

© Copyright SEK. Reproduction in any form without permission is prohibited.

Robotar för hushållsbruk – Funktionsprovning

Performance evaluation methods of mobile household robots

Som svensk standard gäller europastandarden EN 62849:2016. Den svenska standarden innehåller den officiella engelska språkversionen av EN 62849:2016.

Nationellt förord

Europastandarden EN 62849:2016

består av:

- **europastandardens ikraftsättningsdokument**, utarbetat inom CENELEC
- **IEC 62849, First edition, 2016 - Performance evaluation methods of mobile household robots**

utarbetad inom International Electrotechnical Commission, IEC.

Standarder underlättar utvecklingen och höjer elsäkerheten

Det finns många fördelar med att ha gemensamma tekniska regler för bl a mätning, säkerhet och provning och för utförande, skötsel och dokumentation av elprodukter och elanläggningar.

Genom att utforma sådana standarder blir säkerhetsfordringar tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

SEK är Sveriges röst i standardiseringsarbetet inom elområdet

SEK Svensk Elstandard svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

Stora delar av arbetet sker internationellt

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

Var med och påverka!

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

SEK Svensk Elstandard

Box 1284
164 29 Kista
Tel 08-444 14 00
www.elstandard.se

English Version

**Performance evaluation methods
of mobile household robots
(IEC 62849:2016)**

Méthodes d'évaluation de l'aptitude à la fonction
des robots mobiles à usage domestique
(IEC 62849:2016)

Verfahren zur Bewertung der Leistungsfähigkeit
von mobilen Haushaltrobotern
(IEC 62849:2016)

This European Standard was approved by CENELEC on 2016-09-29. 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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

European foreword

The text of document 59/655/FDIS, future edition 1 of IEC 62849, prepared by IEC/TC 59 "Performance of household and similar electrical appliances" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62849:2016.

The following dates are fixed:

- latest date by which the document has to be implemented at (dop) 2017-06-29
national level by publication of an identical national
standard or by endorsement
- latest date by which the national standards conflicting with (dow) 2020-09-29
the 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 [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 62849:2016 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated :

IEC 60335-1:2010	NOTE	Harmonized as EN 60335-1:2012 (modified).
------------------	------	---

Annex ZA

(normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When 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/TS 62885-1	-	Surface cleaning appliances - Part 1: General requirements on test material and test equipment	-	-
IEC 62929	2014	Cleaning robots for household use - Dry cleaning: Methods of measuring performance	EN 62929	2014
ISO 554	-	Standard atmospheres for conditioning and/or testing - Specifications	-	-
ISO 2768-1	1989	General tolerances - Part 1: Tolerances for linear and angular dimensions without individual tolerance indications	EN 22768-1	1993

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references.....	7
3 Terms and definitions	7
4 General conditions for testing	8
4.1 Conditions prior to testing.....	8
4.2 Operating and environmental conditions	8
4.2.1 General	8
4.2.2 Operating conditions	8
4.2.3 Atmospheric conditions	8
4.2.4 Lighting conditions	9
4.3 Test equipment and materials.....	9
4.4 Number of samples	9
4.5 Preparation of battery.....	9
4.6 Operation of the mobile household robot.....	9
4.7 Tolerance of dimensions	9
5 Units	10
6 Pose measurements	10
6.1 General.....	10
6.2 Test bed	10
6.2.1 General	10
6.2.2 Test mode.....	11
6.3 Test method.....	11
7 Capability of homing function	12
7.1 General.....	12
7.2 Test bed	12
7.3 Test method.....	13
8 Operation time per single charge	14
8.1 General.....	14
8.2 Test bed	14
8.3 Test method.....	15
9 Managing a single step	15
9.1 General.....	15
9.2 Test bed	16
9.3 Test method (autonomous modes).....	16
9.4 Test method (manual modes)	17
10 Obstacle avoidance	17
10.1 General.....	17
10.2 Test bed	17
10.3 Test method.....	18
11 Cable traversing behaviour	19
11.1 General.....	19
11.2 Test bed	19
11.2.1 General	19
11.2.2 Circles mark setting	20

11.2.3 Cable.....	20
11.3 Test method.....	21
Annex A (normative)	23
A.1 General.....	23
A.2 Door specification	26
Bibliography	27
Figure 1 – Pose measurements configuration	12
Figure 2 – Capability of homing function configuration	13
Figure 3 – Operation time per single charge configuration.....	14
Figure 4 – Managing a single step configuration	16
Figure 5 – Starting position for managing a single step test	17
Figure 6 – Obstacle avoidance configuration	18
Figure 7 – Starting position for obstacle avoidance test	18
Figure 8 – Wire fastening configuration	20
Figure 9 – Floor circle marks schematic diagram	20
Figure 10 – Floor circle marks schematic diagram with robot	21
Figure 11 – Top view of cable traversing behaviour Configuration	21
Figure 12 – Side view of cable traversing behaviour Configuration	22
Figure A.1 – Details of obstacles around table	23
Figure A.2 – Illustration of metal transition installation	25
Figure A.3 – Illustration of wood transition Installation	25
Figure A.4 – Detail view of checker board and transitions	26
Figure A.5 – Illustration of four-panel door.....	26
Table 1 – Tolerance of linear dimension (from ISO 2768-1).....	10
Table 2 – Tolerance of external radius and chamfer heights (from ISO 2768-1)	10
Table A.1 – Dimensions of furniture and obstacles	24

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**PERFORMANCE EVALUATION METHODS
OF MOBILE HOUSEHOLD ROBOTS****FOREWORD**

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62849 has been prepared by IEC technical committee 59: Performance of household and similar electrical appliances.

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

FDIS	Report on voting
59/655/FDIS	59/656/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.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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

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

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

This standard will cover the generic performance test methods for mobile household robots within one document. However this current version is applicable for indoor floor supported wheeled or wheel-track robots with focus on mobility and power consumption related performance. As the needs for manipulation related performance grows, it will be added into this generic performance standard.

PERFORMANCE EVALUATION METHODS OF MOBILE HOUSEHOLD ROBOTS

1 Scope

This International Standard applies to mobile household robots and provides performance testing and evaluation methods for common features of various mobile household robots.

This standard is neither concerned with safety nor with performance requirements.

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 TS 62885-1, *Surface cleaning appliances – Part 1: General requirements on test material and test equipment*

IEC 62929:2014, *Cleaning robots for household use – Dry cleaning: Methods of measuring performance*

ISO 554, *Standard atmospheres for conditioning and/or testing – Specifications*

ISO 2768-1:1989, *General tolerances – Part 1: Tolerances for linear and angular dimensions without individual tolerance indications*