 | Damp heat, cyclic (operational) | Paragraph 2.10 of GD22-2015; IEC60068-2-30 |
| 10 | Damp heat, steady state (endurance) | Paragraph 5.10 of EN 54-10:2002+A1:2005 |
| 11 | $SO_2$ corrosion (endurance) | Paragraph 5.11 of EN 54-10:2002+A1:2005 |
| 12 | Shock (operational) | Paragraph 5.12 of EN 54-10:2002+A1:2005 |
| 13 | Impact (operational) | Paragraph 5.13 of EN 54-10:2002+A1:2005 |
| 14 | Vibration, sinusoidal, (operational) | Paragraph 5.14 of EN 54-10:2002+A1:2005 |
| 15 | Vibration, sinusoidal, (endurance) | Paragraph 5.15 of EN 54-10:2002+A1:2005 |
| 16 | Variation in supply parameters (operational) | Paragraph 5.16 of EN 54-10:2002+A1:2005 |
| 17 | Radiated emissions from enclosure port | Paragraph 3.3 of GD22-2015; CISPR16-2-3 |
| 18 | Electrostatic discharge | Paragraph 3.4 of GD22-2015; IEC61000-4-2 |
| 19 | Radiated electromagnetic fields | Paragraph 3.5 of GD22-2015; IEC61000-4-3 |
| 20 | Fast transient bursts | Paragraph 3.6 of GD22-2015; IEC61000-4-4 |
| 21 | Slow high-energy voltage surge | Paragraph 3.7 of GD22-2015; IEC61000-4-5 |
| 22 | Immunity to conducted disturbances induced by radio-frequency fields | Paragraph 3.9 of GD22-2015; IEC61000-4-6 |
| 23 | Enclosure | IEC60529 |
| 24 | Flame retardant | IEC60092-101; IEC60695-11-5 |

**Type test items of manual call points** **Table 4.4.5**

| **No.** | **Test items** | **Technical requirements and test method** |
|---|---|---|
| 1 | Variation in supply parameters | Paragraph 5.6 of EN 54-11:2001+A1:2005 |
| 2 | Dry heat (operational) | Paragraph 5.7 of EN 54-11:2001+A1:2005 |
| 3 | Dry heat (endurance) | Paragraph 5.8 of EN 54-11:2001+A1:2005 |
| 4 | Cold (operational) | Paragraph 5.9 of EN 54-11:2001+A1:2005 |
| 5 | Damp heat, cyclic (operational) | Paragraph 2.10 of GD22-2015; IEC60068-2-30 |
| 6 | Damp heat, cyclic (endurance) | Paragraph 5.11 of EN 54-11:2001+A1:2005 |
| 7 | Damp heat, steady state (endurance) | Paragraph 5.12 of EN 54-11:2001+A1:2005 |
| 8 | $SO_2$ corrosion (endurance) | Paragraph 5.13 of EN 54-11:2001+A1:2005 |
| 9 | Shock (operational) | Paragraph 5.14 of EN 54-11:2001+A1:2005 |
| 10 | Impact (operational) | Paragraph 5.15 of EN 54-11:2001+A1:2005 |
| 11 | Vibration, sinusoidal (operational) | Paragraph 2.7 of GD22-2015; IEC60068-2-6 |
| 12 | Vibration, sinusoidal (endurance) | Paragraph 5.17 of EN 54-11 |
| 13 | Radiated emissions from enclosure port | Paragraph 3.3 of GD22-2015; CISPR16-2-3 |
| 14 | Electrostatic discharge | Paragraph 3.4 of GD22-2015; IEC61000-4-2 |
| 15 | Radiated electromagnetic fields | Paragraph 3.5 of GD22-2015; IEC61000-4-3 |

| | | |
|---|---|---|
| 16 | Fast transient bursts | Paragraph 3.6 of GD22-2015; IEC61000-4-4 |
| 17 | Slow high-energy voltage surge | Paragraph 3.7 of GD22-2015; IEC61000-4-5 |
| 18 | Immunity to conducted disturbances induced by radio-frequency fields | Paragraph 3.9 of GD22-2015; IEC61000-4-6 |
| 19 | Enclosure | IEC60529 |
| 20 | Flame retardant | IEC60092-101; IEC60695-11-5 |

**Comes with the battery system additional testing item Table 4.4.6**

| Test | Mains supply voltage | Condition of battery | Loading condition | Duration of test |
|---|---|---|---|---|
| 1 | $V_n$[a] +10% | Discharged[b] | I max. a | 4h |
| 2 | $V_n$ -15% | Discharged[b] | I max. a | 4h |
| 3 | $V_n$ -15% | Discharged[b] | I max. b | Manufacturer's specification with a minimum of 5 min |
| 4 | Disconnected | Discharged[c] | I max. b | |
| 5 | $V_n$ -15% | Replaced by short circuit[d] | I max. a | |
| 6 | $V_n$ -15% | Replaced by short circuit[e] | I max. a | |
| 7 | $V_n$ +10% | Disconnected | I max. b | |
| 8 | $V_n$ -15% | Disconnected | I max. b | |
| 9 | $V_n$ +10% | Fully charged[f] | I min | |

a Vn is nominal voltage of the public electricity supply or equivalent.

b A battery of max. specified capacity discharged to its final voltage. The battery is allowed to charge during the test.

c In this test the battery may be replaced by a laboratory power supply capable of supplying the required output current. The output voltage of the power supply shall be gradually reduced from the fully charged voltage of the battery to the voltage at which the PSE output(s) switch off.( When the system is running in the battery power supply, the power supply device should have the ability to turn off the power supply when the output voltage or the battery voltage is lower than the value specified by the manufacturer.)

d Mains shall be applied after having replaced the battery by a short circuit.

e Replace the battery by a short circuit after the mains is applied.

f A battery charged to its fully charged voltage.