SLOVENSKI STANDARD
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Vgrajene naprave za gašenje - Sestavni deli sprinklerskih sistemov in sistemov s pršečo vodo – 12. del: Črpalke

Fixed firefighting systems - Components for sprinkler and water spray systems - Part 12: Pumps

Ortsfeste Brandbekämpfungsanlagen - Bauteile für Sprinkler- und Sprühwasseranlagen - Teil 12: Sprinklerpumpen

Installations fixes de lutte contre l'incendie - Composants des systèmes d'extinction du type sprinkleur et à pulvérisation d'eau - Partie 12 : Pompes

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Fixed firefighting systems - Components for sprinkler and water spray systems - Part 12: Pumps

Ortsfeste Brandbekämpfungsanlagen - Bauteile für Sprinkler- und Sprühwasseranlagen - Teil 12: Sprinklerpumpen

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

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European foreword

This document (prEN 12259-12:2022) has been prepared by Technical Committee CEN/TC 191 “Fixed fire fighting systems”, the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

1 Scope

This part of the EN 12259 series specifies requirements for single stage and multi-stage centrifugal pumps with mechanical seal or soft packing for use in automatic sprinkler systems and is for use with EN 12845 and EN 17451.

This document is only applicable for the following pumps, independent of installed orientation (vertical, horizontal or sloped):

— end suction pumps (close coupled or long coupled) of the back pull-out type pump;

— axial horizontal split case pumps;

— ring section pumps;

— inline pumps (vertical line shaft pump with inlet and outlet in line);

— vertical turbine pumps;

— multistage inline pumps;

— multi stage-multi outlet pumps;

— submersible motor borehole pumps.

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 ISO 9906:2012, *Rotodynamic pumps - Hydraulic performance acceptance tests - Grades 1, 2 and 3 (ISO 9906:2012)*

EN 12162:2001+A1:2009, *Liquid pumps - Safety requirements - Procedure for hydrostatic testing*

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

EN ISO 17769-1, *Liquid pumps and installation - General terms, definitions, quantities, letter symbols and units - Part 1: Liquid pumps (ISO 17769-1)*

ISO 3069:2000, End-suction centrifugal pumps — Dimensions of cavities for mechanical seals and for soft packing

3 Terms, definitions, symbols and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12845, EN ISO 17769-1 and the following apply.

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

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

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

3.1.1
back pull-out type pump
centrifugal pump design type which allows the rotating assembly to be pulled out of the pump casing without having to remove the pump casing from the piping

3.2 Symbols and abbreviated terms

NPSH	net positive suction head
NPSHr	net positive suction head required
Q_r	rated flow of the pump when tested in accordance 4.1.1

NOTE It is determined from the flow of the pump to generate an NPSHr of 8,5 m for vertical line shaft and submersible pumps or 5 m for all other pumps.

Q_0	zero flow condition (closed valve)
p_{allw}	maximum allowable casing working pressure

4 Assessment methods and criteria

4.1 Characteristic curves, minimum flow and rotational speed tests

4.1.1 Assessment method

Pump characteristic curves shall be drawn for the rated speed condition. The highest flow to be shown in the curves shall be sufficient to demonstrate a non-overloading power characteristic or a flow corresponding to at least NPSHr of 16 m.

In case of non-overloading power characteristic, all curves shall be shown including values which are minimum 15 % higher than the flow at the maximum power demand.

The flow, power consumption, NPSHr and the corresponding delivery head shall be determined in accordance with EN ISO 9906:2012, Grade 2. The measurement uncertainty as specified in EN ISO 9906:2012, Grade 2 shall be applied.

NOTE For examples, see Annex A.

Type tests and conversion of test data shall be undertaken using methods defined in EN ISO 9906:2012, Grade 2 and the tolerances given there.

Where there are a range of impeller diameters, tests shall include the maximum and minimum impeller diameters. Performance between tested impeller diameters can be interpolated in accordance with EN ISO 9906:2012, Annex B for changes not exceeding ± 4 % in impeller diameter.

Inlet, outlet and threaded connections shall be in accordance with appropriate National, European or International Standards. Casing wear rings shall be fitted and shall be prevented from rotating.

The test data required for the purpose of evaluation in accordance with EN ISO 9906:2012, are established at a minimum of 7 points uniformly distributed between the lowest rate of flow and the highest rate of flow to be measured. The lowest rate of flow to be measured shall be between zero and the minimum by-pass flow. NPSHr shall be determined for minimum and maximum impeller diameters and speeds at 5 points between 0,3 Q_r and the highest flow, where Q_r is the rated flow. The highest flow to be measured shall be sufficient to demonstrate a non-overloading power characteristic or a flow corresponding to at least NPSHr of 16m.

Pump characteristic curve conversions for alternative drivers with differing speeds higher than the minimum tested speed and lower than the maximum tested speed shall be converted using the formula (see also EN ISO 9906:2012, Clause 6):

$$\left(\mathrm{NPSHr}\right)_T = \left(\mathrm{NPSHr}\right)\left[\frac{n_{sp}}{n}\right]^x$$

where

NPSHr	is the required NPSH in m;
$(\mathrm{NPSHr})_T$	is the corrected NPSHr for the specified speed n_{sp};
n	is the speed of rotation in 1/min;
n_{sp}	is the specified speed of rotation 1/min;
x	is the conversion exponent according to manufacturer's specification.

The test to verify the validity of the above formula shall entail measuring the NPSHr value for the lowest and highest intended speed.

The test water temperature at the inlet to submersible motor driven pumps shall be 20 ± 5 °C. No motor cooling means shall be used.

Multistage pumps shall be tested in accordance with the minimum and maximum number of stages allowed by their design.

4.1.2 Criteria for rotational speed

The pump shall operate within the rotational speed limits declared by the manufacturer.

When tested in accordance with 4.1.1 the rated speed shall not exceed 3 600 1/min and the maximum allowable continuous speed shall be at least 105 % of the rated speed.

4.1.3 Criteria for characteristic curves

Pump shall have a stable characteristic curve H(Q) within the measurement uncertainty range as specified in EN ISO 9906:2012, Grade 2.

Between flows of zero-flow and Q_r the pump shall have a H(Q) curve where the maximum head and zero-flow head (churn) are coincidental and the total head declines continuously with increasing rate of flow. It is permitted to have the zero-flow head (churn) max. 5 % or 0,5 bar (whichever is the lesser) below maximum head.

NOTE For examples, see Annex A.

Pumps shall be capable of supplying 140 % of Q_r flow at no less than 70 % of pressure at Q_r.

The criterion for NPSHr is 3 % drop in total differential head for the first stage of multi-stage pumps or for single-stage pumps as specified in EN ISO 9906:2012. The measurement uncertainty as specified in EN ISO 9906:2012, Grade 2 shall be applied.

The flow, power consumption, NPSHr and the corresponding total differential head of the pump shall be determined in accordance with EN ISO 9906:2012, Grade 2.

4.2 Minimum flow

4.2.1 Assessment method

The pump shall be run for a minimum of 2 h at closed valve with the maximum impeller diameter at maximum allowable continuous speed and the minimum by-pass flow specified by the manufacturer

The pump inlet and outlet temperatures shall be measured throughout the test.

The maximum water temperature rise across the pump shall not exceed 10 °C for the duration of the test.

Measure the head, flow rate and power input throughout the test at intervals of not exceeding 15 min.

All parameters shall be measured in accordance with EN ISO 9906:2012, Grade 2.

Using a temperature measuring device with an accuracy of ± 2 °C. Temperature measurements shall be made at the pump suction inlet and at an outlet measuring section normally located at a distance of two diameters from the pump outlet housing.

4.2.2 Criteria

The pump manufacturer shall specify the minimum by-pass flow value to mitigate the possibility of pump failure in the closed valve condition.

When tested in accordance with 4.2.1, the declared minimum by-pass flow value shall not lead to a pump failure in the closed valve condition.

4.3 Pump materials

4.3.1 Assessment method

The materials of construction of the pump, as detailed in 4.3.2 shall be fully documented and supported by confirming the materials specifications.

4.3.2 Criteria

The pump body shall be made of cast iron, cast steel, stainless steel, bronze or aluminium bronze.

The pump shafts shall be made of stainless steel.

The protective sleeves for shafts, metal parts of mechanical seals, impellers, impeller fastenings (impeller nuts, locking plates or washers and adjusting springs) and wear rings, including their counterparts shall be made of bronze or stainless steel.

4.4 Pump casing strength

4.4.1 Assessment method

Examine the pump casing for resistance to pressure using the test methods described in EN 12162:2001+A1:2009 with a K_1 factor of 1,5 and K_2 of 1 at a p_{allw} specified by the manufacturer but at least 10 bar.

The pump manufacturer shall conduct a pressure test with the pump casing in finished condition or in assembled condition.

4.4.2 Criteria

Every pump casing shall be capable of withstanding exposure to pressure. The maximum allowable working pressure of the pump at the most severe operating conditions shall be clearly defined by the manufacturer and at least include maximum closed valve pressure, maximum rotational speed and maximum impeller diameter plus maximum inlet pressure.

In no case shall the maximum allowable working pressure of the pump exceed that of the pump flanges or connections.

4.5 Pump leakage test

4.5.1 Assessment method

Examine the pump for leakage in accordance with the hydrostatic test in EN 12162:2001+A1:2009. The hydrostatic test pressure (p_{test}) shall be calculated assuming the product of the factors ($K_1 \times K_2$) is at least 1,5.

4.5.2 Criteria

Pumps shall be capable of withstanding long-term exposure to hydrostatic pressure without leakage.

When tested in accordance with 4.5.1 the assembled pump shall withstand internal hydrostatic pressure and meet the requirements of EN 12162:2001+A1:2009 when tested in accordance with ISO 3069:2000.

4.6 Stress calculations

4.6.1 Assessment method

Stress calculations associated with the functional operation in-line with the performance criteria detailed in 4.6.2 shall be fully documented and provided.

4.6.2 Criteria

Detailed shaft stress calculations shall be provided which show that the shaft is suitable for the maximum impeller diameter at 105 % the maximum rated speed. Detailed shaft stress calculations shall use a density of water of 1035 kg/m³ at 20 °C.

5 Marking and documentation

5.1 General

The marking specified in 5.2 shall be attached to the pump. Pumps with submersible motors, shall have a duplicate maker's nameplate delivered loose with the pump, for affixing to the control panel.

The minimum dimensions of the markings specified in 5.2 shall be as specified in Table 2. See Figure B.1 for an example of a manufacturers' name plate.

Table 2 —Minimum dimensions of marked characters

Type of marking	Minimum character height mm	Minimum depression or projection of characters mm
Cast directly on pump	9,5	0,75
Engraved label	4,7	0,1
Non cast label	2,4	Not applicable
Printed label	2,4	Not applicable
Stamped label	4,7	0,1