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Fixed firefighting systems – Components for gas extinguishing systems – Part 7: Requirements and test methods for nozzles

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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.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This document (prEN 12094-7:2006) 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.

This document will supersede EN 12094-7:2000.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this document.

This document is part of a series concerned with gas extinguishing system components.

The following European Standards are planned to cover:

— gas extinguishing systems (EN 12094)

— sprinkler systems (EN 12259 and EN 12845)

— powder systems (EN 12416)

— explosion protection systems (EN 26184)

— foam systems (EN 13565)

— hose systems (EN 671)

— smoke and heat control systems (EN 12101)

— water spray systems (EN 14816)

This European Standard has the general title "Fixed firefighting systems – Components for gas extinguishing systems" and will consist of the following parts:

— Part 1: Requirements and test methods for electrical automatic control and delay devices

— Part 2: Requirements and test methods for non-electrical automatic control and delay devices

— Part 3: Requirements and test methods for manual triggering and stop devices

— Part 4: Requirements and test methods for container valve assemblies and their actuators

— Part 5: Requirements and test methods for high and low pressure selector valves and their actuators

— Part 6: Requirements and test methods for non electrical disable devices

— Part 7: Requirements and test methods for nozzles

— Part 8: Requirements and test methods for connectors

— Part 9: Requirements and test methods for special fire detectors

— Part 10: Requirements and test methods for pressure gauges and pressure switches

— Part 11: Requirements and test methods for mechanical weighing devices

— Part 12: Requirements and test methods for pneumatic alarm devices

— Part 13: Requirements and test methods for check valves and non-return valves

— Part 16: Requirements and test methods for odorizing devices for CO_2 low pressure systems

— Part 17: Requirements and test methods for pipe hangers

— Part 20: Requirements and test methods for the compatibility of components

Introduction

It has been assumed in the preparation of this Standard that the execution of its provisions is entrusted to appropriately qualified and experienced people.

All pressure data in this document are given as gauge pressures in bar, unless otherwise stated.

NOTE 1 bar = 10^5 N m^{-2} = 100 kPa.

1 Scope

This document specifies requirements and test methods for room protection nozzles which introduce CO_2, inert gas or halocarbon gas into a protected zone.

The design of the nozzles will influence discharge rate and thus the pressure drop in the piping network.

This standard is not applicable to local application nozzles.

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.

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

EN ISO 228-1, *Pipe threads where pressure-tight joints are not made on the threads - Part 1: Dimensions, tolerances and designation*

EN ISO 9001:2000, *Quality management systems – Requirements (ISO 9001:2000)*

ISO 14520 (all Parts), *Gaseous fire-extinguishing systems – Physical properties and system design*

3 Terms and definitions

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

3.1
CO_2-high-pressure installation
fire extinguishing installation in which the CO_2 is stored at ambient temperature. For example, the pressure of the CO_2 in storage is p_{abs} = 58,6 bar at 21 °C

3.2
CO_2-low-pressure installation
fire extinguishing installation in which the CO_2 is stored at low temperature, normally –19 °C to –21 °C

3.3
cross section
total area of all smallest geometrical single areas

3.4
distribution characteristics
volume in which the extinguishant is distributed uniformly from a nozzle

3.5
filter
a component to prevent blockage of nozzles

3.6
flow rate
mass flow of extinguishant against time

3.7
functional reliability
ability of function under different working conditions

3.8
halocarbon gas
extinguishant which contains as primary components one or more organic compounds containing one or more of the elements fluorine, chlorine, bromine or iodine

3.9
halocarbon gas installation
fire extinguishing installation in which the halocarbon gas is stored at ambient temperature

3.10
inert gas
non liquefied gas or mixture of gases which extinguishes the fire mainly by reducing the oxygen-concentration in the protected zone, e.g. Argon, Nitrogen or CO_2 or mixtures of these gases

3.11
inert gas installation
fire extinguishing installation in which the inert gas is stored at ambient temperature

3.12
nozzle
component to achieve a predetermined flow rate and a uniformed distribution characteristic of the extinguishant into or onto a protected hazard

3.13
nozzle efficiency factor
nozzle specific ratio between the real storage mass and the theoretical storage mass based on the extinguishing concentration

3.14
nozzle protection device
component to protect nozzles against exterior dirt

3.15
resistance coefficient
value for the calculation of the pressure drop in a component under flow condition

3.16
room protection nozzle
nozzle, from which extinguishant is discharged for distribution throughout an enclosure

3.17
working pressure
pressure at which the component is used in the system

4 Requirements

4.1 General design

4.1.1 The test sample shall comply to the technical description (drawings, parts list, description of functions, operating and installation instructions) when checked in accordance with 5.3.

Metal parts of the component shall be made of corrosion resistant materials, e.g. stainless steel, copper, copper alloy or corrosion-protected steel (e.g. galvanized steel).

4.1.2 For CO_2 nozzles, the manufacturer shall specify the type of system (CO_2-low pressure and/or CO_2-high pressure).

4.1.3 For inert gas nozzles, the manufacturer shall specify the working pressure and the minimum nozzle pressure.

4.1.4 For halocarbon gas nozzles, the manufacturer shall specify:

a) the type of system (halocarbon gas and storage pressure at + 20 °C); and

b) the working pressure; and

c) the minimum nozzle pressure.

4.2 Connection threads

Connection threads shall comply with National Standards, European Standards or International Standards, e.g. ISO 7-1 and EN ISO 228-1.

NOTE For the purpose of this sub-clause, the term "International" means also "internationally recognized".

4.3 Nozzle opening cross section

The minimum dimension of any individual discharge opening of the nozzle shall not be smaller than 1 mm.

Nozzles with dimension of discharge opening ≥ 3 mm shall not be equipped with a filter. Nozzles with dimensions of discharge openings < 3 mm shall be equipped with a filter.

The filter shall be made of corrosion resistant metal. The unrestricted filter surface area shall be at least five times the nozzle cross section. The mesh of the filter shall be between 0,5 mm and 0,8 mm, measured in the plane of the hole.

To prevent blockage of the nozzle by solid-phase particles the cross sectional area of the nozzle should decrease in the direction of flow. Orifice plates are not allowed in nozzles for extinguishants which can partly change to solid phase, except where blockage of downstream flow paths/orifices by solid-phase particles is prevented by the design of the nozzle.

4.4 Nozzle protection device

If the nozzle opening is protected against exterior dirt with a cap or similar cover, this protection device shall eject clear of the nozzle's full opening cross section at a test pressure between 0,1 bar and 3 bar when tested in accordance with 5.8. The protection device shall not affect extinguishant distribution.

4.5 Flow rate

4.5.1 For CO_2 nozzles the manufacturer shall specify the information which describes the flow rate of the nozzle in kilograms medium per second as follows:

a) in the pressure range from 10 bar to 18 bar depending on storage pressure at storage temperature -20 °C for CO_2-low pressure;

b) in the pressure range from 14 bar to 50 bar depending on storage pressure at storage temperature + 20 °C for CO_2-high pressure.

The flow characteristics figures given by the manufacturer shall be within ± 10 % of the value(s) determined in accordance with 5.5.2.

Where filters are installed, these shall be taken into account when determining the flow rate.

4.5.2 For inert gas nozzles the manufacturer shall specify the information which describes the flow rate of the nozzle in kilograms medium per second in the pressure range from 2 bar to the working pressure and in the temperature range from – 20 °C to + 20 °C.

The flow characteristics figures given by the manufacturer shall be within ± 10 % of the value(s) determined in accordance with 5.5.3.

Where filters are installed, these shall be taken into account when determining the flow rate.

4.5.3 For halocarbon gas nozzles the manufacturer shall specify the information which describes the flow rate of the nozzle in kilograms medium per second in the pressure range from the minimum nozzle pressure to 1 bar below the storage pressure depending on storage pressure at + 20 °C.

The flow characteristics figures given by the manufacturer shall be within ± 10 % of the value(s) determined in accordance with 5.5.4.

Where filters are installed, these shall be taken into account when determining the flow rate.

4.6 Distribution characteristics

4.6.1 For CO_2 nozzles, the distribution of extinguishant shall be tested in accordance with 5.4.2.

4.6.2 For inert gas nozzles, the distribution of extinguishant shall be tested in accordance with 5.4.3 or in accordance with Annex A.

4.6.3 For halocarbon gas nozzles, the distribution of extinguishant shall be tested in accordance with 5.4.4 or in accordance with Annex A.

4.7 Resistance to pressure and heat

The nozzles shall be able to withstand the test pressures and temperatures given in Table 1.

Table 1 — Test pressure and temperature

Type of system	Test pressure bar	Test temperature °C
High-pressure CO_2	60	600
Low-pressure CO_2	25	600
Inert gas	working pressure	600
Halocarbon gas	working pressure	600

Following testing for pressure and heat resistance in accordance with 5.6, the nozzles shall show no signs of deterioration which could impair proper performance.

4.8 Resistance to heat and cold shock for CO_2 and halocarbon gas nozzles

The nozzles shall withstand both the high temperatures generated during a fire and the cold shock caused by the extinguishant as it is discharged. Following testing for heat and cold shock resistance in accordance with 5.7, the nozzles shall show no signs of deterioration which could impair proper functioning.

4.9 Resistance to corrosion

The performance of the nozzles shall not be adversely affected as a result of the corrosion test in accordance with 5.9.

4.10 Resistance to stress corrosion

Any copper alloy part used in nozzles shall not crack, when tested in accordance with 5.10.

4.11 Resistance to vibration

Nozzles assembled from several parts shall not be damaged, when tested in accordance with 5.11.

4.12 Documentation

4.12.1 The manufacturer shall prepare and maintain documentation.

4.12.2 The manufacturer shall prepare installation and user documentation, which shall be submitted to the testing authority together with the sample(s). This documentation shall comprise at least the following:

a) a general description of the component, including a list of its features and functions;

b) a technical specification including:

1) the information mentioned in 4.1;

2) sufficient information to permit an assessment of the compatibility with other components of the system (if applicable e.g. mechanical, electrical or software compatibility);

c) installation instructions including mounting instructions;

d) operating instructions;

e) maintenance instructions;

f) routine testing instructions if appropriate.

4.12.3 The manufacturer shall prepare design documentation, which shall be submitted to the testing authority together with the sample(s). This documentation shall include drawings, parts lists, block diagrams (if applicable), circuit diagrams (if applicable) and a functional description to such an extent that compliance with this document can be checked and that a general assessment of the design is possible.

5 Type test methods

5.1 Conditions

The components shall be assembled for test as specified in the technical description. The tests shall be carried out at a temperature of (25 ± 10) °C, except when otherwise specified for a particular test.

The tolerance for all test parameters is 5 %, unless otherwise stated.

5.2 Samples and order of tests

When testing a nozzle type with only one size, four test samples are necessary. The order of tests is shown in Table 2.

Table 2 — Order of tests

Test methods		Order of tests for			
		Sample A	Sample B	Sample C	Sample D
5.3	Compliance	1	1	1	1
5.4	Determination of distribution characteristics	—	—	2	—
5.5	Determination of flow rate	2/4	—	—	—
5.6	Test for resistance to pressure and heat	—	2	—	—
5.7	Test for resistance to heat and cold shock	—	3	—	—
5.8	Nozzle protection device	—	—	—	2
5.9	Test for resistance to corrosion	3	—	—	—
5.10	Test for resistance to stress corrosion	—	—	—	3
5.11	Vibration test	—	—	3	—