Vägfordon – Bränslecellsdrift,
säkerhetsspecifikationer –
Del 3: Skydd för personer mot elektriska stötar
(ISO 23273-3:2006, IDT)

Fuel cell road vehicles – Safety specifications –
Part 3: Protection of persons against electric shock
(ISO 23273-3:2006, IDT)

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 23273-3 was prepared by Technical Committee ISO/TC 22, Road vehicles, Subcommittee SC 21, Electrically propelled road vehicles.

ISO 23273 consists of the following parts, under the general title Fuel cell road vehicles — Safety specifications:

— Part 1: Vehicle functional safety
— Part 2: Protection against hydrogen hazards for vehicles fuelled with compressed hydrogen
— Part 3: Protection of persons against electric shock
Fuel cell road vehicles — Safety specifications —

Part 3:
Protection of persons against electric shock

1 Scope

This part of ISO 23273 specifies the essential requirements of fuel cell vehicles (FCV) for the protection of persons and the environment inside and outside the vehicles against electric shock.

It applies only to on-board electric circuits with working voltages between 25 V a.c. and 1 000 V a.c., or 60 V d.c. and 1 500 V d.c. respectively (for details on voltage class B, see Clause 5).

This International Standard does not apply to:
— FCV connected to an external electric power supply;
— component protection; or
— manufacturing, maintenance and repair.

2 Normative references

The following referenced documents are indispensable for the application 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 3864-2, Graphical symbols — Safety colours and safety signs — Part 2: Design principles for product safety labels

ISO 6469-1, Electric road vehicles — Safety specifications — Part 1: On-board electrical energy storage

ISO 20653, Road vehicles — Degree of protection (IP-Code) — Protection of electrical equipment against foreign objects, water and access


IEC 60417, Graphical symbols used on equipment — Annex K

IEC 60479-1, Effects of current on human beings and livestock — Part 1: General aspects

IEC 60664-1, Insulation coordination for equipment within low-voltage systems — Part 1: Principles, requirements and tests
3 Terms and definitions

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

3.1 air processing system
system that processes (e.g. that filters, meters, conditions and pressurizes) the incoming air for the fuel cell system

3.2 auxiliary electric circuit
electrical circuit supplying vehicle functions other than for propulsion, such as lamps, windshield wiper motors and radios

3.3 balance of fuel cell power system
remaining portion of the electric circuit of the fuel cell power system when the power sources (i.e. fuel cell stacks, batteries, etc.) are disconnected

3.4 barrier
part providing protection against direct contact from any usual direction of access

3.5 basic insulation
insulation applied to live parts for protection against direct contact under fault-free conditions

NOTE Basic insulation does not necessarily include insulation used exclusively for functional purposes.

3.6 basic protection
protection against direct contact with live parts under fault-free conditions

3.7 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

3.8 battery pack
single mechanical assembly comprising battery cells and retaining frames or trays and possibly components for battery management

3.9 chassis-bonded
electric connection of one point of an electric circuit with the electric chassis

3.10 conductive part
part capable of conducting electric current

3.11 direct contact
contact of persons with live parts

3.12 double insulation
insulation comprising both basic insulation and supplementary insulation

3.13 electric chassis
conductive mechanical structure of the vehicle including all associated electric and electronic components, whose parts are electrically connected and whose potential is taken as reference
3.14 electric circuit
collection of connected devices through which electric current is intended to flow

3.15 dc/dc converter
set of equipment for the conversion of direct current of one voltage to direct current of another voltage and/or for isolating purposes

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

3.17 enclosure
part providing protection of equipment against certain external influences and against direct contact from any direction
NOTE External influences can include the ingress of dust or water, prevention of mechanical damage.

3.18 exposed conductive part
conductive part that can be touched by a test probe according to a protection degree as specified in ISO 20653

3.19 fuel cell
electrochemical device that generates electricity by the conversion of fuel and an oxidant without any physical or chemical consumption of the electrodes or electrolyte

3.20 fuel cell power system
combination of the fuel cell system, dc/dc converter(s), power unit and RESS, if any

3.21 fuel cell stack
assembly of two or more fuel cells, which are electrically connected

3.22 fuel cell system
system, typically containing the following subsystems: fuel cell stack, air processing system, fuel processing system, thermal management, water management, and their control system

3.23 fuel cell vehicle
FCV
vehicle that receives propulsion power from an on-board fuel cell power system
NOTE The general term FCV includes also vehicles with an additional other source of propulsion power.

3.24 fuel processing system
system that converts (if necessary), and/or conditions the fuel as stored in the on-board fuel storage into fuel suitable for operation in the fuel cell stack

3.25 insulation resistance monitoring system
system, which periodically or continuously monitors the insulation resistance between live parts and the electric chassis
3.26 live part
conductor or conductive part intended to be electrically energized in normal use

NOTE “electrically energized” means such conductor or conductive part can have an electric potential against the electric chassis.

3.27 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 manufacturer’s specifications, disregarding transients

3.28 potential equalization
electric connection of exposed conductive parts of the electric equipment to minimize differences in potential

3.29 protection degree
protection provided by a barrier/enclosure related to the contact with live parts by a test probe, such as a test finger (IPXXB), a test rod (IPXXC) or a test wire (IPXXD), as defined in ISO 20653

3.30 power unit
combination of electric motor, associated power electronics, and their associated controls for the purpose of vehicle propulsion

3.31 rechargeable energy storage system
RESS
system that stores energy and is rechargeable by on board and/or external energy sources and associated controls, if any

EXAMPLES These include batteries, capacitors and electromechanical flywheels.

3.32 reinforced insulation
insulation of live parts for protection against electric shock equivalent to double insulation

NOTE Reinforced insulation does not imply that the insulation must be a homogeneous piece. The reinforced insulation may comprise several layers which cannot be tested individually as supplementary or basic insulation.

3.33 supplementary insulation
independent insulation applied in addition to basic insulation for protection against electric shock in the event of a failure of the basic insulation

3.34 traction battery
collection of all battery packs, which are electrically connected for the supply of energy to the power unit and possibly auxiliary systems

3.35 voltage class A electric circuit
electric circuit with a maximum working voltage of \( \leq 25 \text{ V a.c.} \) or \( \leq 60 \text{ V d.c.} \) respectively

3.36 voltage class B electric circuit
electric circuit with a maximum working voltage of \( (> 25 \text{ and } \leq 1 000) \text{ V a.c.} \) or \( (> 60 \text{ and } \leq 1 500) \text{ V d.c.} \) respectively