HGD-5000

Hydrogen (H$_2$) Detector

Installation, Operation & Maintenance

Please read this manual carefully and retain for future use.

For specific requirements that may deviate from the information in this guide – contact your supplier.

Contents

Important Warning Statements

⚠ **Warning Symbol!**
Where this symbol is used, the manual must be consulted to understand the nature of any potential hazards and how to avoid them.

⚠ **Please take the time to thoroughly read these instructions which should be retained for future reference.**
⚠ **Detectors are shipped pre-calibrated and configured.**
⚠ **The expected lifetime of a gas sensor is 10 years upon initial power up dependant on your target gas and environmental factors. The device will display a message to indicate this time and should immediately be replaced.**
⚠ **It is recommended that this device be commissioned upon installation and serviced annually by a competent person.**
⚠ **Do not apply lighter gas or other aerosols to the device – this will cause extreme damage to the sensors.**
⚠ **High concentrations of alcohol found in many products may damage, deteriorate, or affect the gas sensing elements.**
⚠ **This product is not designed to detect smoke, fire or other gases and should not be used as such.**
⚠ **This device provides early warning of the presence of gas, usually before a healthy adult would experience symptoms. This warning is possible provided your alarm is installed and maintained in accordance with this manual.**
⚠ **Never ignore your device when in alarm.**
⚠ **This device requires a continual supply of electrical power – it will not work without power.**
⚠ **This device should not be used to substitute proper installation, use and/or maintenance of fuel burning appliances including appropriate ventilation and exhaust systems.**
⚠ **Multiple detectors may be required to adequately protect property and persons.**
⚠ **This device does not prevent dangerous gasses from occurring or accumulating.**
⚠ **The device is not intended for use in potentially explosive atmospheres.**

Information on waste disposal for consumers of electrical & electronic equipment.

When this product has reached the end of its life it must be treated as Waste Electrical & Electronics Equipment (WEEE). Any WEEE marked products must not be mixed with general household waste, but kept separate for the treatment, recovery and recycling of the materials used. Please contact your supplier or local authority for details of recycling schemes in your area.

At the end of their working life, electrochemical sensors should be disposed of in an environmentally safe manner. Alternatively, they can be securely packaged and returned to S&S Northern clearly marked for disposal. Electrochemical sensors should not be incinerated as this may cause the cell to emit toxic fumes.

Product Description

Overview

The HGD-5000 Hydrogen Gas Detector will monitor hydrogen gas buildup in storage rooms and facilities that house batteries. The detector provides terminal block connections for single-phase 110 AC, 24VAC or 18-60VDC power. Detected Hydrogen levels are displayed in % Vol and traffic light indication - Green (Normal) Yellow (Warning Pre-alarm) Red (Alarm). The control relays are used to switch an exhaust fan and warning alarms, the detector also provides analogue outputs that can be connected directly to the fan speed controller if variable speed is required in your specific application. If the concentration of hydrogen gas to atmospheric air reaches 1% Vol (25% LEL of H2) the screen will display yellow, and the warning relay will close activating the ventilation fan. If the concentration of hydrogen to atmospheric air reaches 2% Vol (50% LEL of H2) the screen will display red, and the alarm relay and an 80 dB internal warning will sound.

Installation

Typical Application & Location

⚠ **Installation must be carried out by a licenced, insured contractor!**
⚠ **Ensure that detectors are not exposed to liquid or dust contamination!**
⚠ **Detectors and cables must be protected against mechanical damage!**
⚠ **Avoid conditions of any other environmental factors outside of the specification that could potentially impede the accuracy and operation of the detector such as condensation, temperature, pressure, the presence of other gases, electromagnetic interference, and draft zones!**
⚠ **Take special precautions to avoid installing in areas with excessive vibration, this may result in zero drift.**
⚠ **The target gas will only be identified when contact is made with the sensing element itself!**

Hydrogen gas is only 7% the density of air, and thus rises. Your hydrogen gas detector, therefore, should be installed at the highest, draft-free location in the battery room or compartment where hydrogen gas would accumulate Gas detectors should be installed in areas at risk of gas leaks considering the design of the air flow patterns within the area. Detectors should be installed in the correct orientation, as recommended, and ease of access should be accounted for to allow for any bump tests and other forms of maintenance throughout its operating life.

There are no official figures of the area coverage of a gas detector; however, 625 feet as a general guide and therefore multiple detectors may be required to adequately protect property and persons. There are no specific standards governing gas detector location (unlike fire detection systems,; there are, however, general guidance documents. The most relevant being *IEC 60079-29-2: Explosive Atmospheres – Part 29: Gas detectors – Selection, installation, use and maintenance of detectors for flammable gases and oxygen*. Much of what it covers is also relevant to toxic gas detection.

Recommended heights may vary based on air flow and temperature conditions in addition to the proposed application and location. Locations for detectors will vary based on the intended application and target gas, they should be located near identified sources of a potential gas leaks/pockets where gas could quickly accumulate and areas of identified consequential risk to detect gas. The composition of the target gas and its density relative to air are used as the basis for the recommended height of sensors. These typical positions may vary based on air flow and temperature conditions in addition to the proposed application and location.

Target Gas	Typical Position
Hydrogen (H_2)	**Ceiling height**

Detectors should be mounted where a potential hazard of gas is most likely to be present. The following points should be noted also when locating gas sensors. When locating detectors consider

- The possible damage caused by natural events e.g., rain or flooding.
- Ease of access to the gas detector for functional testing and servicing.
- How gas may behave due to natural or forced air currents.

Mounting & Cabling

⚠ **If mounting direct to wall - ensure the wall surface is flat to prevent base distortion!**
⚠ **Ensure the rear base is installed in the correct orientation as shown!**
⚠ **Where cable glands/conduits are used for wire entry, use 20mm (3/4 inch) max separated by at least 20mm!**
⚠ **Any parts that form part of the connections/installation must have a minimum fire-retardant rating of UL94v-2!**
⚠ **Damage to PCBs when creating cable entry points or attempting to remove the circuit board may void any warranty!**

⚠ **The monitor is designed for either surface mounting or mounted on a one or two gang electrical box.**

⚠ **Restrain the hazardous live wiring from accidental loosening to prevent wires from moving after installation and touching parts of opposite polarity or at low voltages!**

⚠ **Isolate the equipment from all hazardous live power sources before opening the cover!**

3.54" / 90mm

4.84" / 123mm

3.26" / 83mm

0.137" / 3.5mm DIA.
Mounting holes x8

¾ inch / 20mm
Rear cable entry x2

123
CO | PPM

M4 x 15mm
Socket Cap Screws
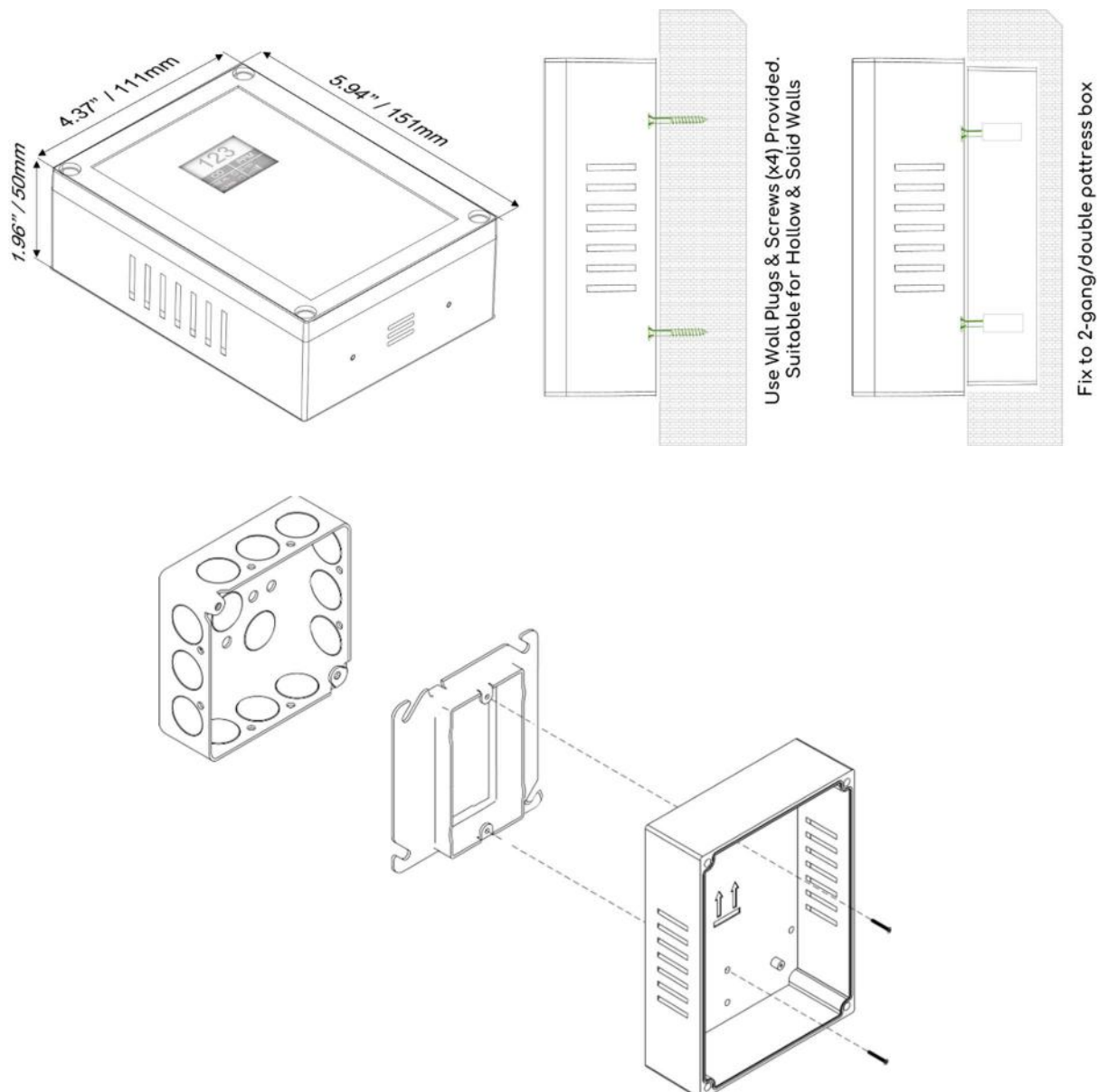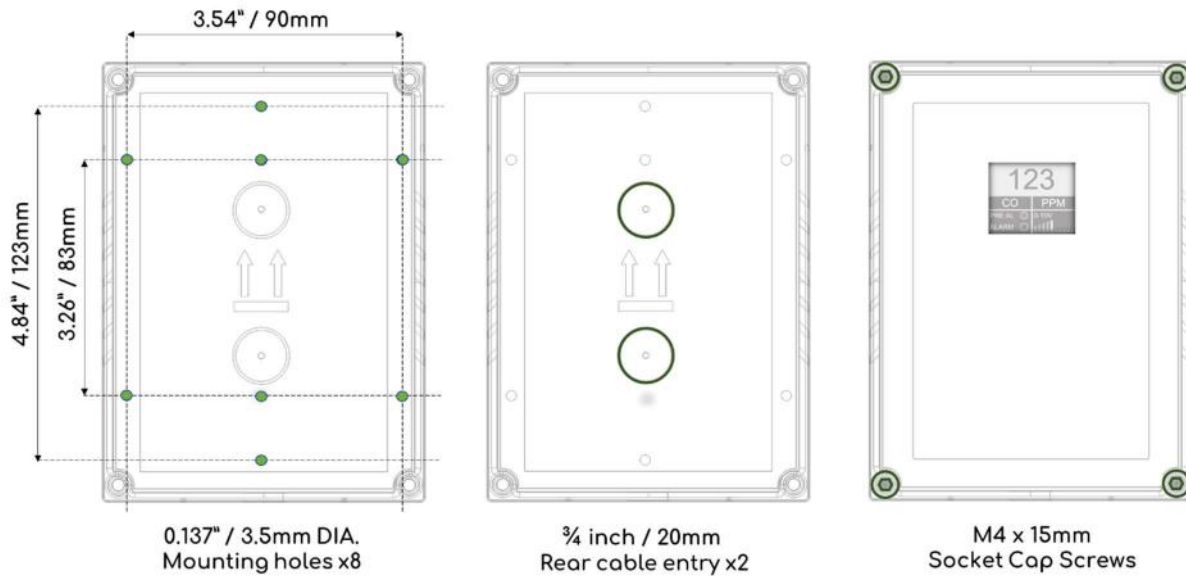
1. Carefully remove the front cover from the unit by using an M3 hex key.
2. Using the rear base - mark mounting holes to the wall or mount to an electrical box.
3. Fixing straight to wall – drill 0.2" (5mm) hole, insert plugs and use the four screws (No.4 Pozi) provided.
4. There are pre-fractured areas for cable entry on the rear of the base and pilot holes positioned on the top and bottom of the enclosure suitable for entry points up to ¾" (20mm). Drill out as necessary ensuring all swarf is removed from the box and holes have smooth edges.
5. After executing the mounting/connections – secure the front cover with all M4 bolts and insert the security caps provided.

Circuit Board Overview

⚠ **Damage to PCBs when creating cable entry points may void any warranty!** 7

⚠ **Any damage attempting to remove the circuit board may void any warranty!**

⚠ **A disconnector is required and accessible for the supply and an adequate overcurrent device is fitted!**

Hydrogen Sensing Module

Replaceable Hydrogen sensor module
Align the white arrows on the module with the arrows on the main PCB
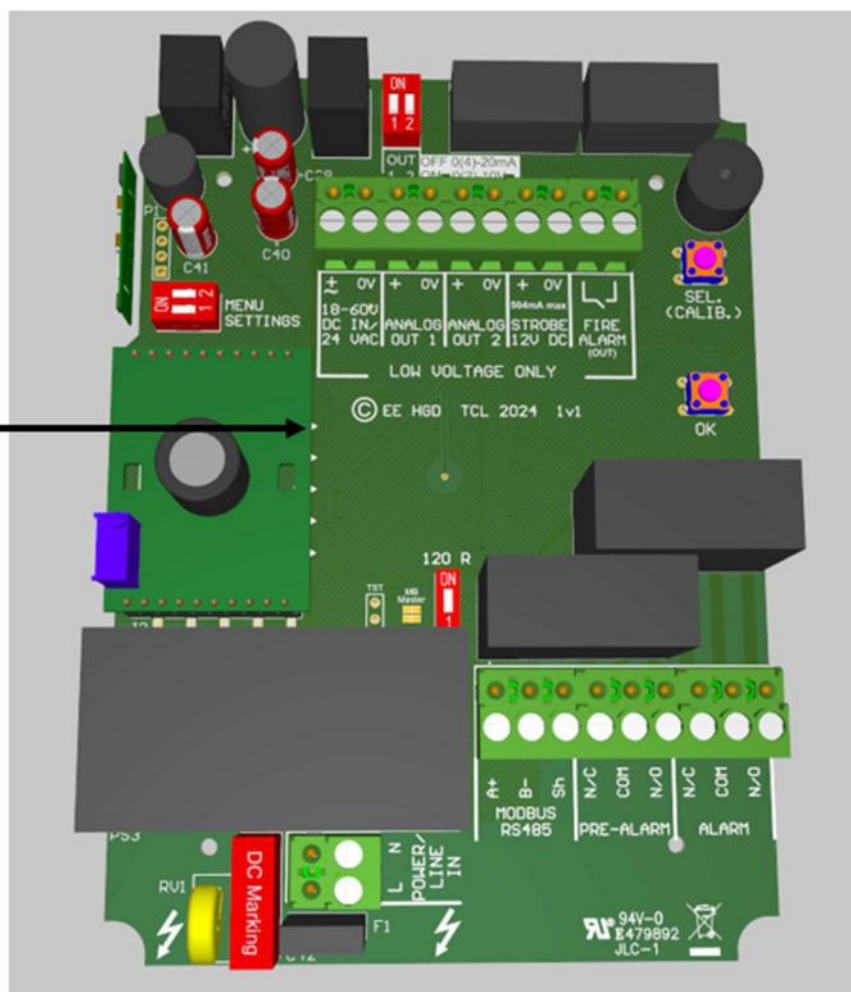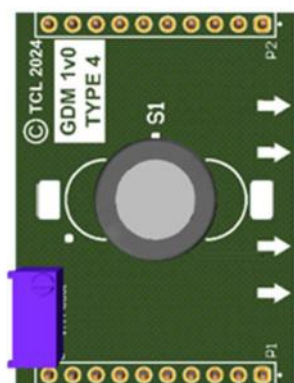
Power Input

Power can be provided using either 24 VAC, 18-60 VDC, or 90~250V AC
Terminals are pluggable types for easier connections.
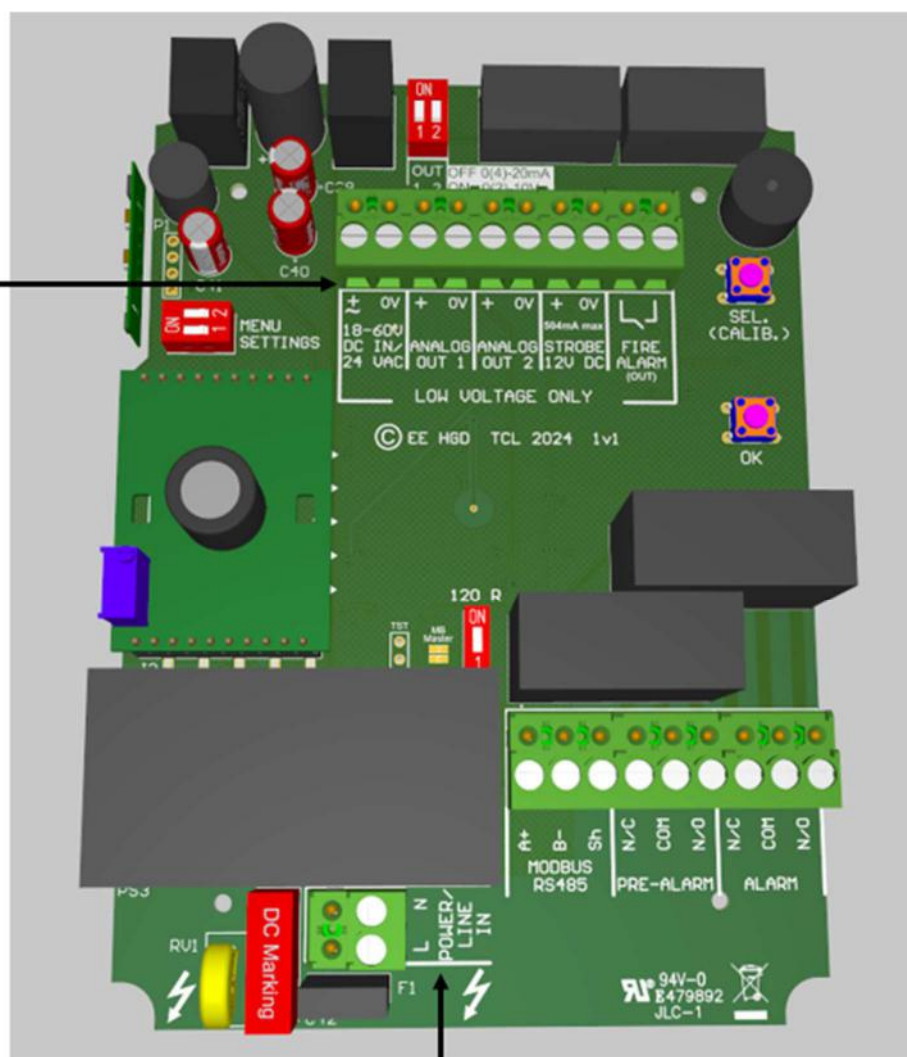
Analogue Outputs

The 0(2)-10V & 0(4)-20mA output is linearly scaled according to the status of gas concentrations detected.

Gas	0(4)~20mA	0(2)-10v
H2 Hydrogen: % Vol	0~2%	0~2%

This output can be used to regulate the external fan speed and can be connected directly to fan speed controllers, select 0(2)-10v or 0(4)-20mA from the S1 dip switch.
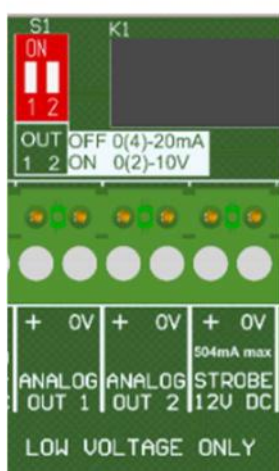
S1 Switch Settings	
S1-1 ON	0(2)-10v Analog Out 1
S1-1 OFF	0(4)-20mA Analog Out 1
S1-2 ON	0(2)-10v Analog Out 2
S1-2 OFF	0(4)-20mA Analog Out 2

Note: Optional 0~4mA and 2-10V outputs can be selected from the settings screen as described in the "Settings Section".

Alarm Relays

The detector has 10 Amp internal pre-alarm and alarm relays.

PRE-ALARM: When the hydrogen level reaches **1%** Vol the contact will close, this relay is suitable for driving a ventilation system

ALARM: When the hydrogen level reaches **2%** Vol the contact will close, this relay is suitable for activating a danger warning alarm.
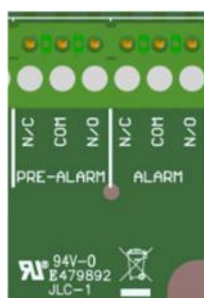
Note: To avoid false activation the alarm has a 4-sec delay, once activated the alarm relay will not deactivate until the gas level reduces below the alarm level at 0.8% Vol for the pre-alarm and 1.8% for the alarm.

When the unit is powered off or H2 is < 1% VOL the relay COM-N/C will be closed and fail-safe.

Optional: External Strobe Model# HGD-AAB

The Strobe connection provides 12V DC (504mA max) output power to an external strobe and will activate when the Hydrogen level reaches 2% Vol.
The HGD-5000 is capable of powering up to four (4) HGD-AAB alarm strobes.
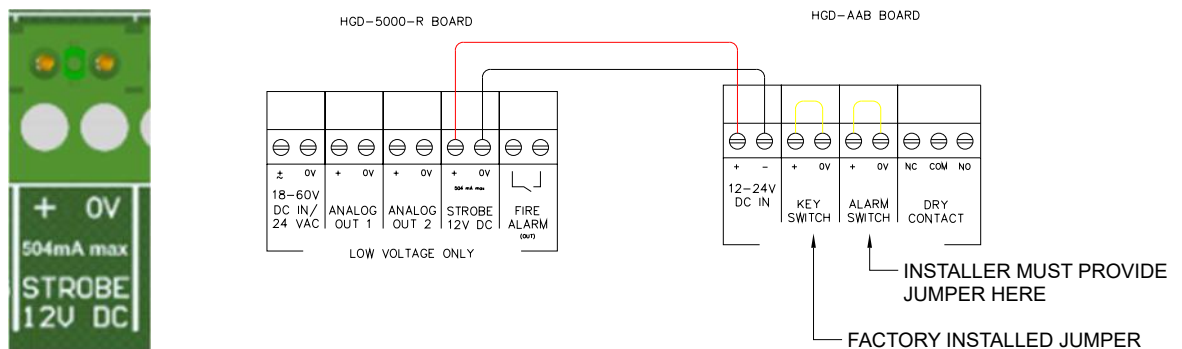
Fire Alarm

The fire alarm connection provides a 1A normally open dry contact output to an external fire alarm, the output will be activated at the warning alarm level of 2% Vol.

Factory Default Setting

Setting	Default
Analog 1	4-20mA
Analog 2	4-20mA
Pre-Alarm Delay(s)	4 Sec
Alarm Delay(s)	4 Sec
Deadband	ON

Operation

Initial Power Up

During initial powering the detector enters a warmup phase for approximately 60 seconds, during this period the initializing screen will display as shown below and during this time the device is not yet ready for operation.

Important: The monitor will require 48hrs of constant powering to reach full accuracy.

Audible Alarm

The internal audible alarm will alert the user that the detector has entered a warning alarm state.

Target Gas	LOW Pre-Alarm	Buzzer	Warning Alarm	Buzzer
Hydrogen (H$_2$)	1% Vol	None	2% Vol	Continuous sound

Settings Screen

There is a settings and menu switch on the main board. Switch the **MENU** or **SETTINGS** switch to prompt the on-screen menu.

Navigate the menu using the **SEL** buttons on the main board, press the **OK** button to save desired settings and switch off to return to the normal operating mode.

[SEL.] button	[OK] button
Scroll through functions (highlighted in red) Change the desired setting when highlighted	Highlights setting (red) Press to save the desired setting.

The Modbus RTU slave settings can allow configuration with a repeater/controller, contact Eagle Eye representative for more information.

```
ID Address                    1
Baud Rate           9600
---
---
---
```

ID Address - Modbus Address range from 1 – 247 (1 Default)

Modbus Baud Rate - Modbus data exchange speed (bit per second).
Selection of: 4800, 9600 (Default),19200, 38400, 57600,115200.

Menu

```
Out 1              0v/0mA
Out 2              0v/0mA
Pre Alarm delay(s)      4
Alarm delay(s)          4
Deadband              ON
```

```
---
---
---
FACTORY RESET
```

Out 1 - Analogue output 0(2)-10 or 0(4)-20mA
Selection between 0v / 0mA and 2v / 4mA

Out 2 - Analogue output 0(2)-10 or 0(4)-20mA
Selection between 0v / 0mA and 2v / 4mA

Pre-Alarm Delay(s) – Delay in seconds for pre-alarm relay activation range from 0-15 second.
Alarm Delay(s) – Delay in seconds for alarm relay activation range from 0-15 second.

Deadband – Set ON/OFF, when ON gas reading < ± 0.3 will be displayed as 0

FACTORY RESET Return to default condition. YES / NO

Maintenance

Cleaning

⚠ **Concentrations of alcohol found in many products may damage, deteriorate or affect the gas sensing elements such as; wine; deodorants; stain removers and thinners. Other gases and substances to avoid are corrosives (i.e., chlorine & hydrogen chloride); alkali metals; basic or acidic compounds; silicones; tetraethyl lead; halogens and halogenated compounds!**

Keep your gas detector in good working order - follow these basic principles.

- Remove any dust/debris from the outer enclosure regularly using a slightly damp cloth.
- Never use detergents or solvents to clean your device.
- Never spray air fresheners, hair spray, paint or other aerosols near the device.
- Never paint the device. Paint will seal vents and interfere with the device.

Manual Circuit Simulation Test

⚠ **This circuit test does not check the gas-sensing element itself!**

Press the self-test button for 3 seconds and the detector will simulate a test to ensure configured systems, outputs, alarms, indications, and other external devices operate as intended in response to gas. The test sequence will automatically terminate after a short period of time and return to normal operation.
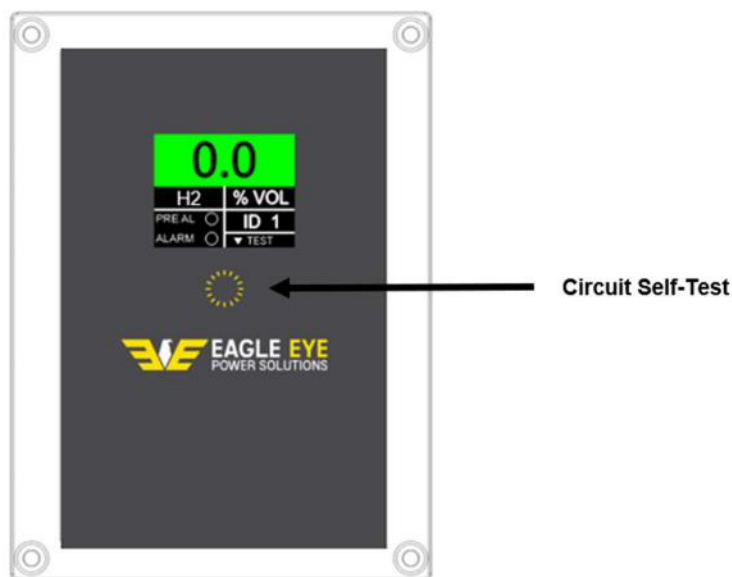
Commissioning

Gas detectors are factory-calibrated when shipped, however, we recommend the response and alarm signals are tested and validated on installation and subsequently every 6-12 months thereafter to retain optimum safety.

During Commissioning

- Check secure installation, mounting, cable entry, and position.
- Check the power supply voltage and display indications.
- Perform a bump test to check the gas response (see Bump Test Procedure)
- Check alarm relays, audible alarm, remote strode and any connected ventilation devices for correct operation by performing a self-test (Manual circuit simulation test)

Inspections and services should be documented and executed at regular intervals with records in place. The frequency must be determined and observed by the person responsible for the gas warning system according to all regulatory, code and legal requirements.

The date for the next maintenance should be affixed to the equipment sensor.

Our equipment is designed to operate in a wide range of harsh environments and conditions. However, exposure to high concentrations of solvent vapours must be avoided, both during storage and operation.

Bump Test (Gas Response Check)

What is a Bump Test?

Gas response checks are often referred to as a 'bump test'. Bump tests are important to make sure a device can detect a release of gas as early as possible. The aim of the bump test is to make sure a detector is working at its optimum by briefly exposing the unit to a known concentration of the target gas that usually exceeds the highest alarm point. If the detector goes into alarm and all signals/outputs activate, then the system is working safely.

If the system fails to operate as intended in an alarm state, the gas detector must not be used until a full inspection and service has been conducted.

Why is it important?

A detector may visually appear in good working order, but its sensitivity and accuracy can be inhibited by external factors. Dust, humidity, temperature fluctuations, cleaning products, contaminants, exposure to its target gas or sensor drift (aging) can cause a decline in sensitivity, accuracy, and eventual failure.

How often?

The frequency should be determined following an appropriate risk assessment by the end user. We recommend testing detectors every 12-18 months along with the regular fire test procedures

Bump Test Procedure

⚠ **To increase reaction time, cover the escape vents at the sides of the device.**
⚠ **Always give at least five (5) minutes between testing the same unit or until gas has fully dispersed!**
⚠ **Always consider safety and use equipment in accordance with Safety Data Sheets!**
⚠ **Reference should always be given to any applicable national & local law and industry codes.**
⚠ **Generally, the gas concentration should be greater than the alarm threshold of the device.**
⚠ **Always remove the regulator/valve after use if using a cylinder!**
⚠ **All cylinders will re-seal upon removal of the regulator/valve!**
⚠ **Deviating from this test process is deemed improper and may affect the functional safety of your device!**
⚠ **Exposure to chemicals, smoke, or any other materials other than the gases intended to be monitored can seriously damage the gas sensing elements!**
⚠ **Always allow a minimum of 5 minutes before testing the same unit!**

What do I need?

The EE-TEST-H-17L-KIT is a bump testing kit that provides all of the components necessary to perform multiple 'bump tests' on installed HGD-5000 detectors. The kit is provided with two cannisters of H2 gas that may be stored away and re-used for future bump tests. In addition to the cannisters, the kit contains all of the necessary accessories to utilize the cannisters.
The cannisters require a regulator, vinyl tubing, and an applicator cone to place over the H2 sensor within the unit. The kit comes with one of each of these accessories, that my be utilized on either one of the two cannisters provided.

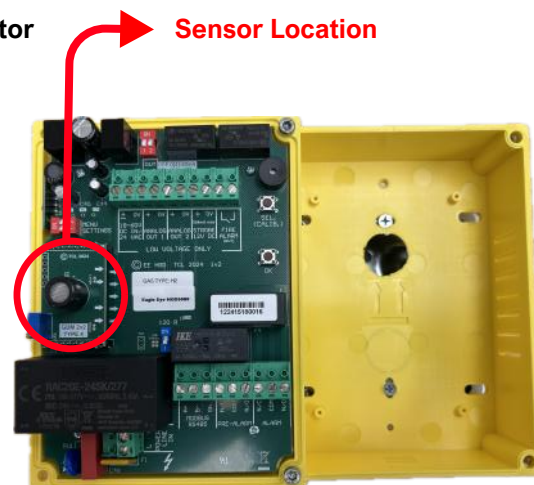| EE-TEST-H-17L-KIT | Cone Applicator | CV-2 Regulator | Vinyl Tubing | H2 Cannister | Assembly |

Bump Test Procedure Cont.

Apply Applicator Cone Directly to Sensor and Open Gas Regulator   **Sensor Location**

Check Response

1. The HGD-5000 should enter alarm fairly quickly.
2. The screen display turns red and the internal audible alarm sounds.
3. If fans and ancillary strobes are connected, they should activate. You may check circuitry with the manual test button, and use the bump test to check gas response only.
4. The HGD-5000 should enter alarm at 2% v/v although some models may be provided with custom alarm set points.

| No Alarm | Pre-Alarm | High Alarm |

Catalytic Sensor Technology

The catalytic-type gas sensor features high accuracy, good durability, quick response, and linear output. This sensor is an excellent solution for monitoring hydrogen gas produced by lead acid and nickel-cadmium batteries, which is a by-product of charging/overcharging battery cells which transforms combustible gases into hydrogen. As the sensor possesses a proprietary filter material inside its sensor cap, its cross sensitivity to organic vapors is small. In addition the sensor is durable against silicone compounds in harsh environments and has been tested in accordance with UL1484.

End of Operational Life (EOL)

The typical life of a gas detector depends on its application and intended target gas, in addition, the operational life can be prolonged if the system and equipment is installed and maintained in accordance the instructions stated within this manual.

At the end of its operational life – the detector will display an 'End of Life' screen, which will be displayed for 3 seconds followed by the gas reading for 9 seconds. This message indicates that the detector has reached its expected operational lifecycle. You must contact your supplier immediately for replacement.
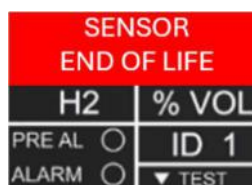
HGD-5000-**R** Repeater Panel (See HGD-5000-**R** Manual and Data Sheet)

The HGD-5000-R is a repeater compatible with HGD-5000 hydrogen gas detectors from software version 1v3 onwards. It can be configured as part of a Hydrogen gas detection system incorporating up to three (3) HGD-5000 hydrogen gas detectors.

The HGD-5000-R can be installed at eye level, with the HGD-5000 detectors being installed 1FT from ceiling, providing a convenient way to monitor and test the gas detection system. The HGD-5000-R features a manual test circuit button to allow for detection system circuitry testing without the need of accessing the detector units at the ceiling. The HGD-5000-R displays system status including alarm conditions, hydrogen levels, and system health.

Specification

General	
Model:	HGD5000
Target Gases:	Hydrogen – H_2
Size: (H x W x D)	5.95 x 4.37 x 1.97" (151 x 111 x 50mm)
Housing Material:	ABS PA765. Flame Retardant UL 94V-1
Mounting:	Safe Zone - Indoor use - Wall Mounted
Weight:	212g
User Interface	
Display:	1.8" TFT
Screen Brightness:	Non-Adjustable
Visual Indicators:	Gas Level (Green: Normal; Yellow: Pre-Alarm; Red: Alarm)
Audible Alarm:	>80dB @ 3.28ft (1m). Quiet conditions.
Language:	English
Power Supply	
Rated Power:	3.5W @ 18-60VDC 9VA @ 120VAC 13VA @ 24VAC
Rated Voltage:	90-250 VAC / 18-60VDC or 24VAC
Relays	
Fire alarm relay	1A
Pre-alarm 1% Vol (25% LEL) Main alarm 2% Vol (50% LEL) volt-free relay outputs:	10A switching current (resistive load)
Environmental	
Operating:	14~104°F / 20 ~ 90% RH (non-condensing)
Storage:	14~104°F / 20 ~ 90% RH (no condensation)
Altitude Rating:	2000m
Wiring	
Typical	Power wiring should apply to all applicable codes. 120VAC & alarm relay outputs 14-16AWG / 24V DC 16-18AWG
Approvals	
Electrical Safety & EMC	CE / UKCA BS EN 61010-1:2010 +A1:2019. & BS EN 50270 / FCC CRF 47 part 15B

Sensor Specification

Catalytic Gas Sensor	Measuring Range	Steps	Response	Recovery	Pre-Alarm:	Alarm:	*EOL (Years)
Hydrogen (H_2)	0-2% Vol	0.1	<60s	<60s	▲1% Vol (25% LEL)	▲2% Vol (50% LEL)	10

Eagle Eye Power Solutions - www.eepowersolutions.com

1-877-805-3377 - info@eepowersolutions.com