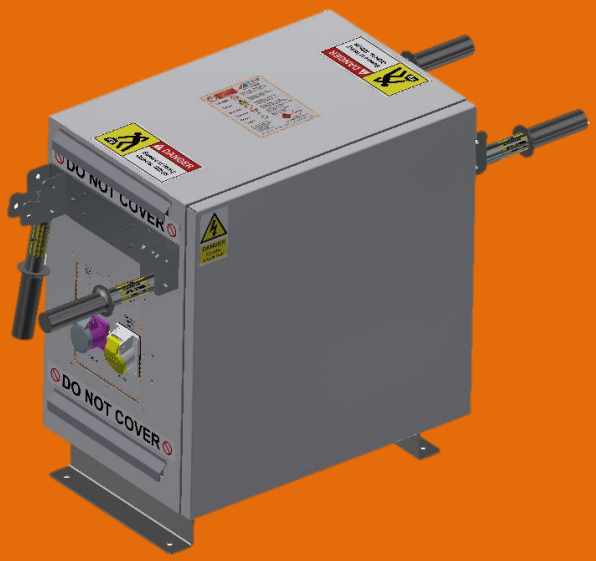
Quayside Industrial Park
Bates Road
Maldon
Essex
CM9 5FA



User Manual

Light Green Power

Eco-CH2-V3, Fuel Cell Generator

LGP 6481 Iss A

WARNING

This product generates voltages which can cause serious injury or death if proper precautions are not taken, or if used improperly.

This product should only be used by competent persons who have read and understood this user manual, and all instructions regarding its use and safety should be observed.

Keep this user's manual handy so that you can refer to it at any time. This user's manual is considered a permanent part of the Power Pack and should remain with the power pack if resold.

The information and specifications included in this publication were in effect at the time of approval for printing Light Green Power Ltd. reserves the right, however, to discontinue or change specifications or design at any time without notice and without incurring any obligation whatever.

Revision history

Version	
1.0	3 April 2022

Light Green Power Limited, Quayside Industrial Park, Bates Road, Maldon, Essex, CM9 5FA
tel: +44 (0) 345 077 2838

Contents

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Preliminary

INTRODUCTION

Light Green Power Ltd (LGP) Ecolite-CH_2 is an eco-friendly, robust and compact mobile power supply. The secure cabinet incorporates a BOC HYMERA fuel cell power generator. The fuel cell uses high purity Hydrogen provided by BOC Linde GENIE gas cylinders to give an efficient and CO_2-free power source at the point of use.

The CH_2 is suitable for outdoor and ventilated indoor use. The secure cabinet construction also makes it easy to manoeuvre and deploy.

Instructions for Use

This User's Manual is a vital reference source for new users and must be retained. When not in use the manual is stowed in the documentation tube provided inside the machine. Make sure that you read the operating instructions carefully before use. With proper care, this product will provide reliable, long-term service.

All information, illustrations and specifications contained in this publication are based on the latest product information available at the time of publication. LGP reserve the right to make changes at any time without notice. Continued improvement and advancement of the design may cause changes to the machine that may not be included in this publication.

PLEASE READ THE OPERATING INSTRUCTIONS CAREFULLY AND UNDERSTAND THEM BEFORE YOU OPERATE THE MACHINE.

Identification of Product

This manual may refer to controls and equipment that are not present on your particular model. It is important that you become familiar with your machine and its equipment and how to operate it properly.

Information about the model, code and chassis serial number is on the serial number sticker inside the door of the machine. Always quote the model and serial number in correspondence with your dealer or the manufacturer.

Modifications to Product

LGP may from time to time issue service bulletins. These will keep you up to date as to any improvements or changes that may take place on the complete assembly or component parts.

Product Compliance and Conformity

The Eco-CH_2 has been designed and assessed with reference to the relevant UK Legislation:

- Electromagnetic Compatibility Regulations 2016
- Electrical Equipment (Safety) Regulations 2016

Full details can be found in the technical file which can be obtained from LGP. Each new machine is issued with a warranty certificate and a certificate of conformity, which are sent to the head office of the purchaser. Further copies are available on request.

Website: www.lightgreenpower.co.uk
E-mail: sales@lightgreenpower.co.uk
Telephone: +44(0)3450 772838

Light Green Power Ltd
Quayside Industrial Park
Bates Road, Maldon
Essex CM9 5FA

UK DECLARATION OF CONFORMITY

Product: ECO-CH_2

Manufacturer: Light Green Power Ltd
Quayside Industrial Park
Bates Road
Maldon
Essex
UK
CM9 5FA

We declare that the above referenced product is in conformity with the following UK regulations:

Electrical Equipment (Safety) Regulations 2016

EN 62368-1:2014*

Electromagnetic Compatibility Regulations 2016

Applied and, as modified, met EMC test standards:

Emissions
EN 50121-4:2016

- Radiated disturbance - **EN 55011:2016 inc A1:2017 & A11:2020**

Immunity*
EN 50121-4:2016

- Electrostatic discharge - **EN 61000-4-2:2009**
- Radiated RF interference - **EN 61000-4-3:2006 inc A1:2008 & A2:2010**
- Fast transient bursts (power outlet) - **EN 61000-4-4:2004 inc A1:2010**
- Conducted RF field (power outlet) - **EN 61000-4-6:2009**
- Power frequency magnetic field - **EN 61000-4-8:2010**
- Pulsed magnetic field - **EN 61000-4-9:1993**

Authorised Signature (23 / 09 / 2021)

*LGP will carry out a gap conformity assessment between this UK declaration of conformity and their previous EU declaration of conformity within three months of issue.

SPECIFICATION

UKCA plate markings on the Eco-CH_2 show that the machine conforms to all applicable directives.

LGP model	Standard CH_2
Overall length	600 mm
Overall width	400 mm
Overall height	600 mm
Gross weight	50-70 kg
Lifting positions	2 X Pair of lifting handles
Power source (FUEL CELL)	BOC HYMERA-200
Output voltage (Hymera)	10-30 V DC (Nominal 24V) [System: 110V / 240V]
Fuel source	Linde GENIE 20 litre compressed hydrogen gas cylinders (300 bar)
Run time (based on one full Genie cylinder running at full power)	Approx. 30 hours
Output power (max)	200 W @24V DC (400W @110V AC)

Safety Information

GENERAL

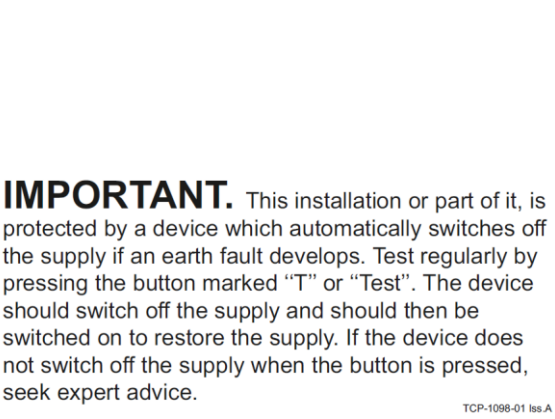
To prevent unexpected and unnecessary down time, report all malfunctions to LGP. Do not operate the machine until corrected. This manual describes general examinations and operations with the safety precautions required for normal operating conditions. It is not a guide however, for other than normal conditions or situations.

Users must be safety conscious at all times. Be alert to recognise potential operating safety hazards and take the necessary precautions to ensure safe operation of the machine.

Where used as non-railborne plant, use is limited to within a possession worksite or outside a possession within a line blockage. The machine must not be used on live third and fourth rail electrification. Emergency recovery of the machine is by manual lifting as detailed in section 0.

DECALS AND LABELS

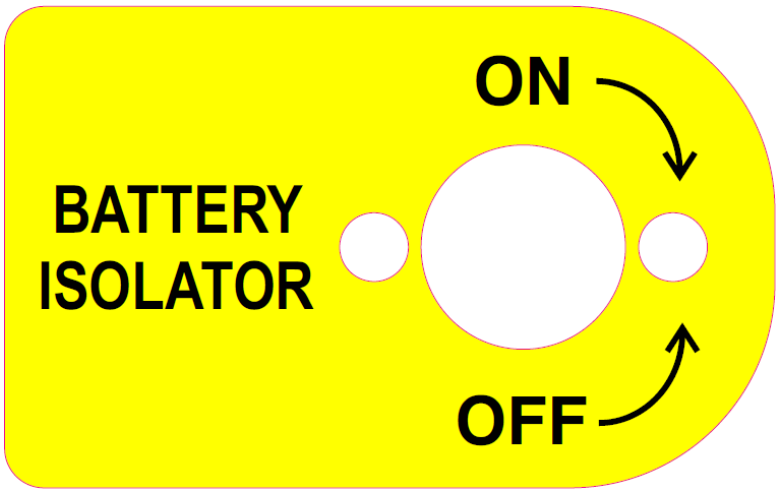
Read and always obey the safety guidelines on the decals and labels attached to the chassis. Failure to do so before you start the machine could result in personal injury or damage to the machine.

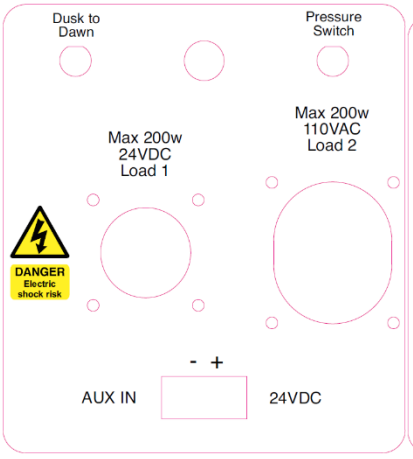


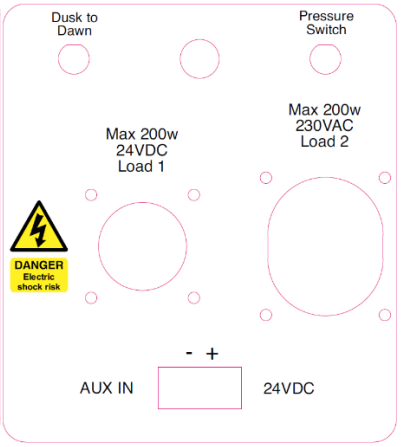
DANGER
Electric shock risk

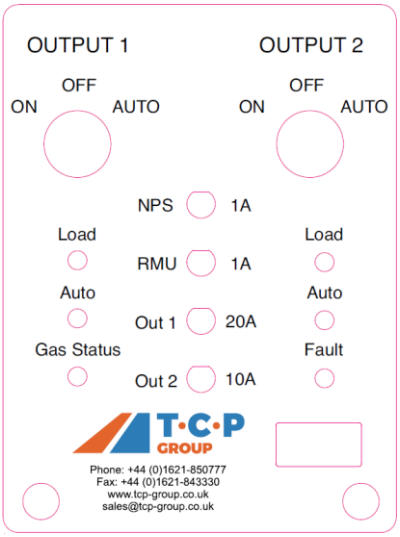
DO NOT COVER

SERIAL No: CBH-00014









Product:- ECO CH2
Part No:- GA-4829-17
Operating Voltage:- 24VDC
Output Voltage:- 110VAC 50Hz
Continuous Output:- 200W
Peak output:- 400W
Max Weight:- 100Kgs
Dimensions:- 700H x 800W x 400D
Ingress Protection:- IP42

Manufacturer:-
Light Green Power Ltd
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UK CA

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Product:- ECO CH2
Part No:- GA-4829-18
Operating Voltage:- 24VDC
Output Voltage:- 230VAC 50Hz
Continuous Output:- 200W
Peak output:- 400W
Max Weight:- 100Kgs
Dimensions:- 700H x 800W x 400D
Ingress Protection:- IP42

Manufacturer:-
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Safety Information

SAFETY MESSAGES

Before you operate the machine, please read, understand and at all times obey the safety messages located throughout this manual.

Safety messages of a general nature are located in this section of the manual. Safety messages specific to a particular section are located at the front of that section. Safety messages specific to a particular task within a section are located before that task.

Safety messages that denote a warning or caution are preceded by a safety alert symbol ⚠ and a signal word.

A warning means that personal injury or death is possible if the instruction is not obeyed. The message identifies the hazard, explains the consequences if ignored and indicates how to avoid it. A caution means that damage to the machine is possible.

Additional safety alert symbols used to reinforce the worded message:

	Read documentation		Discharge static		Hard hat required
	Eye protection required		Gloves required		Foot protection required
	No smoking		No open flame		No flames
	Pressurised cylinder		Flammable gas		Explosion risk
	High voltage hazard		Watch your head		Hand crush hazard

Transportation

ECO-CH_2

⚠ WARNING

Do not transport the machine with the regulator connected to an installed gas cylinder. The regulator may be damaged in transit and lead to a hydrogen gas leak. Always close the cylinder valve and disconnect the regulator before transportation.

⚠ CAUTION

The machine is designed to be lifted manually by a minimum of two people. Always remain aware of the position of other people around you when you lift the machine. For transportation, strap across the machine as shown in below image. Do not strap across the door as this could damage the seal.

Return this manual to the documentation tube for transportation with the machine.

GAS CYLINDERS

⚠ WARNING

Do not smoke in vehicles that carry gas cylinders. Flammable hydrogen gas could be present during transportation. To avoid risk of ignition or explosion, do not smoke or use open flames in the vehicle.

When gas cylinders only are to be transported on vehicles, close the cylinder valve tightly and disconnect the regulator.

Make sure that there are no leaks.

Fit the protective cap to the cylinder valve.

Read the safety requirements of the British Compressed Gases Association (BCGA) Guidance Note 27 (or equivalent in country of use).

Site Deployment

SITE CONDITIONS

Safety Equipment

Know what safety equipment is required and use it. The minimum PPE when you deploy or operate the machine is safety glasses, protective gloves and safety footwear.

A hard hat, high visibility vest, respirator and earplugs may also be a site requirement.

Initial Machine Position

⚠ CAUTION

Make sure the machine is deployed on firm and level ground. Make sure that the area that immediately surrounds the machine is clean, neat and free of debris.

⚠ CAUTION

Bear in mind that, if required, the machine may be used in a well-ventilated indoor space subject to risk assessment.

Earthing Point

An earth point is provided and labelled on the outside of the enclosure for use as required.

Operating Instructions

USING THE ECO-CH_2

Preparation

⚠ WARNING

Do not start a machine that is in need of repair. A faulty machine may be hazardous and could cause personal injury. Contact the manufacturer or supplier.

Read the BOC *High Purity Hydrogen Safety Data Sheet* in conjunction with this procedure.

Put on appropriate PPE, i.e. hard hat, safety glasses, protective gloves and safety footwear.

⚠ WARNING

Do not smoke or use open flames within a 1 metre radius of the machine. Flammable hydrogen gas could be present during operation. To avoid risk of fire or explosion extinguish any source of local ignition.

FIRE EXTINGISHER TYPE: DRY POWDER 1Kg

⚠ CAUTION

Make sure that there is no static electrical charge between yourself and the gas cage. This can be achieved if you touch a grounded piece of metal.

Summary:

- *Read Hydrogen Safety Data Sheet*
- *Put on appropriate PPE*
- *Extinguish sources of local ignition*
- *Discharge static electricity*

Install the Regulator and Gas Hose

⚠ WARNING

Do not release gas into the atmosphere from the cylinder at any point. Hydrogen gas will ignite easily. Avoid 'snifting' the gas cylinder at all times.

⚠ CAUTION

Make sure the gas cylinder valve is off when you install or remove the regulator and gas hose.

NOTE: *If the O-ring is damaged or missing, or if a leak is detected during use, contact the supplier or manufacturer.*

Remove the protective cap from the gas cylinder valve.

Connect the regulator to the gas valve.

Turn the connector in a counterclockwise direction and hand-tighten only.

Examine the sealing O-ring on the gas hose for damage.

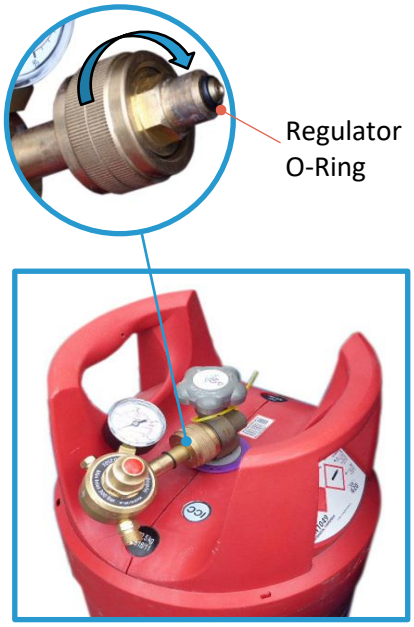
NOTE: *If the O-ring is damaged or missing, or if a leak is detected during use, refer to Section 5.3 before you attempt to replace it.*

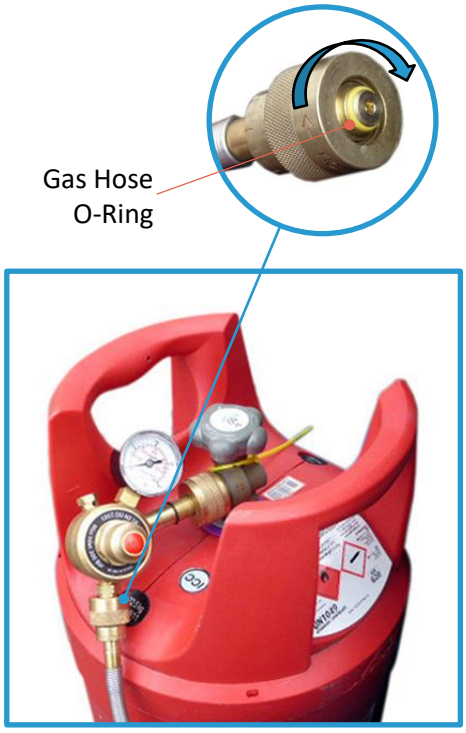
Connect the Hymera gas supply hose to the regulator.

Turn the connector in a counterclockwise direction and hand-tighten only.

Summary:

- *Examine regulator O-ring*
- *Connect regulator to cylinder*
- *Examine gas supply hose O-ring*
- *Connect hose to regulator*





Look for Leaks

⚠ WARNING

Do not damage the regulator when it is connected to the gas cylinder and the valve is open. A damaged regulator may lead to a hydrogen gas leak. In the event of a leak shut down immediately and contact the manufacture or supplier.

Open the gas cylinder valve fully and then back it off half a turn so that it feels loose. The valve should be opened at least a turn and a half. Spray each joint with the 'Teepol' leak detector supplied with the machine and look for bubbles that show a leak. Do this every time a joint is made.

⚠ CAUTION

Make sure that the gas cylinder has adequate content and is properly connected and secured before use.

NOTE: *The gauge on the regulator shows the gas pressure, and is used only to monitor the contents of the cylinder. When the pressure reads zero with the gas valve open, the cylinder is empty.*

NOTE: The Hymera has an internal leak detector. In the event of a leak within the Hymera, this detector will stop operation of the Hymera, displaying an error message. This message is recorded on the Hymera's internal memory to assist fault-finding.

Power Up

⚠ WARNING

Do not obstruct or cover the ventilation holes at the top of the CH_2. Blocked ventilation holes could lead to a build-up of hydrogen gas in the event of a leak. Remove any obstructions to allow the gas to disperse.

Connect the desired load(s) to the correct ouput connector on the side of the CH_2 as shown below.

Connect the dawn till dusk and pressure switch connectors if they are being used.

Using the cabinet key, insert and unlock both locks one after the other and open the door.

Insert the battery isolator key and turn to the 'on' position. Turn the relevant output(s) switch to the 'on' position for manual use or 'auto' for dusk till dawn use, if available, see below.

The load indicator will illuminate on either output when the relevant output is working correctly powering the load. The auto indicator will illuminate on either output when the relevant output has the dusk till dawn feature working correctly, if available, see below.

The gas status indicator will flash when gas is running low and is solid once the gas has run out, see below. The gas status indicator will also flash until a pressure switch is fitted with correct regulators. The fault indicator will flash in accordance with sequences detailed below, if there is a Hymera fault, contact LGP who will be able to advise.

NOTE: Flashing sequences are as follows;

- - - Output 1 fuse has tripped

-- -- -- Output 2 fuse has tripped

- - , -- -- -- Both outputs 1 and 2 fuses have tripped

--- --- --- Hymera fault

NOTE: There is a door switch which turns off the indicators when the door is closed.

Summary:

- *Connect the desired load(s)*
- *Operate battery isolator*
- *Switch on the desired output(s)*

Auxiliary Input

An auxiliary input is available to charge the batteries by alternative DC power sources to supplement the Hymera. For example, a solar panel array or mains battery charger may be used. The Anderson socket is to be used, and the appropriate plug be inserted at any time with or without the system running. When power is applied to the Anderson, the Hymera will standby until a time when the batteries need to be charged and power is no longer present at the Anderson connector.

<u>ANY DC POWER SOURCE BEING PLUGGED INTO THE ANDERSON CONNECTOR SHOULD EITHER BE SUPPLIED BY TCP OR APPROVED BY TCP BEFORE USE.</u>

Maintenance

Shut Down

Turn the both the output switch to the off position and turn the battery isolator to off. Remove the key to stop any unauthorised personnel operating the machine.

Close the door and lock both locks one after the other to stop any unauthorised personnel operating the machine.

To shut down completely, turn off the gas cylinder valve to stop the gas flow.

Resettable Fuse Reset

There are four resettable fuses that can be reset for the NPS, the RMU, output 1 and output 2. Should the fuses blow, the button pops out on the control panel and are pushed in to reset the fuse. Should the button not reset or the fuse continue to blow, TCP should be contacted to deal with the issue.

Reset (240V)

A fault has occurred tripping the RCD and MCB which is to be rectified. For example, the system has been overloaded. This is to be rectified, for example by removing the load.

The RCD and MCB can be reset by lifting the switches as shown in the image.

It should be noted that the protection should be tested regularly as the warning decal states, by pressing the "T" or "Test" button (orange in the below image).

Reset (110V)

A fault has occurred tripping the GFCI circuit within the inverter. For example, the system has been overloaded. This is to be rectified, for example by removing the load.

It should be noted that the protection should be tested regularly. Testing is to be carried out using a Ramp test meter by trained personnel only.

CHANGE A GAS CYLINDER

Preparation

Read the BOC *High Purity Hydrogen Safety Data Sheet* in conjunction with this procedure.

Put on appropriate PPE, i.e. hard hat, safety glasses, protective gloves and safety footwear.

⚠ WARNING

Do not smoke or use open flames within a 1 metre radius of the machine. Flammable hydrogen gas could be present during operation. To avoid risk of fire or explosion extinguish any source of local ignition.

Remove the Regulator and Gas Hose

⚠ CAUTION

Make sure the gas cylinder valve is off when you install or remove the regulator and gas hose.

Close the gas cylinder valve fully to stop any gas flow and remove the gas pressure.

NOTE: *If the gauge still shows pressure, carefully release the Hymera gas supply hose connector before you remove the regulator. The hose and regulator are hand tight only. Turn the connector in a clockwise direction to release.*

Remove the gas cylinder connector hose and then remove the regulator.

⚠ CAUTION

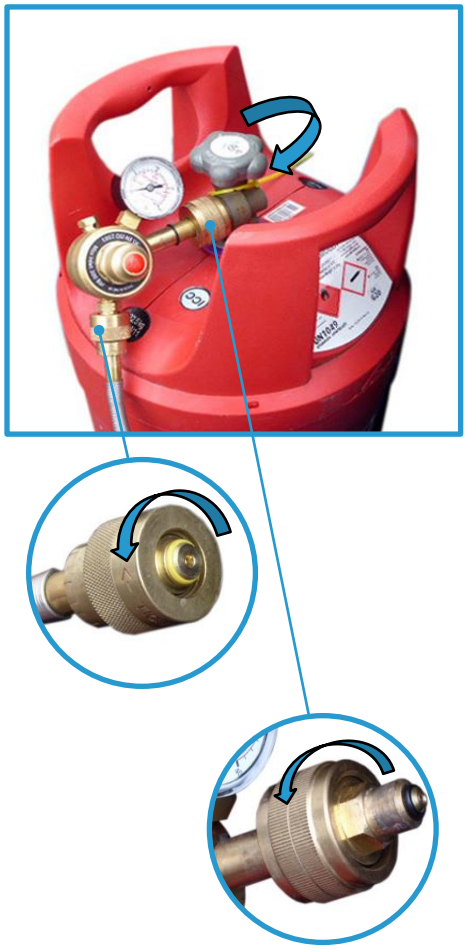
Make sure that there is no static electrical charge between yourself and the gas cage. This can be achieved if you touch a grounded piece of metal.

Summary:

- *Read Hydrogen Safety Data Sheet*
- *Put on appropriate PPE*
- *Extinguish sources of local ignition*
- *Discharge static electricity*

Summary:

- *Close gas cylinder valve*
- *Remove gas supply hose*
- *Remove and stow regulator*



Maintenance

CLEANING

⚠ CAUTION

Make sure that the Hymera inlet and outlet vents are clean and free of obstructions when cleaning the machine.

Make sure that all moving parts are clean and free of dirt and debris to prevent malfunction of the machine.

All hire machines will be cleaned on return to the TCP depot.

When you clean the machine on site, remove the regulator and gas hose.

Wipe over the machine surfaces with lint free cloth and a mild detergent solution.

Never allow water to accumulate around the Hymera fuel cell.

Never wash the machine with a power washer or high pressure hose.

INSPECTION

Do a thorough inspection of the machine and its component parts on a regular basis.

Regulator and Gas Hose

Examine the regulator and gas supply hose, with the connectors, for any damage that may cause a hydrogen leak.

Replace any missing or damaged O-ring seals.

Decals and Labels

Examine all chassis mounted decals and labels for damage.

The decals and labels provide important operating instructions and warn of dangers and hazards.

Replace any missing or hard-to-read labels.

Spares are available from LGP.

O-RING REPLACEMENT

⚠ WARNING

Do not cut the O-ring and take care not to damage the groove on the connector during removal or installation of the O-ring. A damaged O-ring or connector could lead to a hydrogen gas leak. Avoid the use of tools of any kind.

Contact the supplier or manufacturer before you attempt to replace a sealing O-ring on the regulator or gas supply hose.

NOTE: *Spare O-rings are available from LGP, please quote the following stock numbers:*

20-0242 Regulator O-Ring

20-0243 Hose O-Ring

Change O-rings by hand in a clean environment.

Carefully slide off the O-ring from the groove around the connector.

Slide on the replacement O-ring and make sure it is seated correctly in the groove.

Options

OPTION 1

An external cage with manifolds and pressure switch for linking up to four additional gas cylinders may be provided.

OPTION 2

A solar panel array may be provided

OPTION 3

A dusk till dawn sensor may be provided