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F-03 FIXED FIRE DETECTION AND FIRE ALARM SYSTEM

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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.

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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 unit/batch inspection of the fixed fire detection and fire alarm system installed onboard ships engaged on international voyages and off-shore installations after 1 July 2012, as required by Chapter 9 of the International Code for Fire Safety Systems, as revised by MSC.311(88).

For products that are type approved according GB4717 after 1 July 2012, the certificate is to state "applicable only to ships engaged on domestic voyages."

1.1.2 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:

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 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- Part 2: Control and Indicating Equipment
EN 54-4(1997) including AC(1999), A1(2002) and A2(2006)	Fire Detection and Alarm Systems- Part 4: Power Supply Equipment
EN 54-5(2000) including A1(2002)	Fire Detection and Alarm Systems – Part 5:Heat Detectors - Point Detectors
EN 54-7(2000) including A1(2002) and A2(2006)	Fire Detection and Alarm Systems- Part 7: Smoke Detectors - Point Detectors Using Scattered Light,

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

	Transmitted Light or Ionization
EN54-10(2002) including A1(2005)	Fire Detection and Alarm Systems – Part 10: Flame Detectors - Point Detectors
EN54-11(2001) including A1(2005)	Fire Detection and Alarm Systems - Part 11: Manual Call Points
IEC60092-504(2001-03)	Electrical Installations in Ships – Part 504: Special Features - Control and Instrumentation
IEC60533(1999-11)	Electrical and Electronic Installations in Ships - Electromagnetic Compatibility
CCS GD01-2006	CCS Guidelines for Type Approval Test of Electric and Electronic Products and the revisions thereof

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(13.2), EN54-5(4.11), EN54-7(4.11), EN54-10(4.11) and EN54-11(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 GD01-2006. 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 (4.8), EN54-7 (4.6) and EN54-10 (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 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:

(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 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:

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

(2) The design of the power supply unit is to be such that there are at least two sources of power supply, one of which is to be main source and the other is an emergency source. The emergency source of power may be that of the ship or the batteries carried by the power supply unit. The change-over between the two sources is to be done by the power supply unit automatically. Means are to be provided to ensure that the performance of the detection system will not be reduced during and after the change-over.

(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 (including batteries, if applicable) is to be sufficient to maintain the operation of the fire detection and fire alarm system for the periods required under regulations II-1/42 and 43 of the SOLAS Convention, and at the end of that period, is to be capable of operating all connected visual and audible fire alarm signals for a period of at least 30 min.

(5) When used as an emergency source of power, the batteries carried by power supply unit are to be sufficient to meet the requirements of 3.3(3) and be able to be recharged to the capacity required by 3.3(4) within ten hours from a complete discharge state.

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

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:

(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 54-5:2001. In general, class A1 or A2 detectors specified in EN54-5 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 may be used and detailed description is to be given in the documentation submitted.

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:

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 54-7:2001.

3.6 Point-type flame detectors are to be designed, manufactured and tested in compliance with the requirements of EN54-10.

3.7 Manual call points are to be designed, manufactured and tested in compliance with the requirements of EN54-11.

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 Rules.

(2) Although EN54 specifies some of the environmental tests and electromagnetic compatibility tests, the requirements of some items of EN54 are lower than those of the Guidelines for Type Approval Test of Electric and Electronic Product of CCS (GD01). Consequently, these items are to be carried out in accordance with GD01.

(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.

(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.

(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.

(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.

4.3 Test organizations

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. Where the product manufacturer has the test conditions, some functional test items may be carried out in the manufacturer, subject to agreement and witness of the CCS surveyor.

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.

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. GB/T 2828 and 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.	Fire alarm condition	Paragraph 7 of EN 54-2
2.	Fault warning condition	Paragraph 8 of EN 54-2
3.	Disabled condition	Paragraph 9 of EN 54-2
4.	Insulation resistance	Paragraph 2.3 of GD01
5.	High voltage	Paragraph 2.14 of GD01
6.	Power variation	Paragraph 2.4 of GD01
7.	Power supply performance	Paragraph 3.3.3 of these Guidelines
8.	Impact	Paragraph 15.6 of EN 54-2; IEC 60068-2-75
9.	Vibration	Paragraph 2.7 of GD01; IEC60068-2-6
10.	Dry heat	Paragraph 2.8 of GD01; IEC60068-2-2
11.	Cold	Paragraph 2.9 of GD01; IEC60068-2-1
12.	Damp heat, cyclic	Paragraph 2.10 of GD01; IEC60068-2-30
13.	Enclosure	IEC60529

Continue table 4.4.1

No.	**Test items**	**Technical requirements and test methods**
14.	Flame retardant test	IEC60092-101; IEC60695-11-5
15.	Conducted transmission	Paragraph 3.2 of GD01-2006; CISPR16-1, CISPR16-2
16.	Radiated emissions from enclosure port	Paragraph 3.3 of GD01-2006; CISPR16-1, CISPR16-2
17.	Electrostatic discharge	Paragraph 3.4 of GD01-2006; IEC61000-4-2
18.	Radiated electromagnetic fields	Paragraph 3.5 of GD01-2006; IEC61000-4-3
19.	Fast transient bursts	Paragraph 3.6 of GD01-2006; IEC61000-4-4
20.	Slow high-energy voltage surge	Paragraph 3.7 of GD01-2006; IEC61000-4-5
21.	Low frequency conductive immunity	Paragraph 3.8 of GD01-2006; IEC60533
22.	Immunity test to conducted disturbances induced by radio-frequency fields	Paragraph 3.9 of GD01-2006; IEC61000-4-6

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
2	Static response temperature	Paragraph 5.3 of EN 54-5
3	Response times from typical application temperature	Paragraph 5.4 of EN 54-5
4	Response times from 25℃	Paragraph 5.5 of EN 54-5
5	Response times from high ambient temperature	Paragraph 5.6 of EN 54-5
6	Variation in supply parameters	Paragraph 5.7 of EN 54-5
7	Reproducibility	Paragraph 5.8 of EN 54-5
8	Cold (operational)	Paragraph 5.9 of EN 54-5
9	Dry heat (endurance)	Paragraph 5.10 of EN 54-5
10	Damp heat, cyclic (operational)	Paragraph 2.10 of GD01; IEC60068-2-30
11	Damp heat, steady state (endurance)	Paragraph 5.12 of EN 54-5
12	SO_2 corrosion (endurance)	Paragraph 5.13 of EN 54-5
13	Shock (operational)	Paragraph 5.14 of EN 54-5
14	Impact (operational)	Paragraph 5.15 of EN 54-5

Continue table 4.4.2

No.	Test items	Technical requirements and test method
15	Vibration, sinusoidal, (operational)	Paragraph 2.7 of GD01; IEC60068-2-6
16	Vibration, sinusoidal, (endurance)	Paragraph 5.17 of EN 54-5
17	Radiated emissions from enclosure port	Paragraph 3.3 of GD01-2006; CISPR16-1, CISPR16-2
18	Electrostatic discharge	Paragraph 3.4 of GD01-2006; IEC61000-4-2
19	Radiated electromagnetic fields	Paragraph 3.5 of GD01-2006; IEC61000-4-3
20	Fast transient bursts	Paragraph 3.6 of GD01-2006; IEC61000-4-4
21	Slow high-energy voltage surge	Paragraph 3.7 of GD01-2006; IEC61000-4-5
22	Immunity to conducted disturbances induced by radio-frequency fields	Paragraph 3.9 of GD01-2006; IEC61000-4-6
23	Additional test for S-type detectors	Paragraph 6.1 of EN 54-5
24	Additional test for R-type detectors	Paragraph 6.2 of EN 54-5
25	Enclosure	IEC60529
26	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
2	Directional dependence	Paragraph 5.3 of EN 54-7
3	Reproducibility	Paragraph 5.4 of EN 54-7
4	Variation of supply parameters	Paragraph 5.5 of EN 54-7
5	Air movement	Paragraph 5.6 of EN 54-7
6	Dazzling (applicable to detector using a scattered or transmitted light principle of operation)	Paragraph 5.7 of EN 54-7
7	Dry heat (operational)	Paragraph 5.8 of EN 54-7
8	Cold (operational)	Paragraph 5.9 of EN 54-7
9	Damp heat , steady state (operational)	Paragraph 2.10 of GD01; IEC60068-2-30
10	Damp heat, steady state (endurance)	Paragraph 5.11 of EN 54-7
11	SO_2 corrosion (endurance)	Paragraph 5.12 of EN 54-7
12	Shock (operational)	Paragraph 5.13 of EN 54-7
13	Impact (operational)	Paragraph 5.14 of EN 54-7
14	Vibration, sinusoidal, (operational)	Paragraph 2.7 of GD01; IEC60068-2-6
15	Vibration, sinusoidal, (endurance)	Paragraph 5.16 of EN 54-7
16	Radiated emissions from enclosure port	Paragraph 3.3 of GD01-2006; CISPR16-1,

Continue table 4.4.3

No.	Test items	Technical requirements and test method
		CISPR16-2
17	Electrostatic discharge	Paragraph 3.4 of GD01-2006; IEC61000-4-2
18	Radiated electromagnetic fields	Paragraph 3.5 of GD01-2006; IEC61000-4-3
19	Fast transient bursts	Paragraph 3.6 of GD01-2006; IEC61000-4-4
20	Slow high-energy voltage surge	Paragraph 3.7 of GD01-2006; IEC61000-4-5
21	Immunity to conducted disturbances induced by radio-frequency fields	Paragraph 3.9 of GD01-2006; IEC61000-4-6
22	Fire sensitivity	Paragraph 5.18 of EN 54-7
23	Enclosure	IEC60529
24	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
2	Repeatability	Paragraph 5.3 of EN 54-10
3	Directional dependence	Paragraph 5.4 of EN 54-10
4	Fire sensitivity	Paragraph 5.5 of EN 54-10
5	Dazzling (operational)	Paragraph 5.6 of EN 54-10
6	Dry heat (operational)	Paragraph 5.7 of EN 54-10
7	Cold (operational)	Paragraph 5.8 of EN 54-10
8	Damp heat, cyclic (operational)	Paragraph 2.10 of GD01; IEC60068-2-30
9	Damp heat, steady state (endurance)	Paragraph 5.10 of EN 54-10
10	SO_2 corrosion (endurance)	Paragraph 5.11 of EN 54-10
11	Shock (operational)	Paragraph 5.12 of EN 54-10
12	Impact (operational)	Paragraph 5.13 of EN 54-10
13	Vibration, sinusoidal, (operational)	Paragraph 5.14 of EN 54-10
14	Vibration, sinusoidal, (endurance)	Paragraph 5.15 of EN 54-10
15	Variation in supply parameters (operational)	Paragraph 5.16 of EN 54-10
16	Radiated emissions from enclosure port	Paragraph 3.3 of GD01-2006; CISPR16-1, CISPR16-2
17	Electrostatic discharge	Paragraph 3.4 of GD01-2006; IEC61000-4-2
18	Radiated electromagnetic fields	Paragraph 3.5 of GD01-2006; IEC61000-4-3
19	Fast transient bursts	Paragraph 3.6 of GD01-2006; IEC61000-4-4
20	Slow high-energy voltage surge	Paragraph 3.7 of GD01-2006; IEC61000-4-5
21	Immunity to conducted disturbances induced by radio-frequency fields	Paragraph 3.9 of GD01-2006; IEC61000-4-6

Continue table 4.4.4

No.	Test items	Technical requirements and test method
22	Enclosure	IEC60529
23	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	Operational performance test	Paragraph 5.2 of EN 54-11
2	Function test	Paragraph 5.3 of EN 54-11
3	Test facility test (operational)	Paragraph 5.4 of EN 54-11
4	Reliability test (endure)	Paragraph 5.5 of EN 54-11
5	Variation in supply parameters	Paragraph 5.6 of EN 54-11
6	Dry heat (operational)	Paragraph 5.7 of EN 54-11
7	Dry heat (endurance)	Paragraph 5.8 of EN 54-11
8	Cold (operational)	Paragraph 5.9 of EN 54-11
9	Damp heat, cyclic (operational)	Paragraph 2.10 of GD01; IEC60068-2-30
10	Damp heat, cyclic (endurance)	Paragraph 5.11 of EN 54-11
11	Damp heat, steady state (endurance)	Paragraph 5.12 of EN 54-11
12	SO_2 corrosion (endurance)	Paragraph 5.13 of EN 54-11
13	Shock (operational)	Paragraph 5.14 of EN 54-11
14	Impact (operational)	Paragraph 5.15 of EN 54-11
15	Vibration, sinusoidal (operational)	Paragraph 2.7 of GD01; IEC60068-2-6
16	Vibration, sinusoidal (endurance)	Paragraph 5.17 of EN 54-11
17	Radiated emissions from enclosure port	Paragraph 3.3 of GD01-2006; CISPR16-1, CISPR16-2
18	Electrostatic discharge	Paragraph 3.4 of GD01-2006; IEC61000-4-2
19	Radiated electromagnetic fields	Paragraph 3.5 of GD01-2006; IEC61000-4-3
20	Fast transient bursts	Paragraph 3.6 of GD01-2006; IEC61000-4-4
21	Slow high-energy voltage surge	Paragraph 3.7 of GD01-2006; IEC61000-4-5
22	Immunity to conducted disturbances induced by radio-frequency fields	Paragraph 3.9 of GD01-2006; IEC61000-4-6
23	Enclosure	IEC60529
24	Flame retardant	IEC60092-101; IEC60695-11-5