SLOVENSKI STANDARD
SIST EN 14972-15:2021

01-december-2021

Vgrajeni gasilni sistemi - Sistemi s pršečo vodo - 15. del: Protokol preskušanja sistemov z odprtimi šobami za požarno zaščito turbin v ohišjih do 260 m³

Fixed firefighting systems - Water mist systems - Part 15: Test protocol for combustion turbines in enclosures not exceeding 260 m³ for open nozzle systems

Ortsfeste Brandbekämpfungsanlagen - Wassernebelsysteme - Teil 15: Brandversuchsprotokoll für Verbrennungsturbinen in Gehäusen bis 260 m³ für offene Düsensysteme

Installations fixes de lutte contre l'incendie - Systèmes à brouillard d'eau - Partie 15 : Protocole d'essai des systèmes à buses ouvertes pour turbines à combustion situées dans des enceintes ne dépassant pas 260 m³

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Fixed firefighting systems - Water mist systems - Part 15: Test protocol for combustion turbines in enclosures not exceeding 260 m³ for open nozzle systems

Installations fixes de lutte contre l'incendie - Systèmes à brouillard d'eau - Partie 15 : Protocole d'essai des systèmes à buses ouvertes pour turbines à combustion situées dans des enceintes ne dépassant pas 260 m³

Ortsfeste Brandbekämpfungsanlagen - Wassernebelsysteme - Teil 15: Prüfprotokoll für Verbrennungsturbinen in Gehäusen bis 260 m³ für offene Düsensysteme

This European Standard was approved by CEN on 2 August 2021.

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COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (EN 14972-15:2021) has been prepared by Technical Committee CEN/TC 191 “Fixed firefighting systems”, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2022, and conflicting national standards shall be withdrawn at the latest by March 2022.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

EN 14972, *Fixed firefighting systems — Water mist systems*, consists of the following parts:

— Part 1: *Design, installation, inspection and maintenance*;

— Part 2: *Test protocol for shopping areas for automatic nozzle systems*;

— Part 3: *Test protocol for office, school class rooms and hotel for automatic nozzle systems*;

— Part 4: *Test protocol for non-storage occupancies for automatic nozzle systems*;

— Part 5: *Test protocol for car garages for automatic nozzle systems*;

— Part 6: *Test protocol for false floors and false ceilings for automatic nozzle systems*;

— Part 7: *Test protocol for commercial low hazard occupancies for automatic nozzle systems*;

— Part 8: *Test protocol for machinery in enclosures exceeding 260 m^3 for open nozzle systems*;

— Part 9: *Test protocol for machinery in enclosures not exceeding 260 m^3 for open nozzle systems*;

— Part 10: *Test protocol for atrium protection with sidewall nozzles for open nozzle systems*;

— Part 11: *Test protocol for cable tunnels for open nozzle systems*;

— Part 12: *Test protocol for commercial deep fat cooking fryers for open nozzle systems*;

— Part 13: *Test protocol for wet benches and other similar processing equipment for open nozzle systems*;

— Part 14: *Test protocol for combustion turbines in enclosures exceeding 260 m^3 for open nozzle systems*;

— Part 15: *Test protocol for combustion turbines in enclosures not exceeding 260 m^3 for open nozzle systems*;

— Part 16: *Test protocol for industrial oil cookers for open nozzle systems*;

— Part 17: *Test protocol for residential occupancies for automatic nozzle systems*.

NOTE This list includes standards that are in preparation and other standards may be added. For current status of published standards refer to www.cen.eu.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This document specifies fire testing requirements for water mist systems used for fire protection of combustion turbines in enclosures with volumes not exceeding 260 m^3.

2 Normative references

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

EN 14972-1:2020, *Fixed firefighting systems — Water mist systems — Part 1: Design, installation, inspection and maintenance*

EN 10025-2, *Hot rolled products of structural steels — Part 2: Technical delivery conditions for non-alloy structural steels*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 14972-1:2020 apply.

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

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

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

4 General requirements

4.1 The water mist system, operating without manual intervention, shall successfully complete all described performance fire tests for their specific applications.

4.2 The fire tests shall be conducted until the fire is extinguished, as required by the applicable fire test.

4.3 System components, component locations, operating conditions and test enclosure details shall remain unaltered throughout all of the fire tests for a given application.

4.4 All fire tests shall be conducted using the specifications from the manufacturer's DIOM manual (design, installation, operation and maintenance manual) in regard to nozzle placement, spray flux, and spray duration. Sprays can be continuous or intermittent in time. In the case of intermittent, or cycled, sprays, the time period during which the system is not discharging shall not be greater than 50 % of one complete on/off cycle. The system off period shall not exceed 1 min.

4.5 In conjunction with the performance fire tests, all twin fluid water mist systems (except for those applying compressed air) shall be subjected to a straight discharge test with no fire to evaluate the resulting discharge and oxygen concentration. This evaluation shall be conducted using the maximum extinguishing agent flow and pressure. The discharge duration for the test shall be the maximum required for the system and occupancy to be protected. Oxygen measurements shall be recorded at a location(s) within the test enclosure. This information shall be used to evaluate personnel safety, and shall be accounted for in the manufacturer's DIOM manual.

4.6 In addition to the fire tests, an optional spray cooling test may be conducted, and the results shall be analysed by heat transfer calculations to confirm that excessive turbine shell distortion is avoided. No direct spray impingement onto the turbine casing is allowed in real installations unless otherwise proven by the heat transfer calculations using the spray cooling test results.

4.7 Up to a maximum of 5 nozzles used in the fire tests shall be kept for later verification.

5 Test enclosure requirements

The test enclosure volume shall have main dimensions of 7,3 m × 7,3 m × 4,9 m high (see Figure 1).

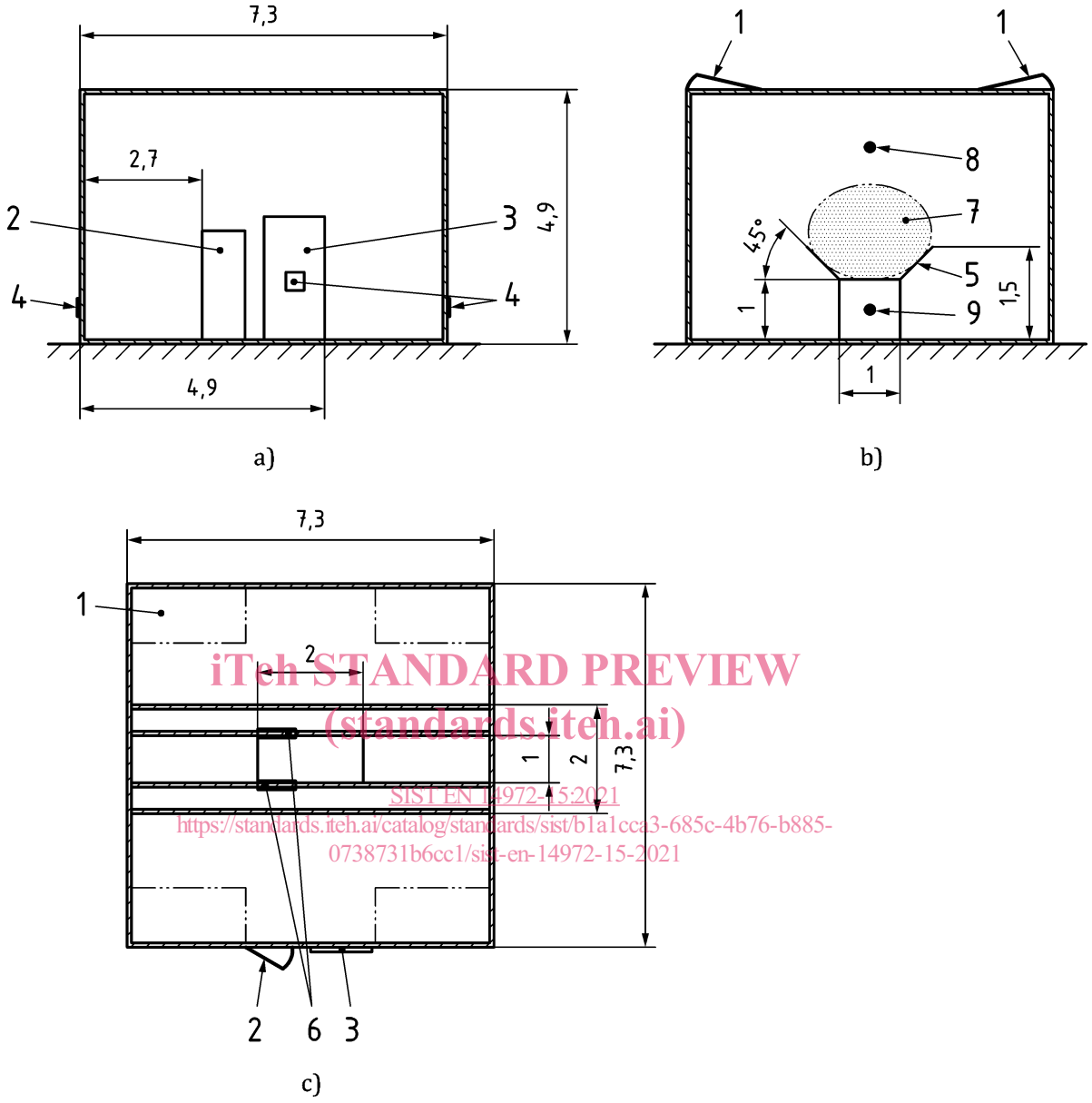
The enclosure shall be constructed of wood or metal frame with an inner lining of minimum 13 mm gypsum or 0,7 mm galvanized steel. To minimize leakages, all joints and gaps shall be sealed.

At 2,70 m from one of the enclosure corners, in one of the walls parallel to the turbine equipment mock-up, a 0,8 m × 2,0 m high personnel door shall be installed with a locking mechanism.

A 1,2 m × 2,4 m high removable panel shall also be installed in one of the walls to allow for test enclosure access (the personnel door may be constructed within this panel). A minimum of two hinged ceiling hatches measuring approximately 0,9 m × 1,8 m shall be installed in opposite diagonal corners for heat and smoke release at the conclusion of the fire test.

The floor shall be non-combustible and any floor drainage or vent openings shall be sealed during testing. A small louvered vent can be provided to allow the intake of air, to prevent excessive suctioning of the walls and ceiling and maintain structural integrity of the fire test enclosure.

Dimensions in metres



Key

a)	front view	4	window
b)	side view	5	sheet metal
c)	top view	6	baffles (0,5 m × 1 m)
1	ceiling hatch (typical)	7	imaginary turbine body
2	door (0,8 m × 2,0 m)	8	exposed spray fire
3	removable panel (1,2 m × 2,4 m)	9	shielded spray fire

NOTE The door (2) may be built within the removable panel (3).

Figure 1 — Test enclosure and combustion turbine simulator steel plate

6 Combustion turbine mock-up requirements

The combustion turbine casing mock-up is simulated with a horizontal flat steel plate and steel baffles to provide shielded spaces for fires (see Figure 1). The specific details and thermal mass of the obstructions are not simulated.

The combustion turbine mock-up unit should be centred along the longer wall dimension in the test enclosure.

A horizontal hot rolled 1.0044 steel plate according to EN 10025-2 or other equivalent steel (in lieu of actual turbine casing material like ductile iron), 1,0 m wide by 2,0 m long by 5 cm thick, is placed at 1 m elevation on steel legs at the four corners of the plate. This is located in the centre of the room or at a location within the test cell to be selected after the nozzles are installed (as per manufacturer's specifications). This allows the fire to be placed in an area considered the most challenging to the specific system being tested.

Horizontal 0,85 mm thick galvanized steel sheet metal shall be placed at an elevation of 1 m on steel legs, on both sides of the 1.0044 steel table, so that the combustion turbine mock-up extends longitudinally the entire length of the enclosure (see Figure 1).

The underside curvature of the turbine is simulated with 0,85 mm thick galvanized sheet metal directed upward at an angle of 45° on either side of the steel plate and horizontal sheet metal extension surface. These side pieces also extend longitudinally the entire length of the enclosure, rising to a height of 1,5 m above the horizontal sheet metal and steel plate surfaces. The total width of the mock-up is 2,0 m. There should be a minimal gap between the various steel table and sheet metal surfaces to permit water run-off. For ease of conducting the optional spray cooling test (see 4.6), it is recommended to either butt up or simply attach the table and sheet metal extension surfaces with screw fasteners.

The space below the plate is partially shielded from water mist using 1 m high by 0,5 m wide sheet metal baffles. The side baffles should be of 0,85 mm thick galvanized sheet metal construction and removable. They can be installed on support legs and kept in place by being pinched between the underside of the steel plate table and the 45° angle extensions and the floor for ease of removal. Placement of additional baffles or obstructions can be needed to prevent the direct impact of mist on the pool or spray test fires.

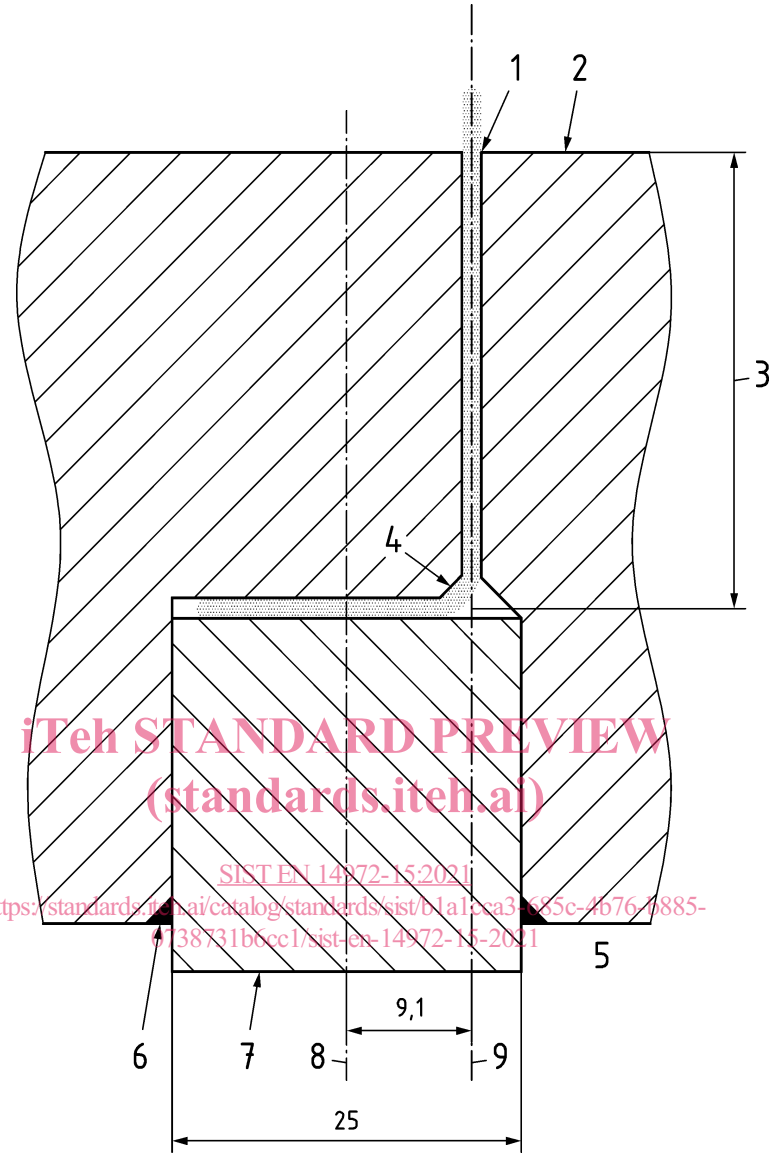
For the optional spray cooling test (see 4.6) the following requirements apply:

a) the centre of the 1.0044 steel plate is instrumented across its thickness with thermocouples placed at various depths, as described below;

b) three thermocouples shall each be embedded near the centre of the plate at approximately 12 mm, 25 mm, and 38 mm below the plate’s top surface. The three stainless steel sheathed thermocouples shall be embedded in the plate by removing cylindrical plugs from the plate;

c) the thermocouples shall be inserted to allow the thermocouple wire to follow a horizontal path of sixteen thermocouple diameters in length, thus reducing errors due to the vertical temperature gradient in the plate. A heat conductive and electrically insulating sealant shall be applied, and the steel cylindrical plugs shall be replaced and welded to the plate around the top periphery of the plugs. This can be accomplished by using a 25 mm diameter miller tool, installing the thermocouples, and then refilling the hole with welded 25 mm round bar stock (see Figure 2).

Dimensions in millimetres



Key

1 diameter hole for thermocouple (1,6 mm)
2 top
3 specified depth
4 45° chamfer
5 bottom
6 weld
7 plug (same material as the steel plate)
8 main axis
9 2nd axis

Figure 2 — Detail of embedded thermocouple for spray cooling test