

# INTERNATIONAL STANDARD

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## Wind turbine generator systems – Part 12: Wind turbine power performance testing

*Aérogénérateurs –  
Partie 12:  
Techniques de mesure des performances de puissance*

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

### WIND TURBINE GENERATOR SYSTEMS –

#### Part 12: Wind turbine power performance testing

#### FOREWORD

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International Standard IEC 61400-12 has been prepared by IEC technical committee 88: Wind turbine generator systems.

The text of this standard is based on the following documents:

FDIS	Report on voting
88/85/FDIS	88/89/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

A bilingual version of this standard may be issued at a later date.

Annexes A and C form an integral part of this standard.

Annexes B, D and E are for information only.

## INTRODUCTION

The purpose of this part of IEC 61400 is to provide a uniform methodology that will ensure consistency and accuracy in the measurement and analysis of power performance by wind turbine generator systems (WTGS). The standard has been prepared with the anticipation that it would be applied by:

- the WTGS manufacturer striving to meet well-defined power performance requirements and/or a possible declaration system;
- the WTGS purchaser in specifying such performance requirements;
- the WTGS operator who may be required to verify that stated, or required, power performance specifications are met for new or refurbished units;
- the WTGS planner or regulator who must be able to accurately and fairly define power performance characteristics of WTGS in response to regulations or permit requirements for new or modified installations.

This standard provides guidance in the measurement, analysis, and reporting of power performance testing for wind turbine generator systems (WTGS). The standard will benefit those parties involved in the manufacture, installation planning and permitting, operation, utilization, and regulation of WTGS. The technically accurate measurement and analysis techniques recommended in this document should be applied by all parties to ensure that continuing development and operation of WTGS is carried out in an atmosphere of consistent and accurate communication relative to environmental concerns. This standard presents measurement and reporting procedures expected to provide accurate results that can be replicated by others.

However, readers should be warned that the site calibration procedure is quite new. As yet there is no substantial evidence that it can provide accurate results for all sites, especially sites in complex terrain. Part of the procedure is based on applying uncertainty calculations on the measurements. In complex terrain situations it is not adequate to state that results are accurate since uncertainties might be 10 % to 15 % in standard deviation. A new measurement standard, accounting for these problems, will be developed in future.

## WIND TURBINE GENERATOR SYSTEMS –

### Part 12: Wind turbine power performance testing

#### 1 General

##### 1.1 Scope

This part of IEC 61400 specifies a procedure for measuring the power performance characteristics of a single wind turbine generator system (WTGS) and applies to the testing of WTGS of all types and sizes connected to the electrical power network. It is applicable for the determination of both the absolute power performance characteristics of a WTGS and of differences between the power performance characteristics of various WTGS configurations.

The WTGS power performance characteristics are determined by the measured power curve and the estimated annual energy production (AEP). The measured power curve is determined by collecting simultaneous measurements of wind speed and power output at the test site for a period that is long enough to establish a statistically significant database over a range of wind speeds and under varying wind conditions. The AEP is calculated by applying the measured power curve to reference wind speed frequency distributions, assuming 100 % availability.

The standard describes a measurement methodology that requires the measured power curve and derived energy production figures to be supplemented by an assessment of uncertainty sources and their combined effects.

##### 1.2 Normative references

The following normative documents, through reference in this text, constitute provisions of this part of IEC 61400. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 61400 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.

IEC 60044-1:1996, *Instrument transformers – Part 1: Current transformers*

IEC 60186:1987, *Voltage transformers*  
Amendment 1 (1988).  
Amendment 2 (1995).

IEC 60688:1992, *Electrical measuring transducers for converting a.c. electrical quantities to analogue or digital signals*

ISO 2533:1975, *Standard atmosphere*

*Guide to the expression of uncertainty in measurement*, ISO information publications, 1995, 110 p. ISBN 92-67-10188-9