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Hydrogen generators using water electrolysis - Part 1: Safety (ISO 22734-1:2025)

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This standard includes the English version of the European Standard.

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EN ISO 22734-1

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ICS 71.100.20; 71.120.99

English version

Hydrogen generators using water electrolysis - Part 1: Safety (ISO 22734-1:2025)

Générateurs d'hydrogène utilisant le procédé d'électrolyse de l'eau - Partie 1: Sécurité (ISO 22734-1:2025)

Wasserstofferzeuger auf Grundlage der Elektrolyse von Wasser - Teil 1: Sicherheitsanforderungen (ISO 22734-1:2025)

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CEN-CENELEC Management Centre:
Rue de la Science 23, B-1040 Brussels

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European foreword

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This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2026, and conflicting national standards shall be withdrawn at the latest by January 2026.

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International Standard

ISO 22734-1

Hydrogen generators using water electrolysis —

Part 1: Safety

Générateurs d'hydrogène utilisant le procédé d'électrolyse de l'eau —

Partie 1: Sécurité

First edition
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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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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 document 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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This document was prepared by Technical Committee ISO/TC 197, *Hydrogen technologies,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/CLC/JTC 6, *Hydrogen in energy systems*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This first edition of ISO 22734-1 cancels and replaces ISO 22734:2019.

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Introduction

The electrochemical cells of a hydrogen generator system dissociate water molecules (H_2O) into two hydrogen (H_2) gas molecules and one oxygen (O_2) gas molecule when direct electrical current (e-) is applied. H_2 gas forms at the negative (-) cathode electrode and O_2 gas forms at the positive (+) anode electrode. An ion transport medium between the electrodes, a solid electrolyte membrane or a liquid electrolyte held in a microporous diaphragm, additionally functions to keep product H_2 and O_2 gases separate.

Water electrolysis hydrogen generator systems include the cell(s), electrical conditioning, gas processing, feed water, electrolyte management, cooling, ventilation, and control equipment. Gas compression, feed water conditioning, and other auxiliary equipment can be included. These systems can scale from small self-contained appliances to a group of factory-matched modules comprising large plant size installations.

This document is intended to assess water electrolysis hydrogen generator safety and may be used for certification purposes.

NOTE See ISO/IEC 17000 for further guidance on certification.

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International Standard **ISO 22734-1:2025(en)**

Hydrogen generators using water electrolysis —

Part 1: Safety

1 Scope

1.1 General

This document specifies the safety requirements of hydrogen gas generation appliances or systems that use electrochemical reactions to electrolyse water to produce hydrogen, herein referred to as hydrogen generators.

1.2 Applicable hydrogen generators

This document is applicable to:

— hydrogen generator appliances or systems (containerised, or skid mounted, complete hydrogen generation systems);

— factory-matched modules (supplied by the same manufacturer) that, when connected together, form a complete hydrogen generation system;

— hydrogen generators intended for industrial, commercial and residential applications;

— hydrogen generators intended for indoor or outdoor environments.

NOTE When this document is applied to hydrogen gas generation appliances or systems intended for installation into buildings, additional requirements for the design of the building are likely to apply. These building requirements are not addressed in this document. Additionally, the hydrogen generator enclosure requirements in this document do not necessarily translate to requirements for a building.

Guidance for hydrogen generators that also provide oxygen used for industrial and commercial applications is provided in this document, however additional considerations can apply.

1.3 Applicable ion transport mediums

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

— aqueous alkaline (basic) electrolytes, such as solutions of potassium hydroxide or sodium hydroxide;

— aqueous acidic electrolytes, such as dilute sulphuric acid;

— solid polymeric materials with acidic function group additions, such as acid proton exchange membrane (PEM);

— solid polymeric materials with basic function group additions, such as anion exchange membrane (AEM).

1.4 Applicability to large scale hydrogen generators

This document is applicable to large scale hydrogen generators assembled on site.

NOTE 1 Large scale water electrolysis systems typically have a production rate of 100 kg/hour or more and can be assembled using modules or equipment from various manufacturers.

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NOTE 2 Building requirements are not addressed in this document and the hydrogen generator enclosure requirements in this document do not necessarily translate to requirements for a building.

1.5 Applicability to certain hydrogen generator subassemblies

This document is applicable to:

— electrochemical cell stacks (as stand-alone products);

— modules (sub-systems) for integration into larger hydrogen generation systems.

In such cases, the entirety of this document will not be applicable, and the specific sections relevant to the product are established in order to develop a product conformance strategy.

1.6 Excluded hydrogen generators

This document is not applicable to the following:

— residential hydrogen generators that also supply oxygen as a product;

— hydrogen generators that can also be used to generate electricity, such as reversible fuel cells (refer to IEC 62282-8-101, IEC 62282-8-102 and IEC 62282-8-201);

— hydrogen generators that use solid oxide electrolyte (refer to IEC 62282-8-101 and IEC 62282-8-201).

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 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 4126-9, *Safety devices for protection against excessive pressure — Part 9: Application and installation of safety devices excluding stand-alone bursting disc safety devices*

ISO 4126-10, *Safety devices for protection against excessive pressure — Part 10: Sizing of safety valves and bursting discs for gas/liquid two-phase flow*

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

ISO 10286, *Gas cylinders — Terminology*

ISO 11119-1, *Gas cylinders — Design, construction and testing of refillable composite gas cylinders and tubes — Part 1: Hoop wrapped fibre reinforced composite gas cylinders and tubes up to 450 l*

ISO 11119-2, *Gas cylinders — Design, construction and testing of refillable composite gas cylinders and tubes — Part 2: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 l with load-sharing metal liners*

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ISO 11119-3, *Gas cylinders — Design, construction and testing of refillable composite gas cylinders and tubes — Part 3: Fully wrapped fibre reinforced composite gas cylinders and tubes up to 450 l with non-load-sharing metallic or non-metallic liners or without liners*

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

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

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 15534-3, *Ergonomic design for the safety of machinery — Part 3: Anthropometric data*

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

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

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

ISO 20485, *Non-destructive testing — Leak testing — Tracer gas method*

ISO 26142, *Hydrogen detection apparatus — Stationary applications*

ISO 80079-36, *Explosive atmospheres — Part 36: Non-electrical equipment for explosive atmospheres — Basic method and requirements*

ISO 80079-37, *Explosive atmospheres — Part 37: Non-electrical equipment for explosive atmospheres — Non-electrical type of protection constructional safety ''c'', control of ignition sources ''b'', liquid immersion ''k''*

IEC 31010:2019, *Risk management — Risk assessment techniques*

IEC 60068-2-18:2017, *Environmental testing — Part 2-18: Tests — Test R and guidance: Water*

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

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

IEC 60079-14, *Explosive atmospheres - Part 14: Electrical installations design, selection and erection*

IEC 60079-17, *Explosive atmospheres - Part 17: Electrical installations inspection and maintenance*

IEC 60079-29-1, *Explosive atmospheres - Part 29-1: Gas detectors. Performance requirements of detectors for flammable gases*

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

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

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

IEC 60335-1:2020, *Household and similar electrical appliances — Safety — Part 1: General requirements*

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

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

IEC 60730-1:2022, *Automatic electrical controls — Part 1: General requirements*

IEC 60947-1, *Low-voltage switchgear and controlgear — Part 1: General rules*

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IEC 60998-2-2, *Connecting devices for low-voltage circuits for household and similar purposes — Part 2-2: Particular requirements for connecting devices as separate entities with screwless-type clamping units*

IEC 60999-1, *Connecting devices — Electrical copper conductors — Safety requirements for screw-type and screwless-type clamping units — Part 1: General requirements and particular requirements for clamping units for conductors from 0,2 mm2 up to 35 mm2 (included)*

IEC 60999-2, *Connecting devices — Electrical copper conductors — Safety requirements for screw-type and screwless-type clamping units — Part 2: Particular requirements for clamping units for conductors above 35 mm2 up to 300 mm2 (included)*

IEC 61010-1:2010/AMD1:2016, *Safety requirements for electrical equipment for measurement, control, and laboratory use — Part 1: General requirements*

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

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

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

IEC 62368-1, *Audio/video, information and communication technology equipment — Part 1: Safety requirements*

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