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Fire detection and alarm systems —

Part 2: Control and indicating equipment

Systèmes de détection et d'alarme d'incendie —

Partie 2: Équipement de contrôle et de signalisation

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 7240-2 was prepared by Technical Committee ISO/TC 21, *Equipment for fire protection and fire fighting*, Subcommittee SC 3, *Fire detection and alarm systems*.

ISO 7240 consists of the following parts, under the general title *Fire detection and alarm systems*:

— *Part 1: General and definitions*

— *Part 2: Control and indicating equipment*

— *Part 4: Power supply equipment*

— *Part 5: Point-type heat detectors*

— *Part 6: Point-type fire detectors for carbon monoxide*

— *Part 7: Point-type smoke detectors using scattered light, transmitted light or ionization*

— *Part 11: Manual call points*

— *Part 14: Guidelines for drafting codes of practice for design, installation and use of fire detection and fire alarm systems in and around buildings* [Technical Report]

— *Part 15: Point-type multisensor (light and heat) fire detectors*

Compatibility assessment of system components and carbon monoxide point-type fire detectors using electrochemical cells are to form the subjects of future Parts 13 and 16.

Introduction

This part of ISO 7240 is drafted on the basis of mandatory functions, which are to be provided on all control and indicating equipment, and optional functions (with requirements) which may be provided. It is intended that the options be used for specific applications, as recommended in application guidelines.

Each optional function is included as a separate entity, with its own set of associated requirements, in order to permit control and indicating equipment with many different combinations of functions to comply with this part of ISO 7240.

Other functions associated with fire detection and alarm may also be provided, even if not specified in this part of ISO 7240.

Fire detection and alarm systems —

Part 2:
Control and indicating equipment

1 Scope

This part of ISO 7240 specifies requirements, test methods and performance criteria for control and indicating equipment (c.i.e.) for use in fire detection and fire alarm systems installed in buildings.

2 Normative references

The following referenced documents are indispensable for the application 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 7240-1:1988, *Fire detection and alarm systems — Part 1: General and definitions*

ISO 7240-4, *Fire detection and alarm systems — Part 4: Power supply equipment*

ISO 7240-7, *Smoke detectors — Part 7: Point detectors using scattered light, transmitted light or ionization*

ISO 8201, *Acoustics — Audible emergency evacuation signal*

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

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

IEC 60068-2-2, *Environmental testing — Part 2: Tests. Tests B: dry heat*

IEC 60068-2-3, *Environmental testing — Part 2: Tests. Test Ca: damp heat, steady state*

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

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

EN 50130-4, *Alarm systems — Part 4: Electromagnetic compatibility — Product family standard: Immunity requirements for components of fire, intruder and social alarm systems*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7240-1 and the following apply. See also Figure 1 of ISO 7240-1:1988.

3.1
access level
one of several states of a c.i.e. in which selected

— controls can be operated,

— manual operations can be carried out,

— indications are visible, and/or

— information can be obtained

See annex A.

3.2
addressable point
point which can be individually identified at the c.i.e.

cf. **point** (3.15)

3.3
alphanumeric display
indicator capable of giving information by the display of messages consisting of text and/or numeric characters

3.4
confirmation signal
signal from a fire detector or manual call point which terminates a first alarm state

3.5
detection circuit
transmission path which connects points to the c.i.e.

cf. **point** (3.15) and **transmission path** (3.22)

3.6
earth fault
unwanted connection between earth potential and any part of the c.i.e., transmission paths to the c.i.e. or transmission paths between parts of the c.i.e.

3.7
field
sub-division of a window

3.8
first alarm signal
signal from a fire detector or manual call point which is interpreted as a fire alarm, but following which the c.i.e. enters a first alarm state

3.9
first alarm state
state of the c.i.e. following the receipt of a first alarm signal during which mandatory functions of the c.i.e. may be inhibited

3.10
functional condition
condition of the c.i.e. characterized by its indication at the c.i.e.

NOTE The functional conditions recognized in this part of ISO 7240 are the following:

— fire alarm condition, when a fire alarm is indicated;

— supervisory signal condition, when a supervisory signal is indicated;

— fault warning condition, when a fault is indicated;

— disabled condition, when the disablement of functions is indicated;

— test condition, when the testing of functions is indicated;

— quiescent condition, when the c.i.e. is powered by a power supply in accordance with ISO 7240-4 and no other functional condition is indicated.

3.11
indicator
a device which can change its state to give information

3.12
indication
information given by an indicator

3.13
mandatory adj.
qualification applied to those functions required to be provided on all c.i.e. and the functions' requirements and to the requirements of any optional functions that have requirements, if such optional functions are provided

3.14
non-volatile memory
memory elements which do not require the presence of an energy source for the retention of their contents

3.15
point
component connected to a detection circuit able to transmit or receive information in relation to fire detection

NOTE Includes Items A and D in Figure 1 of ISO 7240-1:1988.

3.16
program
software necessary for c.i.e. to comply with at least the requirements of this part of ISO 7240, including initializing data, reset and interrupt vectors, operating code and declarations

3.17
reset
operation capable of terminating the fire alarm condition and/or the fault warning condition

3.18
running data
alterable data subject to temporary modification during operation, either automatically or by manual controls

3.19
separate adj.
physically separate and exclusively provided for the purpose or purposes stated in this part of ISO 7240

3.20
silencing n.
manual operation for switching off the audible signal of a sounding device which is capable of being automatically re-sounded by a new event

3.21
site-specific data
alterable data required for the c.i.e. to operate in a defined system configuration

3.22
transmission path
connection, external to the cabinet of the c.i.e., for the transmission of information and/or power

— between the c.i.e. and other components of a fire detection and fire alarm system as defined in ISO 7240-1, and/or

— between parts of c.i.e. contained in different cabinets

3.23
volatile memory
memory elements which require the presence of an energy source for the retention of their contents

3.24
window
part or all of an alphanumeric display used for information relating to one functional condition at a given time.

NOTE A sub-division of the display may be realized either by mechanical separation, or under software control

3.25
zone
geographical sub-division of the protected premises in which one or more points are installed and for which a common zonal indication is provided

4 General requirements

If an optional function with requirements is included in the c.i.e., then all the corresponding requirements shall be met (see also Annex B).

If functions other than those specified in this part of ISO 7240 are provided, they shall not jeopardize compliance with any requirement of this part of ISO 7240.

5 General requirements for indications

5.1 Display of functional conditions

5.1.1 The c.i.e. shall be capable of unambiguously indicating the following functional conditions, in accordance with Clauses 6 to 11:

— quiescent condition;

— fire alarm condition;

— supervisory signal condition;

— fault warning condition;

— disablement condition;

— test condition.

5.1.2 The c.i.e. shall be capable of being simultaneously in any combination of the following functional conditions:

— fire alarm condition;

— supervisory signal condition;

— fault warning condition;

— disablement condition;

— test condition.

5.2 Display of indications

All mandatory indications shall be clearly identifiable, except where otherwise specified in this part of ISO 7240.

5.3 Indications on alphanumeric displays

Where an alphanumeric display is used to display indications relating to different functional conditions, these may be displayed at the same time. However, for each functional condition there shall be only one window, in which all of the fields relating to that functional condition shall be grouped.

5.4 Indication of supply of power

A visible indication shall be given by means of a separate light-emitting indicator while the c.i.e. is supplied with power.

5.5 Audible indications

The audible indication for the fire alarm condition may be the same as that for the fault warning condition. If they are different, the fire alarm indication shall have priority.

5.6 Additional indications

Where indications are used in addition to mandatory indications, these shall not result in contradiction or confusion.

6 Quiescent condition

Any kind of system information may be displayed during the quiescent condition. However, no indications shall be given which could be confused with indications used in the

— fire alarm condition,

— supervisory signal condition,

— fault warning condition,

— disabled condition, or

— test condition.

7 Fire alarm condition

7.1 Reception and processing of fire signals (see also Annex C)

7.1.1 The c.i.e. shall enter the fire alarm condition when signals are received which, after any necessary processing, are interpreted as a fire alarm.

7.1.2 The c.i.e. shall be capable of receiving, processing and indicating signals from zones. A signal from one zone shall not falsify the processing storing and/or indication of signals from other zones.

7.1.3 Except where 7.11 or 7.12 applies, the time taken by scanning, interrogation, or other processing of signals from fire detectors, in addition to that required to take the fire alarm decision, shall not delay the indication of the fire alarm condition, or of a new zone in alarm by more than 10 s.

7.1.4 The c.i.e. shall enter the fire alarm condition within 10 s of the activation of any manual call point.

7.1.5 The mandatory indications and/or outputs shall not be falsified by multiple fire signals received from the same or different detection circuits as a result of the simultaneous operation of two points, the operation of further points or both.

7.2 Indication of fire alarm condition

The fire alarm condition shall be indicated without prior manual intervention. The indication is established when all of the following are present:

a) a visible indication, by means of a separate light-emitting indicator (the general fire alarm indicator);

b) a visible indication, as specified in 7.3, of the zones in alarm, which may be omitted for c.i.e. capable of receiving signals from only one zone;

c) an audible indication, as specified in 7.4.

7.3 Indication of zones in alarm (see also Annex D)

7.3.1 The zones in alarm shall be visibly indicated by means of a separate light-emitting indicator for each zone or an alphanumeric display or both.

7.3.2 If the zonal indications are on an alphanumeric display which because of its limited capacity cannot simultaneously indicate all the zones in alarm, at least the following shall apply:

a) the first zone in alarm shall be displayed in a field at the top of the display;

b) additional zones in alarm shall be displayed in another field until the c.i.e. has been reset;

c) the total number of zones in alarm shall be permanently displayed;

d) zones in alarm not currently indicated shall be capable of being displayed at Access Level 1 or 2. A single manual action shall be required for each display of zonal information.

7.4 Audible indication

7.4.1 The audible indication shall be capable of being silenced by means of a separate manual control at Access Level 1 or 2. This control shall only be used for silencing the audible indication, and may be the same as that used for silencing in the fault warning condition.

7.4.2 The audible indication shall not be silenced automatically.

7.4.3 The audible indication shall re-sound for each new zone in alarm.

7.5 Other indications during the fire alarm condition

7.5.1 If faults, disablements or tests are indicated by means of separate light-emitting indicators, and such indications are suppressed in the fire alarm condition, it shall be possible to reveal these by means of a manual operation at Access Level 1 or 2.

7.5.2 If the fire alarm indications are on an alphanumeric display, the following shall apply to the display of other information:

a) information not related to the fire alarm condition shall be suppressed unless the display has more than one window, one of which is exclusively reserved for fire alarm indications;

b) suppressed indications of faults and disablements shall each be capable of being displayed at any time by manual operations at Access Level 1 or 2. These operations shall be different from, or additional to, that specified in 7.3.2 d) for displaying zones in alarm.

7.6 Reset from fire alarm condition

7.6.1 The c.i.e. shall be capable of being reset from the fire alarm condition. This shall only be possible by means of a separate manual control, at Access Level 2. This control shall be used only for reset and may be the same as that used for reset from the fault warning condition.

7.6.2 Following a reset operation, the indication of the correct functional conditions, corresponding to any received signals, shall either remain, or be re-established, within 20 s.

7.7 Output of fire alarm condition

7.7.1 At least one output that signals the fire alarm condition shall be provided, which may be an output in accordance with 7.8, 7.9 or 7.10.

7.7.2 Except where 7.11 or 7.12 or both apply, the c.i.e. shall activate all mandatory outputs within 3 s of the indication of a fire alarm condition.

7.7.3 Except where 7.11 applies, the c.i.e. shall activate all mandatory outputs within 10 s of the activation of any manual call point.

7.8 Output to fire alarm devices — Optional function (see also 9.2.5 and 10.4.2)

The c.i.e. may have provision for the automatic transmission of fire alarm signals to fire alarm signalling devices (see item C of Figure 1 of ISO 7240-1:1988). In this case the following shall apply.

a) It shall be possible to silence the fire alarm devices at Access Level 2.

b) Following silencing, it shall be possible to re-sound the fire alarm devices at Access Level 2.

c) Fire alarm devices shall not be silenced automatically.

d) Following silencing, it shall be possible to automatically re-sound the fire alarm devices by an alarm in another zone.

7.9 Control of fire alarm routing equipment — Optional function (see also 9.2.5)

7.9.1 Output to fire alarm routing equipment

The c.i.e. may have provision for the automatic transmission of fire alarm signals to fire alarm routing equipment (Item E in Figure 1 of ISO 7240-1:1988). The transmission of the signal may be indicated by means of a separate light-emitting indicator or a field on the alphanumeric display or both. In this case, the indication shall remain until the fire alarm condition is reset.

7.9.2 Input from fire alarm routing equipment

Where the output specified in 7.9.1 is provided, the c.i.e. may have an input which is capable of receiving signals from fire alarm routing equipment (Item E in Figure 1 of ISO 7240-1:1988). In this case the reception of the signals shall be indicated by means of a separate light-emitting indicator or a field on the alphanumeric display or both. The light-emitting indicator may be used instead of the indicator specified in 7.9.1. The indication shall remain until the fire alarm condition is reset.

7.10 Output to fire protection equipment — Optional function [see also 9.2.4 f) and 10.4.1 b)]

7.10.1 Output type A

The c.i.e. may have provision for the transmission of fire alarm signals to controls for automatic fire protection equipment (Item G in Figure 1 of ISO 7240-1:1988).

7.10.2 Output type B

The c.i.e. may have provision for the transmission of fire alarm signals to controls for automatic fire protection equipment (Item G in Figure 1 of ISO 7240-1:1988). In this case the transmission of the signal shall be indicated by means of a separate light-emitting indicator or a field on the alphanumeric display or both. The indication shall be at least common to all such equipment, and shall not be suppressed during the fire alarm condition.

7.10.3 Output type C

The c.i.e. may have provision for the transmission of fire alarm signals to controls for automatic fire protection equipment (Item G in Figure 1 of ISO 7240-1:1988). In this case the reception of a confirmatory signal from such equipment shall be indicated by means of a separate light-emitting indicator or a field on the alphanumeric display or both. The indication shall be at least common to all such equipment, and shall not be suppressed during the fire alarm condition.

7.10.4 Fault monitoring of fire protection equipment

The c.i.e. may have provision to receive fault warning signals from controls for automatic fire protection equipment (Item G in Figure 1 of ISO 7240-1:1988). These faults shall be indicated by means of a separate light-emitting indicator or a field on the alphanumeric display or both. The indication shall be at least common to all such equipment, and shall not be suppressed during the fire alarm condition. The indicator may be the same as that of 9.2.4 f).

7.11 Delays to outputs — Optional function (see also Annex E)

7.11.1 Configuration of delays

The c.i.e. may have provision to delay the activation of outputs to fire alarm devices (Item C in Figure 1 of ISO 7240-1:1988) or to fire alarm routing equipment (Item E in Figure 1 of ISO 7240-1:1988) or to controls for automatic fire protection equipment (Item G in Figure 1 of ISO 7240-1:1988), or all these. In these cases at least the following shall apply.

a) The operation of delays to outputs to fire alarm signalling devices or outputs to automatic fire protection equipment shall be selectable at Access Level 3 to apply to

   — fire detectors, and/or

   — manual call points, and/or

   — signals from specific zones.

b) The operation of delays to outputs to fire alarm routing equipment shall be selectable at Access Level 3, to apply to

   — fire detectors, and/or

   — signals from specific zones.

c) The delay times shall be configurable at Access Level 3, in increments not exceeding 1 min, up to a maximum of 10 min.

d) It shall be possible to override the delays and immediately activate delayed outputs by means of a manual operation at Access Level 1 or by means of a signal from a manual call point or by both means.

e) The delay to one output signal shall not affect the activation of other outputs.

7.11.2 Control of delay

If the configuration is according to 7.11.1, the c.i.e. may have provision to switch on and switch off the delayed operation of outputs. In this case the following is applicable.

a) Provision may be made to switch on and switch off delays, by means of a manual operation at Access Level 2.

b) Provision may be made to automatically switch on and/or switch off delays by means of a programmable timer, which shall be configurable at Access Level 3.

c) A separate light-emitting indicator or a field on the alphanumeric display or both shall be visible when the delayed operation of outputs is switched on. The indication shall not be suppressed during the fire alarm condition.

7.12 Dependency on more than one alarm signal — Optional function

7.12.1 Type A dependency

Following the receipt of a first alarm signal, the entry to the fire alarm condition could be inhibited until the receipt of a confirmation alarm signal from the same fire detector, or from a fire detector in the same zone. In this case the following shall apply.

a) The mode of operation shall be configurable at Access Level 3.

b) The first alarm state need not be indicated.

c) It shall be possible to receive a confirmation alarm signal at least from the same fire detector within 60 s of the receipt of the first alarm signal.

d) The first alarm state shall be automatically cancelled within 30 min of the receipt of the first alarm signal.

7.12.2 Type B dependency

Following the receipt of a first alarm signal, the entry to the fire alarm condition may be inhibited until the receipt of a confirmation alarm signal from another fire detector, which may be in the same or a different zone. In this case the following shall apply.

a) The mode of operation shall be configurable at Access Level 3.

b) The first alarm state shall be indicated by means of

   — an audible indication, which may be the same as that in the fire alarm condition or fault warning condition, or

   — a visible indication of the affected zone, which may be the same as that for indication of the zone in alarm according to 7.3; the fire alarm indicator shall not be illuminated.

c) It shall be possible to manually cancel the first alarm state. This may be done with the same control used for reset from the fire alarm condition or fault warning condition.

d) The c.i.e. may have provision to automatically cancel the first alarm state after a time interval, which shall not be less than 5 min.

7.12.3 Type C dependency

Following the receipt of a first alarm signal from a fire detector or a manual call point, and until a confirmatory signal is received from another fire detector or manual call point in the same or another zone, the c.i.e. shall enter the fire alarm condition but may have provision to inhibit the operation of outputs. In this case it shall be possible to configure the mode of operation at Access Level 3 to apply individually to each of the following (where provided):

— output to fire alarm devices (Item C in Figure 1 of ISO 7240-1:1988), according to 7.8;

— output to fire alarm routing equipment (Item E in Figure 1 of ISO 7240-1:1988), according to 7.9;

— output to fire protection equipment (Item G in Figure 1 of ISO 7240-1:1988), according to 7.10.

The inhibition of one output signal shall not affect the activation of other outputs.

7.13 Alarm counter — Optional function

The c.i.e. may have provision to record the number of instances that the c.i.e. enters the fire alarm condition. In this case at least the following shall apply.

a) Re-initialization of the counter shall only be possible at Access Level 4.

b) The information shall be available at Access Level 1 or 2.

c) The counter shall be capable of recording at least 999 instances.

d) In the event of a loss of the main and the stand-by power sources, the data shall be retained for at least 14 days.

7.14 Output of standard emergency evacuation signal — Optional function

The c.i.e. shall have provision for the output of a standard emergency evacuation signal in accordance with ISO 8201.

The following shall apply:

a) it shall be possible to silence the signals at Access Level 2;

b) following silencing, it shall be possible to re-sound the emergency evacuation signal at Access Level 2.

8 Supervisory signal condition — Optional function

8.1 Reception and processing of supervisory signals

8.1.1 The c.i.e. shall enter the supervisory signal condition when signals are received which, after any necessary processing, are interpreted as an abnormal status (other than a fault) of equipment monitored by the c.i.e. that could adversely affect the performance of other life, safety or property protection systems being monitored by the c.i.e.

8.1.2 The c.i.e. shall be capable of receiving, processing and indicating supervisory signals for which the manufacturer declares the equipment to be suitable, unless this is prevented by

— a fault in the same zone, and/or

— a disablement in the same zone, and/or

— a disablement of the transmission path from which signals originate, and/or

— a test of the same zone or function.

8.1.3 The c.i.e. shall enter the supervisory signal condition within 100 s of the occurrence of the supervisory signal.

8.2 Indication of the supervisory signal condition

The supervisory signal condition shall be indicated without prior manual intervention. The indication shall be established when the following are present:

— a visible indication by means of a separate light-emitting indicator (the general supervisory signal indicator);

— a visible indication for each recognized signal, in accordance with 8.3;

— an audible indication in accordance with 8.4.

8.3 Indication of the supervisory signals from zones

8.3.1 The zones from which supervisory signals originate shall be visibly indicated by means of a separate light-emitting indicator for each zone or an alphanumeric display or both.

8.3.2 If the indication is on an alphanumeric display which cannot simultaneously indicate all of the supervisory signals, the following shall apply.

a) If supervisory signal indications have been suppressed, this fact shall be indicated.

b) Suppressed supervisory signal indications shall be capable of being displayed by means of a manual operation at Access Level 1 or 2.

8.4 Audible indication

8.4.1 The audible indication shall be capable of being silenced by means of a separate manual control at Access Level 1 or 2. This control shall be used for silencing the audible indication and may be the same as that for silencing the fault warning condition.

8.4.2 The audible indication shall not be silenced automatically.

8.4.3 If previously silenced, the audible indication shall re-sound for supervisory signals from each new zone.

8.5 Reset of supervisory signal

8.5.1 The c.i.e. shall be capable of being reset from the supervisory signal condition. This shall only be possible by means of a separate manual control at Access Level 2. This control shall be used only for reset, but may be the same as that used for reset from the fire alarm condition or from the fault warning condition.

8.5.2 Following a reset operation, the indications of the correct conditions, corresponding to the received signals, shall either be maintained or shall be re-established within 20 s.

8.6 Supervisory signal condition output

The c.i.e. shall have an output capable of signalling a common signal for all supervisory signal to supervisory routing equipment (J in Figure 1 of ISO 7240-1:1988).

9 Fault warning condition (see also Annex F)

9.1 Reception and processing of fault signals

9.1.1 The c.i.e. shall enter the fault warning condition when signals are received which, after any necessary processing, are interpreted as a fault.

9.1.2 The c.i.e. shall be capable of simultaneously recognizing all of the faults specified in 9.2 and if provided, in 9.3, unless this is prevented by

— the presence of fire alarm signals from the same zone, and/or

— the disablement of the corresponding zone or function, and/or

— the testing of a corresponding zone or function,

— the activation of the output to a transmission path which is exclusively used to transmit signals to

1) fire alarm devices (Item C in Figure 1 of ISO 7240-1:1988), or

2) fire alarm routing equipment (Item E in Figure 1 of ISO 7240-1:1988), or

3) controls for automatic fire protection equipment (Item G in Figure 1 of ISO 7240-1:1988), or

4) fault warning routing equipment (Item J in Figure 1 of ISO 7240-1:1988).

9.1.3 The c.i.e. shall enter the fault warning condition within 100 s of the occurrence of the fault or the reception of a fault signal, or as specified in 14.6.

9.2 Indication of faults in specified functions

9.2.1 The presence of faults specified in 9.2.4, 9.2.5, 9.2.6 and 9.3 (if provided) shall be indicated without prior manual intervention. The fault warning condition is established when the following are present:

a) a visible indication by means of a separate light-emitting indicator (the general fault warning indicator);

b) a visible indication for each recognized fault;

c) an audible indication, as specified in 9.6.

9.2.2 If the indication is by means of separate light-emitting indicators, these may be the same as those used to indicate disablement and/or testing of the corresponding zones or functions.

9.2.3 If the indication is on an alphanumeric display, which cannot simultaneously indicate all of the faults, the following shall apply:

a) the presence of fault indications which have been suppressed shall be indicated;

b) suppressed fault indications shall be capable of being displayed by means of a manual operation at Access Level 1 or 2.

9.2.4 The following faults shall be indicated by means of separate light-emitting indicators or an alphanumeric display or both. The indications may be suppressed during the fire alarm condition:

a) an indication for each zone in which the transmission of signals from a point to the c.i.e. is affected by

   — a short circuit in a detection circuit, unless the short circuit is reported as a fire alarm,

   — an interruption in a detection circuit,

   — the removal of a point;

b) an indication at least common to any power supply fault resulting from

   — a short circuit or an interruption in a transmission path to a power supply (Item L in Figure 1 of ISO 7240-1:1988), where the power supply is contained in a different cabinet from that of the c.i.e.,

   — power supply faults as specified in ISO 7240-4;

c) an indication at least common to any single earth fault which affects a mandatory function, and which is not otherwise indicated as a fault of a supervised function;

d) an indication as a fault of the supervised function of the rupture of any fuse, or the operation of any protective device which is capable of affecting a mandatory function in the fire alarm condition;

e) an indication of any short circuit or interruption, at least common to all transmission paths between parts of the c.i.e. contained in more than one mechanical cabinet, which is capable of affecting a mandatory function, and which is not otherwise indicated as a fault of a supervised function;

f) an indication of any short circuit or interruption, at least common to all transmission paths, which affects the transmission of a signal to, or reception of signals from, controls for automatic fire protection equipment (Item G in Figure 1 of ISO 7240-1:1988);

g) an indication of any short circuit or interruption, at least common to all transmission paths, which affects the transmission of signals to fault warning routing equipment (Item J in Figure 1 of ISO 7240-1:1988).

9.2.5 The following faults shall be indicated by means of separate light-emitting indicators or an alphanumeric display or both. The indications shall not be suppressed during the fire alarm condition:

a) an indication of any short circuit or interruption, at least common to all transmission paths, which affects the transmission of signals to fire alarm devices (Item C in Figure 1 of ISO 7240-1:1988);

b) an indication of any short circuit or interruption, at least common to all transmission paths, which affects the transmission of signals to fire alarm routing equipment (Item E of Figure 1 of ISO 7240-1:1988).

9.2.6 The following faults shall be indicated at least by means of the general fault warning indicator:

a) any short circuit or interruption in a transmission path between parts of the c.i.e. contained in more than one mechanical cabinet, where the fault does not affect a mandatory function;

b) any short circuit or interruption in a detection circuit, where the fault does not prevent the transmission of signals to the c.i.e.

9.3 Fault signals from points — Optional function

The c.i.e. may have provision for the reception, processing and indication of fault signals from points. In this case, faults shall be indicated at least as zone faults, as specified in 9.2.4.a).

9.4 Total loss of the power supply — Optional function

In the event of the loss of the main power source (in accordance with ISO 7240-4), the c.i.e. may have provision to recognize and indicate the failure of the standby power source to a point where it may no longer be possible to fulfill mandatory functions of this part of ISO 7240. In this case, at least an audible indication shall be given for a period of at least one hour.

9.5 System fault

A system fault is a fault as specified in 14.4 or 14.6 in the case of a software-controlled c.i.e. A system fault may prevent requirements of this part of ISO 7240, other than those specified in this subclause and in 14.6, from being fulfilled. In the event of a system fault, at least the following shall apply.

a) A system fault shall be visibly indicated by means of the general fault warning indicator and a separate light-emitting indicator. These indications shall not be suppressed by any other functional condition of the c.i.e. and shall remain until a manual reset and/or another manual operation at Access Level 2 or 3.

b) A system fault shall be audibly indicated. This indication may be capable of being silenced.

9.6 Audible indication

9.6.1 The audible indication of faults under 9.2 and 9.3 (if provided) shall be capable of being silenced manually at Access Level 1 or 2. The same manual operation may be used as that for silencing in the fire alarm condition.

9.6.2 The audible indication shall be silenced automatically if the c.i.e. is automatically reset from the fault warning condition.

9.6.3 If previously silenced, the audible indication shall re-sound for each newly recognized fault.

9.7 Reset of fault indications

9.7.1 Indications of faults as under 9.2 and 9.3 (if provided) shall be capable of being reset

— automatically when faults are no longer recognized, and/or

— by a manual operation at Access Level 2, which may be the same as that used for resetting from the fire alarm condition.

9.7.2 Following reset, the indication of the correct functional conditions, corresponding to any received signals, shall either remain or be re-established within 100 s.

9.8 Fault output

The c.i.e. shall have an output which signals the fault warning condition. This may be the output specified in 9.9. The output signal shall be given if the c.i.e. is de-energized.

9.9 Output to fault warning routing equipment — Optional function [see also 10.4.1 c)]

The c.i.e. may have provision for the transmission of fault signals to fault warning routing equipment (Item J in Figure 1 of ISO 7240-1:1988). This output shall signal all faults specified in Clause 9. The output signal shall be given if the c.i.e. is de-energized.

10 Disabled condition — Optional function

10.1 General requirements

10.1.1 Disablements in accordance with 10.4 and 10.5 shall inhibit all corresponding mandatory indications or outputs or both, but shall not prevent other mandatory indications and/or outputs.

10.1.2 The c.i.e. shall have provision to independently disable and re-enable each of the functions specified in 10.4, by means of manual operations at Access Level 2.

10.1.3 The c.i.e. shall be in the disabled condition while a disablement in accordance with 10.4 or 10.5 or both exists.

10.1.4 Disablement and re-enablement shall not be affected by a reset from the fire alarm condition, or from the fault warning condition.

10.2 Indication of the disabled condition

The disabled condition shall be indicated visibly, by means of the following:

a) a separate light-emitting indicator (the general disablement indicator);

b) an indication for each disablement, in accordance with 10.3, 10.4 and 10.5.

10.3 Indication of specific disablements

10.3.1 Disablements shall be indicated within 2 s of the completion of the manual operation.

10.3.2 The same light-emitting indicator may be used as that for the indication of the corresponding fault, although the indication shall be distinguishable. The same light-emitting indicator and the same indication may be used to indicate a disabled zone and a zone under test.

10.3.3 If the indication is on an alphanumeric display, which cannot simultaneously indicate all of the disablements because of its limited capacity, at least the following shall apply:

a) the presence of disablement indications which have been suppressed shall be indicated;

b) suppressed indications shall be capable of being displayed, independently of other indications by means of a manual operation at Access Level 1 or 2.

10.4 Disablements and their indication

10.4.1 The following shall be capable of being independently disabled and re-enabled:

a) each zone;

b) output signals or transmission paths to controls for automatic fire protection equipment (Item G in Figure 1 of ISO 7240-1:1988), with control and indication at least common for all such equipment;

c) output signals or transmission paths to fault warning routing equipment (Item J in Figure 1 of ISO 7240-1:1988).

The disablements shall be indicated by means of separate light-emitting indicators or an alphanumeric display or both. The indications may be suppressed during the fire alarm condition.

10.4.2 The following shall be capable of being independently disabled and re-enabled:

a) output signals or transmission paths to fire alarm devices (Item C in Figure 1 of ISO 7240-1:1988), with the manual controls and indication at least common for all such device;

b) output signals or transmission paths to fire alarm routing equipment (Item E in Figure 1 of ISO 7240-1:1988).

The disablements shall be indicated by means of separate light-emitting indicators or an alphanumeric display or both. The indications shall not be suppressed during the fire alarm condition.

10.5 Disablement of addressable points — Optional function

The c.i.e. may have provision for disabling and enabling signals from addressable points by a manual operation at Access Level 2, either individually or in groups. In this case, at least the following shall apply:

a) it shall be possible to disable each addressable point individually;

b) it shall be possible to identify all the disablements by manual interrogation at Access Level 1 or 2;

c) the disablement of addressable points shall not be indicated as zone disablements unless all the addressable points in the zones have been disabled;

d) if all addressable points in a zone are disabled, this shall be indicated as a zone disablement.

11 Test condition — Optional function

11.1 General requirements

The c.i.e. may have provision for testing the processing and indication of fire alarm signals from zones. This may inhibit the requirements during the fire alarm condition which corresponds to that zone. In this case, at least the following shall apply:

a) the c.i.e. shall be in test condition while one or more zones are under test;

b) a test state shall only be entered and cancelled by a manual operation at Access Level 2 or 3;

c) it shall be possible to test the operation of each zone individually;

d) zones in the test state shall not prevent the mandatory indications and outputs from zones not in the test state;

e) signals from a zone under test shall not lead to the operation of the outputs to

- fire alarm devices (Item C in Figure 1 of ISO 7240-1:1988), except temporarily in order to test their functioning in relation to the corresponding zone;
- fire alarm routing equipment (Item E in Figure 1 of ISO 7240-1:1988);
- controls for automatic fire protection equipment (Item G in Figure 1 of ISO 7240-1:1988);
- fault warning routing equipment (Item J in Figure 1 of ISO 7240-1:1988).

11.2 Indication of test condition

The test condition shall be indicated visibly, by means of the following:

a) a separate light-emitting indicator (the general test indicator);

b) an indication for each zone, in accordance with 11.3.

11.3 Indication of zones in test state

Zones in the test state shall be visibly indicated, by means of a separate light-emitting indicator for each zone or an alphanumeric display or both. The same light-emitting indicator and the same indication may be used to indicate a zone under test and a disabled zone. Entry to test states shall either be indicated within 2 s of the completion of the manual operation. For indications on alphanumeric displays, at least the requirements of 10.3.3 shall apply.

12 Standardized input/output interface — Optional function (see also Annex H)

The c.i.e. may have provision for a standardized input/output interface, suitable for the transmission and reception of signals to and from ancillary equipment (e.g. a fire brigade panel). In this case, at least the following shall apply.

a) The interface shall be capable of transmitting at least the occurrence of:

- the fire alarm condition,
- each zone in alarm,
- the transmission of output signals to fire alarm routing equipment (Item E in Figure 1 of ISO 7240-1:1988),
- the transmission of output signals to fire protection equipment (Item G in Figure 1 of ISO 7240-1:1988),
- the fault warning condition,
- each zone fault,
- the disablement and re-enablement of each zone,
- the disablement and re-enablement of the output to fire alarm devices (Item C in Figure 1 of ISO 7240-1:1988),
- the disablement and re-enablement of the output to fire alarm routing equipment (Item E in Figure 1 of ISO 7240-1:1988), and
- the disablement and re-enablement of output signals to fire protection equipment (Item G in Figure 1 of ISO 7240-1:1988).

b) The interface shall be capable of receiving at least the following information and of activating the corresponding functions of the c.i.e.:

- silencing of the audible indication;
- the reset of the fire alarm condition;
- silencing and re-sounding of the fire alarm devices (Item C in Figure 1 of ISO 7240-1:1988);
- the disablement and re-enablement of zones;
- the disablement and re-enablement of output signals to fire alarm devices (Item C in Figure 1 of ISO 7240-1:1988);
- the disablement and re-enablement of output signals to fire alarm routing equipment (Item E in Figure 1 of ISO 7240-1:1988).
- the disablement and re-enablement of output signals to fire protection equipment (Item G in Figure 1 of ISO 7240-1).

13 Design requirements

13.1 General requirements and manufacturer's declarations

The c.i.e. shall comply with the design requirements of clause 13, where relevant to the technology used.

In order to assist the process of design inspection, the manufacturer shall declare, in writing, that

a) the design has been carried out in accordance with a quality management system, that incorporates a set of rules for the design of all elements of the c.i.e. (e.g. ISO 9001), and

b) the components of the c.i.e. have been selected for the intended purpose, and are expected to operate within their specification when the environmental conditions outside the cabinet of the c.i.e. comply with Class 3k5 of IEC 60721-3-3.

13.2 Documentation

13.2.1 The manufacturer shall prepare installation and user documentation, which shall be submitted to the testing authority together with the c.i.e. This shall comprise at least the following:

a) a general description of the equipment, including a list of the

   — optional functions with requirements of this part of ISO 7240,

   — functions relating to other parts of ISO 7240, and

   — ancillary functions not required by this part of ISO 7240;

b) technical specifications of the inputs and outputs of the c.i.e. sufficient to permit an assessment of the mechanical, electrical, and software compatibility with other components of the system (e.g. as described in ISO 7240-1), including, where relevant,

   — the power requirements for recommended operation,

   — the maximum number of zones, points and/or addressable points per detection circuit,

   — the maximum number of zones, points, addressable points and/or fire alarm devices per c.i.e.,

   — the maximum and minimum electrical ratings for each input and output,

   — information on the communication parameters employed on each transmission path,

   — recommended cable parameters for each transmission path, and

   — fuse ratings;

c) installation information, including

   — the suitability for use in various environments,

   — if the c.i.e. is contained in more than one cabinet, how the requirements of 13.3.2 and 13.5.2 may be met,

   — if the c.i.e is designed to be used with a power supply contained in a separate cabinet, how the requirements of 13.3.2 and 13.5.3 may be met,

   — mounting instructions, and

   — instructions for connecting the inputs and outputs;

d) configuring and commissioning instructions;

e) operating instructions;

f) maintenance information.

13.2.2 The manufacturer shall prepare design documentation, which shall be submitted to the testing authority together with the c.i.e. This documentation shall include drawings, parts lists, block diagrams, circuit diagrams and a functional description to such an extent that compliance with this part of ISO 7240 can be checked and that a general assessment of the mechanical and electrical design is made possible.

13.3 Mechanical design requirements

13.3.1 The cabinet of the c.i.e. shall be of robust construction, consistent with the method of installation recommended in the documentation. At Access Levels 1 and 2, it shall meet at least Classification IP30 of IEC 60529.

13.3.2 The c.i.e. may be housed in more than one cabinet. If the documentation shows that the cabinets may be installed in locations distributed within the protected premises, then all of the mandatory manual controls and indicators shall be on one cabinet, or on cabinets declared to be only ones suitable for mounting adjacent to each other.

13.3.3 All mandatory manual controls and light-emitting indicators shall be clearly labelled to indicate their purpose. The information shall be legible at 0,8 m distance in an ambient light intensity from 100 lx to 500 lx.

13.3.4 The terminations for transmission paths and the fuses shall be clearly labelled.

13.4 Electrical and other design requirements

13.4.1 The c.i.e. shall have provision for grouping the signals from points to provide zonal indications.

13.4.2 The processing of signals shall give the highest priority to the indication of fire alarms.

13.4.3 Transitions between the main and the standby power sources shall not change any indications and/or the state of any outputs, except those relating to the power supplies.

13.4.4 If the c.i.e. has provision for disconnecting or adjusting the main or the standby power source, this shall only be possible at Access Level 3 or 4.

13.5 Integrity of transmission paths (see also Annex H)

13.5.1 A fault in any transmission path between the c.i.e. and other components of the fire detection system (as defined in ISO 7240-1) shall not affect the correct functioning of the c.i.e. or of any other required transmission path.

13.5.2 If the manufacturer's documentation shows that points which are installed on a detection circuit may be grouped in more than one zone, or may perform more than one function (see Annex I), then means shall be specified and provided which ensures that a short circuit or an interruption in the detection circuit does not affect more than one function in more than one zone for longer than 300 s following the occurrence of the fault.

13.5.3 If the manufacturer's documentation shows that a c.i.e. contained in more than one cabinet may be installed in locations distributed within the protected premises, then means shall be specified and provided which ensure that a short circuit or an interruption in any transmission path between the cabinets does not affect more than one function (see Annex I) in more than one zone, for longer than 20 s following the occurrence of the fault.

13.5.4 Where the c.i.e. is designed to be used with a power supply (Item L in Figure 1 of ISO 7240-1:1988) contained in a separate cabinet remote from the c.i.e., then an interface shall be provided for at least two

transmission paths to the power supply, such that a short circuit or an interruption in one does not prevent the supply of power to the c.i.e.

13.6 Accessibility of indications and controls (see also Annex A)

13.6.1 Four access levels shall be provided on the c.i.e., from Access Level 1 (most accessible) to Access Level 4 (least accessible). Allocation to an access level shall prevent access to an access level with a higher number, but allow access to an access level of a lower number. Manual controls and other functions shall be grouped on the appropriate access level according to this part of ISO 7240.

13.6.2 All mandatory indications shall be visible at Access Level 1 without prior manual intervention (e.g. the need to open a door).

13.6.3 Manual controls at Access Level 1 shall be accessible without special procedures.

13.6.4 Indications and manual controls which are mandatory at Access Level 1 shall also be accessible at Access Level 2.

13.6.5 The entry to Access Level 2 shall be restricted by a special procedure.

13.6.6 The entry to Access Level 3 shall be restricted by a special procedure, differing from that for Access Level 2.

13.6.7 The entry to Access Level 4 shall be restricted by special means which are not part of the c.i.e.

13.7 Indications by means of light-emitting indicators

13.7.1 Mandatory indications from light-emitting indicators shall be visible in an ambient light intensity up to 500 lux, at any angle up to 22,5 ° from a line through the indicator perpendicular to its mounting surface:

— at 3 m distance for the general indications of functional condition;

— at 3 m distance for the indication of the supply of power;

— at 0,8 m distance for other indications.

13.7.2 If flashing indications are used, both the “on” period and the “off” period shall be $\geqslant$ 0,25 s, and the frequencies of flash shall not be less than

— 1 Hz for fire alarm indications;

— 0,2 Hz for fault indications.

13.7.3 If the same light-emitting indicators are used for the indication of specific faults, disablements and tests, fault indications shall be flashing and disablement or test indications shall be steady.

13.8 Indications on alphanumeric displays

13.8.1 If an alphanumeric display consists of elements or segments, the failure of one of these shall not affect the interpretation of the displayed information.

13.8.2 Alphanumeric displays used for mandatory indications shall have at least one clearly distinguishable window, consisting of at least two clearly identifiable fields.

13.8.3 If not included in the displayed information, the purpose of each field shall be clearly labelled.

13.8.4 Where Arabic characters are used, a field shall be capable of containing at least the following:

a) at least 16 characters where the display of a fire alarm uses a cross-reference to other information to identify the location;

b) at least 40 characters, where the display is intended to include the complete information on the location of a fire alarm.

13.8.5 Where other characters are used, a field shall be capable of containing the following:

a) at least 4 characters where the display of a fire alarm uses a cross-reference to other information to identify the location;

b) at least 8 characters, where the display is intended to include the complete information on the location of a fire alarm.

13.8.6 Mandatory indications on an alphanumeric display shall be legible for the lesser of 1 h or the duration of the standby power source, following the display of a new indication of fire or fault, at 0,8 m distance, in ambient light intensities from 5 lx to 500 lx, at any angle from the normal to the plane of the display up to

— 22,5 ° when viewed from each side;

— 15 ° when viewed from above and below.

Following the lesser of 1 h or the duration of the standby power source, the indications shall be legible at 100 lx to 500 lx, at the above distance and angles. It shall be possible to re-establish the legibility at 5 lx to 100 lx by means of a manual operation at Access Level 1.

13.9 Colours of indications

13.9.1 The colours of the general and specific indications from light-emitting indicators shall be as follows:

a) red for indications of

   — fire alarms,

   — the transmission of signals to, or reception of signals from, fire alarm routing equipment (Item E in Figure 1 of ISO 7240-1:1988), and

   — the transmission of signals to, or reception of signals from, controls for automatic fire protection equipment (Item G in Figure 1 of ISO 7240-1:1988);

b) yellow for indications of

   — fault warnings,

   — disablements,

   — zones in the test state,

   — the transmission of signals to fault warning routing equipment (Item J in Figure 1 of ISO 7240-1:1988), and

   — delays to outputs according to 7.1.3.

c) green for the indication that the c.i.e. is supplied with power.

13.9.2 The use of different colours is not necessary for indications on alphanumeric displays. However, if different colours are used for different indications, the colours used shall be in accordance with 13.9.1.

13.10 Audible indications

13.10.1 Audible indicators shall be part of the c.i.e. The same device may be used for fire alarm and fault warning indications.

13.10.2 The minimum sound level at a distance of 1 m with any access door on the c.i.e. closed shall be either

— 60 dB (A-weighted) for fire alarm indications, and

— 50 dB (A-weighted) for fault warning indications.

or

— 85 dB (A-weighted) for fire alarm indications; and

— 70 dB (A-weighted) for fault warning indications.

NOTE The allowance for two sets of audible indications contemplates some c.i.e. being installed in normally occupied areas (such as a security room).

13.10.3 The sound level shall be measured in anechoic conditions.

13.11 Testing of indicators

All mandatory visible and audible indicators shall be testable by a manual operation at Access Level 1 or 2.

14 Additional design requirements for software-controlled control and indicating equipment

14.1 General requirements and manufacturer's declarations

The c.i.e. may contain elements which are controlled by software in order to fulfil requirements of this part of ISO 7240. In this case, the c.i.e. shall comply with the requirements of Clause 14, as well as those of Clause 13, where relevant to the technology used.

14.2 Software documentation

14.2.1 The manufacturer shall prepare documentation which gives an overview of the software design, which shall be submitted to the testing authority together with the c.i.e. This documentation shall be in sufficient detail for the design to be inspected for compliance with this part of ISO 7240.

14.2.2 The manufacturer shall prepare and maintain detailed design documentation. This need not be submitted to the testing authority, but shall be available for inspection in a manner which respects the manufacturer's rights of confidentiality.

14.3 Software design

In order to ensure the reliability of the c.i.e., measures shall be included in the program to prevent the occurrence of a deadlock in the system.

14.4 Program monitoring (see also Annex J)

14.4.1 The execution of the program shall be monitored. 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.

14.4.2 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.

14.4.3 If an execution failure as in 13.4.1 is detected, the c.i.e. shall enter a safe state within 100 s. This safe state shall be defined by the manufacturer.

14.4.4 The monitoring device shall use the highest priority feature provided to enter the safe state of 14.4.3 (e.g. the highest priority non-maskable interrupt).

14.5 The storage of programs and data (see also Annex J)

14.5.1 All executable code and data necessary to comply with this part of ISO 7240 shall be held in memory which is capable of continuous, unmaintained, reliable operation for a period of at least 10 years.

14.5.2 The program shall be held in non-volatile memory, which can only be written to at Access Level 4. Each memory device shall be identifiable such that its contents can be uniquely cross-referenced to the software documentation.

14.5.3 For site-specific data, the following requirements shall apply:

a) the alteration of site-specific data shall be possible only at Access Level 3 or 4;

b) the alteration of site-specific data shall not affect the structure of the program;

c) if stored in volatile memory, the site-specific data shall be protected against power loss by a back-up energy source which can only be separated from the memory at Access Level 4, and which is capable of maintaining the memory contents for at least 2 weeks;

d) if stored in read-write memory, there shall be a mechanism which prevents the memory being written-to during normal operation at Access Level 1 or 2, such that its contents are protected during a failure in program execution;

e) the site-specific data shall be given a version reference, which shall be updated when each set of alterations is carried out;

f) it shall be possible to identify the version reference of the site-specific data at Access Level 3.

14.6 The monitoring of memory contents

The contents of the memories containing the program and the site-specific data 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.

15 Marking

The c.i.e. shall be marked with the following information, which shall be legible at Access Level 1:

a) the number of this part of ISO 7240;

b) the name or trademark of the manufacturer or supplier;

c) the type number or other designation of the c.i.e.

It shall be possible to identify a code or number which identifies the production period of the c.i.e. at Access Level 2.

16 Tests

16.1 General

16.1.1 Standard atmospheric conditions for testing

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

Temperature: 15 °C to 35 °C

Relative humidity: 25 % to 75 %

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.

16.1.2 Specimen configuration

The specimen configuration shall include at least one of each type of detection circuit, transmission path and internal circuits.

Unless designed only for one detection circuit, then it shall be provided with at least two detection circuits of each type.

16.1.3 Mounting and orientation

Unless otherwise stated in a test procedure, the specimen shall be mounted in its normal orientation by the normal means of mounting indicated by the manufacturer. The equipment shall be in the condition of Access Level 1, except where otherwise required for functional testing.

16.1.4 Electrical connection

If the test procedure requires the specimen to be in the operating condition, it shall be connected to a power supply in accordance with ISO 7240-4.

Unless otherwise required, the power supply shall be in the nominal operating condition.

All detection circuits and transmission paths shall be connected to cables and equipment or to dummy loads. At least one of each type of detection circuit shall be maximum loaded, all within manufacturer's specification. Equipment other than the c.i.e. may be kept in the standard atmospheric condition during the tests.

16.1.5 Provision for tests

At least one c.i.e. shall be provided for testing compliance with this part of ISO 7240.

The specimen or specimens submitted shall be representative of the manufacturer's normal production and shall include the claimed options.

16.2 Functional test

16.2.1 The object of test

The object of the functional test is to demonstrate the operation of the equipment before, during and/or after the environmental conditioning.

16.2.2 Test schedule

A test schedule shall be drawn up which ensures that during the functional test each type of input function and each type of output function is exercized.

This shall include as a minimum tests of the fire alarm condition, the fault warning condition and the disabled condition.

16.2.2.1 Fire alarm condition

Initiate and reset a fire alarm from at least two zones (unless only one zone is provided).

Check that the correct indications and the correct outputs to fire alarm device, fire alarm routing equipment, and controls for automatic fire protection equipment (if provided) are given.

16.2.2.2 Fault warning condition

Initiate and reset fault warnings corresponding at least to

— loss of one of the power sources,

— short circuit in a detection circuit,

— interruption in a detection circuit, and

— interruption in a transmission path to fire alarm device, fire alarm routing equipment, and controls for automatic fire protection equipment, if provided.

Check that the correct indications and the output to fault warning routing equipment (if provided) are given.

16.2.2.3 Disabled condition

Disable and restore one zone.

Disable and restore one transmission path to fire alarm device, fire alarm routing equipment, and controls for automatic fire protection equipment, where provided.

Check that the operation of the disablement controls result in the correct indication on the c.i.e., that only the relevant parts of the system are disabled and that on restoration of the disablements the function is restored.

16.3 Environmental tests

16.3.1 General

One, two or three specimens may be supplied for environmental testing. The tests to be applied are given in Table 1.

Table 1 — Environmental tests

Test	Operational or endurance	Subclause
Cold	Operational	16.4
Damp heat, steady state	Operational	16.5
Impact	Operational	16.6
Vibration, sinusoidal	Operational	16.7
Electromagnetic compatibility (EMC) immunity test	Operational	16.8
Supply voltage variations	Operational	16.9
Damp heat, steady state	Endurance	16.10
Vibration, sinusoidal	Endurance	16.11

16.3.2 Tests for one specimen

If a single specimen is supplied for environmental testing, the specimen shall be subjected to all the operational tests, which may be carried out in any order. After the operational tests, the endurance tests shall be carried out on the same specimen in any order. Before and after each environmental test, a functional test shall be carried out.

NOTE The functional test after one environmental test can be taken as the functional test before the next environmental test.

16.3.3 Tests for two specimens

If two specimens are supplied for environmental testing, then the first test specimen shall be subjected to all the operational tests, which may be carried out in any order, followed by one of the endurance tests. The second specimen shall be subjected to the other endurance test. Before and after each environmental test, a functional test shall be carried out.

NOTE For the first specimen, the functional test after one environmental test can be taken as the functional test before the next environmental test.

16.3.4 Tests for three specimens

If three specimens are supplied for environmental testing, then one test specimen shall be subjected to all the operational tests, which may be carried out in any order. The second specimen shall be subjected to one of the endurance tests, and the third specimen shall be subjected to the other endurance test. Before and after each environmental test, a functional test shall be carried out.

NOTE For the first specimen, the functional test after one environmental test can be taken as the functional test before the next environmental test.

16.3.5 Requirements

During the tests given in 16.4 to 16.9, the specimen shall not change status in any of the functional conditions as specified in the corresponding clauses, except when such a change is required by the test procedure or when the change is a result of a functional test.

However, in the tests of 16.8, 16.10, 16.11 and 16.12 visible and audible indications of purely transitory nature occurring during the application of the conditioning are allowed.

When subjected to the functional test, each specimen shall respond correctly (see 16.2).

16.4 Cold (operational)

16.4.1 Object of test

The object of the test is to demonstrate the ability of the equipment to function correctly at low ambient temperatures appropriate to the anticipated service environment.

16.4.2 Test procedure

16.4.2.1 General

Perform the test procedures with gradual changes in temperature according to IEC 60068-2-1. Use Test Ad for heat-dissipating specimens (in accordance with IEC 60068-2-1) and Test Ab for non-heat-dissipating specimens.

16.4.2.2 Initial examination

Before conditioning, subject the specimen to the functional test.

16.4.2.3 State of the specimen during conditioning

Mount the specimen in accordance with 16.1.3. and connect it to suitable power supply-, monitoring- and loading equipment (see 16.1.4).

The specimen shall be in the quiescent condition.

16.4.2.4 Conditioning

Apply the following severity of conditioning.

Temperature: 0 °C ± 3 °C or other minimum rated temperature

Duration: 16 h

16.4.2.5 Measurements during conditioning

Monitor the specimen during the conditioning period to detect any change in status. During the last hour of the conditioning period, subject the specimen to the functional test.

16.4.2.6 Final measurements

After the recovery period, subject the specimen to the functional test and inspect it visually for mechanical damage both externally and internally.

16.5 Damp heat, steady state (operational)

16.5.1 Object of test

The object of the test is to demonstrate the ability of the equipment to function correctly at high relative humidities (without condensation) which may occur for short periods in the service environment.

16.5.2 Test procedure

16.5.2.1 General

Perform the test procedure according to IEC 60068-2-3.

16.5.2.2 Initial examination

Before conditioning, subject the specimen to the functional test.

16.5.2.3 State of the specimen during conditioning

Mount the specimen in accordance with 16.1.3 and connect it to suitable power supply-, monitoring- and loading equipment (see 16.1.4).

The specimen shall be in the quiescent condition.

16.5.2.4 Conditioning

Apply the following severity of conditioning.

Temperature: 40 °C ± 2 °C

Relative humidity: 93 % $^{+2}_{-3}$%

Duration: four days

Precondition the specimen at the conditioning temperature (40 °C ± 2 °C) until temperature stability has been reached, in order to prevent the formation of water droplets on the specimen.

16.5.2.5 Measurements during conditioning

Monitor the specimen during the conditioning period to detect any change in status. During the last hour of the conditioning period, subject the specimen to the functional test.

16.5.2.6 Final measurements

After the recovery period, subject the specimen to the functional test and inspect it visually for mechanical damage both externally and internally.

16.6 Impact (operational) — Optional test

16.6.1 Object of test

The object of the test is to demonstrate the immunity of the equipment to mechanical impacts upon the surface, which it could sustain in the normal service environment and which it can reasonably be expected to withstand.

16.6.2 Test procedure

16.6.2.1 General

Use the test apparatus and perform the procedure in accordance with IEC 60068-2-75.

16.6.2.2 Initial examination

Before conditioning, subject the specimen to the functional test.

16.6.2.3 State of the specimen during conditioning

Mount the specimen in accordance with 16.1.3 and connect it to suitable power supply-, monitoring- and loading equipment (see 16.1.4).

The specimen shall be in the quiescent condition.

16.6.2.4 Conditioning

Apply impacts to all surfaces of the specimen which are accessible at Access Level 1.

For all such surfaces, apply three blows to any point or points considered likely to cause damage to or impair the operation of the specimen.

Care should be taken to ensure that the results from a series of three blows do not influence subsequent series.

In case of doubt, disregard the defect and apply a further three blows to the same position on a new specimen.

Apply the following severity of conditioning.

Impact energy: 0,5 $\pm$ 0,04 J

Number of impacts per point: three

16.6.2.5 Measurements during conditioning

Monitor the specimen during the conditioning periods to detect any changes in functional condition, and to ensure that the results of the three blows do not influence subsequent series.

16.6.2.6 Final measurements

After the conditioning, subject the specimen to the functional test and inspect it visually for mechanical damage both externally and internally.

16.7 Vibration, sinusoidal (operational) — Optional test

16.7.1 Object of test

The object of the test is to demonstrate the immunity of the equipment to vibrations at levels appropriate to the service environment.

16.7.2 Test procedure

16.7.2.1 General

Perform the test procedure according to IEC 60068-2-6.

The vibration operational test may be combined with the vibration endurance test, so that the specimen is subjected to the operational test conditioning followed by the endurance test conditioning in each axis.

16.7.2.2 Initial examination

Before conditioning, subject the specimen to the functional test.

16.7.2.3 State of specimen during conditioning

Mount the specimen in accordance with 16.1.3. and IEC 60068-2-47, and connect it to suitable power supply-, monitoring- and loading equipment (see 16.1.4).

The specimen shall be tested in each of the following functional conditions:

a) quiescent condition;

b) fire alarm condition, initiated in a zone;

c) disabled condition, initiated by disablement of a zone and an output according to ISO 7240-1.

16.7.2.4 Conditioning

Subject the specimen to vibration in each of the three mutually perpendicular axes in turn, one of which is perpendicular to the plane of mounting of the specimen.

Apply the following severity of conditioning.

Frequency range: 10 Hz to 150 Hz

Acceleration amplitude: 0,981 ms^{-2} (0,1 g_n)

Number of axes: three

Number of sweep cycles per axis : one for each functional condition

16.7.2.5 Measurements during conditioning

Monitor the specimen during the conditioning periods to detect any changes in functional conditions.

16.7.2.6 Final measurements

After the conditioning, subject the specimen to the functional test and inspect it visually for mechanical damage, both externally and internally.

16.8 Electromagnetic compatibility (EMC), Immunity tests (operational)

16.8.1 The following EMC immunity tests shall be carried out in accordance with EN 50130-4.

a) Mains supply voltage variations: These tests are included as they should be applied to a p.s.e. housed in the c.i.e. (see ISO 7240-4), or if the c.i.e. includes other mains inputs for which these tests are applicable.

b) Mains supply voltage dips and interruptions: These tests are included as they should be applied to a p.s.e. housed in the c.i.e. (see ISO 7240-4), or if the c.i.e. includes other mains inputs for which these tests are applicable.

c) Electrostatic discharge.

d) Radiated electromagnetic fields.

e) Conducted disturbances induced by electromagnetic fields.

f) Fast transient bursts.

g) Slow high energy voltage surges.

16.8.2 For the tests according to 16.8.1, the criteria for compliance specified in EN 50130-4 and the following shall apply.

a) The functional test, called for in the initial and final measurements, shall be the functional test according to 16.2.

b) The required operating condition shall be in accordance with 16.1.4 and the equipment shall be tested in the quiescent condition.

c) The connections to the various inputs and outputs shall be made with unscreened cables, unless the manufacturer's installation data specifies that only screened cables shall be used.

d) In the electrostatic discharge test, the discharges shall be applied to parts of the equipment accessible at Access Level 2.

e) In the fast transient burst test, the transients shall be applied to the a.c. mains lines by the direct injection method and to the other inputs, signal, data and control lines by the capacitive clamp method.

f) If the equipment has a number of identical types of inputs or outputs, then the tests of 16.8.1 e), f) and g), and, if applicable, a) and b), shall be applied to one of each type.

16.9 Supply voltage variation (operational)

16.9.1 Object of test

The object of the test is to demonstrate the ability to function correctly over the anticipated range of supply voltage conditions.

16.9.2 Test procedure

16.9.2.1 General

No reference can be made to an international standard at present.

Subject the specimen to each of the specified power supply conditions until temperature stability is reached and the functional test has been conducted.

16.9.2.2 Initial examination

Before conditioning, subject the specimen to the functional test.

16.9.2.3 State of the specimen during conditioning

Mount the specimen in accordance with 16.1.3 and connect it to suitable power supply-, monitoring- and loading equipment (see 16.1.4).

The specimen shall be in the quiescent condition.

16.9.2.4 Conditioning

Apply the following conditions:

a) supply of maximum input voltage as specified by the manufacturer;

b) supply of minimum input voltage as specified by the manufacturer.

NOTE Compatibility between the c.i.e. and any specific type of power supply equipment will require that the range of input voltages specified for the c.i.e. include the range of output voltages recorded for the power supply equipment in the tests of ISO 7240-4.

16.9.2.5 Measurements during conditioning

Monitor the specimen at the supply voltage conditions until temperature stability is reached and subject the specimen to the functional test at each voltage condition.

16.9.2.6 Final measurements

After the conditioning, subject the specimen to the functional test.

16.10 Damp heat, steady state (endurance)

16.10.1 Object of test

The object of the test is to demonstrate the ability of the equipment to withstand the long term effects of humidity in the service environment (changes in electrical properties due to absorption, chemical reactions involving moisture, galvanic corrosion etc.).

16.10.2 Test procedure

16.10.2.1 General

Perform the test procedure according to IEC 60068-2-3.

16.10.2.2 Initial examination

Before conditioning, subject the specimen to the functional test.

16.10.2.3 State of the specimen during conditioning

Mount the specimen in accordance with 16.1.3 and connect it to suitable power supply-, monitoring- and loading equipment (see 16.1.4). Do *not* supply the specimen with power during the conditioning.

16.10.2.4 Conditioning

Apply the following severity of conditioning.

Temperature: 40 °C $\pm$ 2 °C

Relative humidity: $93\ ^{+2}_{-3}$ %

Duration: 21 days

Pre-condition the specimen at the condition temperature (40 °C ± 2 °C) until temperature stability has been reached, in order to prevent the formation of water droplets on the specimen.

16.10.2.5 Final measurements

After the recovery period, subject the specimen to the functional test and inspect it visually for mechanical damage both externally and internally.

16.11 Vibration, sinusoidal (endurance)

16.11.1 Object of test

The object of the test is to demonstrate the ability of the equipment to withstand the long-term effects of vibration at levels appropriate to the environment.

16.11.2 Test procedure

16.11.2.1 General

Perform the test procedure according to IEC 60068-2-6.

The vibration endurance test may be combined with the vibration operational test, so that the specimen is subjected to the operational test conditioning followed by the endurance test conditioning in each axis in turn.

16.11.2.2 Initial examination

Before conditioning, subject the specimen to the functional test.

16.11.2.3 State of the specimen during conditioning

Mount the specimen in accordance with 16.1.3 and in accordance with IEC 60068-2-47, and connect it to suitable power supply-, monitoring- and loading equipment (see 16.1.4). Do *not* supply the specimen with power during the conditioning.

16.11.2.4 Conditioning

Subject the specimen to vibration in each of the three mutually perpendicular axes in turn, one of which shall be perpendicular to the plane of mounting of the specimen.

Apply the following severity of conditioning.

Frequency range: 10 Hz to 150 Hz

Acceleration amplitude: 4,905 ms^{-2} (0,5 g_n)

Number of axes: three

Number of sweep cycles: 20 per axis

16.11.2.5 Final measurements

After the conditioning, subject the specimen to the functional test and inspect it visually for mechanical damage, both externally and internally.

Annex A
(informative)

Explanation of access levels

This part of ISO 7240 defines access levels for the indications and controls relating to mandatory functions. In some cases, alternatives are offered (e.g. Access Level 1 or 2). This is because either may be appropriate in different operational circumstances. The purpose of the different access levels is not defined here. However, in general they are expected to be used as follows.

Access Level 1: by members of the general public, or persons having a general responsibility for safety supervision, who might be expected to investigate and initially respond to a fire alarm or a fault warning.

Access Level 2: by persons having a specific responsibility for safety, and who are trained and authorized to operate the c.i.e. in the

— quiescent condition,

— fire alarm condition,

— fault warning condition,

— disabled condition, and

— test condition.

Access Level 3: by persons who are trained and authorized to

— re-configure the site-specific data held within the c.i.e. or controlled by it (e.g. labelling, zoning, alarm organization), and

— maintain the c.i.e. in accordance with the manufacturer's published instructions and data.

Access Level 4: by persons who are trained and authorized by the manufacturer either to repair the c.i.e., or to alter its firmware, thereby changing its basic mode of operation.

See 13.6 for the minimum requirements for accessibility. Only Access Levels 1 and 2 have a strict hierarchy. Examples of special procedures for entry to Access Level 2 or to Access Level 3 or both, are the use of

— mechanical keys,

— a keyboard and codes, or

— access cards.

Examples of special means for entry to Access Level 4 are the use of

— mechanical keys,

— tools, or

— an external programming device.

It may be acceptable that the entry to Access Level 4 requires only a simple tool, such as a screwdriver, after Access Level 2 or 3 has been reached. For example, the manufacturer may declare in his documentation

which parts of the c.i.e. are not user serviceable, and the entry to Access Level 4 may then be controlled by management of the user. It is also considered acceptable to use external tools to carry out certain functions at Access Level 3, e.g. to program site specific data.

It may be desirable in certain circumstances that the c.i.e. have additional access levels within Access Level 2, or Access Level 3 (e.g. 2A and 2B), which would permit different classes of authorized user to have access to a selected group of controls or functions. This is not excluded by this part of ISO 7240. The exact configuration will depend on the type of installation, the way the c.i.e. is used, and the complexity of the functions provided.

Annex B
(informative)

Optional functions with requirements and alternatives

This part of ISO 7240 specifies mandatory functions and options with requirements. A c.i.e. complying with this part of ISO 7240 will need to fulfil the requirements of all of the mandatory functions, together with the requirements of those optional functions which are provided. The options described in this part of ISO 7240 are currently used in the ISO member countries and have been incorporated into this part of ISO 7240 in order to comply with application guidelines. They may also be called up in national codes of practice. Optional functions and their relevant clause numbers are listed in Table B.1.

Table B.1 — Optional functions

Option	Clause/Subclause
Indications:	
Fault signals from points	9.3
Total loss of power supply	9.4
Recording of the numbers of entries into fire alarm condition	7.13
Controls:	
Co-incidence detection	7.12
Delays to outputs	7.11
Disablement of each addressable point	10.5
Test condition	11
Outputs:	
Fire alarm device(s)	7.8
Fire alarm routing equipment	7.9
Automatic fire protection equipment	7.10
Fault warning routing equipment	9.9
Standardized I/O interface	12

In addition, alternatives are offered in this part of ISO 7240.

EXAMPLE

— automatic or manual reset of the fault warning condition

— indications by means of separate light-emitting indicators, or on an alphanumeric display

— Access Level 1 or 2 for certain functions

— Access Level 3 or 4 for certain functions

The choice of an alternative is entirely up to the manufacturer. They are equivalent solutions in this part of ISO 7240 and should not be called up in national regulations.

Annex C
(informative)

Processing of signals from fire detectors

Functions associated with other parts of ISO 7240 may be integrated within the design of a c.i.e. This integration may include the processing of signals from fire detectors to the point at which a fire alarm decision is taken. The design documentation needs to show where and how this decision is taken, so that these delays may be assessed. This would generally only be the case in a software-controlled c.i.e.

For the purposes of this part of ISO 7240, the processing of the fire signals to this point is not considered to be a function of the c.i.e., but of the appropriate detector standard (e.g. ISO 7240-7 in the case of smoke detectors). Functions which are part of the c.i.e. include

— the scanning and acquisition of signals by the c.i.e. from points,

— the control or scheduling of any processing of signals from points, where this is contained within the overall software structure of the c.i.e., and

— any other processing required for indications and/or the activation of outputs, subsequent to the fire alarm decision.

The intent of 8.1 is that the times associated with the above functions of the c.i.e. do not add a delay of more than 10 s to the approved detector signal processing, either to indicate the fire alarm condition or a new zone in alarm. Demonstration of compliance may be achieved by inspection of the design documentation or by testing with suitable means, such as a simulated detector, or both.

Annex D
(informative)

Explanation of zones and zonal indication of fire alarms

A zone will contain one or more fire detectors or manual call points, installed within a localized area of the protected premises. The requirements for grouping these into zones are more fully described in application guidelines. In general, a protected premises is divided into zones in order to assist in

— the rapid location of the source of a fire alarm,

— assessing the size of the fire, and monitoring its rate of growth, and

— sub-dividing the installed system, for the purposes of alarm organization and fire protection measures.

The number of fire detectors or manual call points or both in a zone will vary, depending on the circumstances. More than one zone is not expected to be configured in a single volume, unless this is very large. It is assumed that a zone will not contain more than 32 fire detectors and/or manual call points, since this would correspond to an unacceptably large search area.

In this part of ISO 7240, zones are the mandatory units for the discrete indication of fire alarms. The aim is to provide unique indications for the zones in which fire alarms originate, so that a multiplicity of alarm signals from fire detectors in one volume do not clutter an alphanumeric display and risk preventing the rapid recognition of new zones in alarm.

Zones may be sub-divided, such that signals from individual points, or groups of points, may also be identified at the c.i.e., thus providing more detailed information on the location of an event, in addition to the indication of the affected zone.

Annex E
(informative)

Delays to outputs

E.1 General

In 7.11, which deals with delays to output signals, a c.i.e. is permitted to be configured at Access Level 3, so that the presence of a fire may be verified following an alarm, before automatic actions or an orderly evacuation of persons are carried out.

If the manufacturer declares that fire detectors and manual call points may be included in the same zone, and output delays may also be operative, the c.i.e. will need to be capable of distinguishing signals from manual call points from signals from fire detectors, in order that the requirements of 7.11.1 a) and b) may be met.

The maximum delay times quoted represent the upper limit of times and are not recommended times. Recommended times are given in application guidelines. Delays to signals from manual call points should be used only in exceptional circumstances.

Delays may be structured such that an initial short delay period may be extended by the use of a manual control, but the total delay should not exceed the specified maximum. It may also be desirable that the operation of any manual call point on the installation can override the delay, so that an alarm can be immediately raised if human inspection of an incident verifies that a fire exists.

It is recognized that delays may be permanently configured in the normal mode of operation of the equipment, and in such cases there is no need for a user control and no indication need be given. However, if (as under 7.11.2) there is provision at Access Level 2 to switch on delays (which may be in addition to delays which are normally configured), this state shall be indicated. It is common practice to switch on delays by a manual operation and to switch them off with a programmable timer, which should ideally have at least a seven-day capability. This is often referred to as “day/night” mode of operation. Such a mode need not only relate to switching delays on and off, but may also be used to change other operational parameters of the system (e.g. the sensitivity of fire detectors), provided that this is in accordance with other parts of ISO 7240.

E.2 Dependency on more than one alarm signal — Optional function

In 7.12. a c.i.e. is permitted to be configured at Access Level 3 so that either the entry to the fire alarm condition, or automatic actions associated with a fire alarm, are dependent on more than one alarm signal. The intention is to reduce the incidence of unwanted alarms or to minimize their implications or both. Three general types of dependency are permitted, and these are briefly explained below. It is not precluded that more than one type may be concurrently used, e.g. Type A could be combined with Type B or Type C. For information on the appropriate type or types to be employed in given circumstances, reference should be made to application guidelines.

Type A dependency (see 7.12.1) provides for delayed operation following a first fire signal, which would normally be interpreted as a fire alarm. The entry to the fire alarm condition usually occurs on the receipt of further fire signals from the same fire detector. A common technique with two-state smoke detectors is to automatically reset the zone following the first fire signal, then interpret a subsequent fire signal as a fire alarm. Alternative signal processing techniques may also be employed. One aim is to permit a transient concentration of aerosol (e.g. fumes from cooking) to dissipate naturally, or be cleared by a person before resulting in a fire alarm. The c.i.e. shall be capable of receiving a second fire signal from the same fire detector within 60 s, and this effectively sets the maximum processing delays which may be introduced within the c.i.e. and the fire detector. There is no requirement to provide an indication of the first fire signal, but in

some applications it may be appropriate to provide a local (e.g. an audible) warning. The benefits are reduced if the time period for dependency following a first fire signal is too long, and a maximum of 30 min is specified.

Type B dependency (see 7.12.2) provides for the entry to the fire alarm condition to depend on a fire signal from two or more fire detectors. In this case, the first fire signal shall be indicated, but not in the same manner as in the fire alarm condition. Except in special cases, fire detectors should be located in the same fire volume, i.e. with smoke detectors the combustion products should be free to diffuse from a source of combustion to more than one fire detector or identifiable sampling point, and with flame detectors the source of a fire should be visible from more than one detector. If the fire detectors are in different zones, these zones are co-sited in such a way to meet the above criteria. It shall be possible to manually cancel the first alarm state at Access Level 2. The first alarm state may also be automatically cancelled with a minimum dependency time period of 5 min. This time period depends on the fire detection application, and it may need to be significantly longer in order to detect slowly developing fires.

Type C dependency (see 7.12.3.) also depends on a fire signal from two or more points, but these may be fire detectors or manual call points. In this case, the c.i.e. enters the fire alarm condition on the first alarm, but the activation of mandatory outputs could be inhibited. In the case of fire detectors, the same siting considerations apply as for Type B dependency. Delays to outputs (as under 7.11) are commonly used in conjunction with Type C dependency, to provide for the automatic activation of outputs should a second fire signal not be received before the delay expires.

Annex F
(informative)

Systems related to the supervisory signal condition

Clause 8 on the supervisory signal condition refers to “other life safety or property protection systems” which may be monitored by the c.i.e. The following are examples of such systems:

— guard tour systems;

— fire suppression systems, such as the monitoring of

  — valve position,

  — water temperature,

  — water pressure, or

  — pump conditions;

— air handling systems, such as the monitoring of

  — damper positions, or

  — fan operation.

Annex G
(informative)

Fault recognition and indication

Clause 9 requires that the faults most likely to occur in a fire alarm system can be recognized and indicated, so that they may be repaired as soon as possible. These include the following:

— certain faults within the c.i.e. itself, and, in transmission paths, between parts of the c.i.e. contained in more than one cabinet;

— faults in transmission paths to other components of an installed system, where these are in different cabinets to that of the c.i.e.;

— faults in other components of an installed system, as defined in ISO 7240-1.

The faults fall into three classes, which are described in

— 9.2 and 9.3, for faults in specified functions,

— 9.4, for total loss of power supply (option with requirements), and

— 9.5, for system fault.

These classes differ in the implications of the fault, hence the reason for the different requirements. Faults according to 9.2 and 9.3 are assumed to affect only the specified function, the rest of the c.i.e. and its connected system remaining fully operational. Faults according to 9.4 and 9.5 can lead to a partial or total loss of all the functions of the c.i.e.

This part of ISO 7240 does not define the technical means for recognizing faults. It defines those faults which are to be recognized and how these are to be indicated. For example, the monitoring for short circuits or interruptions in transmission paths may be carried out by the c.i.e. or by other components of the connected system. However, all the recognized faults have to be indicated on the c.i.e.

The monitoring for faults within other components of the installed system could be at intervals less frequent than 100 s. The c.i.e. has to indicate a fault within 100 s of receiving a signal from this component.

Both automatic and manual reset are possible on the same c.i.e., since it could be desirable that certain fault indications reset automatically, whilst others are latched until a manual reset. In the case of a system fault, only a manual reset is permitted, because of the special implications.

Annex H
(informative)

Standardized input/output interface for the connection of ancillary equipment (e.g. fire brigade panel)

The input/output interface is an optional part of the c.i.e. which transmits information on the status of the c.i.e. to ancillary equipment. It is also capable of receiving signals and activating the appropriate functions on the c.i.e. The ancillary equipment is not a part of the c.i.e. for the purposes of this part of ISO 7240, although it may be mechanically integrated with the c.i.e. in the same cabinet.

Clause 12 specifies the functions which are to be included in the interface. All the specified functions are to be included if a manufacturer declares compliance with this option. The requirements for fire brigade panels differ within the ISO countries, because of differences in national fire fighting practices. Rather than attempting to harmonize fire brigade panels at an international level, an interface has been specified which implements the more common functions used in the ISO countries. Consequently, more input and output functions have been specified than may be needed for any given piece of equipment.

It might not be necessary to call up this option for the connection of ancillary equipment (e.g. a fire brigade panel) which conforms to specific application guidelines or local regulations. As an option without requirements, a sub-set of the functions listed may be provided for this purpose.

No electrical specifications for the interface are given in this part of ISO 7240. In 13.2.1 it is required that the manufacturer's technical documentation give sufficient information to permit the specification of compatible ancillary equipment.

Annex I
(informative)

Integrity of transmission paths

In 13.5.2, providing a capability in the c.i.e. to limit the consequences of faults in detection circuits, or in other transmission paths, is addressed.

If the manufacturer declares that points covering more than one zone may be connected to a detection circuit, or that components performing more than one function may be connected to a transmission path, at least the following measures should be taken.

— The relevant detection circuits, or transmission paths should be capable of being installed as loops.

— The interfaces of the c.i.e. should be capable of independently powering and receiving signals from each end of a loop.

— Compatible devices should be available for installation on detection circuits, or transmission paths, which are capable of automatically isolating short circuits. These devices may be physically incorporated within other components of ISO 7240.

Similar considerations apply to 13.5.3, which relates to limiting the consequences of faults in transmission paths between different parts of c.i.e. contained in more than one cabinet.

Annex J
(informative)

Design requirements for software-controlled control and indicating equipments

The c.i.e. could incorporate software-controlled elements, which are required to fulfil mandatory requirements of ISO 7240-2, but which are supplied to the manufacturer. A good example is an alphanumeric display module, but there are many possibilities, including both physical modules and embedded software (e.g. operating systems). Such elements may be traded world-wide as commodity items, and detailed software documentation (and for that matter details of the hardware design) might not be available to the c.i.e. manufacturer. It is not the intention of this document to forbid the use of appropriate technology, and in such cases the detailed requirements for documentation and design of 13.2. and 13.3. may be relaxed, at the discretion of the testing authority. However, it is expected that products from third parties which are designed and produced exclusively for a c.i.e be fully documented and fulfil the requirements. The manufacturer has to ensure that the element is of proven reliability and is suitable for the application. Proven reliability can be assumed if the components under question are freely available on the market and there is sufficient field experience (e.g. $\geqslant$ 1 year). The interface with the main application has to be clearly and comprehensively specified, and this documentation has to be available to the testing authority.

In 14.4 program monitoring is dealt with. The program is the software necessary for the c.i.e. to carry out mandatory functions (including any declared options with requirements). The execution of the entire program has to be monitored, and this can include software which runs in more than one processor and software in elements supplied to manufacturer. It is up to the manufacturer and the testing authority to agree how comprehensive the degree of monitoring needs to be, but in the case of an alphanumeric display module, it is considered to be sufficient to routinely check that data written to the module may be read back from it.

In 14.4.3 it is required that, in the event of a failure of program execution, the c.i.e. enter a safe state. The safe state is defined by the manufacturer, but it is expected that it will not result in the false activation of mandatory outputs, nor give a false impression to a user that the c.i.e. 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 memory may have been corrupted, the restart procedure should check the contents of this memory and, if necessary, re-initialise running data to ensure that the c.i.e. 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 c.i.e. to be capable of automatically recording details of the restart event. In any event, the system fault indication has to be latched until a manual intervention.

In 14.5.1 it is required that all executable code and data necessary to comply with this part of ISO 7240 be held in memory which is capable of continuous, unmaintained, reliable operation for a period of at least 10 years. 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.

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