

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**E- Transporters –
Part 3-1: Performance test method for the total run time of an e-scooter with
consideration of temperature conditions of actual use**

**E- Transporteurs –
Partie 3-1: Méthode d'essai de performance du temps de fonctionnement total
d'une trottinette électrique en prenant en considération les conditions de
température correspondant à une utilisation réelle**



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2024 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC -

webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, ...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications, symboles graphiques et le glossaire. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 500 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 25 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

INTERNATIONAL STANDARD

NORME INTERNATIONALE

E- Transporters –

Part 3-1: Performance test method for the total run time of an e-scooter with consideration of temperature conditions of actual use

E- Transporteurs –

Partie 3-1: Méthode d'essai de performance du temps de fonctionnement total d'une trottinette électrique en prenant en considération les conditions de température correspondant à une utilisation réelle

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 43.120

ISBN 978-2-8322-8698-2

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

| | |
|----------------------------------------------------------|----|
| FOREWORD..... | 3 |
| 1 Scope..... | 5 |
| 2 Normative references | 5 |
| 3 Terms and definitions | 5 |
| 4 Standard atmospheric conditions | 6 |
| 5 Specimen preparation..... | 6 |
| 5.1 General..... | 6 |
| 5.2 Test specimen | 7 |
| 5.3 Charging of the battery | 7 |
| 5.4 Applied load..... | 7 |
| 5.5 Adjustment of maximum speed | 7 |
| 5.6 Autonomy at fixed speed..... | 7 |
| 5.7 End-of-discharge voltage | 7 |
| 6 Test method | 7 |
| 6.1 General..... | 7 |
| 6.2 Test equipment..... | 8 |
| 6.2.1 Total run time measurement equipment..... | 8 |
| 6.2.2 Temperature test chamber..... | 9 |
| 6.3 Test procedure..... | 10 |
| 7 Test result | 12 |
| Bibliography..... | 13 |
| | |
| Figure 1 – Example of total run time test equipment..... | 8 |
| Figure 2 – Detail roller specification | 9 |
| Figure 3 – Flow chart of the test method | 11 |
| | |
| Table 1 – Example of temperature test conditions | 10 |

ITeH Standards
(<https://standards.iteh.ai>)
Document Preview

<https://standards.iteh.ai/catalog/standards/iec/5d176d26-6222-4844-b793-14c672d1a9ca/iec-63281-3-1-2024>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

E-TRANSPORTERS –**Part 3-1: Performance test method for the total run time of an e-scooter
with consideration of temperature conditions of actual use**

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) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 63281-3 has been prepared by IEC technical committee 125: e-Transporters. It is an International Standard.

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

| Draft | Report on voting |
|-------------|------------------|
| 125/92/FDIS | 125/99/RVD |

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/publications.

A list of all parts in the IEC 63281 series, published under the general title *e-Transporters*, 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, or
- revised.

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

[IEC 63281-3-1:2024](#)

<https://standards.iteh.ai/catalog/standards/iec/5df7bd28-6222-4844-b793-14e672d1a9ea/iec-63281-3-1-2024>

E-TRANSPORTERS –

Part 3-1: Performance test method for the total run time of an e-scooter with consideration of temperature conditions of actual use

1 Scope

This document specifies the test method for the total run time of an e-scooter for single-person transportation with consideration of the temperature conditions of actual use when the e-scooter is operated by the user in various temperatures for use on the road or in public spaces.

This document does not cover e-scooters for persons with disabilities or elderly persons. Also, this document excludes cargo e-scooters.

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 62301, *Household electrical appliances – Measurement of standby power*

IEC 60068-1:2013, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-1, *Environmental testing – Part 2-1: Tests – Test A: Cold*

<https://www.iso.org/obp/ui/#iso:code:63281-3-1:2024>
IEC 60068-2-2, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

3 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:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

e-scooter

electrically powered device for single-person transportation, consisting of a footboard mounted on two aligned wheels, a steering handlebar, and no seat

3.2

battery

one or more cells fitted with devices necessary for use, for example case, terminals, marking and protective devices

[SOURCE: IEC 60050-482:2004, 482-01-04]

3.3

end-of-discharge voltage

specified voltage of a battery at which the battery discharge is terminated

[SOURCE: IEC 60050-482:2004, 482-03-30, modified – Synonyms "final voltage", "cut-off voltage" and "end-point voltage" have been omitted.]

3.4

end-of-charge voltage

voltage attained at the end of a charging step, at a specified constant current

Note 1 to entry: The end-of-charge voltage may be used to initiate the termination of the charge process.

[SOURCE: IEC 60050-482:2004, 482-05-55]

3.5

speed control device

device that sets the speed and/or the motion according to the user's intention

3.6

data monitoring system

test device used for measuring total run time of an e-scooter by recording the amount of power measured using a power analyser to run time

3.7

single charge run time

continuous run time of an electrically powered device starting from a fully charged battery until the battery reaches discharged status resulting in non-operation of the device

3.8

load box

box designed to apply load to the centre of the footboard of the e-scooter

3.9

roller test rig

test rig installed with rollers to conduct driving test of e-scooter which is fixed to the rig

3.10

steering column

bar with a handle mounted on top of the front wheel at a determined caster angle to steer the front wheel of the e-scooter

4 Standard atmospheric conditions

The test shall be conducted in the standard atmospheric conditions of IEC 60068-1:2013, 4.3 unless otherwise agreed by the manufacturer and test provider. If there is a change in atmospheric conditions, the relevant information shall be recorded in the test report.

5 Specimen preparation

5.1 General

The test specimen shall be prepared with the following considerations to measure the total single charge run time of the e-scooter.

5.2 Test specimen

The test specimen shall be tested in accordance with the manufacturer's user manual as a completely assembled product or in its original form as provided by the manufacturer. If changes are made to the specimen, consultation with the manufacturer is required before conducting the test. To obtain reliable test data, it is recommended to test with at least three test specimens. Additional tests may be conducted for higher accuracy as required. However, if the test specimen is not sufficient, proceed with the test and indicate the number of test specimens used.

5.3 Charging of the battery

The battery shall be charged to the end-of-charge voltage in accordance with the manufacturer's instructions.

5.4 Applied load

The mass used for the test should be the rated load announced by the manufacturer (75 ± 2) kg, which is the assumed weight of the driver riding the e-scooter. However, the mass may be adjusted for the test by consultation and agreement with the manufacturer. If there is a change in load mass, the relevant information shall be recorded in the test report.

5.5 Adjustment of maximum speed

The test specimen is evaluated based on the maximum rated speed provided by the manufacturer, as the run time of the e-scooter can be the shortest when operated at maximum speed. The speed control device shall be adjusted to keep the speed controller at its maximum position. If necessary, the maximum speed for the test may be determined through consultation with the manufacturer. The speed for the test shall be specified on the test protocol and recorded speed over the run time. Set to maximum speed, and allow the speed to reduce due to low battery.

5.6 Autonomy at fixed speed

The test specimen is evaluated based on the fixed speed at ($15 \pm 1,5$) km/h. The speed control device shall be used to maintain this speed until the e-scooter battery has discharged or until the above speed drops to below 90 % of the initial value. The speed for the test shall be recorded over the run time.

5.7 End-of-discharge voltage

The e-scooter shall be discharged to that specified voltage of a battery at which the battery discharge is terminated.

6 Test method

6.1 General

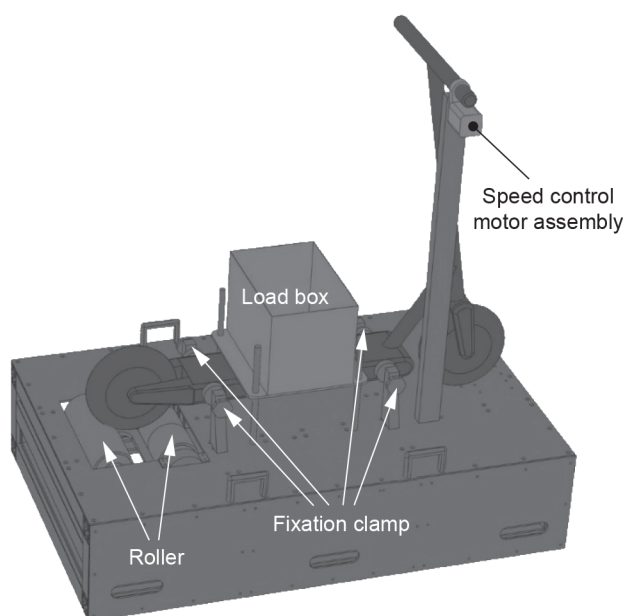
This test method aims to determine the amount of time the e-scooter can be used by the driver. E-scooters are used under various temperature conditions, which are factors that affect the total run time. The test method for measuring the total run time of the e-scooter shall meet the specified temperature conditions as set out in 6.2 due to the fact that the total run time may vary depending on such conditions.

6.2 Test equipment

6.2.1 Total run time measurement equipment

The following characteristics of the test bench can be used as an informative example. The specifications of the equipment for measuring driving power consumption of the e-scooter up to 50 V are as follows:

- As shown in Figure 1, the measurement equipment can be composed of a roller test rig equipped with fixation clamps, load box, speed control device, power analyser and data monitoring system.
- The roller test rig can be installed with rollers for the fixed driving test of an e-scooter with an approximate wheelbase (distance between the front and rear axles) of 1 200 mm and a height of 1 200 mm.
- The roller test rig can be made of non-flammable, corrosion-resistant metal material and height adjustable so that the steering column of the e-scooter is fixed horizontally to the rig.
- The roller may be of a metal material (e.g., SUS304) of not less than 113 mm in diameter, $(7,2 \pm 0,2)$ kg in weight, and approximately 300 mm in length, and two rollers can be used to prevent dislocation of the e-scooter. The distance between the central axes of the two rollers is 180 mm and may be changed according to the wheel size of the e-scooter to be tested. See Figure 2 for details of roller specification. The roller test rig can be equipped with fixation clamps that do not affect the load and that fix the e-scooter onto the rig.
- The roller test rig can be equipped with a load box and fixation clamps capable of loading and fixing a vertical load of (75 ± 2) kg to the centre of the footboard of the e-scooter.
- For the initial driving of an e-scooter, one roller needs a drive mechanism and a controller, including a clutch that is disconnected from the motor after driving, connected to a motor of 300 W or more.
- The roller test rig can be equipped with a sub-motor and controller to operate the accelerator on the steering column to start the e-scooter and continue its operation.
- A power analyser in accordance with IEC 62301 shall be used to measure battery power consumption and run time in real time.
- A data monitoring system shall be connected to the power analyser to store data on run time.



IEC

Figure 1 – Example of total run time test equipment

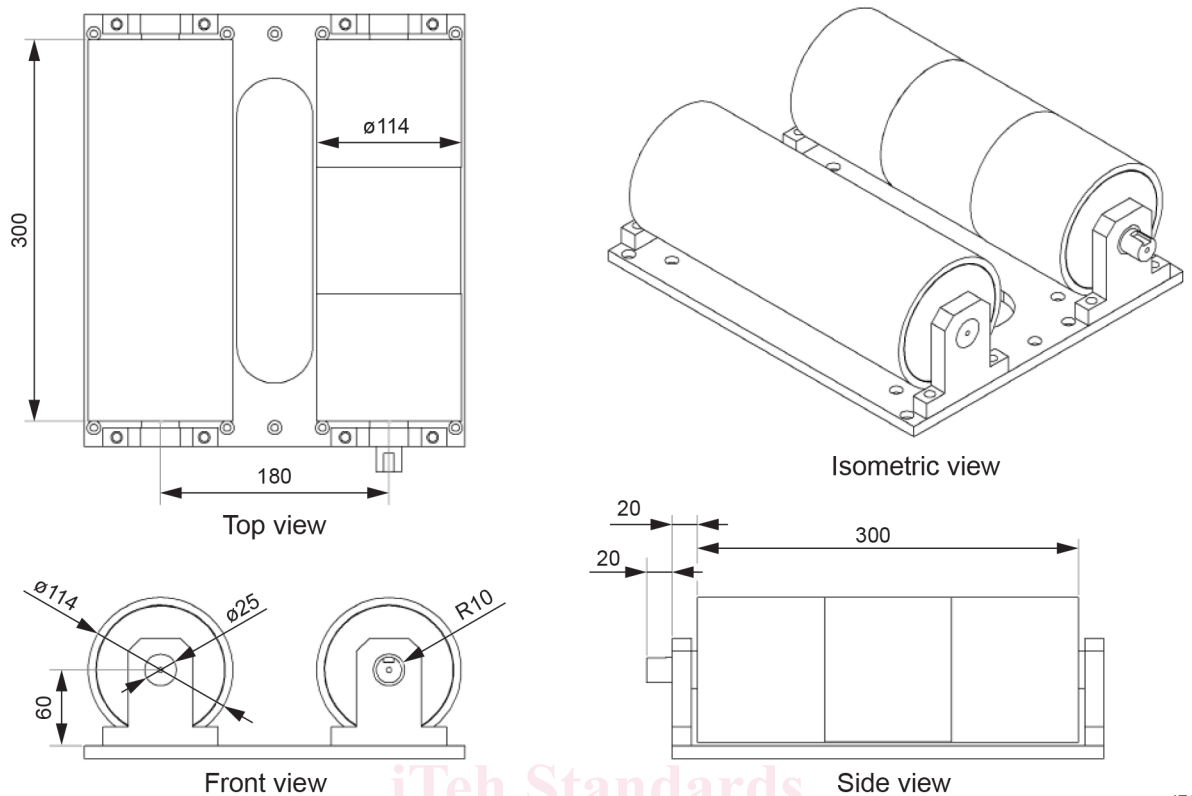


Figure 2 – Detail roller specification

- If necessary, the test bench can be calibrated in the manner specified in ISO 28981 to eliminate losses (rolling resistance, coefficient of inertia, etc.) caused by friction on the bench.

6.2.2 Temperature test chamber

The specifications of the temperature chamber in which to test the e-scooter in the necessary temperature conditions are as follows:

- The temperature test chamber shall meet the requirements of IEC 60068-2-1 and IEC 60068-2-2.
- The size of the temperature test chamber shall be large enough for the total run time measurement equipment.
- A wiring connector shall be used to connect the battery test probe of the e-scooter to an external voltmeter.
- The chamber shall be made of non-flammable and corrosion-resistant material and it shall be isolated.
- The chamber shall be equipped with an air intake and exhaust system that is connected to the fire detection sensor, so that smoke can be discharged in case of fire.
- The chamber shall be equipped with a data monitoring system that can measure the internal temperature of the chamber in real time with an accuracy of ± 2 °C.
- The chamber shall be equipped such that under standard atmospheric conditions for measurements and test (see IEC 60068-1) with an air velocity less than 0,2 m/s, the specimen shall be electrically loaded as specified for the low and high temperatures at which the test is to be carried out.