IEC 62485-4

Edition 1.0 2015-01

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Safety requirements for secondary batteries and battery installations –
Part 4: Valve-regulated lead-acid batteries for use in portable appliances

Exigences de sécurité pour les batteries d'accumulateurs et les installations de batteries –
Partie 4: Batteries au plomb à soupapes pour appareils portables

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

SAFETY REQUIREMENTS FOR SECONDARY BATTERIES AND BATTERY INSTALLATIONS –

Part 4: Valve-regulated lead-acid batteries for use in portable appliances

FOREWORD

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International Standard IEC 62485-4 has been prepared by IEC technical committee 21: Secondary cells and batteries.

This first edition cancels and replaces the first edition of IEC TR 61056-3 published in 1991. It constitutes a technical revision.

This edition includes the following significant technical changes with respect to the IEC TR 61056-3:

a) updating of the requirements, and harmonisation of the text for consistency with the IEC 62485 series.

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

FDIS	Report on voting
21/848/FDIS	21/850/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.

A list of all parts of the IEC 62485 series can be found, under the general title *Safety requirements for secondary batteries and battery installations*, on the IEC website.

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- withdrawn,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.

INTRODUCTION

This standard provides information about the safety and health protection of persons when using valve-regulated lead-acid batteries, which are used as a DC power supply systems in portable appliances. Therefore the standard applies to commercially available valve-regulated lead-acid batteries and battery systems.

IEC 62133 has preference for secondary cells and batteries containing alkaline or other non-acid electrolytes.

In some portable appliances or toys the use of both primary and secondary cells or batteries is possible. Where there is interchangeability of these cells or batteries, the standards for primary batteries in the IEC 60086 series, Parts 1 to 5, have preference.

SAFETY REQUIREMENTS FOR SECONDARY BATTERIES AND BATTERY INSTALLATIONS –

Part 4: Valve-regulated lead-acid batteries for use in portable appliances

1 Scope

This Part of IEC 62485 applies to the safety aspects associated with the accommodation, the arrangements of circuits and the operation of secondary valve-regulated lead-acid cells and batteries in portable appliances. Requirements are specified which oblige the manufacturers of appliances and secondary batteries to prevent the misuse of batteries in the course of operation to provide protective measures avoiding injury to persons in case of battery failure and to provide sufficient information to users.

This standard does not apply to secondary cells and batteries containing alkaline or other non-acid electrolytes.

2 Normative references

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.

IEC 60050-482:2004, *International Electrotechnical Vocabulary – Part 482: Primary and secondary cells and batteries*

IEC 60417, *Graphical symbols for use on equipment*

IEC 61429:1995, *Marking of secondary cells and batteries with the international recycling symbol ISO 7000-1135*

ISO 7000, *Graphical symbols for use on equipment – Registered symbols*

3 Terms and definitions

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

3.1
battery for use in portable appliances
battery mainly used for the power supply of the electrical equipment or parts of it forming an integral, functional unit

Note 1 to entry: Batteries for use in portable equipment are usually maintenance-free types.

3.2
secondary cell
secondary battery
cell being designed to be electrically recharged, forming a basic functional unit providing a source of electrical energy by direct conversion of chemical energy

Note 1 to entry: The cell (or battery) consists of an assembly of electrodes, separators, electrolyte, container and terminals.

[SOURCE: IEC 60050-482:2004, 482-01-03, modified – modification of the definition]

4 Operating instructions

Users of appliances shall be informed through operating instructions about the following items, with specific reference to batteries:

a) proposed or applicable battery systems and battery dimensions according to the applicable standard,
b) correct insertion of batteries into the equipment in terms of polarity,
c) charging instructions for secondary batteries,
d) temperature conditions during storage and operation,
e) maintenance instructions,
f) instructions for the prevention of hazard and measures to be taken following an accident,
g) instructions about disposal.

Operating instructions for batteries in portable appliances shall be provided and can be part of the equipment instructions. Required information for safe operation, like polarity, voltage, battery type, etc shall be repeated inside or close to the battery compartment.

5 Dimensions and interchangeability of cells and batteries

Cells and batteries with reverse polarity but identical dimensions shall not be sent into the retail market. Compliance with the existing standards is required.

Interchangeability of cells and batteries with the same nominal voltage and identical dimensions, but of different technologies is permitted, if stated by the appliance manufacturer.

Cells in a battery string shall be of identical design, type and brand. It is recommended to use cells of same state of charge and same age.

6 Electrical safety

6.1 Protection against incorrect polarity connection

Manufacturers of appliances shall provide measures against incorrect polarity connections of the battery to the device. Measures can be, e.g.:

- marking of the polarity of individual cells or batteries,
- polarity marked cables,
- plugs,
- design of compartments and contacts,
- electronics,

Where applicable the battery symbol according to IEC 60417 database shall be used.

6.2 Design of battery and battery compartments

Both the design of battery and of the battery compartment shall include provisions to minimize the risk of the battery being reversed (connected the wrong way round) either during use or

during charging. The design of terminals and the method of connecting them to the equipment or to the charger shall inhibit incorrect connection of the battery.

7 Safe handling and protection against misuse

7.1 Charging

The charging instructions which apply to the batteries and chargers shall be observed. Where replacement of batteries by the end user is foreseen, the equipment manufacturer shall provide clear instructions about the replacement battery.

7.2 Thermal abuse

Battery systems for portable appliances shall not be overheated. Overheating due to service conditions will destroy the battery and, in individual cases, the equipment as well. Corrosive and/or toxic liquids or gases may be released. Therefore batteries shall be inserted into the appliances in such a way that their permissible temperature range, is not exceeded as declared by the manufacturer.

7.3 Mechanical impact

Batteries shall be protected from mechanical damage which may cause leakage of hazardous chemicals causing short-circuits which may result in overheating and subsequent rupturing of further cells.

7.4 Protection against pole reversal in the event of deep discharge

Secondary batteries shall be charged / discharged, so that each cell gets charged or discharged to the same extent (taps in the battery string lead to uneven discharge condition). Only cells and/or batteries of the same designation, manufacturer and age shall be connected in series.

The maximum number of cells specified by the battery manufacturer and any required protective measure for series connection shall be observed in order to avoid pole reversal of individual cells in the event of deep discharge of the battery bank. Pole reversal can destroy the battery, damage the appliance, and expose the user to danger e.g. due to battery leakage.

If deep discharge can cause any cell reversal, resulting in damage to the appliance or persons using it, then a low voltage protection device is recommended, for disconnection of the equipment from the load before any damage takes place.

7.5 Protection against electrical overload

Appliances and batteries shall be protected by short-circuit and overload protection devices, if the available battery power may cause damage to equipment or persons.

7.6 Safe handling

For safe handling during transport, installation and replacement of the battery, its terminals and the connecting cables shall be designed so that short circuits are prevented.

8 Battery compartments

8.1 General

Secondary batteries in portable appliances may be integral and permanently fixed within the appliance. Alternatively, they may be removable for recharging separately outside of the

appliance. If batteries are charged separate to the appliance, the requirements 8.2 to 8.5 apply.

Where watertight equipment is used safety precautions are required to prevent or limit the generation of hydrogen.

8.2 Battery accommodation

Battery enclosures for accommodation of batteries in electrical equipment shall be designed, where necessary, to be separate from the functional parts of the equipment and accessible from the outside.

Preferably, the housing and securing of batteries within the compartments of portable appliances shall be able to withstand shock acceleration.

NOTE Cells or batteries can leak electrolyte. Both secondary valve-regulated cells and batteries have a safety device (valve) which release gas when operated.

8.3 Replacement battery enclosures

Battery enclosures should be accessible, so that batteries can be replaced, and the enclosure and the contacts can be cleaned.

8.4 Battery terminals

Terminals shall be designed to minimize voltage drop and associated heat generation. The terminals inside the battery compartments shall consist of material resistant against corrosion from battery electrolyte.

8.5 Protection against hazards caused by released gas

Batteries can release gas, which may be flammable or explosive.

The amount of gas released can increase abnormally in the event of a malfunctioning battery or charger.

The gas can be ignited by energy sources, such as sparks, heat or electrostatic discharge when the limits of gas concentration and volume are exceeded.

Different measures can be applied to protect the user from hazards, e.g.

- sparking shall be prevented,
- no sparking devices shall be present inside battery enclosures,
- appropriate ventilation of the battery enclosure shall be provided, e.g. by natural or forced ventilation,
- reduce gas concentration inside the compartment by use of catalysts.

9 Measures in the event of accidents with batteries by burns or poisoning

If in cases batteries start to leak, the release of electrolyte or gases could be experienced. To prevent burns or possibly poisoning, the users of the appliances should be informed of this potential hazard, and actions to take, in the operating instructions.

If some abnormal event, additional to the ones previously mentioned, such as corrosion of battery terminals, leakage of electrolyte, deformation of container or heat generation, is observed, then battery should not be used.

10 Marking and disposal of batteries for use in portable appliances

All cells and batteries containing the electro-chemically active substances (lead) shall be marked with the recycling symbol ISO 7000-1135 according to IEC 61429, respectively with the crossed-out waste bin and the ISO symbol in accordance with IEC 61429:1995.

When used cells or batteries are subjected to disposal and recycling, the local regulation shall be followed.