



**MATHESON  
TRI•GAS**

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## **Hydrogen Generator PGH Series 3**

### **User's manual**

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## Introduction

### Scope of the manual

This manual provides operation and maintenance instructions for model PGH2-100, PGH2-160, PGH2-250, PGH2-300, PGH2-500 and PGH2-600 hydrogen generators.

### Specifications

#### *Specifications of the different models of hydrogen generator*

Hydrogen flow rate	Model PGH2-100	0 -100 cc/min at STP
STP: Standard temperature and pressure (20°C, 1 bar)	Model PGH2-160	0-160 cc/min at STP
	Model PGH2-250	0-250 cc/min at STP
	Model PGH2-300	0-300 cc/min at STP
	Model PGH2-500	0-500 cc/min at STP
	Model PGH2-600	0-600 cc/min at STP
Max outlet pressure	7 bar (100 psi)	
Purity	99.999%	
Weight (dry)	PG 100 – 160 – 250 – 300	17.5 Kg
	PG 500 - 600	19.0 Kg
Power consumption	Model PGH2-100	70VA
	Model PGH2-160	95VA
	Model PGH2-250	140VA
	Model PGH2-300	160VA
	Model PGH2-500	280VA
	Model PGH2-600	310VA
Input voltage	120-240V / 50-60 Hz	
Fuse (not user replaceable)	120V - 6.3 A.T.	240V – 4 A.T. (5x20)
Pressure accuracy	0.1 bar	± 0.5 %
Display	Graphic Display, 128x64 Pixels	
Index of protection	IP2x	
Operating conditions:		
- temperature	+15°C to +40°C	
- relative humidity	80% up to 31°C, decreasing linearly to 50% at 40°C	
Over voltage category	II	
Pollution degree	2	
Sound pressure level	46 dBA	
Case dimensions	230 x 355 x 410 mm (WxHxD)	

### Notes on FCC compliance

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

### **WARNING!**

*Any changes or modifications to this equipment not expressly approved by the manufacturer may void the user's authority to operate the equipment.*

### Correct use

The hydrogen generator is designed to produce hydrogen for laboratory use. The unit must only be operated for this purpose, according to the specifications and instructions provided in this manual. In particular, the following warnings must be observed at all times:

- Indoor use only
- Never operate the unit in below-zero temperatures. This will cause irreversible damage to the electrolysis cell.
- Only use pure water (see "Filling the water tank").
- Only operate the unit in a room with sufficient ventilation (see "Placing the unit").
- Always unplug the unit from the mains power supply before accessing the internal components for replacement.
- Only the parts described in the "Spare parts list" can be replaced by the user.

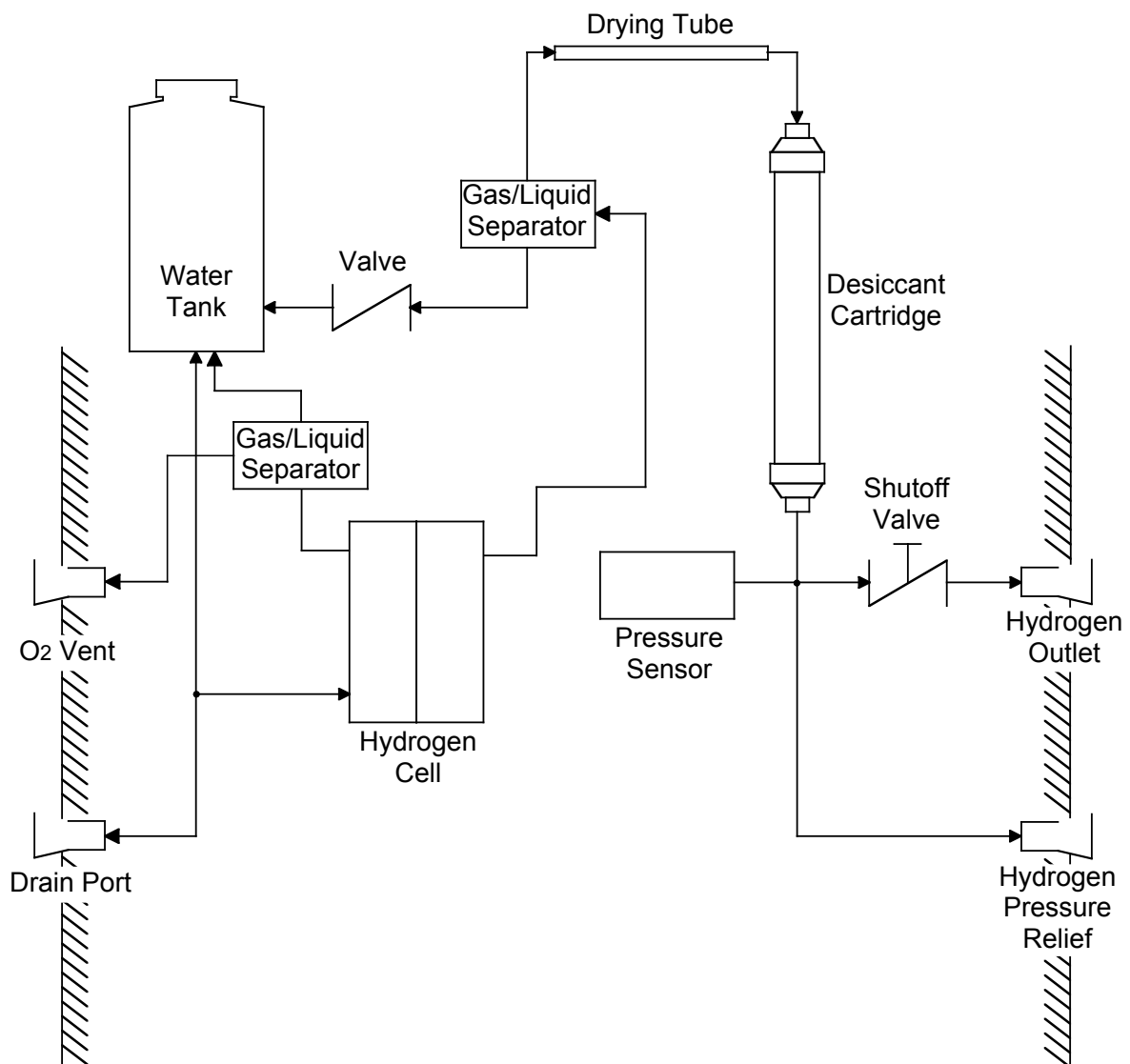
**Packing list*****List of items included in the shipment***

Quantity	Description
1	Hydrogen generator
1	Instruction manual
1	Deionizer triangle bag
1	Water drain with flexible tubing
1	Power cable

## Description

The hydrogen generator produces pure hydrogen (and oxygen as a by-product) by the electrolysis of water. The key element of the generator is an electrochemical cell assembly which contains a solid polymer electrolyte. No free acids or alkalines are used. De-ionized or pure, distilled water is the only liquid which may come into contact with the cell. As this is consumed it must be refilled from time to time as required.

The generated hydrogen gas is accumulated in the hydrogen/water separator and the desiccant housing. The pressure is controlled by a pressure transducer. The output pressure is indicated on the display. The hydrogen is dried by passing it through a drying tube and a desiccant cartridge containing desiccant material. The hydrogen then passes through the shutoff valve and exits the generator through the outlet port at the rear.



## Installation

### Receiving the generator

All units have been carefully inspected before transport. Visual checks for damage and functional tests should be performed upon receipt. Any damage must be immediately noted and reported. The generator must only be returned according to the shipping instructions provided.

### Placing the generator

The hydrogen generator must be placed on a flat, level, vibration-free, shock-free surface. Do not place the generator over a source of heat, as this may cause the device to overheat. The unit should not be in contact with any other objects on any side, and the air inlet must not be blocked. **Leave at least 30cm of free space at the rear for ventilation.** Do not operate the generator in a sealed or unventilated room, or in close proximity to open flame or other sources of ignition. Do not operate the generator at below freezing temperatures. Operation is guaranteed at operating temperatures between +5 and +40°C.

#### **WARNING!**

*Normal precautions for any hydrogen supply should be taken when using the generator. DO NOT use in sealed or unventilated rooms. DO NOT use in close proximity of open flames or other sources of ignition.*

### Symbols used on the generator



Earth symbol: this symbol marks the earth connections to the chassis of the hydrogen generator.

### Gas connections

Pure dry hydrogen at regulated pressure is available at the hydrogen outlet port at the rear of the generator. This port must be connected to 1/8" tubing using a stainless-steel or copper Swagelok connector. Teflon connectors are not suitable. The pressure at this port is adjusted and shown on the display. The hydrogen relief port at the rear of the unit can be connected to an exhaust hood or other vent system.

#### **WARNING!**

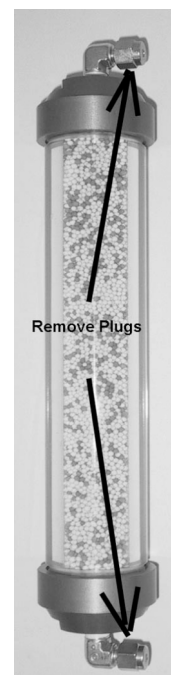
*The line from the relief port should never be connected in such a way that back pressure can develop.*

**IMPORTANT!**

*Remove the plug from the oxygen vent and hydrogen vent before operating the unit.  
Keep this plug for transporting the unit.*

**Cartridge installation**

The desiccant cartridge is shipped separately inside the packaging, and needs to be fitted before operating the unit. Refer to the photos below for the installation of the cartridge. Make sure that the tubing that connects the cartridge is pushed back inside the unit after installation, to allow the front door to close completely.

**Step 1 to Step 4 : Preparation for cartridge installation****Step 1****Step 2****Step 3****Step 4**



**Step 5 to Step 8 : Cartridge installation**

Step 5



Step 6



Step 7



Step 8



N.B.: when silica gel inside the cartridge has changed completely its colour, it's time to substitute it with a new one. Loosen the top fitting of the cartridge by screw the fitting counter clock wise; then empty the 'old' molecular sieve and refill with the new one. Make sure, the O-ring on top of the cartridge is free of dust before screw the fitting again.

## Electrical connections

Check the setting of the voltage selector on the rear of the unit. The set voltage is indicated by the white arrow. To change the voltage, proceed as follows:

- Using a small screwdriver, remove the voltage selector insert.
- Replace the voltage selector insert so that the white arrow points to the correct voltage.

## Remote connections (optional)

The hydrogen generators are fitted with an optional remote control feature, which allows the user to check the status of the machine from a remote position, and to start/stop the production of hydrogen.

The contacts used in the remote control are potentially free relay contacts. The contacts can be configured via software as normally-open or normally-closed (see the *Configuration* section). The maximum voltage and current ratings for the contacts are **1A / 48V**. The pin configuration of the remote connector is shown in the table below.

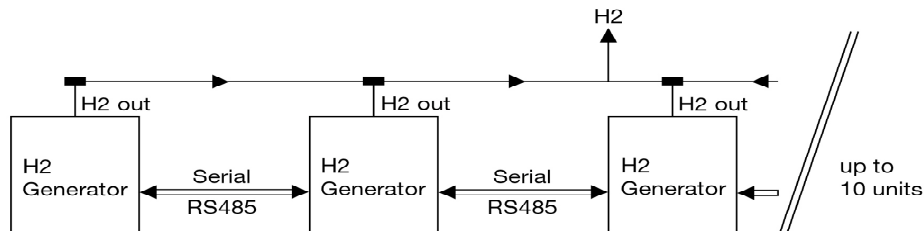
### Remote connector pin configuration

Pin	Description
1+2	Start (12-30 VDC polarity not important)
3+4	Standby (System not OK)
5+6	Reaching normal pressure (Overproduction)
7+8	Refill water (Low water)
9+10	Low water level (Too low water)
11+12	Bad water
13+14	Change water (Bad water pre alarm)

**Cascading (option)**

The RS-485 interface allows up to 10 generators to be operated in parallel mode. One unit has to be defined as the master, while the others operate in "Slave" mode. All the slaves need to be configured with individual ID numbers. Communication between the generators requires a standard D-sub 9 pin serial cable. The serial ports are connected as follows:

Master RS 485 out → Slave 1 RS 485 out - Slave 1 RS 485 in → Slave 2 RS 485 in ....

**Configuration***Configuring the Master*

1. Enter "menu".
2. Scroll until the display shows "Master" and enter: set the value using the +/- buttons to Yes;
3. Exit and scroll until the display shows "Number of slaves" and enter: set the number of slaves connected to the master using the +/- buttons.
4. Exit and scroll until the display shows "ID Nr" and enter: set 1;
5. Exit.

*Configuring the Slaves*

1. Enter "menu".
2. Scroll until the display shows "Master" and enter: set the value using the +/- buttons to No;
3. Exit and scroll until the display shows "ID Nr" and enter: set the ID number of the slave. Use a different number for each slave, starting from ID Nr. 2
4. Exit.

The configuration is now complete.

**Operating in Master Slave Mode**

Connect the gas outputs of all the generators to the same line. Open all the main valves. If the configuration and the serial connection is correct, the slaves will show "Slave Mode" after starting up. Change the pressure setting on the master, and the slaves will follow the master.

**IMPORTANT!**

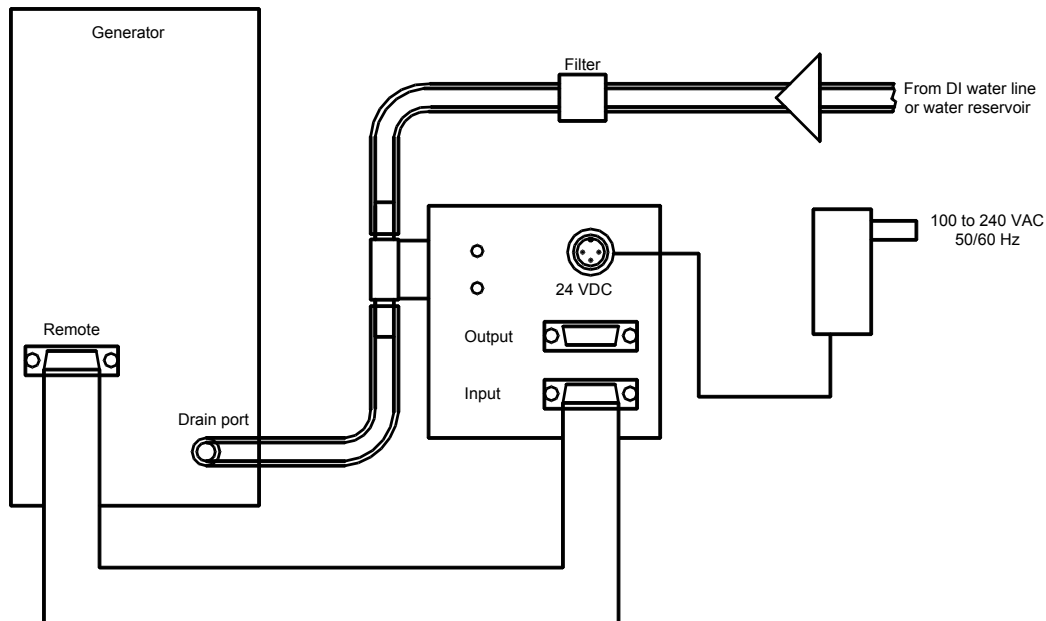
*The cascading function will only work properly if the gas outlets on all the generators are connected together and the main valves are in the open position.*

## Auto refill (option)

### Description

The auto refill option gives you the possibility to refill the water tank of the generator automatically from an external water source. You can either use a DI water line or a water reservoir. The correct refill time is depending on the pressure of the water source.

A higher pressure needs a shorter refill time. **Max. pressure is 60 PSIG.** If you are using a water reservoir, make sure the minimum water level in the reservoir is 2-3 feet higher than the top of the generator.



### Installation steps

1. Connect the water tubes and the electric wires as in the diagram above.
2. Configure the generator as followed :
  - Set the generator to standby
  - Set the auto refill function to ON
  - Adjust the auto refill time to 8 s
3. Test the auto refill time as followed:
  - Empty the water tank
  - Start the generator
  - Obtain the refilling level (should be approx 30 to 50 % of the max level)
  - If the refill level is too little increase the auto refill time.
  - Repeat this steps until you have a correct refilling volume.
  - Note : every time you go into the auto refill menu, you have to put the generator to standby and start it again.

### **Warning**

*If the refill time is too high, the water tank of the generator can overflow, and damage the unit.*

## Initial start-up

### Filling the water tank

To fill the generator with water, remove the cap on the water tank. Carefully fill the tank with distilled or deionized water. The conductivity of the water used in the generator must not exceed  $2\mu\text{S}$ .

Fill the tank to the maximum level indicator. Replace the cap, and then leave the small hole free for ventilation.



#### **WARNING!**

*Do not fill the water tank higher than the marked level.*

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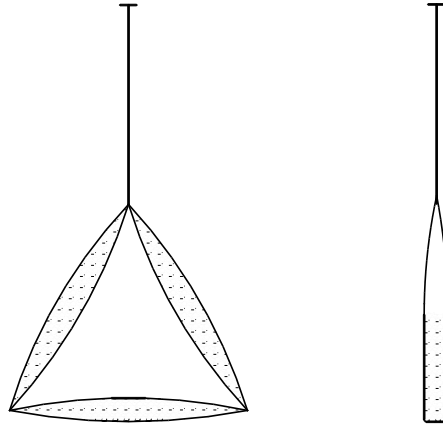
#### **CAUTION**

*To prevent contamination of the cell assembly, it is important to use only deionized or distilled water in the generator. Water containing metallic impurities will contaminate or damage the cell, and will void the warranty.*

### Installing the deionizer bag

After having filled the tank with water, the deionizer bag (supplied) must be placed in the tank. Inspect the bag thoroughly for holes or tears, indicated by loose deionizer beads on the outer surface. If the bag is damaged in any way, discard and replace it with a new one. Only use original parts (see *Spare Parts*). Wash the deionizer bag in deionized water before proceeding.

Insert the free end of the "T" fastener through the hole in the centre of the water filler cap, until it is securely fastened. The bag should not block the outlet at the bottom of the tank. Once in place, the bag should not be allowed to dry out.



This new triangle deionizer bag has been designed for a higher water purifying capacity. It is recommendable to use this bag for new generators, in the first 4 to 6 months of operation. After this time you can use the standard deionizer bag ( see "spare parts").



## Starting the unit

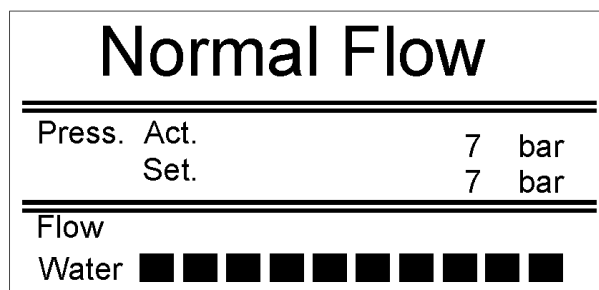
Once all of the previous operations have been performed, the generator is ready for operation.

1. Close the **Shutoff Valve** located on top of the unit, next to the water tank cap.
2. Check that the tank is filled with deionized water.
3. Check that the hydrogen outlet connector is tightly fitted.
4. Check that the plug has been removed from the oxygen vent.
5. Turn the **Power** switch to the ON position.
6. Enter the desired set pressure, using the **Menu** buttons and selecting **Pressure adjust**.
7. Press the **Start** button to start the unit (if the unit has been configured for "Auto Start" - see *Configuration* - it will start automatically).
8. The unit will immediately begin to build up pressure. The LCD display will show the message "Reaching normal pressure", and the H<sub>2</sub> Flow Bar will indicate maximum flow (fully illuminated).
9. Wait until the **Act** pressure reaches the **Set** value. These values are shown on the LCD display. It may take a few minutes to reach the **Set** operating pressure.

### NOTE

*If the generator does not build up pressure as required, the unit will shut down. Refer to the Troubleshooting table.*

10. Once the pressure reaches the **Set** value, the LCD display will show the message "Normal pressure" and the H<sub>2</sub> Flow Bar will indicate no flow (no segments illuminated). This indicates that there are no gas leaks within the generator itself.
11. Open the **Shutoff Valve**. The outlet pressure will fall initially. The amount and the duration of this pressure drop is dependent on the volume of the external equipment connected to the generator.
12. After the initial pressure drop, the outlet pressure should stabilise at the **Set** pressure. A continuing drop in pressure indicates a gas leak in the external equipment, or too high hydrogen consumption. Check the external equipment for leaks or too-high consumption.
13. The generator is now in normal operating conditions.



**Figure 3**      **LCD Display**



## Operation






## LCD display

All important operating information is shown on the display.

### Layout of the display

The LDC display provide the following information.

Normal Flow			
Press.	Act.	7	bar
	Set.	7	bar
Flow			
Water			

### First row, status information

**Sts** shows current information on the operating status of the generator.

The information can be divided into 3 groups:

<i>Information :</i>	displays normal operating status
<i>Pre-alarm :</i>	indicates that a maintenance intervention will soon be required; accompanied by an audible signal.
<i>Alarms :</i>	indicates that maintenance intervention is required and that the machine has been shut down; accompanied by an audible signal.

**Table 1**      **List of messages displayed**

MESSAGE	DESCRIPTION	TYPE	ACTION
Standby	Device ready for H <sub>2</sub> production.	Information	Press start
Reaching Normal Pressure	Device producing H <sub>2</sub> and increasing pressure to the set value	Information	
Normal Pressure	Device producing H <sub>2</sub> and has reached the set pressure value	Information	
Normal Flow	Device producing H <sub>2</sub> and has reached the set pressure value, with H <sub>2</sub> flowing	Information	
Refill Water	Water level approaching alarm threshold	Pre-alarm	Fill the tank with water
Change Water	The conductivity of the water has exceeded 33µs	Pre-alarm	Drain and then refill the tank; change the deionizer bag
Low Pressure	The set pressure can not be reached	Alarm	Check for internal or external leaks. Check max. H <sub>2</sub> consumption
Low Water Level	There is too little water in the tank	Alarm	Refill the tank
Bad Water	The conductivity of the water has exceeded 38µs	Alarm	Drain and then refill the tank; change the deionizer bag
High Cell Voltage	High cell voltage	Alarm	Notify service agent

**Second row, pressure information**

**Act** is the actual pressure of the hydrogen, while **Set** is the set pressure.

The pressure can be increased using the **↑** button, or decreased using the **↓** button.

**Third row, hydrogen flow**

This row displays the current quantity of hydrogen being produced. Each point represents around 10 % of maximum capacity.

This graph also indicates approximately how much hydrogen is being consumed by the connected equipment.

**NOTE**

*The last point on the flow graph will flash only. This indicates that the generator is producing at maximum capacity. In normal operation, this should not be the case, as it indicates that the consumption is too near the maximum limit, and the unit may shut-down if consumption increases further. Maximum flow is normal when the unit is building up pressure.*

**Fourth row, water quality**

This graph shows the quality of the water.

With more than 3 points illuminated, water quality is good.

If only 3 or less points are illuminated, the conductivity of the water is around 33 $\mu$ S (pre-alarm level).

If only 1 point or no points are illuminated, the conductivity of the water is equal to or greater than 38 $\mu$ S (alarm). The generator will be shut down.

**Start/Stop-Reset button**

The Start/Stop button places the generator in normal operating mode from Standby and vice-versa. It is also used to re-start the unit following an alarm. When the problem leading to the alarm has been resolved, the generator must be reset using the Reset button, and then can be started by pressing the Start/Stop button.

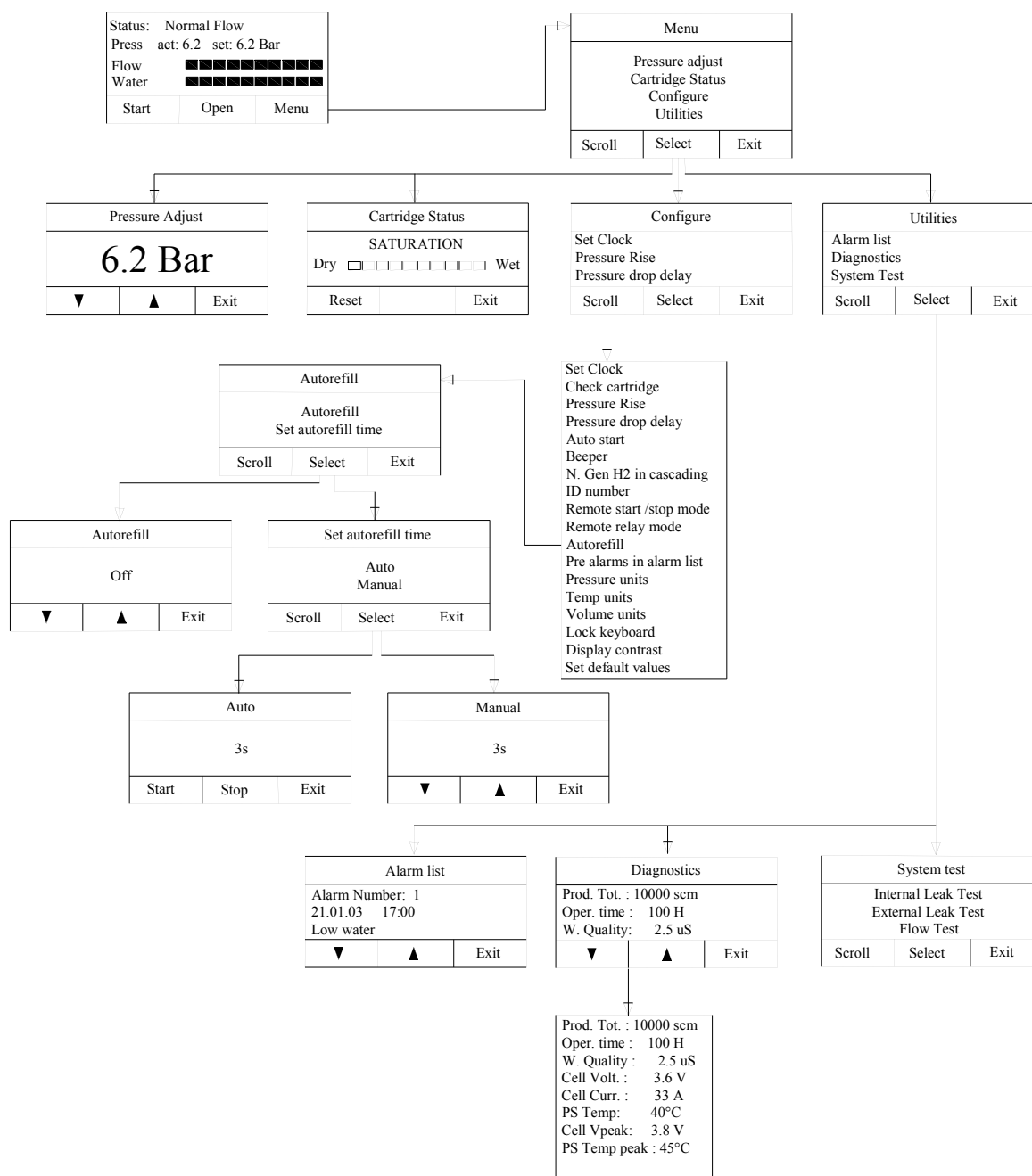
**Exit-Menu button**

Silences the audible alarm. When the problem leading to the alarm has been resolved, the Reset button must be pressed before the generator can be restarted (also see *Special functions*).

The Reset button is also used to access the menu and select.

The button is also used to exit from a displayed voice of the menu tree.

## Menu Tree



**Configure parameters**

Item	Description	Options / Range	Default
Pressure units	<i>Sets the desired unit of measure for the pressure</i>	bar / psi / kPa	bar
Volume units	<i>Sets the desired unit of measure for the volume</i>	scm (standard cubic meters) scf (standard cubic feet)	scm
Temp. units	<i>Sets the desired unit of measure for the temperature</i>	°C and °F	°C
Pressure rise	<i>Sets how fast the pressure has to increase. If the pressure increases at a slower rate, a low pressure alarm is activated.</i>	0.1 – 6.8 bar/min 1.4 - 100 psi/min	0.3 1.5
Pressure drop delay	<i>Sets a delay in seconds to ignore a pressure drop (override low pressure alarm)</i>	2 - 10 min	2
Auto start	<i>Sets whether the unit automatically starts production when power is switched on.</i>	YES / NO	NO
Beeper	<i>Sets whether the audible signal is activated in the event of an alarm.</i>	ON / OFF	ON
Master	<i>Configures the unit as the Master for cascading operation</i>	YES / NO	NO
Number of slaves	<i>Enter the number of slaves connected to the master</i>	0 - 32	0
ID number	<i>Sets the ID number</i>	0 - 32	0
Remote start/stop mode	<i>Configures the remote start/stop function</i>	Start/stop, Start only, Direct control	start/stop
Remote relay mode	<i>Configures the remote relay contacts.</i>	Normally open (NO) Normally closed (NC)	NC
Pre alarms in alarm log	<i>If set to Yes, the pre alarms are also shown in the alarm log.</i>	YES / NO	NO
Lock Keyboard	<i>If set to Yes, the keyboard will be locked automatically after the generator is in the main window for more than 20s. To unlock the keyboard, press the unlock button and hold for 5s.</i>	YES / NO	NO
Display contrast	<i>Adjusts the contrast of the display.</i>	0 - 10	5
Autorefill	<i>If set to ON, the pre-level water alarm is used to trigger an external pump or valve to refill the water tank</i>	ON / OFF	OFF
Autorefill time	<i>Sets the duration of water refilling after the pump or valve has been triggered</i>	0-60 s	0

**Diagnostic display**

Item	Description	Max.
Production Tot.	<i>Total production of hydrogen</i>	99.999 scf 4000.00 scm
Operating time (h)	<i>Total number of hours the unit operation</i>	99.999 hours
Wat. quality ( $\mu$ S)	<i>Actual water conductivity</i>	38 $\mu$ S
Cell current (A)	<i>Actual cell current</i>	-
Cell voltage (V)	<i>Actual cell voltage</i>	-
Cell voltage peak (V)	<i>The maximum cell voltage in the life of the cell</i>	-
PS. temp.	<i>Actual temperature of the power supply</i>	-
PS. temp. peak	<i>The maximum temperature of the power supply reached</i>	-

## Maintenance

With proper care and maintenance, your hydrogen generator should provide you with years of trouble-free operation. There are no adjustments to be made to the generator. The only routine service operations are those described below.

Nevertheless, the generator should be inspected approximately every 2 years. Contact your supplier or the producer directly.

### Routine maintenance

The following section describes the maintenance operations required for the correct operation of the hydrogen generator.

### Cleaning

The internal components of the hydrogen generator do not need to be cleaned and should not be accessed by the user for cleaning. To clean the outside of the unit, only use a damp cloth (no detergents, acids or aggressive or abrasive substances).

### Water refilling

The tank must be refilled when the water level approaches the lower level, and the **Refill Water** pre-alarm message appears.

### Desiccant replacement

Change the desiccant cartridge when the red colour of the desiccant turns to slight orange. The colour of the desiccant can be observed through a view port in the front panel of the generator.

To remove the desiccant cartridge, first loosen the top and bottom connectors. These are finger tight; no tools are required. Then extract the cartridge, and replace with a new or regenerated one. Reconnect the cartridge to the tubing and tighten the connectors (finger tight!).

**Return the used cartridge to your reseller for refilling.**

### Deionizer replacement

Rinse the water tank and replace the deionizer bags approximately **every six months**, or whenever the **Change Water** message appears.

#### Installing the new deionizer bag

After having refilled the tank with water, the new deionizer bag must be placed in the tank. Inspect the bag thoroughly for holes or tears, indicated by loose deionizer beads on the outer surface. If the bag is damaged in any way, discard and replace it with a new one. Only use original parts (see *Spare Parts*). Wash the deionizer bag in deionized water before proceeding.

Insert the free end of the "T" fastener through the hole in the centre of the water filler cap, until it is securely fastened. The bag should not block the outlet at the bottom of the tank. Once in place, the bag should not be allowed to dry out.

### Returning the unit

In the event of any faults or damage, first notify the agent or distributor who supplied the unit. If this is not possible, inform the producer directly. Please also provide full details of the problem, including the model and serial number. Instructions will then be provided for the service or the return of the unit. Only if return authorization is provided by the producer as per these instructions, will the device be received and repaired by the producer. If the one year warranty has expired, or the fault is due to misuse of the unit, all repair and shipping costs are to be paid by the customer. All other costs are borne by the customer, except as otherwise expressly agreed upon.

#### **WARNING!**

*If the unit has to be transported, make sure that the water tank is **completely** empty, and place the plug (supplied with the unit) on the oxygen vent at the rear of the unit. Close the small hole in the cap on the water tank with a strip of adhesive tape. Use suitable packaging. The unit should be transported in an upright position; this warning should be reported on the outside of the packaging*



## Spare parts list

The table below provides a list and description of the spare parts for the hydrogen generator. Please also refer to the corresponding figures.

### List of spare parts – PGH2, 100 ml/min

p/n	DESCRIPTION
H200-019	Desiccant refill (3 cartridges)
H200-003	Desiccant cartridge + fittings + refill
H200-031	Deionizer bag
H200-030	New deionizer triangle bag
NM200-004	Keyboard
PG201-001	Water tank + level sensor
PG200-002	Water tubing kit
H200-005	Water drain outlet + tube
PG200-003	Ball valve for cell IN
H200-007	G/L separator, complete with fittings
H200-008	Perma Pure drying tube
NM200-005	Display
H200-013	Pressure release valve
H200-014	Gas outlet connector + check valve
NM200-006	O <sub>2</sub> separator
NM200-007	H <sub>2</sub> separator
NM200-015	Rear intake fan
NM200-016	Internal circulation fan
H200-021	Gas ON/OFF valve
H200-022	Connector for PermaPure tube
H210000-001	Complete cell
NM200-011	Transformer 230 VA 50/60 Hz
NM200-017	Start button 240/120 V 50/60 Hz
PG205-005	Main board
PG201-006	Cables
H210000-004	Cell service (on old cell)

**List of spare parts - PGH2, 160 ml/min**

p/n	DESCRIPTION
H200-019	Desiccant refill (3 cartridges)
H200-003	Desiccant cartridge + fittings + refill
H200-031	Deionizer bag
H200-030	New deionizer triangle bag
NM200-004	Keyboard
PG201-001	Water tank + level sensor
PG200-002	Water tubing kit
H200-005	Water drain outlet + tube
PG200-003	Ball valve for cell IN
H200-007	G/L separator, complete with fittings
H200-008	Perma Pure drying tube
NM200-005	Display
H200-013	Pressure release valve
H200-014	Gas outlet connector + check valve
NM200-006	O <sub>2</sub> separator
NM200-007	H <sub>2</sub> separator
NM200-015	Rear intake fan
NM200-016	Internal circulation fan
H200-021	Gas ON/OFF valve
H200-022	Connector for PermaPure tube
H210000-001	Complete cell
NM200-011	Transformer 230 VA 50/60 Hz
NM200-017	Start button 240/120 V 50/60 Hz
PG206-005	Main board
PG201-006	Cables
H210000-004	Cell service (on old cell)

**List of spare parts - PGH2, 250 ml/min**

<b>p/n</b>	<b>DESCRIPTION</b>
H200-019	Desiccant refill (3 cartridges)
H200-003	Desiccant cartridge + fittings + refill
H200-031	Deionizer bag
H200-030	New deionizer triangle bag
NM200-004	Keyboard
PG201-001	Water tank + level sensor
PG200-002	Water tubing kit
H200-005	Water drain outlet + tube
PG200-003	Ball valve for cell IN
H200-007	G/L separator, complete with fittings
H200-008	Perma Pure drying tube
NM200-005	Display
H200-013	Pressure release valve
H200-014	Gas outlet connector + check valve
NM200-006	O <sub>2</sub> separator
NM200-007	H <sub>2</sub> separator
NM200-015	Rear intake fan
NM200-016	Internal circulation fan
H200-021	Gas ON/OFF valve
H200-022	Connector for PermaPure tube
H210000-001	Complete cell
NM200-011	Transformer 230 VA 50/60 Hz
NM200-017	Start button 240/120 V 50/60 Hz
PG207-005	Main board
PG201-006	Cables
H210000-004	Cell service (on old cell)

**List of spare parts - PGH 2, 300ml/min**

p/n	DESCRIPTION
H200-019	Desiccant refill (3 cartridges)
H200-003	Desiccant cartridge + fittings + refill
H200-031	Deionizer bag
H200-030	New deionizer triangle bag
NM200-004	Keyboard
PG201-001	Water tank + level sensor
PG200-002	Water tubing kit
H200-005	Water drain outlet + tube
PG200-003	Ball valve for cell IN
H200-007	G/L separator, complete with fittings
H200-008	Perma Pure drying tube
NM200-005	Display
H200-013	Pressure release valve
H200-014	Gas outlet connector + check valve
NM200-006	O <sub>2</sub> separator
NM200-007	H <sub>2</sub> separator
NM200-015	Rear intake fan
NM200-016	Internal circulation fan
H200-021	Gas ON/OFF valve
H200-022	Connector for PermaPure tube
H210000-001	Complete cell
NM200-011	Transformer 230 VA 50/60 Hz
NM200-017	Start button 240/120 V 50/60 Hz
PG206-005	Main board
PG208-006	Cables
H210000-004	Cell service (on old cell)

**List of spare parts - PGH 2, 500ml/min**

p/n	DESCRIPTION
H200-019	Desiccant refill (3 cartridges)
H200-003	Desiccant cartridge + fittings + refill
H200-031	Deionizer bag
H200-030	New deionizer triangle bag
NM200-004	Keyboard
PG201-001	Water tank + level sensor
PG200-002	Water tubing kit
H200-005	Water drain outlet + tube
PG200-003	Ball valve for cell IN
H200-007	G/L separator, complete with fittings
H200-008	Perma Pure drying tube
NM200-005	Display
H200-013	Pressure release valve
H200-014	Gas outlet connector + check valve
NM200-006	O <sub>2</sub> separator
NM200-007	H <sub>2</sub> separator
NM200-015	Rear intake fan
NM200-016	Internal circulation fan
H200-021	Gas ON/OFF valve
H200-022	Connector for PermaPure tube
H210000-001	Complete cell
NM200-011	Transformer 230 VA 50/60 Hz
NM200-017	Start button 240/120 V 50/60 Hz
PG209-005	Main board
PG201-006	Cables
H210000-004	Cell service (on old cell)

**List of spare parts - PGH 2, 600ml/min**

p/n	DESCRIPTION
H200-019	Desiccant refill (3 cartridges)
H200-003	Desiccant cartridge + fittings + refill
H200-031	Deionizer bag
H200-030	New deionizer triangle bag
NM200-004	Keyboard
PG201-001	Water tank + level sensor
PG200-002	Water tubing kit
H200-005	Water drain outlet + tube
PG200-003	Ball valve for cell IN
H200-007	G/L separator, complete with fittings
H200-008	Perma Pure drying tube
NM200-005	Display
H200-013	Pressure release valve
H200-014	Gas outlet connector + check valve
NM200-006	O <sub>2</sub> separator
NM200-007	H <sub>2</sub> separator
NM200-015	Rear intake fan
NM200-016	Internal circulation fan
H200-021	Gas ON/OFF valve
H200-022	Connector for PermaPure tube
H210000-001	Complete cell
NM200-011	Transformer 230 VA 50/60 Hz
NM200-017	Start button 240/120 V 50/60 Hz
PG210-005	Main board
PG201-006	Cables
H210000-004	Cell service (on old cell)

**IMPORTANT!**

*The manufacturer reserves the right to change or modify its products without prior notice.*