
Fixed firefighting systems - Watermist systems - Design and installation

**iTeh STANDARD PREVIEW
(standards.iteh.ai)**

[OSIST prEN 14972:2004](https://standards.iteh.ai/catalog/standards/sist/1b20ec03-a232-43c6-bfef-0a45031da983/osist-pren-14972-2004)

<https://standards.iteh.ai/catalog/standards/sist/1b20ec03-a232-43c6-bfef-0a45031da983/osist-pren-14972-2004>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[OSIST prEN 14972:2004](https://standards.iteh.ai/catalog/standards/sist/1b20ec03-a232-43c6-bfef-0a45031da983/osist-pren-14972-2004)

<https://standards.iteh.ai/catalog/standards/sist/1b20ec03-a232-43c6-bfef-0a45031da983/osist-pren-14972-2004>

August 2004

ICS

English version

Fixed firefighting systems - Watermist systems - Design and installation

Ortsfeste Brandbekämpfungsanlagen -
Feinsprühlöschanlagen - Planung und Einbau

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 191.

If this draft becomes a European Standard, CEN 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.

This draft European Standard was established by CEN in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Contents

	Page
Foreword.....	3
Introduction	4
1 Scope	4
2 Normative references	4
3 Terms and definitions	5
4 Requirements	9
5 Activation and Control	12
6 Installation design	14
7 Components	19
8 Water supply, including additives.....	23
9 Acceptance tests and maintenance.....	30
Annex A (normative) Test procedures	32
A.1 General procedures	32
A.2 Content of a test report	34
A.3 Test procedure for flammable liquids (control and suppression systems)	35
A.3.1 General.....	35
A.3.2 Test procedure for volume protection compartment systems (control and suppression systems)	36
A.4 Fire test procedure for cable tunnels	39
A.4.1 Scope	39
A.4.2 Purpose.....	39
A.4.3 Test configuration.....	39
A.4.4 Description of test apparatus	43
A.4.5 Description of measuring equipment	43
A.4.6 Pass/fail criteria	44
A.4.7 System design and applications covered	44
A.5 Fire test procedure for office occupancies of Ordinary Hazard Group 1	45
A.5.1 Introduction	45
A.5.2 Office fuel package	45
A.5.3 Reference sprinkler system.....	50
Annex B (informative) Drop size distribution determining procedure.....	54
B.1 Symbols and definitions	54
B.1.1 Mean diameters.....	54
B.1.2 Representative diameters	54
B.2 Test data	55
B.3 Data processing	55
Annex C (informative) Testing of nozzles.....	58
C.1 Tests for open and closed nozzles	58
C.2 Clogging test.....	61
Annex D (informative) Function tests.....	63
D.1 Preliminary function tests.....	63
D.2 System function operational test.....	63
Bibliography	65

Foreword

This document (prEN 14972:2004) has been prepared by Technical Committee CEN/TC 191 "Fixed firefighting systems", the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[OSIST prEN 14972:2004](https://standards.iteh.ai/catalog/standards/sist/1b20ec03-a232-43c6-bfef-0a45031da983/osist-pren-14972-2004)

<https://standards.iteh.ai/catalog/standards/sist/1b20ec03-a232-43c6-bfef-0a45031da983/osist-pren-14972-2004>

Introduction

The main purpose of the standard is to provide adequate information to allow accurate selection of watermist technologies for suitable applications.

Although each watermist system is designed according to the manufacturer's guidelines, certain fundamental concepts common to all systems are covered in the standard, to enable quality checks of systems as far as design, installation and reliability are concerned.

1 Scope

This standard provides information for verifiable classification of watermist systems, according to their expected fire protection characteristics with reference to extinguishment, fire control or suppression.

It devises a series of specific test conditions to set out criteria capable of verifying performance claims of watermist systems, classify and determine the extent of their suitability for intended applications, whilst setting a minimum level of acceptable performance and/or safety.

As the fire test scenarios of this standard apply to a group of similar applications, by analogy the successful performance of watermist systems also applies to that group, as defined in annex A.

As individual watermist applications have varied requirements and duty, this European standard is intended to apply to both skidded stand alone and pumped systems. Aspects of watermist associated with explosion protection are beyond the scope of this standard. The standard is not intended to be used as a universal design manual of watermist, as different systems have different characteristics and hence follow different design criteria to satisfy their duty requirements. It is the approving authority's responsibility to assess and implement the design manual of specific watermist systems against the tests set out in this standard.

If the gas in the system is the major factor for extinguishing/suppression the relevant parts of EN 12094 are to be considered.

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.

EN 54-4, *Fire detection and fire alarm systems – Part 4: Power supply equipment.*

EN 12094-1, *Fixed fire fighting systems – Components for gas extinguishing systems – Part 1: Requirements and test methods for electrical automatic control and delay devices.*

EN 12259-1, *Fixed firefighting systems – Components for sprinkler and water spray systems – Part 1: Sprinklers.*

prEN 12259-6, *Fixed firefighting systems – Components for sprinkler and water spray systems – Part 6: Pipe couplings.*¹⁾

prEN 12259-7, *Fixed firefighting systems – Components for sprinkler and water spray systems – Part 7: Pipe hangers.*¹⁾

1) under preparation

EN 12845, *Fixed firefighting systems – Automatic sprinkler systems – Design, installation and maintenance.*

EN 13501-1, *Fire classification of construction products and building elements – Part 1: Classification using test data from reaction to fire tests.*

prEN 14816, *Fixed firefighting systems – Water spray systems – Design and installation.*

EN 60529:1991, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989 + A1:1999).*

EN 60079 (all parts), *Electrical apparatus for explosive gas atmospheres.*

EN ISO 14847, *Rotary positive displacement pumps – Technical requirements (ISO 14847:1999).*

IEC 61241 (all parts), *Electrical apparatus for use in the presence of combustible dust.*

ISO 565, *Test sieves – Metal wire cloth, perforated metal plate and electroformed sheet – Nominal sizes of openings.*

ISO 5660-1, *Reaction-to-fire tests – Heat release, smoke production and mass loss rate – Part 1: Heat release rate (cone calorimeter method).*

3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply.

3.1

automatic nozzle

nozzle with an integrated release element

3.2

authority having jurisdiction

the organization, office, or individual responsible for approving equipment, and installation, or a procedure

3.3

certification of conformity

action by a third party, demonstrating that adequate confidence is provided that a duly identified product, process or service is in conformity with a specific standard or other normative document [EN 45020]

3.4

competent person

person with the necessary training and experience, with access to the relevant tools, equipment and information, manuals and knowledge of any special procedures recommended by the manufacturer and/or holder of the approval of the watermist system, to be capable of carrying out the relevant maintenance procedures of this standard

3.5

deluge system

a watermist system using open nozzles attached to a piping system that is connected to a water supply through a valve that is opened by means of a detection system installed in the same area as the mist nozzles. When the valve opens, water flows into the piping system and discharges through all nozzles attached to the system.

NOTE 1 The system is controlled by a valve which is activated by a detection system and/or by manual means. When the valve is open and the system pressurised, water flows into the pipe work system and discharges simultaneously through all the nozzles. Systems may sometimes be sub-divided into zones.

NOTE 2 For water the word medium might be better as water and/or water with additive can be used.

3.6

discharge flow rate

the flow rate at which firefighting medium is applied, in litres per minute

3.7

dry pipe system

a watermist system using automatic nozzles attached to a piping system containing air, nitrogen, or inert gas under pressure, the release of which (as from an opening of an automatic nozzle) allows the water pressure to open a dry pipe valve. The water then flows into the piping system and out through any open nozzles

3.8

duration (system)

the total time for which the supply of fire fighting medium is designed to last, in minutes. For systems with intermittent discharge it is the sum of the times of discharge and the times without discharge

3.9

duration (discharge)

the time for which fire fighting medium is continuously applied, in minutes

3.10

extended service

third most frequent scheduled maintenance procedure

3.11

firefighting medium

substance which causes fire extinction, suppression or control

NOTE Media for use in watermist systems: demi water, potable and sweet industrial water, and water with additives are relevant.

The terminology includes the following:

- a) water only, i.e. potable water, natural sea water, deionized water;
- b) water with antifreeze;
- c) water with fire extinguishing enhancing additive;
- d) combination of the above with an inert gas or a blend of inert gases used primarily to atomize the water and/or to reduce oxygen concentration at the fire (see 3.26).

3.12

fire extinguishment

complete elimination of any flaming or smouldering fire

3.13

fire suppression

a sharp reduction in the heat release rate and prevention of re-growth of the fire

3.14

fire control

limitation of fire growth and prevention of structural damages (by cooling of the objects, adjacent gases and/or by pre-wetting adjacent combustibles)

3.15

fitness for purpose

ability of a product, process or service to serve a defined purpose under specific conditions [EN 45020]

3.16

inspection

most frequent scheduled maintenance procedure

3.17**installation (watermist)**

part of a watermist system comprising a control valve set, the associated downstream pipes and nozzles

3.18**maintenance**

the combination of all technical and administrative actions, including supervision actions, intended to retain an item in, or restore it to, a state in which it can perform a required function [EN 50126]

3.19**preaction system**

system, in which the control valve can be opened by an independent fire detection system in the protected area, allowing the fire fighting medium into the pipework within the protected area prior to the independent operation and subsequent operation of any automatic nozzle

3.20**watermist system**

a watermist system is the entire means of a fire protection system connected to a water supply equipped with one or more nozzles capable of delivering watermist. Watermist systems may discharge plain watermist or a mixture of watermist and some other agent or agents like gases or additives

3.21**object protection system**

a watermist system designed to discharge directly on an object or hazard to provide either extinguishment control or cooling as required

3.22**overhaul**

least frequent scheduled maintenance procedure

3.23**qualified company**

company registered by a national responsible body or accepted by the authorities having jurisdiction for design, installation and maintenance of fixed watermist systems and fully trained and authorized by the manufacturer

3.24**response time**

the time measured from the moment fire is detected until extinguishing media is applied at full system pressure

3.25**single fluid system**

a system which generates watermist by passage of water through the nozzle

3.26**twin fluid system**

a system which generates watermist at the nozzle by mixing water with an atomizing gas fed from a separate pipe(s) from the water supply

iTeh STANDARD PREVIEW
(standards.iteh.ai)

OSIST prEN 14972:2004

<https://standards.iteh.ai/catalog/standards/sist/1b20ec03-a232-43c6-bfef>

Accepted

3.27

system pressure

- low pressure: up to 12,5 bar;
- medium pressure: higher than 12,5 bar, but below 35 bar
- high pressure: 35 bar and higher

3.28

supplier

the party that is responsible for the product, process or service and is able to ensure that quality assurance is exercised. The definition may apply to manufacturers, distributors, importers, assemblers, service organisations, etc. [EN 45020]

3.29

user

person or persons responsible for/or having effective control over fire safety provisions adopted in or appropriate to the premises or building or risk where the watermist system is installed

3.30

volume protection system

a watermist system designed to protect a predefined volume

3.31

watermist

a water spray for which the $D_{v0,90}$ as measured in a plane 1 m from the nozzle, at its minimum design operating pressure less than 1 mm

3.32

watermist nozzle

special purpose device with one or more orifices which is designed to produce and discharge watermist

[OSIST prEN 14972:2004](https://standards.iteh.ai/catalog/standards/sist/1b20ec03-a232-43c6-bfef-0a45031da983/osist-pren-14972-2004)

3.33

water supply, self-contained

a water supply designed exclusively for a single watermist system, with no connection to an external water source, typically comprising a set of bottles or a skid mounted pressure tank, pre-fabricated in the manufacturer's workshop

[https://standards.iteh.ai/catalog/standards/sist/1b20ec03-a232-43c6-bfef-](https://standards.iteh.ai/catalog/standards/sist/1b20ec03-a232-43c6-bfef-0a45031da983/osist-pren-14972-2004)

[0a45031da983/osist-pren-14972-2004](https://standards.iteh.ai/catalog/standards/sist/1b20ec03-a232-43c6-bfef-0a45031da983/osist-pren-14972-2004)

3.34

wet pipe system

a watermist system using automatic nozzles attached to a piping system containing water and connected to a water supply so that water discharges immediately from nozzles operated by the heat from a fire

3.35

preburn time

time from ignition of the fire source till the design pressure or design flow is available at the hydraulically most remote nozzle

3.36

rated working pressure

design pressure of system and system components

3.37

burst pressure

the pressure when a component will fail during testing under component test conditions

3.38

domestic occupancy

individual dwelling for occupation as a single family unit or constructed or adapted to be used wholly or principally for human habitation

3.39**residential occupancy**

occupancy for multiple occupation, such as apartments, residential homes, houses of multiple occupancy (HMO), blocks of flats, boarding houses, aged persons homes, nursing homes, residential rehabilitation accommodation, and dormitories

4 Requirements**4.1 Protection criteria****4.1.1 General information**

The aim of the present clause is to give a general guidance in order to choose the correct watermist system for each application. Nevertheless the selected watermist system shall be supported by test approvals and shall fulfil the other requirements described in the present standard. Systems that have proved their right performance can overrule the following considerations.

4.1.2 Limitations**4.1.2.1 Material which react with water**

Watermist systems shall not be used for direct application to materials that react with water to produce violent reactions or significant amounts of hazardous products. This materials include:

- a) Reactive metals, such as lithium, sodium, potassium, magnesium, titanium, zirconium, uranium and plutonium;
- b) Metal alkoxides, such as sodium methoxide;
- c) Metal amides, such as sodium amide;
- d) Carbides, such as calcium carbide;
- e) Halides, such as benzoyl chloride and aluminum chloride;
- f) Hydrides, such as lithium aluminum hydride;
- g) Oxyhalides, such as phosphorus oxybromide;
- h) Silanes, such as trichloromethylsilane;
- i) Sulfides, such as phosphorus pentasulfide;
- j) Cyanates, such as methylisocyanate.

4.1.2.2 Liquefied gases

Watermist systems shall not be used for direct application to liquefied gases at cryogenic temperatures (such as liquefied natural gas), which boil violently when heated by water.

4.1.3 Identification of protection objectives on defined hazards

Identifying the fire protection objectives from the table below should be carried for each fire protection application. In multiple hazard cases it is necessary to identify the protection objectives for each hazard. Care shall be taken to prevent negative interaction between individual fire protection systems, see Table 1.

Table 1 — Protection objectives in fire protection

Fire protection	Objective	Requirements	Notes
Fire extinguishing	<ul style="list-style-type: none"> - fire extinguishing preventing the spread of the fire - binding the smoke gases 	<ul style="list-style-type: none"> - fast response fire detectors and a short actuation time (≤ 3 min) - higher volume extinguishing intensities 	minimum operating times according of the results from performance tests or against other technical standards
Fire control	<ul style="list-style-type: none"> - limiting and reducing the intensity of the fire at its seat and in relation to the surroundings - preventing the spread of the fire - binding the smoke gases - protecting people - protecting buildings - protecting technological equipment 	<ul style="list-style-type: none"> - actuation of the system in the developing fire phase (≤ 5 min) - minimum operating time of the system is based on the time taken for the fire brigade to deploy 	<ul style="list-style-type: none"> - Controlled burn-out of the section located in the fire - lower volume extinguishing intensities are necessary than for the "fire extinguishing" protection objectives - operating time according of the results from performance tests or against other technical standards
Fire suppression	see protection objectives fire control with the same or an lower heat flow	<ul style="list-style-type: none"> - actuation of the system in the developing fire phase (≤ 5 min) - minimum operating time of the system is based on the time taken for the fire brigade to deploy 	see under fire control
Fire barrier	<ul style="list-style-type: none"> - complementing and supporting fire protection structures - preventing the spread of the fire into other fire sections and extinguishing sections - abatement of the smoke gases 	<ul style="list-style-type: none"> - minimum operating time of the system corresponds to the fire resistance of the surrounding fire protection structures - coherent and optically dense aqueous film 	no discharge of water onto the actual seat of the fire
Heat binding	<ul style="list-style-type: none"> - binding the quantity of heat released from a fire in the surroundings of the object to be protected - abatement of the smoke gases - preserving the safety of building structures and technological installations 	<ul style="list-style-type: none"> - coherent and optically dense aqueous film - minimum operating time of the system is based on the time taken for the fire brigade to deploy or the specific requirements of the extinguishing system operator 	system is arranged around the object to be protected

Once the protection objectives and the scope have been specified, the fire-specific factors of influence can be determined, taking account of the type of protection, i.e. object protection or volume protection.

4.1.4 Object protection

Systems designed to be installed in an object protection applications shall be tested for the associated hazard class selected and for the main protection objective/objectives of the applications concerned.

Systems designed to be installed in multiple hazard object protection areas, where protection for individual objects is foreseen, they shall be approved for all associated hazards present in the area.

If necessary additional systems/nozzles shall be installed to cover all hazards present in that area.

The system nozzle distribution shall provide sufficient object coverage as specified by the manufacturers design and installation manual.

4.1.5 Volume protection

Systems designed to be installed in a volume protection shall be tested for the hazard class selected and for the main fire protection objective/objectives.

Systems designed to be installed in a multiple hazard application shall be approved for all present hazards in the volume.

System nozzle distribution shall provide total volume protection, specified by the manufacturer's design and installation manual and shall consider relevant factors such as leakage via openings, ventilation rates, obstructions, etc..

NOTE The installation of an automatic door closing mechanism will improve the effectiveness of the system.

4.1.6 Other considerations: (standards.iteh.ai)

4.1.6.1 Discharge delay OSIST prEN 14972:2004

<https://standards.iteh.ai/catalog/standards/sist/1b20ec03-a232-43c6-bfef>

The fire fighting agent shall exit from all nozzles within 30 s after activation, whether the system is wet, dry, preaction or any other.

4.1.6.2 Selection of detection system

Detection shall be the responsibility of the watermist system supplier, who shall inform the end user of the most appropriate detection type to be installed to guarantee correct performance. The detection system shall be as specified in the manufacturers design and installation manual.

The detection system shall comply with clause 6.

4.1.6.3 Oxygen depletion

The system supplier shall demonstrate by calculations or discharge tests that the total amount of gaseous medium delivered into the protected enclosure in twin fluid systems and/or cylinder systems won't decrease oxygen concentration below a level dangerous to persons. In cases, where critical oxygen concentrations may prevail, early warning signals and appropriate system activation time delays shall be implemented in order to enable people to be evacuated from the area. The safety requirements effected by the gas concentration produced by the watermist system shall comply with national regulations.

NOTE This consideration applies to systems based on volume inerting.

4.2 Requirements on the qualified company

Watermist systems shall only be designed, installed and maintained by qualified companies.

5 Activation and Control

5.1 General

The detection and activation system can either be mechanical, hydraulic, pneumatic, sprinkler type or electrical. The pneumatic sprinkler activation systems should be in accordance with prEN 14816. The electrical activation should be in accordance with EN 12845.

Details of specific intermittent misting operations of systems and the associated modes of controls re-setting are not specified in this standard, but such systems can be applied in design, as long as the above agreed principles of system rationale are observed and followed.

Detection, actuation, alarm and control systems shall be installed, tested and maintained in accordance with appropriate national standards.

Failure of the control panel shall not be able to stop the ongoing watermist discharge or the ongoing discharge sequence.

5.2 Electrical activation and control

5.2.1 General

For the design, installation and maintenance of electrically activated systems, and also for component requirements in respect of these systems, see relevant parts of EN 54 and EN 12094.

Watermist systems shall be automatically activated, except where the authorities having jurisdiction allow only manual activation.

The system shall be arranged so that there is no possibility of an alarm being produced in an adjacent extinguishing zone by the fire fighting medium.

5.2.2 Application of EN 54

The relevant part of EN 54 series shall be applied to the detection part of watermist systems, with the following additions:

- a) The cable inlets and the detector bases shall at least comply to protection type IP 54 according to specifications of EN 60529. If the system can be automatically released via the detection system without the need of manual reset after the first release of the system they shall at least comply to protection type IP 65 according to specifications of EN 60529.

NOTE To achieve rapid fire extinguishing, the activation of the watermist system should be activated by one alarm signal only. If, on the other hand, the system is activated after the reception of two alarm signals, generated by automatic fire detectors, the reception of the first signal should be indicated visibly and audibly. On the reception of the first signal, outputs (eg for plant shut down) may be activated.

- b) When the water discharge of the system depends on detector signal after the first release, no flame detectors or smoke detectors shall be used, unless the type of detector has proven its reliability in the presence of watermist.
- c) Heat detectors shall have maximum response temperatures up to 120 °C. If higher temperature is present in the coverage area of the watermist system, the activation temperature shall be at least 30 °C above the maximum temperature to be expected during standard operation.
- d) If monitoring is required, all the following active elements of watermist systems shall have their functions supervised for open line and/or short circuit and shall have its status signalled:
 - 1) The signal from the (separate) detection system to activate the watermist control system.

- 2) The output circuit from the watermist control system to the electrical activating device for the water discharge.
- 3) The system “discharged” device, i.e. pressure device or flow device.
- 4) A maintenance isolate switch, if installed. It shall electrically isolate the electrical activating device.
- 5) The expellent gas pressure-switch, if installed, to monitor the operational status of the system.
- 6) A level-switch (in case of a water storage container) to monitor the operational status of the system.
- 7) The “double-action” manual release device to activate the watermist control system.

NOTE Indicators for elements 4, 5 and 6 may be combined in one “system-status-indicator”.

- e) If networked ringmains (loops) are used, several actuators shall be connected within a maximum of 8 sections in one loop. Between adjacent section actuators short circuit isolators shall be installed.
- f) If a system operates intermittently, a post-spraying period of at least 10 s shall be incorporated after the end of alarm.

NOTE 1 For intermittent system, UV detectors (ultra-violet detectors) should not be utilised for monitoring the extinguishing result, since the ultra-violet range of the light to be detected is falsified in the wavelength range from 170 nm to 290 nm.

NOTE 2 For intermittent system, IR detectors (infrared detectors) may be used, which detect light wavelengths of 1 µm to 10 µm and flickering flame frequencies of < 10 Hz, can detect the flame unambiguously through a watermist jet.

5.2.3 Power supply

The electric power supply shall be independent of the supply for the hazard area and shall comply with EN 54-4.

5.2.4 Manual activation

Watermist systems activation by fire detection shall be equipped with a manual triggering device.

Watermist systems with automatic nozzles need not a manual activation.

The manual triggering device should be located near the exit, outside the protected rooms and should be installed at normal operating height, at highly visible locations.

In addition to any means of automatic operation, the system shall be provided with an emergency triggering device for providing direct mechanical actuation of the system.

NOTE 1 National standards may require the release to operate after the pre-discharge alarms and time delay.

NOTE 2 National standards may require a manual triggering device incorporating a double action or other safety device to restrict accidental operation.

5.2.5 Alarm indications

Alarms or indicators or both shall be used to indicate the operation of the system or failure of any supervised device. The type (audible, visual), number, and location of the devices shall be such that their purpose is satisfactorily accomplished.

The activation of a watermist system should activate an acoustic alarm and an optical alarm.