INTERNATIONAL STANDARD

ISO 8528-1

Second edition
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Reciprocating internal combustion engine driven alternating current generating sets —

Part 1: Application, ratings and performance

Groupes électrogènes à courant alternatif entraînés par moteurs alternatifs à combustion interne —

Partie 1: Application, caractéristiques et performances

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 8528-1 was prepared by Technical Committee ISO/TC 70, *Internal combustion engines*.

This second edition cancels and replaces the first edition (ISO 8528-1:1993), which has been technically revised.

ISO 8528 consists of the following parts, under the general title *Reciprocating internal combustion engine driven alternating current generating sets*:

— *Part 1: Application, ratings and performance*

— *Part 2: Engines*

— *Part 3: Alternating current generators for generating sets*

— *Part 4: Controlgear and switchgear*

— *Part 5: Generating sets*

— *Part 6: Test methods*

— *Part 7: Technical declarations for specification and design*

— *Part 8: Requirements and tests for low-power generating sets*

— *Part 9: Measurement and evaluation of mechanical vibrations*

— *Part 10: Measurement of airborne noise by the enveloping surface method*

— *Part 11: Rotary uninterruptible power systems — Performance requirements and test methods*[1)]

— *Part 12: Emergency power supply to safety services*

1) Part 11 will be published as ISO/IEC 88528-11.

Reciprocating internal combustion engine driven alternating current generating sets —

Part 1: Application, ratings and performance

1 Scope

This part of ISO 8528 defines various classifications for the application, rating and performance of generating sets consisting of a Reciprocating Internal Combustion (RIC) engine, Alternating Current (a.c.) generator and any associated controlgear, switchgear and auxiliary equipment.

It applies to a.c. generating sets driven by RIC engines for land and marine use, excluding generating sets used on aircraft or to propel land vehicles and locomotives.

For some specific applications (e.g. essential hospital supplies, high-rise buildings) supplementary requirements may be necessary. The provisions of this part of ISO 8528 should be regarded as the basis for establishing any supplementary requirements.

For other reciprocating-type prime movers (e.g. sewage-gas engines, steam engines), the provisions of this part of ISO 8528 should be used as a basis for establishing these requirements.

Generating sets meeting the requirements of this International Standard are used to generate electrical power for continuous, peak-load and standby applications. The classifications laid down in this part of ISO 8528 are intended to help understanding between manufacturer and customer.

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.

ISO 3046-1, *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 8528-2[2)], *Reciprocating internal combustion engine driven alternating current generating sets — Part 2: Engines*

ISO 8528-3[2)], *Reciprocating internal combustion engine driven alternating current generating sets — Part 3: Alternating current generators for generating sets*

ISO 8528-4[2)], *Reciprocating internal combustion engine driven alternating current generating sets — Part 4: Controlgear and switchgear*

ISO 8528-5[2)], *Reciprocating internal combustion engine driven alternating current generating sets — Part 5: Generating sets*

2) ISO 8528-2, 3, 4 and 5 are all under revision.

3 Symbols and abbreviations

An explanation of the symbols and abbreviations used in this International Standard are shown in Table 1.

Table 1 — Symbols and abbreviations

Symbol or abbreviation	Term	Unit
P	Power	kW
P_{pp}	Permissible average power	kW
P_{pa}	Actual average power	kW
p_r	Total barometric pressure	kPa
T_{or}	Charge air coolant temperature	K
T_r	Air temperature	K
t	Time	s
φ	Power factor	
$\varnothing_r$	Relative humidity	%
a.c.	Alternating current	
COP	Continuous power	kW
PRP	Prime power	kW
LTP	Limited-time running power	kW
ESP	Emergency standby power	kW

4 Other regulations and additional requirements

For a.c. generating sets used onboard ships and offshore installations, which have to comply with rules of a classification society, the additional requirements of the classification society shall be observed. The classification society name shall be stated by the customer prior to placing the order.

For a.c. generating sets operating in non-classified equipment, any additional requirements are subject to agreement between the manufacturer and customer.

If special requirements from any other regulatory authority (e.g. inspecting and/or legislative authorities) have to be met, the authority name shall be stated by the customer prior to placing the order.

Any additional requirements shall be subject to agreement between the manufacturer and customer.

5 General description

5.1 Generating set

5.1.1 General

A generating set consists of one or more RIC engines used to produce mechanical energy and one or more generators to convert the mechanical energy into electrical energy. The generating set includes any components used for coupling the mechanical prime mover(s) and electrical generator(s) (e.g. couplings, gearbox) and, where applicable, any load-bearing and mounting components.

5.1.2 Prime movers

For the purposes of this International Standard, prime movers may be of two types:

a) compression-ignition engines; and

b) spark-ignition engines.

Depending on the generating set application, the following criteria, among others, may be important in selecting the prime mover to be used:

a) quality of fuel and fuel consumption;

b) exhaust gas and noise emission;

c) speed range;

d) mass and dimensions;

e) sudden electrical loading and frequency behaviour;

f) generator short-circuit characteristics;

g) cooling systems;

h) starting systems;

i) maintenance requirements;

j) waste heat utilization.

5.1.3 Electrical generators

For the purposes of this International Standard, electrical generators may be of two types:

a) synchronous; and

b) asynchronous.

Depending on the generating set application, the following criteria, among others, may be important in selecting the generator to be used:

a) voltage characteristics during starting and normal operation as well as after load changes, taking into account the electrical power factor;

b) short-circuit behaviour (electrical and mechanical);

c) efficiency;

d) generator design and enclosure type;

e) parallel-operation behaviour;

f) maintenance requirements.

5.1.4 Control and switchgear

Equipment for the control, switching, operation and monitoring of the generating set shall be part of the associated controlgear and switchgear systems.

5.1.5 Auxiliaries

Auxiliaries are items of equipment additional to those already fitted/installed on the generating set as supplied but essential to its proper and safe operation, such as:

a) starting system;

b) air intake and exhaust gas systems;

c) cooling systems;

d) lubricating oil system;

e) fuel system (including fuel treatment where applicable);

f) auxiliary electrical power supply.

5.2 Power Station

A power station comprises an installation of one or more generating sets and their auxiliary equipment, the associated controlgear and switchgear and, where applicable, the place of installation (e.g. a building, an enclosure or special equipment for protection from the weather).

6 Application criteria

6.1 Modes of operation

6.1.1 General

The generating set mode of operation may affect certain important performance characteristics (e.g. its economical and reliable operation, the intervals between maintenance and repair) and shall be taken into account by the customer when agreeing the requirements with the manufacturer (see Clause 11).

6.1.2 Continuous operation at constant load

Continuous operation at constant load is defined as operation of a generating set without time limit taking into account the maintenance period, where the applied electrical load is constant.

EXAMPLE Providing a base load for a combined heat and power plant.

6.1.3 Continuous operation at varying load

Continuous operation at varying load is defined as operation of a generating set without time limit, taking into account the maintenance period, where the applied electrical load is variable.

EXAMPLE Providing electrical power where there is no utility electrical power available or the utility electrical supply is uncertain.

6.1.4 Limited time operation at constant load

Limited time operation at constant load is defined as operation of a generating set within set time limits where the applied electrical load is constant.

EXAMPLE Peak shaving load management where a generating set operating in parallel with a utility supply takes a constant load during periods of peak power consumption.

6.1.5 Limited time operation at varying load

Limited time operation at varying load is defined as operation of a generating set within set time limits where the applied electrical load is variable.

EXAMPLE To provide a basic support function to a building electrical supply in the event of normal utility supply failure.

6.2 Site criteria

6.2.1 Land use

Land use applies to generating sets either fixed, transportable or mobile which are used on land.

6.2.2 Marine use

Marine use applies to generating sets used on board ships and offshore installations.

6.3 Single and parallel operation

6.3.1 General

Generating sets may have two types of operation as follows:

a) Single Operation:

This applies to generating sets, irrespective of their configuration or mode of start-up and control, which will operate as the sole source of electrical power;

b) Parallel Operation:

This refers to the electrical connection of a generating set to another source of electrical supply with the same voltage, frequency and phase to share the power supply demand for the connected network. The characteristics of the normal utility electrical power supply, including voltage range and variation, frequency, impedance of the network, etc., shall be stated by the customer.

6.3.2 Generating set parallel operation

In this type of operation, two or more generating sets are electrically connected (not mechanically connected) after having been brought into synchronism. Generating sets with different outputs and speeds can be used.

6.3.3 Generating set operation in parallel with a utility supply

In this type of operation, one or more generating sets operating in parallel (as described in 6.3.1) are electrically connected to a utility supply.

In the case of public utility electrical power supply, permission for parallel operation has to be obtained from the public utility electricity authority. Protective equipment has to be provided in accordance with the public regulations in force at the time.

NOTE This also applies to generating sets which, in order to periodically check their start-up function, have to operate by supplying power into the normal electrical power supply system for a time period laid down by the generating set manufacturer.