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Electrically propelled mopeds and motorcycles — Safety specifications —

Part 3: Electrical safety

Cyclomoteurs et motocycles à propulsion électrique — Spécifications de sécurité —

Partie 3: Sécurité électrique

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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).

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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 22, *Road vehicles*, Subcommittee SC 38, *Motorcycles and mopeds*.

This first edition of ISO 13063-3, together with ISO 13063-1 and ISO 13063-2, cancels and replaces ISO 13063:2012, which has been technically revised.

The main changes are as follows:

— extension of protection against electric shock to all electric safety requirements;

— alignment of structure and requirements as possible with ISO 6469-3:2018;

— splitting the document into three documents which consist of the following parts, under the general title *Electrically propelled mopeds and motorcycles — Safety specifications:*

  — *Part 1: On-board rechargeable energy storage system (RESS)*;

  — *Part 2: Vehicle operational safety*;

  — *Part 3: Electrical safety*;

— addition of specific requirements for capacitive discharge;

— new test specification for the isolation resistance monitoring system;

— new requirements and test for touch current; and

— the requirements for conductive connection to an external electric power supply can be covered by ISO 18246.

A list of all parts in the ISO 13063 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.

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Electrically propelled mopeds and motorcycles — Safety specifications —

Part 3: Electrical safety

1 Scope

This document specifies electric safety requirements for protection against electric shock and thermal incidents of electric propulsion systems and conductively connected auxiliary electric systems of electrically propelled mopeds and motorcycles when used in normal conditions. It is applicable to a maximum working voltage of the on-board electrical circuit up to 1 000 V alternating current (a.c.) or 1 500 V direct current (d.c.). This document does not provide comprehensive safety information for manufacturing, maintenance and repair personnel.

NOTE Requirements for conductive connections of electrically propelled mopeds and motorcycles to an external electric power supply are described in ISO 18246.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 20653, *Road vehicles — Degrees of protection (IP-code) — Protection of electrical equipment against foreign objects, water and access*

IEC 60227-1, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V — Part 1: General requirements*

IEC 60245-1, *Rubber insulated cables — Rated voltages up to and including 450/750 V — Part 1: General requirements*

IEC 60990:2016, *Methods of measurement of touch current and protective conductor current*

3 Terms and definitions

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

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

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

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

3.1
auxiliary electric system
vehicle system, other than the *propulsion system* (3.46), that operates on electric energy

[SOURCE: ISO 6469-3:2021, 3.1]

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3.2
balance of electric circuit
remaining section of an electric circuit when all electric power sources that are energized (e.g. *RESS* (3.23) and fuel cell stacks) are disconnected

[SOURCE: ISO 6469-3:2021, 3.2]

3.3
protective barrier
part providing protection against *direct contact* (3.9) from any usual direction of access

[SOURCE: IEC 60050-826:2004, 826-12-23, modified — Domain "<electrically>" was removed.]

3.4
basic insulation
insulation of *hazardous live parts* (3.35) which provides *basic protection* (3.5)

Note 1 to entry: This concept does not apply to insulation used exclusively for functional purposes.

Note 2 to entry: Where insulation is not provided by solid insulation only, it is complemented with *protective barriers* (3.3) or *protective enclosures* (3.15) to prevent access to *live parts* (3.19) in order to achieve basic protection.

[SOURCE: IEC 60050-581:2008, 581-21-24, modified — "Note 2 to entry was added.]

3.5
basic protection
protection against *electric shock* (3.13) under fault-free conditions.

[SOURCE: IEC 60050-195:2021, 195-06-01, modified — "normal" was replaced by "fault-free".]

3.6
conductive part
part which can carry electric current

[SOURCE: IEC 60050-195:2021, 195-01-06]

3.7
conductor
conductive part (3.6) intended to carry a specified electric current

[SOURCE: IEC 60050-195:2021, 195-01-07]

3.8
creepage distance
shortest distance along the surface of a solid insulating material between two *conductive parts* (3.6)

[SOURCE: IEC 60050-151:2001, 151-15-50]

3.9
direct contact
electric contact of persons or animals with *live parts* (3.19)

[SOURCE: IEC 60050-826:2004, 826-12-03]

3.10
double insulation
insulation comprising both *basic insulation* (3.4) and *supplementary insulation* (3.25)

[SOURCE: IEC 60050-195:2021, 195-06-08]

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3.11
electric chassis
conductive parts (3.6) of a vehicle that are electrically connected and whose potential is taken as reference

3.12
electric drive
combination of traction motor, power electronics and their associated controls for the conversion of electric to mechanical power and vice versa

[SOURCE: ISO 6469-3:2021, 3.13]

3.13
electric shock
physiological effect resulting from an electric current passing through a human body or animal body

[SOURCE: IEC 60050-826:2004, 826-12-01]

3.14
electrically propelled vehicle
vehicle with one or more *electric drive(s)* (3.12) for vehicle propulsion

[SOURCE: ISO 6469-3:2021, 3.15]

3.15
protective enclosure
electrical enclosure surrounding internal parts of equipment to prevent access to *hazardous live parts* (3.35) from any direction

[SOURCE: IEC 60050-195:2021, 195-06-14, modified — Domain "<electrically>" was removed.]

3.16
exposed conductive part
conductive part (3.6) of equipment which can be touched and which is not normally live, but which can become live when *basic insulation* (3.4) fails

Note 1 to entry: A conductive part of electrical equipment which can become live only through contact with an exposed conductive part which has become live is not considered to be an exposed conductive part itself.

[SOURCE: IEC 60050-442:1998, 442-01-21]

3.17
isolation resistance monitoring system
system that periodically or continuously monitors the *isolation resistance* (3.18) between *live parts* (3.19) and the *electric chassis* (3.11)

[SOURCE: ISO 6469-3:2021, 3.24]

3.18
isolation resistance
insulation resistance
resistance between *live parts* (3.19) of an electric circuit and the *electric chassis* (3.11) as well as other electric circuits which are insulated from this electric circuit

[SOURCE: ISO 6469-3:2021, 3.23]

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3.19
live part
conductor (3.7) or *conductive part* (3.6) intended to be energized in normal use, but by convention not the *electric chassis* (3.11)

[SOURCE: IEC 60050-442:1998, 442-01-40, modified — "including a neutral conductor" and Note were removed, and "combined protective and neutral conductor (PEN)" was replaced by "electric chassis".]

3.20
maximum working voltage
highest value of AC voltage (rms) or of DC voltage that can occur under any normal operating conditions according to the manufacturers' specifications, disregarding transients and ripple

[SOURCE: ISO 6469-3:2021, 3.26]

3.21
equipotential bonding
provision of electric connections between *conductive parts* (3.6), intended to achieve equipotentiality

[SOURCE: IEC 60050-826:2004, 826-13-19]

3.22
degree of protection
IP
protection provided by an enclosure or barriers against access, foreign objects and/or water and verified by standardized test methods in accordance with ISO 20653

[SOURCE: ISO 20653:2013, 3.2, modified — The term "IP" and the phrase "in accordance with ISO 20653" were added.]

3.23
rechargeable energy storage system
RESS
rechargeable system that stores energy for delivery of electric energy for the *electric drive* (3.12)

EXAMPLE Battery, capacitor, flywheel.

[SOURCE: ISO 6469-3:2021, 3.31]

3.24
reinforced insulation
insulation of *hazardous live parts* (3.35) which provides protection against *electric shock* (3.13) equivalent to *double insulation* (3.10)

Note 1 to entry: Reinforced insulation may comprise several layers that cannot be tested singly as *basic insulation* (3.4) or *supplementary insulation* (3.25).

[SOURCE: IEC 60050-581:2008, 581-21-27]

3.25
supplementary insulation
independent insulation applied in addition to *basic insulation* (3.4) for *fault protection* (3.29)

[SOURCE: IEC 60050-195:2021, 195-06-07]

3.26
voltage class
classification of an electric component or circuit according to its *maximum working voltage* (3.20)

[SOURCE: ISO 6469-3:2021, 3.36]

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3.27
wiring
system of wires providing electric circuits and including cables and connectors

3.28
service disconnect
device for deactivation of the electrical circuit when conducting checks and services of the vehicle, *RESS* (3.23), etc.

3.29
fault protection
protection against *electric shock* (3.13) under single-fault conditions

[SOURCE: IEC 60050-195:2021, 195-06-02]

3.30
functional insulation
insulation between *conductive parts* (3.6), necessary for the proper functioning of the component

[SOURCE: IEC 60050-195:2021, 195-02-41, modified — "equipment" replaces "component".]

3.31
touch current
electric current passing through a human body or through livestock when it touches one or more accessible parts of cables or equipment

[SOURCE: ISO 17409:2020, 3.57, modified — “cables” replaces “an installation”.]

3.32
vehicle power supply circuit
voltage class (3.26) B electric circuit which includes all parts that are conductively connected to the *vehicle inlet* (3.33) [*case B* (3.40), *case C* (3.41)] or the *plug* (3.45) [*case A* (3.39)]

[SOURCE: ISO 6469-2:2022, 3.18, modified — “conductively” replaces “galvanically” and "and that is operational when connected to an external electric power supply" was deleted.]

3.33
vehicle inlet
part of a vehicle coupler incorporated in, or fixed to, the electric vehicle

[SOURCE: IEC 62196-1:2014, 3.3.2, modified — "electric vehicle inlet" was deleted.]

3.34
removable RESS
RESS (3.23) that by design can be taken out from the vehicle by the vehicle user for off-board charging and/or other operation

3.35
hazardous live part
live part (3.19) which, under certain conditions, can give a harmful *electric shock* (3.13)

Note 1 to entry: For guidance on harmful physiological effects see IEC 61140:2016.

[SOURCE: IEC 60050-195:2021, 195-06-05, modified —Note 1 to entry was replaced.]

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3.36
specific voltage condition
condition that the maximum voltage of a conductively connected electric circuit between a DC *live part* (3.19) and any other live part (DC or AC) is ≤ 30 V a.c. (rms) and ≤ 60 V d.c.

Note 1 to entry: When a DC live part of such an electric circuit is connected to chassis and the specific voltage condition applies, the maximum voltage between any live part and the *electric chassis* (3.11) is ≤ 30 V a.c. (rms) and ≤ 60 V d.c.

Note 2 to entry: For pulsating DC voltages (alternating voltages without change of polarity) the DC threshold is applied.

3.37
chassis-connected electric circuit
electric circuit that is conductively connected to each other, where the DC part of this circuit is connected to the *electric chassis* (3.11) and the *specific voltage condition* (3.36) is fulfilled

3.38
clearance
shortest distance in air between two *conductive parts* (3.6)

[SOURCE: IEC 60050-581:2008, 581-27-76]

3.39
case A
connection of an EV to the supply network with a *plug* (3.45) and cable permanently attached to the EV

[SOURCE: IEC 61851-1:2017, 3.1.10]

3.40
case B
connection of an EV to the AC supply network with a cable assembly detachable at both ends

[SOURCE: IEC 61851-1:2017, 3.1.11]

3.41
case C
connection of an EV to the AC supply network utilizing a cable and vehicle connector permanently attached to the EV charging station

[SOURCE: IEC 61851-1:2017, 3.1.12]

3.42
conductively connected circuit
two electric circuits are considered conductively connected unless they are separated by at least *basic insulation* (3.4)

[SOURCE: ISO/TR 8713:2019, 3.26]

3.43
overload protection
protection intended to operate in the event of overload on the protected section

[SOURCE: IEC 60050-448:1995, 448-14-31]

3.44
overcurrent protection
protection intended to operate when the current is in excess of a predetermined value

[SOURCE: IEC 60050-448:1995, 448-14-26]

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3.45
plug
accessory having contacts designed to engage with the contacts of a socket-outlet, also incorporating means for the electrical connection and mechanical retention of flexible cables or cords

[SOURCE: IEC 61851-1:2017, 3.5.9]

3.46
propulsion system
combination of power source and powertrain for vehicle propulsion

[SOURCE: ISO 6469-2:2022, 3.12]

4 Abbreviated terms

AC alternating current (adjective)

a.c. alternating current (noun)

DC direct current (adjective)

d.c. direct current (noun)

rms root mean square

RESS rechargeable energy storage system

EV electrically propelled vehicle

DUT device under test

SPD surge protective device

RFI radio frequency interference

IEC International Electrotechnical Commission

ISO International Organization for Standardization

5 Voltage classes

Depending on its maximum working voltage *U*, an electric circuit, a section of a circuit or an electric component belongs to the voltage classes specified in Table 1. Voltage class A is specified with maximum working voltage of ≤30 V a.c. (rms) or ≤60 V d.c., respectively.

Voltage class B is specified with maximum working voltage between (> 30 and ≤ 1 000) V a.c. (rms) or (> 60 and ≤ 1 500) V d.c., respectively.

Table 1 — Voltage classes

Voltage class	Maximum working voltage	
	V (DC)	V (AC) (rms value)
A	$0 < U \leq 60$	$0 < U \leq 30$
B	$60 < U \leq 1\,500$	$30 < U \leq 1\,000$
NOTE The values 60 V d.c. and 30 V a.c. are selected taking into account humid weather conditions.		

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