



SLOVENSKI STANDARD

SIST EN 1834-3:2000

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Batni motorji z notranjim zgorevanjem - Varnostne zahteve za načrtovanje in konstruiranje motorjev za uporabo v potencialno eksplozivnih atmosferah - 3. del: Motorji skupine II za uporabo v atmosferah z vnetljivim prahom

Reciprocating internal combustion engines - Safety requirements for design and construction of engines for use in potentially explosive atmospheres - Part 3: Group II engines for use in flammable dust atmospheres

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Hubkolben-Verbrennungsmotoren - Sicherheitsanforderungen für die Konstruktion und den Bau von Motoren zur Verwendung in explosionsgefährdeten Bereichen - Teil 3: Motoren der Gruppe II für Bereiche mit explosionsfähigen Stäuben

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Moteurs alternatifs a combustion interne - Prescriptions de sécurité pour la conception et la construction des moteurs fonctionnant en atmosphere explosible - Partie 3: Moteurs du groupe II utilisés dans des atmosferes de poussieres inflammables

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EUROPEAN STANDARD
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EN 1834-3

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English version

Reciprocating internal combustion engines - Safety requirements for design and construction of engines for use in potentially explosive atmospheres - Part 3: Group II engines for use in flammable dust atmospheres

Moteurs alternatifs à combustion interne - Prescriptions de sécurité pour la conception et la construction des moteurs fonctionnant en atmosphère explosible - Partie 3: Moteurs du groupe II utilisés dans des atmosphères de poussières inflammables

Hubkolben-Verbrennungsmotoren - Sicherheitsanforderungen für die Konstruktion und den Bau von Motoren zur Verwendung in explosionsgefährdeten Bereichen - Teil 3: Motoren der Gruppe II für Bereiche mit explosionsfähigen Stäuben

This European Standard was approved by CEN on 8 July 1999.

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.

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

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 270 "Internal combustion engines", 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 July 2000, and conflicting national standards shall be withdrawn at the latest by July 2000.

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

The standards prepared by CEN/TC 270 are specific to internal combustion engines and supplement those A and B standards concerned with safety.

Normative and informative annexes to this standard are indicated in the contents list. General Safety requirements for Internal Combustion Engines are given in EN 1679-1:1998.

0 Introduction

This standard has been prepared to be a harmonised standard to provide one means of conforming with the essential safety requirements of the Machinery (98/37/EEC) and ATEX (94/9/EEC) Directives and associated EFTA regulations. This European standard is a type C standard as defined in EN 292:1991.

The extent to which hazards are covered is indicated in the scope of this standard. In addition, machinery shall comply as appropriate with parts 1 and 2 of EN 292:1991 for hazards which are not covered by this standard.

The requirements of this standard apply to designers, manufacturers, suppliers and importers of reciprocating internal combustion engines.

This standard also contains the information to be provided by the manufacturer to the user of reciprocating internal combustion engines.

1 Scope

This European standard specifies the safety requirements and/or measures to remove the hazards and limit the risks on reciprocating internal combustion compression ignition engines of group II categories 2 and 3 for use in flammable dust atmospheres.

The standard does not define requirements relating to the driven machinery. These requirements can be found in the appropriate application standards.

This standard does not apply to engines used in premises for the processing, manufacture or storage of explosives.

The safety requirements for engines for use in potentially explosive atmospheres for underground applications are given in EN 1834-2:2000.

The safety requirements for engines for use in flammable gas and vapour atmospheres are given in EN 1834-1:2000.

This standard does not apply to spark ignition engines.

The hazards applicable are listed in 4 and relate to the additional hazards of operation in an atmosphere that may become explosive. The tests which the engine and its ancillary fittings are required to undergo to verify compliance with this specification are detailed in this standard.

General safety requirements i.e those common to all RIC engines, are covered in EN 1679-1:1998.

This European Standard is applicable to engines which are manufactured after the date of issue of this standard.

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.

EN 292-1	1991	Safety of machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology
EN 292-2:1991/+A1:1995		Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles and specifications
EN 1050	1996	Safety of machinery – Principles for risk assessment
EN 1127-1	1997	Explosive atmospheres - Explosion prevention and protection – Part 1: Basic concepts and methodology
EN 1679-1	1998	Reciprocating internal combustion engines - Safety - Part 1: Compression ignition engines
EN 1822-1	1998	High efficiency air filter (HEPA and ULPA) - Part 1 : Classification, performance, testing, marking
EN 1834-1	2000	Reciprocating internal combustion engines - Safety requirements for design and construction of engines for use in potentially explosive atmospheres - Part 1: Group II engines for use in flammable gas and vapour atmospheres

EN 1834-2	2000	Reciprocating internal combustion engines - Safety requirements for design and construction of engines for use in potentially explosive atmospheres - Part 2: Group I engines for use in underground workings susceptible to firedamp and/or combustible dust
EN 50014	1999	Electrical apparatus for potentially explosive atmospheres – General requirements
R044-001	1999	Safety of machinery - Guidance and recommendations for the avoidance of hazards due to static electricity
ISO 1813	1979	Antistatic endless V belts - Electrical conductivity - Characteristics and method of test
ISO 2710	1978	Reciprocating internal combustion engines - Vocabulary
ISO 3046-3	1989	Reciprocating internal combustion engines - Performance - Part 3: Test measurements
ISO 7967-1	1987	Reciprocating internal combustion engines - Vocabulary of components and systems - Part 1: Structure and external covers
ISO 7967-2	1987	Reciprocating internal combustion engines - Vocabulary of components and systems - Part 2: Main running gear
ISO 7967-3	1987	Reciprocating internal combustion engines - Vocabulary of components and systems - Part 3: Valves, camshaft drive and actuating mechanisms
ISO 7967-4	1988	Reciprocating internal combustion engines - Vocabulary of components and systems - Part 4: Pressure charging and air/exhaust gas ducting systems
ISO 7967-8	1994	Reciprocating internal combustion engines - Vocabulary of components and systems - Part 8: Starting systems
ISO 9563	1990	Belt drives - Electrical conductivity of antistatic endless synchronous belts - Characteristics and test method

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3 Definitions

For the purposes of this standard, the definitions in ISO 2710:1978 and ISO 7967-1:1987, ISO 7967-2:1987, ISO 7967-3:1987, ISO 7967-4:1988 and ISO 7967-8:1994 and the following definitions apply:

3.1 Explosive atmosphere

A mixture with air, under atmospheric conditions of combustible material in the form of gas, vapour, mist or dust, in which after ignition, combustion spreads throughout the unconsumed mixture.

3.2 Potentially explosive atmosphere

An atmosphere which could become explosive due to local and operational conditions.

3.3 Categories

Category 2 and 3 of equipment group II are defined in annex I of the ATEX Directive.

In the meaning of the ATEX directive RIC engines are equipments.

NOTE : The letter D is included to identify engines designed according to this European standard.

3.4 Zones for dust

The definitions given in 6.3.3 of EN 1127-1:1997 apply.

3.5 Temperatures

3.5.1 Minimum ignition temperature of an explosive atmosphere

The definition is given in 3.30 of EN 1127-1:1997.

3.5.2 Minimum ignition temperature of dust cloud

The definition is given in 3.32 of EN 1127-1:1997.

3.5.3 Minimum ignition temperature of a dust layer

The definition is given in 3.33 of EN 1127-1:1997.

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3.5.4 Maximum surface temperature

The highest temperature attained under the most adverse operating conditions of the external surfaces to which the surrounding atmosphere has access. This includes the engine, its fittings, its ancillary equipments including, spark arrester, ducts, etc.

3.5.5 Maximum temperature

The maximum temperature is the greatest under the most adverse operating conditions of :

- a) the maximum surface temperature as defined in 3.5.4.
- b) the maximum temperature of :
 - the exhaust gas emitted into the atmosphere immediately after the flame arrester.
 - the charge air at the outlet of the boosting device.

4 List of hazards

Only the specific hazards for engine applications in potentially explosive atmospheres are listed below according to EN 1050:1996.

- Hazards generated by materials and substances processed, used, exhausted or ejected by machinery including fire or explosion hazards (see 5.1, 5.9) ;
- Hazards caused by failure or malfunction of the control system (see 5.12) ;
- Hazards caused by incorrect position or absence of guards or safety related devices including starting and stopping devices, also including safety signs and signals, warning devices or information (see 5.4, 5.5, 5.6).

The main sources of ignition are :

- Hot surfaces,
- Flames and hot gases,
- Mechanically generated sparks,
- Electrical apparatus and systems,
- Static electricity.

The potential sources of ignition likely to ignite the surrounding explosive atmosphere are listed in annex A2.

The design specification for the engine necessary to minimize the likelihood of an ignition depend on the application and are as characterised by :

1. Category 2 D or 3 D,
2. The maximum temperature.

5 Safety requirements and/or measures

Engines of group II shall meet the requirements of EN 1679-1:1998.

No ignition of the explosive atmosphere by hot surfaces, hot gases, flames, sparks or electrical apparatus shall occur.

The relation between the classification of hazardous zones and conformity categories is given in table B.1 (see 6.3.2 of EN 1127-1:1997).

All hot surfaces shall be designed such as to reduce the likelihood of a dust layer build up . In particular the potential of dust layer build up in excess of 5 mm shall be avoided (see also 7.2 a) in the instructions for use.

For category 3 D engines, only normal operating conditions need to be taken into account, malfunctions need not be considered.

For category 2 D engines, normal operating conditions and reasonably foreseeable malfunctions shall be taken into account. Rare malfunctions and catastrophic failures need not be considered.

All safety requirements and/or measures apply to both categories 2 D and 3 D unless otherwise specified.

Engines for use in flammable dust atmospheres including flammable gas and vapour shall fulfil the requirements of EN 1834-1:2000 in addition to the requirements of this standard.

5.1 Maximum temperature

The maximum temperature as defined in 3.5.5 shall be such that :

- a) The maximum surface temperature as defined in 3.5.4, where dust layers can accumulate up to a thickness of 5 mm shall not exceed 150 °C or the ignition temperature of a dust layer minus 75 °C, where this ignition temperature is below 225 °C, which ever is the lower ;
- b) The maximum gas temperature of the exhaust gas emitted into the atmosphere shall not exceed 250 °C or 2/3 of the ignition temperature of a dust cloud where this ignition temperature is below 275 °C, which ever is the lower.

The engines shall be tested according to 6.2.

5.2 Engine designation

Internal combustion engines for use in potentially explosive atmospheres with flammable dust shall be designated by :

- "engine group II",
- the category 2 D or 3 D,

5.3 Air intake system

5.3.1 Air ducts from a non hazardous area

The parts of the inlet ducts which pass through the hazardous area shall be tested as specified in 6.4.

The installation conditions to prevent damage shall be specified by the manufacturer.

5.3.2 Air duct from the hazardous area

Each air inlet duct shall be fitted with a two or more stage air filter located as close as possible to the engine inlet manifold and with an efficiency better or equal to 85 % (see EN 1822-1:1998, class H 10) for the first stage and 95 % (see EN 1822-1:1998, class H 11) for the second stage.

Where a cyclonic air filter is used the dust disposal from the filter shall not be through the exhaust system.

The integrity of the inlet system between air filter and engine shall be maintained on engines of category 2 D (see 7.2). On engines of category 2 D, the inlet system between air filter and engine shall be tested according to 6.4.

5.4 Exhaust system

5.4.1 Exhaust system duct into a non-hazardous area

That part of the exhaust duct which passes through the hazardous area shall be tested as specified in 6.4.

The installation conditions to prevent damage shall be specified by the manufacturer.

5.4.2 Exhaust system duct into a hazardous area

Each exhaust system shall be fitted with a spark arrester complying with 5.6.

The exhaust system shall direct the exhaust above the highest part of the engine to prevent a dust cloud.

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5.5 Other devices

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5.5.1 Cold start devices

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When cold start devices are provided, they shall fulfil the following requirements.

5.5.1.1 Injection system

Category 2 D engines fitted with any cold start fluid system shall have an inlet flame arrester tested according to EN 1834-1:2000 installed downstream of the air filter.