SLOVENSKI STANDARD
SIST EN 12094-7:2001

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Vgrajeni gasilni sistemi - Sestavni deli sistemov za gašenje s plinom - 7. del: Zahteve in preskusne metode za šobe pri sistemih s CO2

Fixed firefighting systems - Components for gas extinguishing systems - Part 7: Requirements and test methods for nozzles for CO2 systems

Ortsfeste Brandbekämpfungsanlagen - Bauteile für Löschanlagen mit gasförmigen Löschmitteln - Teil 7: Anforderungen und Prüfverfahren für Düsen für CO2-Anlagen

Installations fixes de lutte contre l'incendie - Eléments constitutifs des installations d'extinction a gaz - Partie 7: Exigences et méthodes d'essai pour les diffuseurs de systemes
a CO2

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13.220.10 Gašenje požara Fire-fighting

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Fixed firefighting systems - Components for gas extinguishing systems - Part 7: Requirements and test methods for nozzles for CO_2 systems

Installations fixes de lutte contre l'incendie - Eléments constitutifs des installations d'extinction à gaz - Partie 7: Exigences et méthodes d'essai pour les diffuseurs de systèmes à CO_2

Ortsfeste Brandbekämpfungsanlagen - Bauteile für Löschanlagen mit gasförmigen Löschmitteln - Teil 7: Anforderungen und Prüfverfahren für Düsen für CO_2-Anlagen

This European Standard was approved by CEN on 18 November 2000.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists 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, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 191 "Fixed firefighting systems", the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2001, and conflicting national standards shall be withdrawn at the latest by September 2002.

This European Standard 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 89/106/EEC.

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

This part of EN 12094 is one of a number of European Standards prepared by CEN/TC 191 covering components for gas extinguishing systems.

They are included in a series of European Standards 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

The following parts of this European Standard are planned:

- 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 high- pressure container valve assemblies and actuators
- Part 5: Requirements and test methods for selector valves and actuators for CO_2 systems
- Part 6: Requirements and test methods for non-electrical disable devices for CO_2 systems
- Part 7: Requirements and test methods for nozzles for CO_2 systems
- Part 8: Requirements and test methods for flexible connectors for CO_2 systems
- 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 weighing devices
- Part 12: Requirements and test methods for alarm devices
- Part 13: Requirements and test methods for check valves and non-return valves
- Part 16: Requirements and test methods for odorozing devices for CO_2 low pressure systems
- Part 17: Requirements and test methods for pipe hangers
- Part 20: Requirements and test methods for compatibility of components

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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 European Standard are given as gauge pressures in bar, unless otherwise stated.

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

1 Scope

This European Standard specifies requirements and test methods for nozzles which introduce the extinguishing agent into a CO_2 protected zone.

The design of the nozzles will influence discharge rate and thus the pressure drop in the piping network. The extinguishing agent normally arrives at the nozzle in two-phase flow form (liquid-gaseous mixture). It expands into the protected volume to form a gas or a gas-and-dry-ice mixture depending on the nozzle type.

This standard should only be used as guidance for testing nozzles which work on different principles.

2 Normative references

This European Standard incorporates by dated or undated references, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

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

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

3 Terms and definitions

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

3.1
cross section
total area of all smallest geometrical single areas

3.2
distribution characteristics
volume in which CO_2 is distributed uniformly from a nozzle

3.3
filter
a component to prevent blockage of nozzles

3.4
flow rate
mass flow of CO_2 against time

3.5
functional reliability
ability of function under different working conditions

3.6
high pressure container
cylinder filled with CO_2 under ambient temperature conditions

NOTE The pressure at 20°C is 56,3 bar.

3.7
local application nozzle
a nozzle, from which CO_2 is discharged over a partial closed or open hazard

3.8
low pressure container
insulated tank filled with CO_2 equipped with a cooling machine

NOTE The pressure at - 20°C is 18,7 bar.

3.9
nozzle
a component to achieve a predetermined flow rate and a uniformed distribution characteristic of the CO_2 into or onto a protected hazard

3.10
nozzle cover
component to protect nozzles against exterior dirt

3.11
resistance coefficient
a value for the calculation of the pressure drop in a component under two-phase flow condition

3.12
room protection nozzle
a nozzle, from which CO_2 is discharged for distribution throughout an enclosure

3.13
two-phase flow
partial change of phase of a fluid from a liquid to vapour under flowing conditions

3.14
working pressure
pressure at which the component is used in the system

4 Requirements

4.1 General design

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

Metal parts of nozzles shall be made of stainless steel, copper, copper alloy or galvanised steel.

All materials shall be resistant to media with which they come into contact.

Nozzles shall be designed so that the function cannot be adversely affected by ageing or environmental influences.

Non-metallic materials and elastomers shall be selected to be stable and not alter their performance over the working life recommended by the manufacturer.

4.2 Connection threads

Connection threads shall comply with ISO 7-1 or ISO 228-1 for threads.

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 dry-ice the cross sectional area of the nozzle should decrease in the direction of flow. High pressure nozzles with increasing cross sections shall be tested additionally under both conditions in accordance with 5.4. Orifice plates are not allowed.

4.4 Nozzle protection covers

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

4.5 Flow rate

The manufacturer shall specify the flow rate of the nozzle, in kilograms of CO_2 per second for instance, for the pressure ranges shown in Table 1.

Table 1 - Pressure range for nozzles

pressure in bar

Type of system	Range of pressure at the starting point p_{abs}	Range of pressure at the working point p_{abs}
Low pressure CO_2	10 to 18	8,6 to 16,5
High pressure CO_2	14 to 50	12 to 40

Where filters are installed, these shall be taken into account when determining the flow rate. The performance characteristics shall be tested in accordance with 5.5.

4.6 Distribution characteristics

The distribution of CO_2 shall be tested in accordance with 5.4.1 for room protection nozzles and in accordance with 5.4.2 for local application nozzles.

4.7 Resistance to pressure and heat

The extinguishing nozzles shall be able to withstand the test pressures and temperatures given in Table 2.

Table 2 - 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

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

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 which specifies the installation, operation, routine testing and maintenance of the component and all other aspects relating to its incorporation within a fire extinguishing system.

4.12.2 The documentation shall be submitted to the testing authority and shall comprise at least the following:

a) a general description of the equipment, including a list of the features and functions;
b) a technical specification including:
   1) the information as given in 4.5;
   2) the suitability for use in various environments;
   3) mounting instructions;
c) maintenance instructions.

4.12.3 The manufacturer shall also prepare, maintain and submit the following detailed documentation:

a) description of the overall mechanical design including
   1) the main parts of components and their tasks;
   2) the way in which the parts interact;
b) component lists;
c) layouts;
d) design drawings.

This documentation shall also comprise details of any subcomponents.

4.12.4 All documentation normally supplied by and specified by the manufacturer for use by the end user shall be supplied with the device and constitute part of the supply.

5 Type test methods

5.1 Conditions

The components shall be tested assembled as recommended for installation by the manufacturer. The tests shall be carried at out a temperature of (20 ± 5) °C, except when otherwise stated.

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 3.

Table 3 - Order of tests

Test methods	Order of tests			
	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 cover	-	-	-	2
5.9 Test for resistance to corrosion	3	-	-	-
5.10 Test for resistance to stress corrosion	-	-	-	3
5.11 Vibration test	-	-	3	-

When testing a series of nozzles, where the nozzles are of identical design with the exception of their size (cross section of discharge opening), the following test samples are necessary:

- 2 test samples of smallest size
- 1 test sample of medium size
- 2 test samples of largest size
- 1 or more test samples of a size agreed with the testing body

NOTE By this agreement, the dimensions of already available test rooms for test 5.4 may be taken into account.

The order of tests for this case shall be as follows:

- First test sample of smallest size: as test sample A of Table 3
- Second test sample of smallest size: as test sample D of Table 3
- Test sample of medium size: as test sample A of Table 3 without tests 3 and 4
- First test sample of largest size: as test sample A of Table 3 without tests 3 and 4
- Second test sample of largest size: as test sample B of Table 3
- Test sample(s) of the size agreed with the testing body: as test sample C of Table 3

5.3 Compliance

This test relates to the requirement of 4.1.

A visual and measurement check shall be made to determine whether the nozzles correspond to the description in the technical literature (drawings, parts lists, description of function, operating and installation instruction), and whether the device complies to this standard.

5.4 Determination of distribution characteristics

5.4.1 Room protection nozzles

This test relates to the requirement of 4.6.

For testing the distribution characteristics with one or more nozzles in a test room the following test conditions shall be set-up:

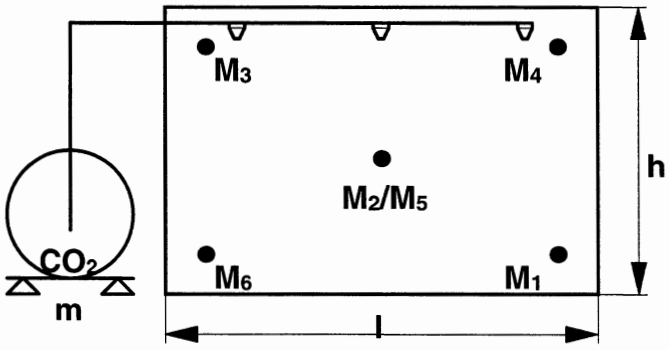
a) Relative humidity in the test room (60 ± 10)%;
b) Pressure in the CO_2 supply container : (20 ± 1) bar;
c) Pressure at the nozzle : (13 ± 2) bar;
d) Flow rate (1 ± 0,1) kg m^{-3} referenced to the volume of the test room;

e) Gaseous phase time maximum 10 s. The mass flow during this time shall not exceed 10% of the mass of the liquid phase;

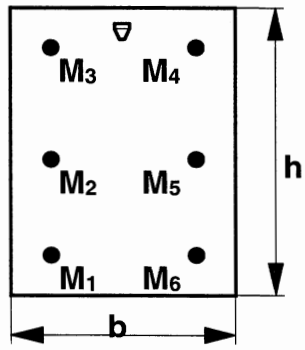
f) Liquid phase time (60 ± 2) s. The CO_2 supply shall be shut down immediately after this period.

Concentration measurements shall be made to determine whether the CO_2 is distributed evenly in the volume served by the nozzle(s). The deviation of the concentration of the different measuring points shall be at maximum five percentage points (60 ± 10) s after the end of the discharge. The test set-up is shown in Figure 1.

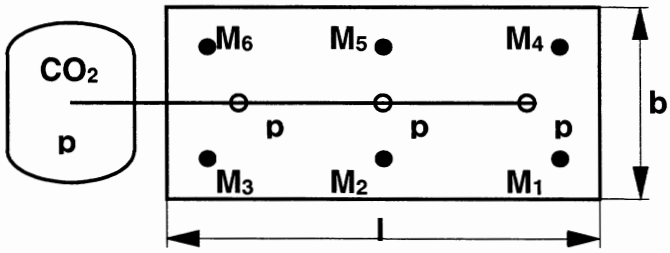
A visual check shall be made, to ensure that no significant quantity of CO_2 "dry-ice" is present in the test room 15 min after the conclusion of testing.



a) front view of the test room



b) side view of the test room



c) top view of the test room

Components

p	pressure measuring point
m	mass measuring point
h	room height, in metres (m)
b	width of room according to the flow rate of nozzle, in metres (m)
l	length of room according to the flow rate of nozzle, in metres (m)
M_1 to M_6	concentration measuring points 1 to 6

Arrangement for concentration measuring points:

- height above floor

M_1 ; M_6:	0,1 x h
M_2 ; M_5:	0,5 x h
M_3 ; M_4	0,9 x h

- distance from walls

M_1, M_2, M_3 and M_4:	0,1 x l from wall of length b and 0,1 x b from wall of length l
M_2 and M_5:	0,5 x l from wall of length b and 0,1 x b from wall of length l.

Figure 1 - Test configuration for room protection nozzles