SLOVENSKI STANDARD
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Neelektriļ na oprema za potencialno eksplozivne atmosfere ï 8. del: Zaġļ ita s potopitvijo v tekoļ ino ñkò

Non-electrical equipment for potentially explosive atmospheres - Part 8: Protection by liquid immersion 'k'

Nicht-elektrische Geräte für den Einsatz in explosionsgefährdeten Bereichen - Teil 8: Schutz durch Flüssigkeitskapselung 'k'

Appareils non électriques destinés a etre utilisés en atmospheres explosibles - Partie 8: Protection par immersion dans un liquide 'k'

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Non-electrical equipment for potentially explosive atmospheres - Part 8: Protection by liquid immersion 'k'

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This European Standard was approved by CEN on 1 August 2003.

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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.

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

Management Centre: rue de Stassart, 36 B-1050 Brussels

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Foreword

This document (EN 13463-8:2003) 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of an identical text or by endorsement, at the latest by March 2004, and conflicting national standards shall be withdrawn at the latest by March 2004.

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 standard is to specify the requirements for the type of protection "Liquid immersion" for equipment intended for use in potentially explosive atmospheres and should be used in conjunction with EN 13463-1 " Non-electrical equipment for potentially explosive atmospheres - Part 1: Basic method and requirements”.

The detailed drafting work was entrusted to Working Group 2 "Equipment for use in potentially explosive atmospheres".

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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

Certain types of non-electrical equipment, intended for use in potentially explosive atmospheres of gas, vapour and/or dust, have their potential ignition sources rendered ineffective by either submersing them in a protective liquid, or by continuously coating them with a flowing film of protective liquid. In some equipment, the protective liquid is provided solely for the purpose of preventing the potential ignition sources from becoming effective. In other equipment, the protective liquid serves additional purposes, such as lubricating and/or cooling moving parts, or as in the case of hydraulic systems, for transmitting energy. In some equipment, the protective liquid may be the actual process liquid itself.

Examples of the kinds of equipment utilising this type of ignition protection are:

a) oil immersed disc brakes, for example, on the wheels of vehicles used in potentially explosive atmospheres,

b) diaphragm and other submersible pumps used for delivering flammable liquids, having their moving mechanisms immersed below the lowest allowable level of the flammable liquid being processed (e.g. petroleum product dispensers),

c) hydraulic pumps and motors having their internal rotating parts continuously immersed in the flowing hydraulic fluid used to transmit the hydrostatic or hydrokinetic energy,

d) oil filled gearboxes, having their gear wheels partially immersed, but continuously coated by a viscous film of lubricating oil. In this example the protective oil coating may be supplied by natural splashing of the wheels as they rotate in the oil, or by directing a continuously flowing stream of oil directly onto them from an oil pump in the gearbox sump,

e) fluid couplings, torque converters, connected for example, between the output shaft of a driving motor and the input shaft of fully loaded machine, to allow it to be started gradually ('soft starting').

In all of the above, ignition protection is achieved by the fact that protective liquid prevents the surrounding explosive atmosphere from coming into contact with the ignition source(s) by continuously coating, and/or lubricating and cooling the moving parts.

A similar type of ignition protection, known as oil immersion "o", has been used for many years for electrical equipment, where, in addition to the above, the liquid also acts as an electrical insulating medium. It is for this latter reason that this standard cannot be applied to electrical equipment, because it allows the use of liquids that conduct electricity.

1 Scope

1.1 This European Standard specifies the requirements for the design, construction, testing and marking of ignition protected equipment using liquid immersion 'k' as a means of preventing potential ignition sources from becoming effective according to the category, or categories, of the equipment to which it is constructed.

1.2 It may be used to provide ignition protection, either as an independent means, in addition to, or in combination with, other types of ignition protection listed in EN 13463-1 for Group I, categories M1 and M2 and Group II, categories 1G, 1D, 2G, 2D, 3G and 3D equipment, according to the ignition hazard assessment.

1.3 This European Standard supplements the requirements of EN 13463-1 insofar as it applies to the protection of non-electrical equipment by liquid immersion 'k'.

1.4 This European Standard does not apply to the ignition protection of electrical equipment. For these requirements reference should be made to EN 50014 and EN 50015, which inter-alia, requires electrically non-conducting protective liquids to be used.

2 Normative references

This European Standard incorporates by dated or undated reference, 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).

EN 13463-1:2001, *Non-electrical equipment for potentially explosive atmospheres Part 1: Basic method and requirements.*

EN 60529, *Degree of protection provided by enclosures (IP code) (IEC 60529:1989.)*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 13463-1 and the following apply.

3.1
liquid immersion 'k'
a type of protection in which potential ignition sources are made ineffective or separated from the explosive atmosphere by either totally immersing them in a protective liquid, or by partially immersing and continuously coating their active surfaces with a protective liquid in such a way that an explosive atmosphere which may be above the liquid, or outside the equipment enclosure cannot be ignited.

3.2
protective liquid
a liquid which prevents the explosive atmosphere from making direct contact with potential ignition sources and thereby ensures it cannot be ignited.

3.3
equipment with a sealed enclosure
totally enclosed equipment that prevents the ingress of an external atmosphere during the expansion and contraction of the internally contained protective liquid during use in service. Such equipment includes any pipework associated with it and may contain an over pressure relief device.

3.4
equipment with a vented enclosure
totally enclosed equipment that allows the ingress and egress of an external atmosphere through a breathing device or constricted opening during the expansion and contraction of the internally contained protective fluid during normal operation. Such equipment includes any pipework associated with it.

3.5
open equipment
equipment that has its components or is itself immersed in a protective liquid that is open to the external atmosphere. For example, an open top vessel with immersed moving components. Such equipment includes any pipework associated with it.

4 Determination of suitability

4.1 Before a decision is made to protect equipment or parts of equipment for use as an assembly, including interconnecting parts, by the measures described in this standard, it shall have been subjected to the ignition hazard assessment in accordance with 5.2 of EN 13463-1:2001.

4.2 The requirements specified in EN 13463-1 shall be complied with except where specifically excluded by this standard.

5 Determination of the maximum/minimum criteria

5.1 The manufacturer of the equipment shall determine by calculation and/or by type testing the following maximum/minimum criteria:

— the maximum and minimum level, or if more appropriate, the maximum and minimum pressure or flow of the protective liquid;

— the maximum working angle to the horizontal of the equipment;

— the maximum and minimum viscosity of the protective liquid, unless the nature of the protective liquid is specified by the manufacturer;

required to ensure that the designated potential ignition sources, are either totally immersed, or continuously coated with sufficient protective liquid, to ensure they cannot become effective. Account shall be taken of the effects of contraction during starting surges, splashing, turbulence, churning of the liquid, the worst case filling condition and standstill of the equipment throughout the normal range of operating temperatures.

5.2 Where the ignition protection is achieved by partial immersion and a pumped, or directed flow of liquid provides the necessary continuous coating on the potential ignition sources, the manufacturer shall determine the most effective location of any nozzle, spray or coating device to give maximum protection.

5.3 The results of the calculation, or type tests, described above, shall be included in the manufacturer's technical documentation; the minimum/maximum criteria shall be given in the operating instructions given to the user required by EN 13463-1.

6 Protective liquid

The protective liquid used shall be of such viscosity and chemical composition that it:

— prevents the potentially explosive atmosphere from coming into direct contact with the potential ignition source(s) identified in the ignition hazard assessment by providing a continuous coating, or film on the potential ignition source(s), and

— does not itself produce an explosive atmosphere on any of the potential ignition source(s). This includes voids, bubbles or mists caused by the churning action of moving parts in service, and/or a chemical reaction between the protective liquid and the materials used in the equipment's construction.

NOTE This does not preclude the use of flammable liquids as to protective liquid.

— does not itself produce an ignition source (e. g. production of deposits prone to self heating).

7 Equipment construction

7.1 The equipment shall be constructed to ensure, that the necessary amount of protective liquid is present. If required by the level of protection, this can be achieved for example by monitoring device(s), indicator(s) or gauge(s), which are provided on the equipment to indicate the maximum and minimum levels or, if more appropriate, pressure and flow rate of the protective liquid determined in accordance with 5. Where fitted, these devices, indicators or gauges shall be so arranged, that they can easily be read by the user.

NOTE Such devices are not safety devices to prevent ignition. Where such devices are additionally used to protect against ignition, reference should be made to EN 13463-6.

7.2 Where the ignition protection would be reduced to an unacceptable level if the equipment is used at an angle to the horizontal, the maximum allowable working angle, or gradient necessary to maintain the required maximum/minimum criteria, determined according to 5, shall be visible or detectable on the equipment.

7.3 Where contamination, deterioration, or degradation, of the protective liquid by external means can reduce the level of the ignition protection below that commensurate with the equipment category, constructional measures shall be incorporated and/or maintenance instructions provided by the manufacturer, to ensure that the liquid continues to maintain the requisite level of ignition protection throughout its intended life.

NOTE This may be achieved, for example by:

a) in the case of equipment with continuously flowing protective liquids, providing filtration to prevent solid contaminants being carried into moving parts;

b) in the case of open equipment, selecting a protective liquid that is not adversely affected by atmospheric contamination, such as atmospheric moisture and dust;

c) in the case of equipment needing protection against high levels of atmospheric dust and water vapour, providing a degree of ingress protection for the enclosure of at least IP 66 as described in EN 60529;

d) in the case of equipment with a sealed enclosure, providing an over pressure relief device having an IP rating of at least IP 23 according to EN 60529 and set by the manufacturer of the liquid filled equipment to operate at least at 1,1 times the absolute pressure above the liquid level and a minimum of 0,1 bar above the normal operating pressure;

e) In the case of equipment having a vented enclosure, constructing it so that any gas or vapour which may evolve from the protective liquid in normal service can readily escape through a breathing device having an IP rating of at least IP 23 according to EN 60529 and incorporating a suitable drying agent if necessary;

f) In the case where manufacturers instructions are used, requiring the liquid to be subjected to routine condition monitoring and specifying the maximum allowable periods between checks for contaminants such as deposits in the liquid and degradation, for example, by chemical changes to the liquid's composition such as abnormal change in acidity, or water content.

7.4 Means shall be provided to guard against accidental loosening of external and internal fasteners associated with covers giving access to the protective liquid. This also applies to any devices needed to indicate the level of the protective liquid and plugs and other parts for filling or draining the protective liquid which could result in unacceptable reduction in the ignition protection if it they were not maintained in leak proof condition.

Examples of the means to guard against accidental loosening are:

a) cementing of threads;

b) locking washers;

c) wiring of bolt heads.

7.5 Monitoring device(s), indicator(s), or gauge(s) shall be so designed and constructed that they indicate the actual level.

7.6 Indicating devices shall be constructed, situated and protected in such a manner that they shall not leak and cannot be damaged in normaloperation.