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Reciprocating internal combustion engine driven alternating current generating sets — Part 6: Test methods

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see ~~www.iso.org/directives~~www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see ~~www.iso.org/patents~~www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see ~~www.iso.org/iso/foreword.html~~www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 70, *Internal combustion engines*.

This third edition cancels and replaces the second edition (ISO 8528-6:2005), which has been technically revised.

The main changes are as follows:

— structure of testing completely modified (table updated);

— Clause ~~6~~7 now includes a test procedure related to generating sets connected to the grid;

— Clause 8 introduced for accessing the performance of generating sets in isochronous mode and grid parallel mode.

A list of all parts in the ISO 8528 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at ~~www.iso.org/members.html~~www.iso.org/members.html.

Reciprocating internal combustion engine driven alternating current generating sets — Part 6: Test methods

1 Scope

This document specifies the test methods to be used for characterizing an entire generating set. It applies to alternating current (AC) generating sets driven by reciprocating internal combustion (RIC) engines for land and marine use, excluding generating sets used on aircraft or to propel land vehicles and locomotives. This document also provides simulation methods as an alternative method for assessing the generating set capability to meet the requirements defined in ISO 8528-5.

For some specific applications (e.g., essential hospital supplies, high-rise buildings, operation in parallel with the grid), supplementary requirements could be necessary. The provisions of this document are intended as a basis for establishing any supplementary requirements.

For AC generating sets driven by other reciprocating-type prime movers (e.g., steam engines), this document is intended as a basis for establishing these requirements.

NOTE Existing test methods for the engine (ISO 3046-1 and ISO 3046-3) and generator (IEC 60034-2) are applicable for those components. The generating set manufacturer is responsible for specifying these characteristics and the tests to be performed to verify them.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 8528-1:2018, *Reciprocating internal combustion engine driven alternating current generating sets — Part 1: Application, ratings and performance*

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

ISO 8528-3:2020, *Reciprocating internal combustion engine driven alternating current generating sets — Part 3: Alternating current generators for generating sets*

ISO 8528-5:2022, *Reciprocating internal combustion engine driven alternating current generating sets — Part 5: Generating sets*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

IEC 60034-5, *Rotating electrical machines — Part 5: Classification of degrees of protection provided by enclosures for rotating machines*

IEC 60947-1, *Low-voltage switchgear and control gear — Part 1: General rules*

IEC 60034-1:2017, *Rotating electrical machines — Part 1: Rating and performance*

IEC 61400-27-2:2020, *Wind energy generation systems – Part 27-1: Electrical simulation models — Model validation*

~~IEC/TS 62786-1[1], *Distributed energy resources connection with the grid — general requirements*~~

3 ~~[1] Under preparation. Stage at the time of publication: IEC TS/CDTS 62786-1:2023~~ Terms, definitions and ~~abbreviated terms~~abbreviations

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at ~~https://www.iso.org/obp~~https://www.iso.org/obp

— IEC Electropedia: available at ~~https://www.electropedia.org/~~https://www.electropedia.org/

3.1.1
envelope width oscillation of generating set
$\hat{}$
~~f~~
$\check{}$
$\hat{}$
f
$\check{}$

Field Code Changed

envelope width oscillation of the generating set frequency at constant power around a mean value

3.1.2
no-load frequency
f_i
frequency at which the generating set is operating without load

3.1.3
rated no-load frequency
$f_{i,r}$
frequency at which the generating set is designed to operate without load

3.1.4
~~**declared**~~**rated frequency**
~~**rated**~~declared frequency
f_r
frequency at which the generating set is designed to operate

3.1.5
frequency at actual power
f_{arb}
frequency at which the generating set is actually operating

3.1.6
overshoot frequency
$f_{d,max}$
maximum transient frequency rise which occurs upon a sudden decrease from a higher to a lower power

Note 1 to entry: The symbol is different from that given in ISO 3046-4.

3.1.7
undershoot frequency
$f_{d,min}$
maximum transient frequency drop which occurs due to a sudden increase of load from a lower to a higher power

Note 1 to entry: The symbol is different from that given in ISO 3046-4.

3.1.8
total stopping time
t_a
time interval between the stop command being received by the generating set control system and the generating set completely stopping

Note 1 to entry: $t_a = t_i + t_c + t_d$.

~~Where,~~

where

- t_i is time interval from a stop command being given until the load is disconnected;
- t_c is the time interval from the removal of the load until the generating stop command is triggered, also known as the cooling run-on time;
- t_d is the time from the generating set stop command is triggered (also known as cooling run-on time) to when the generating set has come to complete stop.

3.1.9
load pick-up readiness time
t_b
time interval between the start command and readiness for supplying an agreed power, taking into account a given frequency and voltage tolerance

Note 1 to entry: $t_b = t_p + t_g$.

~~Where,~~

where

- t_p is time interval from the start command until the beginning of cranking;

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