INTERNATIONAL STANDARD

ISO 7240-11

Second edition
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Fire detection and alarm systems —

Part 11: Manual call points

Systèmes de détection et d'alarme d'incendie —

Partie 11: Déclencheurs manuels d'alarme

Reference number
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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 7240-11 was prepared by Technical Committee ISO/TC 21, *Equipment for fire protection and fire fighting*, Subcommittee SC 3, *Fire detection and alarm systems*.

This second edition cancels and replaces the first edition (ISO 7240-11:2005), which has been technically revised. It also incorporates the Amendment ISO 7240-11:2005/Amd.1:2009.

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 3: Audible alarm devices*

— *Part 4: Power supply equipment*

— *Part 5: Point-type heat detectors*

— *Part 6: Carbon monoxide fire detectors using electro-chemical cells*

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

— *Part 8: Carbon monoxide fire detectors using an electro-chemical cell in combination with a heat sensor*

— *Part 9: Test fires for fire detectors* [Technical Specification]

— *Part 10: Point-type flame detectors*

— *Part 11: Manual call points*

— *Part 12: Line type smoke detectors using a transmitted optical beam*

— *Part 13: Compatibility assessment of system components*

— *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 fire detectors using scattered light, transmitted light or ionization sensors in combination with a heat sensor*

— *Part 16: Sound system control and indicating equipment*

— *Part 17: Short-circuit isolators*

— *Part 18: Input/output devices*

— *Part 19: Design, installation, commissioning and service of sound systems for emergency purposes*

— *Part 20: Aspirating smoke detectors*

— *Part 21: Routing equipment*

— *Part 22: Smoke-detection equipment for ducts*

— *Part 24: Sound-system loudspeakers*

— *Part 25: Components using radio transmission paths*

— *Part 27: Point-type fire detectors using a scattered-light, transmitted-light or ionization smoke sensor, an electrochemical-cell carbon-monoxide sensor and a heat sensor*

— *Part 28: Fire protection control equipment*

A part 23 dealing with visual alarm devices and a part 29 dealing with video fire detectors are under development.

Introduction

This part of ISO 7240 has been prepared by ISO/TC 21/SC 3, the secretariat of which is held by SA and is based on ISO 7240-11:2005.

This part of ISO 7240 has been drafted on the basis of appearance and functions that should be provided on all manual call points for use in fire detection and fire alarm systems. The colours, dimensions, shapes and methods of operation are based on recognized operating principles that give confidence and recognition to the user when operating in genuine fire alarm situations.

The purpose of a manual call point is to enable a person discovering a fire to initiate the operation of a fire alarm system so that appropriate measures can be taken.

It is important for manual call points to be recognizable and simple to use, without the requirement to read elaborate instructions so that anyone discovering a fire is able to use the manual call point without previous familiarity with it.

The intention of this part of ISO 7240 is to specify requirements for operation and reliability. The methods of operation of the manual call points covered are as follows:

— type A: direct operation (single action);

— type B: indirect operation (double action).

Both types require the breaking or the visible displacement by change of the position of a frangible element forming part of the front face, which is considered as the most suitable method for general application and which acts as a deterrent to the misuse of the device.

Importance has been placed on identifying the manual call point, the method by which it is activated and an indication to the user that the initiation of an alarm has been given.

The resulting part of ISO 7340 takes into account national variances in custom and practice and language in bringing together common elements that contribute towards a standard device for use throughout the world.

The performance of manual call points is assessed from results obtained in specific tests. This part of ISO 7240 is not intended to place any other restrictions on the design and construction of such manual call points.

Fire detection and alarm systems —

Part 11:
Manual call points

1 Scope

This part of ISO 7240 specifies the requirements, test methods and performance criteria for manual call points in fire detection and alarm systems in and around buildings (see ISO 7240-1). It takes into account indoor and outdoor conditions, the appearance and operation of the manual call points for type A “direct operation” and type B “indirect operation”, and covers those which are simple mechanical switches, those which are fitted with simple electronic components (e.g. resistors, diodes) and those which contain active electronic components and which work with the control and indicating equipment for signalling and identifying, for example, an address or location.

This part of ISO 7240 does not cover manual call points for special applications, for example manual call points that are intrinsically safe or for use in hazardous conditions, if such applications require additional or other requirements or tests than those given in this part of ISO 7240.

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 209, *Aluminium and aluminium alloys — Chemical composition*

ISO 3098-0:1997, *Technical product documentation — Lettering — Part 0: General requirements*

ISO 3864-1, *Graphical symbols — Safety colours and safety signs — Part 1: Design principles for safety signs and safety markings*

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

ISO 7240-2, *Fire detection and alarm systems — Part 2: Control and indicating equipment*

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

IEC 60068-2-1, *Environmental testing — Part 2-1: Tests — Test A: Cold*

IEC 60068-2-2, *Environmental testing — Part 2-2: Tests — Test B: Dry heat*

IEC 60068-2-5, *Environmental testing — Part 2-5: Tests — Test Sa: Simulated solar radiation at ground level and guidance for solar radiation testing*

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

IEC 60068-2-18, *Environmental testing — Part 2-18: Tests — Test R and guidance: Water*

IEC 60068-2-27, *Environmental testing — Part 2-27: Tests — Test Ea and guidance: Shock*

IEC 60068-2-30, *Environmental testing — Part 2-30: Tests — Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60068-2-42, *Environmental testing — Part 2-42: Tests — Test Kc: Sulphur dioxide test for contacts and connections*

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

EN 894-3, *Safety of machinery — Ergonomics requirements for the design of displays and control actuators — Part 3: Control actuators*

EN 50130-4:1995, *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.

3.1
alarm condition
condition of the manual call point after the operating element has been activated

3.2
frangible element
component, composed of glass or having the appearance of glass and which after receiving a blow or pressure as instructed, is physically broken or is visibly displaced by change of position and remains in that condition until replaced or reset

NOTE The frangible element is intended to give protection against unintentional operation and to be a deterrent against misuse. The visible displacement of the frangible element is accepted as apparent breaking.

3.3
non-resettable frangible element
frangible element that it is necessary to replace after the activation of the manual call point, in order for the manual call point to be able to return to the normal condition

3.4
resettable frangible element
frangible element that can be returned to its original position without replacement, in order for the manual call point to be able to return to the normal condition

3.5
front face
area within the outline of the front view of the manual call point excluding the area of the operating face

NOTE See Figure 1.

3.6
manual call point
component of a fire detection and fire alarm system that is used for the manual initiation of an alarm

[ISO 7240-1]

NOTE Manual call points are divided into two types depending on the method of operation.

3.7
type A
direct operation manual call point in which the change to the alarm condition is automatic (i.e. without the requirement for further manual action) when the frangible element is broken or displaced

3.8
type B
indirect operation manual call point in which the change to the alarm condition requires a separate manual operation of the operating element by the user after the frangible element is broken or displaced

3.9
normal condition
condition in which the frangible element is undamaged or not displaced and the manual call point is operating without giving an alarm or fault signal

3.10
operating element
mechanical and electrical switching element, part of the manual call point that initiates the alarm signal when operated

3.11
operating face
area of the manual call point that can be the visible part of the frangible element or the visible area behind it

NOTE See Figure 1.

3.12
special tool
device not normally carried by the public (e.g. a key), normally provided by the manufacturer and which is used for replacing or resetting the frangible element

NOTE It is intended to deter unauthorized access to the manual call point, while being available on site either at a defined location or from a “responsible person” familiar with and having knowledge of the system.

4 Requirements

4.1 Compliance

In order to comply with this part of ISO 7240, the manual call point shall meet the requirements of this clause, which shall be verified by visual inspection or engineering assessment, shall be tested as described in Clause 5 and shall meet the requirements of the tests.

4.2 Marking and data

4.2.1 Marking

4.2.1.1 Each manual call point shall be permanently marked with the following information:

a) reference to this part of ISO 7240 (i.e. ISO 7240-11:2011);

b) name or trademark of the manufacturer or supplier;

c) model designation;

d) environment category (indoor/outdoor, special environmental conditions);

e) wiring terminal designations;

f) some mark(s) or code(s) (e.g. serial number or batch code), by which the manufacturer can identify, at least, the date or batch and place of manufacture, and the version number(s) of any software, contained within the manual call point.

4.2.1.2 Where any marking on the manual call point uses symbols or abbreviations not in common use, these shall be explained in the data supplied with the device.

4.2.1.3 The marking shall be visible during installation of the manual call point and shall be accessible during maintenance.

4.2.1.4 The markings shall not be placed on screws or other easily removable parts.

4.2.2 Data

4.2.2.1 Either the manual call points shall be supplied with sufficient technical, installation and maintenance data to enable their correct installation and operation or, if all of these data are not supplied with each manual call point, reference to the appropriate data sheet shall be given on, or with, each manual call point.

4.2.2.2 To enable correct operation of the manual call points, these data shall describe the requirements for the correct processing of the signals from the manual call point. This may be in the form of a full technical specification of these signals, a reference to the appropriate signalling protocol or a reference to suitable types of control and indicating equipment, etc.

4.2.2.3 Additional information can be required by organizations certifying that manual call points produced by a manufacturer conform to the requirements of this part of ISO 7240.

4.3 Frangible element

4.3.1 Normal condition

The normal condition shall be easily recognizable by the appearance of the operating face as detailed in 4.7. The frangible element shall be flat and shall not be broken, deformed or displaced.

4.3.2 Alarm condition

4.3.2.1 Transfer from the normal condition to the alarm condition shall be achieved by the following and shall be easily recognizable by the change in the appearance of the operating face:

a) for type A manual call points:

   1) breaking the frangible element, or

   2) displacing the frangible element as a result of the breaking, or

   3) displacing the frangible element without breaking together with changing the appearance of the front face;

b) for type B manual call points:

   1) breaking and/or displacement of the frangible element as described in 4.3.2.1 a), to give access to the operating element, or

   2) manual activation of the operating element.

4.3.2.2 In addition, for type B manual call points, it shall be possible to see that the operating element is in the activated position and it shall not be possible to activate the operating element without breaking or displacing the frangible element [see 4.3.2.1 b)] or without the use of a special tool (see 4.6)

4.4 Indicators for alarm condition

4.4.1 The alarm condition shall be indicated by,

a) for type A, the condition of the frangible element as specified in 4.3,

b) for type B, the frangible element as described in 4.3 together with an identifiable activated position of the operating element.

4.4.2 The alarm condition may be additionally indicated visually by other means, for example lamps or light-emitting diodes (LEDs).

4.4.3 If an additional visual indicator is provided, it shall be positioned within the operating face or within the front face of the manual call point. The visual indicator shall be red, shall identify the manual call point that released an alarm until the alarm condition is reset, and shall be visible from a distance of 2 m at up to 45° from the axis of the manual call point in any direction in an ambient light intensity up to 500 lx. Where other conditions of the manual call point are visually indicated, they shall be clearly distinguishable from the alarm indication, except when the manual call point is switched into a service mode.

4.5 Reset facility

4.5.1 It shall be possible to reset the manual call point after operation only by means of a special tool or special procedure as follows:

a) for non-resettable frangible elements, by inserting a new element;

b) for resettable frangible elements, by resetting the frangible element.

4.5.2 In addition, for type B manual call points, it shall be possible to return the operating element to its normal condition only by means of a special tool.

4.6 Test facility

4.6.1 The manual call point shall be equipped with a facility to carry out routine testing when installed. The operation of this test facility shall

a) simulate the alarm condition by activating the operating element without breaking the frangible element,

b) allow the manual call point to be reset without breaking the frangible element.

4.6.2 The operation of the test facility shall be possible only using a special tool or special procedure.

4.7 Construction and design

4.7.1 Safety

4.7.1.1 When operating the frangible element, injury to the operator shall not occur.

4.7.1.2 For type B manual call points, the actuation force of the operating element shall meet the requirements of EN 894-3.

4.7.1.3 Corners and edges of the manual call points shall be rounded to reduce the possibility of injury.

4.7.2 Shape, dimensions and colours

4.7.2.1 Shape

4.7.2.1.1 The front face shall be symmetrical about the horizontal axis and symmetrical about the vertical axis (see Figure 1).

4.7.2.1.2 The operating face

— shall be approximately symmetrical about the horizontal axis and symmetrical about the vertical axis (see Figure 1),

— shall be level with or recessed into the front face and shall not project beyond the front face,

— may have a vertical offset about the horizontal centre line of the front face.

4.7.2.2 Dimensions

4.7.2.2.1 The front face dimension, a, shall be not less than 85 mm and not greater than 150 mm (see Figure 1).

4.7.2.2.2 The operating face dimensions, b or b_1 and b_2, shall be not less than 34 mm and not greater than 0,8a (see Figure 1).

NOTE A subscript is used only if the two dimensions b_1 and b_2 are different.

4.7.2.2.3 The operating face horizontal centreline vertical offset, c, shall be not greater than 0,16a (see Figure 1).

4.7.2.2.4 The manual call point shall be designed so that it is capable of being mounted, in accordance with the manufacturer's instructions, with the front face at least 15 mm proud of the surrounding surface.

4.7.2.3 Colours

4.7.2.3.1 The colour of the visible surface area of the manual call point when mounted in accordance with 5.1.3 shall be red, except for

a) the operating face,

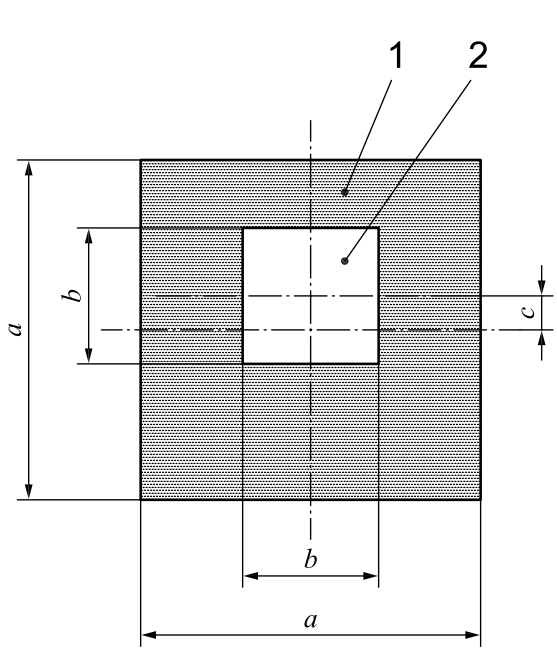
b) the symbols and lettering on the front face specified in 4.7.3.2,

c) the special tool access, cable entry holes and screws.

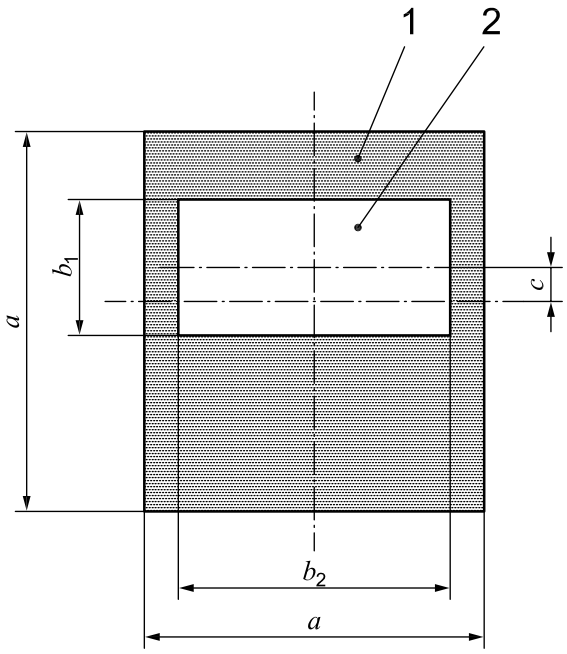
4.7.2.3.2 The colour of the operating face other than symbols and lettering specified in 4.7.3.3 shall be white.

4.7.2.3.3 The colour of the visible part of the operating element (type B manual call point) shall be black.

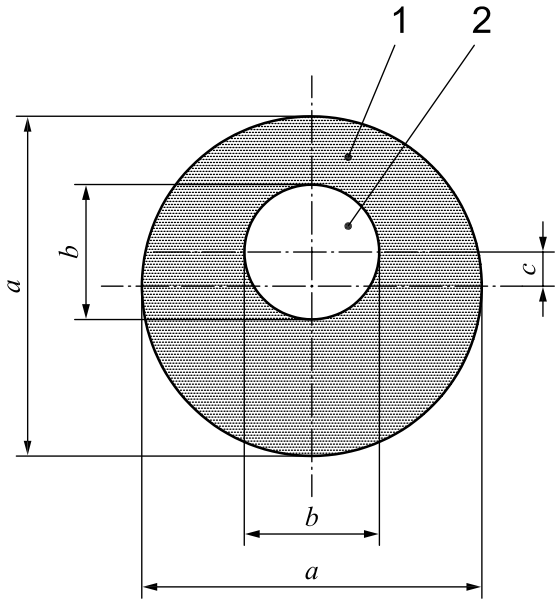
NOTE Suitable red, white and black colours are specified in ISO 3864-1.



a) Example of a square operating face



b) Example of rectangular operating face



c) Example of round operating face

Key

1	front face
2	operating face
a	front face dimension
b, b_1, b_2	operating face dimension
c	operating face horizontal centreline vertical offset

Figure 1 — Manual call point examples

4.7.3 Symbols and lettering

4.7.3.1 General

The manual call point shall be marked, with the appropriate symbols shown in Figure 2, as specified in 4.7.3.2 and 4.7.3.3. Examples of the arrangement of symbols on type A and type B manual call points are given in Figures 3 and 4, respectively.

4.7.3.2 Symbols and lettering on the front face

4.7.3.2.1 On the front face above the operating face and central to the vertical centre line shall be the symbol in accordance with Figure 2 a). This symbol may be supplemented with the word “FIRE”, or equivalent words in the national language. This combination shall be on the front face and above the operating face and central to the vertical centre line. The height of the symbol shall be at least 0,15a and the height of the lettering shall not exceed the height of the symbol. The lettering shall be in accordance with ISO 3098-0:1997, “lettering type B, vertical (V)”. Symbols and lettering shall be white in accordance with ISO 3864-1.

4.7.3.2.2 Markings other than specified in 4.7.3.2.1 (such as company logo or contact address) shall be restricted to the area of the front face below the horizontal centre line of the operating face. The total area for this marking other than red shall not be greater than 5 % of the area of the front face.

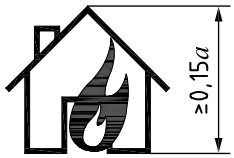
4.7.3.3 Symbols and lettering on the operating face

4.7.3.3.1 The operating face of type A manual call points shall be marked with the symbol in accordance with Figure 2 c). The operating face of type B manual call points shall be marked with the symbols in accordance with Figures 2 b) and 2 c). The symbol in accordance with Figure 2 b) shall point to the operating element and shall remain clearly visible when the frangible element is broken or displaced. These symbols may be supplemented by appropriate words for instruction. Where supplementary wording is used, this shall indicate position and/or operating action (e.g. “PRESS HERE”), in the appropriate language.

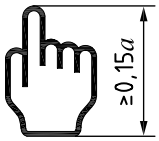
These symbols and lettering for any supplementary instructions shall be black, with the black area not exceeding 10 % of the area of the operating face.

NOTE A suitable black colour is specified in ISO 3864-1.

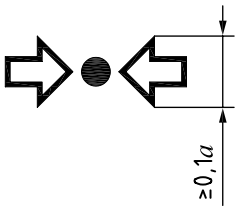
4.7.3.3.2 Markings other than those specified in 4.7.3.3.1 (such as company logo or contact address) shall be restricted to the upper and/or the lower 25 % of the area of the operating face and shall not interfere with the symbols. The total area for this marking other than white shall not be greater than 5 % of the area of the operating face.



a) Symbol on the front face (ISO 7000, symbol 2685)



b) Symbol on the operating face for activating the operating element for type B manual call point (ISO 7000, symbol 2684)



c) Symbol on the operating face (ISO 7000:2004, symbol 1701)

NOTE The dimensions and spacing of the symbols shall be in proportion to the height shown.

Key

a height of the front face; see Figure 1

Figure 2 — Symbols used for manual call points

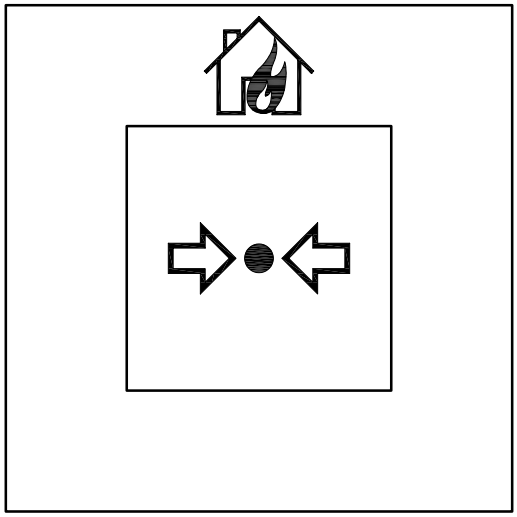


Figure 3 — Example for the front and operating face symbol positions for type A manual call point

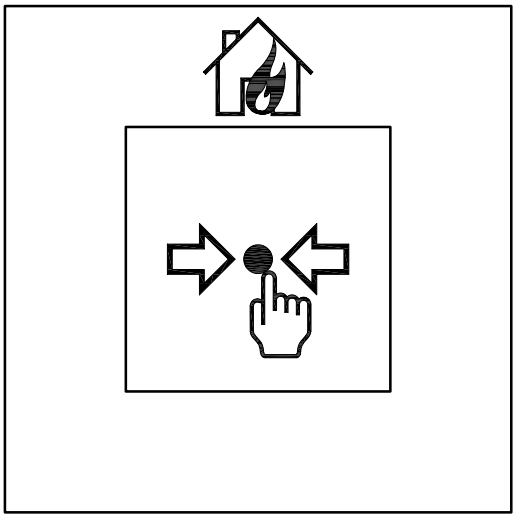


Figure 4 — Example for the front and operating face symbol positions for type B manual call point

4.7.4 Protection against accidental operation

4.7.4.1 In addition to the use of the frangible element, other means of protection may be used, e.g. a transparent flap.

4.7.4.2 Where used, the protection shall be easily and immediately removable and shall have clear instructions for its removal in order to operate the manual call point.

4.7.4.3 With the protection in place, the appearance of the manual call point, the instructions for its operation and the state of the manual call point in the normal and alarm condition shall be clearly visible.

4.7.5 Environment category

4.7.5.1 The environment category (i.e. indoor or outdoor use, special environmental conditions) of the manual call point shall be specified by the manufacturer.

4.7.5.2 The manual call point shall be tested in accordance with the specified environmental category as given in the test schedule in Table 1.

4.8 Requirements for software controlled manual call points

4.8.1 General

For manual call points that rely on software control, the requirements of 4.8.2, 4.8.3 and 4.8.4 shall be met in order to fulfil the requirements of this part of ISO 7240.

4.8.2 Software documentation

4.8.2.1 The manufacturer shall submit documentation that gives an overview of the software design. This documentation shall be in sufficient detail that the design can be inspected for compliance with this part of ISO 7240 and shall include at least the following:

a) functional description of the main program flow (e.g. as a flow diagram or schema), including

   1) a brief description of the modules and the functions that they perform,

   2) the way in which the modules interact,

3) the overall hierarchy of the program,

4) the way in which the software interacts with the hardware of the manual call point,

5) the way in which the modules are called, including any interrupt processing;

b) description of which areas of memory are used for the various purposes (e.g. the program, site-specific data and running data);

c) designation by which the software and its version can be uniquely identified.

4.8.2.2 The manufacturer shall prepare and maintain detailed design documentation. This shall be available for inspection in a manner that respects the manufacturers' rights for confidentiality. It shall be comprised of at least the following:

a) overview of the whole system configuration, including all software and hardware components;

b) description of each module of the program, containing at least

1) the name of the module,

2) a description of the tasks performed,

3) a description of the interfaces, including the type of data transfer, the valid data range and the checking for valid data;

c) full source code listings, as hard copy or in machine-readable form (e.g. ASCII-code), including all global and local variables, constants and labels used, and sufficient comment to recognize the program flow;

d) details of any software tools used in the design and implementation phase (e.g. CASE-tools, compilers).

NOTE This detailed design documentation can be reviewed at the manufacturer's premises.

4.8.3 Software design

In order to ensure the reliability of the manual call point, the following requirements for software design shall apply.

a) The software shall have a modular structure.

b) The design of the interfaces for manually and automatically generated data shall not permit invalid data to cause error in the program operation.

c) The software shall be designed to avoid the occurrence of deadlock of the program flow.

4.8.4 The storage of programs and data

4.8.4.1 The program necessary to comply with this part of ISO 7240 and any preset data, such as manufacturer's settings, shall be held in non-volatile memory. Writing to areas of memory containing this program and these data shall be possible only by the use of some special tool or code and shall not be possible during normal operation of the manual call point.

4.8.4.2 Site-specific data shall be held in memory that retains data for at least two weeks without external power to the manual call point, unless provision is made for the automatic renewal of such data, following loss of power, within 1 h of power being restored.

5 Tests

5.1 General

5.1.1 Atmospheric conditions for tests

5.1.1.1 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 in accordance with IEC 60068-1 as follows:

— temperature: (15 to 35) °C;

— relative humidity: (25 to 75) %;

— air pressure: (86 to 106) kPa.

5.1.1.2 If variations in these parameters have a significant effect on a measurement, then such variations should be kept to a minimum during a series of measurements carried out as part of one test on one specimen.

5.1.2 Operating conditions for tests

5.1.2.1 If a test method requires that a specimen be operational, then connect the specimen to suitable supply and monitoring equipment with characteristics as required by the manufacturer's data. Unless otherwise specified in the test method, set the supply parameters applied to the specimen within the manufacturer's specified range(s), which shall remain substantially constant throughout the tests. The value chosen for each parameter shall normally be the nominal value, or the mean of the specified range. If a test procedure requires monitoring a specimen to detect any alarm or fault signals, then make connections to any necessary ancillary devices (e.g. through wiring to an end-of-line device for conventional manual call points) to allow the recognition of a fault signal.

5.1.2.2 The details of the supply and monitoring equipment and the alarm criteria used shall be given in the test report (see Clause 6).

5.1.3 Mounting arrangements

Mount the specimen by its normal means of attachment in accordance with the manufacturer's instructions. If these instructions describe more than one method of mounting then the method considered to be the least favourable shall be chosen for each test.

5.1.4 Tolerances

5.1.4.1 Unless otherwise stated, the tolerances for the environmental test parameters shall be as given in the basic reference standards for the test (e.g. the relevant part of IEC 60068).

5.1.4.2 If a specific tolerance or deviation limit is not specified in a requirement or test procedure, then a deviation limit of $\pm$ 5 % shall be applied.

5.1.5 Measurement of response time

5.1.5.1 Where the release of an alarm signal in the following tests is required, the alarm signal shall be indicated at the supply and monitoring equipment (see 5.1.2) within a response time of 10 s after the operating element has been activated.

5.1.5.2 Measure and report the response time.

5.1.6 Provisions for tests

5.1.6.1 The following shall be provided for testing compliance with this part of ISO 7240:

a) for manual call points that are simple switches or contain simple electronic components:

   — 8 specimens for indoor use, or

   — 10 specimens for outdoor use;

b) for manual call points with active electronic components:

   — 13 specimens for indoor use, or

   — 15 specimens for outdoor use;

c) 30 additional frangible elements if replacement of the element to reset the manual call point is necessary;

d) technical data sheets or specifications in accordance with 4.2.2;

e) additional technical information, if required, e.g. diagrams, design drawings with dimensions, parts lists and material data.

5.1.6.2 The specimens submitted shall be representative of the manufacturer's normal production with regard to their construction and settings.

5.1.7 Test schedule

5.1.7.1 Number the specimens randomly with the following specifications:

a) 1 to 8, if they are for indoor use and are simple switches or contain simple electronic components;

b) 1 to 13, if they are for indoor use and contain active electronic components;

c) 1 to 8, 14 and 15 if they are for outdoor use and are simple switches or contain simple electronic components;

d) 1 to 15, if they are for outdoor use and contain active electronic components.

5.1.7.2 Record any change in the number and numbering of specimens, e.g. in line with in Table 1, in the test report accordingly.

5.1.7.3 All specimens shall be initially tested in accordance with the test facility test of 5.4 and then be tested in accordance with Table 1.

Table 1 — Test schedule

Test	Number of specimen	Subclause number	Indoor use	Outdoor use
Variation of supply parameters	2	5.6	x	x
Dry heat (operational)	1	5.7	x	x
Dry heat (endurance)	1	5.8	—	x
Cold (operational)	2	5.9	x	x
Damp heat, cyclic (operational)	3	5.10	x	x
Damp heat, cyclic (endurance)	3	5.11	—	x
Damp heat, steady state (endurance)	4	5.12	x	x
SO_2 corrosion (endurance)	5	5.13	x	x
Shock (operational)	6	5.14	x	x
Impact (operational)	7	5.15	x	x
Vibration (operational)	8	5.16	x	x
Vibration (endurance)	8	5.17	x	x
Electromagnetic compatibility (operational)[a], i.e. a) electrostatic discharge b) radiated electromagnetic fields c) conducted disturbances induced by electromagnetic fields d) voltage transient, fast transient bursts e) voltage transient, slow high-energy voltage surge	 9[b] 10[b] 11[b] 12[b] 13[b]	5.18	x	x
Enclosure protection	14	5.19	—	x
Exposure to simulated solar radiation (endurance)	15	5.20	—	x

[a] Test only for manual call points with active electronic components.

[b] In the interests of test economy, it is permitted to use the same specimen for more than one EMC test. In that case, intermediate functional test(s) on the specimen(s) used for more than one test may be deleted, and the full functional test conducted at the end of the sequence of tests. However it should be noted that in the event of a failure, it might not be possible to identify which test exposure caused the failure (see EN 50130-4:1995, Clause 4).

5.2 Operational performance

5.2.1 Object of test

The object of the test is to demonstrate that the device is able to withstand small forces to the frangible element without operation, is able to operate when an appropriate force is applied to the frangible element by the user and that its reset and test facilities are not impaired.

5.2.2 Test procedure

5.2.2.1 Test for non-operation

5.2.2.1.1 State of the specimen during test

Mount the specimen in accordance with 5.1.3 and connected it to suitable supply and monitoring equipment as described in 5.1.2.

5.2.2.1.2 Initial state

At the start of the test, the specimen shall be in its normal condition.

5.2.2.1.3 Conditioning

5.2.2.1.3.1 Subject the frangible element to a horizontal force increasing at a rate not exceeding 5 N/s until it reaches (22,5 ± 2,5) N.

5.2.2.1.3.2 Maintain this force for 5 s then release the force at a rate not exceeding 5 N/s.

5.2.2.1.3.3 The position where this force shall be exerted is the centre point between the arrows; see Figure 2 c). An example of a suitable test apparatus is shown in Annex B.

5.2.2.1.4 Measurements during testing

Monitor the specimen during the test period to detect any alarm or fault signals.

5.2.2.1.5 Final measurements

After the force has been released, examine the frangible element.

Test the specimen as described in the test facility test of 5.4.

5.2.2.2 Test for operation

5.2.2.2.1 Conditioning

5.2.2.2.1.1 Subject the frangible element to a horizontal impact within 5 mm of the centre point between the arrows; see Figure 2. Produce the impact by using the test apparatus in accordance with Annex A. Allow the ball to strike the specimen once only.

5.2.2.2.1.2 For type B manual call points, manually operate the operating element.

5.2.2.2.2 State of the specimen during test

Mount the specimen on the test apparatus (see Annex A) in its normal operating position in accordance with 5.1.3 and connect it to suitable supply and monitoring equipment as described in 5.1.2.

5.2.2.2.3 Initial state

At the start of the test, the specimen shall be in its normal condition.

5.2.2.2.4 Resetting

After operation, reset the specimen to its normal condition by using the reset facility of 4.5.

5.2.2.2.5 Measurements during testing

Monitor the specimen during the test and resetting period to detect any alarm or fault signals.

5.2.3 Requirements

5.2.3.1 In the test of 5.2.2.1, the frangible element shall not transfer into the alarm condition and no alarm or fault signal shall be given, except as required in the test of 5.2.2.1.5. In the test of 5.2.2.1.5, the specimen shall comply with the requirements of 5.4.3.

5.2.3.2 For type A, in the test of 5.2.2.2, the frangible element shall transfer into the alarm condition and an alarm signal shall be given in accordance with 5.1.5. After the specimen has been reset by use of the reset facility of 4.5, there shall be no alarm or fault signal.

5.2.3.3 For type B, in the test of 5.2.2.2, the frangible element shall transfer into the alarm condition and an alarm signal shall be given in accordance with 5.1.5 after activation of the operating element. After the specimen has been reset by use of the reset facility of 4.5 there shall be no alarm or fault signal.

5.3 Function test

5.3.1 Object of test

The object of the test is to demonstrate the ability of the electrical parts of the device to function correctly.

5.3.2 Test procedure

5.3.2.1 Perform the test either as described in 5.2.2.2 (test for operation) or by using the test facility according to 4.6 or some other means that activates the operating element.

NOTE This can be parts or combinations of the operational performance test and the test facility test with suitable modifications to help the test laboratories to carry out the environmental tests.

5.3.2.2 For the dry heat (operational) test according to 5.7 and cold (operational) test according to 5.9, use a procedure that does not result in breakage of the frangible element for the function tests during conditioning [see 5.7.2.4.2 and 5.9.2.4.2, respectively].

5.3.3 Requirements

An alarm signal shall be given in accordance with 5.1.5, when the operating element has been activated.

5.4 Test facility test (operational)

5.4.1 Object of test

The object of the test is to demonstrate the ability of the test facility (see 4.6) of the device to function correctly.

5.4.2 Test procedure

5.4.2.1 General

Conduct the test in accordance with the manufacturer's instructions for routine testing by using the test facility of 4.6.

5.4.2.2 State of the specimen during test

Mount the specimen in accordance with 5.1.3 and connect it to suitable supply and monitoring equipment as described in 5.1.2.

5.4.2.3 Measurements during testing

Monitor the specimen during the test period to detect any alarm or fault signals.

5.4.3 Requirements

5.4.3.1 An alarm signal shall be given in accordance with 5.1.5 when the test facility has been operated.

5.4.3.2 No fault signal shall be given during the test.

5.4.3.3 When reset in accordance with the manufacturer's instructions, the specimen shall return to its normal condition.

5.5 Reliability (endurance)

5.5.1 Object of test

The object of the test is to demonstrate the reliability of the operating element.

5.5.2 Test procedure

5.5.2.1 Test apparatus

Use a suitable method of activating and resetting the operating element, which for type A simulates the alarm condition of the frangible element, followed by the resetting to its normal condition, and for type B activates and resets the operating element with the frangible element removed.

NOTE If suitable, the test facility of 4.6 can be used for this test.

5.5.2.2 State of the specimen during conditioning

Mount the specimen in accordance with 5.1.3 and connect it to suitable supply and monitoring equipment as described in 5.1.2. Adjust the supply parameters within the manufacturer's specifications for conditions most likely to cause failure.

5.5.2.3 Conditioning

Activate and reset the operating element 250 times.

5.5.2.4 Final measurements

5.5.2.4.1 Visually inspect the specimen for any damage.

5.5.2.4.2 Test the specimen as described in the operational performance test of 5.2.

5.5.3 Requirements

5.5.3.1 There shall be no visible damage to the specimen likely to impair its operation.

5.5.3.2 In the test of 5.5.2.4.2, the specimen shall comply with the requirements of 5.2.3.

5.6 Variation of supply parameters

5.6.1 Object of test

The object of the test is to demonstrate that within the specified range(s) of the supply parameters (e.g. voltage), the ability of the device to signal an alarm is not unduly dependent on the supply parameters.

5.6.2 Test procedure

5.6.2.1 State of the specimen during conditioning

Connect the specimen to suitable supply and monitoring equipment as described in 5.1.2.

5.6.2.2 Conditioning

Set the supply parameters within the manufacturer's specifications to the upper limit for a period of 5 min and then to the lower limit for a period of 5 min. The values of the parameters shall be reported.

5.6.2.3 Measurements during conditioning

5.6.2.3.1 Monitor the specimen during the conditioning period to detect any alarm or fault signals.

5.6.2.3.2 At the end of each conditioning period, perform the function test of 5.3 at the upper and lower limits.

5.6.2.3.3 Reset the specimen after each function test.

5.6.3 Requirements

5.6.3.1 No alarm or fault signals shall be given during the conditioning period, except as required in the tests of 5.6.2.3.2.

5.6.3.2 In the test of 5.6.2.3.2, the specimen shall comply with the requirements of 5.3.3.

5.6.3.3 After the specimen has been reset, there shall be no alarm or fault signal.

5.7 Dry heat (operational)

5.7.1 Object of test

The object of the test is to demonstrate the ability of the device to function correctly at high ambient temperatures, which can occur for short periods in the anticipated service environment.

5.7.2 Test procedure

5.7.2.1 Reference

The test apparatus and the test procedure shall be in accordance with IEC 60068-2-2, test Bb and with 5.7.2.2 to 5.7.2.5.

5.7.2.2 State of the specimen during conditioning

Mount the specimen in accordance with 5.1.3 and connect the specimen to suitable supply and monitoring equipment as described in 5.1.2. Adjust the supply parameters to be within the manufacturer's specifications for conditions most likely to cause failure.

5.7.2.3 Conditioning

Apply the appropriate test conditions in Table 2.

Table 2 — Conditions for dry heat (operational) test

Parameters	Indoor use	Outdoor use
Temperature, °C	55 ± 2	70 ± 2
Duration, h	16	

5.7.2.4 Measurements during conditioning

5.7.2.4.1 Monitor the specimen during the conditioning period to detect any alarm or fault signals.

5.7.2.4.2 During the last half hour of the conditioning period, perform the function test of 5.3.

5.7.2.5 Final measurements

5.7.2.5.1 After a recovery period of at least 1 h at standard atmospheric conditions in accordance with 5.1.1, reset the specimen and then test the specimen as described in the operational performance test of 5.2.

5.7.2.5.2 The dry heat operational and endurance tests may be combined such that the specimen for outdoor use is subjected to the operational test conditioning followed (after resetting) by the endurance test conditioning. Only one final measurement shall be made.

5.7.3 Requirements

5.7.3.1 No alarm or fault signal shall be given during the conditioning period, except as required in the test of 5.7.2.4.

5.7.3.2 In the test of 5.7.2.4.2, the specimen shall comply with the requirements of 5.3.3.

5.7.3.3 In the test of 5.7.2.5, the specimen shall comply with the requirements of 5.2.3.

5.8 Dry heat (endurance)

5.8.1 Object of test

The object of the test is to demonstrate the ability of the device to withstand long-term ageing effects.

5.8.2 Test procedure

5.8.2.1 Reference

The test apparatus and the test procedure shall be in accordance with IEC 60068-2-2, test Bb and with 5.8.2.2 to 5.8.2.4.

5.8.2.2 State of the specimen during conditioning

Mount the specimen in accordance with 5.1.3. Do not supply power during the conditioning.

5.8.2.3 Conditioning

Apply the appropriate test conditions in Table 3.

Table 3 — Conditions for dry heat (endurance) test

Parameters	Indoor use	Outdoor use
Temperature, °C	No test	70 ± 2
Duration, d		21

5.8.2.4 Final measurements

After a recovery period of at least 1 h at standard atmospheric conditions in accordance with 5.1.1, test the specimen as described in the reliability test of 5.5.

5.8.3 Requirements

5.8.3.1 No fault signal attributable to the endurance conditioning shall be given on connection of the specimen.

5.8.3.2 In the test of 5.8.2.4, the specimen shall comply with the requirements of 5.5.3.

5.9 Cold (operational)

5.9.1 Object of test

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

5.9.2 Test procedure

5.9.2.1 Reference

The test apparatus and the test procedure shall be in accordance with IEC 60068-2-1, test Ab and with 5.9.2.2 to 5.9.2.5.

5.9.2.2 State of the specimen during conditioning

Mount the specimen in accordance with 5.1.3 and connect the specimen to suitable supply and monitoring equipment as described in 5.1.2. Adjust the supply parameters to be within the manufacturer's specifications for conditions most likely to cause failure.

5.9.2.3 Conditioning

Apply the appropriate test conditions in Table 4.

Table 4 — Conditions for cold (operational) test

Parameters	Indoor use	Outdoor use
Temperature, °C	-10 ± 3	-25 ± 3[a]
Duration, h	16	
[a] For countries with special cold conditions: (-40 ± 3) °C.		

5.9.2.4 Measurements during conditioning

5.9.2.4.1 Monitor the specimen during the conditioning period to detect any alarm or fault signals.

5.9.2.4.2 During the last half hour of the conditioning period, perform the function test of 5.3.

5.9.2.5 Final measurements

After a recovery period of at least 1 h at standard atmospheric conditions in accordance with 5.1.1, reset the specimen and then test the specimen as described in the operational performance test of 5.2.

5.9.3 Requirements

5.9.3.1 No alarm or fault signal shall be given during the conditioning period, except as required in the test of 5.9.2.4.

5.9.3.2 In the test of 5.9.2.4.2, the specimen shall comply with the requirements of 5.3.3.

5.9.3.3 In the test of 5.9.2.5, the specimen shall comply with the requirements of 5.2.3.

5.10 Damp heat, cyclic (operational)

5.10.1 Object of test

The object of the test is to demonstrate the ability of the device to function correctly at high relative humidity, where condensation occurs on the manual call point.

5.10.2 Test procedure

5.10.2.1 Reference

The test apparatus and the test procedure shall be in accordance with IEC 60068-2-30, test Db, using the Variant 1 test cycle and controlled recovery conditions, and with 5.10.2.2 to 5.10.2.4.

5.10.2.2 State of the specimen during conditioning

Mount the specimen in accordance with 5.1.3 and connect the specimen to suitable supply and monitoring equipment as described in 5.1.2. Adjust the supply parameters to be within the manufacturer's specifications for conditions most likely to cause failure.

5.10.2.3 Conditioning

Apply the appropriate test conditions in Table 5.

Table 5 — Conditions for damp heat, cyclic (operational) test

Parameters	Indoor use	Outdoor use
Lower temperature, °C	25 ± 3	
Relative humidity (lower temperature), %	> 95	
Upper temperature, °C	40 ± 2	55 ± 2
Relative humidity (upper temperature), %	93 ± 3	
Number of cycles	2	

5.10.2.4 Measurements during conditioning

Monitor the specimen during the conditioning period to detect any alarm or fault signals.

5.10.2.5 Final measurements

5.10.2.5.1 After the recovery period specified in IEC 60068-2-30, test the specimen as described in the operational performance test of 5.2.

5.10.2.5.2 The damp heat, cyclic operational and endurance tests may be combined such that the specimen for outdoor use is subjected to the operational test conditioning followed by the endurance test conditioning. Only one final measurement shall be made.

5.10.3 Requirements

5.10.3.1 No alarm or fault signals shall be given during the conditioning period.

5.10.3.2 In the test of 5.10.2.5, the specimen shall comply with the requirements of 5.2.3.

5.11 Damp heat, cyclic (endurance)

5.11.1 Object of test

The object of the test is to demonstrate the ability of the device to withstand the longer-term effects of high humidity and condensation.

5.11.2 Test procedure

5.11.2.1 Reference

The test apparatus and the test procedure shall be in accordance with IEC 60068-2-30, test Db, using the Variant 1 test cycle and controlled recovery conditions, and with 5.11.2.2 to 5.11.2.4.

5.11.2.2 State of the specimen during conditioning

Mount the specimen in accordance with 5.1.3. Do not supply power during the conditioning.

5.11.2.3 Conditioning

Apply the appropriate test conditions in Table 6.

Table 6 — Conditions for damp heat, cyclic (endurance) test

Parameters	Indoor use	Outdoor use
Lower temperature, °C	No test	25 ± 3
Relative humidity (lower temperature), %		> 95
Upper temperature, °C		55 ± 2
Relative humidity (upper temperature), %		93 ± 3
Number of cycles		6

5.11.2.4 Final measurements

After the recovery period specified in IEC 60068-2-30, test the specimen as described in the operational performance test of 5.2.

5.11.3 Requirements

5.11.3.1 No fault signal attributable to the endurance conditioning shall be given on connection of the specimen.

5.11.3.2 In the test of 5.11.2.4, the specimen shall comply with the requirements of 5.2.3.

5.12 Damp heat, steady state (endurance)

5.12.1 Object of test

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

5.12.2 Test procedure

5.12.2.1 Reference

The test apparatus and the test procedure shall be in accordance with IEC 60068-2-78, test Cb and with 5.12.2.2 to 5.12.2.4.

5.12.2.2 State of the specimen during conditioning

Mount the specimen in accordance with 5.1.3. Do not supply power during the conditioning.

5.12.2.3 Conditioning

Apply the test conditions in Table 7.

Table 7 — Conditions for damp heat, steady state (endurance) test

Parameters	Indoor use	Outdoor use
Temperature, °C	40 ± 2	
Relative humidity, %	93 ± 3	
Duration, d	21	

5.12.2.4 Final measurements

After a recovery period of at least 1 h at standard atmospheric conditions in accordance with 5.1.1, test the specimen as described in the reliability test of 5.5.

5.12.3 Requirements

5.12.3.1 No fault signal attributable to the endurance conditioning shall be given on connection of the specimen.

5.12.3.2 In the test of 5.12.2.4, the specimen shall comply with the requirements of 5.5.3.

5.13 SO_2 corrosion (endurance)

5.13.1 Object of test

The object of the test is to demonstrate the ability of the device to withstand the corrosive effects of sulfur dioxide as an atmospheric pollutant.

5.13.2 Test procedure

5.13.2.1 Reference

The test apparatus and the test procedure shall be in accordance with IEC 60068-2-42, test Kc, except for the relative humidity of the test atmosphere, which shall be (93 ± 3) % instead of (75 ± 5) %, and with 5.13.2.2 to 5.13.2.4.

5.13.2.2 State of the specimen during conditioning

Mount the specimen in accordance with 5.1.3. Do not supply the specimen with power, but connect untinned copper wires of the appropriate diameter to the terminals to allow the final measurements to be made without making further connections to the specimen.

5.13.2.3 Conditioning

Apply the test conditions in Table 8.

Table 8 — Conditions for SO_2 corrosion (endurance) test

Parameters	Indoor use	Outdoor use
Sulfur dioxide content, µl/l[a]	25 ± 5	
Temperature, °C	25 ± 2	
Relative humidity, %	93 ± 3	
Duration, d	21	
[a] Corresponds to ppm per volume in IEC 60068-2-42.		

5.13.2.4 Final measurements

5.13.2.4.1 Immediately after the conditioning, subject the specimen to a drying period of 16 h at (40 ± 2) °C, and relative humidity of ≤ 50 %, followed by a recovery period of 1 h to 2 h at standard atmospheric conditions in accordance with 5.1.1.

5.13.2.4.2 After the recovery period, test the specimen as described in the operational performance test of 5.2.

5.13.3 Requirements

5.13.3.1 No fault signal attributable to the endurance conditioning shall be given on connection of the specimen.

5.13.3.2 In the test of 5.13.2.4, the specimen shall comply with the requirements of 5.2.3.

5.14 Shock (operational)

5.14.1 Object of test

The object of the test is to demonstrate the immunity of the device to mechanical shocks, which are likely to infrequently occur in the anticipated service environment.

5.14.2 Test procedure

5.14.2.1 Reference

The test apparatus and the test procedure shall be in accordance with IEC 60068-2-27, test Ea, for a half sine wave pulse, but with the peak acceleration related to the specimen mass as indicated in Table 9, and with 5.14.2.2 to 5.14.2.5.

5.14.2.2 State of the specimen during conditioning

Mount the specimen in accordance with 5.1.3 to a rigid fixture and connect the specimen to suitable supply and monitoring equipment as described in 5.1.2.

5.14.2.3 Conditioning

For specimens with a mass $M \leq 4{,}75$ kg, apply the test conditions in Table 9. No test is applied to specimens with a mass $M > 4{,}75$ kg.

Table 9 — Conditions for shock (operational) test

Parameters	Indoor use	Outdoor use
Shock pulse type	Half sine	
Pulse duration, ms	6	
Peak acceleration, m/s^2	10 (100 – 20 M)	
Number of directions	6	
Pulses per direction	3	

5.14.2.4 Measurements during conditioning

Monitor the specimen during the conditioning period and for a further 2 min to detect any alarm or fault signals.

5.14.2.5 Final measurements

After the conditioning, test the specimen as described in the operational performance test of 5.2.

5.14.3 Requirements

5.14.3.1 No alarm or fault signals shall be given during the conditioning period or the additional 2 min.

5.14.3.2 In the test of 5.14.2.5, the specimen shall comply with the requirements of 5.2.3.

5.15 Impact (operational)

5.15.1 Object of test

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

5.15.2 Test procedure

5.15.2.1 Apparatus

5.15.2.1.1 The test apparatus shall consist of a swinging hammer incorporating a rectangular-section aluminium alloy head (aluminium alloy Al Cu_4 Si Mg complying with ISO 209, solution-treated and precipitation-treated condition) with the plane-impact face chamfered to an angle of 60° to the horizontal, when in the striking position (i.e. when the hammer shaft is vertical). The hammer head shall be (50 ± 2,5) mm high, (76 ± 3,8) mm wide and (80 ± 4) mm long at mid-height as shown in Figure C.1. A suitable apparatus is described in Annex C.

5.15.2.1.2 The hardwood mounting board shall have width and height dimensions of not less than 20 mm greater than the dimensions a and b in Figure 1, a minimum thickness of 40 mm and a minimum mass of not less than five times that of the manual call point. It shall be fixed to the rigid frame to allow the manual call point to be located in the positions shown in Figures C.2 and C.3.

5.15.2.2 State of the specimen during conditioning

5.15.2.2.1 Mount the specimen to the test apparatus in accordance with 5.1.3 and connect the specimen to suitable supply and monitoring equipment as described in 5.1.2.

5.15.2.2.2 Position the specimen so that it is struck by the middle of the lower half of the impact face when the hammer is in the vertical position (i.e. when the hammerhead is moving horizontally).

5.15.2.2.3 Apply a first impact to the specimen from the side to the left or right lower side edge where the hammer head is moving (in parallel) not more than 5 mm apart from the specimen's mounting board (see Figure C.2).

5.15.2.2.4 Apply a second impact from the front to the central part of the lower edge of the front face (see Figure C.3).

5.15.2.3 Conditioning

Apply the test conditions in Table 10.

Table 10 — Conditions for impact (operational) test

Parameters	Indoor use	Outdoor use
Impact energy, J	1,9 ± 0,1	
Hammer velocity, m/s	1,5 ± 0,13	
Number of impact positions	2	
Number of impacts per position	1	

5.15.2.4 Measurements during conditioning

Monitor the specimen during the conditioning period and for a further 2 min to detect any alarm or fault signals.

5.15.2.5 Final measurements

After the conditioning, test the specimen as described in the operational performance test of 5.2.

5.15.3 Requirements

5.15.3.1 No alarm or fault signals shall be given during the conditioning period or the additional 2 min.

5.15.3.2 In the test of 5.15.2.5, the specimen shall comply with the requirements of 5.2.3.

5.16 Vibration, sinusoidal (operational)

5.16.1 Object of test

The object of the test is to demonstrate the immunity of the device to vibration at levels considered appropriate to the normal service environment.

5.16.2 Test procedure

5.16.2.1 Reference

The test apparatus and the test procedure shall be in accordance with IEC 60068-2-6, test Fc and with 5.16.2.2 to 5.16.2.5.

5.16.2.2 State of the specimen during conditioning

5.16.2.2.1 Mount the specimen to the test apparatus in accordance with 5.1.3 and connect the specimen to suitable supply and monitoring equipment as described in 5.1.2.

5.16.2.2.2 Apply the vibration in each of three mutually perpendicular axes, in turn. Mount the specimen so that one of the three axes is perpendicular to its normal mounting plane.

5.16.2.3 Conditioning

Apply the test conditions in Table 11.

Table 11 — Conditions for vibration, sinusoidal (operational) test

Parameters	Indoor use	Outdoor use
Frequency range, Hz	10 to 150	
Acceleration amplitude, m/s^2	5 ($\approx$ 0,5 g_n)	
Number of axes	3	
Sweep rate, octave/min	1	
Number of sweep cycles per axis	1	

5.16.2.4 Measurements during conditioning

Monitor the specimen during the conditioning period to detect any alarm or fault signals.

5.16.2.5 Final measurements

5.16.2.5.1 After the conditioning, test the specimen as described in the operational performance test of 5.2.

5.16.2.5.2 The vibration operational and endurance tests may be combined such that the specimen is subjected to the operational test conditioning followed by the endurance test conditioning in one axis before changing to the next axis. Only one final measurement shall be made.

5.16.3 Requirements

5.16.3.1 No alarm or fault signals shall be given during the conditioning period.

5.16.3.2 In the test of 5.16.2.5, the specimen shall comply with the requirements of 5.2.3.

5.17 Vibration, sinusoidal (endurance)

5.17.1 Object of test

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

5.17.2 Test procedure

5.17.2.1 Reference

The test apparatus and the test procedure shall be in accordance with IEC 60068-2-6, test Fc and with 5.17.2.2 to 5.17.2.4.

5.17.2.2 State of the specimen during conditioning

Mount the specimen to the test apparatus in accordance with 5.1.3. Do not supply power during the conditioning.

Apply the vibration in each of three mutually perpendicular axes, in turn. Mount the specimen so that one of the three axes is perpendicular to its normal mounting plane.

5.17.2.3 Conditioning

Apply the test conditions in Table 12.

Table 12 — Conditions for vibration, sinusoidal (endurance) test

Parameters	Indoor use	Outdoor use
Frequency range, Hz	10 to 150	
Acceleration amplitude, m/s^2	10 ($\approx 1\ g_n$)	
Number of axes	3	
Sweep rate, octave/min	1	
Number of sweep cycles per axis	20	

5.17.2.4 Final measurements

After the conditioning, test the specimen as described in the operational performance test of 5.2.

5.17.3 Requirements

5.17.3.1 No fault signal attributable to the endurance conditioning shall be given on connection of the specimen.

5.17.3.2 In the test of 5.17.2.4, the specimen shall comply with the requirements of 5.2.3.

5.18 Electromagnetic compatibility (EMC) (operational)

5.18.1 Object of test

The object of the test is to demonstrate the capability of the device to comply with the EMC immunity requirements in its normal service environment.

5.18.2 Test procedure

5.18.2.1 Reference

The test apparatus and the test procedures shall be in accordance with EN 50130-4 and with 5.18.2.2 to 5.18.2.5.

5.18.2.2 State of the specimen during conditioning

Mount the specimen in accordance with 5.1.3 and connect the specimen to suitable supply and monitoring equipment as described in 5.1.2.

5.18.2.3 Conditioning

Conduct the following EMC immunity tests as specified in EN 50130-4:

a) electrostatic discharge;

b) radiated electromagnetic fields;

c) conducted disturbances induced by electromagnetic fields;

d) fast transient burst;

e) slow, high-energy voltage surges.

5.18.2.4 Measurement during conditioning

Monitor the specimen during the conditioning period to detect any alarm or fault signals.

5.18.2.5 Final measurements

After the conditioning period, perform the function test specified in 5.3. Reset the specimen after the function test.

5.18.3 Requirements

5.18.3.1 No alarm or fault signals shall be given during the conditioning period.

5.18.3.2 In the test of 5.18.2.5, the specimen shall comply with the requirements of 5.3.3.

5.18.3.3 After the specimen has been reset, there shall be no alarm or fault signal.

5.19 Enclosure protection

5.19.1 Object of test

The object of the test is to demonstrate that the device is adequately protected against the ingress of water.

5.19.2 Test procedure

5.19.2.1 Reference

5.19.2.2 State of the specimen during conditioning

The test apparatus and the test procedure shall be in accordance with IEC 60068-2-18, test Rb2.1 and with 5.19.2.2 to 5.19.2.5.

Mount the specimen to the apparatus in accordance with 5.1.3 and connect the specimen to suitable supply and monitoring equipment as described in 5.1.2.

5.19.2.3 Conditioning

Apply the appropriate test conditions in Table 13.

Table 13 — Conditions for enclosure protection test

Parameters	Indoor use	Outdoor use
Spray nozzle angle α, °	No test	± 90
Tube oscillating angle β, °		± 180
Water flow per nozzle, dm^3/min		0,10
Nozzle orifice diameter, mm		0,40
Over pressure, kPa		80
Duration, min		10

5.19.2.4 Measurement during conditioning

Monitor the specimen during the conditioning period to detect any alarm or fault signals.

5.19.2.5 Final measurements

After the conditioning, test the specimen as described in the operational performance test of 5.2.

5.19.3 Requirements

5.19.3.1 No alarm or fault signals shall be given during the conditioning period.

5.19.3.2 In the test of 5.19.2.5, the specimen shall comply with the requirements of 5.2.3.

5.20 Exposure to simulated solar radiation (endurance)

5.20.1 Object of test

The object of the test is to demonstrate that the device can withstand the long-term effects of solar radiation.

5.20.2 Test procedure

5.20.2.1 Reference

The test apparatus and the test procedure shall be in accordance with IEC 60068-2-5, procedure B and with 5.20.2.2 to 5.20.2.4.

5.20.2.2 State of the specimen during conditioning

Mount the specimen to the apparatus in accordance with 5.1.3, with the front face oriented to the simulated solar radiation source. Do not supply power during the conditioning.

5.20.2.3 Conditioning

Apply the appropriate test conditions in Table 14.

Table 14 — Conditions for enclosure protection test

Parameters	Indoor use	Outdoor use
Lower temperature, °C	No test	55
Duration, h		240

5.20.2.4 Final measurements

After the conditioning, test the specimen as described in the impact test of 5.15 and the operational performance test of 5.2.

5.20.3 Requirements

5.20.3.1 In the test of 5.20.2.4, the specimen shall comply with the requirements of 5.15.3.

5.20.3.2 In the test of 5.20.2.4, the specimen shall comply with the requirements of 5.2.3.

5.20.3.3 The front face shall be coloured red.

NOTE A suitable red colour is specified in ISO 3864-1.

6 Test report

The test report shall contain, as a minimum, the following information:

a) identification of the test specimen;

b) reference to this part of ISO 7240 (i.e. 7240-11:2011);

c) results of the test: the individual response times, and any other data, such as specimen orientation, as specified in the individual tests;

d) conditioning period and the conditioning atmosphere;

e) temperature and the relative humidity in the test room throughout the test;

f) details of the supply and monitoring equipment and the response criteria;

g) details of any deviation from this part of ISO 7240 or from the International Standards to which reference is made, and details of any operations regarded as optional.

Annex A
(normative)

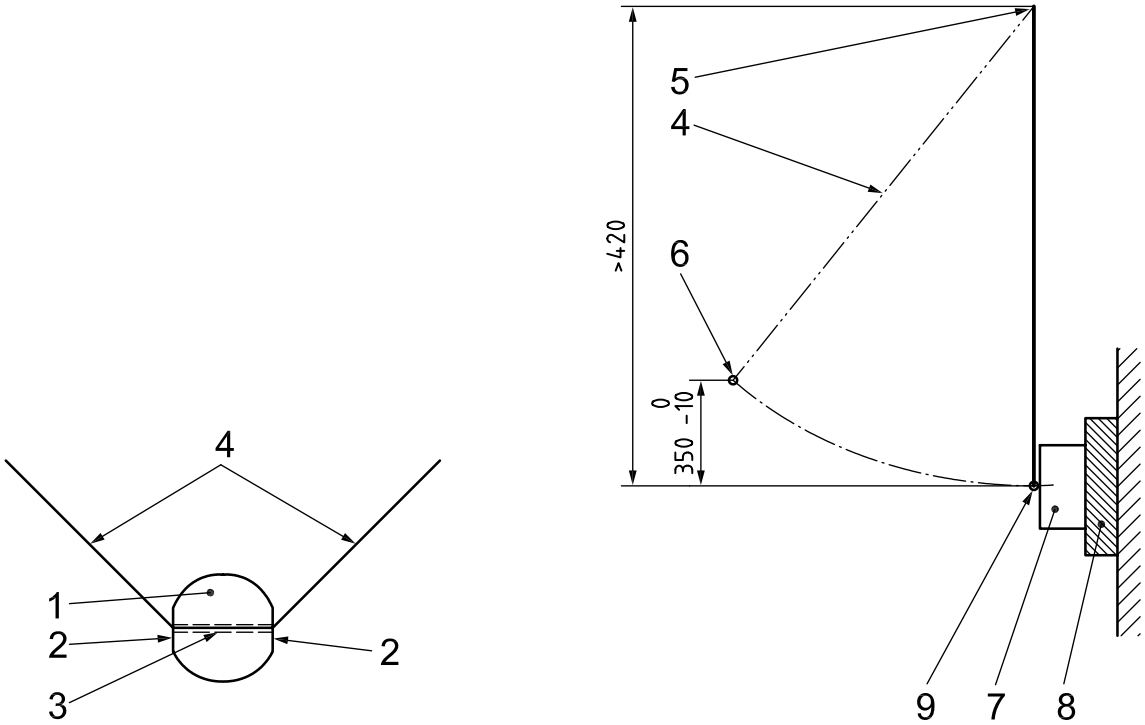
Test apparatus for test of operation

A.1 The test apparatus for test of operation shall be as shown in Figure A.1. The apparatus consists of a brass spherical ball (1) suspended by a woven cord (4) in front of the vertical face of the manual call point mounted on a suitable frame. The points of suspension (5) can be adjusted vertically and horizontally, so that the point (9) at which the brass ball strikes the defined area of operation on the frangible element indicated by the symbols within the operating face, is in the vertical plane. The suspension distance between (4) and (9) shall not be less than 420 mm.

A.2 To operate, the ball is swung back and located into a release mechanism, which holds the ball at the height defined by (6) in Figure A.1. The mechanism is then released, allowing the ball to swing freely through an arc defined by the suspension point and strike the frangible element with a single blow.

A.3 The mounting board (8) on which the manual call point is fixed is part of the rigid frame of which the ball suspension and the release mechanism are a part.

Dimensions in millimetres



a) Details of the brass ball **b) Principle of the test apparatus**

Key

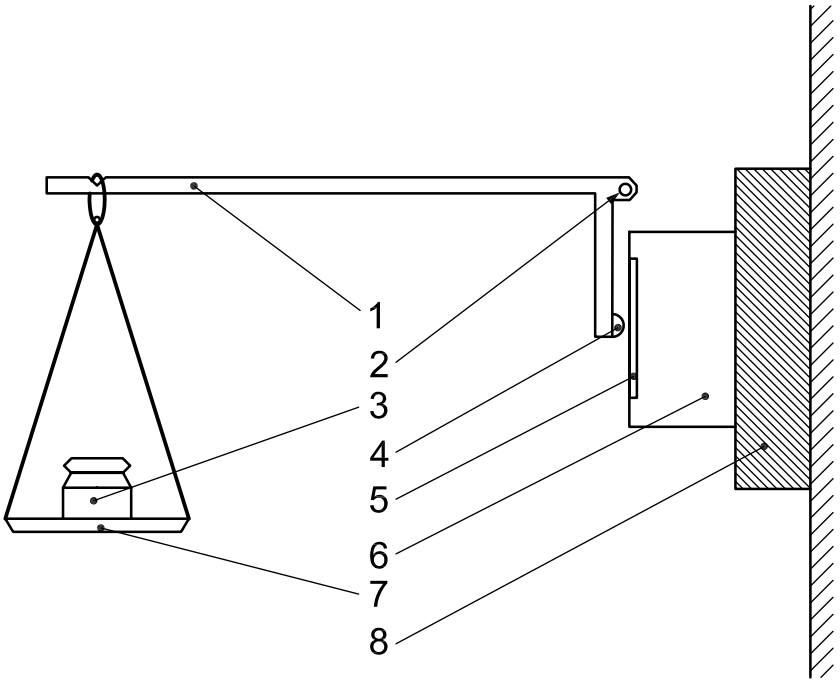
1 brass ball with a total mass of 85 g ± 1 g
2 flats to adjust the mass
3 hole through the spherical brass ball with a diameter of ($1{,}2^{+0{,}2}_{0}$) mm
4 woven cord with a diameter of 1,2 mm
5 suspension point on the vertical frame
6 centre of mass of the brass ball
7 manual call point
8 wooden mounting board as described in 5.15.2.1, clamped to the rigid frame
9 centre of the strike point on the frangible element

Figure A.1 — Test apparatus for test for operation

Annex B
(informative)

Test apparatus for test for non-operation

A suitable test apparatus for test for non-operation is shown in Figure B.1.



Key

1 metal rod
2 pivot
3 mass
4 rubber
5 frangible element
6 manual call point
7 pan
8 wooden block, clamped to rigid surface shown (wooden mounting board as described in 5.15.2.1)

Figure B.1 — Test apparatus for test for non-operation

Annex C
(informative)

Apparatus for impact test

C.1 The apparatus for the impact (see Figure C.1) consists essentially of a swinging hammer composed of a rectangular section head (striker), with a chamfered impact face, mounted on a tubular steel shaft. The hammer is fixed into a steel boss, which runs on ball bearings on a fixed steel shaft mounted in a rigid steel frame, so that the hammer can rotate freely about the axis of the fixed shaft. The design of the rigid frame is such as to allow complete rotation of the hammer assembly when the manual call point and its mounting board are not present.

C.2 The striker is of dimensions 76 mm wide, 50 mm high and 94 mm long (overall dimensions), and is manufactured from aluminium alloy (Al Cu_4 Si Mg according to ISO 209), solution-treated and precipitation-treated condition. It has a plane impact face chamfered at (60 ± 1)° to the long axis of the head. The tubular steel shaft has an outside diameter of (25 ± 0,1) mm with walls (1,6 ± 0,1) mm thick.

C.3 The striker is mounted on the shaft so that its long axis is at a radial distance of 305 mm from the axis of rotation of the assembly, the two axes being mutually perpendicular. The central boss is 102 mm in outside diameter and 200 mm long, and is mounted coaxially on the fixed steel pivot shaft, which is approximately 25 mm in diameter, although the precise diameter of the shaft depends on the bearings used.

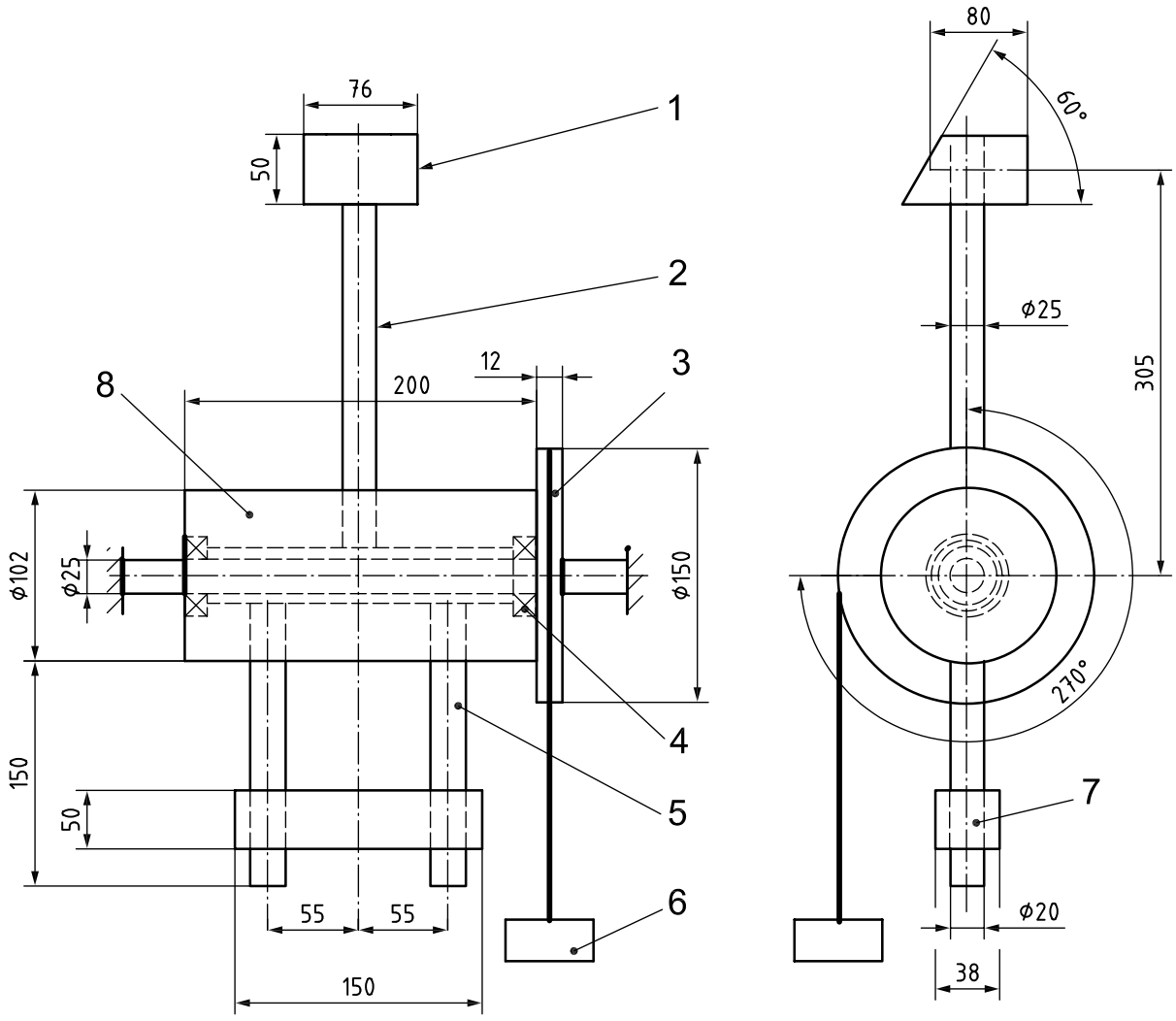
C.4 Diametrically opposite the hammer shaft are two steel counter balance arms, each 20 mm in outside diameter and 185 mm long. These arms are screwed into the boss so that the length of 150 mm protrudes. A steel counter balance weight is mounted on the arms so that its position can be adjusted to balance the mass of the striker and arms, as shown in Figure C.1. On one end of the central boss, a 12 mm wide and 150 mm diameter aluminium alloy pulley is mounted, and round this an inextensible cable is wound, one end being fixed to the pulley. The other end of the cable supports the operating weight.

C.5 The rigid frame also supports the mounting board on which the manual call point is mounted in its normal operating position by its normal fixings. The mounting board is adjustable in order to fix the required strike positions as shown in Figure C.2 and Figure C.3.

C.6 To operate the apparatus, the position of the specimen and the mounting board is first adjusted as shown in Figure C.1 or Figure C.3 and the mounting board is then secured rigidly to the frame. The hammer assembly is then balanced carefully by adjusting the counter-balance weight with the operating weight removed. The hammer arm is then drawn back to the horizontal position ready for release and the operating weight is reinstated. On release of the assembly, the operating weight spins the hammer and arm through an angle of $3\pi/2$ rad to strike the specimen. The mass of the operating weight to produce the required impact energy of 1,9 J equals $0{,}388/(3\pi r)$ kg, where r is the effective radius of the pulley in metres. This equals approximately 0,55 kg for a pulley radius of 75 mm.

C.7 As this part of ISO 7240 calls for a hammer velocity at impact of (1,5 ± 0,13) m s^{-1}, it is necessary to reduce the mass of the hammer head by drilling the back face sufficiently to obtain this velocity. It is estimated that a head of mass of about 0,79 kg is required to obtain the specified velocity, but it is necessary to determine this by trial and error.

Dimensions in millimetres unless otherwise specified

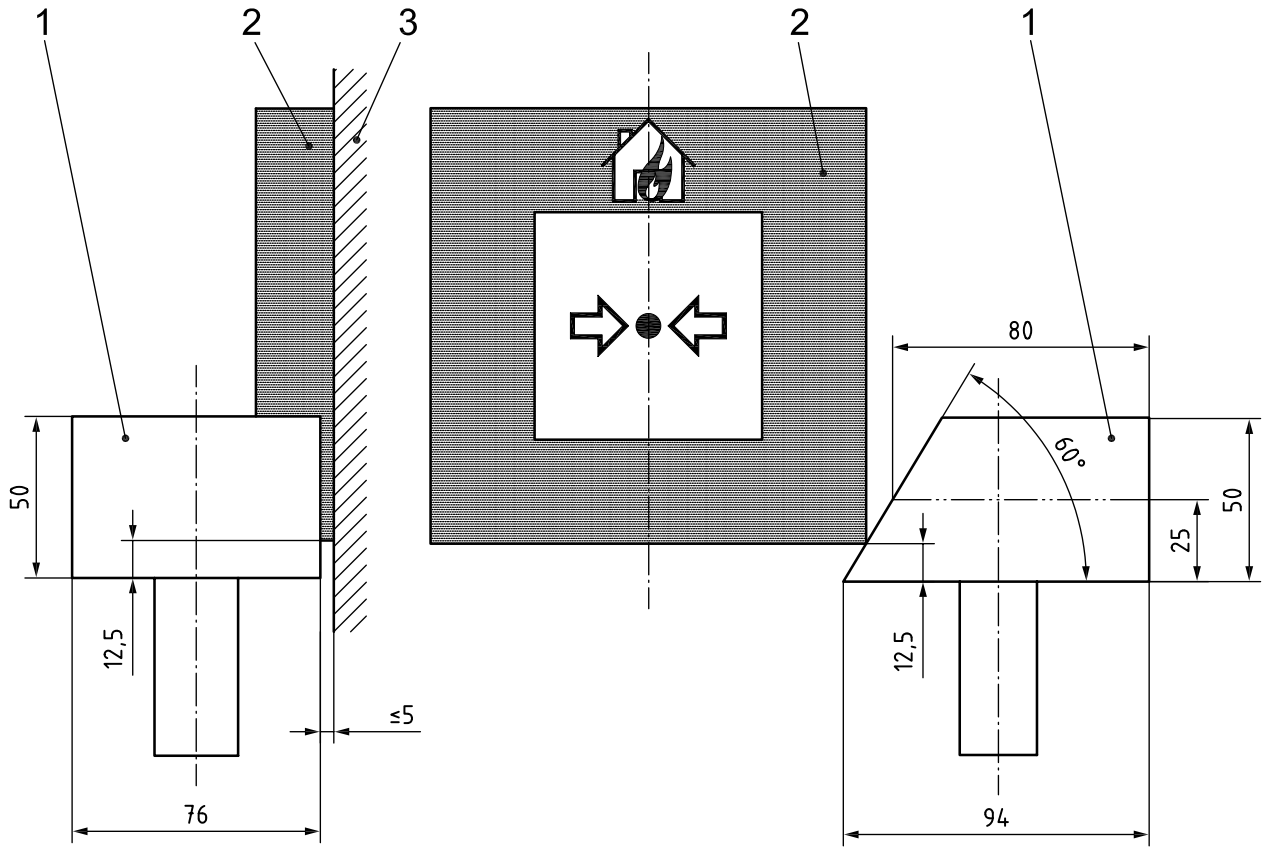


Key

1 striker
2 striker shaft
3 pulley
4 ball bearings
5 counter-balance arms
6 operating weight
7 counter-balance weight
8 boss

Figure C.1 — Impact apparatus

Dimensions in millimetres unless otherwise specified

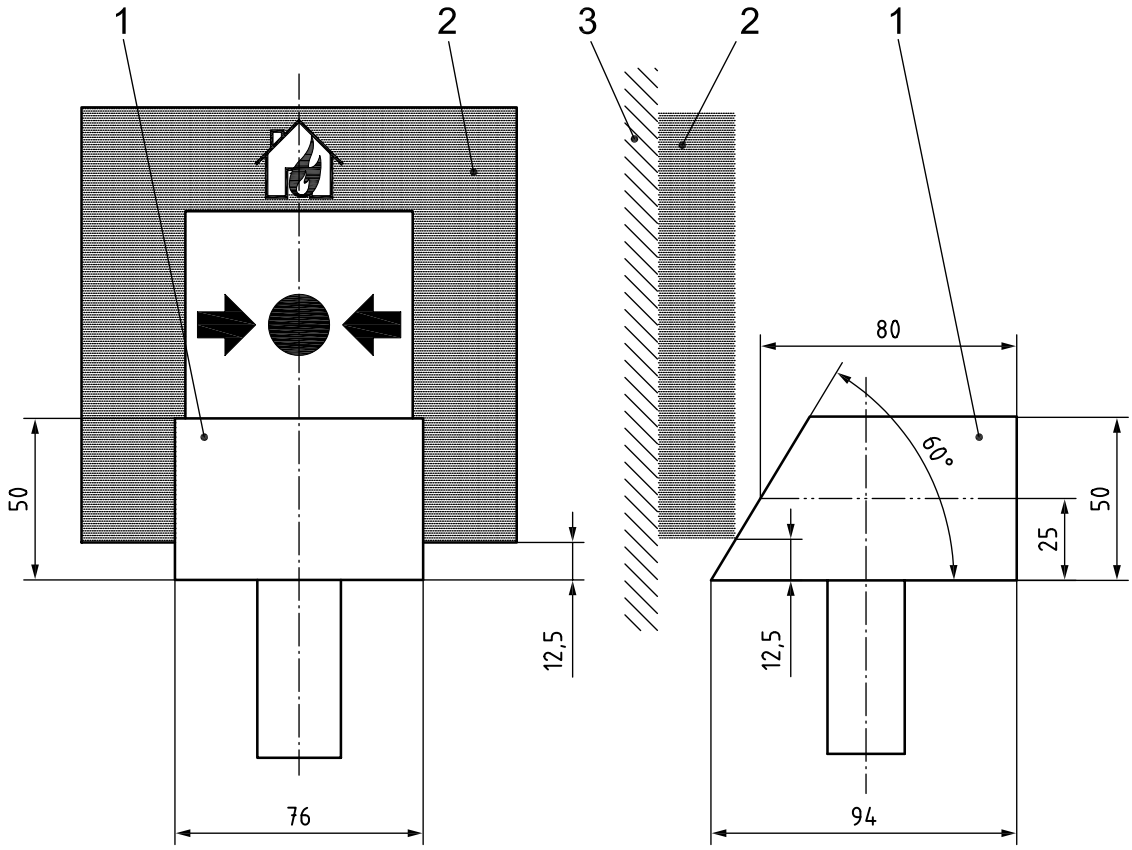


Key

1 striker
2 manual call point
3 mounting board

Figure C.2 — First impact, position (lower side edge)

Dimensions in millimetres unless otherwise specified



Key

1 striker
2 manual call point
3 mounting board

Figure C.3 — Second impact, position (lower edge of the front face)

Bibliography

[1] ISO 7240-2, *Fire detection and alarm systems — Part 2: Control and indicating equipment*

[2] ISO 7000:2004, *Graphical symbols for use on equipment — Index and synopsis*

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