

Linear Solid State Gas Sensor

## Manning LSS Instruction and Installation Manual

07/09

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# About This Document

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## World Wide Web

The following Honeywell web sites may be of interest.

Honeywell Organization	WWW Address (URL)
Corporate	<a href="http://www.honeywell.com">www.honeywell.com</a>
Honeywell Analytics	<a href="http://www.honeywellanalytics.com">www.honeywellanalytics.com</a>
Manning Gas Detection	<a href="http://www.manningsystems.com">www.manningsystems.com</a>

## Telephone

Contact us by telephone at the numbers listed below.

Organization		Phone Number
United States	Honeywell Analytics Inc.	1-800-538-0363 1-913-712-5576 1-913-712-5580 Fax
Canada	Honeywell Analytics Inc.	1-888-749-8878
Europe	Honeywell PACE	+44 (0)1202 676161
Asia Pacific	Honeywell Asia Pacific Inc.	+82 (0)2 2025 0307
Middle East	Honeywell Analytics Inc.	+971 4 3458 338





## Sales Information

Contact us at [detectgas@honeywell.com](mailto:detectgas@honeywell.com)

# Symbol Definitions

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The following table lists those symbols used in this document to denote certain conditions.

Symbol	Definition
	<b>ATTENTION:</b> Identifies information that requires special consideration.
	<b>TIP:</b> Identifies advise or hints for the user, often in terms of performing a task.
	<b>REFERENCE-EXTERNAL:</b> Identifies an additional source of information outside of this bookset.
	<b>REFERENCE-INTERNAL:</b> Identifies an additional source of information within this bookset.

# Contents Serial number:

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## Introduction

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This manual has been prepared to help in the use and installation of the Manning LSS Linear Solid State Gas Sensor. This manual will convey the operating details of the sensor, ensure proper installation, and demonstrate start-up and routine maintenance procedures.



**ATTENTION: This manual must be carefully followed by all individuals who have or will have the responsibility for using or servicing the sensor.** Warranties made by Honeywell Analytics with respect to this equipment will be voided if the equipment is not used and serviced in accordance with the instructions in this manual. If in doubt about a procedure, please contact Honeywell Analytics before proceeding.

# 1 Sensor Description

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The Manning LSS Sensor is a three-wire, solid state sensor with a linear 4/20 mA output.

The Manning LSS is available in the following versions:

**LSS-H<sub>2</sub> – Hydrogen Sensor:** suitable for use in battery room and charging stations. It has a range of 0–2,000 ppm.

**LSS-R22 – R22 Sensor:** for detection of R22. It has a range of 0-3,000 ppm.

**LSS-CO – Carbon Monoxide sensor:** suitable for use in garages and docks for vehicle exhausts. It has a range of 0-200 ppm.



Note that the Manning LSS is to be used in **non-hazardous** locations. If explosion-proof designs are required, contact Honeywell Analytics.

It is very important to note that all of the solid state sensors are NOT totally selective to the gas being measured. These sensors must be considered “broad spectrum,” i.e., they will smell other gases. Therefore, always make sure the area is reviewed for possible interference gases.

These sensors are designed to be more sensitive to the desired gases, but such gases as hydrogen (from battery chargers), paints, solvents, exhaust fumes from fork lifts, cars, and trucks are just a small example of possible interference gases.

Sensors are normally long-lived (3-5 years), unless physically damaged or wetted with water or other liquid.

The Manning LSS pre-amp continuously monitors the sensor's operation and, when a fault is detected, reduces the output signal to 0.5 mA as an indicator of the fault. The fault is indicated by illumination of the red LED in the sensor unit. When monitored by the Manning GM-1, GM-JR, GM-4, GM-10, or other appropriately configured alarm system, the result is a highly reliable system that ensures protection.



**Monitoring equipment must be configured to indicate a fault if the signal is less than 1.5 mA. A signal above 20 mA must be considered a high gas concentration.**

## Specifications

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**Electrical Power:** 24 Volts DC regulated, 250 mA

**Output:** Linear 4/20 mA output, maximum 250 ohm impedance

**Cable Recommendation:** Three-conductor, #18 AWG, stranded, shielded cable with drain wire all enclosed in a vinyl jacket (Belden #8770 or equivalent)

**Cable Length to Sensor:** 1,500 feet maximum

**Unit Enclosure:** NEMA 1, gasketed, 16-gauge steel. Special enclosures available for NEMA 4, low temperatures, etc.



**Note: The standard Manning LSS is for use in non-classified areas only.** If explosion-proof designs are required, contact Honeywell Analytics.

## Sensor Specifications

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**Type:** Broad spectrum solid-state gas sensor/transmitter

**Measurable Gases:** Carbon monoxide (CO), R22, hydrogen (H<sub>2</sub>)

**Method of Detection:** Solid-state

**Humidity:** 5-95% RH (non-condensing). Modifications are available for more severe conditions.

**Operating Ambient Temperature Range:** –10° F to +120° F. Modifications are available for temperatures below –10° F. If relative humidity is above 95% and condensing, please contact Honeywell Analytics for housing modifications and/or other sensor possibilities.

**Storage Temperature:** –40° F to +140° F

**Gas Sampling:** Diffusion

**Weight:** 3 lbs.

**Dimensions:** 6" high x 4" wide x 3.5"

# 2 Installation

## A Locating the Manning LSS



Because each sensor can only “report” what it seeing at the moment, it is **very important that the sensor is located where leaks are most likely to occur.**

### Most sensor failures are caused by water damage.

The location should be chosen to protect the sensor from water, excessive humidity, and vibration. Protect sensors from hose-down by clean up and maintenance crews.

**Give special attention to sources of potential interference gases** such as hydrogen (battery chargers), diesel fumes, carbon monoxide (propane lifts), ethylene (flowers and produce), smoke, solvents, paint, cleaners and alcohols. If these noise gases present a problem, contact Honeywell Analytics for information on special sensor designs that eliminate these interferences.

The following guidelines must be considered when determining sensor mounting locations:

- Take air movement and ventilation patterns into account when locating sensors.
- Always remember that someone (maybe you) will have to periodically work on the sensor, so make sure it is easily accessible.
- Mounting dimensions are included in Figure 1.
- Target gas mounting location guidelines are outlined in the following paragraphs.

## Hydrogen Sensor Mounting Recommendations

Because hydrogen vapor is much lighter than ambient air, the sensor should normally be located near the ceiling of equipment rooms.

While keeping in mind the general guidelines for sensor mounting, also consider the following for hydrogen applications:

- Give special attention to sources of interference gases such as paints, cleaners, solvents, and alcohols.

## R22 Sensor Mounting Recommendations

R22 vapor is heavier than ambient air, so in a room with no air movement, it will tend to settle.

While keeping in mind the general guidelines for sensor mounting, also consider the following for refrigerant applications:

- Locate the sensor near the area where the leak is most likely to occur.
- For quickest detection, mount the sensor about 1 to 2 feet off of the floor, close to the leak source.
- With the sensor mounted low, protect from water damage due to floor cleaning.

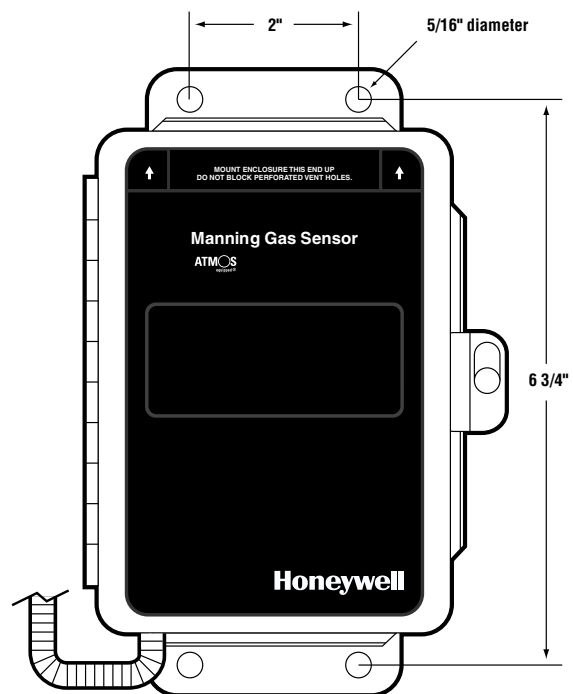
## Carbon Monoxide Mounting Recommendations

Carbon Monoxide vapor is about the same weight as ambient air, so for area personnel protection, consider mounting the sensor in the normal breathing zone (4 to 5 feet above the floor).

While keeping in mind the general guidelines for sensor mounting, also consider the following for carbon monoxide applications:

- Locate the sensor close to the expected source of carbon monoxide.
- Give special attention to sources of interference gases such as paints, cleaners, solvents, and alcohols.

Figure 1: Mounting Dimensions for the LSS Sensor



# 2 Installation continued

## B Wiring

Figure 2 presents wiring information for the Manning LSS sensor.

Electrical wiring must comply with all applicable codes. Plant equipment that may be involved and operating conditions should be discussed with local operating personnel to determine if any special needs should be taken into account.

Almost all start-up problems are due to improper wiring or monitor configuration. Please follow these guidelines carefully.

Always use three conductor, insulated, stranded, shielded copper cable. Use only three conductor cable, not two cables of two conductor wire.



**Do not pull sensor wiring with AC power cables.** This will cause electrical interference.

Be sure there are no breaks or splices in sensor wiring runs. If cable runs cannot be made without a splice, all connections must be soldered. Soldering should be done using a rosin flux to tie the connecting ends of sensor wires to ensure a positive and long-lasting contact.

Ground the shield at the main control panel. Connect the shield wire in the sensor terminal block labeled *SHLD*.

Tape all exposed shield wire at the sensor to insulate it from the enclosure.

All penetrations into a refrigerated room should be sealed to prevent condensate from forming in the conduit and dripping into the sensor enclosure. Silicone should not be used near the sensor, because silicone can damage the sensor.

Make drip loops for cables going into sensor housings. Follow the special mounting instructions on the enclosure (... *This End Up*).

Mount sensor enclosures through the flange holes as shown in Figure 1, and always mount vertically.

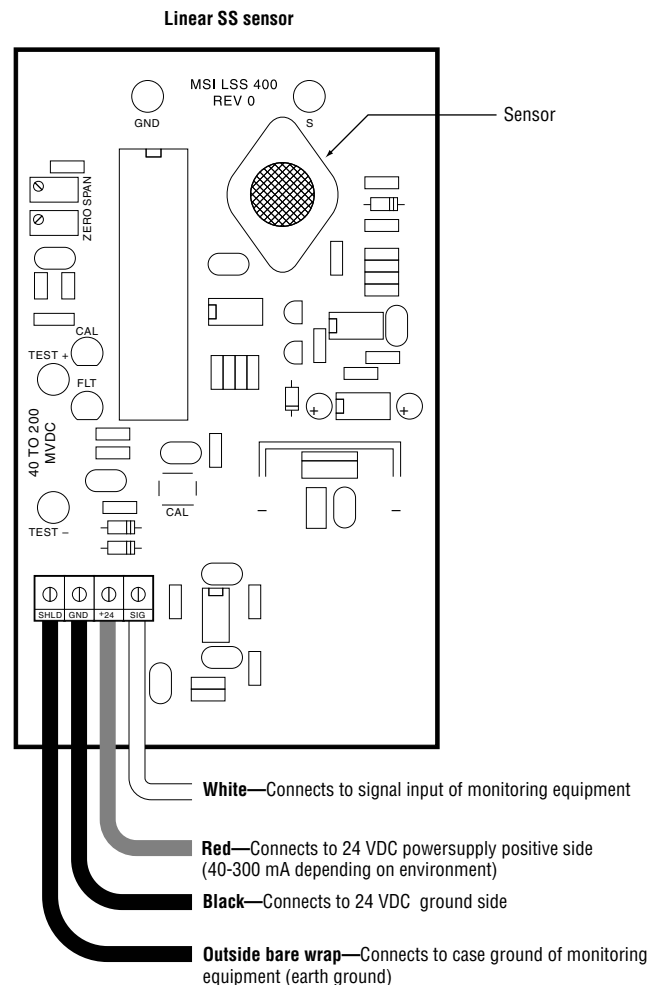
**Electrical Power:** 24 VDC regulated, 250 mA.

**Output:** Circuit board mounted sensor provides a linear 4/20 mA output. Monitoring equipment may have a maximum input impedance of 250 ohms.

**Cable Recommendation:** #18/3 shielded cable (Belden #8770 or equivalent). Length of cable to sensor should be no greater than 1,500 feet. Use only the existing punched holes for connections to the sensor.

**Monitoring:** The Manning LSS sensor may be monitored by the Manning GM-1, GM-JR, GM-4, GM-10, or other appropriately configured system. Monitoring equipment must be configured to indicate a fault if the signal is below 1.5 mA. All signals over 20 mA must be considered a high gas concentration.

**Figure 2: Wiring diagram for the Manning LSS Sensor**



# 3 Operation

## A Start-Up Procedures

Before applying power, make a final check of all wiring for continuity, shorts, grounds, etc. It is usually best to disconnect external alarms and other equipment from the sensor until the initial start-up procedures are completed.

After power-up, allow 24 hours for the system to stabilize before testing the sensors. Because sensors are normally located at a distance from the main unit, the test time required and accuracy of the response checks will be improved if two people perform the start-up procedures and use radio contact.

### Start-Up Test:

- 1) One person exposes each sensor to a small amount of the gas that is being monitored.
- 2) The second person stays at the control unit to determine that each sensor, when exposed to the gas fumes, is connected to the proper input and responds, causing appropriate alarm functions.

## B Calibration

The Manning LSS sensor comes factory calibrated and should require minimal adjustments after installation. There are two pots on the preamp that are used for calibrations.

**Zero Calibration:** After the unit is installed and has been powered up for a minimum of 24 hours, the unit should be zero calibrated by the following:

- Be sure the unit is in clean air.
- Adjust the zero pot until the sensor outputs 4.0 mA (40 mV from Test [-] to Test [+]) (see Figure 3, Notes 2 and 3).

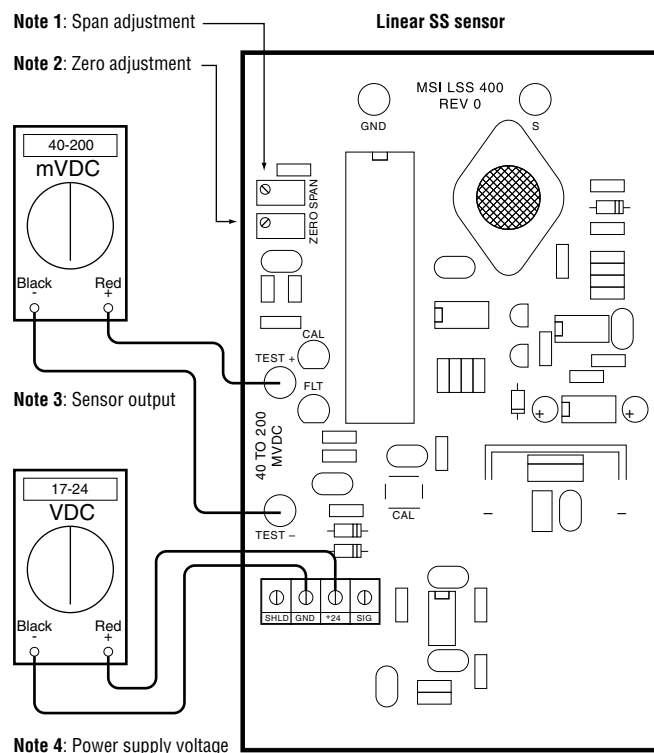
**Span Calibration:** The unit is factory calibrated and normally does not need to be spanned upon initial installation. Do not adjust the span pot without certified calibration gas!

If span adjustment is required, the following procedure will span the unit:

- Perform zero adjustment before spanning.
- Apply span gas at 1.0 L/min\* (span gas must be in air, not nitrogen or other carrier).
- After span gas has been on sensor for two minutes, adjust the span pot until the correct output is achieved (see Figure 3, Notes 1 and 3). After span adjustments, allow the sensor to clear out for two hours and perform zero calibration if necessary.

Calibration kits are available from Honeywell Analytics.

**Figure 3: Checking sensor output, power supply voltage, and zero and span adjustments**



\*Check with Technical Support for use with another type of regulator or the discontinued flow meter.

# 3 Operation continued

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## c Troubleshooting

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The greatest probability for trouble is reversed or incorrect wiring. Always be consistent with color codes and double-check terminal screw tightness.

**If sensor output is 0.5 mA:** The Manning LSS continuously monitors the status of the sensor and, if fault conditions arise, the red FLT LED will light. After a short time delay, the sensor will output a signal of 0.5 mA. Monitoring equipment must be configured to indicate a fault if the signal is less than 1.5 mA.

If the FLT LED is lit continuously or flashing, this indicates a faulty sensor. Contact Honeywell Analytics for a replacement sensor.

**If the sensor output is 0 mA:** First, verify +24 VDC at the sensor terminal block (see Figure 3, Note 4).

Second, check voltage between *Test-* and *Test+* (see Figure 3, Note 3). Voltage should be in the range of 40 mV to 200 mV corresponding to an actual current flow of 4 to 20 mA. If this voltage is 0 mV, the signal has no path to ground. Check monitoring equipment connections and configuration. Input impedance must be 250 ohms or less.

### **If sensor output indicates a gas concentration when no apparent gas is present:**

Honeywell Analytics uses a number of different solid-state sensors depending on the gas to be detected.

Even with this special selection, the solid-state sensor must be considered a broad spectrum device that responds to gases (which may not be the target gas) such as ammonia, hydrogen (battery chargers), diesel fumes, carbon monoxide (propane lifts), ethylene (flowers and produce), smoke, solvents, paint, high moisture levels, wash-down, etc.



“Nuisance” alarms *do* occur for no *obvious* reason. The most usual reaction to a nuisance alarm is to raise the alarm trip levels. However, many nuisance alarms can be traced to an unknown or unexpected source of a gas or vapor. Serious efforts should be made to investigate and eliminate the source before raising the alarm trip level.

If interference gases are not present, then, depending on the environment and background gases, etc., the clean air signal may slowly drift upward with age. The sensor should be recalibrated every six months.

If the sensor cannot be calibrated or is overly jumpy or sluggish, it could be at the end of its useful life and a replacement sensor may be required. Contact Honeywell Analytics.

### **Special notice for odorless gases:**

Gases such as hydrogen, carbon monoxide, and refrigerants (halocarbons) are odorless and can't be sensed by the human sense of smell. Special precautions should be taken in these cases to confirm the presence of a target gas if the source of false trips appear to be coming from interference gases.

Honeywell Analytics recommends the use of a portable instrument for verification before assuming the target gas is not present.

Honeywell Analytics has a complete line of portable instruments for this purpose, as well as normal plant monitoring. Please contact Honeywell Analytics if you have this requirement.

## d Maintenance

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Honeywell Analytics recommends that as a minimum each sensor be calibrated with a certified calibration gas sample once every six (6) months.

Also, the signal being sent by the sensor should be logged on a monthly basis.

During the sensor calibration, all alarm outputs should be confirmed and logged to insure system integrity.

## e Replacement Parts

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For replacement parts, contact Honeywell Analytics. Be sure to give serial number of unit and model number.

# 4 Limited Warranty

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## 1. Limited Warranty

Honeywell Analytics, Inc. warrants to the original purchaser and/or ultimate customer ("Purchaser") of Manning products ("Product") that if any part thereof proves to be defective in material or workmanship within eighteen (18) months of the date of shipment by Honeywell Analytics or twelve (12) months from the date of first use by the purchaser, whichever comes first, such defective part will be repaired or replaced, free of charge, at Honeywell Analytics' discretion if shipped prepaid to Honeywell Analytics at 405 Barclay Blvd., Lincolnshire, IL 60069, in a package equal to or in the original container. The Product will be returned freight prepaid and repaired or replaced if it is determined by Honeywell Analytics that the part failed due to defective materials or workmanship. The repair or replacement of any such defective part shall be Honeywell Analytics' sole and exclusive responsibility and liability under this limited warranty.

## 2. Exclusions

- A. If gas sensors are part of the Product, the gas sensor is covered by a twelve (12) month limited warranty of the manufacturer.
- B. If gas sensors are covered by this limited warranty, the gas sensor is subject to inspection by Honeywell Analytics for extended exposure to excessive gas concentrations if a claim by the Purchaser is made under this limited warranty. Should such inspection indicate that the gas sensor has been expended rather than failed prematurely, this limited warranty shall not apply to the Product.
- C. This limited warranty does not cover consumable items, such as batteries, or items subject to wear or periodic replacement, including lamps, fuses, valves, vanes, sensor elements, cartridges, or filter elements.

## 3. Warranty Limitation and Exclusion

Honeywell Analytics will have no further obligation under this limited warranty. All warranty obligations of Honeywell Analytics are extinguishable if the Product has been subject to abuse, misuse, negligence, or accident or if the Purchaser fails to perform any of the duties set forth in this limited warranty or if the Product has not been operated in accordance with instructions, or if the Product serial number has been removed or altered.

## 4. Disclaimer of Unstated Warranties

THE WARRANTY PRINTED ABOVE IS THE ONLY WARRANTY APPLICABLE TO THIS PURCHASE. ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED.

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