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**Hydrogen generators using water  
electrolysis process —**

**Part 2:  
Residential applications**

*Générateurs d'hydrogène utilisant le procédé d'électrolyse de l'eau —  
Partie 2: Applications résidentielles*



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ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

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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 22734-2 was prepared by Technical Committee ISO/TC 197, *Hydrogen technologies*.

ISO 22734 consists of the following parts, under the general title *Hydrogen generators using water electrolysis process*:

- *Part 1: Industrial and commercial applications*
- *Part 2: Residential applications*

## Introduction

The technology in this part of ISO 22734 is as follows.

In a hydrogen generator cell, electricity causes dissociation of water into hydrogen and oxygen molecules. An electric current is passed between two electrodes separated by a conductive electrolyte or “ion transport medium”, producing hydrogen at the negative electrode (cathode) and oxygen at the positive electrode (anode). As water is  $H_2O$ , twice the volume of hydrogen is produced compared with oxygen.

Hydrogen gas produced using electrolysis technology can be utilized immediately or stored for later use.

The cell(s), and electrical, gas processing, ventilation, cooling, monitoring equipment and controls are contained within an enclosure. Gas compression and feed water conditioning and auxiliary equipment may also be included.

# Hydrogen generators using water electrolysis process —

## Part 2: Residential applications

### 1 Scope

This part of ISO 22734 defines the construction, safety and performance requirements of packaged hydrogen gas generation appliances, herein referred to as hydrogen generators, using electrochemical reactions to electrolyse water to produce hydrogen.

This part of ISO 22734 is applicable to hydrogen generators that use the following types of ion transport medium:

- group of aqueous bases;
- solid polymeric materials with acidic function group additions, such as acid proton exchange membrane (PEM).

This part of ISO 22734 is applicable to hydrogen generators intended for indoor and outdoor residential use in sheltered areas, such as car-ports, garages, utility rooms and similar areas of a residence. This part of ISO 22734 includes cord-connected equipment for outdoor and garage use only.

Portable generators as well as hydrogen generators that can also be used to generate electricity, such as reversible fuel cells, are excluded from the scope of this part of ISO 22734.

Hydrogen generators that also supply oxygen as a product are excluded from the scope of this part of ISO 22734.

This part of ISO 22734 is intended to be used for certification purposes.

### 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 1182, *Reaction to fire tests for products — Non-combustibility test*

ISO 3746, *Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Survey method using an enveloping measurement surface over a reflecting plane*

ISO 3864-2, *Graphical symbols — Safety colours and safety signs — Part 2: Design principles for product safety labels*

ISO 4126-1, *Safety devices for protection against excessive pressure — Part 1: Safety valves*

ISO 4126-2, *Safety devices for protection against excessive pressure — Part 2: Bursting disc safety devices*

ISO 4126-6, *Safety devices for protection against excessive pressure — Part 6: Application, selection and installation of bursting disc safety devices*

ISO 7000, *Graphical symbols for use on equipment — Index and synopsis*

ISO 7010, *Graphical symbols — Safety colours and safety signs — Registered safety signs*

ISO 7866, *Gas cylinders — Refillable seamless aluminium alloy gas cylinders — Design, construction and testing*

ISO 9300, *Measurement of gas flow by means of critical flow Venturi nozzles*

ISO 9951, *Measurement of gas flow in closed conduits — Turbine meters*

ISO 9614-1, *Acoustics — Determination of sound power levels of noise sources using sound intensity — Part 1: Measurement at discrete points*

ISO 9809-1, *Gas cylinders — Refillable seamless steel gas cylinders — Design, construction and testing — Part 1: Quenched and tempered steel cylinders with tensile strength less than 1 100 MPa*

ISO 10286, *Gas cylinders — Terminology*

ISO 10790, *Measurement of fluid flow in closed conduits — Guidance to the selection, installation and use of Coriolis meters (mass flow, density and volume flow measurements)*

ISO 11119-1, *Gas cylinders of composite construction — Specification and test methods — Part 1: Hoop wrapped composite gas cylinders and tubes*

ISO 11119-2, *Gas cylinders of composite construction — Specification and test methods — Part 2: Fully wrapped fibre reinforced composite gas cylinders with load-sharing metal liners*

ISO 11119-3, *Gas cylinders of composite construction — Specification and test methods — Part 3: Fully wrapped fibre reinforced composite gas cylinders and tubes with non-metallic and non-load-sharing metal liners*

ISO 12100, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

ISO 12499, *Industrial fans — Mechanical safety of fans — Guarding*

ISO 13709, *Centrifugal pumps for petroleum, petrochemical and natural gas industries*

ISO 13850, *Safety of machinery — Emergency stop — Principles for design*

ISO 13854, *Safety of machinery — Minimum gaps to avoid crushing of parts of the human body*

ISO 13857, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs*

ISO 14511, *Measurement of fluid flow in closed conduits — Thermal mass flowmeters*

ISO 14687 (all parts), *Hydrogen fuel — Product specification*

ISO 14847, *Rotary positive displacement pumps — Technical requirements*

ISO 15534-1, *Ergonomic design for the safety of machinery — Part 1: Principles for determining the dimensions required for openings for whole-body access into machinery*

ISO 15534-2, *Ergonomic design for the safety of machinery — Part 2: Principles for determining the dimensions required for access openings*

ISO 15649, *Petroleum and natural gas industries — Piping*

ISO/TR 15916, *Basic considerations for the safety of hydrogen systems*

ISO 16111, *Transportable gas storage devices — Hydrogen absorbed in reversible metal hydride*

ISO 16528-1, *Boilers and pressure vessels — Performance requirements*

ISO 17398, *Safety colours and safety signs — Classification, performance and durability of safety signs*



ISO 22734-1, *Hydrogen generators using water electrolysis process — Part 1: Industrial and commercial applications*

ISO 26142, *Hydrogen detection apparatus — Stationary applications*

IEC 60034-1, *Rotating electrical machines — Part 1: Rating and performance*

IEC 60068-2-18:2010, *Environmental Testing — Part 2-18: Tests — Test R and Guidance: Water*

IEC 60079-0, *Explosive atmospheres — Part 0: Equipment — General requirements*

IEC 60079-2:2007, *Explosive atmospheres — Part 2: Equipment protection by pressurized enclosures “p”*

IEC 60079-10-1, *Explosive atmospheres — Part 10-1: Classification of areas — Explosive gas atmospheres*

IEC 60079-29-2, *Explosive atmospheres — Part 29-2: Gas detectors — Selection, installation, use and maintenance of detectors for flammable gases and oxygen*

IEC 60079-30-1, *Explosive atmospheres — Part 30-1: Electrical resistance trace heating — General and testing requirements*

IEC 60146 (all parts), *Semiconductor converters*

IEC 60204-1:2005, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*

IEC/TR 60269-5, *Low-voltage fuses — Part 5: Guidance for the application of low-voltage fuses*

IEC 60335-1:2010, *Household and similar electrical appliances — Safety — Part 1: General requirements*

IEC 60335-2-41, *Household and similar electrical appliances — Safety — Part 2-41: Particular requirements for pumps*

IEC 60335-2-51, *Household and similar electrical appliances — Safety — Part 2-51: Particular requirements for stationary circulation pumps for heating and service water installations*

IEC 60335-2-80, *Household and similar electrical appliances — Safety — Part 2-80: Particular requirements for fans*

IEC 60364-4-43, *Low-voltage electrical installations — Part 4-43: Protection for safety — Protection against overcurrent*

IEC 60364-6:2006, *Low-voltage electrical installations — Part 6: Verification*

IEC 60417, *Graphical symbols for use on equipment*

IEC 60439-1, *Low-voltage switchgear and controlgear assemblies — Part 1: Type-tested and partially type-tested assemblies*

IEC 60439-2, *Low-voltage switchgear and controlgear assemblies — Part 2: Particular requirements for busbar trunking systems (busways)*

IEC 60439-3, *Low-voltage switchgear and controlgear assemblies — Part 3: Particular requirements for low-voltage switchgear and controlgear assemblies intended to be installed in places where unskilled persons have access for their use — Distribution boards*

IEC 60439-5, *Low-voltage switchgear and controlgear assemblies — Part 5: Particular requirements for assemblies for power distribution in public networks*

IEC 60445, *Basic and safety principles for man-machine interface, marking and identification — Identification of equipment terminals, conductor terminations and conductors*

IEC 60364-6:2006, *Low-voltage electrical installations — Part 6: Verification*

IEC 60529, *Degrees of protection provided by enclosures (IP Codes)*

IEC 60534 (all parts), *Industrial-process control valves*

IEC 60695-11-10, *Fire hazard testing — Part 11-10: Test flames — 50 W horizontal and vertical flame test methods*

IEC 60695-11-20, *Fire hazard testing — Part 11-20: Test flames — 500 W Flame test methods*

IEC 60730-1:2010, *Automatic electrical controls for household and similar use — Part 1: General requirements*

IEC 60747 (all parts), *Semiconductor devices — Discrete devices*

IEC/TR 60877, *Procedures for ensuring the cleanliness of industrial-process measurement and control equipment in oxygen service*

IEC 60947-2, *Low-voltage switchgear and controlgear — Part 2: Circuit-breakers*

IEC 60947-3, *Low-voltage switchgear and controlgear — Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units*

IEC 60947-4-1, *Low-voltage switchgear and controlgear — Part 4-1: Contactors and motor-starters — Electromechanical contactors and motor-starters*

IEC 60947-4-2, *Low-voltage switchgear and controlgear — Part 4-2: Contactors and motor-starters — AC semiconductor motor controllers and starters*

IEC 60947-4-3, *Low-voltage switchgear and controlgear — Part 4-3: Contactors and motor-starters — AC semiconductor controllers and contactors for non-motor loads*

IEC 60947-5-1, *Low-voltage switchgear and controlgear — Part 5-1: Control circuit devices and switching elements — Electromechanical control circuit devices*

IEC 60947-5-2, *Low-voltage switchgear and controlgear — Part 5-2: Control circuit devices and switching elements — Proximity switches*

IEC 60947-5-3, *Low-voltage switchgear and controlgear — Part 5-3: Control circuit devices and switching elements — Requirements for proximity devices with defined behaviour under fault conditions*

IEC 60947-5-5, *Low-voltage switchgear and controlgear — Part 5-5: Control circuit devices and switching elements — Electrical emergency stop device with mechanical latching function*

IEC 60947-6-1, *Low-voltage switchgear and controlgear — Part 6-1: Multiple function equipment — Transfer switching equipment*

IEC 60947-6-2, *Low-voltage switchgear and controlgear — Part 6-2: Multiple function equipment — Control and protective switching devices (or equipment)*

IEC 60947-7-1, *Low-voltage switchgear and controlgear — Part 7-1: Ancillary equipment — Terminal blocks for copper conductors*

IEC 60947-7-2, *Low-voltage switchgear and controlgear — Part 7-2: Ancillary equipment — Protective conductor terminal blocks for copper conductors*

IEC 60950-1:2005, *Information technology equipment — Safety — Part 1: General requirements*

IEC 61000 (applicable parts), *Electromagnetic compatibility (EMC)*

IEC 61010-1:2010, *Safety requirements for electrical equipment for measurement, control, and laboratory use — Part 1: General requirements*

IEC 61069-7, *Industrial-process measurement and control — Evaluation of system properties for the purpose of system assessment — Part 7: Assessment of system safety*

IEC 61131-1, *Programmable controllers — Part 1: General information*

IEC 61131-2, *Programmable controllers — Part 2: Equipment requirements and tests*

IEC 61204-1, *Low-Voltage Power Supply Devices, D.C. Output — Part 1: Performance Characteristics*

IEC 61508, *Functional safety of electrical/electronic/programmable electronic safety-related systems*

IEC 61511-1, *Functional safety: Safety instrumented systems for the process industry sector — Part 1: Framework, definitions, system, hardware and software requirements*

IEC 61558-1, *Safety of power transformers, power supplies, reactors and similar products — Part 1: General requirements and tests*

IEC 61558-2-17, *Safety of power transformers, power supply units and similar — Part 2-17: Particular requirements for transformers for switch mode power supplies*

IEC 61672-1, *Electroacoustics — Sound level meters — Part 1: Specifications*

IEC 61672-2, *Electroacoustics — Sound level meters — Part 2: Pattern evaluation tests*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 22734-1 and the following apply.

#### 3.1

##### **accessible part**

part or surface that can be touched by means of test probe B of IEC 61032, and if the part or surface is made of metal, any conductive part connected to it

#### 3.2

##### **all-pole disconnection**

disconnection of all supply conductors by a single initiating action

NOTE For three-phase hydrogen generators, the neutral conductor is not considered to be a supply conductor.

#### 3.3

##### **built-in hydrogen generator**

fixed hydrogen generator intended to be installed in a cabinet, in a prepared recess in a wall or in a similar location

#### 3.4

##### **fixed hydrogen generator**

hydrogen generator that is intended to be used while fastened to a support or while secured in a specific location

NOTE Adhesives are not recognized as a means for fastening a fixed hydrogen generator to a support.

#### 3.5

##### **hazard**

potential source of harm

#### 3.6

##### **mechanical ventilation**

replacement of air inside an enclosure with fresh air accomplished by a mechanical device (such as a fan) to prevent or eliminate hazardous concentrations of hydrogen

#### 3.7

##### **natural ventilation**

replacement of air inside an enclosure with fresh air accomplished exclusively by a natural draft caused, for example, by the effects of wind, temperature gradients or buoyancy effects, to prevent or eliminate hazardous concentrations of hydrogen