

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Wind energy generation systems –
Part 12: Power performance measurements of electricity producing wind
turbines – Overview**

**Systemes de génération d'énergie éolienne –
Partie 12: Mesurages de performance de puissance des éoliennes de production
d'électricité – Vue d'ensemble**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

WIND ENERGY GENERATION SYSTEMS –**Part 12: Power performance measurements
of electricity producing wind turbines – Overview**

FOREWORD

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IEC 61400-12 has been prepared by IEC technical committee 88: Wind energy generation systems. It is an International Standard.

This first edition of IEC 61400-12 is part of a structural revision that cancels and replaces the performance standards IEC 61400-12-1:2017 and IEC 61400-12-2:2013. The structural revision contains no technical changes with respect to IEC 61400-12-1:2017 and IEC 61400-12-2:2013, but the parts that relate to wind measurements, measurement of site calibration and assessment of obstacle and terrain have been extracted into separate standards.

The purpose of the re-structure was to allow the future management and revision of the power performance standards to be carried out more efficiently in terms of time and cost and to provide a more logical division of the wind measurement requirements into a series of separate standards which could be referred to by other use case standards in the IEC 61400 series and subsequently maintained and developed by appropriate experts.

The text of this International Standard is based on the following documents:

Draft	Report on voting
88/830/CDV	88/866/RVC

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all parts in the IEC 61400 series, published under the general title *Wind energy generation systems*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

The IEC 61400-12 series comprises a sub-set of standards which are for use in the evaluation and measurement of the power performance characteristics of wind turbines. The power performance characterization of wind turbines of all types and sizes is covered.

IEC TC 88 has made this revision to reduce the complexity and to improve the maintainability of the previous version. Wind measurement procedures have been extracted from the performance standard, recognizing that wind measurements need to be referenced from other standards, such as in loads, noise and resource assessment measurements. IEC TC 88 recommends that the restructured standards gradually take over the previous standards before Maintenance Cycle Reports are written on the restructured standards introducing new technical requirements. Revision of the restructured documents should be proposed at the same time to incorporate such technical changes, recommendations, clarifications and simplifications.

The purpose of the IEC 61400-12 series is to provide a uniform methodology that will ensure consistency, accuracy and reproducibility in the measurement and analysis of power performance by wind turbines. These International Standards have been prepared with the anticipation that they would be applied by:

- a) a wind turbine manufacturer striving to meet well-defined power performance requirements and/or a possible declaration system;
- b) a wind turbine purchaser in specifying such performance requirements;
- c) a wind turbine operator who can be required to verify that stated, or required, power performance specifications are met for new or refurbished units;
- d) a wind turbine planner or regulator who needs to be able to accurately and fairly define power performance characteristics of wind turbines in response to regulations or permit requirements for new or modified installations.

The IEC 61400-12 series provides guidance in the measurement, analysis, and reporting of power performance testing for wind turbines. These International Standards will benefit those parties involved in the manufacture, installation planning and permitting, operation, utilization, and regulation of wind turbines. The technically accurate measurement and analysis techniques recommended in these standards should be applied by all parties to ensure that continuing development and operation of wind turbines is carried out in an atmosphere of consistent and accurate communication relative to wind turbine performance. These standards present measurement and reporting procedures expected to provide accurate results that can be replicated by others. Meanwhile, a user of these standards should be aware of differences in performance or the measurement of performance that arise from large variations in wind shear and turbulence. Not all of the test methods specified in the IEC 61400-12 series enable quantification of the impact of shear and turbulence. Therefore, a user should consider the influence of these differences, the most appropriate test method/standard and the data selection criteria in relation to the purpose of the test before contracting the power performance measurements.

Procedures for calibration, classification and uncertainty assessment of cup anemometers and ultrasonic anemometers are given in IEC 61400-50-1. Procedures for calibration, classification and uncertainty assessment of remote sensing devices are given in IEC 61400-50-2. Special care should be taken in the selection of the instruments chosen to measure the wind speed because it can influence the result of the power performance test.

WIND ENERGY GENERATION SYSTEMS –

Part 12: Power performance measurements of electricity producing wind turbines – Overview

1 Scope

This part of IEC 61400 defines procedures for assessing the power performance characteristics of wind turbines.

This document provides a general introduction to the available options for power performance measurement and the contributing evaluations which are further detailed in the other parts of the IEC 61400-12 series. Although this document (along with other parts of the IEC 61400-12 series) also defines the specifications of the meteorological variables (and in particular wind speed) required for the power performance evaluation, the methods and procedures for measuring or otherwise acquiring the wind speed data are defined in the IEC 61400-50 wind measurement series.

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.

IEC 61400-12-1, *Wind energy generation systems – Part 12-1: Power performance measurements of electricity producing wind turbines*

IEC 61400-12-2, *Wind energy generation systems – Part 12-2: Power performance of electricity producing wind turbines based on nacelle anemometry*

IEC 61400-12-3, *Wind energy generation systems – Part 12-3: Power performance – Measurement based site calibration*

IEC 61400-12-5, *Wind energy generation systems – Part 12-5: Power performance – Assessment of obstacles and terrain*

IEC 61400-12-6, *Wind energy generation systems – Part 12-6: Measurement based nacelle transfer function of electricity producing wind turbines*

IEC 61400-50, *Wind energy generation systems – Part 50: Wind measurement – Overview*

IEC 61400-50-1, *Wind energy generation systems – Part 50-1: Wind measurement – Application of meteorological mast, nacelle and spinner mounted instruments*

IEC 61400-50-2, *Wind energy generation systems – Part 50-2: Wind measurement – Application of ground-mounted remote sensing technology*

IEC 61400-50-3, *Wind energy generation systems – Part 50-3: Use of nacelle-mounted lidars for wind measurements*