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SM_H2 Hydrogen Gas Detector Kit

For battery charging rooms and other areas where hydrogen gas may be present





Electrical Safety – UL 61010-1

Compliant with NFPA 70E[®] and IEEE Recommendations Pollution Degree 2



Please read the following safety instructions carefully

- This detector is not a substitute for general safety measures for detecting hydrogen gas. It is an • additional device to enhance operation safety.
- When operating inside large sensitive zones, we recommend to install additional sensors to cover up • the entire operating space.
- The hydrogen sensor is not suitable to run or trigger fire or hydrogen explosion prevention measures • directly - the potential-free contacts are designed to contact safety management systems for alarm and notification behavior, automatic ventilation or emergency system shutdown procedures.
- Ensure your installation meets the local safety and health regulations. If you are unsure, contact the • local authorities in your country.
- If waring or alarm state is active, an imminent risk of combustion or explosion is pending:
 - Leave this area immediately! 0
 - Contact the responsible department!
- This sensor is calibrated to operate in environments with air when operating in environments with other gas, the sensor may not work as expected:
 - Inaccurate measuring / altered measuring behavior
 - False alarm / No Alarm
 - Damage the sensor itself permanently
- Some gases may damage the sensor or alter the measuring behavior in the troubleshooting guide, • you will find a list of known gas problems.
- Do not place the sensors next to uncured silicone compounds Due to the fact they will gassing off, • measured values may be corrupted.

1.0 Overview

Why charging batteries can be dangerous

Charing a battery is a chemical process that emits hydrogen gas. As more batteries are in charging process, as more hydrogen gas will be emitted. As hydrogen is lighter than normal air, it rises and collects in poorly ventilated locations.

- Shelves
- Storage areas
- Static air vortices in the ceiling area

Note:

As soon as the saturation of air with at least 4.1% hydrogen to 75% air is reached, a highly explosive gas mixture is formed - Sparks or hot surfaces can ignite the hydrogen gas. Since hydrogen is colorless and odorless, it requires sensors that alarm before a dangerous mixture is build up.

The SM_H2 hydrogen detector is a monitoring device that provides a visual and audible alarm when hydrogen is detected:

The device provides a

- 1% concentration relay
- 2% concentration relay

If the sensor detects hydrogen gas the according relay will open or close accordingly to inform management systems

How the SM_H2 sensor works

Each SM_H2 hydrogen sensor provides connections for up to three sensor probes - these probes can be placed as required to monitor the according room.

If one of the probes shows a hydrogen content of 1% by volume, the base station of the sensor responds and switches the yellow warning LED. At the same time, the relay drops out for a 1% warning and can be used as normally closed or normally closed contact for appropriate management systems.

Should the concentration of hydrogen gas in the air surrounding the sensor probe reach 2% by volume, the sensor reacts as followed:

The hydrogen should accumulate to the extent that 2% by volume is detected

- A red alarm LED lights up
- A stroboscopic warning light activated
- An audible warning tone is emitted
- The corresponding relay for the 2% warning drops out and can optionally be used as an NC or NO contact for appropriate emergency management systems.

Leaving warning/alarm states

The hydrogen sensor warning and alarm states will be withdrawn if these conditions are met:

- The 1% warning has dropped below a value of 0.5%.
- The 2% warning has dropped below a value of 1.5%.

The warning and alarm states run independently of each other. When the sensors are fully equipped, all alarm conditions can be monitored simultaneously at the sensor ports, and the respective flashing frequency at the corresponding sensor clearly indicates where the corresponding alarm is exactly located.

2.0 Specifications

Dimensions

- Main control: 4.7" L x 4.7" W x 1.2" D
- Sensor: 3.1" L x 1.6" W x 0.87" D

Mounting

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- Wall: two 3/16" screws (not included)
- H2-JB Junction box: 4 11/16" x 4 11/16" 2-gang junction box



Power Requirements/Options

Warning: Power requirements for the unit and relays should not exceed min/max specifications

- 120 Vac, 50/60 Hz Nominal (Terminal J8)
 - o 93 121 Vac
 - o 250mA / 10W Max
- 220 Vac, 50/60 Hz Nominal (Terminal J8)
 - o 185 242 Vac
 - o 125mA / 10W Max
- 12-48 Vdc Nominal (Terminal J9)
 - 9 48 Vdc `
 - o 600mA / 6W Max
 - **Note:** An earth ground must be supplied to the GND terminal on the AC terminal block when using only the DC power supply



- 1% Warning Relay (Terminal J6) "Fail Safe Mode of Operation"
 - o 1 Normally Open and 1 Normally Closed contact
 - Rated for 15 Å resistive @ 120 Vac
 - Rated for 10 A resistive @ 277 Vac
 - Rated for 10 A resistive @ 28 Vdc
 - 2% Alarm Relay (Terminal J3) "Fail Safe Mode of Operation"
 - o 1 Normally Open and 1 Normally Closed contact
 - Rated for 0.5A @ 28 Vdc

Temperature/Humidity

- Operating Temperature
- Range: 32°F (0°C) to 122°F (50°C)
- Operating Humidity Range: 20-95% non-condensing
- Storage Humidity Range: 5-95% non-condensing

Maximum Altitude

• 2000 meters

Audible Alarm

• 85 dB at 10' @ 1.6 - 3.2 KHz

Strobe LED

• 146 lumens at 1A @ 3.2-4.2V

3.0 Sensor Parts

Control station

Each control station can manage up to three hydrogen sensor probes and provides local optical and acoustical alarms in case of one of the probes detect hydrogen gas in the air. Ensure this unit is clearly visible so that a warning level can be seen by the staff immediately.



Sensor unit

The H2-SENSOR consists of an electronic sensing element whose electrical conductivity increases when hydrogen is detected at its surface. Conductivity of the sensor is proportional to the gas concentration, which is continuously monitored by the electronic alarm circuits.

The sensor only monitors for hydrogen gas (H_2) and will not alarm for Hydrogen Sulfide (H_2S) , which has an odor at very low concentrations.



4.0 Installation



AC voltage relay terminals (120/240 Vac) are located within this detector, presenting a hazard to service technicians. Only qualified technicians should open the detector case and service the internal circuits. Ensure power is removed from the detector relays prior to servicing the unit. Failure to do so may result in injury or death.

Mounting and Power Options



Wall Mountable

Integrated back mounting plate allows user to easily mount directly to any wall using 3/16" screws (not included).

Wiring

Power and alarm wires can run through the sides of the unit.

Input Power

H2-JB Junction Box Mountable (optional) Mounts to a standard, 4 11/16" x 4 11/16" 2-gang junction box

Hardwire Option

Run AC and/or DC power and alarm wires through back of the unit, into the gang box and out through conduit.

Mounting Location of sensor probes

As mentioned, hydrogen is colorless and odorless. Since it is lighter than the surrounded air, it will raise until something stops it. Therefore, hydrogen accumulates at the places where it either cannot rise any more. Due to this fact, the probes should be installed at those places, where hydrogen gas may form up critical concentration.

Mounting the sensor probes

Once the sensor probe is installed, it monitors the hydrogen concentration of the surrounding air. Please note, that the entire area a single probe can monitor, is difficult to predict:Although hydrogen always rises, it does not always gather in the same place.

Depending on the installation, it can also be found between shelves, cable trees or next to compartments and cabinets, etc. Furthermore, barely noticeable air flow like opening a door may cause hydrogen gas to gather to a place you have never thought about. As a consequence, nearly identical battery rooms need may need individual mounting locations for the sensor probes. If in doubt, install multiple sensors to avoid a blind spot in the monitoring.

Mounting the base station

Since the base station has its own acoustic and visual alarms, it should always be installed in a location where it is clearly visible. A probe should always be installed in the highest draft protected location in the battery room cabinet or compartment.

Assembly:

- 1. Remove the screws and the front panel and carefully lift the front cover of the base station.
- 2. Fix the base station to the wall via the recesses of the mounting plate
- 3. Connect the alarm wires and power supply.
- 4. Connect the sensor probes to the appropriate CAT 5e sensor cable.
- 5. Close the front cover and gently tighten the screws.

Power Options

The detector has terminal blocks for connections to a single-phase 120/240 Vac 50/60 Hz power source **(Terminal J8)**, and/or a 12-48 Vdc power source **(Terminal J9)**. The power supply inputs are redundant, so the unit can use the DC input as a backup source.

Relays

Relay connections

The sensor base offers two different alarm relays:

- 1% "Warning Relay" (Terminal J6): This relay activates when one of the connected sensors reports hydrogen saturation of 1%. The relay remains active until the hydrogen saturation has fallen below 0,5%. The potential-free connections of the relay are designed for up to 10A / 250 Vac.
- 2% "Alarm Relay" (Terminal J3): This relay activates when one of the connected sensors reports a hydrogen saturation of 2%. The relay remains active until the hydrogen saturation has fallen below 1,5%The potential-free connections of the relay are designed for up to 0.5A / 28 Vdc

Note:

If higher currents are in use, please connect an external relays that can handle this task.

Mounting Options

Junction Box Mounted

For 120/240 Vac power, use 18-3 gauge stranded wire. For 9 - 58 Vdc power, use 18-2 conductor insulated wire. For relay wires, use stranded wire. Maximum wire size for connector terminations is **14 AWG**. Stranded conductors must be terminated in a manner to prevent shorting from one terminal to another by a loose strand. Tin the wires with solder if required.

Wall Mounted

For 120 Vac power, an 18-3 gauge insulated line cord is required. For 9 - 58 Vdc power, use 18-2 conductor insulated cable from the DC supply. For relay wires, use stranded wire. Maximum wire size for connector terminations is **14 AWG**.



SM_H2 is supplied with a tie-wrap to secure the AC mains' wiring. The tie wrap can rotate up to 270 degrees to accommodate your installation.

Disconnection of Supplying Power

When the unit is hard wired, an external 10 Amp (minimum) circuit-breaker or switch should be installed to act as a disconnecting device. The circuit-breaker must open all supply conductors simultaneously, be easily reached by operators and be marked as the disconnecting device for the equipment.

For Installation of Additional Sensors



Copyright of the European Union is effective (Copyright EU) (c) 2020 GENEREX Systems GmbH, Hamburg, Germany, All rights reserved TEL +49(40)22692910 - EMAIL generex@generex.de - WEB www.generex.de (This and all other product datasheets are available for download.) Each base station can accommodate up to three sensors to increase the spatial coverage. Simply connect a second or third sensor to the corresponding port of the base station. The cable length of the supplied cable defines the maximum distance to the corresponding base station.

Operating environment of the sensor probes:

Avoid places with corrosive gas mixtures

The sensor should not be installed in environments where the probes come into contact with corrosive gas mixtures like hydrogen sulfide, sulfur oxide, chlorine, hydrogen chloride, and the like at times, because these gas mixtures react with the sensor head and the sensor may not function as expected or even completely fail.

Heavy metals and impurities

The performance characteristics of the sensor probes may be compromised if the sensor becomes dirty or exposed to heavy metals.

Ensure correct atmospheric conditions

The sensor is designed for normal room air - environments with greatly reduced oxygen or 0-oxygen levels can not be monitored.

Moisture and condensate

When a sensor collects condensation, its measurement characteristics and measurement results may temporarily be off the standard. Before and during installation and initialization of the sensors, check whether the local operating conditions have a negative effect on the alarm behavior. For normal indoor use, however, condensation should not be a significant performance issue.

Connection Diagram

The correct relay connection points are listed on the following drawing. It is recommended to use AWG 14 or less stranded cable for the relay contacts to avoid interference within the connection area: Interferences may possibly lead to false alarms.



How to find the hydrogen gas reporting sensor probe

Each of the sensor connections has its own status LED. If the sensor is properly installed, this LED will begin to look green together with the sensor connector on the base station:

- The LED for a sensor that is in alarm mode flashes as fast as the strobe LED.
- The alarm sensor and the strobe LED flash faster than the LED of a sensor that is only in warning mode.

Using the switching relays

Remove the front cover to expose the corresponding relay contacts. The mounting screws are located on the front. Find the terminals for the corresponding alarm relays. Use stranded wire with a maximum rating of 14 AWG to connect contacts. Then replace the front cover.

5.0 Initialization of the sensors

The base station is designed for continuous operation - make sure that the power supply is guaranteed at all times. When the unit is powered, the Power LED lights up on the front panel.

As soon as the base station is initialized, the connected sensors their search for hydrogen.

To avoid a false alarm during the initialization phase, the relays energize but hold on standby for 30 seconds before the automatic switching control will take over.

If a sensor detects a hydrogen concentration of 1% by volume, the yellow warning LED lights up on the base station. In addition, the relay for the 1% warning drops - depending on the connection, the corresponding relay contacts open or close. At the corresponding sensor, the indicator LED flashes faster than with the other sensors.

If a sensor detects a hydrogen concentration of 2% by volume, the red alarm LED lights up, the stroboscopic alarm LED flashes and an audible alarm sounds. In addition, the 2% alarm relay drops out and opens or closes depending on the type of connection



Condition	Main C Pow	Control Ind ver War Alarm	licators ming	Individual Sensor Indicators	Relay Closure	Audible Alarm	Strobe
Normal Operation	G	0	0	G (sensor installed)	Energized	None	None

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H ₂ Warning (1% H ₂)	G	Y	\bigcirc	(blinking green)	Warning Relay De- Energized	None	None
H ₂ Alarm (2% H ₂)	G	Y	R	(same flash rate as strobe)	Warning and Alarm Relay De-Energized	ON	ON
Sensor/Cable Fault	G	\bigcirc	\bigcirc		N/A	None	None
Communication with Sensor Lost	6	0	0	(plugged in, but not lit)	N/A	None	None

6.0 Testing the sensors

To trigger the self-test, press and hold the Test button on the front of the base for 10 seconds. The following functions are tested:

- The warning LED
- The alarm LED
- The stroboscopic warning LED
- The alarm buzzer
- The relays drop and switch the connected alarm wires

Note:

The sensor test can only check the electrical integrity and indicates a possible electrical malfunction. The functionality of the probes themselves can only be checked with a corresponding hydrogen test.

7.0 Troubleshooting and Maintenance

No Power

Verify the AC and/or DC power cables are installed accordingly and main power is present.

Alarm during initialization of the sensor base

The alarm contacts can be connected both - as Normally Open and Normally Closed. Some management systems also provide functions to invert the current status of a contact wire. Check the connection type at the base station. Do not forget to check if the signal input was inverted by the remote station.

False Alarms

The sensors have been specially calibrated to detect hydrogen, but they also detect other flammable gases and may trigger warning and alarm routines.

The following list contains known gases and chemical compounds that may cause a sensor strikes:

- Acetone
- Acetylene
- Ammonia
- Benzene
- Butane
- n-Butyl Acetate
- Carbon Dioxide
- Carbon Monoxide
- Ethane
- Ethanol
- Ethyl Acetate

- Ethyl Ether
- Ethyl Oxide
- Gasoline
- Heptane
- Hexane
- Hydrogen
- Hydrogen Cyanide
- Hydrogen Sulfide
- Isopropyl Alcohol
- Methane
- Methanol

- Methyl Ethyl Ketone
- Nitric Oxide
- Nitric Dioxide
- Propane
- Propylene Oxide
- Styrene
 - Sulfur Dioxide
- Toluene
- Turpentine
- Vinyl Acetate
- Xylene

If a sensor reports the concentration of hydrogen is reached, the sensor base responds with switching into the appropriate alarm state (1% warning state level, 2% alarm state level). In case of contaminated gas measuring, this may even happen without hydrogen.

Note:

When carrying out the sensor test with a hydrogen test kit, remember that the relays do not drop off immediately as soon as a warning or alarm concentration has become sub stepped:

If the warning state is active at the hydrogen concentration of 1%, the state is maintained until it falls below 0.5%. If the alarm status is active at 2%, the measured value must be less than 1.5% before the relays are reopened.

The sensor cannot differentiate between hydrogen and other gases as mentioned. When installing, ensure that no outgassing materials are stored in the immediate vicinity.

8.0 Storage

The longer a sensor is stored prior to being energized, the longer the warm up and stabilization period may become. Storage Humidity Range: 5 - 95% non-condensing.

9.0 Maintenance Tips

To maintain the unit, it is recommended to:

- 1. Test the detector once a month by pressing the 'TEST' button.
- 2. Vacuum the alarm cover once a month to remove accumulated dust.
- 3. Never use detergents or solvents to clean the unit or sensor. Chemicals can permanently damage or temporarily contaminate a sensor.
- 4. Avoid spraying air fresheners, hair spray, paint or other aerosols near a sensor.
- 5. Never paint the unit or sensor. Paint will seal the vents and interfere with proper sensor operation.



WARNING

Do not disassemble unit or attempt to repair or modify any component of this instrument. This instrument contains no user serviceable parts, and substitution of components may impair intrinsic safety, which may adversely affect product performance and result in injury

The SM_H2 Hydrogen Alarm System is not a standalone safety device and does not provide protection from hydrogen explosions. The relay contacts are intended to be connected to a safety system, enabling audible alarms, system shutdown, ventilation, or other measures to ensure monitoring of hydrogen gas occurs before concentrations reach dangerous levels.

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