
Electric mopeds and motorcycles - Terminology and classification

*Cyclomoteurs et motocycles électriques ; Terminologie et
classification*

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Foreword

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The committee responsible for this document is ISO/TC 22, *Road vehicles*, Subcommittee SC 38, *Motorcycles and mopeds*.

Electric mopeds and motorcycles - Terminology and classification

1 Scope

This Technical Report establishes a vocabulary of terms and the related definitions used in ISO/TC 22/SC 38 standards. These terms are specific to the electric propulsion systems of electrically propelled mopeds and motorcycles.

2 Terms and definitions

2.1 Complete motorcycle/moped

2.1.1 Type of Electric motorcycle and electric moped

2.1.1.1

motorcycle

two-wheeled motor-driven vehicle or three-wheeled motor-driven vehicle whose unladen weight does not exceed 400 kg

Note 1 to entry: *Mopeds* ([2.1.1.2](#)), as defined in [2.4](#), are not included in this definition.

[SOURCE: ISO 3833:1977, 3.5]

2.1.1.2

moped

two-wheeled or three-wheeled motor-driven vehicle with a maximum design speed not exceeding 50 km/h

Note 1 to entry: If the driving motor is an engine, its displacement or equivalent *capacity* ([2.3.3.2](#)) must not exceed 50 cm³.

[SOURCE: ISO 3833:1977, 3.4]

2.1.1.3

electric vehicle

electrically propelled vehicle

EV

vehicle with one or more electric drive(s) for vehicle propulsion

[SOURCE: ISO 13063:2012, 3.19]

2.1.1.4

battery-electric vehicle

BEV

electric vehicle ([2.1.1.3](#)) with only a *traction battery* ([2.3.1.3](#)) as the power source for vehicle propulsion

Note 1 to entry: The abbreviation BEV is often shortened to EV.

[SOURCE: ISO 13063:2012, 3.6]

2.1.1.5

hybrid electric vehicle

HEV

vehicle with at least one *RESS* (2.3.1.1) and one fuelled power source for vehicle propulsion

EXAMPLE ICE or fuel cell systems are typically types of fuelled power sources.

[SOURCE: ISO 13063:2012, 3.22]

2.1.1.6

externally chargeable hybrid-electric vehicle

HEV (2.1.1.5) with *RESS* (2.3.1.1) that is intended to be charged from an external electric energy source

Note 1 to entry: Externally chargeable HEVs are widely known as plug-in HEVs (PHEVs).

[SOURCE: ISO/TR 8713:2012, 2.34, modified]

2.1.1.7

fuel cell hybrid-electric vehicle

FCHEV

electrically propelled vehicle (2.1.1.3) with an *RESS* (2.3.1.1) and a fuelcell system as power source for vehicle propulsion

[SOURCE: ISO/TR 8713:2012, 2.36]

2.1.1.8

electric motorcycle

electrically propelled motorcycle

motorcycle (2.1.1.1) driven by electric motor with two or three wheels

2.1.1.9

electric moped

electrically propelled moped

moped (2.1.1.2) driven by electric motor with two or three wheels

2.1.2 Construction and components

2.1.2.1 Propulsion and driving device

2.1.2.1.1

auxiliary electric system

on-board vehicle system, other than for vehicle propulsion, which operates on electric energy

[SOURCE: ISO 13063:2012, 3.1]

2.1.2.1.2

propulsion system

combination of on-board power source for vehicle propulsion and power train

[SOURCE: ISO/TR 8713:2012, 2.56]

2.1.2.1.3

electric power train

power train, consisting of electric drive and drive train

[SOURCE: ISO/TR 8713:2012, 2.25]

2.1.2.1.4

hybrid power train

power train of an *HEV* (2.1.1.5), consisting of a fuelled power source and an *electric power train* (2.1.2.1.3)

[SOURCE: ISO/TR 8713:2012, 2.43]

2.1.2.1.5**drive direction control**

device physically actuated by the rider for selecting the driving direction of the road vehicle (forward or backward)

EXAMPLE A lever or a push-button switch.

[SOURCE: ISO 13063:2012, 3.13]

2.1.2.2 Electric devices and components**2.1.2.2.1****live part**

conductor or *conductive part* ([2.1.2.2.2](#)) intended to be electrically energized in normal use

[SOURCE: ISO 13063:2012, 3.25]

2.1.2.2.2**conductive part****conductor**

part capable of conducting electric current

[SOURCE: ISO 13063:2012, 3.9]

2.1.2.2.3**exposed conductive part**

conductive part ([2.1.2.2.2](#)) of the electric equipment that can be touched by a test finger according to IPXXB after removing *barriers* ([2.1.3.3.7](#))/*enclosures* ([2.1.3.3.8](#)) that can be removed without using tools and that is not normally live, but which may become live under fault conditions

Note 1 to entry: *Protection degrees* ([2.1.3.3.18](#)) (e.g. IPXXB) are defined in ISO 20653.

[SOURCE: ISO 13063:2012, 3.21]

2.1.2.2.4**electrical chassis**

conductive parts ([2.1.2.2.2](#)) of a vehicle that are electrically connected and whose potential is taken as reference

[SOURCE: ISO 13063:2012, 3.15]

2.1.2.2.5**electric power system**

electric circuit, containing electric power sources

EXAMPLE Fuel cell stacks, batteries.

[SOURCE: ISO 13063:2012, 3.17]

2.1.2.2.6**isolation-resistance monitoring system**

system which periodically or continuously monitors the *isolation resistance* ([2.1.3.3.10](#)) between *live parts* ([2.1.2.2.1](#)) and the electric chassis or *exposed conductive parts* ([2.1.2.2.3](#))

[SOURCE: ISO 13063:2012, 3.23]

2.1.3 Performance

2.1.3.1 Drivability

2.1.3.1.1

range at 80% maximum speed

total distance the vehicle can cover when running at 80 % *maximum speed* ([2.1.3.1.4](#))

Note 1 to entry: For the relevant test procedure, see ISO 13064-2:2012, 9.1.

[SOURCE: ISO 13064-2:2012, 3.5]

2.1.3.1.2

reference range

distance covered by an *electrically propelled vehicle* ([2.1.1.3](#)) over a designated test sequence on a fully charged *traction battery* ([2.3.1.3](#)), to the end of the test sequence as defined by the end of test sequence criteria

Note 1 to entry: The reference range is usually expressed in kilometers (km).

[SOURCE: ISO 13064-1:2012, 3.2]

2.1.3.1.3

reference energy consumption

quantity of electric energy from the mains needed to charge the *traction battery* ([2.3.1.3](#)), divided by the distance covered after the vehicle has been driven through the specified test sequence

Note 1 to entry: The reference energy consumption is usually expressed in watt-hours per kilometer (Wh/km).

[SOURCE: ISO 13064-1:2012, 3.1]

2.1.3.1.4

maximum speed

highest average speed which the vehicle can maintain twice over a distance of 200 m

Note 1 to entry: For the relevant test procedure, see ISO 13064-2:2012, 9.3.

[SOURCE: ISO 13064-2:2012, 3.6]

2.1.3.1.5

acceleration ability

shortest time required to accelerate the vehicle from standstill over a given distance

Note 1 to entry: For the relevant test procedure, see ISO 13064-2:2012, 9.5.

[SOURCE: ISO 13064-2:2012, 3.7]

2.1.3.1.6

hill starting ability

maximum slope on which the vehicle can start moving over a minimum distance of 10 m

Note 1 to entry: For the relevant test procedure, see ISO 13064-2:2012, 9.6.

[SOURCE: ISO 13064-2:2012, 3.8]

2.1.3.1.7 Efficiency

2.1.3.1.7.1

direct determination of efficiency

determination of the efficiency from direct measurement of active input power and active output power

[SOURCE: IEC 60050, 411-53-10]

2.1.3.1.7.2**indirect determination of efficiency**

determination of the efficiency from the measurements of the power loss

[SOURCE: IEC 60050, 411-53-11]

2.1.3.1.8**speed uphill**

highest average speed which the vehicle can maintain on a given slope over a distance of 200 m

Note 1 to entry: For the relevant test procedure, see ISO 13064-2:2012, 9.7.

[SOURCE: ISO 13064-2:2012, 3.9]

2.1.3.2 Braking**2.1.3.2.1****regenerative braking**

braking with conversion of kinetic energy into electric energy for charging the *RESS* ([2.3.1.1](#))

[SOURCE: ISO/TR 8713:2012, 2.64]

2.1.3.3 Protection against electric shock**2.1.3.3.1****maximum working voltage**

highest value of a.c. voltage (rms) or of d.c. voltage which may occur in an electric system under any normal operating conditions according to manufacturers' specifications, disregarding transients

[SOURCE: ISO 13063:2012, 3.26]

2.1.3.3.2**voltage class A**

classification of an electric component or circuit as belonging to voltage class A, if its *maximum working voltage* ([2.1.3.3.1](#)) is ≤ 30 V a.c. or ≤ 60 V d.c., respectively

[SOURCE: ISO 13063:2012, 3.33]

2.1.3.3.3**voltage class B**

classification of an electric component or circuit as belonging to voltage class B, if its *maximum working voltage* ([2.1.3.3.1](#)) is $(>30$ and $\leq 1\,000$) V a.c. or $(>60$ and $\leq 1\,500$) V d.c., respectively

[SOURCE: ISO 13063:2012, 3.34]

2.1.3.3.4**electric shock**

physiological effect resulting from an electric current passing through a human body

[SOURCE: ISO 13063:2012, 3.18]

2.1.3.3.5**balance of electric power system**

remaining portion of an *electric power system* ([2.1.2.2.5](#)) when the power sources are disconnected

EXAMPLE Fuel cell stacks, batteries.

[SOURCE: ISO 13063:2012, 3.2]

2.1.3.3.6

potential equalization

electric connections of *exposed conductive parts* ([2.1.2.2.3](#)) of the electric equipment to minimize differences in potential between these parts

[SOURCE: ISO 13063:2012, 3.27]

2.1.3.3.7

barrier

part providing protection against *direct contact* ([2.1.3.3.12](#)) from any usual direction of access

[SOURCE: ISO 13063:2012, 3.3]

2.1.3.3.8

enclosure

part providing protection of equipment against *direct contact* ([2.1.3.3.12](#)) from any direction

[SOURCE: ISO 13063:2012, 3.20]

2.1.3.3.9

basic protection

protection against *direct contact* ([2.1.3.3.12](#)) with *live parts* ([2.1.2.2.1](#)) under fault-free conditions

[SOURCE: ISO 13063:2012, 3.5]

2.1.3.3.10

isolation resistance

resistance between *live parts* ([2.1.2.2.1](#)) of voltage class B electric circuit and the electric chassis or *exposed conductive parts* ([2.1.2.2.3](#)) as well as the voltage class A system

[SOURCE: ISO 13063:2012, 3.24]

2.1.3.3.11

creepage distance

shortest distance along a surface of a solid insulating material between two *conductive parts* ([2.1.2.2.2](#))

[SOURCE: ISO 13063:2012, 3.10]

2.1.3.3.12

direct contact

contact of persons with *live parts* ([2.1.2.2.1](#))

[SOURCE: ISO 13063:2012, 3.11]

2.1.3.3.13

indirect contact

contact of persons with an *exposed conductive part* ([2.1.2.2.3](#)) made live by a fault of the *basic insulation* ([2.1.3.3.14](#)) of a *live part* ([2.1.2.2.1](#))

2.1.3.3.14

basic insulation

insulation applied to *live parts* ([2.1.2.2.1](#)) for protection against *direct contact* ([2.1.3.3.12](#)) under fault-free conditions

Note 1 to entry: Basic insulation does not necessarily include isolations used exclusively for functional purposes.

[SOURCE: ISO 13063:2012, 3.4]

2.1.3.3.15**supplementary insulation**

independent insulation applied in addition to *basic insulation* ([2.1.3.3.14](#)) for protection against *electric shock* ([2.1.3.3.4](#)) in the event of a failure of the basic insulation

[SOURCE: ISO 13063:2012, 3.31]

2.1.3.3.16**double insulation**

insulation system comprising both *basic insulation* ([2.1.3.3.14](#)) and *supplementary insulation* ([2.1.3.3.15](#))

[SOURCE: ISO 13063:2012, 3.12]

2.1.3.3.17**reinforced insulation**

insulation of *live parts* ([2.1.2.2.1](#)) for protection against *electric shock* ([2.1.3.3.4](#)) equivalent to *double insulation* ([2.1.3.3.16](#))

Note 1 to entry: Reinforced insulation does not imply that the insulation shall be a homogeneous piece. The reinforced insulation may comprise several layers which cannot be tested individually as supplementary or *basic insulation* ([2.1.3.3.14](#)).

[SOURCE: ISO 13063:2012, 3.30]

2.1.3.3.18**protection degree**

protection provided by a *barrier* ([2.1.3.3.7](#))/*enclosure* ([2.1.3.3.8](#)) related to the contact with *live parts* ([2.1.2.2.1](#)) by a test probe, such as a test finger (IPXXB), a test rod (IPXXC), or a test wire (IPXXD)

Note 1 to entry: Protection degrees (e.g. IPXXB, IPXXC, or IPXXD) are defined in ISO 20653.

[SOURCE: ISO 13063:2012, 3.28]

2.1.3.4 Mass**2.1.3.4.1****complete battery-electric moped (motorcycle) kerb mass**

total unladen mass of the battery-electric moped (*motorcycle*) ([2.1.1.1](#)), including traction batteries, cooling liquid, window-washer fluid, lubricating oil, tool kit, spare wheel (if mandatory), and on-board charger and portable charger or part of it, if provided as standard equipment by the manufacturer

[SOURCE: ISO 13064-2:2012, 3.1]

2.1.3.4.2**test mass of a battery-electric vehicle**

complete battery-electric vehicle kerb mass increased by a uniform figure of 75 kg, which represents the mass of a rider

[SOURCE: ISO 13064-2:2012, 3.3]

2.1.3.4.3**maximum design total mass**

maximum vehicle mass as specified by the battery-electric moped (*motorcycle*) ([2.1.1.1](#)) manufacturer

[SOURCE: ISO 13064-2:2012, 3.2]

2.2 Electric motor and controller

2.2.1 General

2.2.1.1

electric machine

energy transducer that can transform electric energy into mechanical energy or vice versa

Note 1 to entry: The term “electric machine” is also used for synchronous compensators and torque motors.

[SOURCE: IEC 60050, 151-13-39]

2.2.1.2

(rotating) generator

rotating electric machine intended to transform mechanical energy into electric energy

[SOURCE: IEC 60050, 151-13-40]

2.2.1.3

traction motor

electric motor driving one or more axles

[SOURCE: IEC 60050, 811-12-01]

2.2.2 Types of electric motors

2.2.2.1

series motor

motor with excitation provided by a winding connected in series with the armature winding

[SOURCE: IEC 60050, 811-12-13]

2.2.2.2

shunt motor

motor with excitation provided by a winding connected in parallel with the armature winding

[SOURCE: IEC 60050, 811-12-14]

2.2.2.3

synchronous induction motor

cylindrical rotor synchronous motor with a secondary coil winding similar to that of a slip-ring induction motor which is used for both starting and excitation

[SOURCE: IEC 60050, 411-33-04]

2.2.2.4

synchronous motor

alternating current motor in which the speed of the motor is in a fixed ratio with the frequency of the current supplied

[SOURCE: IEC 60050, 811-12-24]

2.2.3 Components of controller

2.2.3.1

converter

on-board portion of the traction battery charger and traction battery controller management system that conditions the off-board electrical energy for delivery to the energy storage

2.2.3.2**electric energy converter**

device for changing one or more characteristics associated with electric energy

Note 1 to entry: Characteristics associated with energy are, for example, voltage, number of phases, and frequency including zero frequency.

[SOURCE: IEC 60050, 151-13-36]

2.2.3.3**inverter**

electric energy converter ([2.2.3.2](#)) that changes direct electric current to single-phase or polyphase alternating currents

[SOURCE: IEC 60050, 151-13-46]

2.2.3.4**rectifier**

electric energy converter ([2.2.3.2](#)) that changes single-phase or polyphase alternating electric currents to unidirectional current

[SOURCE: IEC 60050, 151-13-45]

2.2.3.5**dc/dc converter****DC/DC converter**

electronic device that conditions dc electrical energy from the on-board energy storage for use by an auxiliary system operating on direct current

2.2.4 Performance parameters**2.2.4.1****rated power**

conventional value of apparent power establishing a basis for the design of a transformer, a shunt reactor or an arc-suppression coil, the manufacturer's guarantees, and the tests determining a value of the rated current that may be carried with rated voltage applied under specified conditions

Note 1 to entry: Both windings of a two-winding transformer have the same rated power, which by definition, is the rated power of the transformer. For multi-winding transformers, the rated power for each of the windings may differ.

[SOURCE: IEC 60050, 421-04-04]

2.2.4.2**maximum output power**

maximum electrical power that can be taken from the apparatus

[SOURCE: IEC 60050, 426-11-23]

2.2.4.3**rated torque**

torque the motor develops at its shaft end at rated output and speed

[SOURCE: IEC 60050, 411-48-05]

2.2.4.4**locked-rotor torque**

smallest measured torque the motor develops at its shaft end with the rotor locked over all its angular positions at rated voltage and frequency

[SOURCE: IEC 60050, 411-48-06]

2.2.4.5

voltage control

method of speed control in which the voltage applied to the motors is varied by means of a generator, transformer, or electronic power convertor supplying a variable output voltage

[SOURCE: IEC 60050, 811-30-06]

2.2.4.6

current control

current which flows in a control winding of a transductor

[SOURCE: IEC 60050, 431-02-03]

2.2.4.7

frequency control

method of controlling motor speed enabling several speeds, or a continuous range of speeds, to be obtained by varying the supply frequency

[SOURCE: IEC 60050, 811-30-07]

2.2.4.8

motor characteristic

statement of the speed, current, torque (or tractive effort), and power output of a motor operating under various specified conditions

[SOURCE: IEC 60050, 811-13-01]

2.2.4.9

steady-state load characteristic

relation between the power absorbed by a load and the voltage or frequency at the load terminals under steady-state operating conditions

[SOURCE: IEC 60050, 603-04-14]

2.2.4.10

transient load characteristic

relation between the power absorbed by a load and the voltage or frequency under transient-state operating conditions

[SOURCE: IEC 60050, 603-04-15]

2.3 Battery

2.3.1 General

2.3.1.1

rechargeable energy storage system

RESS

system that stores energy for delivery of electric power and which is rechargeable

EXAMPLE Batteries, capacitors.

[SOURCE: ISO 6469-1:2009, 3.16]

2.3.1.2

battery

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

[SOURCE: IEC 60050, 482-01-04]

2.3.1.3**traction battery**

collection of all *battery packs* (2.3.2.1.2) that are electrically connected, for the supply of electric power to the electric drive and to the conductively connected *auxiliary electric system* (2.1.2.1.1), if any

[SOURCE: ISO 6469-3:2011, 3.29]

2.3.1.4**rated capacity**

supplier's specification of the total number of ampere hours that can be withdrawn from a fully charged *battery pack* (2.3.2.1.2) or system for a specified set of test conditions, such as discharge rate, temperature, and discharge cut-off voltage

[SOURCE: ISO 12405-1:2011, 3.12]

2.3.2 Structure and components**2.3.2.1 Structure****2.3.2.1.1****battery cell**

basic rechargeable energy storage device, consisting of electrodes, electrolyte, container, terminals, and usually separators, that is a source of electric energy obtained by direct conversion of chemical energy

[SOURCE: ISO/TR 8713:2012, 2.7]

2.3.2.1.2**battery pack**

mechanical assembly comprising *battery cells* (2.3.2.1.1) and retaining frames or trays, and possibly components for battery management

[SOURCE: ISO/TR 8713:2012, 2.10]

2.3.2.1.3**battery control unit****BCU**

electronic device that controls or manages or detects or calculates electric and thermal functions of the *battery system* (2.3.2.1.4) and that provides communication between the battery system and other vehicle controllers

[SOURCE: ISO/TR 8713:2012, 2.8]

2.3.2.1.4**battery system**

energy storage device that includes cells or cell assemblies or *battery pack(s)* (2.3.2.1.2) as well as electrical circuits and electronics

EXAMPLE BCU (2.3.2.1.3), contactors.

Note 1 to entry: Battery system components can also be distributed in different devices within the vehicle.

[SOURCE: ISO/TR 8713:2012, 2.11]

2.3.3 Specifications and performance

2.3.3.1

state of charge

SOC

available *capacity* ([2.3.3.2](#)) in a *battery pack* ([2.3.2.1.2](#)) or system

Note 1 to entry: State of charge is expressed as a percentage of *rated capacity* ([2.3.1.4](#)).

[SOURCE: ISO 12405-1:2011, 3.16]

2.3.3.2

capacity

total number of ampere-hours that can be withdrawn from a battery under specified conditions

[SOURCE: ISO/TR 8713:2012, 2.12]

2.3.3.1 Density

2.3.3.3.1

energy density

amount of stored energy related to the *battery pack* ([2.3.2.1.2](#)) or system volume

Note 1 to entry: Expressed in Wh/l.

Note 2 to entry: The *battery pack* ([2.3.2.1.2](#)) or system includes the cooling system, if any, to the point of a reversible attachment of the coolant lines or air ducts, respectively.

[SOURCE: ISO/TR 8713:2012, 2.30]

2.3.3.3.2

specific energy

amount of stored energy related to the *battery pack* ([2.3.2.1.2](#)) or system mass

Note 1 to entry: Expressed in Wh/kg.

Note 2 to entry: The battery pack or system shall include the cooling system, if any, to the point of a reversible attachment of the coolant lines or air ducts, respectively. For liquid cooled systems, the coolant mass inside the battery pack or system shall be included.

[SOURCE: ISO/TR 8713:2012, 2.66]

2.3.3.4 Efficiency

2.3.3.4.1

coulombic efficiency

Ah efficiency

efficiency of the *battery* ([2.3.1.2](#)) based on electricity (Coulomb) for a specified charge/discharge procedure, which is expressed by output electricity divided by input electricity

[SOURCE: ISO/TR 8713:2012, 2.18]

2.3.3.4.2

energy efficiency

Wh efficiency

efficiency of the *battery* ([2.3.1.2](#)) based on energy, for a specified charge/discharge procedure, which is expressed by output energy divided by input energy

[SOURCE: ISO/TR 8713:2012, 2.31]