

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Lead-acid starter batteries –
Part 7: General requirements and methods of test for motorcycle batteries

Batteries d'accumulateurs de démarrage au plomb –
Partie 7: Exigences générales et méthodes d'essais pour les batteries de
motocycles

STANDARD PREVIEW
(standards.iteh.ai)

IEC 60095-7:2019
<https://standards.iteh.ai/catalog/standards/sist/a5804259-5b4d-4a05-ab94-ec812987322e/iec-60095-7-2019>



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2019 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 Central Office
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 It also gives information on projects, replaced and withdrawn publications.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.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22,000 terminological entries in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

67,000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

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.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary

67 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Lead-acid starter batteries –
Part 7: General requirements and methods of test for motorcycle batteries**

**Batteries d'accumulateurs de démarrage au plomb –
Partie 7: Exigences générales et méthodes d'essais pour les batteries de
motocycles**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.220.20

ISBN 978-2-8322-7367-8

**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.....	4
1 Scope.....	6
2 Normative references	6
3 Terms and definitions	6
4 Designation of starter batteries.....	7
4.1 Battery designation of starter batteries.....	7
4.2 Electrolyte density and open circuit voltage.....	7
4.3 Terminal	7
4.4 Size	7
5 Condition on delivery	7
5.1 VRLA battery	7
5.2 Flooded battery.....	8
6 General requirements	8
6.1 Identification and labelling	8
6.1.1 General.....	8
6.1.2 The identification of manufacturer or supplier.....	8
6.1.3 Nominal voltage: 12 V or 6 V.....	8
6.1.4 Capacity $C_{10,e}$ (Ah) and nominal cranking current I_{cc} (A) at -18 °C (see 7.1).....	8
6.1.5 Production date code.....	8
6.1.6 Safety labelling	8
6.1.7 Recycling labelling	8
6.1.8 Valve-regulated batteries.....	9
6.2 Marking of the polarity	9
7 Functional characteristics	9
7.1 Electrical characteristics	9
7.2 Mechanical characteristics	10
8 General test conditions.....	10
8.1 Sampling of batteries	10
8.2 Charging of batteries	10
8.3 Test equipment.....	10
8.3.1 Measuring instruments.....	10
8.3.2 Water bath.....	10
8.3.3 Environmental chamber	10
8.4 Test sequence	10
8.4.1 Batteries filled and charged	10
8.4.2 Dry-charged or conserved-charge batteries	11
9 Tests methods.....	11
9.1 10 h capacity check $C_{10,e}$	11
9.2 Cranking performance test.....	12
9.3 Charge acceptance test	12
9.4 Charge retention test	12
9.5 Endurance test for batteries (cycling test).....	13
9.6 Water consumption test	13
9.7 Vibration resistance test	14

9.8 Cranking performance for dry-charged (or conserved-charge) batteries after activation	14
10 Requirements	14
Annex A (normative) Battery size	16
A.1 Battery size for VRLA battery	16
A.2 Battery size for flooded battery	17
Bibliography	20
Figure 1 – Designation of the position for measurement.....	7
Table 1 – Charging method.....	10
Table 2 – Test sequence.....	11
Table 3 – Summary of requirements	15
Table A.1 – Battery size for VRLA battery	16
Table A.2 – First letter for each battery type	16
Table A.3 – Size codes for each battery dimension	17
Table A.4 – Battery size for 6 V flooded battery	17
Table A.5 – Battery size for 12 V flooded battery	18

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[IEC 60095-7:2019](https://standards.iteh.ai/catalog/standards/sist/a3804239-384d-4a03-ab94-ec812987322e/iec-60095-7-2019)

<https://standards.iteh.ai/catalog/standards/sist/a3804239-384d-4a03-ab94-ec812987322e/iec-60095-7-2019>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

LEAD-ACID STARTER BATTERIES –

**Part 7: General requirements and methods
of test for motorcycle batteries**

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 60095-7 has been prepared by IEC technical committee 21: Secondary cells and batteries.

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

FDIS	Report on voting
21/1014/FDIS	21/1019/RVD

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

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

A list of all parts in the IEC 60095 series, published under the general title *Lead-acid starter batteries*, 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 "<http://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.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[IEC 60095-7:2019](#)

<https://standards.iteh.ai/catalog/standards/sist/a3804239-384d-4a03-ab94-ec812987322e/iec-60095-7-2019>

LEAD-ACID STARTER BATTERIES –

Part 7: General requirements and methods of test for motorcycle batteries

1 Scope

This part of IEC 60095 is applicable to lead-acid batteries used primarily as a power source for the starting of internal combustion engines, lighting and ignition (SLI) of motorcycles and other power sport vehicles. The nominal voltage is 12 V or 6 V.

Test definitions and criteria in this document are for batteries with a nominal voltage of 12 V only. For batteries with a nominal voltage of 6 V, all voltages have to be divided by two.

The other power sports vehicles covered in this document are snowmobiles, personal water crafts and all-terrain vehicles.

This document is not applicable to batteries for other purposes, such as the back-up power sources, auxiliary equipment of internal combustion engine vehicles and e-bikes.

This document specifies:

- general requirements;
- size, essential functional characteristics, relevant test methods and results required.

<https://standards.iteh.ai/catalog/standards/sist/a3804239-384d-4a03-ab94-ec812987322e/iec-60095-7-2019>

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 60050-482, *International Electrotechnical Vocabulary (IEV) – Part 482: Primary and secondary cells and batteries*

IEC 60095-1:2018, *Lead-acid starter batteries – Part 1: General requirements and methods of test*

IEC 60417, *Graphical symbols for use on equipment* (available at <http://www.graphical-symbols.info/equipment>)

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-482 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

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

4 Designation of starter batteries

4.1 Battery designation of starter batteries

For VRLA batteries, flooded batteries, dry charged batteries (or conserved charge batteries), AGM batteries, and gel batteries, refer to IEC 60095-1.

4.2 Electrolyte density and open circuit voltage

For electrolyte density and open circuit voltage, refer to IEC 60095-1.

4.3 Terminal

The standard terminal shall be manufactured using lead alloy, and for a battery having a bolt and nut, the terminal shall be mounted. However, for a battery whose outside dimensions are small, a lead wire type may be used instead of a terminal. As regards this lead wire, an electric wire, and as a wire covering colour, red shall be used for the positive polarity side and black for the negative polarity one.

4.4 Size

As regards the size, the outside dimensions shown in Table 1 for VRLA batteries and Tables A.4 and A.5 for flooded batteries (see Annex A), shall be measured using a length meter.

The designation of the position in which the outside dimensions are measured is shown in Figure 1.

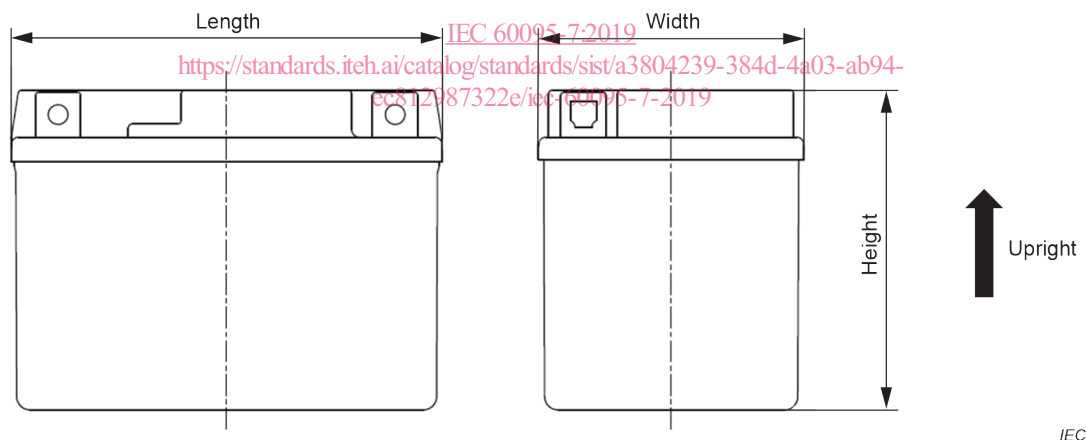


Figure 1 – Designation of the position for measurement

5 Condition on delivery

5.1 VRLA battery

The battery is normally supplied in a state ready for use. For these batteries, the electrolyte is not accessible and, therefore, its density cannot be checked.

The battery may be supplied in a dry-charged (or charge-conserved) state not filled with electrolyte. These batteries shall be supplied, by the manufacturer, with a bottle of electrolyte of specific strength and volume. The density of the acid to fill these batteries before use (unless otherwise recommended by the manufacturer) shall be: 1,32 kg/l ± 0,01 kg/l at 25 °C for valve regulated batteries.

5.2 Flooded battery

The battery may be supplied:

- in a state ready for use
- in a dry-charged (or charge-conserved) state not filled with electrolyte. The density of the acid to fill these batteries before use (unless otherwise recommended by the manufacturer) shall be:
 - 1,28 kg/l \pm 0,01 kg/l at 25 °C.

Any other manufacturer instruction for handling after filling and before first usage shall be considered.

6 General requirements

6.1 Identification and labelling

6.1.1 General

Batteries according to this document shall bear the characteristics described from 6.1.2 to 6.1.8 on at least one of their sides or on the top surface.

6.1.2 The identification of manufacturer or supplier

The name of the manufacturer or supplier shall be indicated.

6.1.3 Nominal voltage: 12 V or 6 V

The nominal voltage of 6 V or 12 V shall be indicated.

6.1.4 Capacity $C_{10,e}$ (Ah) and nominal cranking current I_{cc} (A) at -18 °C (see 7.1)

Label size: The capacity $C_{10,e}$ (Ah) and the cold cranking current I_{cc} (A) shall be displayed on a separate label or as text on a combined label (e.g. together with additional information of the producer or type mark). The size of the label shall be at least 3 % of the largest side of the battery. The height of the characters should be at least 3 mm. The label shall be fixed on one of the four sides or on the lid. A multiple labelling is allowed.

Instead of labels, silk printing or similar methods for marking can be used as well. Designated marking areas with corresponding sizes should be realized.

The battery designed for lighting application only is not required to be marked with the value of nominal cranking current.

6.1.5 Production date code

Subclause 6.1.5 of IEC 60095-1:2018 is applicable.

6.1.6 Safety labelling

Subclause 6.1.6 of IEC 60095-1:2018 is applicable.

6.1.7 Recycling labelling

Subclause 6.1.7 of IEC 60095-1:2018 is applicable.

6.1.8 Valve-regulated batteries

Subclause 6.1.8 of IEC 60095-1:2018 is applicable.

6.2 Marking of the polarity

The batteries shall be marked with signs for both polarities that have to be positioned near the terminals.

The marking of the positive terminals shall take the form of the symbol "+". It shall be in accordance with IEC 60417-5005:2002-10.

The negative terminal shall take the form of the symbol "-". It shall be in accordance with IEC 60417-5006:2002-10.

7 Functional characteristics

7.1 Electrical characteristics

7.1.1 The 10 h capacity of a starter battery is defined for a temperature of $25\text{ °C} \pm 2\text{ °C}$.

The 10 h nominal capacity C_n may be indicated by the manufacturer.

The 10 h nominal capacity C_n is the electric charge in ampere hours (Ah) that a battery can supply with a current:

$$I_n = C_n / 10\text{ h (A)}$$

IEC 60095-7:2019

until the terminal voltage falls to $U_f = 10,50\text{ V}$.

The effective 10 h capacity $C_{10,e}$ shall be determined by discharging a battery with constant current I_n to $U_f = 10,50\text{ V}$ (see 9.1). The resultant discharge time, in hours, is used for the verification of C_n .

7.1.2 The cranking performance is the discharge current I_{cc} as indicated by the manufacturer, which a battery can supply (see 9.2).

7.1.3 The charge acceptance is expressed as the current I_{ca} which a partially discharged battery accepts at 0 °C and a constant voltage of $14,40\text{ V}$ (see 9.3).

7.1.4 The charge retention is defined as the cold cranking performance of the charged and filled battery after storage on open circuit under defined conditions of temperature and time (see 9.4).

7.1.5 The endurance test represents the ability of a battery to perform repeated discharge and recharge cycles and long rest periods on open circuit. This ability shall be tested by a series of cycles and rest periods under specified conditions after which the cold cranking performance shall be determined (see 9.5).

7.1.6 Water consumption: maintenance-free service of a battery requires a low rate of water decomposition through overcharge (see 9.6).

VRLA batteries have a very low water consumption and are not intended to receive additional water.

7.2 Mechanical characteristics

Vibration resistance represents the ability of a battery to maintain service under periodic or irregular acceleration forces. Minimum requirements shall be verified by a test (see 9.7).

8 General test conditions

8.1 Sampling of batteries

Regarding the sampling of batteries, refer to 8.1 of IEC 60095-1:2018.

8.2 Charging of batteries

Batteries shall be considered as fully charged if they have undergone the charging procedures. Prior to the first capacity test, the battery charge shall be limited to 16 h.

If not specified differently by the battery manufacturer, the batteries that will be tested according to this document shall be charged according to Table 1.

Table 1 – Charging method

Battery type	Voltage U_c	Current	Time	Remarks
VRLA batteries	14,80 V ± 0,05 V	2,5 I_{10}	24 h (16 h) ^{a)}	
Flooded batteries	16,00 V ± 0,05 V	2,5 I_{10}	24 h (16 h) ^{a)}	

^{a)} After cranking performance test and prior to first capacity check

If necessary, the environmental control system shall be used instead of the water bath.

8.3 Test equipment

8.3.1 Measuring instruments

Regarding the measuring instruments, refer to 8.3.1 of IEC 60095-1:2018.

8.3.2 Water bath

Regarding the water bath, refer to 8.3.2 of IEC 60095-1:2018.

8.3.3 Environmental chamber

Regarding the environmental chamber, refer to 8.3.3 of IEC 60095-1:2018.

8.4 Test sequence

8.4.1 Batteries filled and charged

a) Initially, the batteries are subjected to the following series of tests:

- first $C_{10,e}$ check;
- first cranking performance test;
- second $C_{10,e}$ check;
- second cranking performance test;
- third $C_{10,e}$ check;
- third cranking performance test.

b) It is not necessary to complete the sequence if the specified values are achieved on the first or second test.

The tests according to Table 2 shall be carried out only if the batteries have complied with the tests mentioned in a), and no more than one week after completion of the said tests.

Table 2 – Test sequence

Step	Test	Reference	Battery				
			1	2	3	4	5
0	Cranking performance for dry-charged batteries	8.4.2, 9.8	✓	✓	✓	✓	✓
1	Initial charge prior to test	8.2	✓	✓	✓	✓	✓
2	1 st 10 h capacity	9.1	✓	✓	✓	✓	✓
3	1 st cranking performance	9.2	✓	✓	✓	✓	✓
4	2 nd 10 h capacity	9.1	✓	(✓)	(✓)	(✓)	(✓)
5	2 nd cranking performance	9.2	(✓)	(✓)	(✓)	(✓)	(✓)
6	3 rd 10 h capacity	9.1	✓	(✓)	(✓)	(✓)	(✓)
7	3 rd cranking performance	9.2	(✓)	(✓)	(✓)	(✓)	(✓)
8	Charge acceptance	9.3	✓				
9	Charge retention	9.4		✓			
10	Endurance tests	9.5			✓		
11	Water consumption	9.6				✓	
12	Vibration resistance	9.7					✓
Key							
✓ test to be fulfilled.							
(✓) test to be fulfilled only if the previous identical test carried out failed.							

For batteries used only for lighting with no cranking performance required, the cranking performance test shall be replaced by a discharge at the current of $10 I_{10}$ in the test sequence step 9, 10 and 12 of Table 2.

8.4.2 Dry-charged or conserved-charge batteries

- Initially, the batteries are subjected to the initial cranking performance test after being filled with electrolyte (see 9.8).
- The tests according to Table 2 shall be carried out only if the batteries have complied with the test mentioned in a) and no more than one week after that test.

9 Tests methods

9.1 10 h capacity check $C_{10,e}$

Throughout the duration of the tests, the battery shall be placed in a water bath at a temperature of $25\text{ °C} \pm 2\text{ °C}$, according to 8.3.2. If necessary, the environmental control system (refer to 8.3.3) shall be used instead of the water bath.

The battery shall be discharged with the current I_n (calculated according to 7.1.1) kept constant at $\pm 2\%$ of the nominal value until the terminal voltage falls to $10,50\text{ V} \pm 0,05\text{ V}$. The duration t (h) of the discharge shall be recorded. The beginning of the discharge shall take place between 1 h to 5 h after the completion of charging according to 8.2.