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Fire detection and alarm systems —

Part 4: Power supply equipment

Systèmes de détection et d'alarme d'incendie —

Partie 4: Équipement d'alimentation électrique

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 21, *Equipment for fire protection and fire fighting*, Subcommittee SC 3, *Fire detection and alarm systems*.

This second edition cancels and replaces the first edition (ISO 7240-4:2003), which has been technically revised.

The main changes compared to the previous edition are as follows:

— this document has been reformatted and modified to comply with the current ISO structure for standards;

— a reference has been made to power ratings in place of current ratings as this is better with custom and practice of product specifications; however, it is expected that these new values can be derived from previous test results quoted in voltage and current;

— the time limits for notification of some PSU faults have been added;

— an optional dry heat, (operational) test has been added.

A list of all the parts in the ISO 7240 series can be found on the ISO website.

Introduction

This document is based on ISO 7240-4:2003.

The power supply function (see ISO 7240-1:2014, Figure 1, item L), within a fire detection and alarm system (FDAS) installed in and around buildings, is provided by power supply equipment (PSE). The PSE provides power to all parts of the FDAS, either by direct connection or through one function to another function.

This document is drafted on the basis of mandatory functions, which are to be provided on all the PSE and optional functions (with requirements) which may be provided. It is intended that the options be used for specific applications and to meet the fire detection and alarm system design objectives. Each optional function is included as a separate entity, with its own set of associated requirements, in order to permit the PSE with different combinations of functions to comply with this document. Other functions associated with fire detection and fire alarm may also be provided, even if not specified in this document.

Fire detection and alarm systems —

Part 4:
Power supply equipment

1 Scope

This document specifies requirements, test methods and performance criteria for power supply equipment (PSE) for use in fire detection and alarm systems installed in buildings.

For the testing of other types of the PSE, this document is intended to be used only for guidance. The PSE with special characteristics, developed for specific risks, are not covered in this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 7240-1:2014, *Fire detection and alarm systems — Part 1: General and definitions*

IEC 60068-1, *Environmental testing — Part 1: General and guidance*

IEC 60068-2-1, *Environmental testing — Part 2: Tests. Tests A: cold*

IEC 60068-2-6, *Environmental testing — Part 2: Tests. Test Fc: vibration (sinusoidal)*

IEC 60068-2-47, *Environmental testing — Part 2: Test methods — Mounting of components, equipment and other articles for vibration, impact and similar dynamic tests*

IEC 60068-2-75, *Environmental testing — Part 2: Tests — Test Eh: Hammer tests*

IEC 60068-2-78, *Environmental testing — Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60721-3-3:1994, *Classification of environmental conditions — Part 3: Classification of groups of environmental parameters and their severities —Section 3: Stationary use and weatherprotected locations*

IEC 60950-1, *Information technology equipment — Safety — Part 1: General requirements*

IEC 62599-2, *Alarm systems — Part 2: Electromagnetic compatibility — Immunity requirements for components of fire and security alarm systems*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7240-1 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at https://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

4 Symbols and abbreviated terms

4.1 Symbols

$P_{a, max}$ rated maximum output power that can be supplied continuously

$P_{b, max}$ rated maximum output power higher than $P_{a, max}$ that can be supplied while battery charging is not required

$P_{c, max}$ rated maximum output power higher which can be supplied by the standby power source

P_{min} minimum output power specified by the manufacturer

V_n nominal mains voltage of the public electricity supply

4.2 Abbreviated terms

FDAS fire detection and alarm system

FDCIE fire detection control and indicating equipment

PSE power supply equipment

5 Requirements

5.1 General

5.1.1 The PSE shall have safety characteristics in accordance with IEC 60950-1 for protection against direct and indirect contact, for the separation of the extra low voltage DC circuits from the low voltage AC circuits and for earthing of metal parts.

5.1.2 All outputs shall have appropriate power limitations in order to ensure that in case of external short circuits no danger exists because of heat production.

5.2 Compliance

5.2.1 In order to comply with this document, the PSE shall meet the following requirements.

a) Clause 5, which shall be verified by visual inspection or engineering assessment, shall be tested in accordance with Clause 6 and shall meet the requirements of the tests.

b) Clauses 8 and 9, shall be verified by visual inspection.

5.2.2 If an optional function with requirements is included in the PSE, then all the corresponding requirements shall be met.

5.2.3 If functions other than those specified in this document are provided, they shall not jeopardize compliance with any requirement of this document.

5.3 Power sources

5.3.1 General

5.3.1.1 There shall be at least two power sources for the power supply of the FDAS: the main power source and the standby power source.

5.3.1.2 Each power source, on its own, shall be capable of meeting the PSE manufacturer's output specification or, in the case of an integrated the PSE, shall be capable of operating the equipment in which it is integrated within its specifications.

5.3.1.3 Switching from one power source to the other shall not cause any change in status or indications within other equipment of the FDAS, other than those relating to the power supply.

5.3.1.4 Failure of one of the power sources shall not cause the failure of any other power source or the failure of the supply of power to the FDAS.

NOTE The compatibility of the separated PSE with the other equipment, for example, FDCIE, is dealt with in ISO 7240-13.

5.3.2 Main power source

5.3.2.1 The main power source shall be designed to operate from the public electricity supply or equivalent system.

5.3.2.2 When the main power source is available, it shall be the exclusive source of power to the FDAS, except for currents associated with battery monitoring.

5.3.2.3 If the main power source fails, then the PSE shall automatically switch over to a standby power source. When the main power source is restored, the PSE shall automatically switch back to the main power source.

5.3.2.4 When operated from the main power source, the following shall apply.

a) The PSE shall be capable of operating in accordance with its specification given in the manufacturer's data, irrespective of the condition of the standby power source. This includes any charge condition of the standby power source, or open circuit or short circuit of the connection to the standby power source.

b) The PSE shall be capable of continuously supplying $P_{a,\,max}$ and simultaneously charging a battery discharged to its final voltage.

c) It may allow battery charging to be limited or interrupted when the PSE is delivering power greater than $P_{a,\,max}$ (see note to Table 1).

5.3.3 Standby power source

5.3.3.1 At least one standby power source shall be a rechargeable battery.

5.3.3.2 When operated from the standby power source, the PSE shall be capable of operating in accordance with the specification given in the manufacturer's data. The PSE shall be capable of supplying $P_{c,\,max}$, irrespective of the condition of the main power source, and with an internal resistance of the battery and its associated circuitry, e.g. connections, fuses (see 6.4) equal to $R_{i,\,max}$.

NOTE Standby periods and alarm periods for specific applications are specified in ISO 7240-14 and ISO 7240-19, or other national design and installation standards where they take precedence.

5.3.3.3 The battery shall

— be rechargeable,

— be suitable to be maintained in a fully charged state,

— be constructed for stationary use,

— be marked with its type designation and code or number identifying the production period, and

— have a safety mechanism to prevent explosion.

5.3.3.4 If the battery is mounted in a cabinet which houses other FDAS equipment, then it shall be of the sealed type and shall be mounted in accordance with the manufacturer's data.

5.3.3.5 When operating from a standby power source, the PSE shall have a facility to switch off the PSE output if the output voltages or the voltage of the battery falls below a value specified by the PSE manufacturer.

5.4 Charger

5.4.1 The PSE shall include charging equipment to charge the battery and maintain it in a fully charged state.

5.4.2 The charger shall be designed and rated so that

— the battery can be charged automatically,

— a battery discharged to its final voltage can be recharged to at least 80 % of its rated capacity within 24 h and thereafter be maintained at its float voltage at least after another 48 h, and

— the charging characteristics are within the battery manufacturer's specification for the range of battery temperatures reached with the ambient temperature (i.e. outside the standby power source enclosure) from –5 °C to +40 °C.

5.4.3 Except for currents associated with battery monitoring, the battery shall not discharge through the charger when the charging voltage is below the battery voltage.

5.5 Faults

5.5.1 The PSE shall be capable of recognizing and signalling the following faults:

a) a loss of the main power source within 90 min of the occurrence;

b) loss of the standby power source within 1 min of the occurrence;

c) if batteries can be damaged by deep charge, the PSE shall have a facility to protect the batteries against deep charge. In this case, reduction of the battery voltage to less than the final voltage when the main power source is unavailable shall signal a fault. Manufacturers may signal a fault at a higher voltage, depending on the battery requirements or other factors (such as maximizing life expectancy);

d) loss of the battery charging voltage within 90 min of the occurrence, except where the charger is switched off or limited as under 5.3.2.4 c);

e) the battery impedance shall be monitored as described in 6.4 and a fault warning signal given within 4 h of the occurrence of a high battery impedance.

5.5.2 If the PSE is separately housed from other functions of the FDAS (ISO 7240-1:2014, Figure 1), then at least a fault output common to the faults listed in 5.5.1 shall be provided. This output shall also be given if the PSE is de-energized.

5.5.3 If the PSE is housed within the cabinet of other equipment within the FDAS (e.g. FDCIE), then the faults listed in 5.5.1 shall be indicated in accordance with the requirements of the other equipment, either on the equipment or on the PSE itself.

5.6 Mechanical

5.6.1 The cabinet of the PSE shall be of robust construction, consistent with the method of installation recommended in the documentation. It shall meet at least the classification IP 30 of IEC 60529.

5.6.2 The PSE may be housed either in a separate cabinet or in cabinets associated with other FDAS equipment.

5.6.3 If the PSE is housed in the cabinet of other equipment within the FDAS (e.g. FDCIE), then manual controls, fuses, calibration elements, etc. for disconnection and adjustment of the power sources shall be accessible only by persons who are trained and authorized to maintain or repair the PSE in accordance with the manufacturer's published instructions and data.

NOTE This corresponds to Access Level 3 or 4 as defined in ISO 7240-2 and ISO 7240-16.

5.6.4 If the PSE is not housed in the cabinet of other equipment within the FDAS (e.g. FDCIE), then manual controls, fuses, calibration elements, etc. for disconnection and adjustment of the power sources shall be accessible only by the use of a tool or key.

5.6.5 All manual controls, fuses, calibration elements and cable terminals shall be clearly labelled (e.g. to indicate their function, rating or reference to appropriate drawings).

5.6.6 If mandatory indicators required by other equipment within the FDAS (e.g. FDCIE) are repeated on a separately housed the PSE, then the indicators shall be in accordance with the requirements of the relevant equipment.

5.7 Power supply interface

Where the PSE directly supplies power to functions of the FDAS and is not housed in the same cabinet as the other equipment, then an interface shall be provided for at least two transmission paths to the other equipment, such that a short circuit or interruption in one path does not prevent the supply of power.

5.8 Software

5.8.1 General

The PSE may contain elements which are controlled by software in order to fulfil requirements of this document. In this case, the PSE shall comply with the requirements of 5.8 where relevant to the technology used.

5.8.2 Program monitoring

5.8.2.1 The execution of the program shall be monitored to prevent the occurrence of a deadlock in the system. The monitoring device shall signal a system fault if routines associated with the main functions of the program are not executed within a time limit of 100 s.

5.8.2.2 The functioning of the monitoring device and the signalling of a fault warning shall not be prevented by a failure in the execution of the program of the monitored system.

5.8.2.3 If an execution failure as in 5.8.2.1 is detected, the PSE shall enter a safe state within 100 s. This safe state shall be defined by the manufacturer.

The safe state should be defined by the manufacturer and should not give a false impression to a user that the PSE remains operational if it is not. In practice, it may be acceptable either to stop or automatically restart the program execution. If there is a possibility that the memory may have been corrupted, the restart procedure should check the contents of this memory and, if necessary, re-initialize the running data to ensure that the PSE enters a safe operating state. Even if program execution is successfully restarted, it is important that the user be made aware of the incident. For this reason, it could be advantageous for the PSE to be capable of automatically recording details of the restart event.

5.8.2.4 The monitoring device shall use the highest priority feature provided to enter the safe state of 5.8.2.3 (e.g. the highest priority non-maskable interrupt).

5.8.3 Storage of programs and data

5.8.3.1 All executable code and data necessary to comply with this document shall be held in memory which is capable of continuous, unmaintained, reliable operation for a period of at least 10 years.

NOTE In the existing state of the art, memory with moving mechanical parts is not believed to be sufficiently reliable. The use of tapes, or magnetic or optical data discs, for the storage of programs and data is therefore not considered to be acceptable at the time of publication.

5.8.3.2 The program shall be held in non-volatile memory. Each memory device shall be identifiable such that its contents can be uniquely cross-referenced to the software documentation.

5.8.4 Monitoring of memory contents

The contents of the memories containing the program shall be automatically checked at intervals not exceeding 1 h. The checking device shall signal a system fault if a corruption of the memory contents is detected.

6 Tests

6.1 General

6.1.1 Standard atmospheric conditions for testing

Unless otherwise stated in a test method, the testing shall be carried out after the test specimen has been allowed to stabilize in the standard atmospheric conditions for testing according to IEC 60068-1, as follows:

a) temperature: 15 °C to 35 °C;

b) relative humidity: 25 % to 75 %;

c) air pressure: 86 kPa to 106 kPa.

The temperature and humidity shall be substantially constant for each environmental test where the standard atmospheric conditions are applied.

