BRITISH STANDARD

BS EN
60950-22:2006

Information technology equipment — Safety —

Part 22: Equipment installed outdoors

The European Standard EN 60950-22:2006 has the status of a British Standard

ICS 35.020; 29.020

BSI
British Standards

National foreword

This British Standard is the official English language version of EN 60950-22:2006. It was derived by CENELEC from IEC 60950-22:2005.

The CENELEC common modifications have been implemented at the appropriate places in the text and are indicated by tags [C⟩ ⟨C].

The UK participation in its preparation was entrusted to Technical Committee EPL/108, Safety of electronic equipment within the field of audio/video, information technology and communication technology, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

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EUROPEAN STANDARD

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EUROPÄISCHE NORM

EN 60950-22

April 2006

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English version

Information technology equipment - Safety
Part 22: Equipment installed outdoors
(IEC 60950-22:2005, modified)

Matériels de traitement de l'information - Sécurité
Partie 22: Matériels destinés à être installés à l'extérieur
(CEI 60950-22:2005, modifiée)

Einrichtungen der Informationstechnik - Sicherheit
Teil 22: Einrichtungen für den Außenbereich
(IEC 60950-22:2005, modifiziert)

This European Standard was approved by CENELEC on 2005-12-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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CENELEC
European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 108/145//FDIS, future edition 1 of IEC 60950-22, prepared by IEC TC 108, Safety of electronic equipment within the field of audio/video, information technology and communication technology, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60950-22 on 2005-12-01.

A draft amendment, prepared by the Technical Committee CENELEC/TC 108, Safety of electronic equipment within the fields of audio/video, information technology and communication technology, was submitted to the formal vote and was approved by CENELEC for inclusion in EN 60950-22 on 2005-12-01.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2006-12-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2008-12-01

This Part 22 of EN 60950 is intended to be used with EN 60950-1. The subclauses of EN 60950-1 apply as is reasonable. Where safety aspects are similar to those of Part 1, the relevant Part 1 clause or subclause is shown for reference in parentheses after the clause or subclause title in Part 22. Where a requirement in Part 22 refers to a requirement or criterion of Part 1, a specific reference to EN 60950-1 is made.

EN 60950 consists of the following parts, under the general title *Information technology equipment – Safety*:

Part 1: General requirements;

Part 21: Remote power feeding;

Part 22: Equipment installed outdoors;

Part 23: Large data storage equipment.

In this standard, the following print types are used:

– requirements proper and normative annexes: roman type;

– *compliance statements and test specifications: italic type;*

– notes in the text and in tables: smaller roman type;

– terms that are defined in Clause 2 and in EN 60950-1: SMALL CAPITALS.

Annexes ZA and ZB have been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60950-22:2005 was approved by CENELEC as a European Standard with agreed common modifications.

CONTENTS

INTRODUCTION

This document proposes safety requirements for information technology equipment intended to be installed, when exposed wholly or partly, in a location where protection from the weather and other outdoor influences such as rain, dust, etc. normally provided by a building or other structure is limited or non-existent. There are many examples of information technology equipment in use throughout the world that are housed in special ENCLOSURES located on pavements, mounted on telecommunications poles and situated underground. Presently, IEC 60950 has no requirements for such equipment and this proposal would rectify this omission. The proposed requirements would not apply to portable or transportable equipment that may be occasionally used outdoors, but are not intended to be installed in conditions of inclement weather.

It is expected that IEC TC108 will continue to coordinate the output of its work with other technical committees dealing with equipment installed outdoors, such as IEC TC70 (Degrees of Protection by Enclosures, responsible for IEC 60529) and IEC TC48 (Electromechanical Components and Mechanical Structures for Electronic Equipment).

Annex E describes the rationale behind the treatment of specific safety aspects in this standard.

INFORMATION TECHNOLOGY EQUIPMENT – SAFETY –

Part 22: Equipment to be installed outdoors

1 Scope

1.1 Equipment covered

This part of IEC 60950 applies to information technology equipment intended to be installed in an OUTDOOR LOCATION.

The requirements for OUTDOOR EQUIPMENT also apply, where relevant, to empty OUTDOOR ENCLOSURES supplied for housing information technology equipment to be installed in an OUTDOOR LOCATION.

1.2 Additional requirements

Each installation may have particular requirements. Some examples are given in 4.2. In addition, requirements for protection of the OUTDOOR EQUIPMENT against the effects of direct lightning strikes are not covered by the standard. For information on this subject, see IEC 61024-1.

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.

IEC 60068-2-11:1981, *Environmental testing – Part 2: Tests. Test Ka: Salt mist*

IEC 60364 (all parts), *Electrical installations of buildings*

IEC 60364-4-43:2001, *Electrical installations of buildings – Part 4-43: Protection for safety – Protection against overcurrent*

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

IEC 60950-1:2005, *Information technology equipment – Safety – Part 1: General requirements*

IEC 61643 (all parts), *Low-voltage surge protective devices*

ISO 178, *Plastics – Determination of flexural properties*

ISO 179 (all parts), *Plastics – Determination of Charpy impact strength*

ISO 180, *Plastics – Determination of Izod impact strength*

ISO 527 (all parts), *Plastics – Determination of tensile properties*

ISO 3231, *Paints and varnishes – Determination of resistance to humid atmospheres containing sulfur dioxide*

ISO 4628-3, *Paints and varnishes – Evaluation of degradation of coatings – Designation of quantity and size of defects, and of intensity of uniform changes in appearance – Part 3: Assessment of degree of rusting*

ISO 4892-1, *Plastics – Methods of exposure to laboratory light sources – General guidance*

ISO 4892-2, *Plastics – Methods of exposure to laboratory light sources – Xenon-arc sources*

ISO 4892-4, *Plastics – Methods of exposure to laboratory light sources – Open-flame carbon-arc lamps*

ISO 8256, *Plastics – Determination of tensile-impact strength*

ISO 18173:2005 *Non-destructive testing – General terms and definitions*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60950-1 and the following apply.

3.1
OUTDOOR LOCATION
location for equipment where protection from the weather and other outdoor influences provided by a building or other structure is limited or non-existent

3.2
OUTDOOR EQUIPMENT
equipment specified by the manufacturer to be installed where exposed wholly or partly to the conditions in an OUTDOOR LOCATION

NOTE TRANSPORTABLE EQUIPMENT, for example, a laptop or notebook computer, or a telephone, is not OUTDOOR EQUIPMENT unless specified by the manufacturer for continuous use in an OUTDOOR LOCATION.

3.3
OUTDOOR ENCLOSURE
part of OUTDOOR EQUIPMENT that is exposed to the adverse conditions in an OUTDOOR LOCATION and that is intended to protect the interior of the equipment from those conditions

NOTE 1 An OUTDOOR ENCLOSURE can also perform the functions of one or more of the following: a FIRE ENCLOSURE; an ELECTRICAL ENCLOSURE; a MECHANICAL ENCLOSURE.

NOTE 2 A separate cabinet or housing into which the equipment is placed can provide the function of an OUTDOOR ENCLOSURE.

4 Conditions for outdoor equipment

4.1 Ambient air temperature

OUTDOOR EQUIPMENT and OUTDOOR ENCLOSURES shall be suitable for use at any temperature in the range specified by the manufacturer. If not specified by the manufacturer, the range shall be taken as:

– minimum ambient temperature; –33 ºC
– maximum ambient temperature; +40 ºC.

Compliance is checked by inspection.

NOTE 1 The temperature values are based on IEC 60721-3-4 Class 4K2. These temperatures do not take into account severe environments (for example, extremely cold or extremely warm), nor do they include provision for heating by radiation from the sun (solar loading).

NOTE 2 Attention is drawn to IEC 61587-1 for additional information on performance levels C1, C2 and C3.

〚C〛 For special national conditions, see Annex ZB. 〚C〛

4.2 AC mains supply

Mains-operated OUTDOOR EQUIPMENT shall be suitable for the highest Overvoltage Category expected in the installation location.

Consideration shall be given to the following:

– the prospective fault current of the supply to OUTDOOR EQUIPMENT can be higher than for indoor equipment, see IEC 60364-4-43; and
– the Overvoltage Category for OUTDOOR EQUIPMENT can be higher than for indoor equipment.

Equipment that is part of the building installation, or that may be subject to transient overvoltages exceeding those for Overvoltage Category II, shall be designed for Overvoltage Category III or IV, unless additional protection is to be provided internal or external to the equipment. In this case, the installation instructions shall state the need for such additional protection.

It is permitted to include components within OUTDOOR EQUIPMENT that reduce the Overvoltage Category or the prospective fault current. Components used to reduce the Overvoltage Category shall comply with the requirements of IEC 61643-series.

NOTE 1 Annex G of IEC 60950-1 only provides a method of determining minimum CLEARANCES for transient voltages corresponding to Overvoltage Categories III and IV. Other parts of the insulation system, for example requirements for solid insulation and for electric strength testing, must be capable of withstanding the higher transient voltages (see IEC 60664-1).

NOTE 2 The Overvoltage Category of OUTDOOR EQUIPMENT is normally considered to be one of the following:

– if powered via the normal building installation wiring, Overvoltage Category II;
– if powered directly from the mains distribution system, Overvoltage Category III;
– if at, or in the proximity of, the origin of the electrical installation, Overvoltage Category IV.

NOTE 3 For further information regarding protection from overvoltages, see IEC 60364-5-53.

Compliance is checked by inspection of the equipment and the installation instructions.

4.3 Rise of earth potential

Attention is drawn to the fact that during fault clearing conditions, HAZARDOUS VOLTAGES may exist and be accessible for longer periods than for indoor equipment and special earthing conditions may be necessary. These are typically specified in local installation codes.

〈C〉 *Note deleted* 〈C〉

Compliance is checked by evaluation of the installation instructions.

5 Marking and instructions

The installation instructions for OUTDOOR EQUIPMENT shall include details of any special features needed for protection from conditions in the OUTDOOR LOCATION (see 1.7.2 of IEC 60950-1).

If a manufacturer of an OUTDOOR ENCLOSURE classifies a product in accordance with IEC 60529, the IP code shall be declared, however it is not required to mark the IP code on the OUTDOOR ENCLOSURE. It is not required to make such a declaration for OUTDOOR EQUIPMENT.

Compliance is checked by inspection.

6 Protection from electrical shock in an outdoor location

6.1 Voltage limits of user-accessible parts in outdoor locations

USER-accessible conductive parts in an OUTDOOR LOCATION shall meet the requirements for an SELV CIRCUIT in 2.2.2 and 2.2.3 of IEC 60950-1, except that the voltage limits shall not exceed:

– 15 V a.c., 21,2 V peak, or 30 V d.c. under normal operating conditions (see 2.2.2),

– 15 V a.c., 21,2 V peak, or 30 V d.c. for longer than 0,2 s under single fault conditions (see 2.2.3). Moreover, the voltage shall not exceed 30 V a.c., 42,4 V peak or 60 V d.c.

The exception in 2.2.3 of IEC 60950-1 relating to 2.3.2.1 b) of the same publication, does not apply to USER-accessible conductive parts.

NOTE Lower voltage limits apply because the contact resistance of the body is reduced when subjected to wet conditions.

Compliance is checked by measurement.

6.2 Limited current circuits in outdoor locations

The requirements of 2.4 of IEC 60950–1, apply without change.

7 Wiring terminals for connection of external conductors

The mains supply terminations for OUTDOOR EQUIPMENT that is intended to be powered:

– via the normal building installation wiring, shall be as specified in 3.3 of IEC 60950-1;
– directly from the mains distribution system, shall be as specified in IEC 60364.

NOTE For other terminals, IEC 60950-1 applies.

Compliance is checked by inspection.

8 Construction requirements for outdoor enclosures

8.1 General

Protection against corrosion shall be provided by the use of suitable materials or by the application of a protective coating applied to the exposed surface, taking into account the intended conditions of use.

Parts, such as dials or connectors, that serve as a functional part of an OUTDOOR ENCLOSURE shall comply with the same environmental protection requirements as for the OUTDOOR ENCLOSURE.

NOTE 1 Aspects affecting safety which require the integrity of the OUTDOOR ENCLOSURE through the life of the product include:

– continued protection against impact;
– continued protection against ingress of dust and water;
– continued provision of earth continuity.

An OUTDOOR ENCLOSURE shall not be used to carry current during normal operation if this could cause corrosion that would impair safety. This does not preclude connection of a conductive part of an OUTDOOR ENCLOSURE to protective earth for the purpose of carrying fault currents.

NOTE 2 The action of a current flowing through a joint can increase corrosion under wet conditions.

Where a conductive part of an OUTDOOR ENCLOSURE is connected to protective earth for the purpose of carrying fault currents, the resulting connection shall meet the requirements of 2.6 of IEC 60950-1, after the appropriate weather conditioning tests, see 8.3.

Compliance is checked by inspection and, if necessary, by the tests of 2.6 of IEC 60950-1 and 8.3 of this standard.

8.2 Resistance to ultra-violet radiation

Non-metallic parts of an OUTDOOR ENCLOSURE required for compliance with this standard shall be sufficiently resistant to degradation by ultra-violet (UV) radiation.

Table 1 – Minimum property retention limits after UV exposure

Parts to be tested	Property	Standard for the test method	Minimum retention after test
Parts providing mechanical support	Tensile strength [a] or	IS0 527	70 %
	Flexural strength [a, b]	ISO 178	70 %
Parts providing impact resistance	Charpy impact [c] or	ISO 179	70 %
	Izod impact [c] or	ISO 180	70 %
	Tensile impact [c]	ISO 8256	70 %
All parts	Flammability classification	1.2.12 and annex A of IEC 60950-1	see [d]

[a] Tensile strength and flexural strength tests are to be conducted on specimens no thicker than the actual thicknesses.

[b] The side of the sample exposed to UV radiation is to be in contact with the two loading points when using the three-point loading method.

[c] Tests conducted on 3,0 mm thick specimens for Izod impact and tensile impact tests and 4,0 mm thick specimens for Charpy impact tests are considered representative of other thicknesses, down to 0,8 mm.

[d] The flammability classification may change as long as it does not fall below that specified in Clause 4 of IEC 60950-1.

Compliance is checked by examination of the construction and of available data regarding the UV resistance characteristics of the ENCLOSURE material and any associated protective coating. If such data is not available, the tests in Table 1 are carried out on the parts.

Samples taken from the parts, or consisting of identical material, are prepared according to the standard for the test to be carried out. They are then conditioned according to Annex C. After conditioning, the samples shall show no signs of significant deterioration, such as crazing or cracking. They are then kept at room ambient conditions for not less than 16 h and not more than 96 h, after which they are tested according to the standard for the relevant test.

In order to evaluate the percent retention of properties after test, samples that have not been conditioned according to Annex C are tested at the same time as the conditioned samples. The retention shall be as specified in Table 1.

8.3 Resistance to corrosion

8.3.1 General

Metallic parts of OUTDOOR ENCLOSURES, with or without protective coatings, shall be resistant to the effects of water-borne contaminants.

Compliance is checked by inspection, by evaluation of data provided by the manufacturer or, if necessary, by the tests and criteria as specified in 8.3.2 through 8.3.4.

Compliance with the applicable performance level (A1, A2 or A3) of IEC 61587-1 is to be considered an acceptable alternative to complying with 8.3.2 through 8.3.4.

8.3.2 Test apparatus

The apparatus for the salt spray test comprises a test chamber and spraying devices as described in IEC 60068-2-11.

The apparatus for the test in a water-saturated sulphur dioxide atmosphere comprises an inert, hermetically sealed, chamber containing a water-saturated sulphur dioxide atmosphere (see Annex A) in which the test specimens and their supports are held. The chamber is as described in ISO 3231.

8.3.3 Test procedure

The test is comprised of two identical and successive 12 day periods.

Each 12 day period is comprised of test a) followed by test b):

test a) – 168 h of exposure to the salt spray atmosphere. The concentration of the saline solution forming the salt spray atmosphere is 5 % ± 1 % by weight and the temperature of the test chamber is maintained at 35 °C ± 2 °C.

test b) – 5 exposure cycles each consisting of an 8 h exposure to a water-saturated sulphur dioxide-rich atmosphere, (see Annex A), during which the temperature of the test chamber is maintained at 40 °C ± 3 °C , followed by 16 h at rest with the test chamber door open.

After each 12 day period, the test specimens are washed with demineralized water.

8.3.4 Compliance criteria

Compliance is checked by visual inspection. The equipment shall not show rust, cracking or other deterioration. However, surface corrosion of the protective coating is permitted. In case of doubt, reference shall be made to ISO 4628-3 to verify that the samples conform to specimen Ri1.

8.4 Bottoms of fire enclosures

The bottom of a FIRE ENCLOSURE of OUTDOOR EQUIPMENT shall comply with 4.6.2 of IEC 60950-1, except there are no requirements for the bottoms of FIRE ENCLOSURES of OUTDOOR EQUIPMENT provided that the installation instructions specify that the equipment is to be mounted directly and permanently on a non-combustible surface (such as concrete or metal). There is no need for a marking on the equipment.

Compliance is checked by inspection.

8.5 Gaskets

When gaskets are used as the method providing protection against the ingress of potential contaminants, 8.5.1 through 8.5.3 shall apply as appropriate.

〖C〗 *Note deleted* 〖C〗

8.5.1 General

Joints for all devices closing openings into the equipment cavity of an ENCLOSURE subjected to splashing or seepage of oil, as well as any door or cover for such an ENCLOSURE, shall include a gasket in the full length of the joint.

A gasket of elastomeric or thermoplastic material, or a composition gasket utilizing an elastomeric material that is provided on an ENCLOSURE subjected to water or dust, shall meet requirements of this standard.

Compliance is checked by inspection and by applying the relevant tests of Annex D.

8.5.2 Oil resistance

A gasket provided on an ENCLOSURE subjected to oil or coolant shall be oil resistant.

Compliance is checked by inspection and by the oil immersion test of Clause D.4.

8.5.3 Securing means

A gasket shall be secured with adhesive or by mechanical means. The gasket and its securing means shall not be damaged when the joint is opened.

Compliance is checked by inspection.

9 Protection of equipment within an outdoor enclosure

9.1 Protection from moisture

The OUTDOOR ENCLOSURE shall provide adequate protection from the effect of moisture on the enclosed equipment. Examples of constructions regarded as meeting the requirements are shown in Table 2.

NOTE 1 This does not preclude OUTDOOR ENCLOSURE or OUTDOOR EQUIPMENT being constructed with segmented volumes, each providing a different pollution degree.

NOTE 2 For consideration of the effects of the presence of conductive pollution, as opposed to non-conductive pollution which may become conductive only due to the presence of moisture, see the relevant requirements in IEC 60529.

Table 2 – Examples of the provision of pollution degree environments

Pollution degree	Method of achievement
Pollution Degree 3	The use of an ENCLOSURE meeting IPX4 or the Annex B requirements relating to the ingress of water is considered to provide a Pollution Degree 3 environment within the ENCLOSURE.
Reduction of Pollution Degree 3 to Pollution Degree 2	Control of the Pollution Degree 3 environment to Pollution Degree 2 can be accomplished by either: – providing continuous energization of the enclosed equipment; or – providing separate climate conditioning which prevents condensation within the OUTDOOR EQUIPMENT or OUTDOOR ENCLOSURE; or – the use of an ENCLOSURE meeting IP54.
Reduction to Pollution Degree 1	Control of the environment at the insulation surface to Pollution Degree 1 can be accomplished by the methods in IEC 60950-1, for example, encapsulation, potting or coating.

Where necessary, the ENCLOSURE of OUTDOOR EQUIPMENT shall be provided with drain holes to control the accumulation of moisture due to:

– entrance of water through openings; and

– condensation, when this is likely to occur (for example, keeping the equipment energized or separately heating the equipment is considered to keep it free of condensation).

The provision of drain holes and their location shall be taken into consideration when determining the IP rating.

Compliance is checked by inspection and, if necessary, by the relevant tests of IEC 60529 or Annex B.

Prior to testing, the equipment shall be mounted, so far as is reasonably practicable, according to the manufacturer's installation instructions. If fans or other means for ventilation are provided, which could affect the ingress of water, the test shall be conducted with the ventilation means both on and off unless it is evident that one of the modes of operation will produce the more onerous result.

At the conclusion of the test the following conditions shall exist:

– *For OUTDOOR ENCLOSURES – no water shall have entered the ENCLOSURE.*

– *For OUTDOOR EQUIPMENT – water is permitted to enter the ENCLOSURE provided it does not:*

a) deposit on insulation where it could lead to tracking along the CREEPAGE DISTANCE,

b) deposit on bare live parts or wiring, or on windings not designed to operate when wet, or

c) enter any supply wiring space, see 3.2.9 of IEC 60950-1.

9.2 Protection from plants and vermin

If entry by plants and vermin is a consideration, OUTDOOR EQUIPMENT shall have adequate protection.

NOTE For protection against plants and vermin, see IEC 61969-3.

Compliance is checked by inspection.

9.3 Protection from excessive dust

If the presence of excessive dust is a consideration, OUTDOOR EQUIPMENT shall have adequate protection against the ingress of the dust through the use of an appropriately rated IPXX ENCLOSURE, or equivalent.

NOTE Dust from road vehicles is not considered to be conductive.

Compliance is checked by inspection and, if necessary, by the relevant tests of IEC 60529.

10 Mechanical strength of enclosures

10.1 General

OUTDOOR ENCLOSURES and OUTDOOR EQUIPMENT shall have adequate mechanical strength and shall provide protection against access to energized parts and other hazards within the equipment throughout the intended ambient operating range.

Compliance is checked by the inspection of the construction and available data and, if necessary, by the test of 10.2. After the test the following criteria shall be met:

- *the level of protection shall remain in accordance with 9.1; and*
- *the requirements of 4.2.1 of IEC 60950-1, shall be met.*

10.2 Impact test

OUTDOOR ENCLOSURES and OUTDOOR EQUIPMENT are to be subjected to the impact test of 4.2.5 of IEC 60950-1. Where the ENCLOSURE is made of polymeric material, the test is carried out at an ambient temperature equal to the minimum ambient temperature specified by the manufacturer or –33 °C if no minimum ambient temperature is specified. The test can be applied to a portion of the enclosure representing the largest unreinforced area, supported in its normal position.

〖C〗 For special national conditions, see Annex ZB. 〖C〗

The impacts are applied to doors, covers, seams and the like which could affect the ingress of dust and moisture. The test is performed whether or not failure would give direct access to hazardous parts. The impacts are applied immediately after removal from the climatic chamber.

11 Outdoor equipment containing vented batteries

The compartment housing a vented battery, where gassing is possible during normal usage or over-charging, shall have adequate ventilation.

In a compartment containing both a battery and electrical components, the risk of ignition of local concentrations of hydrogen and oxygen by adjacent operational arcing parts, such as contactors and switches close to battery vents or valves, shall be controlled. This shall be achieved, for example, by the use of fully enclosed components, separation of battery compartments or adequate ventilation.

Compliance is checked by inspection and, if necessary, by test.

The following test shall be used to measure gas concentration if the adequacy of the required ventilation is not obvious.

Samples of the atmosphere within the battery compartment are to be taken after 7 h of operation. The samples are to be taken at locations where the greatest concentration of hydrogen gas is likely. The hydrogen gas concentration shall not be more than 1 % by volume if the mixture is in proximity to an ignition source, or exceeding 2 % by volume if the mixture is not in proximity to an ignition source. See 4.3.8 of IEC 60950-1 for evaluating the overcharging of a rechargeable battery.

Annex A
(normative)

Water – saturated sulphur dioxide atmosphere
(see 8.3.2 and 8.3.3)

If the test chamber has an internal volume of 300 l ± 30 l the water-saturated sulphur dioxide atmosphere is created by the introduction of 0,2 l of sulphur dioxide with a concentration of 0,067 % by volume into the closed test chamber. The sulphur dioxide can either be introduced from a gas cylinder or by creating a specific reaction within the chamber. For test chambers having a different internal volume the quantity of sulphur dioxide is varied accordingly.

Sulphur dioxide can be formed inside the test apparatus by treating sodium pyrosulphite ($Na_2S_2O_5$) with a relatively strong acid, sulphamic acid (HSO_3NH_2).

NOTE 1 The method consists of dissolving excess sodium pyrosulphite in water, giving the reaction:

$$Na_2S_2O_5 + H_2O \rightarrow 2\ NaHSO_3$$

A stoichiometric quantity of sulphamic acid is then added giving the reaction:

$$NaHSO_3 + HSO_3NH_2 \rightarrow NaSO_3NH_2 + H_2O + SO_2$$

The resulting overall reaction is:

$$Na_2S_2O_5 + 2\ HSO_3NH_2 \rightarrow 2\ NaSO_3NH_2 + H_2O + 2\ SO_2$$

To obtain 1 l of SO_2 under normal conditions of 0 °C temperature and 1,0133 × 105 Pa, air pressure, 4,24 g sodium pyrosulphite and 4,33 g sulphamic acid are required.

NOTE 2 Sulphamic acid is the only solid mineral acid that is easy to conserve.

NOTE 3 The above description is taken from 8.2.11.3.1 and 8.2.11.3.2 of IEC 60439-5.

Annex B
(normative)

Water spray test
(see 9.1)

The water-spray test apparatus, using fresh water, is to consist of three spray heads mounted in a water supply pipe rack as shown in Figure B.1. Spray heads are to be constructed in accordance with the details shown in Figure B.2. The ENCLOSURE is to be positioned in the focal area of the spray heads so that the greatest quantity of water is likely to enter the ENCLOSURE. The water pressure is to be maintained at 34,5 kPa at each spray head. The ENCLOSURE is to be exposed to the water spray for 1 h.

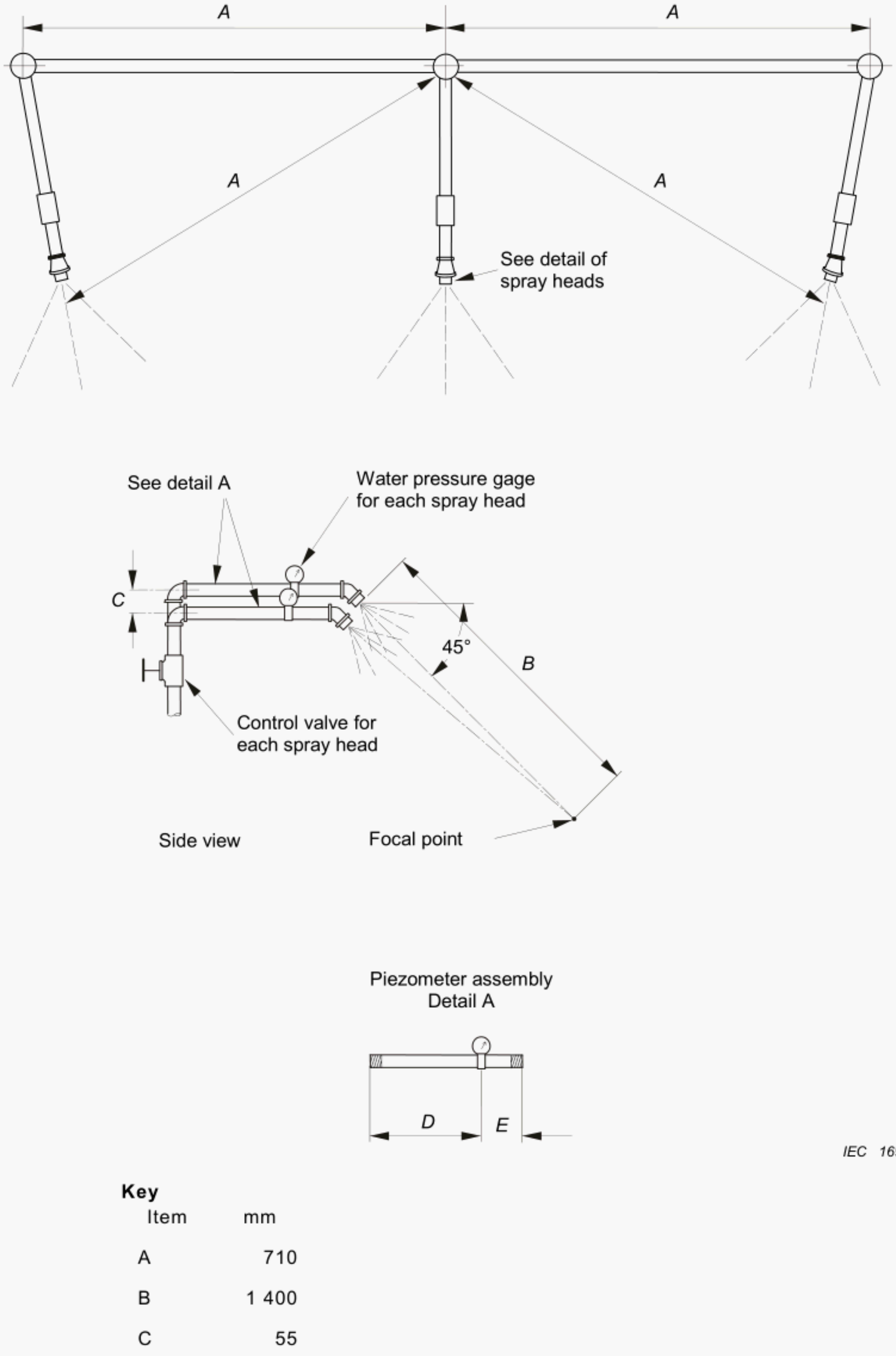
Unless the construction is such that a test on one side of the ENCLOSURE is representative of a test on another side, the test is to be repeated on other sides of the ENCLOSURE as necessary.

The water spray is to produce a uniform spray over the surface or surfaces under test. The various vertical surfaces of an ENCLOSURE may be tested separately or collectively, provided that a uniform spray is applied.

The top surface of the OUTDOOR ENCLOSURE shall be tested by applying a uniform spray from nozzles located at proper heights (see the focal point in Figure B.1), if

a) there are openings in the top surface, or
b) from an examination of the construction, it is determined that run-off from the top surface could cause water ingress at a vertical surface which would not be detected by the test of the vertical surface.

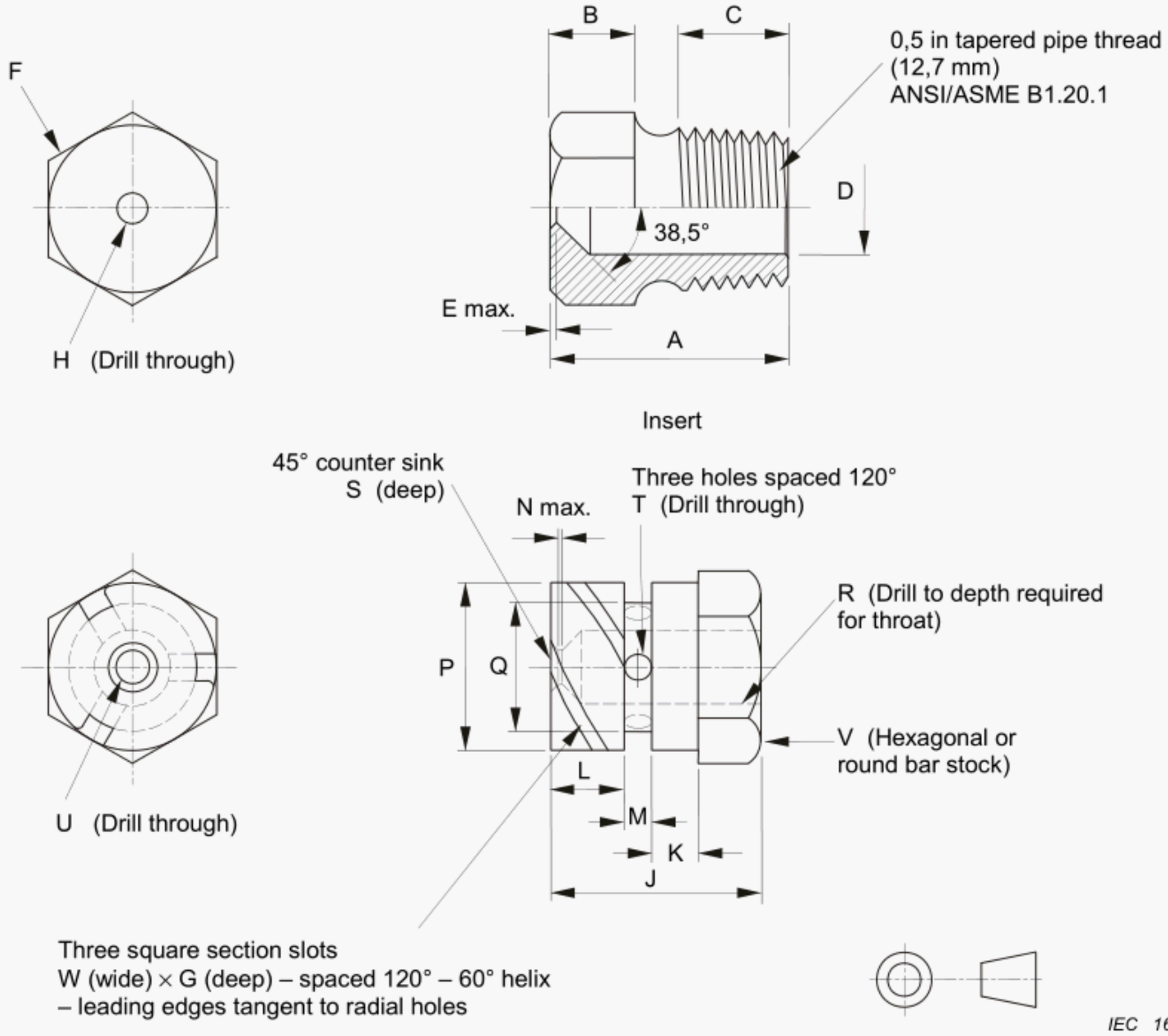
If there are openings in a vertical surface, located lower than 250 mm above ground level, such that water ingress from rain bouncing upwards from the ground surface might occur, a test shall be performed, spraying water on the ground surface in front of such openings, over such distance necessary to cause the deflected spray to reach the OUTDOOR ENCLOSURE. This test is not carried out if, from an examination of the construction, it is determined that the test of the vertical surface adequately assures compliance.



Key

Item	mm
A	710
B	1 400
C	55
D	230
E	75

Figure B.1 – Water-spray test spray-head piping



Item	mm	Item	mm
A	31,0	N	0 ,80
B	11,0	P	14,61
C	14,0		14,63
D	14,68	Q	11,51
	14,73		11,53
E	0,40	R	63,5
F	[a]	S	0,80
G	1,52	T	2,80
H	5,0	U	2,50
J	18,3	V	16,0
K	3,97	W	16,0
L	6,35		
M	2,38		

[a] Optional – To serve as a wrench grip

Figure B.2 – Water-spray test spray head

Annex C
(normative)

Ultraviolet light conditioning test
(see 8.2)

C.1 Test apparatus

Samples are exposed to ultraviolet light by using one of the following apparatus:

a) a twin enclosed carbon-arc, (see Clause C.3), with continuous exposure. The test apparatus shall operate with a black-panel temperature of 63 °C °± 3 °C in a relative humidity of 50 % ± 5 %; or

b) a xenon-arc (see Clause C.4), with continuous exposure. The test apparatus shall operate with a 6 500 W, water-cooled xenon-arc lamp, a spectral irradiance of 0,35 W/m^2 at 340 nm, a black-panel temperature of 65 °C ± 3 °C in a relative humidity of 50 % ± 5 %.

C.2 Mounting of test samples

The samples are mounted vertically on the inside of the cylinder of the light exposure apparatus, with the widest portion of the sample facing the arcs. They are mounted so that they do not touch each other.

C.3 Carbon-arc light-exposure apparatus

The apparatus described in ISO 4892-4, or equivalent, is used in accordance with the procedures given in ISO 4892-1 and ISO 4892-4 using a type 1 filter, with water spray.

C.4 Xenon-arc light-exposure apparatus

The apparatus described in ISO 4892-2, or equivalent, is used in accordance with the procedures given in ISO 4892-1 and ISO 4892-2 using method A, with water spray.

Annex D
(normative)

Gasket tests
(see 8.5)

D.1 Gasket tests

The relevant tests specified in Clause D.2 or D.3, depending on the type of gasket material used, are applicable to gaskets employed on an ENCLOSURE subjected to water or dust. The additional test of Clause D.4 is applicable to gaskets employed on an ENCLOSURE subjected to oil or coolant. A set of three specimens of the gasket material shall be subjected to the relevant tests.

D.2 Tensile strength and elongation tests

This test is applicable to gaskets, which can stretch (such as O-rings). Gasket material, shall be of such quality that samples subjected to a temperature of 69 °C to 70 °C in circulating air for 168 h have a tensile strength of not less than 75 % and an elongation of not less than 60 % of values determined for unaged samples. At the conclusion of the tests, there shall be no visible deterioration, deformation, melting, or cracking of the material and the material shall not harden as determined by normal hand flexing.

D.3 Compression test

This test is applicable to gaskets with closed cell construction. The set of specimens of gasket material shall be tested to the requirements of a), b) and c) (see Figure D.1). On completion of each test, the specimens shall not show signs of deterioration or cracks that can be seen with normal or corrected vision.

a) *A cylindrical weight sufficient to apply 69 kPa shall be placed on the middle portion of each specimen for a period of 2 h. At the end of that time the weight shall be removed and the specimen allowed to rest at a room temperature of 25 °C ± 3 °C for 30 min. The thickness of the gasket shall then be determined and compared with a measurement obtained before the application of the weight. The compression set shall not exceed 50 % of the initial thickness of the specimen.*

b) *Following the test specified in a), the same specimens shall be suspended in an air oven at a temperature of 70° C for a period of 5 days. The specimens shall then be tested for compliance with a), approximately 24 h after removal from the oven.*

c) *Following the test specified in b), the same specimens shall be cooled to a temperature of –30 °C for a period of 24 h and then subjected to an impact from a hammer of 1,35 kg mass falling from a height of 150 mm upon removal from the cold chamber. The hammer head shall be steel, 28,6 mm in diameter and have a flat striking surface, 25,4 mm in diameter with slightly rounded edges. The specimens being tested shall be placed on short lengths of 50 mm by 100 mm minimum wooden pieces (clear spruce) when being impacted. Following the impact the specimens shall be examined for evidence of cracking or other adverse effects. The test shall be continued and the specimens impacted every 24 h for two more days. The specimens shall then be removed from the cold chamber, allowed to rest at a room temperature of 25 °C ± 3 °C for approximately 24 h, and then again tested for compliance with a).*

〈C〉 For special national conditions, see Annex ZB. 〈C〉

D.4 Oil immersion test

Gasket material shall not swell more than 25 % or shrink more than 1 % as a result of immersion in oil for 70 h at a room temperature of 25 °C ± 3 °C. Specifications are provided in ISO 18173:2005 or ASTM D471-98.

〖C〉 *Note deleted* 〈C〗

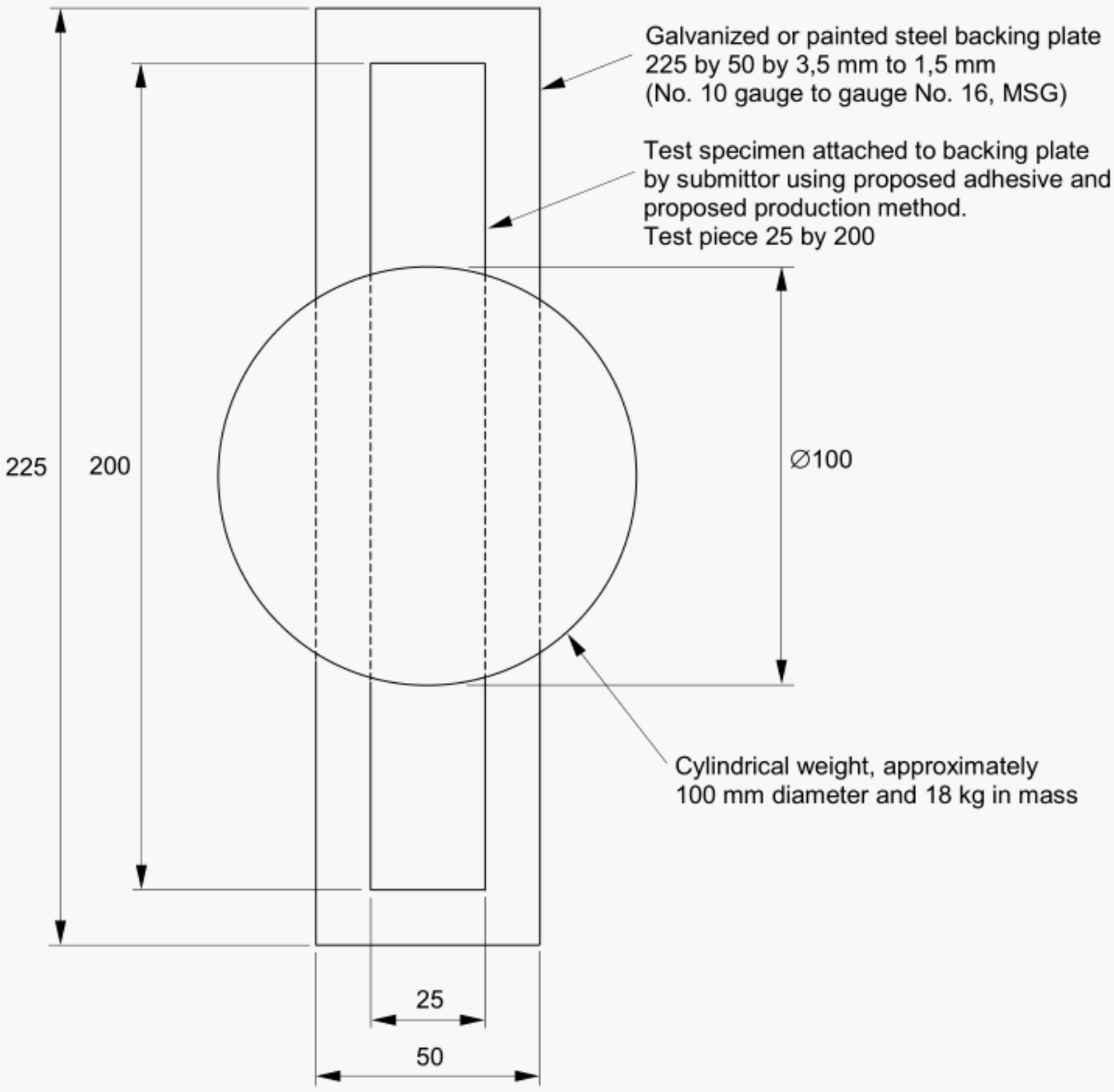


Figure D.1 – Gasket test

Annex E
(informative)

Rationale

E.1 General

In preparing this part of IEC 60950, it has been assumed that:

– exterior to the OUTDOOR EQUIPMENT there should be no hazards, just as is the case with other information technology equipment;

– protection against vandalism and other purposeful acts will be treated as a product quality issue (for example, IEC 60950 should not contain requirements for the security of locks, types of acceptable screw head, forced entry tests, etc.).

E.2 Electric shock

It is believed that most aspects relating to protection against the risk of electric shock are adequately covered by IEC 60950-1, first edition including current proposals, and in some cases, quoted safety standards (in particular, the IEC 60364 series), and with the exception of the following, do not require modification. Specific requirements not already suitably addressed in IEC 60950-1 were considered as follows:

– clearing of earth faults for remotely located (exposed) information technology equipment;

– the degree of protection provided by the ENCLOSURE to rain, dust, etc.;

– the effect of moisture and pollution degree on the insulation of the enclosed parts;

– the possible consequences of ingress by plants and animals (since these could bridge or damage insulation);

– the maximum permissible touch voltage and body contact impedance for wet conditions.

E.3 Energy Related Hazards

It is believed that most aspects relating to protection against energy hazards for humans are adequately covered by IEC 60950-1. However, the level of available fault current at the point of mains supply to the equipment can be significantly higher and hence the rating of components would need to take this into account (underrating of components in this area can also result in a fire hazard).

E.4 Fire

It is believed that most aspects relating to protection against fire emanating from within the equipment are adequately covered by IEC 60950-1. However, certain measures that may be acceptable for equipment located inside a building would not be acceptable outdoors because they would permit the entry of rain, etc.

For certain types of OUTDOOR EQUIPMENT it could be appropriate to allow the 'no bottom FIRE ENCLOSURE required if mounted on a concrete base' exemption that presently can be used for equipment for use within a RESTRICTED ACCESS LOCATION.

E.5 Mechanical hazards

It is believed that all aspects relating to protection against mechanical hazards emanating from the equipment are adequately covered by IEC 60950-1.

E.6 Heat related hazards

It is believed that most aspects relating to protection against direct heat hazards are adequately covered by IEC 60950-1. However, it may be appropriate to permit higher limits for equipment that is unlikely to be touched by passers by (for example, equipment that is only intended to be pole mounted out of reach).

A default nominal ambient temperature range for OUTDOOR EQUIPMENT has been proposed. The effects of solar heating have not been addressed.

In addition to direct thermal hazards, there is a need to consider consequential hazards. For instance, some plastics become brittle as they become cold. An ENCLOSURE made from such brittle plastic could expose users to other hazards (for example, electrical or mechanical) if it were to break.

E.7 Radiation

It is believed that most aspects relating to direct protection against radiation hazards are adequately covered by IEC 60950-1. However, there may be consequential hazards to consider.

Just as polymeric materials can be affected by low temperatures, they can also become embrittled due to the effect of UV radiation. An ENCLOSURE made from such brittle plastic could expose USERS to other hazards (for example, electrical or mechanical) if it were to break.

E.8 Chemical hazards

It is believed that certain types of OUTDOOR EQUIPMENT need to have measures relating to chemical hazards originating within, or external to, the equipment.

Exposure to chemicals in the environment (for example, salt used to clear roads in the winter) can also cause problems.

E.9 Biological hazards

These are not presently addressed in IEC 60950-1.

As with radiation hazards and chemical hazards, it is thought that there is not likely to be any direct biological hazard. However, plastics and some metals can be attacked by fungi or bacteria and this could result in weakening of protective ENCLOSURES. As stated under 'electric shock', the ingress of plants and animals could result in damage to insulation.

E.10 Explosion hazards

OUTDOOR EQUIPMENT may need to be weather-tight, in such cases there is an increased probability that an explosive atmosphere can build up as a result of:

– hydrogen being produced as a result of charging lead-acid batteries within the equipment and;

– methane and other ‘duct gasses’ entering the equipment from the outdoors.

Bibliography

IEC 60364-1:2001, *Electrical installations of buildings – Part 1: Fundamental principles, assessment of general characteristics, definitions*

〈C〉 NOTE Harmonized as HD 384.1 S2:2001 (modified). 〈C〉

IEC 60364-4-44, *Electrical installations of buildings – Part 4-44: Protection for safety – Chapter 44: Protection against voltage disturbances and electromagnetic disturbances*

〈C〉 NOTE Partly harmonized as HD 60364-4-443:2006 (modified), HD 384.4.442 S1:1997 (related) and R064-004:1999 (IEC 60364-4-444:1996, modified). 〈C〉

IEC 60364-5-53, *Electrical installations of buildings – Part 5-53: Selection and erection of electrical equipment – Isolation, switching and control*

IEC 60439-5:1996, *Low-voltage switchgear and controlgear assemblies – Part 5: Particular requirements for assemblies intended to be installed outdoors in public places – Cable distribution cabinets (CDCs) for power distribution in networks*[1)]
Amendment 1 (1998)

〈C〉 NOTE Harmonized as EN 60439-5:1996 + A1:1998 (not modified). 〈C〉

IEC 60664-1, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

〈C〉 NOTE Harmonized as EN 60664-1:2003 (not modified). 〈C〉

IEC 60721-3-4, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 4: Stationary use at non-weather protected locations*

〈C〉 NOTE Harmonized as EN 60721-3-4:1995 (not modified). 〈C〉

IEC 61024-1:1990, *Protection of structures against lightning –Part 1: General principles*

IEC 61587-1:1999, *Mechanical structures for electronic equipment – Tests for IEC 60917 and IEC 60297 – Part 1: Climatic, mechanical tests and safety aspects for cabinets, racks, subracks and chassis*

〈C〉 NOTE Harmonized as EN 61587-1:1999 (not modified). 〈C〉

IEC 61969-3, *Mechanical structures for electronic equipment – Outdoor enclosures – Part 3: Sectional specification – Climatic, mechanical tests and safety aspects for cabinets and cases*

〈C〉 NOTE Harmonized as EN 61969-3:2001 (not modified). 〈C〉

ASTM D471-98: *Standard Test Method for Rubber Property-Effect of Liquids*

1) A consolidated edition (1.1) exists, including IEC 60439-5:1996 and its Amendment 1 (1998).

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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 amendment) applies.

NOTE When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60068-2-11	1981	Environmental testing Part 2: Tests - Test Ka: Salt mist	EN 60068-2-11	1999
IEC 60364 (mod)	Series	Electrical installations of buildings	HD 384/ HD 60364	Series
IEC 60364-4-43	2001	Part 4-43: Protection for safety - Protection against overcurrent	- [1)]	-
IEC 60529	- [2)]	Degrees of protection provided by enclosures (IP Code)	EN 60529 + corr. May	1991 [3)] 1993
IEC 60950-1 (mod)	2005	Information technology equipment - Safety Part 1: General requirements	EN 60950-1	2006
IEC 61643 (mod)	Series	Low-voltage surge protective device	EN 61643	Series
ISO 178	- [2)]	Plastics - Determination of flexural properties	EN ISO 178	2003 [3)]
ISO 179	Series	Plastics - Determination of Charpy impact strength	EN ISO 179	Series
ISO 180	- [2)]	Plastics - Determination of Izod impact strength	EN ISO 180	2000 [3)]
ISO 527	Series	Plastics - Determination of tensile properties	EN ISO 527	Series
ISO 3231	- [2)]	Paints and varnishes - Determination of resistance to humid atmospheres containing sulfur dioxide	EN ISO 3231	1997 [3)]

[1)] IEC 60364-4-43:1977 + A1:1997 (modified) are harmonized as HD 384.4.43 S2:2001.

[2)] Undated reference.

[3)] Valid edition at date of issue.

Publication	Year	Title	EN/HD	Year
ISO 4628-3	- [2)]	Paints and varnishes - Evaluation of degradation of paint coatings - Designation of intensity, quantity and size of common types of defect Part 3: Designation of degree of rusting	EN ISO 4628-3	2003 [3)]
ISO 4892-1	- [2)]	Plastics - Methods of exposure to laboratory light sources Part 1: General guidance	EN ISO 4892-1	2000 [3)]
ISO 4892-2	- [2)]	Part 2: Xenon-arc sources	EN ISO 4892-2	1999 [3)]
ISO 4892-4	- [2)]	Part 4: Open-flame carbon-arc lamps	–	–
ISO 8256	- [2)]	Plastics - Determination of tensile-impact strength	EN ISO 8256	2004 [3)]
ISO 18173	2005	Non-destructive testing - General terms and definitions	–	–

Annex ZB
(normative)

Special national conditions

Special national condition: National characteristic or practice that cannot be changed even over a long period, e.g. climatic conditions, electrical earthing conditions.

NOTE If it affects harmonization, it forms part of the European Standard or Harmonization Document.

For the countries in which the relevant special national condition apply these provisions are normative, for other countries they are informative**.**

Subclause	Special national condition
4.1	In **Finland, Norway** and **Sweden**, the temperature in winter may be extremely low. For OUTDOOR EQUIPMENT this will demand special design so that the equipment can withstand transport, erection and operation/service at temperatures down to -50 °C.
10.2	In **Finland**, **Norway** and **Sweden** there are additional requirements for the minimum ambient temperature. See 4.1 of this annex.
D.3	In **Finland**, **Norway** and **Sweden** there are additional requirements for the minimum ambient temperature. See 4.1 of this annex.

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