

SLOVENSKI STANDARD SIST EN 14373:2006

01-februar-2006

Sistemi za dušenje eksplozij

Explosion suppression systems

Explosions-Unterdrückungssysteme

Systemes de suppression d'explosion DARD PREVIEW

Ta slovenski standard je istoveten z: EN 14373:2005

SIST EN 14373:2006

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ICS:

13.230 Varstvo pred eksplozijo Explosion protection

SIST EN 14373:2006 en

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2005

EN 14373

ICS 13.230

English Version

Explosion suppression systems

Systèmes de suppression d'explosion

Explosionsunterdrückungs-Systeme

This European Standard was approved by CEN on 16 August 2005.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

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

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Foreword

This European Standard (EN 14373:2005) has been prepared by Technical Committee CEN/TC 305 "Potentially explosive atmospheres - Explosion prevention and protection", the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by April 2006, and conflicting national standards shall be withdrawn at the latest by April 2006.

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(s).

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

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

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Scope

This European Standard describes the basic requirements for the design and application of explosion suppression systems. This European Standard also specifies a method for evaluating the effectiveness and the scale up of explosion suppression systems against defined explosions. It gives the criteria for alternative test apparatus used to undertake explosion suppression efficacy tests and criteria to be applied in defining the safe operating regime of an explosion suppression system.

It covers:

- general requirements for explosion suppression components:
- evaluating the effectiveness of an explosion suppression system;
- evaluating the scale up of an explosion suppression system;
- evaluation and development of design tools for explosion suppression systems;
- instructions for installation of an explosion suppression system;
- maintenance instructions for an explosion suppression system.

This European Standard is applicable only to explosion suppression systems intended for the protection of closed, or essentially closed, enclosures in which an explosion may result as a consequence of ignition of an explosible mixtures, e.g. dust-air mixtures, gas(vapour)-air mixtures, dust-gas(vapour)-air mixtures and mists.

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This European Standard is not applicable for explosions of materials listed below, or for mixtures containing some of those materials: SIST EN 14373:2006

- unstable materials that are liable to dissociate by 16-21077e-573627/sist-en-14373-2006
- explosive materials;
- pyrotechnic materials;
- pyrophoric materials.

NOTE For the listed materials expert advice is required.

2 Normative references

The following referenced documents are indispensable for the application of this European Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including amendments) applies.

EN 1127-1:1997, Explosive atmospheres — Explosion prevention and protection — Part 1: Basic concepts and methodology

EN 13237:2003, Potentially explosive atmospheres — Terms and definitions for equipment and protective systems intended for use in potentially explosive atmospheres

EN 13673-1, Determination of the maximum explosion pressure and the maximum rate of pressure rise of gases and vapours — Part 1: Determination of the maximum explosion pressure

EN 13673-2, Determination of maximum explosion pressure and the maximum rate of pressure rise of gases and vapours — Part 2: Determination of the maximum explosion pressure rise

EN 14034-1, Determination of explosion characteristics of dust clouds — Part 1: Determination of the maximum explosion pressure p_{max} of dust clouds

prEN 14034-2, Determination of explosion characteristics of dust clouds — Part 2: Determination of the minimum rate of explosion pressure rise (dp/dt)_{max} of dust clouds

prEN 14034-3, Determination of explosion characteristics of dust clouds — Part 3: Determination of the lower explosion limit LEL of dust clouds

EN 14034-4, Determination of explosion characteristics of dust clouds - Part 4: Determination of the limiting oxygen concentration LOC of dust clouds

prEN 14491, Dust explosion venting protective systems

prEN 14994, Gas explosion venting protective systems

EN 26184-3, Explosion protection systems — Part 3: Determination of explosion indices of fuel/air mixtures other than dust/air and gas/air mixtures (ISO 6184-3:1985)

Terms and definitions 3

For the purposes of this European Standard, the terms and definitions given in EN 1127-1:1997, EN 13237:2003 and the following apply.

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3.1

HRD-suppressor appliance containing an explosion suppressant, which can be expelled by the action of internal pressure

This pressure may be stored pressure of may be obtained by a chemical reaction such as the activation of an NOTF 1 explosive or pyrotechnic deviceps://standards.iteh.ai/catalog/standards/sist/31158cd5-8bd1-4194-

b776-2f077e573627/sist-en-14373-2006 NOTE 2 HRD is the abbreviation of High Rate Discharge.

3.2

suppressant

substance contained in the HRD-suppressor which, when dispersed into a volume to be protected, can arrest or prevent a developing explosion in that volume

NOTE Three categories of suppressants are in general use, separately or in combination:

- powder suppressant:
- water suppressant;
- chemical suppressant.

3.2.1

powder suppressant

powder with recognised flame extinguishing properties such as products based on monoammonium phosphate, potassium bicarbonate or sodium bicarbonate

NOTE Such suppressants may contain additives to improve their flow properties and their effectiveness.

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3.2.2

water suppressant

water, cold or hot, used as an explosion suppressant

NOTE Additives may be included to provide frost protection, and/or to improve the suppressant effectiveness.

3.2.3

chemical suppressants

chemical suppressants with recognised flame-extinguishing properties

3.3

dispersion agent pressure

p_s

maintained pressure in a stored pressure-type suppressor at which the suppressant is dispersed, e.g. dry gas, chemical reaction or the application of heat

3.4

suppressant charge

M_s

mass or volume of the suppressant contained within the suppressor

3.5

explosion sensor

device which is responsive to the changes, caused by a developing explosion, in one or more of the parameters such as pressure, temperature and/or radiation

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3.6

explosion detector

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device or arrangement of apparatus, containing one or more explosion sensors, that responds to a developing explosion by providing an explosion detection signal 1, 10, 14373,2006

3.7 activation pressure

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p_a

pressure threshold, above the pressure at ignition of the reactants (p_i) , at which a detection of the explosion is deemed to have occurred

3.8

reduced (suppressed) explosion pressure

$oldsymbol{p}_{\mathsf{red}}$

explosion overpressure, above the pressure at ignition of the reactants (p_i) , recorded in a suppressed explosion event

3.9

maximum reduced (suppressed) explosion pressure

$oldsymbol{p}_{\sf red,max}$

maximum explosion overpressure, above the pressure at ignition of the reactants (p_i), recorded in a suppressed explosion event at optimum fuel concentration

3.10

explosion suppression

technique by which burning in an explosive atmosphere is detected and arrested during incipient stages, restricting development of pressure

3.11

explosion suppression system

composite arrangement of devices to detect automatically the onset of an explosion and initiate the deployment of suppressant so as to limit the destructive effects of the explosion

3.12

control and indicating equipment

CIF

explosion protection equipment which controls, records and monitors the explosion sensors/detectors and the explosion protection devices

NOTE On detection of an incipient explosion, the CIE activates the explosion protection devices and initiates alarm systems.

3.13

dispersion device

device fitted on a HRD-Suppressor and designed to spread the suppressant throughout the volume to be protected

3.14

enclosure

3.14.1

compact enclosure

cubic enclosure

enclosures having a length (height) to diameter ratio of less than 2

3.14.2

elongated enclosures

enclosures with length (height) to diameter ratio of 2 to 10

3.14.3

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pipe

construction with a ratio length (height) to diameter greater than 101. 21)

3.15

combination systems

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suppression combined with venting

system combining the technology of explosion suppression with explosion venting

3.15.2

venting combined with suppression

system designed to minimise flame ejection out of an explosion vent

3.15.3

reduced oxygen concentration combined with suppression

system where a reduced oxygen concentration is used to minimise the explosion intensity and suppression is used to suppress the reduced explosion intensity

3.16

design strength of enclosure p (plant strength)

3.16.1

explosion resistant enclosures

enclosures and equipment, inclusive of attached pipelines, which are designed in accordance with CEN-regulation, such that the expected explosion pressure can be withstood without permanent deformation

3.16.2

explosion shock resistant enclosures

enclosures and equipment, inclusive of attached pipelines, which are designed in accordance with CEN-regulation such that they will resist the anticipated overpressure of an explosion. Unlike the criteria for explosion resistant enclosures, with explosion shock resistant enclosures some plastic deformation is allowable. In designing these enclosures, a higher utilisation of the strength of the material of construction is assumed

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3.17

hazard sector

three dimensional space for which the explosion suppression system is designed to be active

3.18

LOAEL

lowest concentration at which an adverse toxicological or physiological effect has been observed

NOTE LOAEL is the abbreviation of Lowest Observable Adverse Effect Level.

3.19

model

mathematical calculation which predicts the course of an explosion, the action of the suppression system and its interaction with the explosion, in order to enable an accurate design of explosion suppression systems

3.20

NOAEL

highest concentration at which no adverse toxicological or physiological effects have been observed

NOTE NOAEL is the abbreviation of No Observable Adverse Effect Limit.

3.21

obstructed volume

volume element containing internal obstructions

3.22 occupied space

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three dimensional expanse in which personnel may be of are present . 21

3 23

segregated volumes

three dimensional space that is set apart from others or itendants with 1500 de-8bd1-4194-

3.24

threshold dose

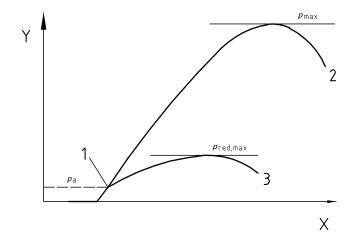
dose level below which no adverse toxicological or physiological effects have been observed

4 Explosion suppression

4.1 General

Explosion suppression is a technique by which combustion of an explosive atmosphere in a closed or essentially closed volume is detected and arrested during incipient stages, restricting development of damaging pressures.

A control and indicating equipment, CIE initiates the discharge of the HRD-Suppressor and the suppressant is dispersed into the volume to be protected in as short a time as possible. An explosion is regarded as suppressed when it is possible either to restrict the maximum explosion pressure to a suppressed (reduced) explosion pressure, which is lower than the protected volume design strength, or to limit fireball propagation to a specified maximum size in unconfined spaces. The maximum explosion overpressure, p_{max} will therefore be lowered to a maximum reduced (suppressed) explosion overpressure $p_{\text{red, max}}$ of typically between 0,2 bar and 1 bar (Figure 1).



Key

- 1 Activation of the suppression system
- 2 Closed enclosure explosion
- 3 Suppressed explosion
- Y Explosion overpressure p, in bar
- X Time t, in s

Figure 1 — Pressure behaviour versus time for a normal and suppressed explosion

For most practical applications of explosion suppression the worst case maximum suppressed explosion pressure, $p_{\text{red, max}}$ that can result is determined. Provided that this suppressed explosion pressure is lower than the process equipment design strength and provided further that suppression is achieved with a sufficient margin of safety, effective explosion suppression can be assured.

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4.2 Influencing factors

4.2.1 General

The effectiveness of an explosion suppression system depends on the parameters listed in 4.2.2 to 4.2.4.

4.2.2 The explosion hazard

- a) Volume of enclosure (free volume, V);
- b) shape of enclosure (surface area and length (height) to diameter ratio);
- c) explosible material (gas, dust, flammable liquids, mixtures thereof);
- d) homogeneity and intrinsic turbulence of the explosive atmosphere;
- e) induced turbulence caused by interaction of the combustion wave with internal obstacles and reflected pressure waves;
- f) initial pressure;
- g) temperature condition;
- h) explosibility parameters of explosible materials:
 - 1) maximum explosion overpressure, p_{max} ;