

TECHNICAL SPECIFICATION

Low-voltage docking connectors for removable energy storage units
(standards.iteh.ai)

[IEC TS 63066:2017](#)

<https://standards.iteh.ai/catalog/standards/sist/a82c1607-f715-437b-8b33-41e19eac80a7/iec-ts-63066-2017>



THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2017 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing 20 000 terms and definitions in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

65 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

IEC STANDARD PREVIEW
(standards.iteh.ai)
IEC 18 630 06 2017
41e19eac80a7/iec-is-03666-2017

TECHNICAL SPECIFICATION

Low-voltage docking connectors for removable energy storage units
(standards.iteh.ai)

[IEC TS 63066:2017](https://standards.iteh.ai/catalog/standards/sist/a82c1607-f715-437b-8b33-41e19eac80a7/iec-ts-63066-2017)

<https://standards.iteh.ai/catalog/standards/sist/a82c1607-f715-437b-8b33-41e19eac80a7/iec-ts-63066-2017>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.120.30

ISBN 978-2-8322-4124-0

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	5
INTRODUCTION.....	7
1 Scope.....	8
2 Normative references	8
3 Terms and definitions	9
4 General	11
4.1 General requirements	11
4.2 General notes on tests.....	11
4.3 General construction.....	11
4.4 Visual examination tests	12
4.5 Cable to be used.....	12
4.6 Voltage and current for test purposes	12
4.7 Type of accessories	12
5 Standard ratings	13
6 Classification of accessories.....	13
7 Marking	15
8 Dimensions.....	16
9 Protection against electric shock	16
10 Provision for earthing	17
11 Terminals and terminations.....	18
12 Interlocks.....	18
13 Resistance to ageing of rubber and thermoplastic material	19
14 General construction	19
15 Construction of accessories.....	19
16 Degrees of protection	19
17 Insulation resistance and dielectric strength	19
18 Mechanical endurance.....	19
19 Temperature rise	20
20 Mechanical strength	20
21 Screws, current-carrying parts and connections.....	20
22 Creepage distances, clearances and distances through sealing compound.....	20
23 Resistance to heat, to fire and to tracking.....	21
24 Conditional short-circuit current withstand test.....	21
25 Electromagnetic compatibility	21
26 Dynamic mechanical severities	21
26.1 Minimum degree of dynamic mechanical severities	21
26.2 Appropriate functionality	22
27 Electrical endurance	22
27.1 General requirements for accessories	22
27.2 Temperature burden for accessories	22
27.3 Damp heat for accessories.....	23
27.4 Contact resistance	23

iTech STANDARD PREVIEW
(standards.itech.ai)

[IEC TS 63066:2017](https://standards.itech.ai/catalog/standards/sist/a82e1607-f715-437b-8b33-41e19eac80a7/iec-ts-63066-2017)

[https://standards.itech.ai/catalog/standards/sist/a82e1607-f715-437b-8b33-](https://standards.itech.ai/catalog/standards/sist/a82e1607-f715-437b-8b33-41e19eac80a7/iec-ts-63066-2017)

[41e19eac80a7/iec-ts-63066-2017](https://standards.itech.ai/catalog/standards/sist/a82e1607-f715-437b-8b33-41e19eac80a7/iec-ts-63066-2017)

28	Climatic endurance for contacts.....	23
28.1	General requirements for contacts	23
28.2	Thermal change for contacts	24
28.3	Dry heat for contacts.....	24
28.4	Corrosion resistance for contacts.....	24
28.5	Damp heat for contacts	24
28.6	Functionality for contacts	24
28.7	Shocks for contacts	24
29	Climatic endurance for bodies	25
29.1	General requirements for bodies	25
29.2	Dry heat for bodies	25
29.3	Cold resistance for bodies.....	25
29.4	Cold temperatures for bodies	25
30	Salt stress endurance	26
30.1	General requirements for accessories	26
30.2	Salt stress resistance.....	26
31	Operation with misalignments	26
31.1	Misalignment at normal operation	26
31.2	Misalignment after unmating	30
31.3	Misalignment by terminated wires	30
31.4	Mating process effected by misalignment.....	30
32	Environmental conditions.....	31
	Annex A (normative) Test cycle electric endurance.....	33
	Annex B (informative) Environmental performance classes for vehicles.....	34
	Annex C (informative) Examples for accessories on the market	35
	C.1 General.....	35
	C.2 Accessory example 1	35
	C.3 Accessory example 2	38
	C.4 Accessory example 3	42
	C.5 Accessory example 4	44
	C.6 Accessory example 5	46
	C.7 Accessory example 6	48
	Bibliography.....	50
	Figure 1 – Diagram showing the use of the accessories	11
	Figure 2 – Orthogonal misalignment – front view.....	27
	Figure 3 – Angular misalignment – side view	27
	Figure 4 – Angular misalignment – top view	27
	Figure C.1 – Layout of accessory example 1	36
	Figure C.2 – Accessory example 1 Type A.....	37
	Figure C.3 – Accessory example 1 Type B.....	38
	Figure C.4 – Layout of accessory example 2.....	39
	Figure C.5 – Accessory example 2 Type A.....	40
	Figure C.6 – Accessory example 2 Type B.....	41
	Figure C.7 – Accessory example 3 Type A.....	43
	Figure C.8 – Accessory example 3 Type B.....	44

Figure C.9 – Drawings for accessory example 4 Type A..... 45

Figure C.10 – Drawings for accessory example 4 Type B..... 46

Figure C.11 – Drawings for accessory example 5 Type A..... 47

Figure C.12 – Drawings for accessory example 5 Type B..... 48

Figure C.13 – Drawings for accessory example 6 Type A..... 49

Figure C. 14 – Drawings for accessory example 6 Type B..... 49

Table 1 – General design and usage of accessories 12

Table 2 – Preferred rated currents 13

Table 3 – Short-time test currents 18

Table 4 – Mechanical endurance 20

Table 5 – Dimensions of misalignments 28

Table 6 – Combinations of misalignments 29

Table 7 – Environmental performance classes 31

Table 8 – Severities for environmental performance classes 32

Table B.1 – Severities for environmental performance classes for vehicles 34

Table C.1 – Parameters for accessory example 1 36

Table C.2 – Parameters for accessory example 2 39

Table C.3 – Parameters for accessory example 3 42

Table C.4 – Parameters for accessory example 4 45

Table C.5 – Parameters for accessory example 5 47

Table C.6 – Parameters for accessory example 6 48

iteh STANDARD PREVIEW
 (standards.iteh.ai)
 IEC TS 63066:2017
<https://standards.iteh.ai/catalog/standards/sist/a82c1607-f715-437b-8b33-41e19eac80a7/iec-ts-63066-2017>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**LOW-VOLTAGE DOCKING CONNECTORS
FOR REMOVABLE ENERGY STORAGE UNITS**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a technical specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- 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.

[IEC TS 63066:2017](#)

<https://standards.iteh.ai/catalog/standards/sist/a82c1607-f715-437b-8b33-41e19eac80a7/iec-ts-63066-2017>

ITeH STANDARD PREVIEW
(standards.iteh.ai)

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.

iTeh STANDARD PREVIEW **(standards.iteh.ai)**

[IEC TS 63066:2017](https://standards.iteh.ai/catalog/standards/sist/a82c1607-f715-437b-8b33-41e19eac80a7/iec-ts-63066-2017)

<https://standards.iteh.ai/catalog/standards/sist/a82c1607-f715-437b-8b33-41e19eac80a7/iec-ts-63066-2017>

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 earth¹ 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*

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

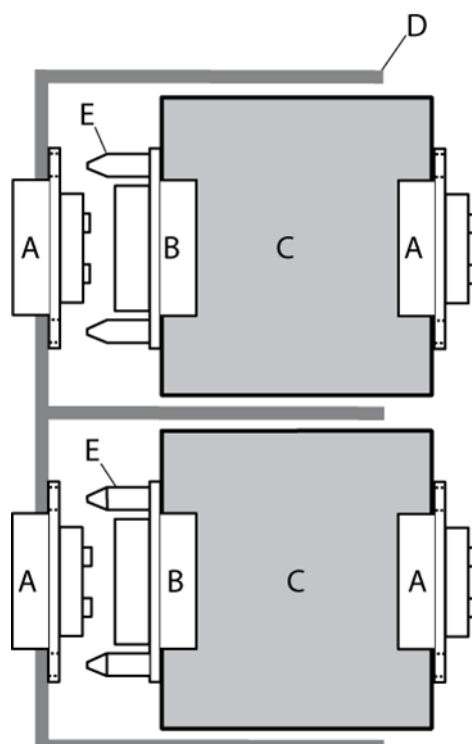
[SOURCE: IEC 60884-1:2002/AMD2:2013, 3.27, modified – 'socket-outlet' and 'plug' are replaced by 'accessory', 'automatically' is deleted and 'complementary' is added]

[IEC TS 63066:2017](https://standards.iteh.ai/catalog/standards/sist/a82c1607-f715-437b-8b33-41e19eac80a7/iec-ts-63066-2017)

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



iTech STANDARD PREVIEW ^{IEC}
(standards.iteh.ai)

Key

- A docking accessories type A
 - B complementary docking accessories type B
 - C removable energy storage units
 - D rack
 - E guiding means
- <https://standards.iteh.ai/catalog/standards/sist/a82c1607-f715-437b-8b33-41e19eac80a7/iec-ts-63066-2017>

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; [IEC TS 63066:2017](#)
- marking; <https://standards.iteh.ai/catalog/standards/sist/a82c1607-f715-437b-8b33-41e19eac80a7/iec-ts-63066-2017>
- 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

iTeh STANDARD PREVIEW
(standards.iteh.ai)

IEC TS 63066:2017

<https://standards.iteh.ai/catalog/standards/sist/a82c1607-f715-437b-8b33-41e19eac80a7/iec-ts-63066-2017>

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 to 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);