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Wheelchairs —

Part 25:
Lead-acid batteries and chargers for powered wheelchairs — Requirements and test methods

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 173, *Assistive products for persons with disability*, Subcommittee SC 1, *Wheelchairs*.

This second edition cancels and replaces the first edition (ISO 7176.25:2013), which has been technically revised.

The main changes compared to the previous edition are as follows:

— xxx xxxxxxx xxx xxxx

A list of all parts in the ISO 7176 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Since the reliability and performance of an electrically powered wheelchair depend on the operation, performance and reliability of the battery set and the battery charger, it is important to ensure that wheelchair batteries and chargers are suitable for the purpose and that the wheelchair, batteries and charger are compatible. It is also important to ensure that risks arising from the use of wheelchair batteries and their chargers are eliminated or reduced as far as is practicable. Consequently, it is essential that performance requirements and safety requirements for wheelchair batteries and battery chargers are available.

Battery chargers are divided into three types: off-board, carry-on and on-board. Operating, transport and storage situations can differ for these types, so it is appropriate to apply different requirements to them.

Wheelchairs —

Part 25:
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WARNING — This part of ISO 7176 calls for the use of procedures that might be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve those carrying out or commissioning the tests from legal obligations relating to health and safety. Prior to carrying out tests that could cause batteries or chargers to exhibit dangerous behaviour, it is recommended that the likely outcome is assessed and appropriate arrangements made to minimize risk.

1 Scope

This International Standard specifies requirements and test methods for lead-acid batteries and their chargers intended for use with electrically powered wheelchairs. Requirements for chargers are applicable to those with a rated input voltage not greater than 250 V a.c. and a nominal output voltage not greater than 36 V.

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.

ISO 7176-8, *Wheelchairs — Part 8: Requirements and test methods for static, impact and fatigue strengths*

ISO 7176-21, *Wheelchairs — Part 21: Requirements and test methods for electromagnetic compatibility of electrically powered wheelchairs and scooters, and battery chargers*

IEC 60254-1, *Lead-acid traction batteries — Part 1: General requirements and methods of tests*

IEC 60254-2, *Lead-acid traction batteries — Part 2: Dimensions of cells and terminals and marking of polarity on cells*

IEC 60335-2-29, *Household and similar electrical appliances — Safety — Part 2-29: Particular requirements for battery chargers*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 61076-2-103, *Connectors for electronic equipment — Part 2-103: Circular connectors — Detail specification for a range of multipole connectors (type 'XLR')*

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

ISO 14971, *Medical devices — Application of risk management to medical devices*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7176-26 and the following apply.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
battery
one or more cells fitted with devices necessary for use, for example case, terminals, marking and protective devices

[SOURCE: IEV 482-01-04]

3.2
lead acid battery
lead dioxide lead battery
secondary battery with an aqueous electrolyte based on dilute sulphuric acid, a positive electrode of lead dioxide and a negative electrode of lead

Note 1 to entry: to entry: Lead dioxide lead batteries are often called accumulators (deprecated).

[SOURCE: IEV 482-05-01]

3.3
nominal voltage
suitable approximate value of the voltage used to designate or identify a cell, a battery or an electrochemical system

[SOURCE: IEV 482-03-31]

Note 1 to entry: to entry: For lead acid batteries the nominal voltage is usually two volts multiplied by the number of cells.

3.4
rated d.c. output current
output current assigned to the battery charger by its manufacturer

3.5
rated d.c. output voltage
output voltage assigned to the battery charger by its manufacturer

3.6
rated input voltage
supply mains voltage assigned to the battery charger by its manufacturer

3.7
safety hazard
potential source of physical injury or damage to the health of the user, other persons or animals, or damage to the surroundings, arising directly from the battery charger or battery

Note 1 to entry: to entry: Adapted from IEC 60601-1.

3.8
C_5
rated capacity of the battery for a discharge time of 5 h, expressed in ampere hours

Note 1 to entry: C_5 is equivalent to C_N as defined in IEC 60254-1.

Note 2 to entry: IEC 60254-1 states that the nominal capacity, C_N, is a reference value declared by the manufacturer, which is valid for a cell/battery temperature of 25 °C, a discharge time of 5 h, and a cut-off voltage U_f of 1.75V per cell.

Note 3 to entry: The nominal capacity, C_N, can differ from the actual capacity of the battery.

3.9
I_5
the electric current (C_5 / 5), expressed in amperes

Note 1 to entry: to entry: The numerical value of C_5 divided by a numerical value of time in hours yields a numerical value of current.

4 Apparatus

4.1 Mean current meter, capable of measuring the arithmetic mean current supplied by a battery charger to an accuracy of 2 % of the measurement, which does not introduce a voltage drop (added to the voltage at the output connector of the battery charger) that exceeds 0,2 % of the nominal battery voltage.

NOTE 1 The measuring device may be an integral part of an electronic load as specified in 4.4.

NOTE 2 It is important to match the averaging time of the meter to any cyclic variations in the charging current.

4.2 Root-mean-square (r.m.s.) current meter, capable of measuring the r.m.s. current supplied by a battery charger to an accuracy of 2 % of the measurement, which does not introduce a voltage drop that exceeds 0,2 % of the nominal battery voltage.

NOTE The measuring device may be an integral part of an electronic load as specified in 4.4.

4.3 Voltmeter, capable of measuring the voltage supplied by a battery charger, to an accuracy of 0,1 % of the measurement.

NOTE The measuring device may be an integral part of an electronic load as specified in 4.4.

4.4 Electronic load, for simulating a battery to the extent necessary to provide the test loads for battery chargers included in the scope of this standard.

EXAMPLE Figure 1 shows an outline schematic for an electronic load that can be used in constant-voltage mode or constant-current mode, with terminals for connection to the output terminals of the battery charger.

In the constant-voltage mode (switch in CV position), the circuit will keep the voltage between the load terminals substantially constant while sinking the current supplied by the battery charger.

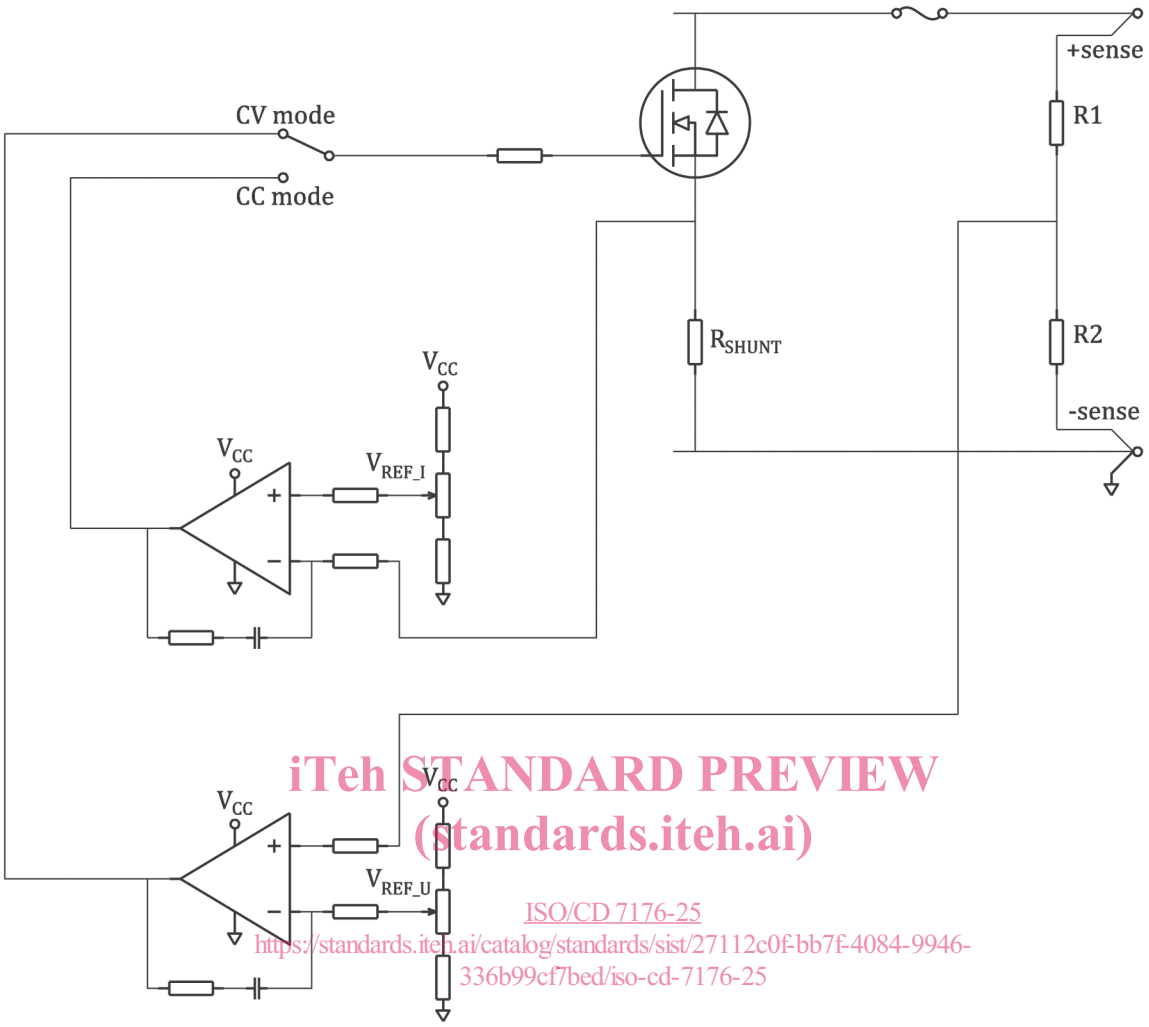
In the constant-voltage mode the voltage at the load terminals will be given by

$$V_{REF\_U} \times \frac{R1+R2}{R2}$$

In the constant-current mode (switch in CC position), the circuit will sink a substantially constant current with the load terminal voltage being the output voltage of the battery charger.

In constant-current mode the load current will be given by

$$\frac{V_{REF\_I}}{R_{SHUNT}}$$



NOTE 1 R_{SHUNT} may be utilized as a part of a current measuring device (4.1 and 4.2).

NOTE 2 Some battery chargers might need a voltage to be applied to the output terminals to energize or maintain their output. To initialize such chargers it will be necessary to connect a current-limited voltage source to the load terminals.

NOTE 3 It is important to confirm correct operation of the battery charger with the electronic load. For example, some battery chargers might need a capacitive load, in which case an appropriate capacitor should be added to the load terminals and correct operation confirmed.

NOTE 4 It is essential that the voltage range at the load terminals and the maximum load current are matched to the battery charger under test.

Figure 1 — Electronic load outline schematic

4.5 Means to alter the a.c. supply voltage to a battery charger, normally consisting of a tapped or continuously adjustable variable transformer. The means should not cause the peak supply voltage of the charger when fully loaded to differ by more than 2 % from the peak supply voltage of the charger when not loaded.

5 Battery chargers

5.1 Electrical safety

5.1.1 General

It is important that battery chargers intended for use with electrically powered wheelchairs do not constitute a safety hazard when utilized in the intended use environment and during foreseeable misuse. Based on intended use environmental conditions, a risk analysis should take into account items such as storage and operating temperature.

5.1.2 Risk analysis shall be carried out in accordance with ISO 14971.Requirements

5.1.2.1 On-board and carry-on battery chargers shall meet the following requirements after being exposed to vibration as specified in 5.1.3.2.

5.1.2.2 Battery chargers shall meet the requirements of IEC 60335-2-29.

5.1.2.3 Off-board battery chargers intended for use only in dry indoor areas shall provide a degree of protection not less than IPX1 as specified in IEC 60529.

5.1.2.4 Carry-on battery chargers, installed on-board battery chargers and off-board battery chargers intended for use in places other than dry indoor areas shall provide a degree of protection not less than IPX4 as specified in IEC 60529.

5.1.3 Test methods

5.1.3.1 General

Test battery chargers in accordance with the applicable parts of IEC 60335-2-29 and IEC 60529. For battery chargers that have cooling fans, include locked or disconnected fans in the abnormal operation testing.

NOTE 1 An electronic load in constant-voltage mode as described in 4.4 may be used for loading the battery charger during testing.

NOTE 2 IEC 60335-2-29 specifies tests and inspection criteria for appliances with IP ratings.

5.1.3.2 Exposure to vibration

5.1.3.2.1 On-board battery chargers

Where a wheelchair intended for use with the charger is available install the on-board battery charger on the wheelchair in accordance with the charger manufacturer's instructions. Subject the wheelchair to the multi-drum fatigue test and the kerb-drop fatigue test specified in ISO 7176-8.

NOTE This may be combined with wheelchair testing in accordance with ISO 7176-8.

Alternatively, expose the on-board battery charger to vibration as specified in IEC 60335-2-29 for battery chargers for installing in caravans and similar vehicles.