# Hydrogen standards release summary NOV 2021


## AS 16110.1:2020, *Hydrogen generators using fuel processing technologies, Part 1: Safety (ISO 16110-1:2007, MOD)*

HYDROGEN PRODUCTION

**OBJECTIVES** Aims to cover significant hazards, hazardous situations and events relevant to hydrogen generators when they are used as intended, with the exception of those associated with environmental compatibility (installation conditions).

**USE CASES** Applicable to stationary hydrogen generators intended for indoor and outdoor commercial, industrial, light industrial and residential use.

It applies to packaged, self-contained or factory matched hydrogen generation systems with a capacity of less than 400 $m^3/h$ (at stp) that convert a feedstock to a hydrogen-rich stream of composition and conditions suitable for the type of device using the hydrogen (e.g. a fuel cell power system or a hydrogen compression, storage and delivery system). Feedstocks includes natural gas and other methane rich gases, fuels derived from oils and alcohols and a number of others.

Potential application could be small scale generation (nominally <850 kg/day) using natural gas for a direct source or gas network, or biogas feed to generate $H_2$ for use.

## AS ISO 16110.2:2020, *Hydrogen generators using fuel processing technologies, Part 2: Test methods for performance*

HYDROGEN PRODUCTION

**OBJECTIVES** Describes how to measure and document the performance of stationary hydrogen generators for residential, commercial and industrial applications.

**USE CASES** Applicable to stationary hydrogen generators intended for indoor and outdoor commercial, industrial, light industrial and residential use and is the companion to AS ISO 16110.1.

The standards provides prescriptive requirements for measurement techniques, test plans, test procedures, calculations and test reports for hydrogen generators. As hydrogen generator systems may vary depending on conversion processes, this standard provides a baseline to enable hydrogen generator systems to be equally compared for performance.

## AS ISO 14687:2020, *Hydrogen fuel quality – Product specification*

HYDROGEN PRODUCTION & USE

**OBJECTIVES** Specifies the minimum quality characteristics of hydrogen fuel for utilisation in vehicular and stationary applications.

**USE CASES** Depending on the end-use application, the quality of hydrogen required will vary. For example, use in fuel cells (stationary and mobile) requires a high purity of hydrogen with very low contaminants to avoid catalyst poisoning or mechanical damage, whereas for combustion applications the minimum requirements are not as severe. This standard identifies a number of end-uses for each grade and provides industry agreed minimum quality requirements.

It is expected that this standard will provide the quality basis from a technical, safety and commercial perspective for hydrogen systems in Australia (similar to AS 4564:2020, *General-purpose natural gas*).

## AS 22734:2020, *Hydrogen generators using water electrolysis – Industrial, commercial, and residential applications (ISO 22734:2019, MOD)*

HYDROGEN PRODUCTION

**OBJECTIVES** Defines the construction, safety and performance requirements of packaged or factory matched hydrogen gas generation appliances, using electrochemical reactions to electrolyser water to produce hydrogen and oxygen gas.

**USE CASES** Applicable for both Alkaline and Proton Exchange Membrane (PEM) electrolyser stacks and packages. It provides details on the mechanical and electrical design and installation requirements as well as advice on package control system and test methods.

This standard will be important for Australia to provide a set of minimum requirements when comparing electrolysers for equipment selection and project planning for installation.

## SA TS 19883:2020, *Safety of pressure swing adsorption systems for hydrogen separation and purification (ISO/TS 19883:2017, MOD)*

HYDROGEN PRODUCTION

**OBJECTIVES** Defines safety measures and applicable design features for the design, commissioning and operation of pressure swing absorption systems for hydrogen separation and purification.

**USE CASES** Applies to hydrogen pressure swing absorptions (PSA) systems, stationary and skid-mounted, that are used to separate and purify hydrogen post hydrogen generation. The PSA systems can be used downstream of any hydrogen generation technology.

Sets out the general hazardous associated with PSA systems, safety requirements in the field and specifications of equipment and piping. It also provides examples system diagrams and locations of safety critical devices e.g. relief valves.

The use of PSA systems for hydrogen purification is anticipated in Australia to enable supply of hydrogen to the required quality for end use.

## AS ISO 16111:2020, *Transportable gas storage devices – Hydrogen absorbed in reversible metal hydride*

HYDROGEN STORAGE

**OBJECTIVES** Defines the requirements for material, design, construction and testing of metal hydride transportable hydrogen gas storage systems. Excludes use as an on-board fuel storage solution for hydrogen-fuelled vehicles.

**USE CASES** New and improved hydrogen storage techniques are required for hydrogen gas. Absorption of hydrogen onto alloys means hydrogen can be transported in a solid form at a high density and later released. Metal hydride assemblies could be used as fuel cell cartridges; fuel storage contained and storage/release of high-purity hydrogen supplies for niche applications.

## AS ISO 19881:2020, *Gaseous hydrogen – Land vehicle fuel containers*

HYDROGEN MOBILITY

**OBJECTIVES** Specifies the requirements for material, design, manufacture and testing of serially produced, refillable, permanently attached containers intended for the storage of fuel cell grade compressed hydrogen gas for land vehicle operation.

**USE CASES** The standard supports the implementation of hydrogen-powered land vehicles through delivery of performance-based testing requirements for fuel containers and is one of a suite of standards needed to enable successful commercialisation of hydrogen land vehicle technologies. Standardisation of vehicle fuel system components supports the evolving market for hydrogen powered vehicles.

## AS 19880.3:2020, *Gaseous hydrogen – Fuelling stations, Part 3: Valves (ISO 19880-3:2018, MOD)*

HYDROGEN MOBILITY

**OBJECTIVES** This standard specifies the requirements and test methods for the safe performance of high pressure gas vales used in hydrogen refuelling stations up to H70 designation.

**USE CASES** Hydrogen infrastructure for fuelling hydrogen vehicles is essential. The development of safety standards for fuelling stations and components supports safe operations of these stations. Valves are a critical component as the control the flow and shut it down in an emergency.

Hydrogen fuelling station infrastructure is already deployed in Australia as part of a number of projects with several new projects also planning stations.

Part of a broader suite covering hydrogen fuelling station requirements. Assessment for adoption for other parts of the ISO 19880 suite for fuel stations is underway.

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## SA TR 15916, *Basic considerations for the safety of hydrogen system*

GENERAL HYDROGEN SAFETY

**OBJECTIVES** Provides those unfamiliar with the technology for hydrogen energy applications a basis on which to understand the safety issues. This Technical Report concerns itself with applications that derive their utility from the chemical reactions of hydrogen and does not apply to applications based on nuclear processes.

**USE CASES** This technical report is the logical starting point for any hydrogen system to be designed, installed or operated in Australia.

It applies to both liquid and gaseous hydrogen and provides peer reviewed background information, properties of hydrogen, safety issues and references to other applicable standards.

## AS 62282.3.100, *Fuel cell technologies, Part 3.100: Stationary fuel cell power systems - Safety*

FUEL CELL TECHNOLOGIES

**OBJECTIVES** This standard for fuel cell power systems contemplates all significant hazards, hazardous situations and events, with the exception of those associated with environmental compatibility (installation conditions) . This document deals with conditions that pose hazards to persons, as well as damage to the exterior of the fuel cell power system but does not address protection against damage to fuel cell power system internals, unless it leads to hazards outside the fuel cell power system.

**USE CASES** This document is applicable to stationary fuel cell power systems intended for indoor and outdoor commercial, industrial and residential use in non-hazardous areas. It applies to that stationary packaged, self-contained fuel cell power systems or fuel cell power systems comprised of factory matched packages of integrated systems which generate electricity through electrochemical reactions.

Note that this is a modified adoption of the IEC 62282.3.100:2019 standards, and referenced standards have been replaced with equivilent Australian and/or Australia/New Zealand Standards.

## AS 62282.3.300, *Fuel cell technologies, Part 3.300: Stationary fuel cell power systems - Installation*

FUEL CELL TECHNOLOGIES

**OBJECTIVES** This document provides the minimum safety requirements for the installation of indoor and outdoor stationary fuel cell power systems in compliance with AS 62282.3.100

**USE CASES** This document applies to the to installation of fuel cell systems intended for electrical connection to mains directly or with a readily accessible, manually
operable switch or circuit-breaker;
– intended for a stand-alone power distribution system;
– intended to provide AC or DC power;
– with or without the ability to recover useful heat.

## AS 26142, *Hydrogen detection apparatus – stationary applications*

GENERAL HYDROGEN SAFETY

**OBJECTIVES** The document defines the general requirements of gas detection used in hydrogen service inlcuding performance requirements and test methods of hydrogen detection apparatus that is designed to measure and monitor hydrogen concentrations in stationary applications.

**USE CASES** This standard will be used in Australia to provide a set of minimum requirements for gas detection devices that are installed in stationary hydrogen systems.

## AS ISO 19880.8 & Amendment 1, *Gaseous hydrogen — Fuelling stations, Part 8: Fuel quality control*

MOBILITY

**OBJECTIVES** The objective of this document is to specify the protocol for ensuring the quality of the gaseous hydrogen at hydrogen distribution facilities and hydrogen fuelling stations for proton exchange membrane (PEM) fuel cells for road vehicles.

**USE CASES** The document discusses hydrogen quality control approaches for routine and non-routine conditions, as well as quality assurance plans. It is based upon best practices and experience from the gaseous fuels and automotive industry and wil be used in mobility applications.

There has been an amendment published for this standard that Australia is in the process of adopting”

## AS ISO 19880.5, *Gaseous hydrogen - Fuelling stations, Part 5: Dispenser hoses and hose assemblies*

MOBILITY

**OBJECTIVES** This document specifies the requirements for wire or textile reinforced hoses and hose assemblies for dispensing hydrogen up to 70 MPa nominal working pressure, in the operating temperature range of –40 °C to 65 °C. It also contains safety requirements for hoses and hose assemblies used in hydrogen fuelling stations, yet excludes those used in vehicle high pressure on-board fuel storage systems and low pressure fuel delivery systems, and flexible metal hoses.

**USE CASES** This standard will be used for hydrogen refuelling stations in Australia.