

AS 60095.6:2022



Lead-acid starter batteries

**Part 6: Batteries for micro-cycle applications (IEC 60095-6:2019
(ED. 1.0), MOD)**



AS 60095.6:2022

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- Consumers Federation of Australia
- CSIRO
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Part 6: Batteries for micro-cycle applications (IEC 60095-6:2019 (ED. 1.0), MOD)

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Preface

This Standard was prepared by the Standards Australia Committee EL-005, Secondary Batteries.

The objective of this document is to specify the general requirements and methods of test specific to lead-acid batteries used for micro-cycle applications.

This document is applicable to —

- (a) lead-acid batteries of the dimensions according to IEC 60095-2 for vehicles with the capability to automatically switch off the ICE during vehicle operation either in standstill or when moving (“start-stop”); and
- (b) lead-acid batteries of the dimensions according to IEC 60095-2 for vehicles with start-stop applications with the capability to recover braking energy or energy from other sources.

This document is applicable to lead-acid batteries with a nominal voltage of 12 V, used primarily as power source for the starting of internal combustion engines (ICE), lighting and auxiliary equipment of ICE vehicles.

A list of all parts in the 60095 series can be found in the Standards Australia online catalogue.

This document is an adoption with national modifications, and has been reproduced from, IEC 60095-6:2019, *Lead-acid starter batteries – Part 6: Batteries for micro-cycle*. The modifications are additional requirements and are set out in [Appendix ZZ](#), which has been added at the end of the source text.

[Appendix ZZ](#) lists the variations to IEC 60095-6:2019 for the application of this document in Australia.

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- (i) In the source text “this part of IEC 60095” should read “this document”.
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The terms “normative” and “informative” are used in Standards to define the application of the appendices or annexes to which they apply. A “normative” appendix or annex is an integral part of a Standard, whereas an “informative” appendix or annex is only for information and guidance.

Section National Foreword

AS 60095.1:2022 and AS 60095.6:2022 are modified adoptions of IEC 60095-1:2018 and IEC 60095-6:2019 respectively. For more information, also refer to IEC 60095-2:2021 and 60095-4:2021.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

LEAD-ACID STARTER BATTERIES –

Part 6: Batteries for micro-cycle applications

FOREWORD

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International Standard IEC 60095-6 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
21/1013/FDIS	21/1018/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.

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LEAD-ACID STARTER BATTERIES –

Part 6: Batteries for micro-cycle applications

1 Scope

This part of IEC 60095 is applicable to lead-acid batteries with a nominal voltage of 12 V, used primarily as power source for the starting of internal combustion engines (ICE), lighting and also for auxiliary equipment of ICE vehicles. These batteries are commonly called "starter batteries".

The batteries within the scope of this document are used for micro-cycle applications in vehicles which can also be called start-stop (or stop-start, idling-stop system, micro-hybrid or idle-stop-and-go) applications. In cars with this special capability, the internal combustion engine is switched off during a complete vehicle stop, during idling with low speed or during idling where there is no need to support the vehicle movement by the internal combustion engine. During the phases in which the engine is switched off, most of the electric and electronic components of the car are supplied by the battery without support of the alternator. In addition, in most cases an additional regenerative braking (recuperation or regeneration of braking energy) function is installed. The batteries under these applications are stressed in a completely different way compared to classical starter batteries. Aside from these additional properties, these batteries need to crank the ICE and support the lighting and also auxiliary functions in a standard operating mode with the support of the alternator when the internal combustion engine is switched on. All batteries within this scope fulfil basic functions, which are tested under the application of IEC 60095-1.

This document specifies the general requirements and methods of test specific to lead-acid batteries used for micro-cycle applications.

This document is applicable to batteries for the following purposes:

- lead-acid batteries of the dimensions according to IEC 60095-2 for vehicles with the capability to automatically switch off the ICE during vehicle operation either in standstill or when moving ("start-stop");
- lead-acid batteries of the dimensions according to IEC 60095-2 for vehicles with start-stop applications with the capability to recover braking energy or energy from other sources.

Li-ion technology is excluded from this document.

NOTE The applicability of this document also for batteries according to IEC 60095-4 is under consideration.

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 60095-2, *Lead-acid starter batteries – Part 2: Dimensions of batteries and dimensions and marking of terminals*

3 Terms, definitions, abbreviated terms and symbols

3.1 Terms and definitions

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

3.1.1

flooded battery

vented battery

lead-acid battery having a cover provided with one or more openings through which gaseous products may escape

3.1.2

enhanced flooded battery

EFB battery

flooded lead-acid battery with additional special design features to significantly improve the cycling capability compared to standard flooded batteries

Note 1 to entry: This note applies to the French language only.

3.1.3

valve regulated lead-acid battery

VRLA battery

lead-acid battery which is closed under normal conditions but which has an arrangement that allows the escape of gas if the internal pressure exceeds a predetermined value

Note 1 to entry: The VRLA battery cannot receive addition to the electrolyte and after activation of dry-charged VRLA.

Note 2 to entry: In VRLA batteries the electrolyte is immobilized.

Note 3 to entry: This note applies to the French language only.

3.1.4

absorbent glass mat battery

AGM battery

VRLA battery in which the electrolyte is immobilized by absorption in a glass mat

Note 1 to entry: This note applies to the French language only.

3.1.5

gel battery

VRLA battery in which the electrolyte is immobilized by fixing as a gel

3.2 Abbreviated terms and symbols

EN European Standard (Euro Norm) created by CENELEC (European Committee for Electrotechnical Standardization)

SBA Standard Battery Association created by Battery Association of Japan

CHA Charge Battery; to be charged with given parameters

DCA	Dynamic charge acceptance
DCH	Discharge Battery; to be discharged with given parameters
PAU	Pause; no charging or discharging but measurement of voltage as required. If the battery is connected to the test unit, there shall be no quiescent current
RPT	Repeat; instruction to repeat certain steps several times
CAS	Case of; decision point leading to different actions dependent on the value of the reference variable
C_e	Effective capacity [Ah]
C_n	Nominal capacity [Ah]
C_{rch}	Recharged capacity [Ah]
DoD	Depth of discharge [% of C_n]
EOS	End of step
I_{CHA}	Charge current [A]
I_{CC}	Discharge current for cranking [A]
I_{DCA}	Weighted normalized dynamic charge acceptance, measured in A per Ah nominal capacity C_n [A/Ah]
I_{DCH}	Discharge current [A]
I_c	Average charge current in DCA test after charge history [A]
I_d	Average charge current in DCA test after discharge history [A]
I_n	Nominal discharge current [A], $I_n [A] = C_n [Ah] / 20 [h]$
I_r	Average charge current in DCA test during regenerative braking [A]
Q_{CHA}	Charged capacity [Ah]
Q_{DCH}	Discharged capacity [Ah]
R_{dyn}	Calculated dynamic internal resistance [Ω]
R_i	Internal resistance [Ω]
RC	Reserve capacity (discharge with a fixed current of 25 A to $U = 10,5$ V), used in DCA test
SoC	State of charge
t_{DCH}	Discharge time [s]
U_c	Charging voltage [V]

4 Designation of batteries for micro-cycle applications – Electrolyte density and open circuit voltage

4.1 Designation according to type

Subclause 4.1 of IEC 60095-1:2018 is applicable.

4.2 Electrolyte density and open circuit voltage

Subclause 4.3 of IEC 60095-1:2018 is applicable.

5 Condition on delivery

Clause 5 of IEC 60095-1:2018 is applicable.