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Električni generatorji z batnim motorjem z notranjim zgorevanjem - Varnost

Reciprocating internal combustion engine driven generating sets - Safety

Stromerzeugungsaggregate mit Hubkolben-Verbrennungsmotoren - Sicherheit

Groupes électrogènes entrainés par moteurs alternatifs à combustion interne - Sécurité

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Reciprocating internal combustion engine driven generating sets - Safety

Groupes électrogènes entraînés par moteurs alternatifs à combustion interne - Sécurité

Stromerzeugungsaggregate mit Hubkolben-Verbrennungsmotoren - Sicherheit

This European Standard was approved by CEN on 23 October 2010.

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Foreword

This document (EN 12601:2010) 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of an identical text or by endorsement, at the latest by June 2011 and conflicting national standards shall be withdrawn at the latest by June 2011.

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 supersedes EN 12601:2001.

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, Bulgaria, Croatia, 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

This document is a type C standard as stated in EN ISO 12100 (all parts).

The machinery concerned and the extent to which hazards, hazardous situations and hazardous events are covered are indicated in the scope of this document.

When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this type C standard take precedence over the provisions of the other standards, for machines that have been designed and built according to the provisions of this type C standard.

1 Scope

This European Standard specifies the safety requirements for reciprocating internal combustion (RIC) engine driven generating sets up to 1 000 V consisting of a RIC engine, an alternating current (a.c.) generator including the additional equipment required for operating, e.g. controlgear, switchgear, auxiliary equipment.

This European Standard is not applicable for generating sets which are manufactured before the date of its publication as a national EN standard.

It applies to generating sets for land and marine use, excluding generating sets used on board of seagoing vessels and mobile offshore units as well as on aircraft or to propel road vehicles and locomotives. The special requirements needed to cover operation in potentially explosive atmospheres are not covered in this standard.

The hazards relevant to RIC engine driven generating sets are identified in Annex A.

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 547-2, *Safety of machinery — Human body measurements — Part 2: Principles for determining the dimensions required for access openings*

EN 953, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards*

EN 981, *Safety of machinery — System of auditory and visual danger and information signals*

EN 1679-1:1998, *Reciprocating internal combustion engines — Safety — Part 1: Compression ignition engines*

EN 60034-5:2001, *Rotating electrical machines — Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code) — Classification (IEC 60034-5:2000)*

EN 60204-1:2006, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:2005, modified)*

EN 60335-1:2002, *Household and similar electrical appliances — Safety — Part 1: General requirements (IEC 60335-1:2001, modified)*

EN 60529:1991, *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

EN 61310-1, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, acoustic and tactile signals (IEC 61310-1:2007)*

EN ISO 4871:2009, *Acoustics — Declaration and verification of noise emission values of machinery and equipment (ISO 4871:1996)*

EN ISO 12100-1:2003, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology (ISO 12100-1:2003)*

EN ISO 12100-2:2003, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles (ISO 12100-2:2003)*

EN ISO 13732-1, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 1: Hot surfaces (ISO 13732-1:2006)*

EN ISO 13850:2008, *Safety of machinery — Emergency stop — Principles for design (ISO 13850:2006)*

EN ISO 13857:2008, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2008)*

EN ISO 14122-2, *Safety of machinery — Permanent means of access to machinery — Part 2: Working platforms and walkways (ISO 14122-2:2001)*

ISO 2261:1994, *Reciprocating internal combustion engines — Hand-operated control devices — Standard direction of motion*

ISO 2710-1:2000, *Reciprocating internal combustion engines — Vocabulary — Part 1: Terms for engine design and operation*

ISO 2710-2:1999, *Reciprocating internal combustion engines — Vocabulary — Part 2: Terms for engine maintenance*

ISO 3046-1:2002, *Reciprocating internal combustion engines — Performance — Part 1: Declarations of power, fuel and lubricating oil consumptions, and test methods — Additional requirements for engines for general use*

ISO 3046-6:1990, *Reciprocating internal combustion engines — Performance — Part 6: Overspeed protection*

ISO 6826:1997, *Reciprocating internal combustion engines — Fire protection*

ISO 7000, *Graphical symbols for use on equipment — Index and synopsis*

ISO 7967-1:2005, *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 7967-3:2010, *Reciprocating internal combustion engines — Vocabulary of components and systems — Part 3: Valves, camshaft drive and actuating mechanisms*

ISO 7967-4:2005, *Reciprocating internal combustion engines — Vocabulary of components and systems — Part 4: Pressure charging and air/exhaust gas ducting systems*

ISO 7967-8:2005, *Reciprocating internal combustion engines — Vocabulary of components and systems — Part 8: Starting systems*

ISO 7967-9:2010, *Reciprocating internal combustion engines — Vocabulary of components and systems — Part 9: Control and monitoring systems*

ISO 8528-1:2005, *Reciprocating internal combustion engine driven alternating current generating sets — Part 1: Application, ratings and performance*

ISO 8528-2:2005, *Reciprocating internal combustion engine driven alternating current generating sets — Part 2: Engines*

ISO 8528-3:2005, *Reciprocating internal combustion engine driven alternating current generating sets — Part 3: Alternating current generators for generating sets*

ISO 8528-4:2005, *Reciprocating internal combustion engine driven alternating current generating sets — Part 4: Controlgear and switchgear*

ISO 8528-5:2005, *Reciprocating internal combustion engine driven alternating current generating sets — Part 5: Generating sets*

ISO 8528-6:2005, *Reciprocating internal combustion engine driven alternating current generating sets — Part 6: Test methods*

ISO 8528-7:1994, *Reciprocating internal combustion engine driven alternating current generating sets — Part 7: Technical declarations for specification and design*

ISO 8528-8:1995, *Reciprocating internal combustion engine driven alternating current generating sets — Part 8: Requirements and tests for low-power generating sets*

ISO 8528-9:1995, *Reciprocating internal combustion engine driven alternating current generating sets — Part 9: Measurement and evaluation of mechanical vibrations*

ISO 8528-10:1998, *Reciprocating internal combustion engine driven alternating current generating sets — Part 10: Measurement of airborne noise by the enveloping surface method*

IEC 60364-4-41:2005, *Low-voltage electrical installations — Part 4-41: Protection for safety — Protection against electric shock*

IEC 60417-DB-12M:2002, *Graphical symbols for use on equipment — 12-month subscription to online database comprising all graphical symbols published in IEC 60417*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 8528-1:2005, ISO 8528-2:2005, ISO 8528-3:2005, ISO 8528-4:2005, ISO 8528-5:2005, ISO 8528-6:2005, ISO 8528-7:1994, ISO 8528-8:1995, ISO 8528-9:1995, ISO 8528-10:1998, ISO 2710-1:2000, ISO 2710-2:1999, ISO 3046-1:2002, ISO 3046-6:1990, ISO 7967-1:2005, ISO 7967-2:1987, ISO 7967-3:2010, ISO 7967-4:2005, ISO 7967-8:2005, ISO 7967-9:2010, and EN ISO 12100-1:2003 and the following apply.

3.1
low power generating sets
power generating sets for the purpose of this standard which are determined by the following special features:

- low power is taken to mean power of a magnitude up to approximately 10 kW;
- users normally are laymen;
- complete generating set is usually transportable, or mobile;
- electrical output is connected by plugs and sockets;
- generating set is ready for use without any additional installation work by the user

3.2
close proximity
30-mm space immediately around the operating and adjusting controls and carrying handles, including their whole movement range

4 General

If the installation of a generating set can create hazards in addition to those covered by this European Standard, the safety requirements and/or protective measures related to these additional hazards are the responsibility of the installer, if necessary with the agreement of the manufacturer of the generating set. The

installer will be responsible for ensuring compliance for the additional hazards arising because of the installation.

5 Hazards

The hazards relevant to RIC engine driven generating sets that have to be considered in order to prevent personal injury are listed in Annex A.

6 Safety Requirements

6.1 General

Machinery shall comply with the safety requirements and/or protective measures of this clause. In addition, the machine shall be designed according to the principles of EN ISO 12100 (all parts) for relevant but not significant hazards, which are not dealt with by this document.

6.2 Starting system

6.2.1 Requirements

Starting systems shall meet the requirements of Clause 6, Subclause "Starting system" of EN 1679-1:1998.

6.2.2 Verification

Compliance with the requirements shall be verified by inspection and testing of the starting systems.

6.3 Stopping

6.3.1 Requirements

6.3.1.1 Normal stopping

All generating sets shall have a normal stopping device which can be manually or automatically actuated. Stopping controls shall remain in the stop position when operated. This shall operate by a device ensuring the cutting off of the fuel or the ignition (for spark ignition engines) supply. This device may include an air supply cut-off.

6.3.1.2 Stopping in case of failure

Generating sets except low power generating sets shall be provided with an automatically actuated stopping device in case of failure.

This device shall monitor one or more signals of the generating set and if these signals are out of the allowable range it triggers the automatic stop.

The main signals that might be used to actuate automatic stopping are e.g.

a) for the RIC engine:

   1) overspeed (see ISO 3046-6);

   2) low lubricating oil pressure;

3) high coolant temperature;

4) low coolant level;

b) for the generator:

1) excessive overvoltage;

2) overload.

Which of these or other measures should be specified depends on the application.

6.3.2 Verification

Normal stopping shall be verified by inspection and testing of the stopping device in manual and in automatic modes (if provided in the application).

Automatic stopping in case of failure shall be verified by testing the action of typical failure modes in operating conditions (an appropriate method shall be used to create typical failure conditions, e.g. manual triggering, short-circuiting of contacts).

6.4 Emergency stopping

6.4.1 Requirement

Emergency stopping devices are required for remote controlled generating sets and generating sets with an enclosure or container accessible by persons. An emergency stopping device is not required for low power generating sets.

Emergency stopping devices shall be actuated manually. As for normal stopping, emergency stopping shall operate by a device ensuring the cutting off of the fuel supply or ignition (for spark ignition engines). This device may include an air supply cut-off.

Emergency stopping devices shall also meet the requirements of EN ISO 13850:2008, category 0, and the reset shall not initiate a restart or any hazardous conditions.

Manually actuated emergency stopping devices shall be located inside and outside the enclosure or container in which a generating set is located and which is accessible for personnel to carry out maintenance or control operations when generating sets are in operation.

6.4.2 Verification

Emergency stopping devices shall be verified by inspection and testing in operating conditions.

6.5 Control devices

6.5.1 Design, safety and mechanical strength

6.5.1.1 Requirement

Control devices for the RIC engine of the generating set shall meet the following requirements:

— hand controls shall be designed to withstand 1,2 times the maximum actuating forces given in Table 1 of EN 1679-1:1998;