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TECHNICAL SPECIFICATION

Low-voltage docking connectors for removable energy storage units

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LOW-VOLTAGE DOCKING CONNECTORS FOR REMOVABLE ENERGY STORAGE UNITS

FOREWORD

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- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 63066, which is a technical specification, has been prepared by subcommittee 23H: Plugs, socket-outlets and couplers for industrial and similar applications, and for electric vehicles, of IEC technical committee 23: Electrical accessories.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
23H/372/DTS	23H/361/RVC

Full information on the voting for the approval of this technical specification 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.

In this document, the following print types are used:

- requirements proper: in roman type;
- *test specifications: in italic type;*
- explanatory matter: in smaller roman type.

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- withdrawn,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.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

Pluggable energy storage technology has a large demand and perspective in certain areas. With the advent of electric vehicles, energy storage units for renewable energy and other applications, guidance is needed to ensure safe and reliable operation, interoperability, environmental protection and energy efficiency. The industry needs such a document to promote the technology development and popularization of pluggable energy storage technology.

Compared to other accessories, several specific items are considered. The mating process may not have haptic support by the operator to find the correct position between the two parts of the connector. The mating process may have a mechanical feed which precludes the finding of the correct position between the two parts of the connector. To overcome these issues, the design of the accessories may consist partly of moveable parts to compensate a mechanical feed and tolerances.

LOW-VOLTAGE DOCKING CONNECTORS FOR REMOVABLE ENERGY STORAGE UNITS

1 Scope

This document applies to docking connectors (hereinafter referred to as accessories) incorporated in or fixed to electrical equipment, intended to connect removable energy storage units to a dedicated electric power conversion unit, to an energy consuming unit or to another energy storage unit.

These accessories are intended for DC and may include an earth[1] contact and/or optional auxiliary contacts for signaling and data. These accessories have a rated current of up to 800 A and rated operating voltages not exceeding 1 000 V DC.

These accessories are not suitable for mating or unmating under load. These accessories are intended to be installed by instructed persons (IEC 60050-195:1998, 195-04-02) or skilled persons (IEC 60050-195:1998, 195-04-01) only.

The list of preferred ratings is not intended to exclude other ratings.

This document applies to accessories for use under environmental conditions as described in Clause 32.

These accessories are intended to be connected to current carrying parts in copper or copper alloy only, plated or not plated.

This document also applies to accessories intended to be used at extra-low voltage.

In locations where special conditions prevail, for example on board vehicles, additional requirements may apply.

These accessories are intended to be used with a specific charging system.

NOTE For conditions other than operation, additional requirements could be applicable, for instance IEC 62133 and the UN Recommendations on the Transport of Dangerous Goods section 38.338.3.

2 Normative references

Clause 3 of IEC 60309-1:1999, IEC 60309-1:1999/AMD1:2005 and IEC 60309-1:1999/AMD2:2012 applies, except as follows:

Addition of the following new references:

IEC 60068-2-1, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-14, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

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1 In some countries, the term ground is used instead of earth.

IEC 60068-2-30, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic* (12 h + 12 h cycle)

IEC 60068-2-38, *Environmental testing – Part 2-38: Tests – Test Z/AD: Composite temperature/humidity cyclic test*

IEC 60068-2-52, *Environmental testing – Part 2: Tests – Test Kb: Salt mist, cyclic (sodium chloride solution)*

IEC 60068-2-60, *Environmental testing – Part 2-60: Tests – Test Ke: Flowing mixed gas corrosion test*

IEC 60309-1:1999, *Plugs, socket-outlets and couplers for industrial purposes – Part 1: General requirements*
IEC 60309-1:1999/AMD1:2005
IEC 60309-1:1999/AMD2:2012

IEC 60352 (all parts), *Solderless connections*

IEC 60417, *Graphical symbols for use on equipment* (available at http://www.graphical-symbols.info/equipment)

IEC 61140:2016, *Protection against electric shock – Common aspects for installation and equipment*

IEC 61373:2010, *Railway applications – Rolling stock equipment – Shock and vibration tests*

ISO/IEC TR 29106:2007, *Information technology – Generic cabling – Introduction to the MICE environmental classification*
ISO/IEC TR 29106:2007/AMD1:2012

3 Terms and definitions

Clause 2 of IEC 60309-1:1999, IEC 60309-1:1999/AMD1:2005 and IEC 60309-1:1999/AMD2:2012 applies, except as follows:

Addition of the following new terms and definitions:

3.1
docking connector
accessory where the two complementary accessories are equipped with guiding means allowing their connection without the haptic support of an operator

3.2
unmated condition
position of the accessory without any contact between both parts

3.3
mated condition
service condition and position where the two parts of the accessory are in a position as described in the relevant standard sheet

3.4
guiding means
mechanical structure intended to ensure the proper alignment of the two complementary accessories before their mating

3.5
energy storage unit
unit, which includes accessories, multiple batteries or other chargeable cells arranged in a way to store electrical energy

Note 1 to entry: This may also include supporting means for charging, storage, interlocking and discharging.

3.6
removable energy storage unit
energy storage unit, which can be easily detached and inserted into a rack to establish the electrical connection with an accessory

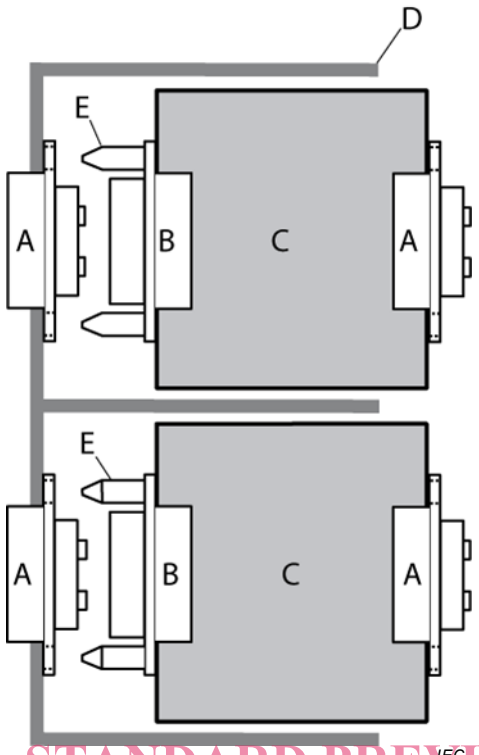
3.7
rack
mechanical structure intended to incorporate one or more removable energy storage units

3.8
electric power conversion unit
device converting electric energy from one form to another, converting between AC and DC, or changing the voltage or frequency, or a combination of these

3.9
shutter
movable part incorporated into an accessory arranged to automatically shield at least the live contacts when the complementary accessory is withdrawn

[SOURCE: IEC 60884-1:2002/AMD2:2013, 3.27, modified – 'socket-outlet' and 'plug' are replaced by 'accessory', 'automatically' is deleted and 'complementary' is added]

3.10
superordinate system
overall technical system as a set of components or systems with relationships between the components or systems and between their attributes



Key

A docking accessories type A

B complementary docking accessories type B

C removable energy storage units

D rack

E guiding means

Figure 1 – Diagram showing the use of the accessories

4 General

Clause 4 of IEC 60309-1:1999, IEC 60309-1:1999/AMD1:2005 and IEC 60309-1:1999/AMD2:2012 applies, except as follows:

4.1 General requirements

Replacement of the fourth paragraph with:

Accessories shall have a minimum degree of protection as indicated in Table 8, test variable TV1.

4.2 General notes on tests

Subclause 4.2 of IEC 60309-1:1999, IEC 60309-1:1999/AMD1:2005 and IEC 60309-1:1999/AMD2:2012 applies.

4.3 General construction

Different possibilities for the movement, adjustment and mating of components and accessories are stated in Table 1.

Table 1 – General design and usage of accessories

Case	Accessory Type A		Accessory Type B		Removable energy storage unit
	Possibility of movement relative to the structure of the rack or removable energy storage unit	Self-adjustment to the nominal position of the movable part after disconnecting	Possibility of movement relative to the structure of the removable energy storage unit	Self-adjustment to the nominal position of the movable part after disconnecting	Possibility of movement relative to the rack
1	Not movable	No	Not movable	No	Not movable
2	Not movable	No	Not movable	No	Movable
3	Not movable	No	Movable	No	Not movable
4	Not movable	No	Movable	Yes	Not movable
5	Movable	Yes	Not movable	No	Not movable
6	Movable	No	Not movable	No	Not movable
NOTE Other combinations are not excluded.					

Annex C shows examples of accessories.

4.4 Visual examination tests

If required by a test and unless otherwise specified, visual examination tests shall be performed with the naked eye. The following characteristics shall be checked:

- quality of assembling before test;
- marking;
- materials;
- marks of corrosion;
- colour, change of colour after the test;
- impurities, contamination, particles of abrasion after the test;
- damages, holes, cracks;
- damaged and loosened parts;
- status and location of lubrication and glues.

No noticeable problems shall occur which could impair normal operation or show a deviation from this standard.

4.5 Cable to be used

Unless otherwise specified by the manufacturer, the following stranded cable shall be used for the power contacts: H07V.

4.6 Voltage and current for test purposes

As deviation from the referred test standards, tests may be performed with AC or DC.

4.7 Type of accessories

Requirements mentioned for accessories called plug or inlet are applicable for accessories Type B.

Requirements mentioned for accessories called socket outlet or connector are applicable for accessories Type A.

5 Standard ratings

Clause 5 of IEC 60309-1:1999, IEC 60309-1:1999/AMD1:2005 and IEC 60309-1:1999/AMD2:2012 applies, except as follows:

5.2 *Replacement:*

Preferred rated currents are given in Table 2.

Table 2 – Preferred rated currents

Rated current A
16
32
63
125
250
315
400
630
800

Additional subclause:

5.3 Rated current for data, communication and control circuit purposes is 2 A.

Rated voltage for data, communication and control circuit purposes is 30 V or less according the manufacturer's specification.

6 Classification of accessories

6.1 Accessories are classified according to degree of protection as tested in Clause 16.

6.2 Accessories are classified according to earthing facilities:

- accessories without earthing contact;
- accessories with earthing contact.

6.3 Accessories are classified according to the method of connecting the cable:

- rewirable accessories;
- non-rewirable accessories.

6.4 Accessories are classified according to interlocking facilities:

- accessories without interlock;
- accessories with mechanical interlock (with latching device);