INTERNATIONAL STANDARD

ISO 8528-12

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Reciprocating internal combustion engine driven alternating current generating sets —

Part 12:
Emergency power supply to safety services

Groupes électrogènes à courant alternatif entraînés par moteurs alternatifs à combustion interne —
Partie 12: Alimentation électrique de secours des services de sécurité

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Contents

International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet central@iso.ch
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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.

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.

International Standard ISO 8528-12 was prepared by Technical Committee ISO/TC 70, *Internal combustion engines*.

International Standard 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: Dynamic uninterruptible power supply systems*

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

Annex A of this part of ISO 8528 is for information only.

Reciprocating internal combustion engine driven alternating current generating sets —

Part 12:
Emergency power supply to safety services

1 Scope

This part of ISO 8528 applies to generating sets driven by reciprocating internal-combustion (RIC) engines for emergency power supply to safety services.

It applies, for example, to safety equipments in hospitals, high-rise buildings, public gathering places etc. This part of ISO 8528 establishes the special requirements for the performance, design and maintenance of power generators used in the applications referred to above and taking into account the provisions of ISO 8528-1 to ISO 8528-6 and ISO 8528-10.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 8528. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 8528 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

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

ISO 8528-2:1993, *Reciprocating internal combustion engine driven alternating current generating sets — Part 2: Engines.*

ISO 8528-3:1993 *Reciprocating internal combustion engine driven alternating current generating sets — Part 3: Alternating current generators for generating sets.*

ISO 8528-4:1993 *Reciprocating internal combustion engine driven alternating current generating sets — Part 4: Controlgear and switchgear.*

ISO 8528-5:1993, *Reciprocating internal combustion engine driven alternating current generating sets — Part 5: Generating sets.*

ISO 8528-6:1993, *Reciprocating internal combustion engine driven alternating current generating sets — Part 6: Test methods.*

IEC 34-1:1996, *Rotating electrical machines — Part 1: Rating and performance.*

IEC 285:1993, *Alkaline secondary cells and batteries — Sealed nickel-cadmium cylindrical rechargeable single cells.*

IEC 364-5-56:1980, *Electrical installations of buildings — Part 5: Selection and erection of electrical equipment — Chapter 56: Safety services.*

IEC 364-7-710:—[1], *Electrical installations of buildings — Part 7: Requirements for special installations or locations — Section 710: Medical locations.*

IEC 601-1:1988, *Medical electrical equipment — Part 1: General requirements for safety.*

IEC 622:1988, *Sealed nickel-cadmium prismatic rechargeable single cells.*

IEC 623:1990, *Vented nickel-cadmium prismatic rechargeable single cells.*

IEC 896-1:1987, *Stationary lead-acid batteries — General requirements and methods of test — Part 1: Vented types.*

IEC 896-2:1995, *Stationary lead-acid batteries — General requirements and methods of test — Part 2: Vale-regulated types.*

3 Definitions

For the purposes of this part of ISO 8528 the following definitions and those in ISO 8528-1 to 6 apply.

3.1 change-over time, t_{co}: Time interval from the appearance of a malfunction of the normal electrical power supply system until the safety services are again connected to the emergency power supply; this connection to the safety services may be applied in several load steps.

3.2 bridging time, t_B: Minimum time for which the generating station must supply the consumers with electrical power under pre-determined operating conditions and which corresponds with the rated operating time as defined in IEC 601-1.

3.3 safety services: Equipment for the safety of persons which is installed and kept prepared in case of failure of the usual electrical power supply system.

3.4 consumer power demand: Total of all intended demands of the connected consumers, taking into consideration the actual load steps.

3.5 power demand for safety services: Required power demand to fulfil the safety service requirements.

4 Symbols

I_2/I_N	Unbalanced load current ratio
k_U	Total voltage harmonic content
t_B	Bridging time
t_{co}	Change-over time
$t_{U,de}$ $t_{U,in}$	Voltage recovery time
β_f	Steady-state frequency band

1) To be published.

δU^{-}_{dyn}, δU^{+}_{dyn} } Transient voltage deviation

δf_{dyn} Transient frequency deviation

δf_{st} Frequency droop

δU_{st} Steady-state voltage deviation

5 Additional regulations and requirements

If special requirements or additional regulations are to be observed, they shall be stated by the customer and agreed upon between manufacturer and customer.

6 Classification designation

6.1 General

Classification of generating sets for safety services is based on performance class G2 as defined in ISO 8528-1 and the required change-over time, t_{co}, according to IEC 364-5-56 and table 1.

Table 1 — Classification by change-over time

Generating sets	no break	short break	long break	
Change-over time	0	< 0,5 s	< 15 s	> 15 s
Classification	1	2	3	4

6.2 Typical examples of classification

Typical examples of classification as defined in table 1 are given in table 2.

Table 2 — Examples

Classification	Typical examples
1	The mains voltage drops below the rated voltage by more than 10 %. After a change-over time of 0 s the power for the consumer power demand for safety services shall be available. The design of the no-break generating sets depends on the required frequency and voltage deviations.
2	The mains voltage drops below the rated voltage by more than 10 %. After a change-over time of 0,5 s the power for the consumer power demand for safety services shall be available. The design of the short-break generation set depends on the required frequency and voltage deviations.
3	The mains voltage drops below the rated voltage by more than 10 % for a period longer than 0,5 s. After a change-over time of max. 15 s, power for 100 % of the consumer power demand for safety services shall be available in steps.
4	The mains voltage drops below the rated voltage by more than 10 % for a period longer than 0,5 s. After a change-over time of max. 15 s, power for 80 % of the consumer power demand for safety services shall be available in two steps, and the power for 100 % of the consumer demand shall be available after an additional 5 s has passed.

7 Generating set design

7.1 Criteria for determining the required power

To ensure a reliable supply of electrical power by the generating set, the generating set manufacturer shall be informed of the power requirements of the installations to be supplied.

The power requirements shall include short load peaks when switching in electrical installations (e.g. lifts, pumps, fans, lighting equipment and non-linear electrical installations). Where applicable, e.g. for reasons of redundancy, the use of several generating sets operating in parallel may be required.

Since many modern RIC engines are turbocharged it will be necessary to arrange load acceptance in several steps.

For load acceptance the definitions and values laid down in ISO 8528-5:1993, clause 9 and figures 6 and 7 apply, where the load acceptance capability of the generating set is shown to be dependent on the brake mean effective pressure of the RIC engine.

If larger steps are used than those recommended in ISO 8528-5:1993, figures 6 and 7, either suitable additional measures shall be taken, or the generating set power rating, and where applicable the rotating mass of the flywheel, shall be increased.

The information provided by the check list in clause 14 is suggested as necessary for designing the power generator.

Essential equipment of emergency generating sets such as cooling system, fuel system including storage tank, lubrication system etc. shall be provided in order to ensure the operation of the generating set for the required time period.

The cooling system of the RIC engine shall be self-contained.

NOTE — The application of spark ignition engines is under consideration for special requirements and for national specifications.

7.2 Power determination

ISO 8528-1:1993, 13.1 and 13.3 applies for determining the power requirement.

7.3 Operating limit values

The operating limits shall at least meet the requirements of performance class G2 as in ISO 8528-5:1993.

Special requirements for the limit values are given in ISO 8528-5.

The transient operating limits generally apply as in ISO 8528-5:1993, table 3.

Classifications given in table 2 are listed in table 3.

Table 3 — Special requirements for examples given in table 2

Parameter	Symbol	Dimension	Reference	Classification			
				1	2	3	4
Frequency droop	δf_{st}	%	ISO 8528-5:1993, 5.1.1	AMC[1)]	AMC	5	4
Steady-state frequency band	β_f	%	ISO 8528-5:1993, 5.1.4	AMC	AMC	1,5	0,5
Transient frequency deviation	δf_{dyn}	%	ISO 8528-5:1993, 5.3.4	AMC	AMC	−10	−10
Steady state voltage deviation	δU_{st}	%	ISO 8528-5:1993, 7.1.4	AMC	AMC	± 2,5	± 1
Transient voltage deviation	δU^-_{dyn} δU^+_{dyn}	% %	ISO 8528-5:1993, 7.3.3	AMC	AMC	+20 −15	+10 −10
Voltage recovery time	$t_{U,de}$ $t_{U,in}$	s s	ISO 8528-5:1993, 7.3.5	AMC	AMC	4	4
Unbalanced load current ratio	I_2/I_N [2)]	1	ISO 8528-3:1993, 10.1	33 [3)] 15 [4)]	33 [3)] 15 [4)]	33 [3)] 15 [4)]	33 [3)] 15 [4)]
Total voltage harmonic content	k_U	%	—	AMC	AMC	—	5 [5)]

NOTE — All other values are given in ISO 8528-5.

1) AMC Agreement between manufacturer and customer.

2) See also definition in IEC 34-1:1983, section 22.

3) For generating sets with ratings above 300 kV·A.

4) For generating sets with ratings above 300 kV·A.

5) This applies also to the voltage between conductors and the neutral conductor under linear and symmetrical loading.