

# HGD-100

## Hydrogen (H<sub>2</sub>) Detector

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## 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.

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## Contents

|                                           |           |
|-------------------------------------------|-----------|
| <b>Important Warning Statements .....</b> | <b>3</b>  |
| <b>Product Description .....</b>          | <b>3</b>  |
| Overview .....                            | 3         |
| <b>Installation.....</b>                  | <b>4</b>  |
| Typical Application & Location .....      | 4         |
| Mounting & Cabling .....                  | 5         |
| Circuit Board Overview .....              | 6         |
| Hydrogen Sensing Module.....              | 6         |
| Power Input .....                         | 7         |
| Analogue Outputs .....                    | 8         |
| Alarm Relays.....                         | 8         |
| External Strobe .....                     | 9         |
| Fire Alarm .....                          | 9         |
| Factory Default Setting.....              | 9         |
| <b>Operation .....</b>                    | <b>9</b>  |
| Initial Power Up.....                     | 9         |
| Audible Alarm .....                       | 9         |
| Mute Alarm .....                          | 10        |
| Settings Screen .....                     | 10        |
| Menu .....                                | 11        |
| <b>Maintenance.....</b>                   | <b>11</b> |
| Cleaning .....                            | 11        |
| Manual Circuit Simulation Test .....      | 12        |
| Bump Test (Gas Response Check).....       | 12        |
| Bump Test Procedure .....                 | 13        |
| Commissioning .....                       | 13        |
| Catalytic Sensor Technology.....          | 13        |
| End of Operational Life (EOL).....        | 14        |
| <b>Specification .....</b>                | <b>15</b> |

## 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-100 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 90-250V 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 detected reaches 1% Vol the screen will display yellow, and the warning relay will close activating the ventilation fan. If the concentration reaches 2% 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; vibration; temperature, pressure, the presence of other gases, electromagnetic interference, and draft zones!
- ⚠ 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, 58 m<sup>2</sup> 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.

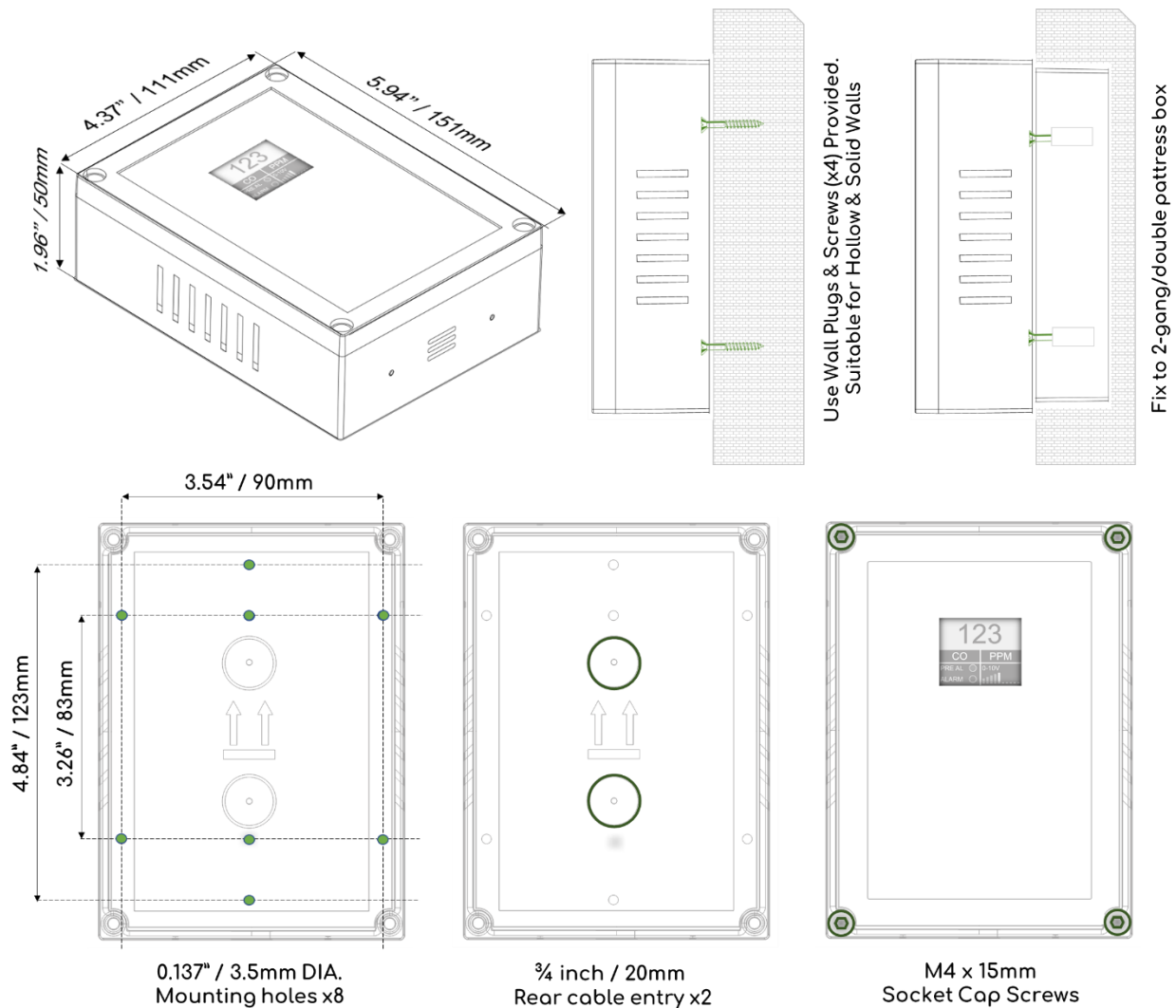
| Target Gas                 | Typical Position |
|----------------------------|------------------|
| Hydrogen (H <sub>2</sub> ) | Ceiling height   |

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!



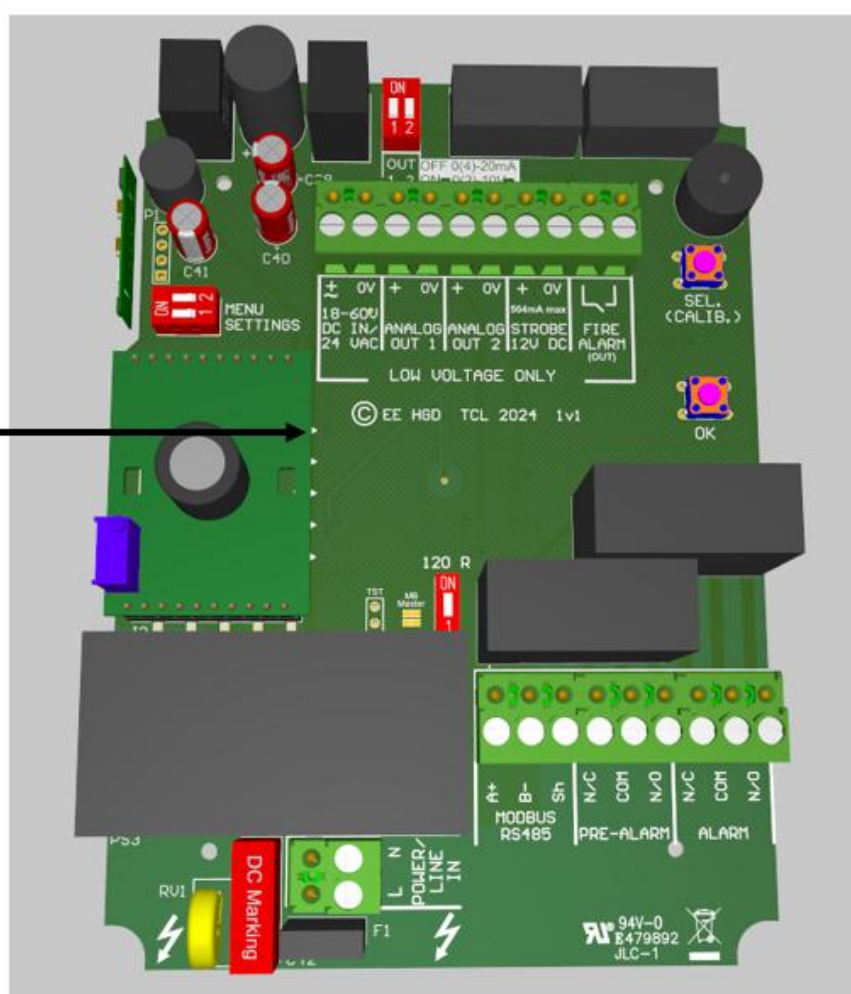
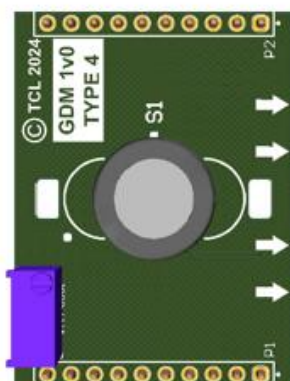
1. Carefully remove the front cover from the unit by using an M3 hex key.
2. Using the rear base - mark mounting holes to the wall or align with a vertical 2-gang/pattress box.
3. Fixing straight to wall – drill 0.2" (5mm) hole, insert plugs and use the four screws (No.4 Poz) provided.
4. There are pre-fractured 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 3/4" (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 security caps provided.

## Circuit Board Overview

- ⚠ Damage to PCBs when creating cable entry points may void any warranty!
- ⚠ Any damage attempting to remove the circuit board may void any warranty!
- ⚠ A disconnecter 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

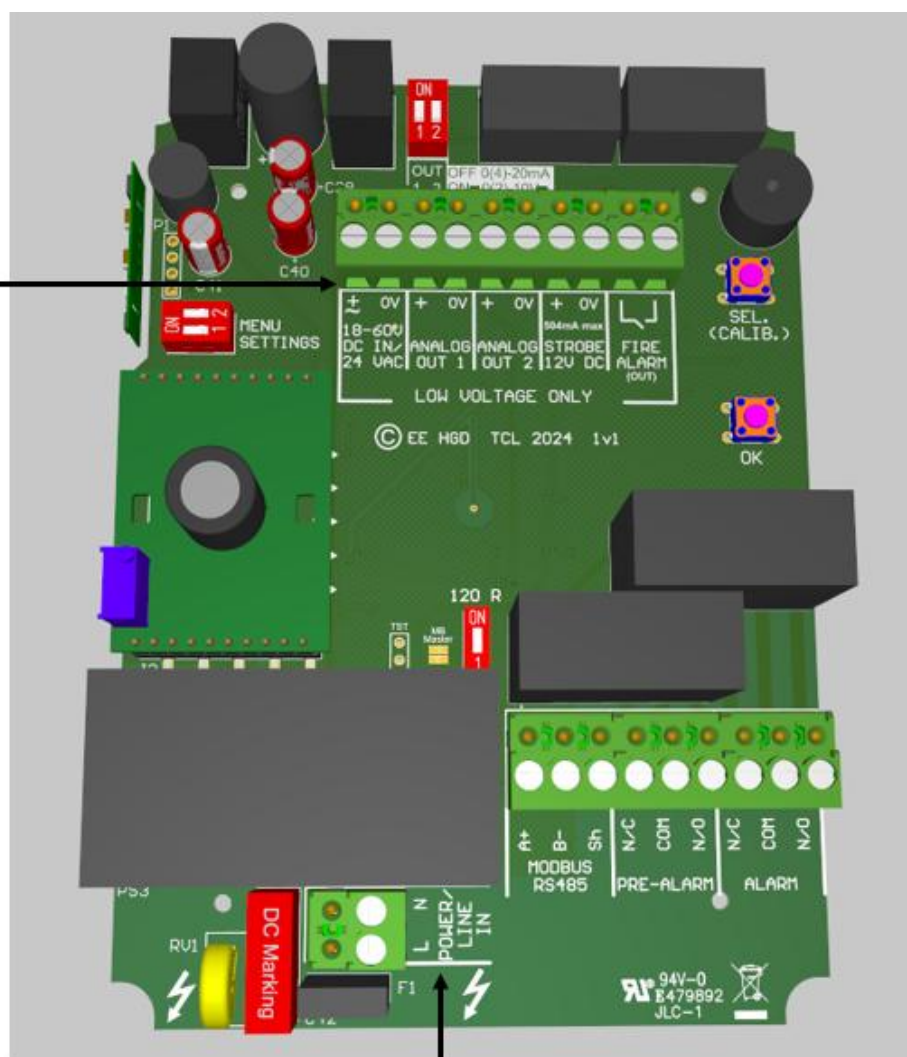


## Power Input

Power can be provided using either 24 VAC, 18-60 VDC, or 90~250V AC

Terminals are pluggable types for easier connections.

**18-60 VDC  
24V AC INPUT**



**90~250V AC INPUT 50-60Hz**

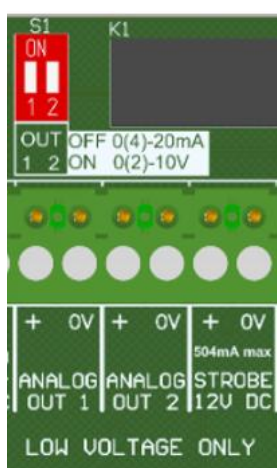


## Analogue Outputs

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 |

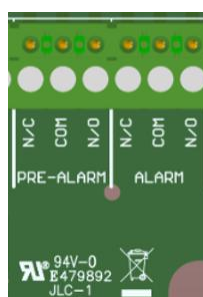
**Note:** Optional 0~4mA and 2-10V outputs can be selected from the settings screen as described in the “Settings Section”.

## 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 unit is powered off and when H2 is < 1% VOL the relay COM- N/C will be closed.



## External Strobe

The Strobe connection provides 12V DC (504mA max) output power to an external strobe and will activate when the Hydrogen level reaches 2% Vol.



## 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   |

# 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 <sub>2</sub> ) | 1% Vol        | None   | 2% Vol        | Continuous sound |

## Mute Alarm

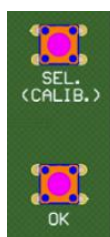
To mute the audible ALARM, press the front panel touch button.  
Mute will auto-reset when the alarm exits an alarm condition.



## Settings Screen

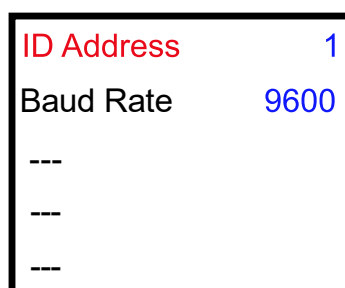
There is a settings and menu switch on the main board. Switch the **MENU** or **SETTINGS** switch to prompt the on-screen menu.

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) | Highlights setting (red)           |
| Change the desired setting when highlighted   | Press to save the desired setting. |

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



**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 | Relay Latch   | OFF |
| 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  $< \pm 0.3$  will be displayed as 0

**Relay Latch** – Set ON/OFF, when ON, upon alarm status the 'High' LED indicator (RED) will remain lit when the main alarm relay has latched. The audible alarm will alert the user that the detector has entered a main alarm state (High). To reset the detector, press and hold the touch button for ~1s.



**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!

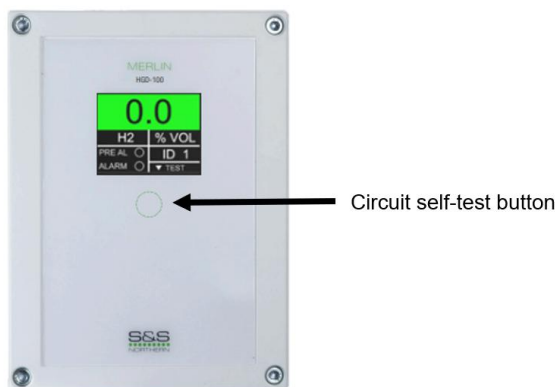
Keep your gas detector in good working order - follow these basic principles.

- 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.



## 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 (ageing) can cause a decline in sensitivity, accuracy, and eventual failure.

### How often?

Regular bump tests are important to make sure the detector can detect a release of gas as early as possible and usually takes seconds (gas type dependant) and is often completed alongside a scheduled fire alarm test, however 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

### What do I need?

Contact your S&S Northern representative for details of suitable bump testing kits and gases. Kits usually consist of a certified gas cylinder or spray. We recommend only using approved gas kits to ensure correct flow rates meet technical requirements. A bump-testing gas is usually a concentration mix that exceeds the highest alarm set point.

## Bump Test Procedure

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- ⚠ 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!

1. Ensure you have a suitable bump testing kit, contact your S&S Northern representative for details.
2. Using tape seal off the side vents, leaving the vents on underneath open.
3. Offer up the applicator hose/cone or spray to the small vents of the device located underneath.
4. Apply gas.
5. The device will enter alarm status after reaching alarm set point.
6. The device will activate all configured outputs/relays.
7. Test complete.
8. Record your test details.

## Commissioning

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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 strobe 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.

## Catalytic Sensor Technology

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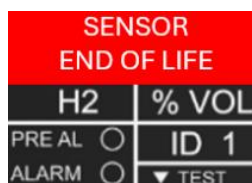
The catalytic type gas sensor features high accuracy, good durability, quick response, and linear output. This sensor is an excellent solution for monitoring gas leakage from stationary fuel cell systems which transform combustible gases into hydrogen. As the sensor possesses a proprietary filter material inside its sensor cap, its cross sensitivity to organic vapours is small. In addition, the sensor is durable against silicone compounds in harsh environments.

## End of Operational Life (EOL)

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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.



# Specification

| General                                      |                 |                                                                                                               |          |          |            |          |              |
|----------------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------|----------|----------|------------|----------|--------------|
| Model:                                       |                 | HGD100                                                                                                        |          |          |            |          |              |
| Target Gases:                                |                 | Hydrogen – H <sub>2</sub>                                                                                     |          |          |            |          |              |
| 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<br>9VA @ 230VAC<br>13VA @ 24VAC                                                               |          |          |            |          |              |
| Rated Voltage:                               |                 | 90-250 VAC / 18-60VDC or 24VAC                                                                                |          |          |            |          |              |
| Relays                                       |                 |                                                                                                               |          |          |            |          |              |
| Fire alarm relay                             |                 | 1A                                                                                                            |          |          |            |          |              |
| Pre-alarm and alarm volt-free relay outputs: |                 | 10A switching current (resistive load)                                                                        |          |          |            |          |              |
| Environmental                                |                 |                                                                                                               |          |          |            |          |              |
| Operating:                                   |                 | -10~40 °C (14~104°F) / 20 ~ 90% RH (non-condensing)                                                           |          |          |            |          |              |
| Storage:                                     |                 | -10~40 °C (14~104°F) / 20 ~ 90% RH (no condensation)                                                          |          |          |            |          |              |
| Altitude Rating:                             |                 | 2000m                                                                                                         |          |          |            |          |              |
| Wiring                                       |                 |                                                                                                               |          |          |            |          |              |
| Typical                                      |                 | Power wiring should apply to all applicable codes.<br>120VAC & alarm relay outputs 14-16AWG / 24V DC 16-18AWG |          |          |            |          |              |
| Approvals                                    |                 |                                                                                                               |          |          |            |          |              |
| Electrical Safety & EMC                      |                 | CE / UKCA<br>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 <sub>2</sub> )                   | 0-2% Vol        | 0.1                                                                                                           | <60s     | <60s     | ▲ 1% Vol   | ▲ 2% Vol | 10           |



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