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Electrically propelled mopeds and motorcycles — Safety specifications —

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

Cyclomoteurs et motocycles à propulsion électrique — Spécifications de sécurité —

Partie 1: Système de stockage d'énergie rechargeable à bord du véhicule (RESS)

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Foreword

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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).

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

The main changes are as follows:

— 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*;

— requirements for lithium-ion batteries refer to ISO 18243;

— requirements for the connector of the removable RESS are provided.

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.

Electrically propelled mopeds and motorcycles — Safety specifications —

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

1 Scope

This document specifies safety requirements for rechargeable energy storage systems (RESS) of electrically propelled mopeds and motorcycles for the protection of persons.

It does not provide the comprehensive safety information for the manufacturing, maintenance and repair personnel.

NOTE Additional safety requirements can apply for RESS that can be recharged by means different from supplying electric energy (e.g. redox flow battery).

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 13063-3: 2022, *Electrically propelled mopeds and motorcycles — Safety specifications— Part 3: Electrical safety*

ISO 18243, *Electrically propelled mopeds and motorcycles — Test specifications and safety requirements for lithium-ion battery systems*

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
clearance
shortest distance in air between two *conductive parts* (3.2)

[SOURCE: IEC 60050-426:2020, 426-04-12]

3.2
conductive part
part which can carry electric current

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

3.3
creepage distance
shortest distance along a surface of a solid insulating material between two *conductive parts* (3.2)

[SOURCE: IEC 60050-151:2001/AMD1:2013, 151-15-50]

3.4
electric chassis
conductive parts (3.2) of a vehicle that are electrically connected and whose potential is taken as reference

[SOURCE: ISO 6469-3:2021, 3.12]

3.5
electric drive
combination of an electric 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, modified —"traction motor" was replaced by "electric traction motor".]

3.6
electrically-propelled vehicle
vehicle with one or more *electric drive(s)* (3.5) for vehicle propulsion

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

3.7
explosion
sudden release of energy sufficient to cause pressure waves and/or projectiles that can cause structural and/or physical damage to the surrounding area

[SOURCE: ISO 6469-1:2019, 3.10]

3.8
isolation resistance
insulation resistance
resistance between *live parts* (3.10) of an electric circuit and the *electric chassis* (3.4) as well as other electric circuits which are insulated from this electric circuit

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

3.9
leakage
escape of liquid or gas except for venting

[SOURCE: ISO 6469-1:2019, 3.15]

3.10
live part
conductor or *conductive part* (3.2) intended to be energized in normal use, but by convention, not the *electric chassis* (3.4)

[SOURCE: IEC 60050-442:1998, 442-01-40, modified — “including a neutral conductor” and Note 1 to entry deleted and "a PEN conductor or PEM conductor or PEL conductor" replaced by "the electric chassis".]

3.11
maximum working voltage
highest value of AC voltage (rms) or of DC voltage that can occur under any normal operating conditions according to the manufacturer's specifications, disregarding transients and ripple

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

3.12
rechargeable energy storage system
RESS
rechargeable system that stores energy for delivery of electric energy for the *electric drive* (3.5)

[SOURCE: ISO 6469-1:2019, 3.22, modified — The example was deleted.]

3.13
voltage class
classification of an electric component or circuit according to its *maximum working voltage* (3.11)

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

3.14
removable RESS
RESS (3.12) that is designed to be taken out from the vehicle by the vehicle user

Note 1 to entry: The same term and definition is described in Regulation No 136 of the Economic Commission for Europe of the United Nations (UN/ECE).

4 General requirements

4.1 Environmental and operational conditions

The requirements given in this document shall be met across the range of environmental and operational conditions for which the electrically-propelled vehicle is designed to operate, as specified by the vehicle manufacturer.

NOTE See ISO 16750 for guidance.

4.2 General electrical requirements

If not otherwise specified in this document, the RESS shall fulfil the electrical safety requirements in accordance with ISO 13063-3. These electrical safety requirements shall be fulfilled on the component level or the vehicle level. ISO 7010–W012 shown in Figure 1 shall be visible on the RESS that is the part of voltage class B electric circuits.

Figure 1 — Symbol of voltage class B electric components

4.3 Marking of voltage class B wiring

The outer covering of the cables and harness conductively connected to the RESS that is the part of voltage class B electric circuits shall be marked with orange colour according to ISO 13063-3.

5 Requirements for RESS

5.1 General

If the safety aspects in relation to the whole vehicle are not affected, the tests may be performed outside the vehicle on the components or parts of the voltage class B electric circuits individually instead.

It is recommended that the vehicle manufacturer performs the isolation resistance measurements (see 5.2) on each vehicle before their entrance into service. The RESS which consists of a lithium-ion battery shall comply with the specific safety requirements described in ISO 18243.

5.2 Isolation resistance measurement for the voltage class B electric power sources

For a voltage class B RESS its isolation resistance divided by its maximum working voltage shall be at least as follows:

— 100 Ω/V, if the RESS contains DC circuits only;

— 100 Ω/V, if the RESS contains AC circuits and additional AC protection in accordance with ISO 13063-3;

— 500 Ω/V, if the RESS contains AC circuits without additional AC protection in accordance with ISO 13063-3.

When the RESS is installed in a vehicle and conductively connected to a voltage class B electric circuit, a higher resistance value for the RESS is necessary to meet the requirements in ISO 13063-3.

NOTE For the isolation resistance required on a voltage class A RESS conductively connected to a voltage class B electric circuit see ISO 13063-3.

Compliance shall be tested according to the relevant test given in ISO 13063-3.

5.3 Creepage distance of voltage class B electric components and RESS

This subclause concerns an additional leakage current hazard along with the surface between the connection terminals of voltage class B electrical circuit and RESS, including any conductive fittings attached to them and any conductive parts, due to the risk of electrolyte or dielectric medium spillage from leakage under normal operating conditions

If electrolytic leakage does not occur, the RESS should be designed according to ISO 13063-3. The pollution degree shall be suitable for the range of application. If electrolyte leakage can occur it is recommended that the creepage distance be as follows (see Figure 2).

a) In the case of a creepage distance between two connection terminals of either the electric circuit or the RESS connection terminals, or both:

$$d \geq 0{,}25\ U + 5 \quad (1)$$

b) In the case of a creepage distance between live parts and the electric chassis:

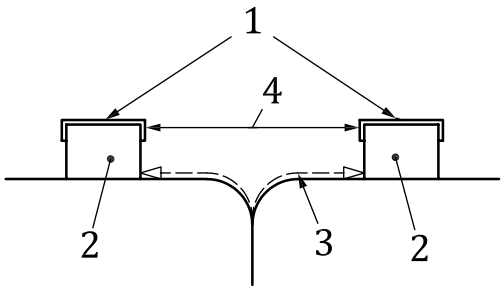
$$d \geq 0{,}125\ U + 5 \quad (2)$$

where

d is the creepage distance measured on the tested RESS, in millimetres;

U is the maximum working voltage between the two RESS connection terminals, in volts.

Compliance shall be checked by inspection of the design.



Key

1 conductive surface
2 connector terminal (RESS pack or RESS)
3 creepage distance
4 clearance

Figure 2 — Creepage distance and clearance

5.4 Clearance of voltage class B RESS

This subclause concerns an additional leakage current hazard through the minimum distance between the connection terminals of voltage class B electrical circuit and RESS, including any conductive fittings attached to them and any conductive parts, due to the risk of electrolyte or dielectric medium spillage from leakage under normal operating conditions.

If electrolytic leakage may not occur, the RESS should be designed according to ISO 13063-3. The pollution degree shall be suitable for the range of application. If electrolyte leakage may occur, the minimum clearance shall be at least 2,5 mm, and be recommended as shown in Table 1.

Compliance shall be checked by inspection of the design.

Table 1 — Minimum clearance of voltage class B electric components and RESS

Maximum working voltage, U [V]		**Minimum clearance**, d[a] [mm]			
		Current ≤ 63 A		Current > 63 A	
DC	AC	L-L[b]	L-A[c]	L-L[b]	L-A[c]
60 < U ≤ 125	30 < U ≤ 125	3	5	5	6
125 < U ≤ 250		3	5	5	6
250 < U ≤ 380		4	6	6	8
380 < U ≤ 500		6	8	8	10
500 < U ≤ 660		6	8	8	10
660 < U ≤ 800	660 < U ≤ 750	10	14	10	14
800 < U ≤ 1 500	750 < U ≤ 1 000	14	20	14	20

[a] See Figure 2.

[b] It is the distance between two of electric circuit and/or RESS connection terminals.

[c] It is the distance between the live part and the electric chassis.

5.5 Requirements for safety means and protection of persons against hazardous situations from RESS

5.5.1 Emission of hazardous gases and other hazardous substances

To prevent explosion, fire or toxicity hazards, the following requirements shall apply when hazardous gases and other substances can be emitted by the RESS. These requirements shall consider normal operating and environmental conditions. No potentially dangerous concentration of hazardous gases and other hazardous substances shall be allowed anywhere in rider and person around the vehicle.

Measure to prevent the accumulation of hydrogen gas shall be equipped for open type traction batteries that may produce hydrogen gas.

NOTE The maximum allowed accumulated quantity of hazardous gases and other substances can be found in some applicable latest version of national/International Standards or regulations.

Appropriate countermeasures shall manage first failure situations.

Compliance shall be checked by inspection of the design.

5.5.2 Heat generation

Heat generation under any first failure condition which could form a hazard to persons shall be prevented by appropriate measures, for example, based on monitoring of current or voltage or temperature.

Compliance shall be checked by inspection of the design.

5.5.3 Protection against electrolyte spills

No spilled electrolyte from the RESS and its components shall reach the rider nor any person around either the motorcycle or moped, or both during normal condition of either use or functional operation, or both.

Electrolyte shall not spill from the vehicle when the vehicle is tilted to the ground and when the RESS is put upside-down.

Compliance shall be checked by inspection of the design.

5.6 Accidental or unintentional detachment

The RESS and its components shall not be ejected during either normal condition of use or functional operation, or both. The RESS and its components shall not be ejected when the vehicle is tilted to the ground and when the RESS is put upside-down.

Compliance shall be checked by inspection of the design.

5.7 Over-current interruption

If a RESS system is not short-circuit proof in itself, a RESS over-current interruption device shall open the RESS circuit under conditions specified by either the vehicle or RESS manufacturer, or both, to prevent dangerous effects for persons, the vehicle and the environment.

Compliance shall be checked by inspection of the design.

5.8 Requirements for connector of removable RESS

If not otherwise specified in this document, the requirements for the connector of the removable RESS shall fulfil the electrical safety requirements in accordance with ISO 13063-3:2022, 7.5.