INTERNATIONAL STANDARD

IEC 60896-21

First edition
2004-02

Stationary lead-acid batteries –

Part 21: Valve regulated types – Methods of test

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

STATIONARY LEAD-ACID BATTERIES –

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FOREWORD

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International Standard IEC 60896-21 has been prepared by IEC technical committee 21: Secondary cells and batteries.

This standard cancels and replaces IEC 60896-2 published in 1995.

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

FDIS	Report on voting
21/594/FDIS	21/600/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.

This standard constitutes Part 21 of the IEC 60896 series, published under the general title *Stationary lead-acid batteries*. At the time of the publication of this part, the following parts had already been published or were in the process of being published:

Part 11: Vented types – General requirements and methods of tests

Part 21: Valve regulated types – Methods of test [1)]

Part 22: Valve regulated types – Requirements

The committee has decided that the contents of this publication will remain unchanged until 2011. At this date, the publication will be

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- withdrawn,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

1 This standard replaces IEC 60896-2:1995, *Stationary lead-acid batteries – General requirements and methods of test – Part 2: Valve regulated types*.

STATIONARY LEAD-ACID BATTERIES –

Part 21: Valve regulated types – Methods of test

1 Scope

This part of IEC 60896 applies to all stationary lead-acid cells and monobloc batteries of the valve regulated type for float charge applications, (i.e. permanently connected to a load and to a d.c. power supply), in a static location (i.e. not generally intended to be moved from place to place) and incorporated into stationary equipment or installed in battery rooms for use in telecom, uninterruptible power supply (UPS), utility switching, emergency power or similar applications.

The objective of this part of IEC 60896 is to specify the methods of test for all types and construction of valve regulated stationary lead acid cells and monobloc batteries used in standby power applications.

This part of IEC 60896 does not apply to lead-acid cells and monobloc batteries used for vehicle engine starting applications (IEC 60095 series), solar photovoltaic energy systems (IEC 61427), or general purpose applications (IEC 61056 series).

2 Normative references

The following referenced documents are indispensable for the application 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 60068-2-32:1975, *Basic environmental testing procedures – Part 2: Test; Test Ed: Free fall* Amendment 2 (1990)

IEC 60695-11-10, *Fire hazard testing – Part 11-10 Test flames – 50 W horizontal and vertical flame test methods*

IEC 60707, *Flammability of solid non-metallic materials when exposed to flame sources – List of test methods*

IEC 60896-22:2004, *Stationary lead acid batteries – Part 22: Valve regulated types – Requirements*

IEC 60950-1:2001, *Information technology equipment – Safety – Part 1: General requirements*

IEC 61430:1997, *Secondary cells and batteries – Test methods for checking the performance of devices designed for reducing explosion hazards – Lead-acid starter batteries*

ISO 1043-1, *Plastics – Symbols and abbreviated terms – Part 1: Basic polymers and their special characteristics*

3 Definitions

For the purpose of this part of IEC 60896, the following definitions apply:

3.1
accuracy (of a measuring instrument)
quality which characterizes the ability of a measuring instrument to provide an indicated value close to a true value of the measurand

[IEV 311-06-08]

NOTE Accuracy is all the better when the indicated value is closer to the corresponding true value.

3.2
accuracy class
category of measuring instruments, all of which are intended to comply with a set of specifications regarding uncertainty

[IEV 311-06-09]

3.3
ambient temperature
temperature of the medium in the immediate vicinity of a cell or battery

[IEV 486-03-12]

3.4
ampere-hour
quantity of electricity or a capacity of a battery obtained by integrating the discharge current in ampere with respect to time in hours.

NOTE One ampere-hour equals 3 600 coulombs.

3.5
secondary battery
two or more secondary cells connected together and used as a source of electrical energy

[IEV 486-01-03]

3.6
monobloc battery
secondary battery in which the plate packs are fitted in a multi-compartment container

[IEV 486-01-17]

3.7
floating battery
secondary battery whose terminals are permanently connected to a source of constant voltage sufficient to maintain the battery approximately fully charged, intended to supply a circuit, if the normal supply is temporarily interrupted

[IEV 486-04-10]

3.8
battery capacity
quantity of electricity or electrical charge, which a fully charged battery can deliver under specified conditions

[IEV 486-03-01]

NOTE The SI unit for electric charge is the coulomb (1 C = 1 A.s) but in practice, battery capacity is expressed in ampere-hours (Ah).

3.9
charge
operation during which a secondary battery receives from an external circuit electrical energy, which is converted into chemical energy

[IEV 486-01-11]

NOTE A charge is defined by its maximum voltage, current and duration.

3.10
full charge
state where all the available active material of a secondary cell or battery has been reconverted to its fully charged status

[IEV 486-03-37]

3.11
overcharge
continued charging after the full charge of a secondary cell or battery

[IEV 486-03-35]

3.12
cell
assembly of electrodes and electrolyte, which constitutes the basic unit of a secondary battery

[IEV 486-01-02]

3.13
electrochemical cell
electrochemical system capable of storing in chemical form the electric energy received and which can give it back by reconversion, i.e. a secondary cell

[IEV 486-01-01, modified]

3.14
secondary cell
assembly of electrodes and electrolyte which constitutes the basic unit of a secondary battery

[IEV 486-01-02]

3.15
valve regulated cell
secondary cell which is closed under normal conditions but which has an arrangement which allows the escape of gas if the internal pressure exceeds a predetermined value. The cell cannot normally receive the addition of electrolyte

[IEV 486-01-20]

NOTE Such cells have an immobilized electrolyte to prevent spillage and allow for oxygen recombination on the negative electrode.

3.16
actual capacity
C_a
quantity of electricity delivered by a cell or battery, determined experimentally with a discharge at a specified rate to a specified end-voltage and at a specified temperature

NOTE This value is usually expressed in ampere-hours (Ah).

3.17
nominal capacity
C_n
suitable approximate quantity of electricity used to identify the capacity of a cell or battery

NOTE This value is usually expressed in ampere-hours (Ah).

[IEV 486-03-021]

3.18
rated capacity
C_{rt}
quantity of electricity, declared by the manufacturer, which a cell or battery can deliver under specified conditions after a full charge

NOTE This value is usually expressed in ampere-hours (Ah).

[IEV 486-03-22]

3.19
shipping capacity
C_{sh}
quantity of electricity, declared by the manufacturer, which a cell or battery can deliver, at the time of shipment, under specified conditions of charge.

NOTE 1 This value is usually expressed in ampere-hours (Ah).

NOTE 2 In the present standard this value is assumed to be at least 0,95 C_{rt}.

3.20
durability
ability of an item (battery) to perform a required function under given conditions of use and maintenance, until a limiting state is reached

NOTE A limiting state of an item (battery) may be characterized by the end of the useful life, unsuitability for any economic or technological reasons or other relevant factors.

[IEV 191-02-02]

3.21
electrolyte
solid or liquid phase containing mobile ions that render the phase electrically conducting

[IEV 486-02-19]

3.22
stationary equipment
either fixed equipment or equipment not provided with a carrying handle and having such a mass that it cannot easily be moved

[IEV 826-07-06]

3.23
failure
termination of the ability of an item (battery) to perform the required function

[IEV 603-035-06]

3.24
lead-acid battery
secondary battery in which the electrodes are made mainly from lead and the electrolyte is a sulphuric acid solution

[IEV 486-01-04]

3.25
design life
expected period of useful life of a battery according to components, design and application

3.26
service life
period of useful life of a battery under specified conditions

[IEV 486-03-23]

3.27
useful life
under given conditions, the time interval beginning at a certain instant of time, and ending when the failure intensity becomes unacceptable or when the item (battery) is considered un-repairable as a result of a fault

[IEV 191-10-06]

3.28
performance
characteristics defining the ability of a battery to achieve its intended functions

[IEV 311-06-11]

3.29
product range
range of products, i.e. cells or monobloc batteries, over which specified design features, materials, manufacturing processes, and quality systems (e.g. ISO 9000) of manufacturing locations are identical

NOTE This definition guides the selection of the units to be tested in the framework of this standard.

3.30
accelerated test
test in which the applied stress level is chosen to exceed that stated in the reference conditions in order to shorten the time duration required to observe the stress response of the item (battery), or to magnify the response in a given time duration

NOTE To be valid, an accelerated test shall not alter (or conceal) the basic fault modes and failure mechanisms, or their relative prevalence.

[IEV 191-14-07]

3.31
acceptance test
contractual test to prove to the customer that the device (battery) meets certain conditions of its specification

[IEV 151-16-23]

3.32
commissioning test
tests applied on a device (battery) carried out on site to prove the correctness of installation and operation

[IEV 151-15-24]

3.33
compliance test
test used to show whether or not a characteristic or property of an item (battery) complies with the stated requirements.

[IEV 191-14-02]

3.34
endurance test
test carried out over a time interval to investigate how properties of an item (battery) are affected by the application of stated stresses and by their time duration or repeated application

[IEV 151-16-22]

3.35
laboratory test
compliance test made under prescribed and controlled conditions, which may or may not simulate field conditions

[IEV191-14-04]

3.36
life test
test to ascertain the probable life, under specified conditions, of a component or a device (battery)

[IEV 151-16-21]

NOTE In VRLA batteries it is customary to assume that for every 10 K rise in service temperature above the reference temperature (20 °C – 25 °C) a halving of the life in a life test is observed. (For a test temperature up to 60 °C)