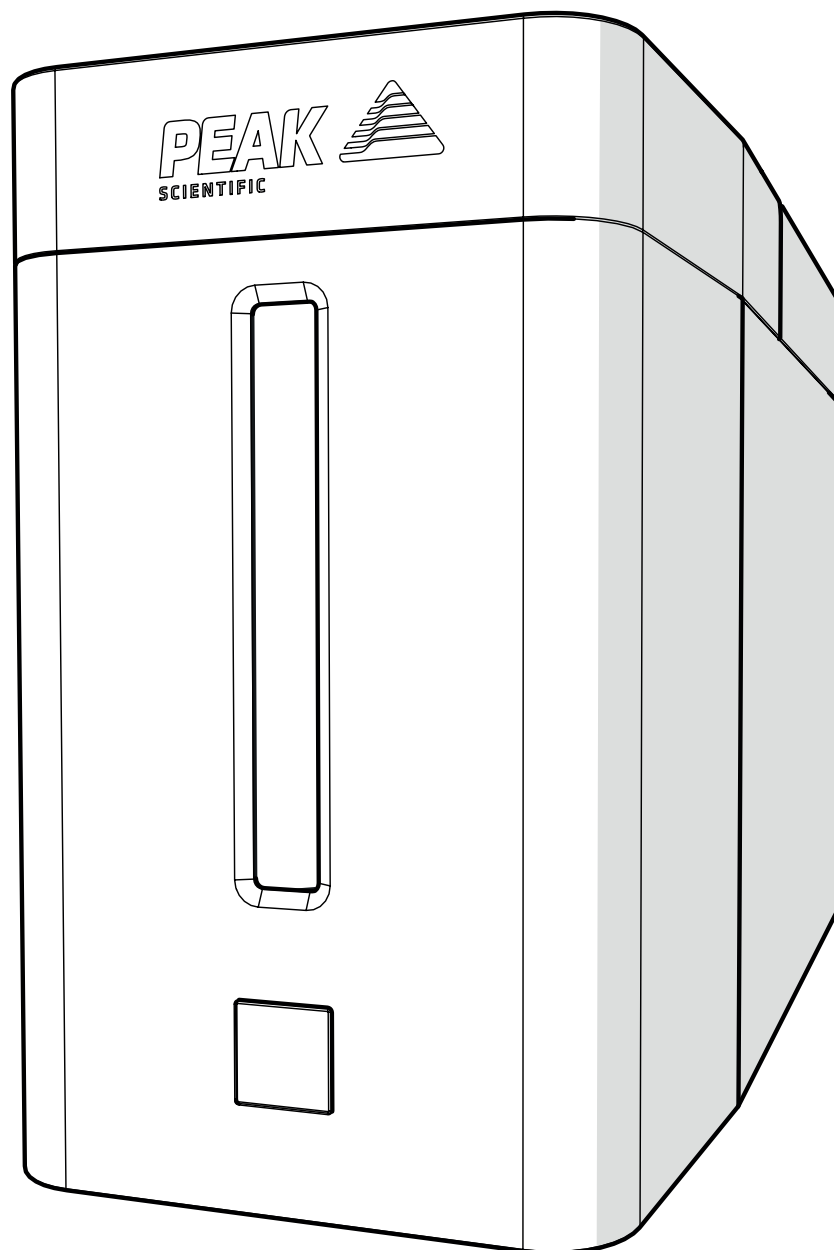


# Precision Hydrogen SL (All Models)

User Manual



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# Change History

Rev	Comment	Name	Date
1			
2			
3			
4			

## How to use this Manual

This manual is intended for end users and has been written so that it can either be read as a step by step guide to installation and usage or as a reference document where you can skip to the relevant information.

Users of a hard copy version can refer to the contents page to find the relevant information. Users of the soft copy version can use the hyperlinks from the contents page as well as the hyperlinks between sections.

Please review each of the following sections carefully.

Thank you for selecting Peak Scientific to meet your gas generation needs, and should you require any further assistance or support please do not hesitate to contact Peak Scientific or the Peak Partner from which you purchased your Generator.

# Introduction

Precision Hydrogen SL has been developed to provide a source of high purity gas, suitable for GC detector gas.

Features include:

- Easy to use single button interface
- Status indicative lighting feature
- Purities of up to 99.9995%

Precision Hydrogen SL is based on proven technology, producing hydrogen by electrolysis using a Proton Exchange Membrane (PEM) cell. Moisture removal is achieved by a two-stage patented Nafion technology and desiccant drying.

To ensure this generator model meets our high expectations with regards to reliability and performance, we have tested this model extensively at our manufacturing plant and in the field to ensure reliability and longevity of the system.

# Health and Safety Data

## De-ionizer Resin

This sheet to be retained by the 'Health & Safety Officer'

The recipient of this Health & Safety Data sheet is required to ensure that all personnel handling, using or likely to come into contact with the material are made aware of the Health & Safety information contained herein.

### General Description

Cylinder containing ion exchange resin. 60% Cation and 40% Anion by mass.

### Chemical Components

Polystyrene divinylbenzene cation and ion exchange resin.

<b>Form</b>	Solid beads
<b>Flash Point</b>	N/A
<b>Colour</b>	Tan
<b>Ignition Temperature</b>	427 °C (Estimated)
<b>Odour</b>	None
<b>Explosion Limits</b>	N/A
<b>Decomposition Temperature</b>	Over 220 °C
<b>Vapour Pressure @ 25 °C</b>	17mm CFH @ 20 °C (Water)
<b>Viscosity @ 25°C</b>	N/A
<b>Solubility in Water</b>	Negligible
<b>Specific Gravity @ 25°C</b>	1.1-1.3
<b>pH @ 25 °C</b>	7-9.5 in aqueous slurry
<b>Eye Protection</b>	Safety Glasses (BS2092C)
<b>Storage</b>	Store in a cool place above 0 °C, out of direct sunlight
<b>Fire &amp; Explosion Hazards</b>	Toxic combustion products may include sulphur dioxide and sulphur trioxide
<b>Disposal</b>	This product can be disposed as ordinary waste if local regulations permit

### Emergency & First Aid Procedures

#### Spillages

Floor may be slippery. Use care to avoid falls. Wear protective glasses.

Sweep up and transfer to containers for recovery and disposal.

#### Extinguishing Media

Carbon Dioxide (CO<sub>2</sub>), Water Fog and Dry Powder.

#### Fire Fighting and Protection

Wear HSE approved, pressure demand, self-contained breathing apparatus or equivalent.

**First Aid****Skin Contact**

Wash effected areas with soap and water. Consult doctor if irritation persists.

**Eye Contact**

Product can cause severe eye irritation. Flush eyes with large amounts of water for at least 15 minutes. Consult a doctor if irritation persists.

**Inhalation**

This product should present no hazard if operated under normal conditions. If irritation persists, move patient to fresh air.

**Ingestion**

If resin has been confined to the mouth, administer 250 ml. of water as a mouthwash. Avoid swallowing. This product is considered non-hazardous if ingested in small amounts; however, it is advisable to seek medical advice.

**Toxicological Data**

No toxicity data available on this product

**Occupation exposure limits**

STEL/TLV = None established.

**Incompatible Materials (to avoid hazardous reactions)**

Avoid contact with concentrated nitric acid and any other strong oxidising agents at all times.

## Desiccant

This sheet to be retained by the 'Health & Safety Officer'

The recipient of this Health & Safety Data sheet is required to ensure that all personnel handling, using or likely to come into contact with the material are made aware of the Health & Safety information contained herein.

### General Description

Column containing orange to green indicating silica gel.

### Chemical Components

Amorphous silica 98.2%, activated colouring agent 0.2% max.

<b>Form</b>	Beads
<b>Flash Point</b>	N/A
<b>Colour</b>	Dry: yellow/orange      Saturated: Green
<b>Ignition Temperature</b>	>1000 °C
<b>Odour</b>	Odourless
<b>Explosion Limits</b>	N/A
<b>Decomposition Temperature</b>	Over 155 °C
<b>Vapour Pressure @ 25 °C</b>	17mm CFH @ 20 °C (Water)
<b>Viscosity @ 25°C</b>	N/A
<b>Solubility in Water</b>	less 1.0% in weight
<b>pH @ 25 °C</b>	2-10 at 5% w/w in water
<b>Eye Protection</b>	Safety Glasses (BS2092C)
<b>Storage</b>	All containers must be closed air tight and kept in a dry place.
<b>Fire &amp; Explosion Hazards</b>	N/A
<b>Disposal</b>	This product can be disposed as ordinary waste if local regulations permit.

### Emergency & First Aid Procedures

#### Spillages

Contain spillage. Collect in suitable containers for recovery or disposal. During collection avoid creating dust.

#### Extinguishing Media

N/A. Inorganic compound. Not combustible.

#### Fire Fighting and Protection

Wear HSE approved, pressure demand, self-contained breathing apparatus or equivalent.

**First Aid****Skin Contact**

Wash spillage from skin with soap and water.

**Eye Contact**

Wash immediately with copious amounts of water and obtain medical attention.

**Inhalation**

Remove from source of exposure.

**Ingestion**

Wash out mouth with water. If large amount swallowed or symptoms develop obtain medical attention.

**Toxicological Data**

The lethal dose for humans for synthetic amorphous silica is estimated at over 15,000 mg/kg

**Occupation exposure limits**

DNEL/PNEC < 1 = No immediate concern.

**Incompatible Materials (to avoid hazardous reactions)**

None known.



## Molecular Seive

This sheet to be retained by the 'Health & Safety Officer'

The recipient of this Health & Safety Data sheet is required to ensure that all personnel handling, using or likely to come into contact with the material are made aware of the Health & Safety information contained herein.

### General Description

Column containing white to tan molecular sieve.

### Chemical Components

Quartz (SiO<sub>2</sub>) <10%, balance Zeolite.

<b>Form</b>	Spheres
<b>Flash Point</b>	N/A
<b>Colour</b>	White to tan
<b>Ignition Temperature</b>	N/A
<b>Odour</b>	Odourless
<b>Explosion Limits</b>	N/A
<b>Decomposition Temperature</b>	N/A
<b>Vapour Pressure @ 25 °C</b>	N/A
<b>Viscosity @ 25°C</b>	N/A
<b>Solubility in Water</b>	Insoluble
<b>pH @ 25 °C</b>	N/A
<b>Eye Protection</b>	Safety Glasses (BS2092C)
<b>Storage</b>	All containers must be closed air tight and kept in a dry place.
<b>Fire &amp; Explosion Hazards</b>	N/A
<b>Disposal</b>	This product can be disposed as ordinary waste if local regulations permit.

### Emergency & First Aid Procedures

#### Spillages

Contain spillage. Collect in suitable containers for recovery or disposal. During collection avoid creating dust.

#### Extinguishing Media

N/A. Inorganic compound. Not combustible.

#### Fire Fighting and Protection

Wear HSE approved, pressure demand, self-contained breathing apparatus or equivalent.

**First Aid****Skin Contact**

Wash spillage from skin with soap and water.

**Eye Contact**

Wash immediately with copious amounts of water and obtain medical attention.

**Inhalation**

Remove from source of exposure.

**Ingestion**

Wash out mouth with water. If large amount swallowed or symptoms develop obtain medical attention.

**Toxicological Data**

The lethal dose for humans for synthetic amorphous silica is estimated at over 15,000 mg/kg

**Occupation exposure limits**

DNEL/PNEC < 1 = No immediate concern.

**Incompatible Materials (to avoid hazardous reactions)**

None known.

## Warranties and Liabilities




1. The Company warrants that it has title to the Goods.
2. Subject to the provisions of this clause the Company warrants that the Goods shall comply in all material respects with any specification referred to in the Order Confirmation (as the same may be amended) and shall, subject thereto, be free from defects in material and workmanship for the lesser of a period of twenty-four months from the date of delivery or twenty-five months from the date of dispatch from the factory. The 24m warranty is conditional on completion of replacement of the de-ionizer cartridge every 12 months from the date of first use of the generator and use of the correct grade of deionized water (ASTM type II,  $<1\mu\text{S}$  conductivity /  $>1\text{M}\Omega$  resistivity). Failure to change the de-ionizer cartridge and supply the correct grade of de-ionized water will render the 24 month warranty null and void.
3. Save as provided in this clause and except where the Goods are sold to a person dealing as a consumer (within the meaning of the Unfair Contract Terms Act 1977) all warranties, conditions or other terms implied by statute or common law are hereby expressly excluded save to the extent they may not be lawfully excluded. When the Goods are sold to a consumer within the meaning of the Unfair Contract Terms Act 1977 their statutory rights are not affected by the provisions of this clause.
4. In the event of the Customer making a claim in respect of any defect in terms of clause 2 hereof the Customer must.
  1. Reasonably satisfy the Company that the Goods have been properly installed, commissioned, stored, serviced and used and without prejudice to the generality of the foregoing that any defect is not the direct or indirect result of lack of repair and/or servicing, incorrect repair and/or servicing, use of wrong materials and/or incorrect spare parts
  2. Allow the company to inspect the Goods and/or any installation and any relevant packaging as and when reasonably required by the Company.
5. Subject to the Company being notified of any defect as is referred to in sub-clause 2 hereof within a reasonable time of it becoming apparent and subject always to the terms of sub-clause 3 hereof, the Company shall, in its option, replace or repair the defective Goods or refund a proportionate part of the Price. The Company shall have no further liability to the Customer (save as mentioned in sub-clause 4 hereof).
6. The Company shall be liable to indemnify the Customer in respect of any claim for death or personal injury to any person in so far as such is attributable to the negligence or breach of duty of the Company or any failure by the Company to comply with the provisions of sub-clause 2 hereof.
7. Save as provided in sub-clause 2 hereof the Company shall not be liable in respect of any claim by the Customer for costs, damages, loss or expenses (whether direct, indirect, consequential or otherwise) or indemnity in any respect howsoever arising including, but not by way of limitation, liability arising in negligence (other than pursuant to clause 5 above) that may be suffered by the Customer or any third party.

# Safety Notices

Peak Scientific Instruments cannot anticipate every possible circumstance which may represent a potential hazard. The warnings detailed within this manual refer to the most likely potential hazards, but by definition cannot be all inclusive. If the user employs an operating procedure, item of equipment or a method of working which is not specifically recommended by Peak Scientific, the user must ensure that the equipment will not be damaged or become hazardous to persons or property.

## Symbols

This manual uses the following symbols to highlight specific areas important to the safe and proper use of the Generator

 WARNING	A WARNING notice denotes a hazard. It calls attention to an operating procedure, process or similar, which if not correctly performed or adhered to, could cause personal injury or in the worst case death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood or met.
 CAUTION	A CAUTION notice denotes a hazard. It calls attention to an operating procedure, process or similar, which if not correctly performed or adhered to, could cause damage to the generator or the application. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood or met.
	Caution, risk of electric shock. Ensure power to the generator has been removed before proceeding.

## Safety Notice to Users



These instructions must be read thoroughly and understood before installation and operation of your Peak Precision Hydrogen Generator. Use of the generator in a manner not specified by Peak Scientific MAY impair the SAFETY provided by the equipment.



When handling, operating or carrying out any maintenance, personnel must employ safe engineering practices and observe all relevant local health and safety requirements and regulations. The attention of UK users is drawn to the Health and Safety at Work Act 1974, and the Institute of Electrical Engineers regulations.



If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

## Attention - Important Notice to All Users



These instructions must be read thoroughly, section by section and understood before installation and operation of your Peak Scientific Hydrogen Generator. Please follow the appropriate safety standards for handling hydrogen gas and other gases as determined by the laws and regulations of your country.



Generator is for indoor use only.

Please save the product packaging for storage or future shipment of the generator.

1. For your own personal safety and to prevent accidental damage to your generator please ensure that you read and understand our User Manual.
2. Do not store away the generator when not in operation. External water bottles must be made of a dark coloured glass or Nalgene in order to prevent biological growth (available from Peak Scientific). It is recommended that you check the water quality weekly to prevent biological growth developing in the tank and tubing. Failure to do this will greatly reduce the life of the generator and render the 2 year generator warranty void.
3. If you are using a manual fill system, the tank filter must be replaced after filling the tank with water.
4. If your system requires an external tank, do not place the external water bottle above the height of the generator. The bottle may be placed at the same level or below the generator.
5. Use ASTM Type I or Type II water only. ( $<1\mu\text{S}$  conductivity /  $>1\text{M}\Omega$  resistivity). Failure to use the correct quality water will invalidate the cell and system warranty.
6. Failure to maintain the de-ionizer cartridge as recommended will reduce the operational life of your generator and render its 2 year generator warranty void.
7. Do not attach any additional tanks or gas cylinders to your generator without first consulting Peak Scientific.
8. Ensure your entire installation, both pipe work and analysers, are completely gas tight. Even minor leaks will affect the operation of your generator and can reduce its operational life.
9. Check that the output capacity of your generator meets the total gas requirements of your application. If in doubt, consult your dealer or Peak Scientific.
10. Ensure the ambient temperature inside your laboratory does not rise above  $35^{\circ}\text{C}/95^{\circ}\text{F}$ . Extremes of operating temperature will reduce cell life.

# Declaration of Conformity

We Peak Scientific Instruments Ltd.  
Of Fountain Crescent, Inchinnan, Renfrewshire, PA4 9RE

Declare that:

Equipment: Hydrogen Generator  
Models: Precision Hydrogen SL

To which this declaration relates, is in conformity with the applicable EC directives, harmonized standards, and other normative requirements.

- Low Voltage Directive 2014/35/EU  
EN 61010-1: 2010 Electrical Equipment for measurement, control and laboratory use.
- Electromagnetic Compatibility Directive 2014/30/EU  
EN 61326-1: 2013 Electrical Equipment for measurement, control and laboratory use.
- FCC47 CFR Part 15 Class B  
Unintentional radiators; Conducted and Radiated emissions limits.

All evaluation, testing and certification issued by:

## CSA Group

Unit 6, Hawarden Industrial Park,  
Hawarden, Deeside, UK  
CH5 3US

## Eurofins (York) Ltd.

Unit 1, Grangemouth Technology Park,  
Earls Road, Grangemouth,  
United Kingdom, FK3 8UZ

Signed:



Name:

Chris Pugh

Date:

28/02/2020

Position:

Engineering Director



# Environmental Declaration

We Peak Scientific Instruments Ltd.  
Of Fountain Crescent, Inchinnan, Renfrewshire, PA4 9RE

Declare that:

Equipment: Hydrogen Generator

Models: Precision Hydrogen SL

Is fully compliant with the following Directives

- 2012/19/EU WEEE (Waste of Electrical and Electronic Equipment)
- 2011/65/EU RoHS 2 (Restriction of Hazardous Substance)

Peak Scientific Instruments Ltd fully complies with its obligations towards the European WEEE (Waste of Electrical and Electronic Equipment) Directive 2012/19/EU. These obligations are being met within the B2B compliance group.

Peak Scientific Instruments Ltd has developed all reasonable 'due diligence' controls to ensure that our products comply with the principles and requirements of the European recast RoHS (Restriction of Hazardous Substances) Directive 2011/65/EU. Similar directives in the United States and China, for example, have also been captured within this program.

Where a specific certificate of compliance is required, this can be requested, on a product serial number basis, directly from Peak Scientific Instruments Ltd, by contacting us through our website on [www.peakscientific.com](http://www.peakscientific.com)

Signed:



Name: Chris Pugh

Date:

28/02/2020

Position: Engineering Director



# Technical Specification

## Precision Hydrogen SL

### Environment

	100 cc	200 cc
Minimum Operating Ambient Temperature	10°C (50°F)	
Maximum Operating Ambient Temperature	35°C (95°F)	
Maximum Altitude	3000 m	
Maximum Relative Humidity	90% Non-Condensing	
Minimum Storage Temperature*	10°C (50°F)	
Maximum Storage Temperature*	25°C (77°F)	

### Generator Outlets

Max Flow Rate	100 cc/min	200 cc/min
Purity	99.9995%	
Gas outlet	1 x 1/8" Swagelok compression fitting	
Delivery pressure	100 psi (6.9 bar)	

### Electrical Requirements

Voltage	100-240VAC +/-10%	
Frequency	50/60 Hz	
Current	6A Max.	
Input Connection	C14 Connection	
Power Cord (Supplied)	C13 socket to local connection (10A minimum)	
Pollution Degree	2	
Installation / Over Voltage Category	II	

### General

Generator Dimensions cm	16.0 (6.3") x 38.5 (15.2") x 25.0 (9.8")	
Generator Weight	8 kg (17.6 lbs)	
Shipping Crate Dimensions cm	23.4 (9.2") x 59.4 (23.4") x 34.2 (13.5")	
Shipping Weight	11 kg (24.2 lbs)	
Noise Level @ 1 m	<55 dB	
Heat Output	983 BTU / Hr	
Water Purity Requirement	ASTM Type II (<1 µS/cm / >1 MΩ-cm)	

\* When taken out of storage the Generator should be allowed to acclimatize at room temperature for a minimum of 3 hours before operation.



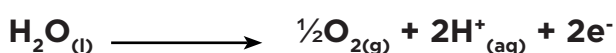
## Principle of Operation

The Peak Scientific hydrogen generator produces high purity hydrogen gas, H<sub>2</sub>. Hydrogen does not occur naturally on earth and must be formed via the decomposition of other molecules, in this case via the splitting of water molecules into hydrogen and oxygen in a process known as electrolysis.

The electrolyser used in the Peak Scientific hydrogen generator is known as a Proton Exchange Membrane (PEM) electrolyser. This type of electrolyser was first described in the mid-1960's by General Electric as a method for producing oxygen for the Gemini space program. PEM electrolysis has been continually developed since its introduction and has remained the state-of-the-art technology for water electrolysis and the production of high purity hydrogen ever since.

The most important element of the generator is the electrolyser cell where the electrolysis reaction takes place. This consists of two electrodes (an anode and a cathode), which are separated by the proton exchange membrane which gives the technology its name. During operation deionised water is fed to the anode of the electrolysis cell where it is split into oxygen, protons and electrons with the aid of a precious metal catalyst. The oxygen is vented to atmosphere from the generator. The protons travel across the membrane and simultaneously the electrons travel around the external electrical circuit. These protons and electrons then recombine at the cathode of the electrolyser, again with the aid of a precious metal catalyst to produce the hydrogen gas. The high purity of the hydrogen is assured by the membrane which completely separates the hydrogen produced at the cathode from the oxygen being produced at the anode. These processes are described by the following equations:

Anode Reaction



Cathode Reaction



Deionised water is critical to the operation of the system and must have a purity of 1µS/cm or better to prevent damage to the membrane. Failure to use this grade of deionised water will invalidate the 2 year warranty of your generator. The water is automatically loaded (either at power up or periodically during operation) and the rate at which the water is consumed depends on the amount of hydrogen being produced.

A small amount of the electrical energy input is lost as heat and this is removed from the generator by the ventilation system.

The Peak Scientific hydrogen generator generates hydrogen on demand. By maintaining the pre-set pressure and using this as a reference value, the generator will produce the precise amount of hydrogen required. As soon as the demand ceases, no further hydrogen will be sent to the user's application. During this time bubbles may still be observed in the water tank. This is due to the generator maintaining its internal pressure and ensuring that clean, dry hydrogen is available immediately on demand when the user requires it.

## General Safety

The generator produces gas when the application places a demand on the unit. The **maximum** quantity of hydrogen stored in the generator at any one time is 175ml at a pressure of 7.6bar (110psi). The unit also meets the European Electromagnetic Compatibility and Low Voltage Directives. The Generator is CE approved and has the CE mark attached.

All of the Precision Hydrogen Series generators have the necessary control circuitry, both hardware and software, to ensure the shutdown of the instrument in the event of a fault or faults occurring.

## **Generator Safety Features**

The Precision Hydrogen range have the following safety features to ensure safe and reliable operation:

- Overpressure switch.
- Safe and accurate control of pressure.
- Internal leak detection.
- Cell shut down in critical alarm status.
- Critical water level detection.

## Unpacking

Although Peak Scientific takes every precaution with safe transit and packaging, it is advisable to fully inspect the unit for any sign of transit damage.

**Any damage should be reported immediately to the carrier and Peak Scientific or the Peak Partner from where the unit was purchased.**

Follow the unpacking instructions posted on the side of the crate.

Please save the product packaging for storage or future shipment of the generator.

Note: Included with the Generator is a “Fittings Kit” containing mains power leads for UK, EU & US and also all the required fittings and warranty registration card. Be careful not to discard these.

## Fittings Kit Contents

Supplied in the Fittings Kit are all the fittings required to connect the generator to the application. The contents of the Fittings Kit are as follows:

1. Tygon Tubing*	x 1m
2. Barbed Hose Fitting*	x 1
3. In-line Water Filter**	x 1
4. UK Mains Power Cable	x 1
5. EU Mains Power Cable	x 1
6. US Mains Power Cable 110V	x 1
7. US Mains Power Cable 230V	x 1
8. Installation Guide- Precision Hydrogen	x 1
9. 4 Litre Water Bottle***	x 1
10. A5 simple user maintenance guide	x 1
11. Desiccant Cartridges	x 1 (100cc) x3 (200cc)
12. DI cartridge	x1 (to be installed prior to customer using the generator)

\* supplied with all models

\*\* supplied with automatic and pressure fill models

\*\*\* optional extra for models with automatic fill

All of the generator output ports are located on the output panel at the rear of the generator.

## Unpacking Instructions

The generator is safe to be unpacked by one person providing safe lifting practices are employed.

# Installation

## Location

The generator should be located on a flat, level surface for operation - this will ensure that the water level sensors within the unit operate correctly. Some components in the generator produce heat during operation and therefore an adequate airflow must be maintained around the generator to allow the ventilation system to perform efficiently.

If the generator is stored in an enclosed space the environment must be controlled via an air conditioner or extraction fan. The provision must be made to allow the volume of air in the room to be changed 5 times per hour. The risk with hydrogen is a leak into the environment raising the hydrogen content to the explosive limit. The rear of the generator will become warm to the touch during operation - a minimum clearance of 15 cm (6") from other bodies is recommended.

Do not obstruct or connect the vents to any application. Failing to observe this could lead to permanent damage of the generator.

Do not expose the unit to freezing conditions. Please adhere to the operating temperatures below:

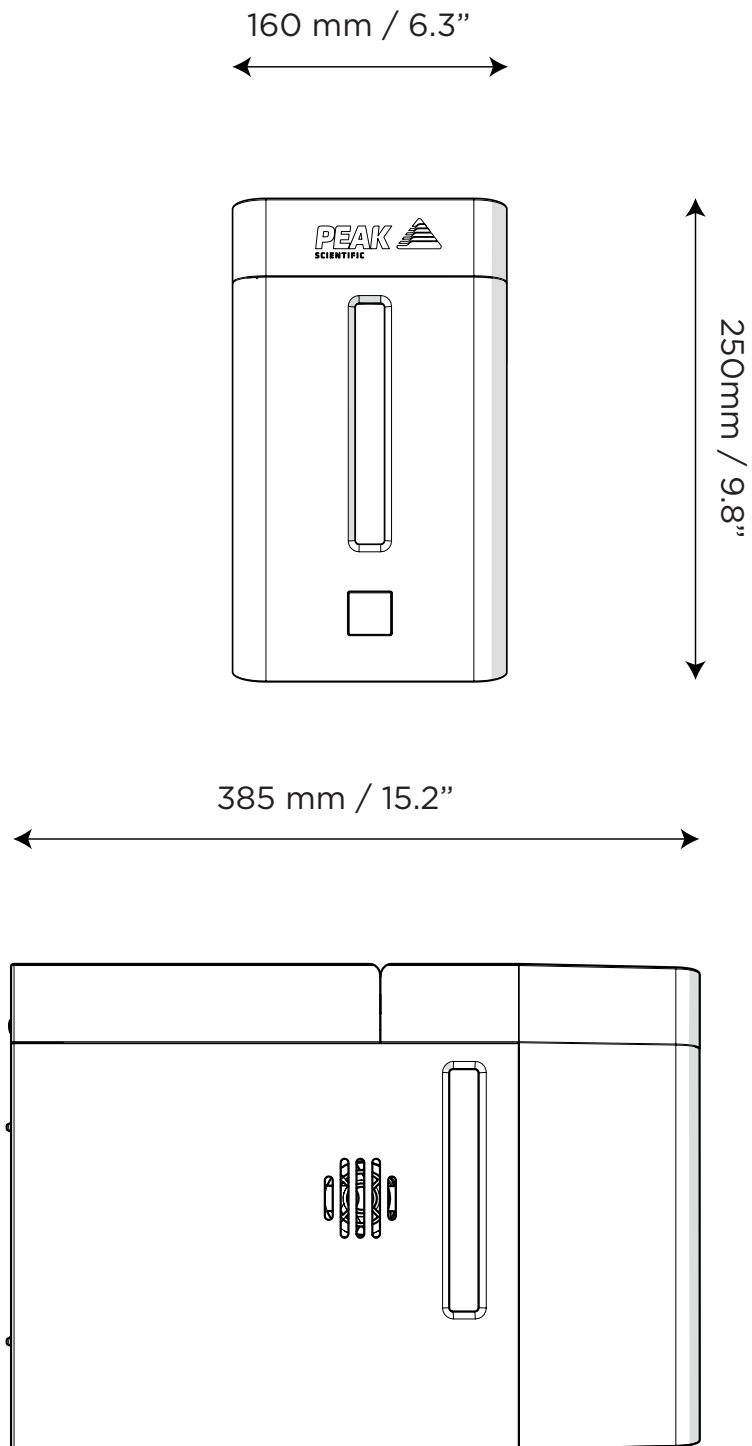
Do not position the equipment so that it is difficult to disconnect the mains plug.

Minimum Operating Ambient Temperature: 10 °C (50 °F)

Maximum Operating Ambient Temperature: 35 °C (95 °F)

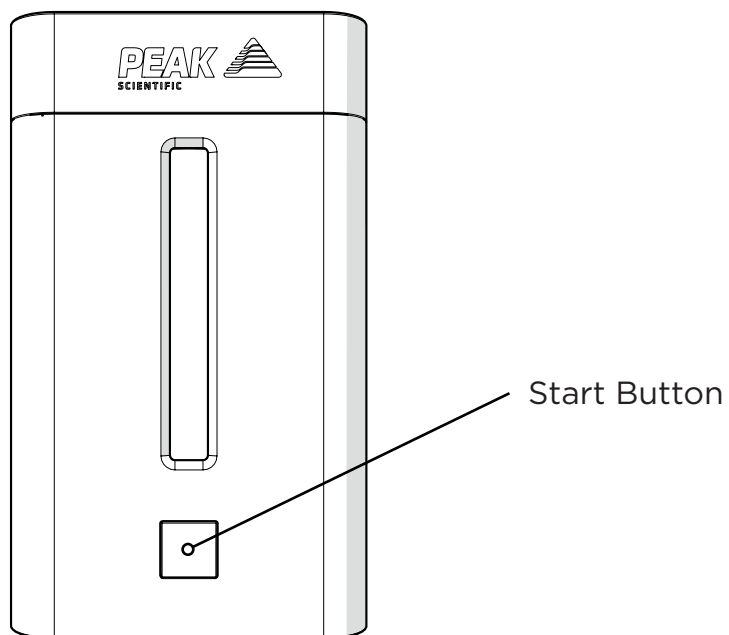
# Generator Overview

## General Dimensions

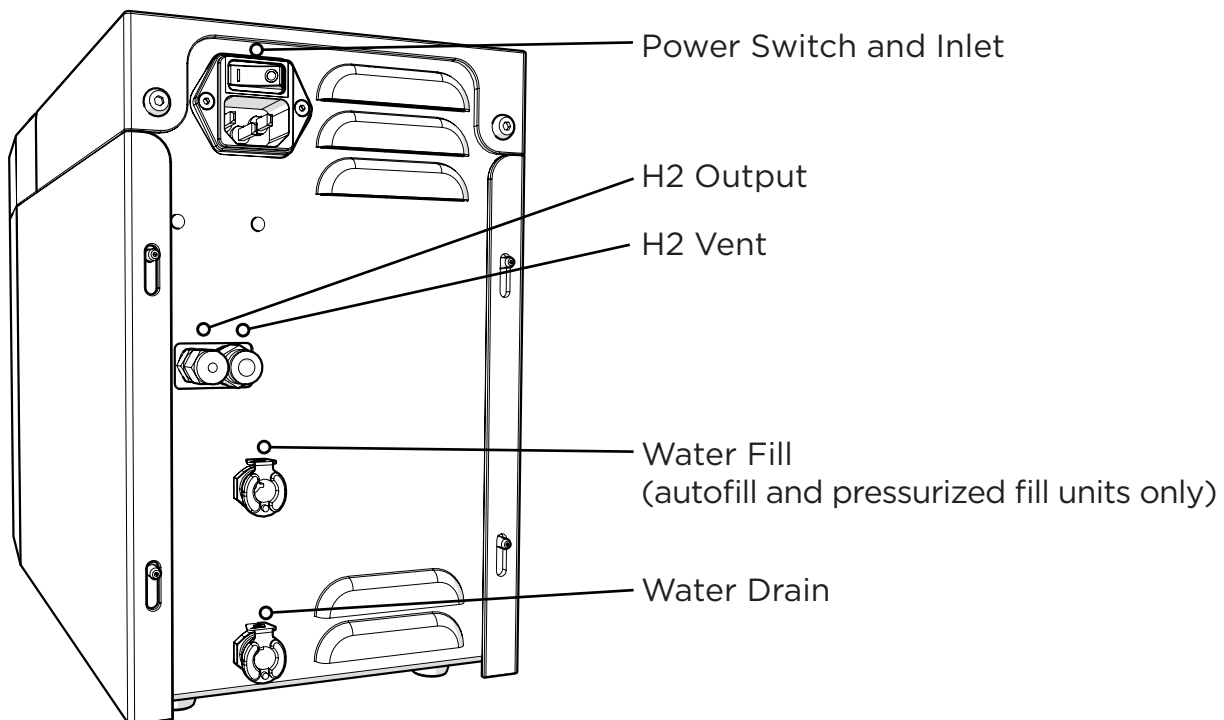


The Generator must always be placed on a flat, level surface. Failure to do so will affect the performance of the Generator.

## Unit Controls



## Rear Connections







Ensure all inlets and outlets are connected to correct sources and applications



All connections should only be made by personnel who are technically competent to do so



Generator must be switched off and unplugged prior to any cleaning or maintenance operations

## Tubing

For the hydrogen supply line, it is recommended that only clean grade copper or stainless steel tubing should be used.

Plastic tubing material such as Teflon<sup>®</sup>, polyvinyl chloride, or Tygon<sup>®</sup> should not be used when plumbing GCs since these materials will allow air and water to diffuse into the gas lines. In addition, plastic tubing can give off organic impurities which can cause ghost peaks and baseline instability.

Furthermore Peak Scientific recommend that compression fittings are used, and that the fittings are free from Teflon<sup>®</sup> tape.

## H2 Ventilation

Peak Scientific recommends that the H2 Exhaust port at the rear of the unit should be connected to an exhaust hood, or other ventilation system, to ensure safe disposal of vented gasses. Tubing sizes for the vent port are 6mm OD.

## Water Quality

Use only High Grade Deionised water, which must have a conductivity of less than or equal to  $1\mu\text{S}/\text{cm}$  @ 20°C and should be replaced as required. Water quality should be checked prior to being used to supply the Precision Hydrogen Generator.

Use of water in the Precision Hydrogen Generator with a purity not specified above will result in a reduced efficiency of hydrogen production, failure of the generator and loss of warranty.

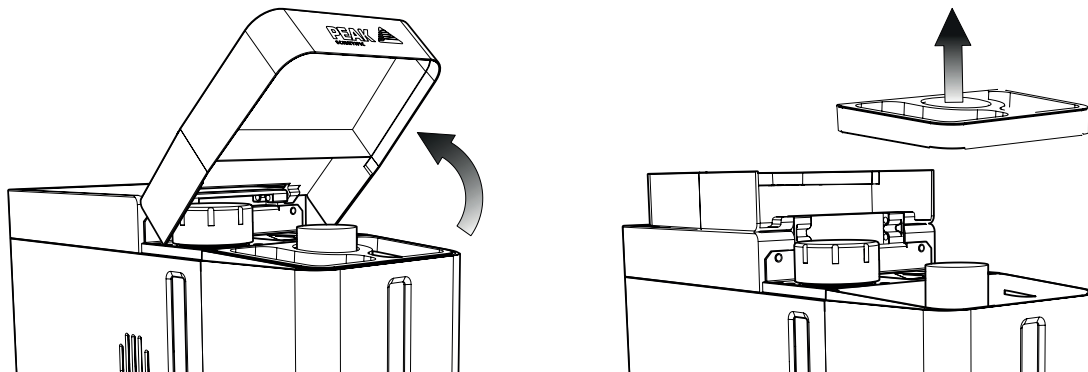
Water should be stored in a UV protected dark container away from direct sunlight. The bottle should have a vented lid to minimise any dust or debris contaminating the water supply. A suitable external water bottle is available from Peak Scientific.

Note: Customers should check the water quality of the external water supply once a week to maintain the health of the generator.

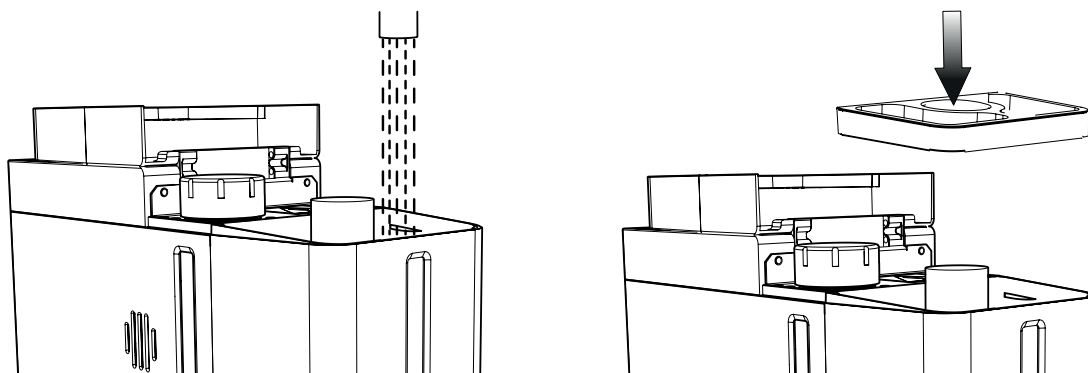
## Manual Water Tank Filling

The generator must be filled with DI water to be functional. For manual fill systems, follow the below steps.

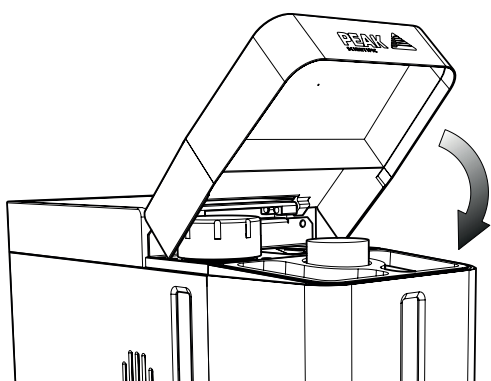
1. Lift the hinged lid back, then remove the tank cover.



2. Fill the water tank from your lab's supply of DI water, and ensure the tank cover is replaced, afterwards.



3. Close the hinged lid.



## Automatic Filling (Automatic Fill Upgrade units only)

The Precision Hydrogen generator uses an automatic water filling system as an optional upgrade, whereby sensors in the unit's internal water tank detect when the water level reaches a minimum.

This then refills the tank using a rear connection to an external DI water supply.

The unit should be connected to the water supply as shown below.

Using the length of FEP tubing and the hose barb fitting from the fittings kit, attach the barb to the tubing. Then connect one end to the water supply and the other to the Fill port at the rear of the Precision Hydrogen.

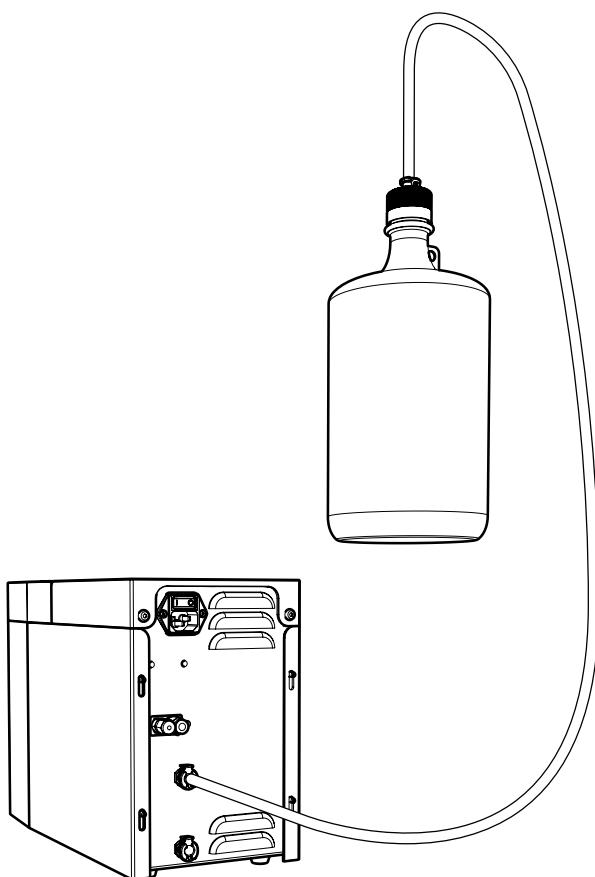
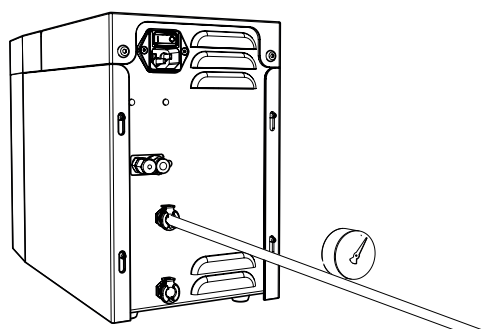
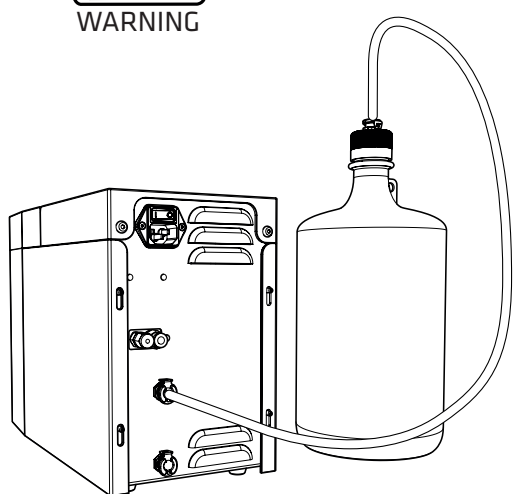
For efficient water filling the external supply should be no more than 2 metres away from the connection on the generator.



The DI Water Supply source **MUST NOT** be located higher than the height of the surface that the Precision Hydrogen generator is placed upon. A supply located higher than specified will result in the generator's internal water bottle over filling.



A pressurized DI Water Supply Source may only be used if the Pressurised Water Feed optional upgrade is purchased.



If the generator cannot load enough water to switch the sensors in the water bottle the generator will illuminate yellow and cease generating hydrogen until the fault has been resolved.

To resolve this, check your external supply before cycling the power on the generator. Once the low level water sensor disengages the generator will then begin producing hydrogen as before.

Four and eight litre water storage bottles can be purchased from Peak Scientific, please contact your Sales Representative for more information.

## **Pressurized Filling** (Automatic Fill Upgrade units only)

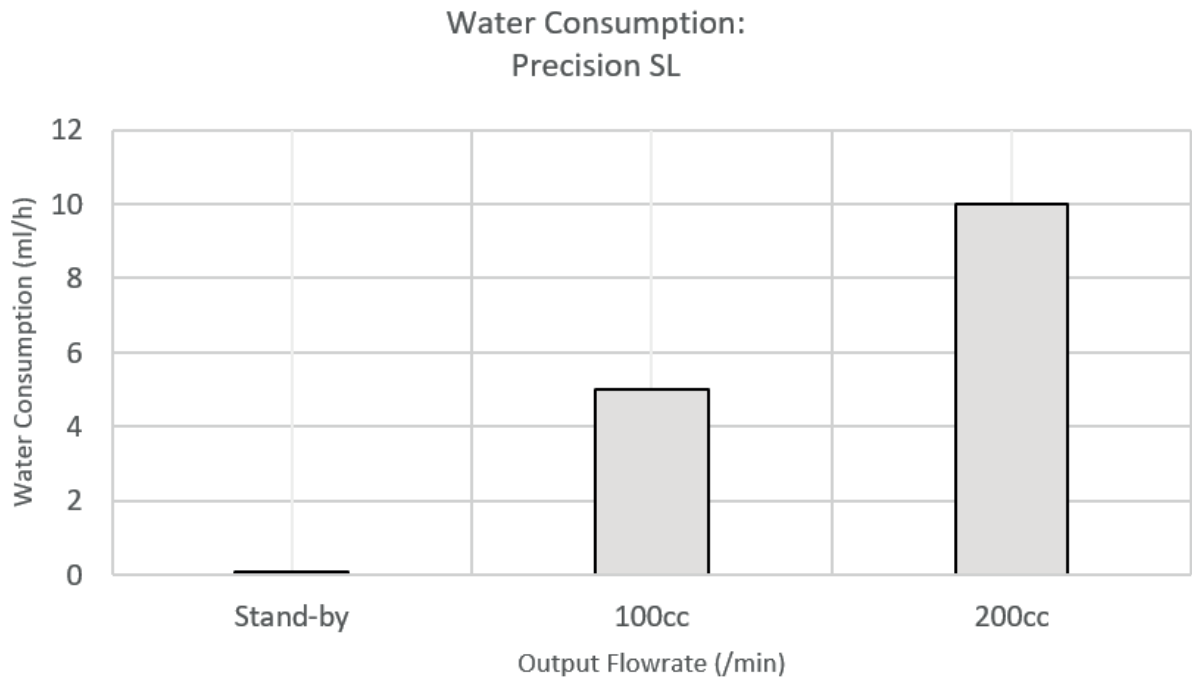
A pressurized feed option is available as a valve fitted to the fill inlet, instead of the load pump and has a 1-3 bar pressurised water feed.

**Note: No more than 3Bar pressure is allowed.**

# Water Usage

The water consumption rate of the Precision Hydrogen Generator is completely dependent on the rate at which the hydrogen is produced.

The graphs below show an estimation of the water consumption from the generator in Stand-by mode through to maximum Hydrogen output.



# Electrical Connection

Connect the generator into an appropriate electricity supply, between 100-240VAC. Refer to the generator serial plate for input specification and ensure your supply matches the requirements.

If the appropriate power cord is not supplied; a new CSA, UL approved power cord, rated to at least 10 amps, can be fitted by a qualified electrician. If a substitute main supply cord is used, ensure that it has adequate ratings and appropriate approvals for the country of operation. Failure to do so could cause damage to the generator or risk of overloading of the power cord.



This unit is classified as SAFETY CLASS 1. THIS UNIT MUST BE EARTHED. Before connecting the unit to the mains supply, please check the information on the serial plate. The mains supply must be of the stated AC voltage and frequency.

EARTH/GROUND (E):-	Green & Yellow	or	Green
LIVE (L):-	Brown	or	Black
Neutral (N):-	Blue	or	White

## Start-up Sequence

CHECK:

1. H<sub>2</sub> Outlet is connected to application
2. Mains power is connected

Turn the power switch ON. The water tank will light up, the cooling fan will rotate.

On power up the generator will check the water level, once the water level is at the minimum level required the generator will perform a diagnostic check including a leak test, this should take approximately six minutes and during this time the tank illumination will cycle from dim to bright

Upon successful completion of the leak test, the tank illumination will turn solid green and the generator is ready to deliver hydrogen.

Once the generator is at pressure, the delivery valve may be toggled by momentarily pressing the front button. Bubbles will be visible through the viewing window when the generator is producing hydrogen.

The generator may be restored to a depressurised state by pressing and holding the front button for at least three seconds. This will cause the generator to cease hydrogen production, illuminate the water tank blue, and exhaust any stored hydrogen through the exhaust port at the rear of the generator.

Note: If leak test is unsuccessful, the water tank will illuminate orange and the generator will cease attempting to produce hydrogen. The user should contact their Peak service provider.

### Liquid Leak Detectors

Liquid leak detectors should not be used on the Precision Hydrogen. These solutions are easily drawn into the high purity hydrogen gas system and can cause contamination of the system. If a liquid solution has to be used, then it should be IPA based, or a portable hydrogen detector should be used.

### Gas Traps

It is recommended to follow the best practice advice from your instrument manufacturer. For hydrogen supplied to GC detectors, a hydrocarbon trap is normally recommended.

The hydrogen gas produced by the Precision Hydrogen will be sufficiently pure for these contaminant traps to last a long time, but should a leak ever occur on the gas line, the traps will ensure that any harmful contaminants are caught, thereby preventing potential damage to the instrument.

## Switching the Unit Off

The unit can be switched off at any time using the following procedure.

The generator may be restored to a depressurised state by pressing and holding the front button for at least three seconds. This will cause the generator to cease hydrogen production, illuminate the water tank blue, and exhaust any stored hydrogen through the exhaust port at the rear of the generator. The generator may then be switched off by the power switch on the rear panel.

## Cleaning

Clean the outside of the generator, using only warm soapy water and a clean damp cloth. Ensure the cloth is thoroughly rung out to remove excess fluid prior to use.



Cleaning should only be undertaken with the power switched off and the power cord removed from the rear of the Generator.



CAUTION

Under no circumstances should any solvents or abrasive cleaning solutions be used as these can contain fumes that could be harmful to the Generator.

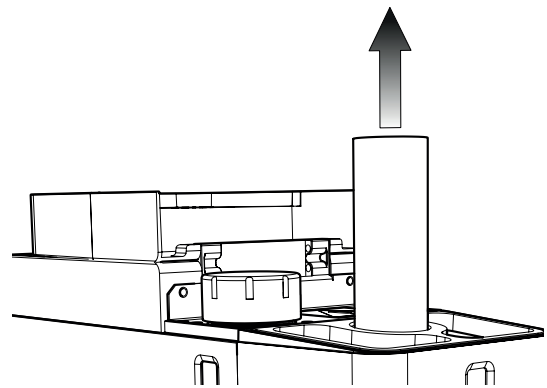
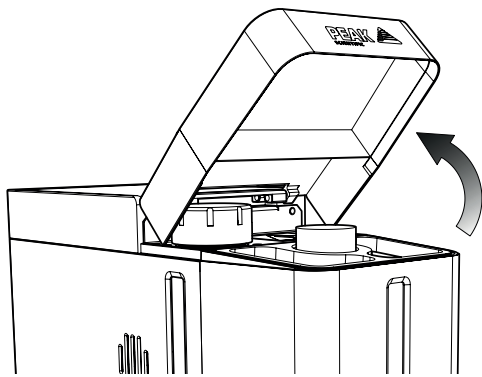
Water tank should be cleaned as a minimum on an annual basis in line with instructions given step 2 of the DI cartridge change instructions.



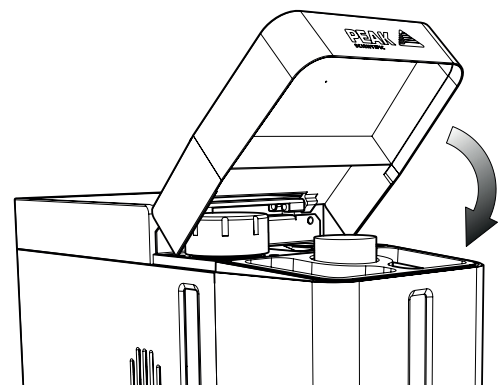
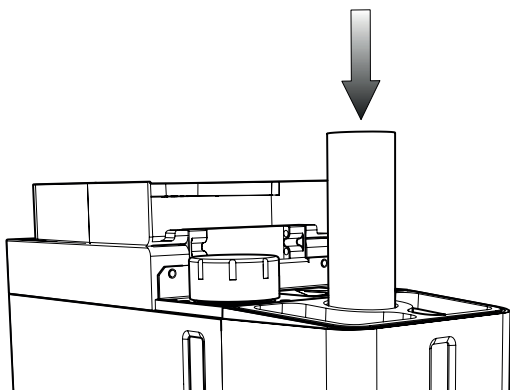
## De-ionizer cartridge Replacement

DI cartridge requires an annual change, although it should also be changed if the water supply is contaminated with water of a conductivity above the specified limit. Replacement of the DI column (the column in the middle of the water tank) is by rotating 90° anti-clockwise then pulling up and out of the tank. The new cartridge is put in by lowering into the recess and twisting 90° clockwise to lock in position.

- 1. Depressurise the generator and disconnect power.** To replace the DI cartridge, lift the hinged lid back, then remove the de-ionizer column by turning 90° anticlockwise and pulling upwards..



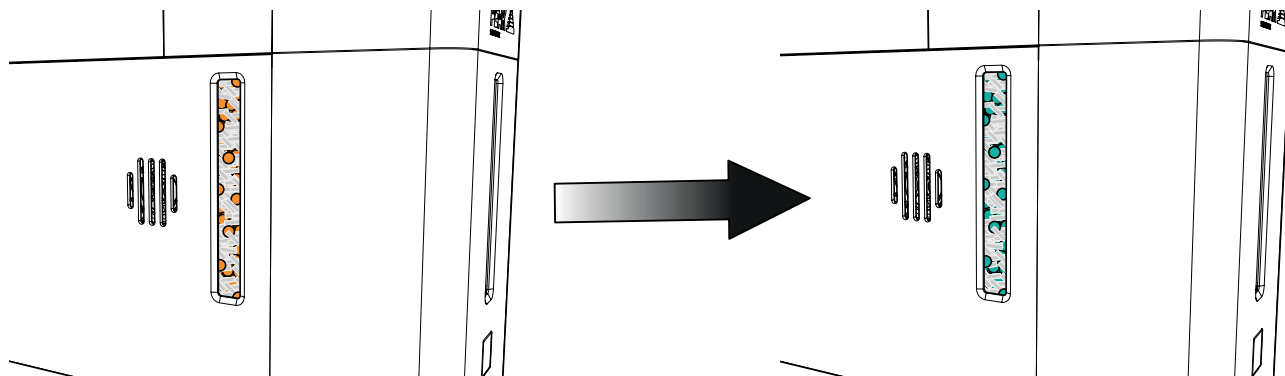
2. Drain the tank using the drain port on the rear of the generator. Once tank is empty, wipe down with a clean, lint-free cloth.
3. Lower the new DI cartridge into the recess and rotate 90° clockwise to lock in position, then close the lid.



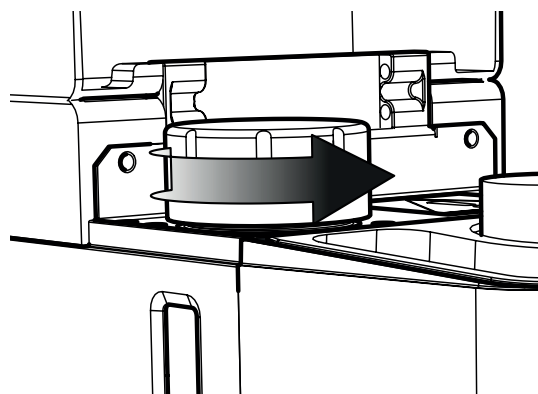
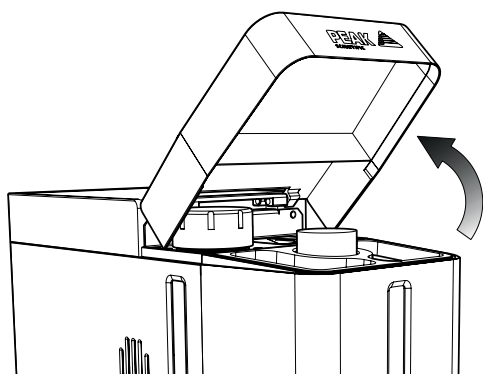
4. The unit can now be re-filled with water and switched on.

## Replacement of Desiccant Capsule

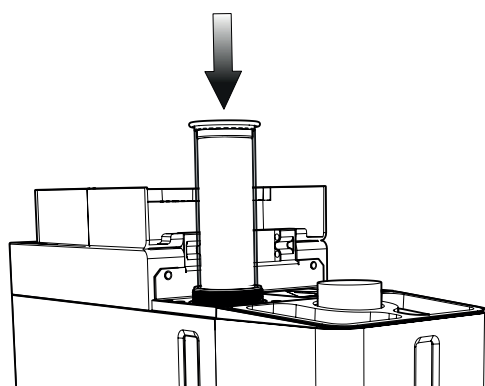
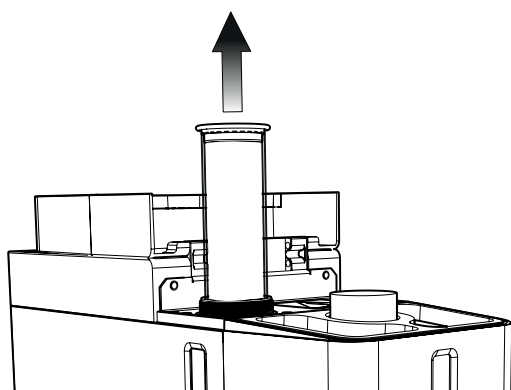
The desiccant capsule has a minimum expected life of 12 weeks. The capsule consists of molecular sieve interspersed with silica gel, viewable through the window on the side of the generator. The capsule should be replaced when all of the silica gel has visibly darkened.



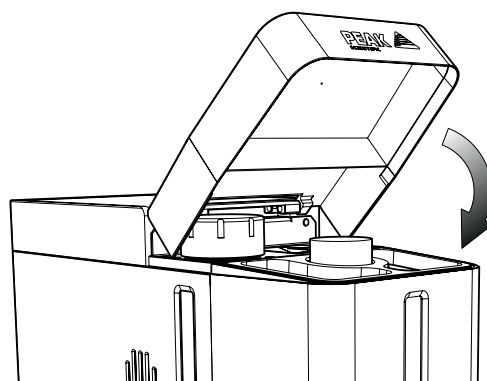
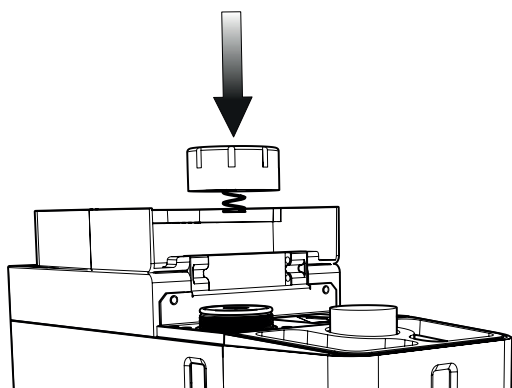
1. To replace the capsule, **depressurise the generator and disconnect power**. Lift the hinged lid back, then unscrew the capsule cap anticlockwise to remove.



2. Next withdraw the inner tube and dispose as per your company's hazardous waste disposal policy. The new capsule may now be inserted into the outer collar.



3. The cap can then be replaced ensuring not to over-tighten the cap and the hinged lid can be closed.



4. The unit can now be switched on.

# Service Requirements

## Service Schedule

Purchase Interval	Component	Visit
12 Months	Precision Hydrogen SL 100cc 12 Month Kit	<a href="http://www.peakscientific.com/ordering">www.peakscientific.com/ordering</a>
	Precision Hydrogen SL 200cc 12 Month Kit	
24 Months	Precision Hydrogen SL 100cc 24 Month Kit	
	Precision Hydrogen SL 200cc 24 Month Kit	


Note: Only Peak approved components should be used.

## Service Plans

Peak Scientific offer two service plans. The Complete Service Plan, specifically designed for generators operated in critical environments, also includes full breakdown cover, guaranteed response times and generator upgrades if available. Our Standard Service Plan, covering the basic needs of our generators, features special deals on spare parts and breakdowns.

If you want to know more about our Service Plan options and how we ensure that your instrument can run with the maximum uptime and performance, please contact us at [maintenance@peakscientific.com](mailto:maintenance@peakscientific.com)

# Troubleshooting

Problem	Possible Solution
The generator will not switch on and the power switch does not illuminate	<ul style="list-style-type: none"> <li>• Ensure power cord is plugged into the Generator and that the power socket is turned on.</li> <li>• Check the fuse in the power cord plug, if fitted.</li> <li>• Contact your service provider.</li> </ul> 
The generator is illuminated solid ORANGE	<ul style="list-style-type: none"> <li>• Contact your service provider.</li> </ul>
The generator illumination is pulsing orange	<ul style="list-style-type: none"> <li>• Ensure the water tank is adequately filled</li> <li>• Check for external leaks</li> <li>• Contact your service provider.</li> </ul>
The generator is not producing hydrogen	<ul style="list-style-type: none"> <li>• Contact your service provider.</li> </ul>
The generator is not producing the required amount of hydrogen	<ul style="list-style-type: none"> <li>• Check the water quality of the external supply.</li> <li>• Contact your service provider.</li> <li>• Check for external leaks.</li> </ul>

# Go Online or Complete and Return

You can register for your **FREE 12 month Warranty** with ease online at [www.peakscientific.com/protected](http://www.peakscientific.com/protected).

Alternatively, you can send the completed form to Peak Scientific by post or email at [warranty@peakscientific.com](mailto:warranty@peakscientific.com).

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Product Warranty Registration			
Contact name			
Email address			
Company			
Address			
City/town			
Postcode			
Country			
Telephone			
Generator serial #			
Model type			
Installation date			
Do you still use an alternative gas solution i.e. cylinders or bulk liquid?	Yes	No	
What gas requirements do you have in your lab?	Hydrogen	Nitrogen	Zero Air

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Peak Scientific offer comprehensive gas generator after sales support packages. Peak [Protected] aftercare support can guarantee an on-site response within 72 hours\*, genuine parts from our ISO9001 approved factory and a 95% first-time fix rate. See our enclosed Peak [Protected] leaflet for further information.

**Important!**

You have 1 month to register your Peak Scientific product from the date of installation. Once registered the warranty will be honoured for a period of 12 months. If you wish to defer the installation of your generator, you must notify Peak Scientific immediately by emailing [warranty@peakscientific.com](mailto:warranty@peakscientific.com). For generators that remain unregistered after 1 month from the shipment date, the warranty will be considered active from the date of factory dispatch.

\* Complete Plan only



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For further information on any of our generator products please contact [marketing@peakscientific.com](mailto:marketing@peakscientific.com)