



SLOVENSKI STANDARD

SIST EN 12601:2001

01-junij-2001

Električni generatorji z batnim motorjem z notranjim izgorevanjem - Varnost

Reciprocating internal combustion engine driven generating sets - Safety

Stromerzeugungsaggregate mit Hubkolben-Verbrennungsmotoren - Sicherheit

Groupes électrogènes entraînés par moteurs alternatifs à combustion interne - Sécurité

Ta slovenski standard je istoveten z: **EN 12601:2001**

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| 27.020 | Motorji z notranjim zgorevanjem | Internal combustion engines |
| 29.160.40 | Električni agregati | Generating sets |

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EUROPEAN STANDARD

EN 12601

NORME EUROPÉENNE

EUROPÄISCHE NORM

February 2001

ICS 27.020; 29.160.40

English version

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 16 November 2000.

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 Management Centre 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 Management Centre 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
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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of an identical text or by endorsement, at the latest by August 2001, and conflicting national standards shall be withdrawn at the latest by August 2001.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, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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0 Introduction

This European Standard has been prepared under a mandate given to CEN by the Commission of the European Communities and the European Free Trade Association, and supports essential requirements of the EU Machinery Directive (98/37/EC) and the associated EFTA regulations.

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

The requirements of this standard concern the designers, manufacturers, suppliers, importers and installers of RIC engine driven generating sets.

This standard gives also the information which the manufacturer shall provide to the user.

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1 Scope

This Standard specifies the safety requirements for RIC engine driven generating sets up to 1000 V consisting of a RIC engine, an alternating current (a.c.) generator including the additional equipment required for operating e.g., controlgear, switchgear and auxiliary equipment.

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.

This standard specifies the special safety requirements for RIC engine driven generating sets based on the general requirements laid down in EN 292-1 and EN 292-2. In addition the RIC engine shall as appropriate comply with the requirements of EN 1679-1.

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 292-1:1991, *Safety of machinery - Basic concepts, general principles for design – Part 1: Basic technology, methodology*

EN 292-2:1991 + A1:1995, *Safety of machinery - Basic concepts, general principles for design – Part 2: Technical principles and specifications*

EN 294, *Safety of machinery - Safety distances to prevent danger zones being reached by the upper limbs*

EN 418, *Safety of machinery - Emergency stop equipment, functional aspects - Principles for design*

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

EN 563, *Safety of machinery - Temperatures of touchable surfaces; ergonomics data to establish temperature limit values for hot surfaces*

EN 811, *Safety of machinery - Safety distances to prevent danger zone being reached by the lower limbs*

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

EN 1088, *Safety of machinery – Interlocking devices associated with guards – Principles for design and selection*

EN 1679-1:1998, *Internal combustion engines – Safety – Part 1: Compression ignition engines*

prEN 12437-2:1996, *Safety of machinery – Permanent means of access to machines and industrial plants – Part 2: Working platforms and gangways*

EN 60204-1:1997, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements*

EN 61310-1, *Safety of machinery – Indication, marking and actuation – Part 1: Requirements for visual, auditory and tactile signals*

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

EN ISO 8178-1, *Reciprocating internal combustion engines – Exhaust emission measurement – Part 1: Test bed measurement of gaseous and particulate emissions*

EN ISO 8178-2, *Reciprocating internal combustion engines – Exhaust emission measurement – Part 2: Measurement of gaseous and particulate emissions at site*

EN ISO 8178-4, *Reciprocating internal combustion engines – Exhaust emission measurement – Part 4: Test cycles for different engine applications*

EN ISO 8178-5, *Reciprocating internal combustion engines – Exhaust emission measurement – Part 5: Specification of test fuels*

EN ISO 8178-6, *Reciprocating internal combustion engines – Exhaust emission measurement – Part 6: Report on measurement results and test reports*

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

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

ISO 3046-1, *Reciprocating internal combustion engines - Performance – Part 1: Standard reference conditions and declarations of power, fuel consumption and lubricating oil consumption and test methods*

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

ISO 3046-7, *Reciprocating internal combustion engines – Performance – Part 7: Codes for engine power*

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

ISO 7967-1, *Reciprocating internal combustion engines - Vocabulary of components and systems – Part 1: Structure and external covers*

ISO 7967-2, *Reciprocating internal combustion engines - Vocabulary of components and systems – Part 2: Main running gear*

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

ISO 7967-4, *Reciprocating internal combustion engines - Vocabulary of components and systems – Part 4: Pressure charging and air/exhaust gasducting systems*

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

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

ISO 8178-3, *Reciprocating internal combustion engines - Exhaust emission measurement – Part 3: Definitions and methods of measurement of exhaust gas smoke under steady-state conditions*

ISO 8178-7, *Reciprocating internal combustion engines - Exhaust emission measurement – Part 7: Engine family determination*

ISO 8178-8, *Reciprocating internal combustion engines - Exhaust emission measurement – Part 8: Engine group determination*

ISO 8528-1:1993, *Reciprocating internal combustion engine driven generating sets – Part 1: Application, ratings and performance*

ISO 8528-2, *Reciprocating internal combustion engine driven generating sets – Part 2: Engines*

ISO 8528-3, *Reciprocating internal combustion engine driven generating sets – Part 3: AC generators for generating sets*

ISO 8528-4:1993, *Reciprocating internal combustion engine driven generating sets – Part 4: Control and switchgear for generating sets*

ISO 8528-5:1993, *Reciprocating internal combustion engine driven generating sets – Part 5: Generating sets*

ISO 8528-6, *Reciprocating internal combustion engine driven generating sets – Part 6: Test methods*

ISO 8528-7, *Reciprocating internal combustion engine driven generating sets – Part 7: Technical declarations for protectioning and design for the operating of generating sets*

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

ISO 8528-9, *Reciprocating internal combustion engine driven generating sets – Part 9: Test methods for measurement of mechanical vibration*

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

3 Terms and definitions

For the purposes of this standard, terms and definitions as specified in ISO 8528-1 to -10, ISO 2710-1, ISO 2710-2, ISO 3046-1, -6 and -7, ISO 7967-1, -2, -3, -4, -8 and -9 and the following apply:

3.1

low power generating sets

see clause 1 of ISO 8528-8:1995.

4 General

If generating sets require additional installation work to be put into service, the desired degree of compliance with these safety requirements depends on the application and shall be subject to agreement between the generating set manufacturer and the generating set installer. In particular when it is possible to deal with specific hazards either on the generating set itself or on the complete application the installer shall be responsible for choosing the most appropriate solution.

5 Hazards

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

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6 Safety requirements

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6.1 Starting system

Starting systems shall meet the requirements of 6.1 of EN 1679-1:1998.

6.2 Normal stopping

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

6.3 Emergency stopping

Emergency stopping devices are only required for remote controlled generating sets and generating sets with an enclosure accessible by persons. For low power generating sets no emergency stopping device is necessary.

Emergency stopping devices can be actuated manually or automatically. The emergency stopping shall operate by cutting off the fuel or ignition (for spark ignition engines) supply. It may include an air supply cut-off.

6.3.1 Manually actuated

The generating set shall be provided with a manually actuated emergency stopping device if this can be actuated or reacts quicker than the normal stopping device. According to EN 418 the reset of the stop function shall not initiate a restart or any hazardous conditions.

Manually actuated emergency stopping device shall meet the requirements of EN 418, category 0.

In the case of generating sets operating in a housing, which is accessible to persons a manually actuated emergency stopping device shall be located inside and outside the housing.

6.3.2 Automatically actuated

The generating set shall be provided with an automatically actuated emergency stopping device if the normal stop control is not accessible to persons working on or around the generating set.

This device monitors one or more signals of the generating set and if these signals are out of the permissible 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
 - overspeed (see ISO 3046-6)
 - low lubricating oil pressure
 - high coolant temperature
 - low coolant level
- b) for the generator
 - excessive overvoltage
 - earth-fault current

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

6.4 Control devices

6.4.1 Design, safety and mechanical strength

Control devices on generating sets shall comply with 6.4 of EN 1679-1:1998.

For control devices on electrical equipment 10.1 and 10.2 of EN 60204-1:1997 with the exception as given in B.10 shall apply.

6.4.2 Identification

The requirements of 6.4.2 of EN 1679-1:1998 shall apply. For control devices on electrical equipment 10.1 and 10.2 of EN 60204-1:1997 with the exception as given in B.10 shall apply.

6.4.3 Accessibility

The requirements of 6.4.3 of EN 1679-1:1998 shall apply.

6.5 Monitoring devices

The instruments for the monitoring of the generating set shall comply with the requirements in 6.5 of EN 1679-1:1998

Devices for electrical equipment shall comply with 10.3 of EN 60204-1:1997

6.6 Warning devices

Warning devices, signs, markings and colours shall meet the requirements of EN 61310-1 and EN 981.

6.7 Guarding

Persons shall be protected against hazards within the safety distances specified in EN 294 and EN 811. The safety distance depends on the generating set installation. For fixed installed generating sets the need of guarding shall be agreed between generating set manufacturer and installer considering that the persons shall be protected during operating and routine servicing.

Because it is not possible to envisage the layout of fixed installation the overall requirements for this situation are not dealt with in this standard. The following clauses give the requirements for the specific hazards and these principles shall be followed for any installation.

6.7.1 Guarding against mechanical hazards

Moving parts at generating sets e. g. fan, belt, chains etc. shall be so arranged or enclosed as to prevent direct involuntary access during normal use.

6.7.2 Guarding against hot surfaces

The hazard a hot surface presents depends on the surface temperature, its location and if a person is likely to touch it. A guard shall be provided to prevent accidental contact with any engine exhaust component during normal operation; any surface below 10 cm² needs not be guarded.

To decide if there is a measure needed, EN 563 should be used as a guide for evaluating the limit temperature of the hot surfaces. The guards used shall not exceed the permissible temperatures as defined in EN 563 under normal operating conditions, which are at continuous power according to ISO 8528-1.

In order to define the surfaces which may need a guard, the following described test procedure shall be used.

- The generating set shall be operated at its rated speed until the surface temperatures stabilize. The test shall be conducted in the shade. If the test is conducted at an ambient temperature outside of the nominal 20 °C ± 3 °C the reported temperatures shall be determined by correcting the observed temperature by adding the difference between the 20 °C and the actual test ambient temperature. When the distance between the identified hot area and the nearest control is in excess of 100 mm, cone A as shown in figure 1 shall be used. For distances less than 100 mm between the identified hot area and the nearest control, cone B as shown in figure 1 shall be used. For cone A with the axis of the cone anywhere 0° and 180° to the horizontal and with the point of the cone in a downward to horizontal direction, move the cone towards the hot surface. The cone shall not be moved in an upwards direction. When moving the cone, determine if contact is made with the hot surface area(s) with the cone tip or conical surface of the cone. Cone B shall be moved in any direction.

Any surface that cannot be reached by the cones is considered out of reach for the operator.