SLOVENSKI STANDARD
oSIST prEN 12259-15:2023

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Vgrajene naprave za gašenje - Sestavni deli sprinklerjev in sistemov s pršečo vodo - 15. del: Razpršilniki z razpršilnim vzorcem s faktorjem k najmanj K160, z razširjeno pokritostjo najmanj K80 in za posebno uporabo z nadzornim režimom

Fixed firefighting systems - Components for sprinkler and water spray systems - Part 15: Spray pattern sprinklers with a k-factor of at least K160, extended coverage sprinklers of at least K80 and control mode special application sprinklers

Ortsfeste Brandbekämpfungsanlagen– Bauteile für Sprinkler- und Sprühwasseranlagen– Teil 15: Sprinkler mit einem k-Faktor von mindestens K160, Sprinkler mit erweiterter Reichweite von mindestens K80 und Sprinkler für spezielle Anwendungen im Regelbetrieb

Installations fixes de lutte contre l'incendie - Composants des systèmes d'extinction du type sprinkleur et à pulvérisation d'eau - Partie 15 : Sprinkleurs de type spray avec un coefficient K d'au moins K160, sprinkleurs à couverture étendue d'au moins K80 et sprinkleurs en mode contrôle pour applications spécifiques

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Fixed firefighting systems - Components for sprinkler and water spray systems - Part 15: Spray pattern sprinklers with a k-factor of at least K160, extended coverage sprinklers of at least K80 and control mode special application sprinklers

Ortsfeste Brandbekämpfungsanlagen - Bauteile für Sprinkler- und Sprühwasseranlagen - Teil 15: Sprinkler mit einem k-Faktor von mindestens K160, Sprinkler mit erweiterter Reichweite von mindestens K57 und CMSA-Sprinkler

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (prEN 12259-15:2023) 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.

EN 12259, *Fixed firefighting systems - Components for sprinkler and water spray systems*, consists of the following parts:

— *Part 1: Sprinklers;*

— *Part 2: Wet alarm valve assemblies;*

— *Part 3: Dry alarm valve assemblies;*

— *Part 4: Water motor alarms;*

— *Part 5: Water flow detectors;*

— *Part 9: Deluge alarm valves;*

— *Part 12: Pumps;*

— *Part 13: ESFR sprinklers;*

— *Part 14: Sprinklers for residential applications.*

Introduction

The response characteristics of classic sprinklers (EN 12259-1 and EN 12259-15) is based on the measurement of both sensitivity and conductivity (C-factor). For EN 12259-13 sprinkler type (ESFR) their response characteristics are determined without reference to its conductivity.

1 Scope

This document specifies requirements and test methods for spray pattern sprinklers with a k-factor of at least K160, extended coverage (EC) sprinklers of at least K80, extended coverage storage (ECS) sprinklers of at least K200 and control mode special application (CMSA) sprinklers of all k-factors.

This document does not apply to concealed, conventional, flat spray, flush and recessed sprinklers.

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 12259 (all parts), *Fixed firefighting systems — Components for sprinkler and water spray systems*

EN 12259-1:1999+A1:2001,[1] *Fixed firefighting systems — Components for sprinkler and water spray systems — Part 1: Sprinklers*

EN 12845 (all parts),[2] *Fixed firefighting systems — Automatic sprinkler systems — Design, installation and maintenance*

EN 60751, *Industrial platinum resistance thermometers and platinum temperature sensors (IEC 60751)*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in the EN 12845 series and the EN 12259 series apply.

ISO and IEC maintain terminology 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/

3.1
extended coverage sprinkler
sprinkler with a k-factor of 80 to 200 intended to be installed in accordance with EN 12845-1 to protect non-storage occupancies

3.2
extended coverage storage sprinkler
sprinkler with a k-factor of 200 and larger and intended to be installed in accordance with EN 12845-2 to protect storage occupancies

[1] As impacted by EN 12259-1:1999+A1:2001/A2:2004 and EN 12259-1:1999+A1:2001/A3:2006.
[2] This series is under development. Current stage: prEN 12845.

4 Assessment methods and criteria

4.1 Tolerances

If not given differently in the specific clause below, the tolerances of Annex A shall be applied.

4.2 Connections

4.2.1 Assessment method

The sprinkler connection, e.g. the thread size, shall be assessed by measurements.

4.2.2 Criteria

The thread connections of the sprinkler shall be in accordance with ISO 7-1 or shall be grooved connections. Alternative connection methods that have been tested and validated for use in fire sprinkler systems also fulfil 4.2.2.

4.3 Durability of coated sprinklers

4.3.1 Assessment method

Expose 12 coated sprinklers for a period of 90 days in an oven at a temperature of 30 °C below the nominal operating temperature. At intervals of 7 days, remove the sprinklers from the oven, allow to cool for 2 h to 4 h and inspect the coating with the unaided eye, corrected for normal vision if necessary. Return the sprinklers to the oven. At the end of the exposure period, remove the sprinklers from the oven, cool them again and re-examine the coating.

4.3.2 Criteria

The coating shall show no visible evidence of damage.

4.4 High temperature exposure

4.4.1 Assessment method

The assessment method given in EN 12259-1:1999+A1:2001, Annex O shall be applied.

4.4.2 Criteria

Sprinklers, less operating mechanisms, shall not show significant deformation, blistering, or fracture following exposure to an elevated temperature as detailed below.

When surfaces of the orifice or frame exhibit significant deformation a discharge coefficient (K-Factor), (see 4.16) and/or distribution/ADD tests (see 4.13 or 4.14) on exposed samples to validate compliance with these requirements shall be conducted.

4.5 Conductivity (C-Factor)

4.5.1 Assessment method

The assessment method given in EN 12259-1:1999+A1:2001, N.2 shall be applied.

For sprinklers which could damage or cause problems in a plunge tunnel setup shall be allowed to be tested in accordance with 4.6.

4.5.2 Criteria

The criteria given in EN 12259-1:1999+A1:2001, 4.15 shall be applied.

4.6 Sensitivity (Air oven)

4.6.1 Assessment method

This assessment shall only be applied for sprinklers which could damage or cause problems in a plunge tunnel setup (see 4.5).

Ten previously untested sprinklers of each nominal temperature rating shall be individually operated in an air oven with the inlet of the sprinkler pressurized to the minimum operating pressure in accordance with 4.8. The rate-of-temperature-rise within the oven, starting from room temperature 22 °C ± 5 °C, shall be controlled in accordance with Table 1.

Table 1 —Time vs. temperature points for air oven sprinkler sensitivity test

Time min:sec	Temperature °C	Time min:sec	Temperature °C	Time min:sec	Temperature °C
0:15	135	6:00	327	16:00	399
0:30	210	7:00	332	17:00	407
0:45	246	8:00	341	18:00	414
1:00	263	9:00	349	19:00	421
1:15	274	10:00	354	20:00	429
1:30	282	11:00	363	22:00	443
2:00	290	12:00	368	24:00	457
3:00	302	13:00	377	26:00	471
4:00	310	14:00	385	28:00	485
5:00	318	15:00	391	30:00	499

4.6.2 Criteria

New, uncoated sprinklers which cannot be tested in the plunge tunnel shall operate within a time limit not exceeding the maximum permitted in Table 2 for the respective nominal temperature rating.

New sprinklers having corrosion resistant coatings (decorative, wax, etc.), which cannot be tested in the plunge tunnel, shall operate within a time limit not exceeding the maximum permitted in Table 3 for the respective nominal temperature rating.

Sprinklers having corrosion resistant coatings (decorative, wax, etc.), which cannot be tested in the plunge tunnel, and have been subjected to environmental testing, shall operate within the limits stated in Table 4.

Table 2 —Air oven sprinkler sensitivity for new, uncoated sprinklers utilizing the time vs. temperature Data

Sprinkler nominal temperature rating °C	Maximum operating temperature °C	Maximum operating time min:sec
57 to 76	274	1:15
79 to 107	288	1:45
121 to 149	302	3:00
163 to 191	319	5:00
204 to 246	338	7:30
260 to 302	391	15:00

Table 3 —Air oven sprinkler sensitivity for new sprinklers having corrosion resistant coating utilizing the time vs. temperature data

Sprinkler nominal temperature rating °C	Maximum operating temperature °C	Maximum operating time min:sec
57 to 76	275	1:34
79 to 107	293	2:11
121 to 149	308	3:45
163 to 191	328	6:15
204 to 246	351	9:22
260 to 302	419	18:45

Table 4 —Air oven sprinkler sensitivity for aged or elevated temperature exposed sprinklers having corrosion resistant coating utilizing the time vs. temperature data

Sprinkler nominal temperature rating °C	Maximum operating temperature °C	Maximum operating time min:sec
57 to 76	291	2:00
79 to 107	302	3:00
121 to 149	319	5:00
163 to 191	341	8:00
204 to 246	355	10:00
260 and more	To be evaluated on a case by case basis.	

4.7 Leak resistance

4.7.1 Assessment method

Subject 4 sprinklers to water pressure of (30 ± 1) bar at the inlet. Increase the pressure from 0 to (30 ± 1) bar at a rate not exceeding 1 bar/s, maintain the pressure at (30 ± 1) bar for a period of $3\,^{+1}_{0}$ min and then allow it to fall to 0 bar. After the pressure has dropped to 0 bar, increase it to (0,5 ± 0,1) bar in not more than 5 s. Maintain this pressure for $15\,^{+5}_{0}$ s, and then increase it to (10 ± 0,5) bar at a rate not exceeding 1 bar/s and maintain it for $15\,^{+5}_{0}$ s. Examine the sprinkler for evidence of leakage during the test.

4.7.2 Criteria

The sprinklers shall not show any visible hydraulic leakage.

4.8 Release of the sprinkler at minimum operating pressure

4.8.1 Assessment method

The assessment method given in EN 12259-1:1999+A1:2001, Annex E shall be applied.

4.8.2 Criteria

When tested in accordance with EN 12259-1:1999+A1:2001, E.1 the sprinkler shall open and within 5 s of release of the thermally sensitive element shall operate satisfactorily. Any lodgement of released parts shall be cleared within 60 s of the release of the thermally sensitive element.

4.9 Nominal operating temperature

4.9.1 Assessment method

4.9.1.1 Apparatus

Laboratory temperature measuring device having an accuracy of ± 0,25 % of the nominal rating, calibrated to a depth of 40 mm immersion, for determining temperatures of liquids in bath tests and operating temperatures. The thermally sensitive part of the sensor (e.g. bulb of a thermometer) shall be held level with the centre of the sprinkler operating parts (fusible element). To control the temperature in the thermal bath, a PT100 sensor in accordance with EN 60751 shall be used.

For sprinklers with a nominal operating temperature less than or equal to 80 °C a liquid bath of demineralized water shall be used. For sprinklers with higher rated elements a liquid bath of glycerine, vegetable oil or synthetic oil shall be used.

4.9.1.2 Procedure

A total of 10 sprinklers shall be tested. Heat sprinklers in a liquid bath from a temperature of (20 ± 5) °C to an intermediate temperature of 20 °C ± 2 °C below their nominal operating temperature. The rate of temperature increase shall not exceed $20\,^{+2}_{0}$ °C per minute. Maintain the intermediate temperature for $10\,^{+1}_{0}$ min. Then increase the temperature at a rate of (0,5 ± 0,1) °C per minute until the sprinklers operate or up to 2,0 °C above the upper operating limit.

Determine the nominal operating temperature with temperature measuring device having an accuracy of ± 0,25 % of the nominal temperature rating.

The sprinklers shall be located in the vertical position and totally covered by the liquid to a depth of at least 5 mm. The geometric centre of the fusible element shall be located not less than 35 mm below the liquid surface and in alignment with the temperature sensing device. The temperature deviation within the test zone should be within 0,25 °C. The preferred location of the geometric centre of the fusible

element and temperature measuring device should be (40 ± 5) mm below the liquid surface. If strutting occurs during the test the air bath test (see 4.9.1.3) shall be performed.

4.9.1.3 Air bath test

Fifty previously untested sprinklers shall be placed on their threaded inlets in a programmable oven circulating air at ambient temperature. The temperature in the oven shall be steadily raised to 11,1 °C ± 1,1°C below the nominal temperature rating of the sprinklers over a $20^{+0,1}_{0}$ minute period. Once this temperature is reached, the oven shall be maintained at constant temperature for a period of 60 min ± 5 min. The temperature shall then be raised at a constant rate of 0,5 °C ± 0,3 °C per minute until the temperature reaches 22 °C ± 2,8 °C above the nominal temperature rating of the sprinklers.

4.9.2 Criteria

Full rupture of heat responsive element in liquid bath (see 4.9.1.2) within a temperature range of t ± (0,035 t +0,62)] °C, where 't' is the nominal operating temperature, resulting in sprinkler operation.

Sprinklers with nominal temperature ratings of 204 °C or greater shall meet the requirements stated above, or shall have an actual operating temperature of t + (0,07 t +0,62) °C of the marked nominal temperature rating. When subjected to the air bath test no partial fracture of a glass bulb or no partial rupture of a fusible link (i.e. strutting) shall occur.

4.10 Function

4.10.1 Assessment method

Samples shall be selected in accordance with Table 5 and shall be individually installed in their intended installation position, on a pipe manifold. A typical example of the test apparatus is shown in EN 12259-1:1999+A1:2001, Figure E.1. Each sample shall be subjected to an inlet water pressure in accordance with 4.8.2, operated using a suitable heat source, and observed for complete and proper functioning. A total of 100 sprinklers shall be tested.

Dry sprinklers shall be tested at both the minimum and maximum lengths, and may require a total sample quantity of up to 200 sprinklers. The pipe manifold shall be modified by installing a plugged tee in place of the elbow and may be modified further to accommodate long samples of dry sprinklers.

Table 5 — Lodgement

Pressure [a]	Number of samples
0,5 bar	10
1,7 bar	10
3,4 bar	10
5,2 bar	10
6,9 bar	10
8,6 bar	10
10,3 bar	10
12,1 bar	10
[a] A tolerance of ± 5 % applies to all pressures specified in the table.	

4.10.2 Criteria

Upon activation of each sample, the discharge coefficient shall be measured to verify complete operation.

4.11 Size of water passageways

4.11.1 Assessment method

Pass a sphere of diameter 8 mm through each water passage in the sprinkler.

4.11.2 Criteria

The sphere passes freely through each water passage or the sprinkler.

4.12 Sprinkler temperature identification

4.12.1 Assessment method

4.12.1.1 Glass bulb sprinklers

Perform visual inspection to determine the colour of the liquid inside the bulb.

4.12.1.2 Fusible link sprinklers

Perform visual inspection to determine colour painted on frame arm surface. Perform visual inspection to ensure at least 50 % of frame arm surface is painted the colour, and that paint is visible from all directions. If percentage of painted colour surface is in doubt, optical measurement shall be applied.

4.12.2 Criteria

Sprinklers shall be in accordance with Table 6. In addition, fusible link sprinklers are painted for at least 50 % of each frame arm surface and the paint is visible from all directions.

Table 6 — Nominal operating temperatures and colour codes

Glass bulb sprinklers		Fusible link sprinklers	
Nominal operating temperature ° C	Liquid colour code	Nominal operating temperature within range ° C	Yoke arms colour code
57	orange	57 to 77	uncoloured
68	red	80 to 107	white
79	yellow	121 to 149	blue
93	green	163 to 191	red
100	green	204 to 246	green
121	blue	260 to 302	orange
141	blue	320 to 343	black
163	mauve	-	-
182	mauve	-	-
204	black	-	-
227	black	-	-
260	black	-	-
286	black	-	-
343	black	-	-

4.13 Water distribution

4.13.1 General

Both test methods given in 4.13.2 and 4.13.3 can be used. It is not necessary to carry out both procedures.

4.13.2 Assessment method 1

4.13.2.1 General

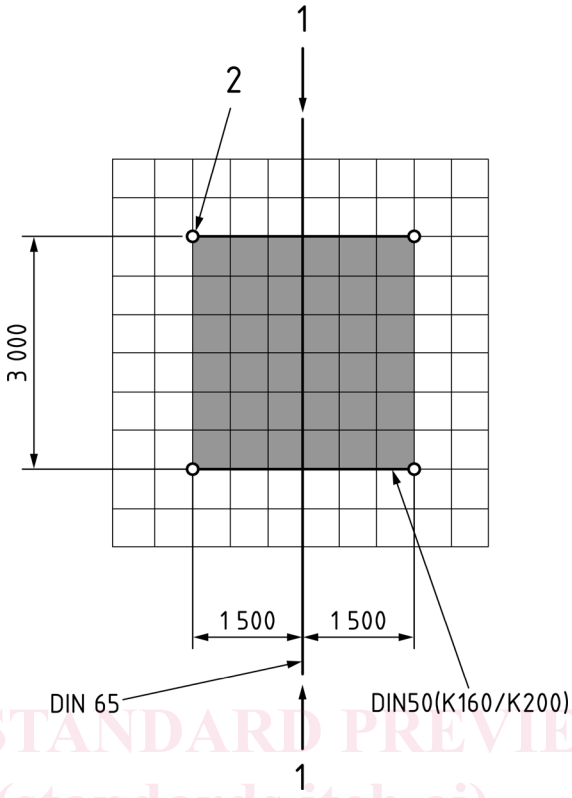
In a test chamber (7^{+1}) m × (7^{+1}) m, sprinklers of the same type shall be mounted in a square arrangement on a designated pipe. The arms of the sprinkler body shall be aligned parallel to the supply pipes. The distance between the ceiling and the deflector of upright sprinklers shall be (50 ± 5) mm and of pendent sprinklers (275 ± 5) mm.

The arrangement of the pipe network and the measuring containers for collecting the water can be seen in Figure 1 to Figure 3. The water distribution is measured using measuring containers with an opening area of (500 ± 10) mm × (500 ± 10) mm. The distance between the ceiling and the upper edge of the containers shall be (2 700 ± 25) mm. The test is carried out according to the conditions met in the following clauses and the water flowing from the sprinklers is collected until a complete measurement result is obtained for the measurement area under consideration.

4.13.2.2 Assessment method for spray pattern sprinkler with at least K160

The test shall be carried out in accordance with the test procedure described 4.13.2.1 but in accordance with the test arrangement shown in Figure 1.

Dimensions in mm



Key

1 waterflow

2 sprinkler

Figure 1 —Arrangement of the K160 / K200 sprinklers at the water distribution (9 m²)

The parameters in Table 7 shall be applied for the assessment.

Table 7 — Assessment parameters for spray pattern sprinkler

K-factor	Flow rate l/min	Measuring area m²	Sprinkler spacing m
160	112,5	9,00	3,0
160	270,0	9,00	3,0
200	270,0	9,00	3,0

4.13.2.3 Assessment method for extended coverage sidewall sprinklers with at least K80

In addition to the test procedure described in 4.13.2.1, extended coverage sidewall sprinklers shall be tested according to Figure 2 with the following adjustments:

— the distance between the ceiling and the deflector shall be (150 ± 5) mm.

— the measurement with a measuring area of 19,5 m^2 (3 m × 6,5 m) shall be carried out in two steps (see Figure 3).