DRAFT INTERNATIONAL STANDARD ISO/DIS 7176-25

ISO/TC **173**/SC **1** Secretariat: **SIS**

Voting begins on: **2004-11-10** Voting terminates on: **2005-04-11**

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Wheelchairs —

Part 25:
Requirements and test methods for batteries and their chargers for electrically powered wheelchairs and motorized scooters

Fauteuils roulants —

Partie 25: Exigences et méthodes d'essai des batteries et leurs chargeurs pour les fauteuils roulants électriques et scooters motorisés

ICS 11.180.10

In accordance with the provisions of Council Resolution 15/1993 this document is circulated in the English language only.

Conformément aux dispositions de la Résolution du Conseil 15/1993, ce document est distribué en version anglaise seulement.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Pour accélérer la distribution, le présent document est distribué tel qu'il est parvenu du secrétariat du comité. Le travail de rédaction et de composition de texte sera effectué au Secrétariat central de l'ISO au stade de publication.

Contents

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 7176-25 was prepared by Technical Committee ISO/TC 173, *Technical systems and aids for disabled or handicapped persons*, Subcommittee SC 1, *Wheelchairs*.

ISO 7176 consists of the following parts, under the general title *Wheelchairs*:

— *Part 1: Determination of static stability*

— *Part 2: Determination of dynamic stability of electric wheelchairs*

— *Part 3: Determination of effectiveness of brakes*

— *Part 4: Energy consumption of electric wheelchairs and scooters for determination of theoretical distance range*

— *Part 5: Determination of overall dimensions, mass and turning space*

— *Part 6: Determination of maximum speed, acceleration and deceleration of electric wheelchairs*

— *Part 7: Measurement of seating and wheel dimensions*

— *Part 8: Requirements and test methods for static, impact and fatigue strengths*

— *Part 9: Climatic tests for electric wheelchairs*

— *Part 10: Determination of obstacle-climbing ability of electric wheelchairs*

— *Part 11: Test dummies*

— *Part 13: Determination of coefficient of friction of test surfaces*

— *Part 14: Power and control systems for electric wheelchairs — Requirements and test methods*

— *Part 15: Requirements for information disclosure, documentation and labelling*

— *Part 16: Resistance to ignition of upholstered parts — Requirements and test methods*

— *Part 19: Wheeled mobility devices for use in motor vehicles*

— *Part 21: Requirements and test methods for electromagnetic compatibility of electrically powered wheelchairs and motorized scooters*

— *Part 22: Set-up procedures*

— *Part 23: Requirements and test methods for attendant-operated stair-climbing devices*

— *Part 25: Batteries and chargers for electrically powered wheelchairs and motorized scooters — Requirements and test methods*

— *Part 26: Vocabulary.*

A Technical Report (ISO/TR 13570:2001, *Guidelines for the application of the ISO 7176 series on wheelchairs*) is also available giving a simplified explanation of these parts of ISO 71766.

Introduction

The reliability and performance of an electrically powered wheelchair or scooter depend on the performance and reliability of the battery set, which depend in turn on the performance and reliability of the battery charger, and on the correct operation of the charger by the user. Batteries and chargers are used in a wide range of conditions. Since batteries are often costly, it is important to avoid premature failure by maintaining a correct charging regime under such operating conditions.

It is important that wheelchair manufacturers, and battery and charger manufacturers who intend their products to be used with wheelchairs, ensure that risks to disabled or elderly users and carers arising from their equipment are eliminated or reduced as far as is practicable. Such risks can include those arising from high surface temperatures, incompatibility, misuse of connectors and extended periods of charging.

Battery chargers can be 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. In particular, on-board chargers are treated as wheelchair components, while carry-on chargers and off-board chargers are not.

Wheelchairs —

Part 25:
Requirements and test methods for batteries and their chargers for electrically powered wheelchairs and motorized scooters

WARNING This International Standard calls for the use of procedures that may be hazardous to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the manufacturer or test house from legal obligations relating to health and safety.

1 Scope

This International Standard specifies requirements and test methods for lead-acid batteries and battery chargers for electrically powered wheelchairs and scooters, having a maximum speed not greater than 15 km/h, intended for use by people with disabilities. It is not applicable to battery types other than lead-acid. The requirements for chargers are applicable to those with a rated input voltage not greater than 250 V a.c. intended for charging lead-acid batteries with a nominal voltage not greater than 36 V.

This International Standard specifies test methods that can help assess compatibility between batteries and chargers.

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 7176-9, *Wheelchairs — Part 9: Climatic tests for electric wheelchairs*

ISO 7176-15, *Wheelchairs — Part 15: Requirements for information disclosure, documentation and labelling*

ISO 7176-19, *Wheelchairs — Part 19: Wheeled mobility devices for use in motor vehicles*

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

IEC 60335-1, *Household and similar electrical appliances — Safety — Part 1: General requirements*

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 61056-1, *General purpose lead-acid batteries (valve-regulated types) — Part 1: General requirements, functional characteristics — Methods of test*

3 Terms, definitions and symbols

For the purposes of this document, the following terms and definitions apply.

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

[IEV 482-01-04]

3.2
lead acid 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 Lead dioxide lead batteries are often called accumulators (deprecated).

[IEV 482-05-01]

3.3
nominal voltage
<batteries> suitable approximate value of voltage used to designate or identify the voltage of the battery

NOTE 1 Adapted from IEV 482-03-31.

NOTE 2 For lead acid batteries the nominal voltage is usually two volts multiplied by the number of cells.

3.4
free ventilated battery
wet battery
lead acid battery that has a liquid electrolyte free to move within cells that are vented at atmospheric pressure

3.5
valve regulated lead acid battery
VRLA (abbreviation)
sealed lead acid battery
valve regulated sealed battery
lead acid battery in which cells are closed but have a valve that allows the escape of gas if the internal pressure exceeds a predetermined value

NOTE 1 The battery cannot normally receive additions to the electrolyte.

NOTE 2 Adapted from IEV 482-05-15.

NOTE 3 Valve regulated lead acid batteries often have a construction similar to that of free ventilated batteries. Common types of valve regulated batteries are gelled electrolyte batteries and absorbent glass mat (AGM) batteries.

3.6
gelled electrolyte battery
gel battery
lead acid battery in which the electrolyte is a thixotropic gel

NOTE This type of battery is resistant to leakage within orientations specified by the battery manufacturer.

3.7
absorbent glass mat (AGM) battery
lead acid battery in which the electrolyte is absorbed into separators made of glass fibres

NOTE This type of battery is resistant to leakage within orientations specified by the battery manufacturer.

3.8
off-board battery charger
free-standing, self-contained battery charger separate from a wheelchair

3.9
carry-on battery charger
off-board battery charger intended for transportation on a wheelchair

3.10
on-board battery charger
battery charger that is built into a wheelchair and cannot be removed without use of tools

3.11
rated input voltage
supply voltage assigned to the battery charger by its manufacturer

3.12
equalising current
extended charging current intended to ensure an equal state of charge of all cells in the battery

NOTE Equalising the charge of the cells in a battery can significantly extend battery life.

3.13
test battery
battery of the type, rated capacity and nominal voltage for which the battery charger is specified

3.14
safety hazard
potentially detrimental effect on the user, other persons, animals, or the surroundings, arising directly from the battery charger or battery

NOTE Adapted from IEC 60601-1.

3.15
C_5
rated capacity of the battery for a discharge time of 5 h, expressed in ampere hours

3.16
C_{20}
rated capacity of the battery for a discharge time of 20 h, expressed in ampere hours

3.17
I_5
the electric current C_5 / 5 h, expressed in amperes

3.18
I_{20}
the electric current C_{20} / 20 h, expressed in amperes

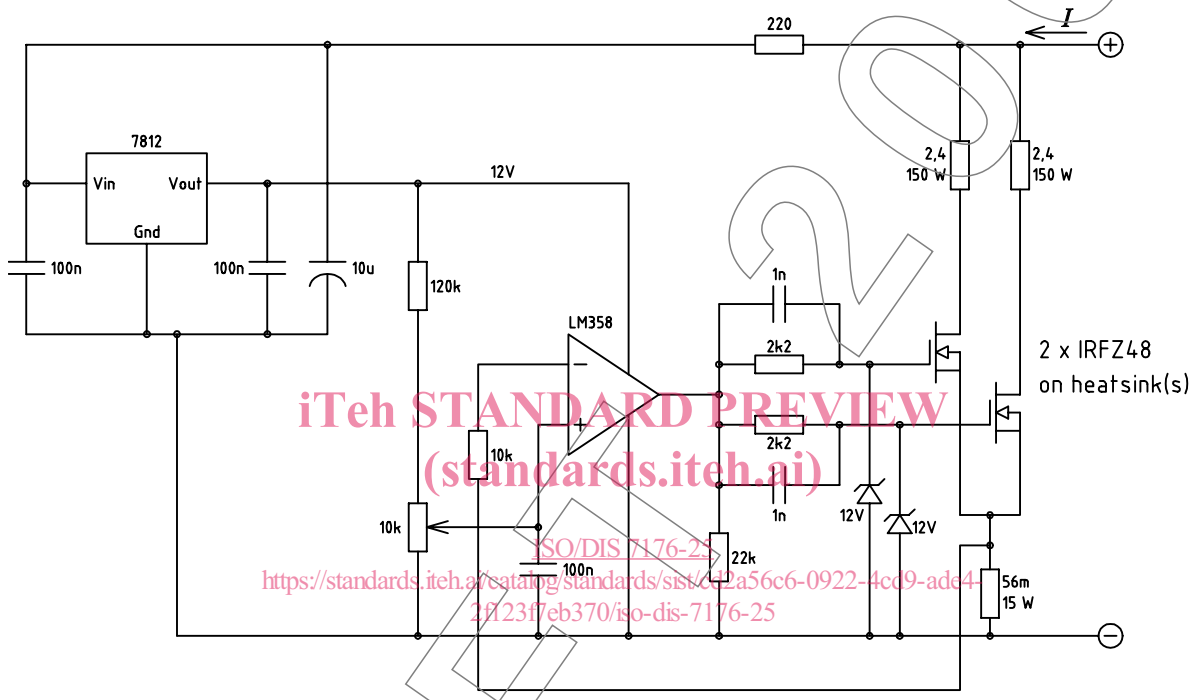
4 Apparatus

The circuit for testing battery chargers specified in IEC 60335-2-29 is not to be used, since inconsistent measurements will result. The circuitry specified in this standard is intended to improve consistency.

4.1 Means for discharging a battery, that can be adjusted to draw a specified current to an accuracy of 2 %. It shall include

- a means to end the discharge after a specified time has elapsed, with an accuracy of 1 min,
- a means to prevent the battery being discharged below the minimum voltage specified by the battery manufacturer, and
- a means to measure the capacity drawn from the battery to an accuracy of 3 %.

EXAMPLE A circuit diagram for a means to discharge a battery at a specified current is shown in Figure 1.

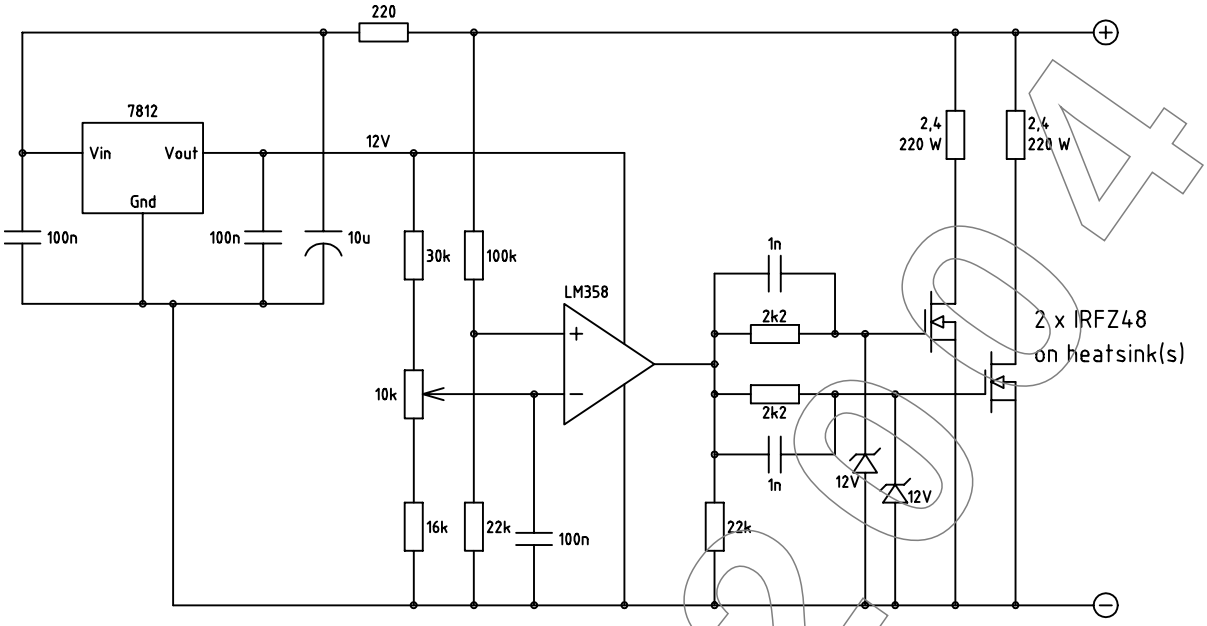


Key

I discharge current

NOTE This example is intended for use with a battery that has a nominal voltage of 24 V. It is suitable for discharge currents not greater than 15 A. It does not include a means to discontinue discharging or a means to measure the capacity drawn from the battery.

Figure 1 — Example of a means to discharge a battery at a specified current



NOTE This example is intended for use with a battery that has a nominal voltage of 24 V. It is suitable for charging currents not greater than 15 A.

Figure 2 — Example of a shunt voltage regulator

4.2 Shunt voltage regulator, that can be adjusted to conduct at a specified voltage (usually $(2{,}1 \times n)$ V, where n is the number of cells in the battery) and that is capable of dissipating the maximum power that can be supplied by the battery charger. In use, the shunt voltage regulator is connected in parallel with a battery. The regulator shall prevent the battery terminal voltage from exceeding $(2{,}2 \times n)$ V at the maximum charging current.

NOTE Some chargers will not commence charging if their load voltage is less than a minimum value.

EXAMPLE A circuit diagram for a shunt voltage regulator is shown in Figure 2.

4.3 Means to measure surface temperature, as specified in IEC 60335-1 for measuring the temperature rise of windings.

4.4 Means to measure and record the arithmetic mean current of a battery, to an accuracy of 2 % of the measurement, consisting of a current transducer, such as a suitably rated resistor, and a recording means, such as a chart recorder or storage oscilloscope. The recording means shall be capable of recording over a period of 25 h with a sampling period not longer than 1 min. Avoid any measurement errors due to changes of gain or offset during the recording period, and due to noise and aliasing.

The voltage drop across the current transducer shall not exceed 0,2 % of the nominal battery voltage.

4.5 Means to measure the arithmetic mean current delivered to a battery, to an accuracy of 5 % of the measurement. Suitable means include a current transducer, such as a suitably rated resistor, and an indicating means, such as an oscilloscope.

The voltage drop across the current transducer shall not exceed 0,2 % of the nominal battery voltage.

4.6 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.