SLOVENSKI STANDARD
SIST EN 15198:2007

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Metodologija za oceno tveganja neelektriļ ne opreme in komponent, namenjenih za uporabo v potencialno eksplozivnih atmosferah

Methodology for the risk assessment of non-electrical equipment and components for intended use in potentially explosive atmospheres

Methodik zur Risikobewertung für nicht-elektrische Geräte und Komponenten zur Verwendung in explosionsgefährdeten Bereichen

Méthodes pour l'évaluation du risque d'inflammation des appareils et des composants non électriques destinés a etre utilisés en atmospheres explosibles

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Methodik zur Risikobewertung für nicht-elektrische Geräte und Komponenten zur Verwendung in explosionsgefährdeten Bereichen

This European Standard was approved by CEN on 13 July 2007.

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Foreword

This document (EN 15198:2007) 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of an identical text or by endorsement, at the latest by February 2008, and conflicting national standards shall be withdrawn at the latest by February 2008.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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 94/9/EC.

For relationship with EU Directive 94/9/EC, see informative Annex ZA, which is an integral part of this document.

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

Introduction

The function of this type A standard (description of general principles) as defined in CEN Guide 414 is to describe principles for a consistent systematic procedure for ignition risk assessment depending on Group II or Group I equipment.

Annex A is informative and contains examples for ignition risk assessment.

This European Standard does not provide means to prove the conformity of equipment categories. The procedure of ignition risk assessment for the design of equipment and components lead to a defined safety level which allows categorisation according to the appropriate criteria.

It is in both the manufacturer's and user's interest to establish a common methodology for achieving safety, reliability and efficacy in functioning and operating equipment and components with respect to the ignition hazards. Thus, ignition risk assessment is a tool which provides the essential link between manufacturers and users, but only aspects that directly address manufacturers are incorporated.

Integrated explosion safety is conceived to prevent the formation of explosive atmospheres as well as sources of ignition and, should an explosion nevertheless occur, to halt it immediately and / or to limit its effects. In this connection, the manufacturer must take measures with respect to the potential ignition sources. In addition, equipment and component must be designed and constructed after due analysis of possible operating faults in order as far as possible to preclude dangerous situations taking the misuse which can reasonably be anticipated into account. Therefore it is absolutely necessary to conduct an ignition risk assessment process.

For the equipment and components the identification of the potential ignition sources is the most relevant part of the ignition risk assessment.

1 Scope

This European Standard specifies basic methodology used in achieving safety of equipment for intended use in potentially explosive atmospheres.

The provisions specified in this European Standard are intended for the designer. It also specifies a strategy for standard makers.

This European Standard specifies the procedure and information required to allow ignition risk assessment to be carried out for the design of equipment or component.

This European Standard provides advice for a decision to be made for the categorisation of equipment but does not provide means to prove the conformity of equipment categories.

In this procedure the following information is to be taken into account:

a) Possible occurrence of an explosive atmosphere inside the equipment or component or penetrating the equipment or component from the outside (in normal operation or during malfunctions) and the amount of explosive atmosphere involved leading to possible explosion impact inside of the equipment or component;

b) equipment or components surrounded by an explosive atmosphere (in normal operation or during malfunctions);

c) equipment or components wholly or partly surrounded by an explosive atmosphere considering also any explosive atmosphere in connection (in normal operation or during malfunctions);

d) presence and likelihood (effectiveness) of ignition sources.

The final objective is designing and manufacturing equipment or components intended for use in potentially explosive atmospheres. For this purpose equipment or components if necessary should be designed with adequate preventive and/or protective measures.

This European Standard specifies neither specific methods of analysis associated with ignition risk assessment, nor specific requirements for a category of equipment. It describes the methodology of ignition risk assessment.

This European Standard does not apply to equipment with a potentially explosive atmosphere inside under operating conditions, and without interfaces to an external potentially explosive atmospheres.

This European Standard is applicable to all categories of equipment referred to in EN 13463-1.

This ignition risk assessment procedure does not preclude the conditions prevailing in an installation where the equipment or component is put into operation by a user.

NOTE Functional safety assessment of protective systems is covered by EN 15233.

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.

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

EN 1127-2, *Explosive atmospheres — Explosion prevention and protection — Part 2: Basic concepts and methodology for mining*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 13237:2003 and the following apply.

3.1
ignition risk
probability of occurrence of an ignition source that is capable of igniting an explosive atmosphere

3.2
ignition hazard
occurrence of a potential ignition source that is capable of igniting an explosive atmosphere

3.3
potential ignition source
equipment related ignition source that has the capability to ignite an explosive atmosphere (i.e. to become an effective ignition source)

3.4
protective measure
means used to reduce the probability of an ignition source to become effective

3.5
ignition risk estimation
determination of the probability of the occurrence of an ignition source

3.6
ignition risk evaluation
procedure to determine whether the intended level of protection (related to the equipment category) has been achieved

4 General requirements

4.1 Basic concept

Ignition risk assessment is a series of logical steps (see Figure 1) that enable designers and safety engineers to examine in a systematic way, the function of an equipment or component arising from its use in a potentially explosive atmosphere and to decide whether protective measures and/or type of protection are needed. The objective shall be to achieve an adequate level of safety.

Ignition risk assessment includes the following four steps:

a) product description: performance, lifetime, configuration (see 5.2),

b) identification of ignition hazards (see 5.3),

c) ignition risk estimation (see 5.4),

d) ignition risk evaluation (see 5.5).

These four steps are the basis for the decision whether the intended safety level is achieved (see 5.6). The result of the assessment shall be detailed in the technical documentation (see Clause 6).

If the intended level of protection is not achieved, it shall be necessary after redesign, to reassess the procedure to obtain the correct category or use of suitable protective measures.

NOTE The determination of correct categories and the selection of the suitable protective measures is not part of this standard.

4.2 Extent of ignition risk assessment

Initially the boundary or limit of the equipment and/or components must be specified under which the ignition risk assessment has to be carried out.

The limit is determined by the extent of explosive atmosphere or the ignition sources which are originated by the considered equipment and/or components.

The ignition risk assessment shall be limited to equipment and/or components and not extended to aspects for which the user is responsible.

The extent of the ignition risk assessment, which includes all operations, shall take into account:

a) intended use; and

b) misuse which can be reasonably anticipated.

An ignition risk assessment shall also include the possibility of an explosion inside the equipment and/or components causing an impact on the outside.

NOTE Misuse that can be reasonably anticipated indicates incorrect use and/or operation of the equipment and/or components by the operator due to carelessness or misunderstanding. Misuse is not part of the normal operation. Intent is not included in misuse that can reasonably be anticipated.

4.3 Information needed for ignition risk assessment

The information needed to perform the ignition risk assessment shall include the following where appropriate:

a) intended use referring to group I or group II and categories 1, 2, 3;

b) initial appraisal of the equipment or component;

c) materials to be processed (or necessary safety data);

d) requirements for maintenance including cleaning;

e) design drawings;

f) results of design calculations made, examinations carried out.

If available:

g) test reports, if they allow the evaluation of the probability of occurrence and/or the efficiency of ignition sources;

h) accident history;

i) information on relevant safety aspects.

If an accident history is not available for the equipment and/or components, available information for similar equipment and/or components shall be used as it is unlikely that equipment and/or components are so unique that similar equipment and/or components cannot be found. The absence of an accident history, a small

number of accidents or low severities of accidents shall not be taken as an automatic presumption of a low ignition risk.

The information shall be updated as the design develops and modifications are required.

For quantitative assessment, data from data bases, handbooks, laboratories and manufacturers specifications shall be used provided that there is confidence in its suitability. Any uncertainty associated with the data shall be recorded in the documentation (see Clause 6).

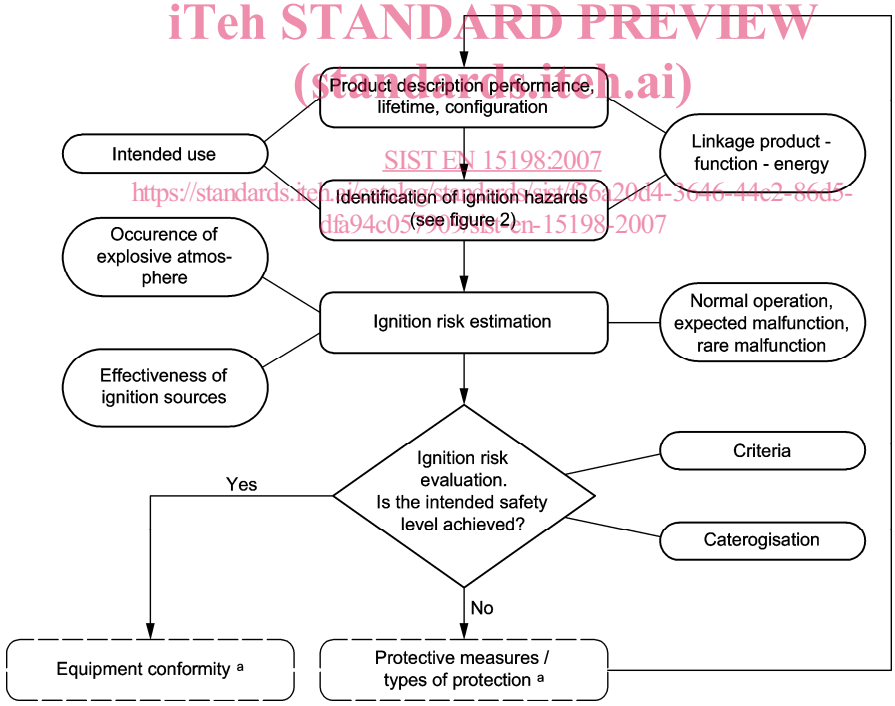
NOTE Data is used to define foreseeable operations requirements related to reliability, serviceability, durability, disposability, benign failure and failsafe characteristics and labelling, warnings, identification, traceability requirements and instructions. Data based on the consensus of expert opinion derived indirectly from experience as opposed to measured data, may be used to supplement qualitative assessment.

5 Ignition risk assessment Procedure

5.1 Principle Procedure

The principal steps for the ignition risk assessment procedure are shown in Figure 1. It is comprised of four steps taking into consideration the assessment criteria in the oval blocks.

To guarantee the intended level of protection maintenance and installation requirements shall also be considered.



Key

a Protective measures / types of protection and equipment conformity are not part of ignition risk assessment

Figure 1 — Ignition risk assessment for design of equipment or component

5.2 Product description: Performance, lifetime, configuration

The step-approach shall be carried out with an understanding of the functioning of the equipment and/or components and of the types of substances processed, used or released. A functional and state analysis for the intended use shall be undertaken for this purpose.

Intended use shall consider, for example, the following items:

a) life cycles of equipment and/or components;

b) limits in terms of use, time and space;

c) accurate definition of the function

d) selection of materials for construction;

e) performance, lifetime and configuration;

f) description of the type of substances that shall be processed and process conditions.

Constructive attributes of the material (e.g. non-conductive or non-sparking) may be presupposed provided that their application shall be implemented. It is not permissible to change the material due to constructional demands. Types of protection (e.g. liquid immersion "k" or control of ignition source "b") shall be regarded as non-existent in this step.

5.3 Identification of ignition hazards

5.3.1 General

Generally, an equipment and/or component shall be assessed by considering the probability and amount of explosive atmosphere.

The block diagram in Figure 2 provides the aspects for determination whether ignition hazards are present.

Block 1: It shall be decided if the intended use is the use in an explosive atmosphere (i.e. surrounding the equipment or component). If equipment or a component containing a potentially explosive atmosphere can, due to its construction, operation etc. create a potentially explosive atmosphere, which wholly or partially surrounds it, then such equipment or a component is in effect in a potentially explosive atmosphere.

Block 2: It shall be analysed, whether an explosive atmosphere will occur inside the equipment or component either from the process itself or from a connection to the surrounding area. This is necessary because an internal explosion, which can ignite the explosive atmosphere in the surrounding of the equipment, shall be considered as an ignition source of its own. Therefore the likelihood and duration of occurrence of an internal explosive atmosphere shall be determined.

Block 3: It shall be decided if the present ignition source is able to ignite the atmosphere, i.e. the ignition source is a potential ignition source. It is to consider if this ignition source becomes effective under normal conditions, foreseeable malfunctions or rare malfunctions.

NOTE The energy required to ignite an explosive atmospheres depends on its nature. Thus, non electrical equipment or a component that moves very slowly or has low power may not ignite the particular explosive atmosphere present during intended use.

Block 4: Ignition hazard of equipment or component shall be determined for each part of the equipment or component that comes into contact with or is connected to an “external” explosive atmosphere.

Regarding the following aspects, reference shall be made to EN 1127-1.