



SLOVENSKI STANDARD
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**Vgrajene naprave za gašenje - Sestavni deli sprinklerskih sistemov in sistemov s
pršečo vodo - 14. del: Sprinklerji za uporabo v stanovanjih**

Fixed firefighting systems - Components for sprinkler and water spray systems - Part 14:
Sprinklers for residential applications

Ortsfeste Brandbekämpfungsanlagen - Bauteile für Sprinkler- und Sprühwasseranlagen -
Teil 14: Sprinkler für die Anwendung im Wohnbereich

Installations fixes de lutte contre l'incendie - Organes constitutifs des systèmes
sprinklers et à pulvérisation - Partie 14: Sprinkleurs pour applications résidentielles

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Fixed firefighting systems - Components for sprinkler and water spray systems - Part 14: Sprinklers for residential applications

Installations fixes de lutte contre l'incendie - Organes constitutifs des systèmes sprinkleurs et à pulvérisation - Partie 14: Sprinkleurs pour applications résidentielles

Ortsfeste Brandbekämpfungsanlagen - Bauteile für Sprinkler- und Sprühwasseranlagen - Teil 14: Sprinkler für die Anwendung im Wohnbereich

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Contents

	Page
Foreword.....	5
1 Scope	5
2 Normative references	5
3 Terms and definitions	6
4 Construction and performance	8
4.1 General.....	8
4.2 Product assembly	9
4.2.1 Protective Covers	9
4.3 Dimensions and pressure rating.....	9
4.3.1 Dimensions.....	9
4.3.2 Pressure ratings.....	9
4.4 Nominal operating temperature	9
4.5 Operating temperatures	9
4.6 Water flow and distribution	10
4.6.1 K-factor	10
4.6.2 Water distribution	10
4.6.3 Water Impingement Test.....	11
4.7 Function.....	11
4.8 Fire Test.....	11
4.8.1 General.....	11
4.9 Strength of sprinkler body	11
4.9.1 Strength of frame test	11
4.9.2 Flow endurance.....	11
4.10 Strength of release element.....	12
4.10.1 Glass bulb sprinklers	12
4.10.2 Fusible link sprinklers.....	12
4.11 Leak resistance.....	12
4.11.1 Hydrostatic strength.....	12
4.11.2 Heat exposure	12
4.11.3 Thermal shock.....	12
4.12 Corrosion.....	12
4.12.1 Stress corrosion	12
4.12.2 Sulphur dioxide–Carbon dioxide corrosion.....	12
4.12.3 Salt mist corrosion	13
4.12.4 Moist air	13
4.13 Water hammer	13
4.14 Thermal response	13
4.15 Resistance to vibration	13
4.16 Resistance to impact.....	13
4.16.1 Impact test for sprinklers.....	13
4.16.2 Impact test for protective covers	13
4.17 Resistance to low temperature.....	14
4.18 Resistance to heat	14
5 Marking	14
5.1 Identification number	14
5.2 Temperature rating and year of manufacture	14
5.3 Manufacturing location	14
5.4 Glass bulb manufacturer	14
5.5 Painted decorative sprinklers.....	15
5.6 Protective covers.....	15
5.7 Sidewall sprinklers	15

5.7.1	General	15
5.7.2	Horizontal sidewall sprinklers.....	15
5.8	Concealed sprinklers	15
5.9	Removable recessed housing.....	15
6	Instruction charts	15
6.1	General	15
6.2	Installation Instructions	15
7	Evaluation of conformity	16
7.1	General	16
7.2	Initial type testing	16
7.3	Factory production control (FPC).....	17
7.3.1	General	17
7.3.2	Production leakage test.....	17
7.3.3	Glass bulb integrity test.....	17
Annex A (normative) Conditions for tests.....		18
Annex B (normative) Test to determine operating temperatures of fusible link sprinklers and glass bulb sprinklers.....		19
Annex C (normative) Water flow and distribution tests.....		20
C.1	Calibration Test	20
C.2	Test equipment	20
C.3	Dry type sprinklers	22
C.4	Test procedure.....	22
Annex D (normative) Water distribution test.....		23
D.1	Water distribution test – Horizontal surface.....	23
D.1.1	General	23
D.1.2	Upright, pendant, flush, and concealed sprinklers.....	23
D.1.3	Sidewall Sprinklers.....	25
D.2	Water distribution test – vertical surface.....	26
D.2.1	Test method.....	26
D.3	Water impingement test.....	28
D.3.1	Test method	28
Annex E (normative) Fire test.....		29
E.1	Extent of testing	29
E.2	Test arrangement	33
E.2.1	General	33
E.2.2	Test room	33
E.2.3	Fire source	35
E.2.4	Sprinkler installation.....	36
E.3	Test method	37
E.4	Supplementary test	37
Annex F (normative) Functional test		38
Annex G (normative) Strength of sprinkler body		40
G.1	Strength of sprinkler body.....	40
G.2	Flow endurance test.....	40
Annex H (normative) Strength of release elements test.....		41
H.1	Load on heat responsive element	41
H.2	Sample number and temperature for load test	41
H.3	Glass bulbs	41
H.4	Fusible links	41
Annex I (normative) Leak resistance tests.....		42
I.1	Hydrostatic Strength Test.....	42
Table I.1 — Test pressures for the leakage and hydrostatic tests.....		42
Annex J (normative) Heat exposure		43

prEN 12259-14:2014 (E)

J.1	Test duration	43
J.2	Test oven	43
Annex K	(normative) Glass bulb sprinkler thermal shock test	44
K.1	Performance	44
K.2	Test procedure	44
Annex L	(normative) Exposure and corrosion tests	45
L.1	Stress corrosion	45
L.2	Moist carbon dioxide–sulphur dioxide air mixture	45
L.3	5 % salt spray	46
L.4	Moist Air	46
Annex M	(normative) Water hammer test	47
M.1	Water hammer test	47
Annex N	(normative) Thermal response test	48
N.1	Oven heat test	48
N.2	Room heat test	51
Annex O	(normative) Vibration test	54
Annex P	(normative) Impact test	55
P.1	Impact test	55
P.2	Impact test – protective covers	57
Annex Q	(normative) Resistance to low temperature test	59
Annex R	(normative) Resistance to high temperature test	60
Annex S	(informative) Tolerance Limit Calculation Methods	61

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Foreword

This document (prEN 12259-14:2014) 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.

Annexes A to R are normative. Annex S is informative. This document includes a Bibliography.

It is included in a series of European standards planned to cover:

- automatic sprinkler systems (EN 12259 and EN 12845);
- gas extinguishing systems (EN 12094);
- powder systems (EN 12416);
- explosion protection systems (EN 26184);
- foam systems (EN 13565);
- gas systems (EN 12094);
- hydrant and hose reel systems (EN 671);
- smoke and heat control systems (EN 12101);

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prEN 12259-14:2014
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1 Scope

This European standard specifies requirements for construction and performance of residential sprinklers and their rosettes which are operated by a change of state of an element or bursting of a glass bulb under the influence of heat, for use in automatic residential sprinkler systems. Test methods and a recommended test schedule for type approval testing are also given.

This standard does not cover representative fire and other tests for special sprinklers that are intended to provide for specific fire hazards, nor does it cover fire and other tests for sprinklers for commercial and industrial sprinkler systems as in EN 12845. Those test requirements are covered by EN 12259-1.

NOTE All pressure data in this European standard are given as gauge pressures in bar.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ASTM B117, *Standard practice for operating salt spray (fog) apparatus*

ASTM E1354, *Standard test method for heat and visible smoke release rates for materials and products using and oxygen consumption calorimeter*

EN 12845, *Fixed fire fighting systems – Automatic sprinkler system – Design, installation and maintenance*

prEN 12259-14:2014 (E)

ISO 7-1, *Pipe threads where pressure-tight joints are made on the treads – Part 1: Dimensions, tolerances and designation*

UL 723, *Standard for test for surface burning characteristics of building materials*

3 Terms and definitions

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

3.1 painted sprinkler
sprinkler that has factory applied paint, platings or coatings for corrosion protection or decorative purposes

3.2 concealed ceiling sprinkler
sprinkler assembly having a cover plate

3.3 discharge coefficient “K”

known as K-factor

coefficient of discharge in the formula,

$$Q = K \sqrt{p}$$

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where

Q is the flow in litres per minute, and p is the pressure in bar

3.4 dry-type sprinkler

sprinkler secured in an extension nipple that has a seal at the inlet end to prevent water from entering the nipple until the sprinkler operates

Note 1 to entry: These sprinklers may consist of a pendant, sidewall, ceiling or other types.

3.5 flush ceiling sprinkler

sprinkler in which all or part of the body, including the shank thread, is mounted above the lower plane of the ceiling

3.6 heat responsive element

that portion of a sprinkler that breaks, melts, or otherwise functions to initiate the automatic operation of the sprinkler when exposed to sufficient heat

3.7 heptane

commercial grade heptane having the following characteristics:

- a) minimum Initial Boiling Point of 88 °C;
- b) maximum Dry Point of 100 °C; and
- c) specific Gravity (15,6 °C/15,6 °C) of 0,68 - 0,73

3.8**orifice**

opening that controls the amount of water discharged from a sprinkler at a given pressure

3.9**pendant sprinkler**

sprinkler intended to be installed so that its deflector is located below the orifice and the water flows downward through the orifice

3.10**residential sprinkler**

sprinkler intended to be installed in residential occupancies that opens automatically at a specified temperature by operation of a heat-responsive releasing mechanism that otherwise maintains the discharge orifice closed and which upon operating discharges water in a specific pattern and quantity over a designated area

3.11**sidewall sprinkler**

sprinkler intended for installation on or near the wall and near the ceiling, and designed to discharge most of the water away from the nearby wall with a small portion of the discharge directed at the wall behind the sprinkler

3.12**upright sprinkler**

sprinkler intended to be installed so that its deflector is located above the orifice and the water flows upward through the orifice

3.13**conductivity factor**

C

measure of the conductance between the sprinkler's heat responsive element and the water filled fitting, expressed in (meters/second) (m/s)

3.14**response time index**

RTI

measure of the thermal sensitivity of the sprinkler expressed in (meters seconds)^{1/2} (m×s)^{1/2}

3.15**automatic sprinkler**

nozzle with a thermally sensitive sealing device that opens to discharge water for fire fighting

3.16**design lower tolerance limit**

DLTL

glass bulb supplier's specified and assured lowest lower tolerance limit (LTL)

3.17**design upper tolerance limit**

DUTL

sprinkler supplier's specified and assured highest upper tolerance limit (UTL)

3.18**fusible link sprinkler**

sprinkler which opens when an element provided for that purpose melts

3.19**glass bulb sprinkler**

sprinkler which opens when a liquid-filled glass bulb bursts

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prEN 12259-14:2014 (E)**3.20****mean design service load**

sprinkler supplier's specified and assured highest mean service load for any batch of 10 or more sprinklers

3.21**mean design strength**

glass bulb supplier's specified and assured lowest mean bulb strength for any batch of 55 or more bulbs

3.22**horizontal sprinkler**

sprinkler in which the nozzle directs the water horizontally

3.23**lower tolerance limit**

LTL

glass bulb lowest strength determined by test and statistical analysis of a batch of 55 or more bulbs

3.24**recessed sprinkler**

sprinkler in which all or part of the thermally sensitive element is above the plane of the ceiling

3.25**supplier**

company responsible for the design, manufacture and quality assurance of a product

3.26**upper tolerance limit**

UTL

highest service load determined by test and statistical analysis of a batch of 20 or more sprinklers

3.27**sprinkler yoke (arms)**

part of a sprinkler that maintains the thermally sensitive element in load bearing contact with the sprinkler head valve

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4 Construction and performance**4.1 General**

4.1.1 A residential sprinkler shall be constructed to effect closure of its water seat for extended periods of time without leakage and to open as intended and release all parts as specified in this standard. The closure of the water seat shall not be achieved by the use of a dynamic O-ring or similar seal (an O-ring or similar seal that moves during operation or is in contact with a component that moves during operation).

4.1.2 A sprinkler shall be chemically or mechanically staked to maintain the manufacturer's assembly load. The assembly load shall be incapable of being changed by the use of common hand tools without causing visible damage to the sprinkler.

4.1.3 Stampings shall show no cracking or splitting and shall be uniformly smooth and clean cut.

4.1.4 The operation and distribution characteristics of a sprinkler shall not be impaired by the application of any factory applied coating or plating.

4.1.5 When installed with the intended fittings specified in the installation instructions (see 6.2), dry-type sprinklers installed in dry systems shall be constructed to minimize the potential to accumulate water, scale, and sediment on the sprinkler inlet and shall provide an unobstructed flow path upon operation.

4.1.6 Except where indicated, a component of a product covered by this standard shall conform to the requirements for that component.

4.1.7 A component is not required to conform to a specific requirement that involves a feature or characteristic not required in the application of the component in the product covered by this standard.

4.1.8 A component shall be used in accordance with its rating established for the intended conditions of use.

4.1.9 Specific components are incomplete in construction features or restricted in performance capabilities. Such components are intended for use only under limited conditions, such as certain temperatures not exceeding specified limits, and shall be used only under those specific conditions.

4.2 Product assembly

4.2.1 Protective Covers

4.2.1.2 Sprinklers with glass bulb type heat responsive elements shall be equipped with protective covers that are designed to remain in place during installation and be removed before the sprinkler system is placed in service.

Exception: Certain sprinkler designs, such as concealed sprinklers, dry-type sprinklers, and sprinklers with guards, may not be required to have protective covers.

4.2.1.3 Sprinklers required to be equipped with sprinkler covers shall conform to 4.16.2

4.3 Dimensions and pressure rating

4.3.1 Dimensions

4.3.1.1 Nominal thread sizes shall be suitable for fittings threaded in accordance with ISO 7-1.

4.3.1.2 Threads shall be clean cut and true and free from burrs, scoring, chatter marks, or the like.

4.3.1.3 The diameter of a discharge orifice or any internal passage of a sprinkler shall be at least 5,3 mm.

4.3.2 Pressure ratings

A residential sprinkler shall have a minimum rated pressure of 12 bar.

4.4 Nominal operating temperature

The operating temperature of residential sprinklers and cover plates, when tested in accordance with Annex B, shall be within a range of $\pm 3,5$ % of its marked nominal temperature rating.

4.5 Operating temperatures

4.5.1 The temperature classification, temperature rating, and colour coding of a residential sprinkler shall be as specified in Table 1.

Table 1 — Temperature classification ratings and colour coding

Temperature rating °C	Colour code		Maximum ceiling temperature °C
	• Frame arms	• Glass bulb	
57 – 77	Uncoloured or black	Orange 57 ± 2,6 °C or Red 68 ± 3,0 °C	38
79 – 107	White	Yellow 79 ± 3,4 °C or Green 93 ± 3,9 °C	66

4.6 Water flow and distribution

4.6.1 K-factor

Sprinkler orifices shall have individual K-factor values that are within ± 5 % of the average K-factor determined at a specific pressure for the dimensional tolerance specified by the manufacturer when tested in accordance with C.4

Exception: A sprinkler with an average K-factor of less than 5,5 is able to have individual K-factor values that are not within ±5 % of the average K-factor if the single K-factor value is within ± 0,2 units of the average K-factor value.

4.6.2 Water distribution

4.6.2.1 Water distribution test – Horizontal surface

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When installed in accordance with the installation instructions and tested as described in D.1 a residential sprinkler shall distribute water over a horizontal surface so that the application rate for any 0,1 m² area within the design area (the maximum area the sprinkler is intended to protect) shall be at least 0,8 mm/min except that:

- No more than four 0,1 m² areas for each quadrant shall be allowed to be at least 0.6 mm/min for upright and pendant sprinklers; and
- No more than eight 0,1 m² areas shall be allowed to be at least 0,6 mm/min for each half (split along the sprinkler centerline) of the design area for sidewall sprinklers.

4.6.2.2 Water distribution test – Vertical surface

When installed in accordance with the installation instructions and tested as described Annex D.2, a residential sprinkler shall distribute water in a uniform manner over vertical surfaces as follows:

- Walls within the coverage area shall be wetted to at least within 700 mm of the ceiling with one sprinkler discharging water at the specified design flow rate.
- For square coverage areas, each wall within the coverage area shall be wetted with at least 5 percent of the sprinkler flow; for rectangular coverage areas, each wall within the coverage area shall be wetted with a proportional water amount based on 20 % of the total sprinkler discharge in accordance with the following formula:

$$WW = 20 \% (D / P) \quad (2)$$

where

WW is required amount of water collected on a wall, percent;

D is wall length, metres;

P is total perimeter of coverage area, metres.

4.6.3 Water Impingement Test

When tested in accordance with Annex O and while discharging water at a service pressure of 0,5 bar less than the rated pressure, a residential sprinkler shall not prevent the operation of a second ordinary-temperature rated residential sprinkler.

4.7 Function

When tested in accordance with Annex F each of the residential sprinklers shall operate at service pressures of 0,5 bar to the rated pressure. All operating parts shall release with a sharp, positive action. Operating parts intended to be released from the sprinkler assembly shall clear the sprinkler frame and deflector so as not to impair the water distribution pattern.

4.8 Fire Test

4.8.1 General

When fire tested as described in Annex E a residential sprinkler shall limit temperatures as specified below when tested at each rated spacing referenced in the installation instructions. Additionally, a maximum of two residential sprinklers shall operate. The sprinklers shall limit temperatures as follows:

- a) The maximum temperature 76 mm below the ceiling at either location as illustrated in Figure E.1, Figure E.2 and Figure E.3 shall not exceed 316 °C.
- b) The maximum temperature 1,6 m above the floor shall not exceed 93 °C.
- c) The temperature at the location described in (b) shall not exceed 54 °C for more than any continuous 2 min period.
- d) The maximum ceiling material temperature 6,4 mm behind the finished ceiling surface shall not exceed 260 °C.

See Figure E.1, (pendant, upright, flush, recessed pendant, and concealed sprinklers) or Figure E.2 and Figure E.3 (sidewall sprinklers) for temperature measuring locations.

4.9 Strength of sprinkler body

4.9.1 Strength of frame test

A residential sprinkler frame shall not show permanent distortion when tested in accordance with Annex G.1.

4.9.2 Flow endurance

A residential sprinkler shall withstand for 30 min, without evidence of cracking, deformation, or separation of any part, when tested in accordance with Annex G.2.

prEN 12259-14:2014 (E)**4.10 Strength of release element****4.10.1 Glass bulb sprinklers**

The lower tolerance limit for bulb strength, based on calculations with a degree of confidence of 0,99 for 99 % of samples, shall exceed two times the upper tolerance limit for sprinkler assembly load based on calculations with the same degree of precision as for bulb strength when tested in accordance with Annex H.3.

4.10.2 Fusible link sprinklers

A fusible-alloy heat responsive element of a residential sprinkler shall either:

- a) sustain a load of 15 times its maximum design load for 100 h; or
- b) demonstrate the ability to sustain the maximum design load when tested in accordance with Annex H.4.

4.11 Leak resistance**4.11.1 Hydrostatic strength**

A residential sprinkler shall not leak when tested in accordance with Annex I.1.

4.11.2 Heat exposure

A residential sprinkler shall withstand for 90 days, without evidence of weakness or malfunction, an exposure to the high-ambient temperature in accordance with Annex J.1.

4.11.3 Thermal shock

A sprinkler having a glass bulb shall withstand the thermal shock of rapid temperature changes when tested in accordance with Annex K

4.12 Corrosion**4.12.1 Stress corrosion****4.12.1.1 Stress-corrosion cracking of brass sprinkler parts test**

After being subjected for 10 days to a moist ammonia exposure as described in Annex L.1 a residential sprinkler having brass parts shall:

- a) show no evidence of cracking, delamination, or degradation; or
- b) perform as intended when tested as described in Annex O.

If the application of a 12 bar water pressure to the inlet of the sprinkler increases the assembly load by more than 10 %, the additional load is to be applied during the moist ammonia-air mixture exposure specified in Annex O and Annex 0.

4.12.2 Sulphur dioxide–Carbon dioxide corrosion

Residential sprinklers shall withstand an exposure to carbon dioxide–sulfur dioxide atmospheres when tested in accordance with Annex L.2.

4.12.3 Salt mist corrosion

Residential sprinklers shall withstand an exposure to a salt mist atmosphere when tested in accordance with Annex L.3.

4.12.4 Moist air

Residential sprinklers shall withstand an exposure to moist air atmospheres when tested in accordance with Annex L.4.

4.13 Water hammer

Residential sprinklers shall withstand an exposure to carbon dioxide–sulfur dioxide atmospheres when tested in accordance with Annex L.2.

4.14 Thermal response

A residential sprinkler shall have the following operating time characteristics when tested in the sensitivity test oven as specified in Annex N:

- a) a maximum operating time specified in Table 2 for each sample sprinkler. If the sprinkler temperature rating is not shown in Table 2, the maximum operating time for each sample sprinkler shall be determined by using the formula specified in Annex O based on a Response Time Index (RTI) value of $50 \text{ (m}\cdot\text{s)}^{1/2}$, and the marked temperature rating of the sprinkler;
- b) Mean operating time equal to or less than a 1,30 multiple of the mean operating time of the sprinkler tested in accordance with 4.14(a) after being subjected to the exposure tests specified in s 4.11.2 and 4.12 (heat exposure and corrosion exposure tests, respectively).

Table 2 — Maximum operating time for sprinklers in oven-heat test

Sprinkler temperature rating °C	Maximum operating time Seconds
57	11,2
60	12,3
68	16,0
71	17,4
74	18,8
79	12,1

4.15 Resistance to vibration

A residential sprinkler shall withstand the effects of vibration without deterioration of its performance characteristics when tested in accordance with Annex O.

4.16 Resistance to impact

4.16.1 Impact test for sprinklers

A residential sprinkler, except for dry-type sprinklers, shall not be damaged or leak when tested as described in Annex P.1.

4.16.2 Impact test for protective covers

A glass bulb type sprinkler, with the protective cover installed, shall not be damaged or leak, and the cover shall remain in place, when tested as described in Annex P.2.