



BSI Standards Publication

Wind energy generation systems

Part 12-5: Power performance — Assessment of obstacles and terrain



National foreword

This British Standard is the UK implementation of EN IEC 61400-12-5:2022. It is identical to IEC 61400-12-5:2022. Together with BS EN IEC 61400-50-2:2022 and BS EN IEC 61400-12-3:2022, it supersedes BS EN IEC 61400-12-1:2017, which will be withdrawn upon publication of the rest of the series. Together with BS EN IEC 61400-50-2:2022 and BS EN IEC 61400-12-3:2022, it supersedes BS EN IEC 61400-12-2:2013, which will be withdrawn upon publication of the rest of the series.

The UK participation in its preparation was entrusted to Technical Committee PEL/88, Wind turbines.

A list of organizations represented on this committee can be obtained on request to its committee manager.

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

This publication has been prepared under a mandate given to the European Standards Organizations by the European Commission and the European Free Trade Association. It is intended to support requirements of the EU legislation detailed in the European Foreword. A European Annex, usually Annex ZA or ZZ, describes how this publication relates to that EU legislation.

For the Great Britain market (England, Scotland and Wales), if UK Government has designated this publication for conformity with UKCA marking (or similar) legislation, it may contain an additional National Annex. Where such a National Annex exists, it shows the correlation between this publication and the relevant UK legislation. If there is no National Annex of this kind, the relevant Annex ZA or ZZ in the body of the European text will indicate the relationship to UK regulation applicable in Great Britain. References to EU legislation may need to be read in accordance with the UK designation and the applicable UK law. Further information on designated standards can be found at www.bsigroup.com/standardsandregulation.

For the Northern Ireland market, UK law will continue to implement relevant EU law subject to periodic confirmation. Therefore Annex ZA/ZZ in the European text, and references to EU legislation, are still valid for this market.

UK Government is responsible for legislation. For information on legislation and policies relating to that legislation, consult the relevant pages of www.gov.uk.

© The British Standards Institution 2022
Published by BSI Standards Limited 2022

ISBN 978 0 539 18335 1

ICS 27.180

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 October 2022.

Amendments/corrigenda issued since publication

Date	Text affected
------	---------------

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN IEC 61400-12-5

October 2022

ICS 27.180

English Version

**Wind energy generation systems - Part 12-5: Power
performance - Assessment of obstacles and terrain
(IEC 61400-12-5:2022)**

Systèmes de génération d'énergie éolienne - Partie 12-5:
Performance de puissance - Évaluation des obstacles et du
terrain
(IEC 61400-12-5:2022)

Windenergieanlagen - Teil 12-5: Leistungsverhalten -
Bewertung von Hindernissen und Gelände
(IEC 61400-12-5:2022)

This European Standard was approved by CENELEC on 2022-10-04. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.



European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

© 2022 CENELEC All rights of exploitation in any form and by any means reserved worldwide for CENELEC Members.

European foreword

The text of document 88/825/CDV, future edition 1 of IEC 61400-12-5, prepared by IEC/TC 88 "Wind energy generation systems" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61400-12-5:2022.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2023-07-04 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2025-10-04 document have to be withdrawn

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

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

Endorsement notice

The text of the International Standard IEC 61400-12-5:2022 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61400-12-1	-	Wind energy generation systems - Part 12- EN IEC 61400-12-1 - 1: Power performance measurement of electricity producing wind turbines		
IEC 61400-12-2	-	Wind energy generation systems - Part 12- EN IEC 61400-12-2 - 2: Power performance of electricity producing wind turbines based on nacelle anemometry		
IEC 61400-12-3	-	Wind energy generation systems - Part 12- EN IEC 61400-12-3 - 3: Power performance - Measurement based site calibration		
IEC 61400-12-6	-	Wind energy generation systems - Part 12- EN IEC 61400-12-6 - 6: Measurement based nacelle transfer function of electricity producing wind turbines		

This page is left deliberately blank.

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms and definitions	7
4 Symbols, units and abbreviated terms	9
5 General	9
6 Measurement sector procedure to be used for power performance measurements according to IEC 61400-12-1	10
6.1 General.....	10
6.2 Requirements regarding neighbouring and operating wind turbines	11
6.3 Requirements regarding obstacles	11
6.4 Method for calculation of sectors to exclude.....	12
6.5 Special requirements for extended obstacles	15
7 Measurement sector procedure to be used during the determination of the nacelle transfer function (NTF) between free wind speed and nacelle anemometer wind speed	15
8 Measurement sector procedure to be used during the determination of the nacelle power curve (NPC)	15
8.1 General.....	15
8.2 Requirements regarding neighbouring and operating wind turbines	16
8.3 Requirements regarding obstacles	16
8.4 Calculation of the excluded sector	17
8.5 Self-consistency check procedure for the measurement sector	18
9 Assessment of terrain at the test site	19
10 Terrain classification for evaluation of NTF and NPC	22
10.1 General.....	22
10.2 RIX indices	22
10.3 Average slope.....	22
10.4 Determine terrain class	23
10.5 Ridge formations.....	24
Figure 1 – Sectors to exclude due to wakes of neighbouring and operating wind turbines and significant obstacles	13
Figure 2 – An example of sectors to exclude due to wakes of the wind turbine under test, a neighbouring and operating wind turbine and a significant obstacle.....	14
Figure 3 – Example of the result of a sector self-consistency check	19
Figure 4 – Illustration of area to be assessed, top view	20
Figure 5 – Example of determination of slope and terrain variation from the best-fit plane: "2L to 4L" and the case "measurement sector" (Table 5, line 2).....	21
Figure 6 – Determination of slope for the distance "2L to 4L" and "8L to 16L" and the case "outside measurement sector" (Table 5, line 3 and line 5).....	21
Table 1 – Interfaces from other International Standards to this document	10
Table 2 – Interfaces from this document to other International Standards	10
Table 3 – Obstacle requirements: relevance of obstacles.....	10

Table 4 – Obstacle requirements: relevance of obstacles.....	17
Table 5 – Test site requirements: topographical variations.....	20
Table 6 – Slope terrain classification	23
Table 7 – RIX terrain classification.....	23
Table 8 – Final terrain class.....	23
Table 9 – Maximum ridge step effects on terrain class	24