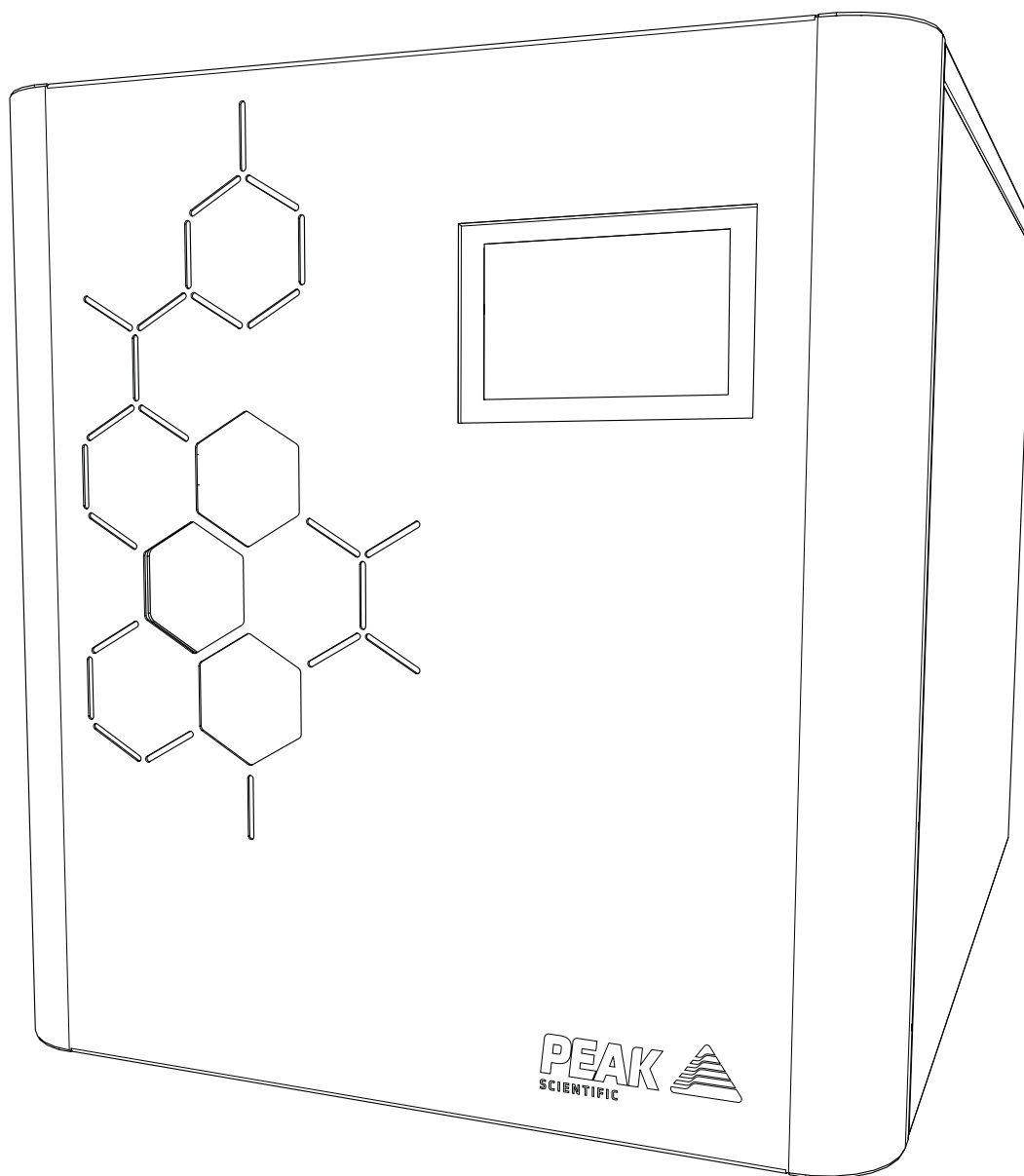


Precision Hydrogen (All Colour Screen Models)

User Manual



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Change History

Rev	Comment	Name	Date
1	Initial Release	Liam Couttie	17/05/2016
2	Hydrogen Trace Updates	Liam Couttie	19/12/2017
3	Transit Plugs Added	Liam Couttie	22/03/2018
4	Technical Spec Update	Liam Couttie	18/05/2018
5	Maintenance Instructions Update	Liam Couttie	28/08/2019
6	Hydrogen Trace Purity Update	Liam Couttie	03/11/2020
7	Declarations Update	Cleo Denholm	30/08/2021
8	Fittings Kit Update	Liam Couttie	29/04/2022
9	H2 Ventilation Info Update	Liam Couttie	16/01/2023
10	Declarations Update	Liam Couttie	09/03/2023
11	Draining the Water Tank	Liam Couttie	26/07/2023
12	Declarations Update	Liam Couttie	01/08/2023
13	Technical Spec. Update	Liam Couttie	19/06/2024
14	Part Number Update	C Denholm	14/01/2025
15	Text Update Note	D Lai	03/03/2025

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

The Precision Hydrogen Series has been developed to cater for the requirements of GC instruments.

These generators, depending on model, provide a source of high purity hydrogen gas, suitable for carrier gas and detector gas.

Other features include:

- Easy to use touch screen interface
- Status indicative lighting feature
- Stackable with other Precision units
- Purities of up to 99.99999% (7-9's)

With the Precision Hydrogen Series based on proven technology, it produces hydrogen by electrolysis using a Proton Exchange Membrane (PEM) cell. Moisture removal is achieved by a desiccant drying process or by a highly efficient PSA dryer.

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

Deioniser 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.

Form	Solid beads
Flash Point	N/A
Colour	Tan
Ignition Temperature	427 °C (Estimated)
Odour	None
Explosion Limits	N/A
Decomposition Temperature	Over 220 °C
Vapour Pressure @ 25 °C	17mm CFH @ 20 °C (Water)
Viscosity @ 25°C	N/A
Solubility in Water	Negligible
Specific Gravity @ 25°C	1.1-1.3
pH @ 25 °C	7-9.5 in aqueous slurry
Eye Protection	Safety Glasses (BS2092C)
Storage	Store in a cool place above 0 °C, out of direct sunlight
Fire & Explosion Hazards	Toxic combustion products may include sulphur dioxide and sulphur trioxide
Disposal	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 (CO₂), 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 (Applies to Precision Hydrogen only)

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.

Form	Beads
Flash Point	N/A
Colour	Dry: yellow/orange Saturated: Green
Ignition Temperature	>1000 °C
Odour	Odourless
Explosion Limits	N/A
Decomposition Temperature	Over 155 °C
Vapour Pressure @ 25 °C	17mm CFH @ 20 °C (Water)
Viscosity @ 25°C	N/A
Solubility in Water	less 1.0% in weight
pH @ 25 °C	2-10 at 5% w/w in water
Eye Protection	Safety Glasses (BS2092C)
Storage	All containers must be closed air tight and kept in a dry place.
Fire & Explosion Hazards	N/A
Disposal	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 twelve months from the date of delivery or thirteen months from the date of dispatch from the factory.
3. Subject to the provisions of this clause the Company warrants that the Hydrogen Cell 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 period of three years from the date of delivery.
4. 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.
5. 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.
6. 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 4 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 6 hereof).
7. 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.
8. 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 6 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 maybe 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.

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 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 3 year cell warranty void.
3. 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.
4. Use ASTM Type I or Type II water only. (1µS/cm or better). Failure to use the correct quality water will invalidate the cell and system warranty. Do not attempt to connect pressurised water to the generator.
5. It is recommended that you operate the generator at the lowest pressure permissible for your particular application. Do not automatically set the pressure to maximum if not required to avoid potentially damaging your application.
6. Failure to maintain the deioniser cartridge as recommended will reduce the operational life of your generator and render its 3 year cell 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 generally reduce its operational life.
9. Has your generator been correctly sized for your application? If in doubt, consult your dealer or Peak Scientific.
10. Ensure the ambient temperature inside your laboratory does not rise above 35°C/95°F. Extremes of operating temperature will reduce cell life.

EU Declaration of Conformity

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

Hereby declare that, this declaration of conformity is issued under the sole responsibility of the manufacturer.

Equipment Type: Hydrogen Generator
Model Designator: Precision Hydrogen (100cc, 200cc, 300cc & 450cc)
Precision Hydrogen Trace (250cc & 500cc)

To which this declaration relates, is in conformity with the following applicable EU Directives, harmonized standards, and other normative requirements.

- **Low Voltage Directive 2014/35/EU**
EN 61010-1: 2010+ A1:2019 Safety Requirements for 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 – EMC Requirements. (Class A)
- **Restriction on the use of certain hazardous substances in electronic equipment (RoHS) Directive 2011/65/EU as amended by EU 2015/863.**

Signed for and on behalf of Peak Scientific by

Signed:



Name: Fraser Dunn

Position: Design Engineering Manager
Peak Scientific Instruments Ltd,
Inchinnan, Renfrew, Scotland, PA4 9RE, UK.

Date: 1st August 2023



UK Declaration of Conformity

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

Hereby declare that, this declaration of conformity is issued under the sole responsibility of the manufacturer.

Equipment Type: Hydrogen Generator
Model Designator: Precision Hydrogen (100cc, 200cc, 300cc & 450cc)
Precision Hydrogen Trace (250cc & 500cc)

To which this declaration relates, is in conformity with the following applicable UK Statutory Instruments, Standards and other normative requirements.

- **The Electrical Equipment (Safety) Regulations 2016 (SI 2016 / 1101) as amended.**
BS61010-1:2010 + A1:2019 Safety Requirements for Electrical Equipment for Measurement Control and Laboratory Use.
- **The Electromagnetic Compatibility Regulations 2016 (SI 2016 / 1091) as amended.**
BS61326-1:2013 Electrical Equipment for Measurement , Control and Laboratory Use – EMC Requirements.
- **The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (SI 2012 / 3032) as amended.**

Signed for and on behalf of Peak Scientific by

Signed:



Name: Fraser Dunn

Position: Design Engineering Manager
Peak Scientific Instruments Ltd,
Inchinnan, Renfrew, Scotland, PA4 9RE, UK.

Date: 1st August 2023



WEEE Compliance Statement

The Waste Electrical and Electronic Equipment (WEEE) Regulations SI 2013 No 3113 and or the Waste Electrical and Electronic Equipment (WEEE) Directive 2012/19/EU apply to all electrical and electronic equipment placed on the market in the UK and EU covered by the scope of regulations which can be found in the Government Guidance Notes (PDF) produced by the Department for Business Innovation and skills for the UK and here for Europe.

All PEAK products that are subject to the WEEE directive are compliant with the WEEE marking requirement. Such products are marked with the “crossed-out wheellie bin” symbol (shown below) in accordance with European standard EN50419. All old electrical equipment can be recycled. Please do not dispose of any electrical equipment (including those marked with this symbol) in general rubbish bins. Please contact your dealer or distributor for clarity.



CSA Compliance Statement

CSA Group (Canadian Standards Authority) is a Nationally Recognised Testing Laboratory (NRTL), headquartered in Toronto Canada.

They are authorised to evaluate product to both their own and Underwriters Laboratory (UL) standards and certify the product to be in compliance to the relevant standards.

Peak products are certified to the current in force revision of the following standards in order to cover both Canadian and United States requirements for “Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory use, Part 1: general Requirements”.

Canada: CAN/CSA C22.2 No 61010-1-12

United States: UL 61010-1

As a result the products covered by this statement are certified and listed by CSA accordingly and are entitled to carry the CSA mark with both Canadian and United States subscripts , as shown below on the product rating label.



EMC Class A Compliance Statements

European Union (EU) and United Kingdom (UK) Class A Compliance statement

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

FCC Class A Compliance Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.



Industry Canada Class A emission compliance statement

This ISM device complies with Canadian ICES-001 (A).

Cet appareil ISM est conforme à la norme NMB-001 (A) du Canada.

Korea Communications Commission (KCC) statement

이 기기는 업무용(A급)으로 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

(This is electromagnetic wave compatibility equipment for business (Type A). Sellers and users need to pay attention to it. This is for any areas other than home.)

Technical Specification

Precision Hydrogen Trace

Environment

	250cc	500cc
Minimum Operating Ambient Temperature	10°C (50°F)	
Maximum Operating Ambient Temperature	35°C (95°F)	
Maximum Altitude	2000 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**	250 cc/min	500 cc/min
Purity	99.99999%***	
Gas outlet	1 x 1/8" Swagelok compression fitting	
Delivery pressure	0-100 psi (0-6.9 bar)	

Electrical Requirements

Voltage	100-230VAC
Frequency	50/60 Hz
Current	6A Max.
Input Connection	C14 Connection
Power Cord (Supplied)	C13 socket to local connection (10A minimum)
Pollution Degree	2
Insulation Category	II

General

Generator Dimensions cm	38.0 (14.9") x 54.0 (21.2") x 40.6 (15.9")
Generator Weight	32 kg
Shipping Crate Dimensions cm	54.0 (21.2") x 70.0 (27.5") x 49.0 (19.2")
Shipping Weight	40 kg
Noise Level @ 1 m	20 dB
Heat Output	1000 BTU / Hr
Water Purity Requirement	ASTM Type II (<1.0 uS / > 1Mohm)

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

** Note: All flow rates are stated in sccm at 273.15K and 1.01bar

*** Note: Based on O2 content independently verified by National Physical Laboratory, UK

Technical Specification

Precision Hydrogen

Environment

	100cc	200cc	300cc	450cc
Minimum Operating Ambient Temperature	10°C (50°F)			
Maximum Operating Ambient Temperature	35°C (95°F)			
Maximum Altitude	2000 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	300 cc/min	450 cc/min
Purity	99.9995%			
Gas outlet	1 x 1/8" Swagelok compression fitting			
Delivery pressure	0-100 psi (0-6.9 bar)			

Electrical Requirements

Voltage	100-230VAC
Frequency	50/60 Hz
Current	6A Max.
Input Connection	C14 Connection
Power Cord (Supplied)	C13 socket to local connection (10A minimum)
Pollution Degree	2
Insulation Category	II

General

Generator Dimensions cm	38.0 (14.9") x 54.0 (21.2") x 40.6 (15.9")
Generator Weight	31 kg (68 lbs)
Shipping Crate Dimensions cm	54.0 (21.2") x 70.0 (27.5") x 49.0 (19.2")
Shipping Weight	39 kg (86 lbs)
Noise Level @ 1 m	20 dB
Heat Output	1000 BTU / Hr
Water Purity Requirement	ASTM Type II (<1.0 uS / > 1Mohm)

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

** Note: All flow rates are stated in sccm at 273.15K and 1.01bar

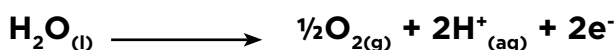
Principle of Operation

The Peak Scientific hydrogen generator produces high purity hydrogen gas, H₂. 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 3 year cell 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 user's 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 separating 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 300cc for Precision Hydrogen and 350cc for Precision Hydrogen Trace, at a pressure of 6.9bar (100psi). The unit also meets the European Electromagnetic Compatibility and Low Voltage Directives. The Generator is CE approved and has the CE mark attached.

The Precision Hydrogen range has been tested according to EN60079-2 as part of Peak Scientific's risk assessment evidence provided as part of the CSA Accreditation process. This means that the Hydrogen Generator can be safely installed in your laboratory and does not classify the surrounding area as dangerous.

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

Generator Safety Features

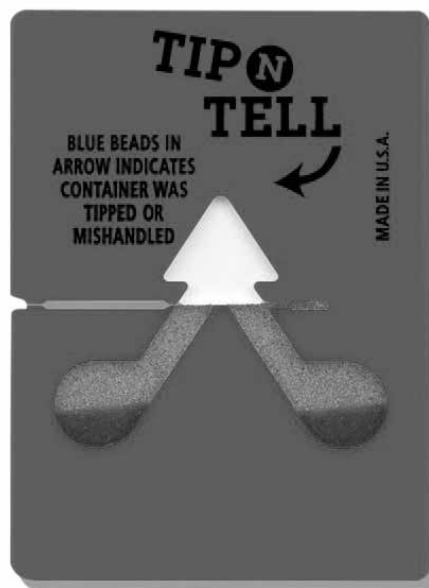
The Precision Hydrogen range have the following safety features to ensure safe and reliable operation:

- Overpressure sensor.
- Safe and accurate control of pressure.
- Capacity excess for leak detection.
- Cell shut down in critical alarm status.

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.

Check 'SHOCKWATCH' and 'TIP-N-TELL' labels for signs of rough handling prior to unpacking.



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. It will require two people to remove the unit from the shipping crate and to manoeuvre the generator onto the bench.

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 with the packaging.

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. UK Mains Power Cable	x 1
4. EU Mains Power Cable	x 1
5. US Mains Power Cable 110V	x 1
6. US Mains Power Cable 230V	x 1
7. Installation Guide- Precision Hydrogen	x 1
8. 4 Litre Water Bottle**	x 1
9. Transit Plugs	x 2

*Optional Extra, Includes additional Barbed Hose Fitting

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

Unpacking Instructions

The generator weight constitutes a two person lift and as such, safe lifting practices should be employed; do not attempt to lift on your own, as you will significantly increase the chance of injury & damage to yourself and others around you.

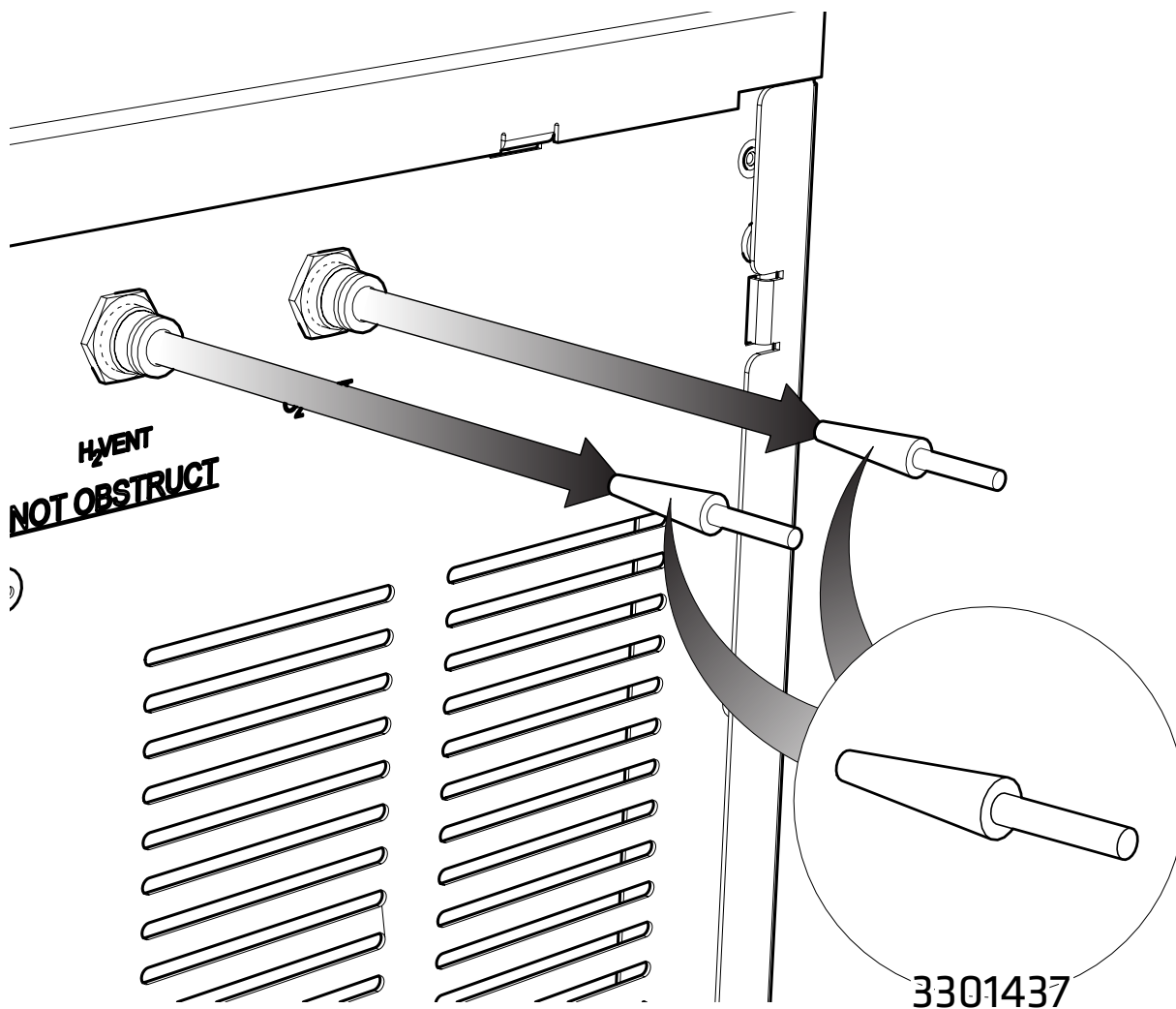
1. Cut the plastic strapping and remove the cardboard lid, protective foam packaging and cardboard sleeve. Finally remove the plastic covering the generator.
2. Next, with someone on either side of the unit, position your hands underneath the unit ready to lift.
3. Ensuring your knees are bent and your back is straight, lift the unit to the desired location.

Transit Plug Removal

All hydrogen generators should be fitted with two Transit Plugs 3301437 during the packaging process. These plugs are fitted to the H₂ vent and O₂ vent of all hydrogen units and ensure no water from the internal water bottle can escape during transit.

Plugs should be removed during the installation of the generator.

These plugs require very little force to remove and will self-remove if left in the vents



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.

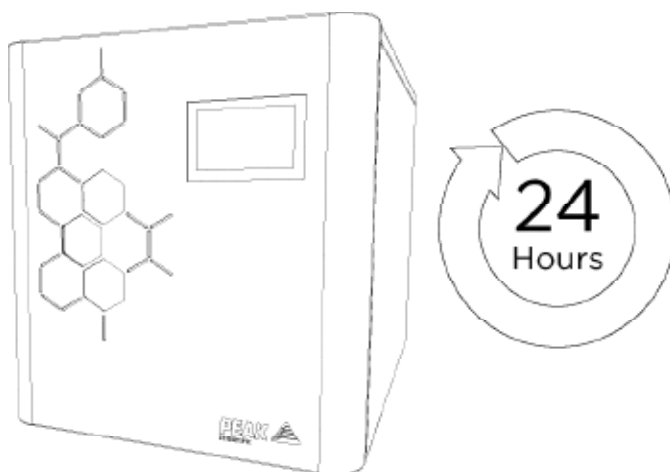
Do not obstruct or connect the vents to any application. Failing to observe this could lead to permanent damage of the generator.

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)

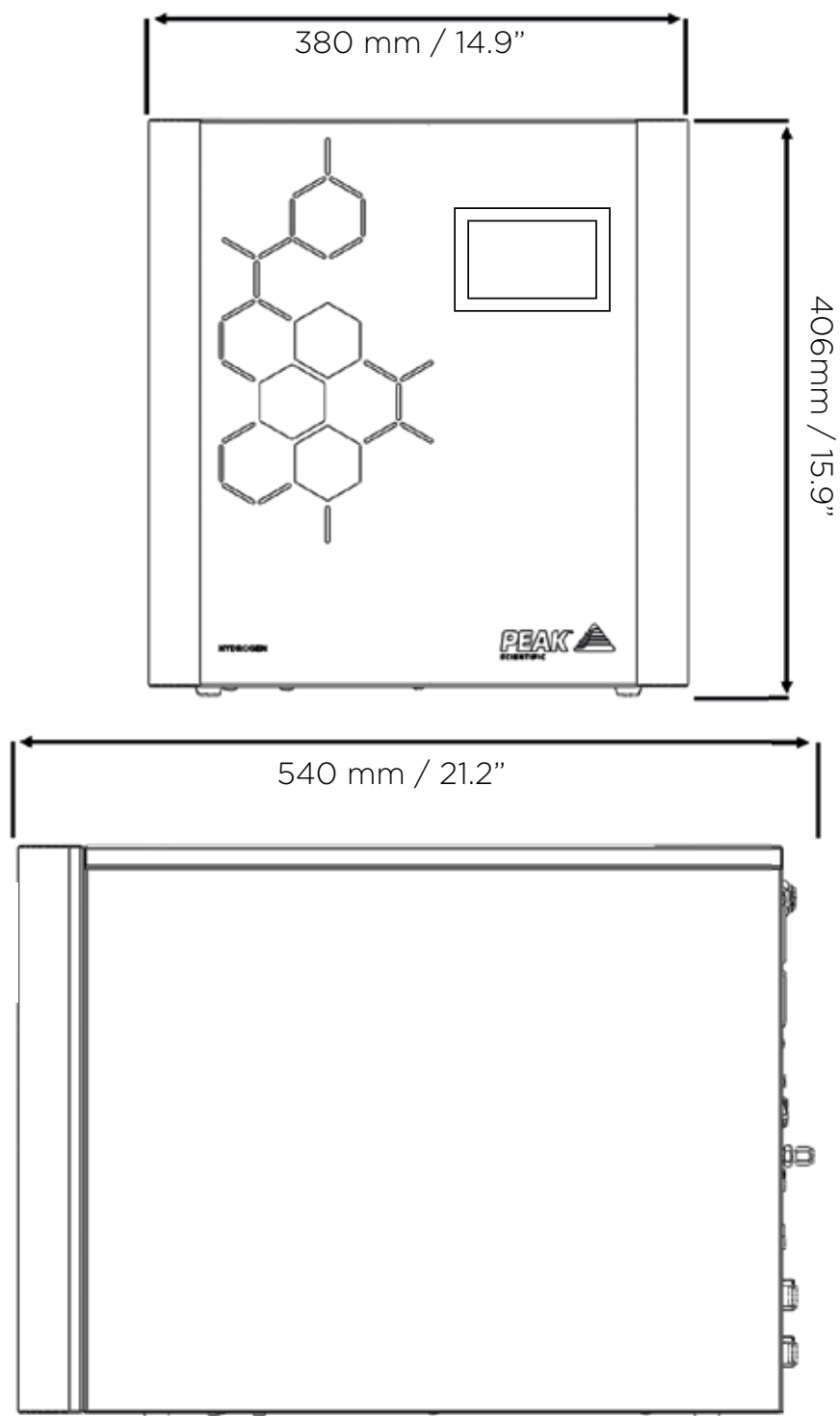
Maximum Operating Ambient Temperature: 35 °C (95 °F)



Note: If using a moisture trap between your Peak Hydrogen Generator and your GC/ GC-MS please ensure the generator has been operated for 24 hours before supplying gas to the application to ensure longevity of moisture trap. Please repeat the process for each time the generator has been switched off for any period of time. Peak Scientific Gas Generators are designed to consume the least possible amount of power; our Hydrogen Generators have been developed with safety in mind and have passed most stringent NRTL safety testing. It is safe to keep the generator in standby.

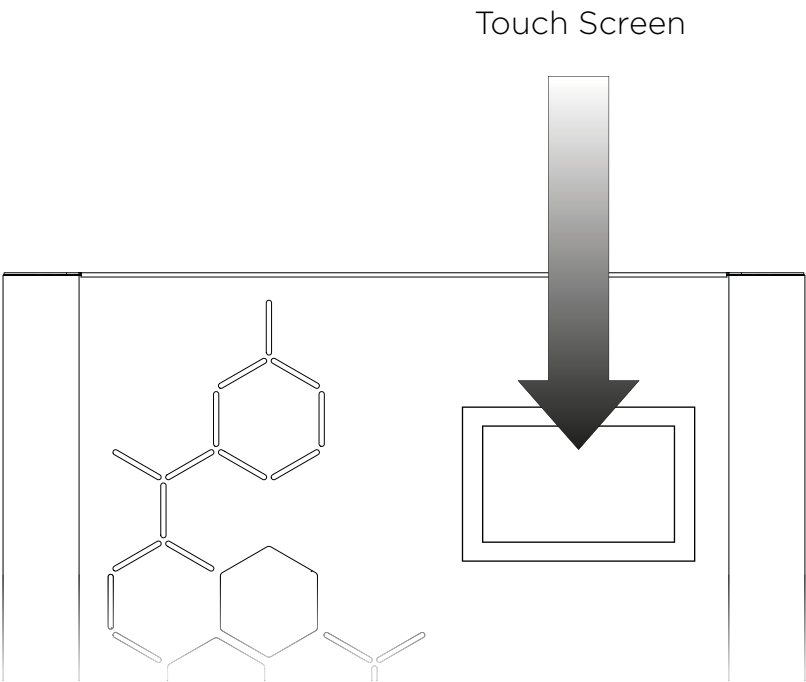
Generator Overview

General Dimensions

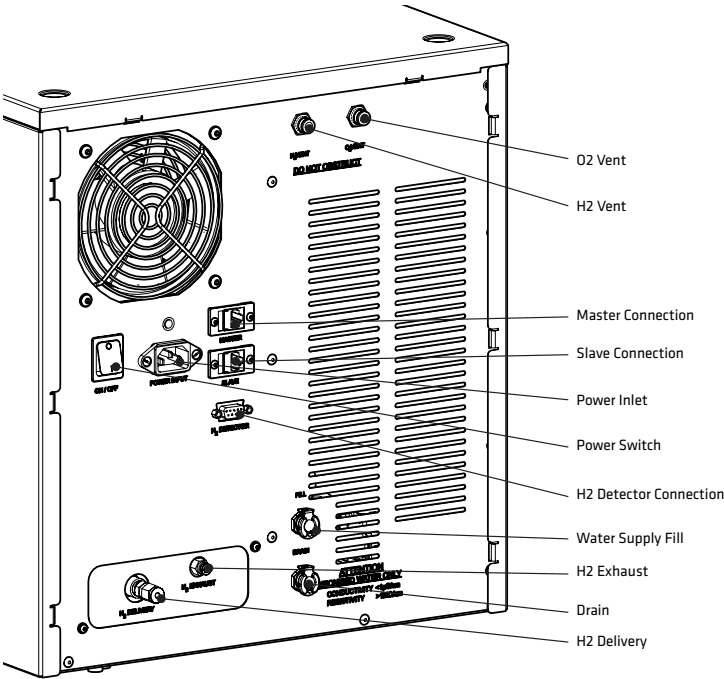


The Generator must always be placed on a flat, level surface. Failure to do so will affect the performance of the Generator.

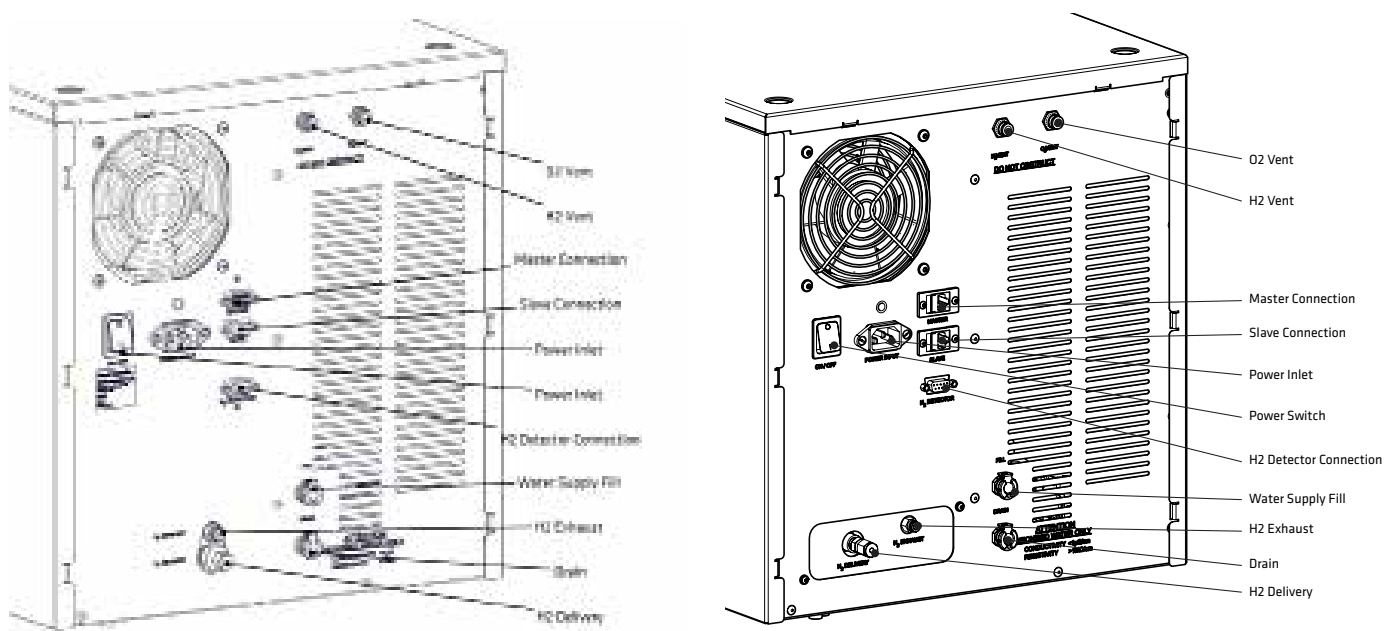
Unit Controls



Rear Connections



Hydrogen



Hydrogen Trace

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®, polyvinyl chloride, or Tygon® 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® tape.

H2 Ventilation

Peak Scientific recommends that both the H2 Exhaust and H2 Vent ports 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 ports are 6mm OD for the H2 Exhaust and 6mm OD for the H2 Vent. If the 1m length of PTFE tubing (00-4411) supplied in the generator fittings kit is insufficient to reach the nearest fume hood or ventilation system, we would recommend using tubing of sufficient length, which can be ordered from Peak Scientific. Please do not attach the 1m length of supplied tubing (00-4411) to the H2 Exhaust or H2 Vent ports if NOT venting gas away to a fume hood or ventilation system as this can result in a localized build-up of hydrogen gas.

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 (Trace) Generator.

Use of water in the Precision Hydrogen (Trace) 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.

Automatic Filling

The Precision Hydrogen generator uses an automatic water filling system, 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 on the next page.

Using the length of Tygon 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.

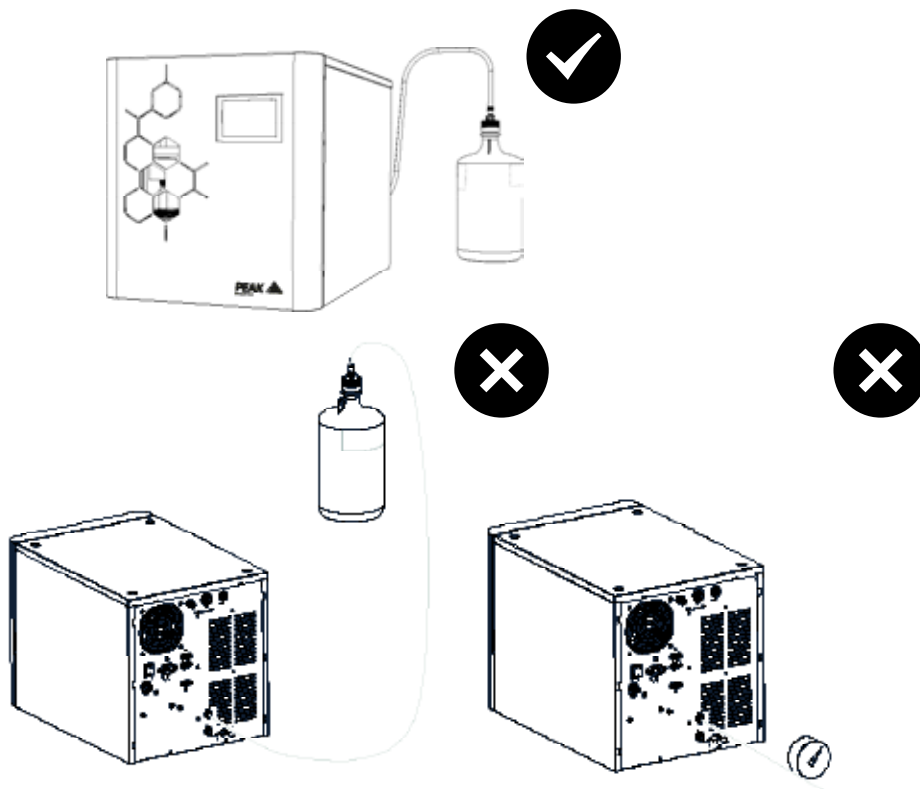
For efficient water filling the external supply should be no more than 2 metres away from the connection on the generator.



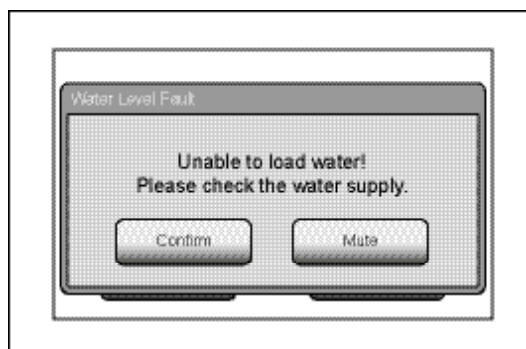
The DI Water Supply source **MUST NOT** be located higher than the height of the surface that the Precision Hydrogen generator is placed upon. A supply located higher than specified will result in the generator's internal water bottle over filling.



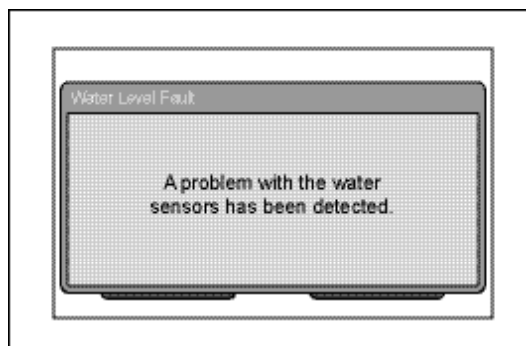
A pressurized DI Water Supply Source will also result in the internal water bottle over filling, and also **MUST NOT** be used.



If the generator cannot load enough water to switch the sensors in the water bottle the generator will alarm providing the user with the screen below.

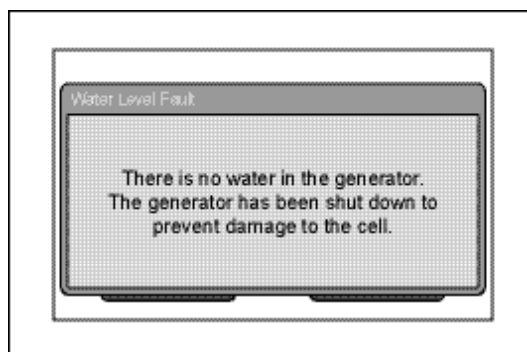


The external water supply should be checked prior to pushing the Confirm button which will then re-engage the load pump and will allow the generator to continue to fill with water. If the generator again fails to load water the below screen will be displayed.



When the system detects a low water level it starts a 3 hour timer, should the system not receive enough water to switch the low level sensor it will then stop the generator from producing hydrogen. This happens to prevent damage to the hydrogen cell and ensure that your Precision Hydrogen Generator remains in its optimum operating condition.

If the generator has reached this point the screen below will be shown on the Human Machine Interface (HMI).



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.

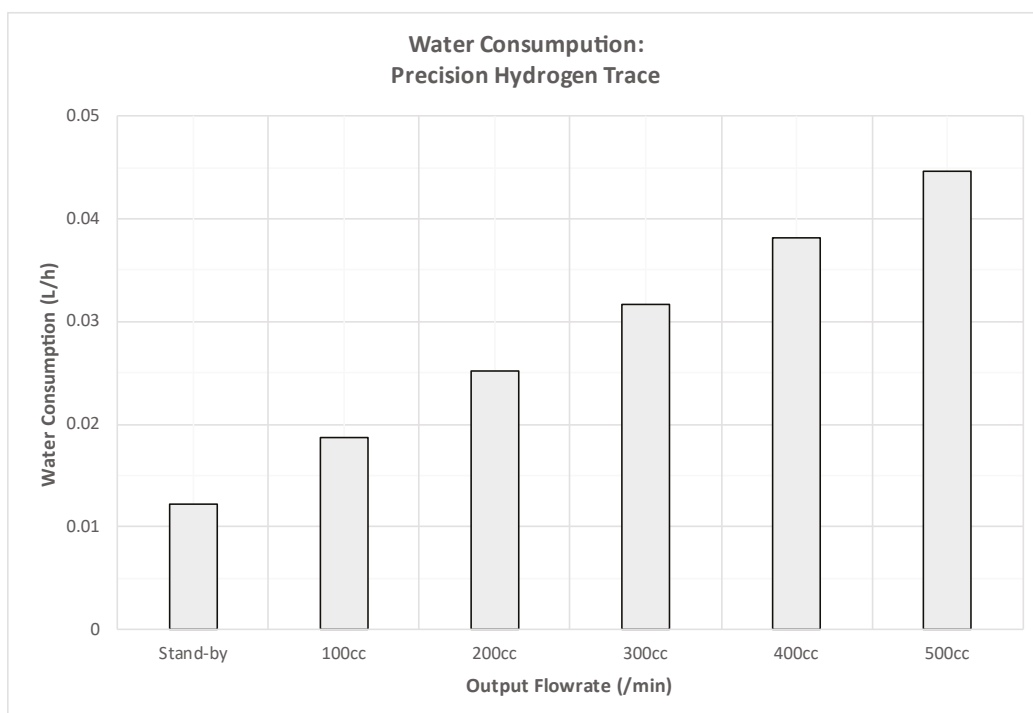
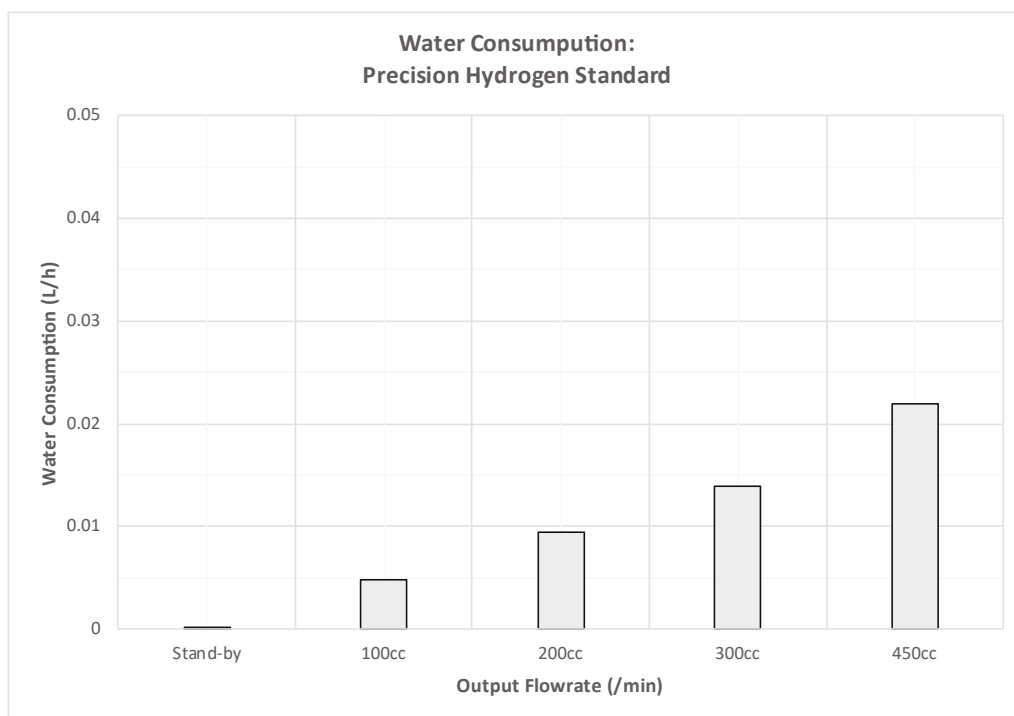
Draining the Water Tank

1. Before draining the generator, ensure that you have tubing with a barbed connector and a vessel to collect drained water
2. Connect tubing to the 'Drain' port on the rear of the Precision Hydrogen generator using the barbed fitting with loose end in the vessel
3. Once the barbed fitting is inserted into the drain connector, water will drain from the generator's internal tank into the vessel
4. Fill the external water bottle with fresh DI water (ASTM type II)
5. Once the internal tank of the generator is emptied, connect the barbed connector to the 'Fill' port of the generator and the generator will automatically draw water from the external water bottle

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 100-230VAC. 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.



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. H₂ Outlet is connected to application
2. Mains power is connected

Turn the power switch ON. The digital display 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.

Upon successful completion of the leak test, the operator is presented with the main screen and the generator is ready to deliver hydrogen.

The main screen has two options available, Start and Menu. The first time the unit is switched on the user should select the Menu option which allows the desired unit of measure and delivery pressure to be selected.

Also displayed on the Menu screen are the Shutdown and Back buttons. Shutdown will depressurize the generator. This should be selected before turning the unit off using the Power switch at the rear of the unit. The Back button returns the user to the home screen where the Start option will allow the flow of hydrogen to the application.

If the unit has been used previously the Start button will initiate the supply of hydrogen to the application at the last used pressure.

Note: If leak test is unsuccessful, an alarm will sound and a Yellow failure screen will be displayed complete with a mute button. The user is prompted at this point to 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 irreparable damage to a GC column. 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 that moisture, oxygen and hydrocarbon traps are used on the gas supply line between the Peak generator and the instrument to provide back-up contaminant protection for your instrument.

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.

Expanding Capacity



These are not standard serial ports, damage to serial equipment is highly likely if connected. 24Vdc signal level exists on certain pins with a maximum power rating of 5W.

The Precision Hydrogen has an expandable feature, where the flow capacity of the unit is increased, by connecting up to 16 units in a Master-Slave format.

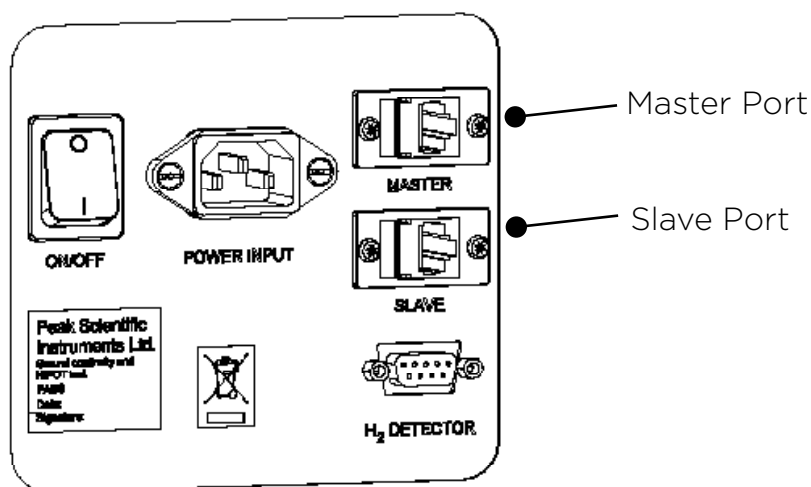
Rear Connections

In order to use this feature the units must be connected together via the 'Master' port on the first Precision Hydrogen, and the 'Slave' port at the rear of the next Precision Hydrogen unit.

The first Precision Hydrogen unit is automatically defined as the Master, and before the connections are made and H₂ is supplied, the desired pressure must be set on all units. This must be the same pressure for all.

The user can now press Start on the Master unit to begin the flow of H₂. The Master will now manage all the other units.

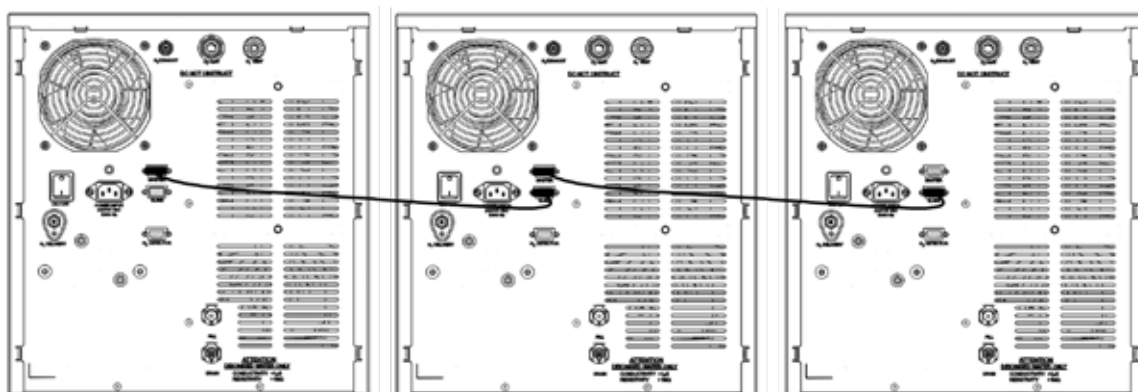
The Data Cables (00-5587) used to connect units together can be purchased from Peak Scientific.



Master

Slave

EOL



Switching the Unit Off

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

Press the Stop button on the Home screen, then press Menu and select Shut Down.

The unit will take a few moments to depressurize after which the power switch at the rear of the generator can be switched off.

Chlorinated hydrocarbons

Chlorinated hydrocarbon compounds and chlorofluorocarbons (or freons) will severely damage the hydrocarbon catalyst used in this gas generator, resulting in generator failure.

The generator can also be contaminated by high concentrations of lead, sulfur or phosphorous compounds, heavy metals and long chain polymers. Care should be taken to avoid introducing these compounds into this gas generator. Please ensure that none of these compounds are stored near the intake of the compressed air supply supporting the gas generator.

Chlorinated Solvents

Under no circumstances should any Chlorinated solvents be stored in the immediate vicinity of the gas generator or the compressed air source. Failure to adhere to this could result in severe contamination of the generator or failure.

Cleaning

Clean the outside of the Generator, with the exception of the HMI screen, 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.

To clean the HMI Screen, moisten a cloth with either isopropyl or ethyl alcohol.



CAUTION

Do not use water, ketone or aromatic solvent to clean the HMI Screen. Ensure that saliva or water drops are wiped off immediately and avoid contacting with oil or fats.

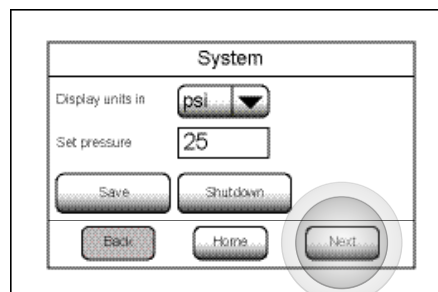
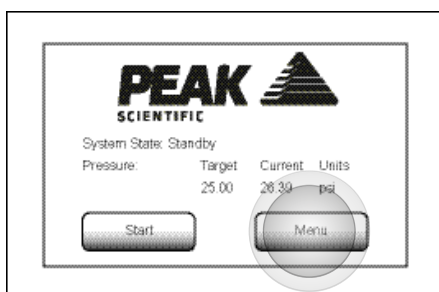
Deioniser Column Replacement - A

Precision Hydrogen Trace

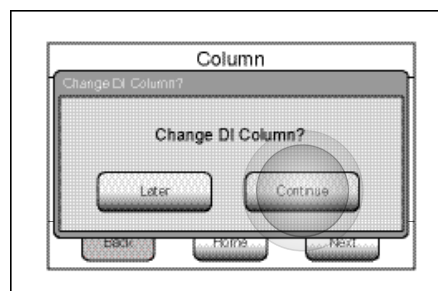
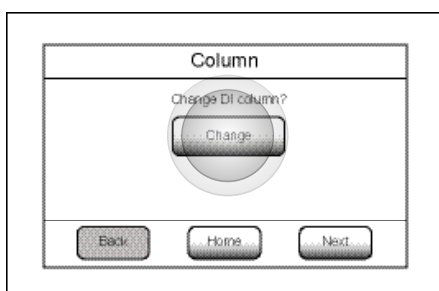
The deioniser column maintains the water quality of the water as it is circulated through the system and to ensure the optimum health of the generator, the resin in the deioniser column should be replaced every 12 months.

Listed below are the instructions for replacing the deioniser column. The user will be prompted to do this by the HMI screen displaying 'Change DI Column'. However in the event of a change being required out with the 12 month schedule, this screen can also be accessed manually.

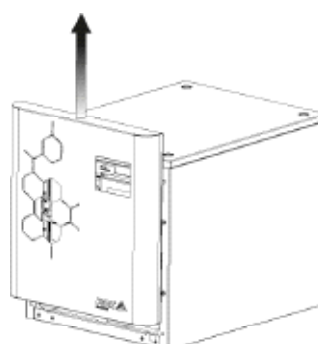
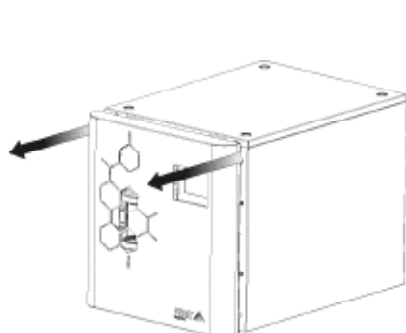
1. From the main screen pressing MENU will bring up the system screen, the NEXT option should now be selected. If this is a scheduled change, the screen will already display CHANGE D.I. COLUMN.



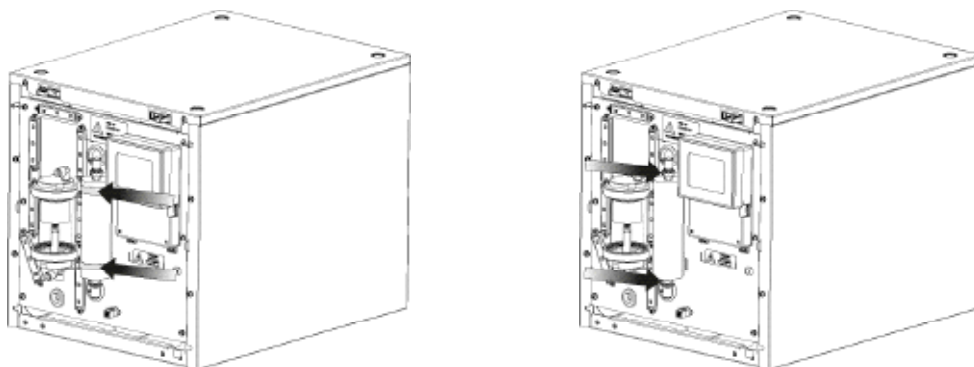
2. The user should now select CHANGE, the next screen shown will ask the user to confirm this by pressing CONTINUE.



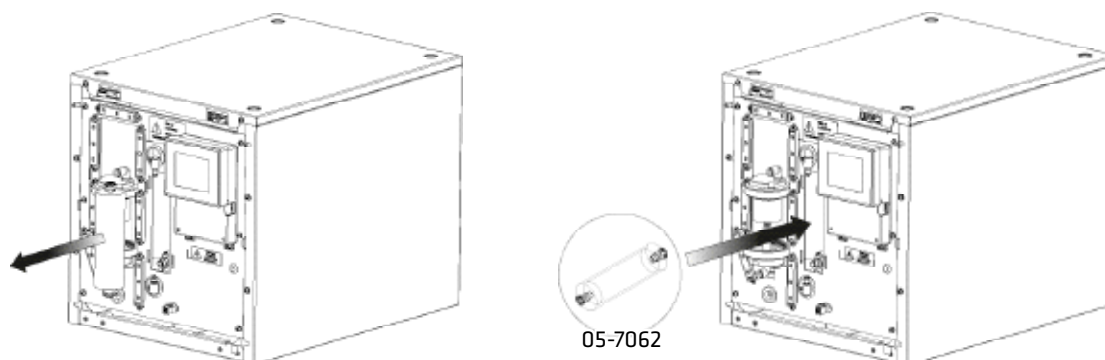
3. Remove the Fascia by first pulling it forwards and then sliding it up, ensuring that the HMI screen is disconnected from the unit.



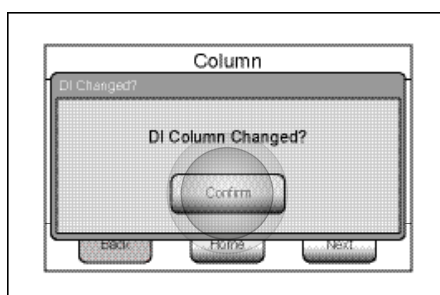
4. The deioniser column is held in place by two Velcro straps, these must be unfastened.
5. Next disconnect the deioniser column by pressing the silver tabs on the fittings at the top and bottom of the column.



6. Remove the used column by pulling it towards you.
7. Fit a new deioniser column (05-7062) into the generator and reconnect the tubing



8. Refasten the velcro straps and re-attach the front fascia, making sure to connect the HMI screen to the unit again.
9. Finally, the HMI screen will display D.I. COLUMN CHANGED? The CONFIRM button should now be selected, to resume normal operation.



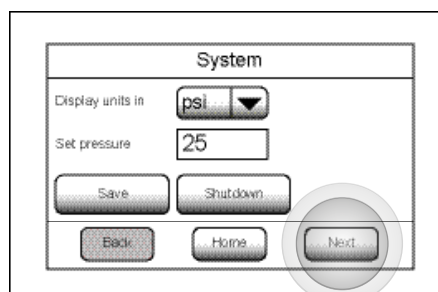
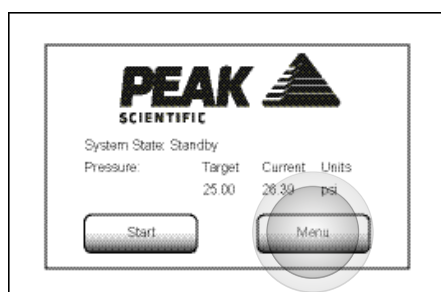
Deioniser Column Replacement - B

Precision Hydrogen

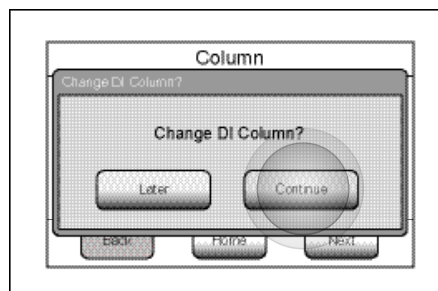
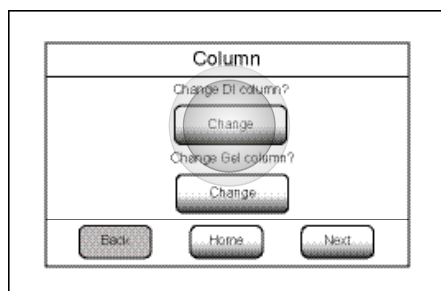
The deioniser column maintains the water quality of the water as it is circulated through the system and to ensure the optimum health of the generator, the resin in the deioniser column should be replaced every 12 months.

Listed below are the instructions for replacing the deioniser column. The user will be prompted to do this by the HMI screen displaying 'Change DI Column'. However in the event of a change being required out with the 12 month schedule, this screen can also be accessed manually.

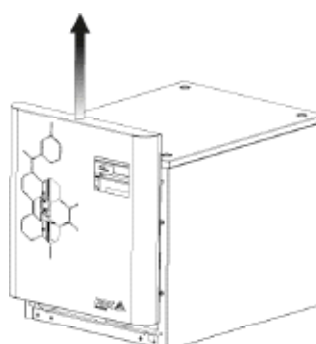
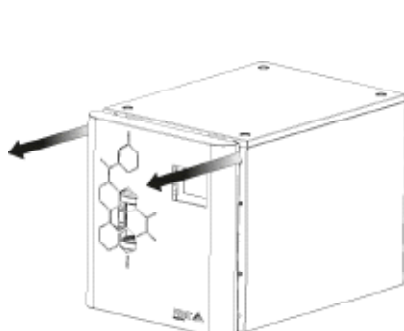
1. From the main screen pressing MENU will bring up the system screen, the NEXT option should now be selected. If this is a scheduled change, the screen will already display CHANGE D.I. COLUMN.



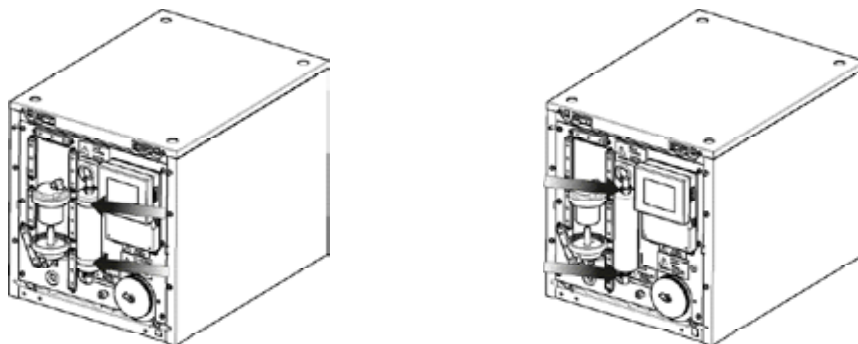
2. The user should now select CHANGE, the next screen shown will ask the user to confirm this by pressing CONTINUE.



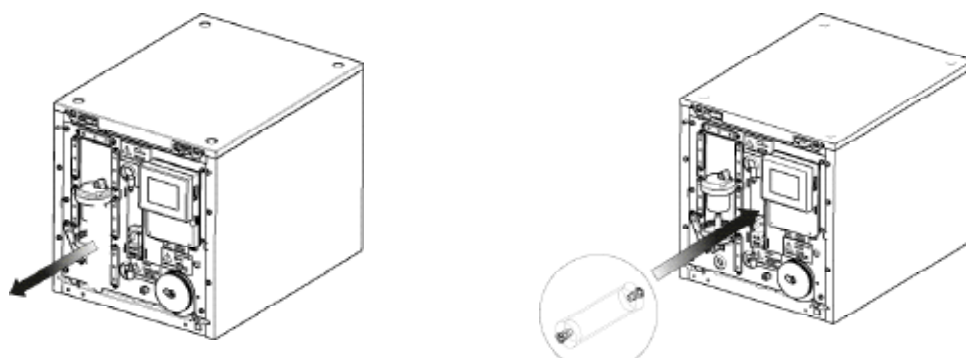
3. Remove the fascia by first pulling it forwards and then sliding it up, ensuring that the HMI screen is disconnected from the unit.



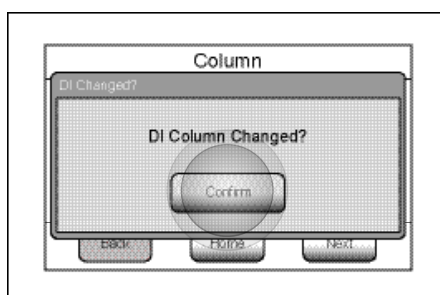
4. The deioniser column is held in place by two Velcro straps, these must be unfastened.
5. Next disconnect the deioniser column by pressing the silver tabs on the fittings at the top and bottom of the column.



6. Remove the used column by pulling it towards you.
7. Fit a new deioniser column (05-7062) into the generator and reconnect the tubing



8. Refasten the velcro straps and re-attach the front fascia, making sure to connect the HMI screen to the unit again.
9. Finally, the HMI screen will display D.I. COLUMN CHANGED? The CONFIRM button should now be selected, to resume normal operation.



Replacement of Desiccant Column

Precision Hydrogen Only

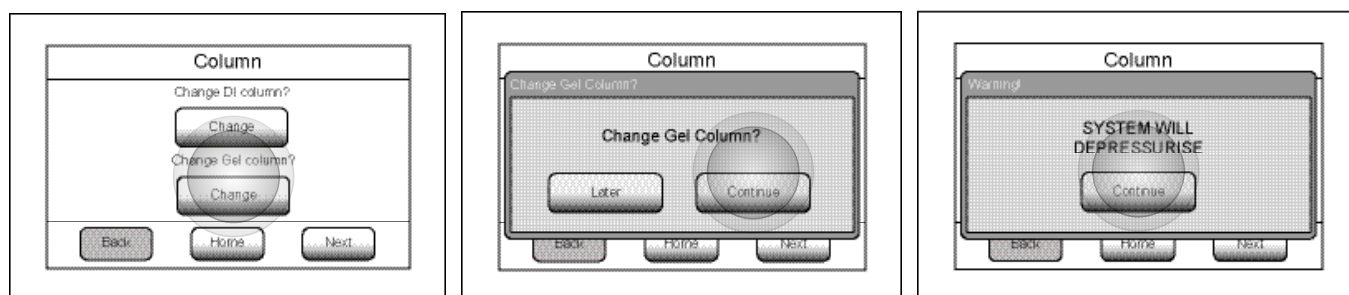
The silica gel in the desiccant column must be removed and either regenerated or replaced once it becomes saturated.

The silica gel can be regenerated by tipping the gel into a suitable container and placed into an oven in accordance with the guidelines on page 39.

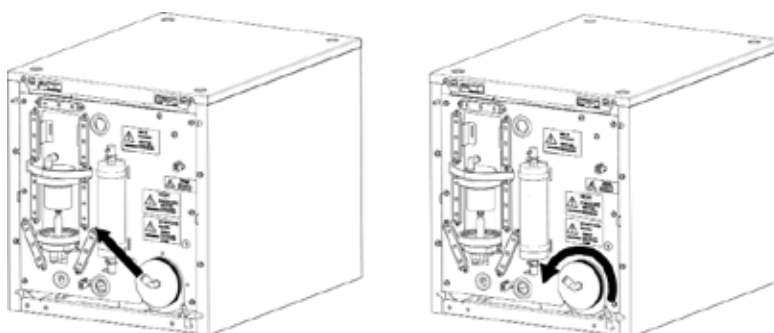
The HMI screen prompts the user to do this.

Instructions are listed below on how to do this.

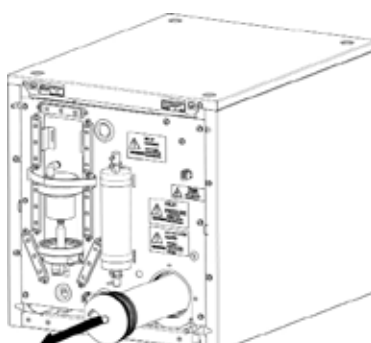
1. From the previously used column screen select CHANGE below change gel column. Next press CONTINUE. The screen will then warn the user that the system will depressurise, press CONTINUE



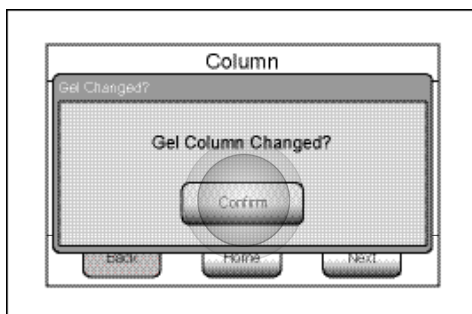
2. Now that the unit is depressurised, remove the front fascia and disconnect the tubing connected to the desiccant column. Next unscrew the column by turning to the left, this should be hand tight.



3. Remove the column from the generator and unscrew the cap. The gel inside should now be removed and replaced with new OR regenerated gel.



4. The column should now be reassembled, and then screwed back into the generator, again this must only be hand tight.
5. Next reconnect the tubing to the push fit fitting on the cap of the column.
6. Now replace the fascia of the hydrogen generator.
7. Finally press CONFIRM on the HMI screen which will display a GEL COLUMN CHANGED? screen. This will bring the generator back up to pressure.



Regeneration of Desiccant

When reactivating the desiccant it is vital that the activity indicator is not used to control the process.

1. As a general rule saturated desiccant will require a minimum of 4-6 hours at a temperature of between 105-110°C throughout the entire desiccant bed for the reactivation process to be effective and reduce the adsorbed moisture to less than 2% by weight.
2. Reactivation should be carried out in a ventilated electric oven. A sealed oven will limit the moisture liberated and prevent efficient reactivation. Gas ovens and microwave cookers are also not suitable for reactivation.
3. Devices that pass warm air through the desiccant bed changing the activity indicator to blue should be avoided.
4. Ideally after reactivation the desiccant must be placed in a sealed container and allowed to cool. The reactivated desiccant should not be stored in a warm oven at 60°C as this will cause partial saturation of the desiccant although the activity indicator will remain stable.
5. To validate the reactivation efficiency a fundamental weight loss test conducted before and after processing will provide the amount of moisture loss data.
6. A supply of pre-heated air is an integral requirement for an efficient reactivation process. For saturated desiccant a minimum air flow of between 5-10 cubic feet per minute.

Service Requirements

Service Schedule


Purchase Interval	Component	Visit
12 Months	Precision Hydrogen Trace Annual Service Kit	www.peakscientific.com/ordering
	Precision Hydrogen Annual Service Kit	

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**

Troubleshooting

Problem	Possible Solution
The generator will not switch on and the power switch does not illuminate	<ul style="list-style-type: none"> • Ensure power cord is plugged into the Generator and that the power socket is turned on. • Check the fuse in the power cord plug, if fitted. • Contact your service provider. 
Diagnostics Failed Alarm	<ul style="list-style-type: none"> • Contact your service provider.
Over Pressure Alarm	<ul style="list-style-type: none"> • Contact your service provider.
Capacity Excess Alarm	<ul style="list-style-type: none"> • Check demand flow, ensure that it does not exceed maximum capacity of the generator. • Check external pipework for leaks. • Restart generator to run self test and check for internal leaks. • Contact your service provider.
Water Level Fault	<ul style="list-style-type: none"> • Contact your service provider.
Low Water Supply Alarm	<ul style="list-style-type: none"> • Check Water Supply level, and fill if necessary. • Contact your service provider.
Hydrogen Detected*	<ul style="list-style-type: none"> • Check for external leaks.
The generator is not producing hydrogen	<ul style="list-style-type: none"> • Check the Customer Set Pressure is at least 1 PSI or greater. • Contact your service provider.
The generator is not producing the required amount of hydrogen at the set pressure.	<ul style="list-style-type: none"> • Check the water quality of the external supply. • Contact your service provider. • Check for external leaks.

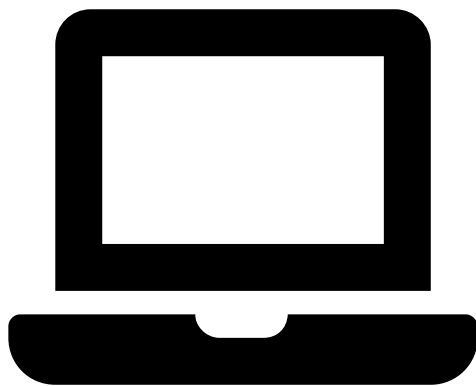
* If Hydrogen Detector is fitted.

Go Online or Complete and Return

We know that registering any of your recently purchased products is not the first thing on your mind- but it is very important to both of us. Not all warranties are alike and Peak Scientific stand out against other gas suppliers as we offer a comprehensive, quick response, on-site warranty. This means that in the very unlikely case that your gas generator develops a fault we have rapid support teams on-hand around the world who are able to come to your lab and get you back up and running in no time.

Register for your **comprehensive 12 month on-site warranty** with ease online at www.peakscientific.com/protected.

Alternatively, you can send the completed form to Peak Scientific by post or email at warranty@peakscientific.com.



The desktop form is titled 'PEAK' and includes a search bar. It contains the following fields: 'Serial number' (with a dropdown for 'Generator Serial Number'), 'Installation date', 'Contact details' (with sub-fields for 'First name', 'Last name', 'Email address', and 'Phone'), and a 'Submit' button at the bottom.



The mobile form is titled 'Your Details' and includes the following fields: 'First name', 'Last name', 'Email address' (with a note 'We will never share your email with third parties'), 'Phone number', 'Address', and 'City'. There is a 'Submit' button at the bottom right.

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**. For generators that remain unregistered after 1 month from the shipment date, the warranty will be considered active from the date of factory dispatch.

[PEAK Protected]TM

Peak Scientific has highly trained, fully certified Field Service Engineers located in over 20 countries across every continent around the world. This allows us to provide an industry-leading rapid response service to our customers. With **[Peak Protected]**, your laboratory's productivity becomes our top priority.

To discuss Peak Protected generator cover and payment options speak to your local Peak Representative or for further information contact: **protected@peakscientific.com**

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