

Sensor for Ammonia

Manning IR-F4-NH₃ Instruction and Installation Manual

07/09

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About This Document

World Wide Web

The following Honeywell web sites may be of interest.

Honeywell Organization	WWW Address (URL)
Corporate	www.honeywell.com
Honeywell Analytics	www.honeywellanalytics.com
Manning Gas Detection	www.manningsystems.com

Telephone

Contact us by telephone at the numbers listed below.






Organization	Phone Number
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Europe	Honeywell PACE +44 (0)1202 676161
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Sales Information

Contact us at detectgas@honeywell.com

Symbol Definitions

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

Symbol	Definition
	ATTENTION: Identifies information that requires special consideration.
	TIP: Identifies advise or hints for the user, often in terms of performing a task.
	REFERENCE-EXTERNAL: Identifies an additional source of information outside of this bookset.
	REFERENCE-INTERNAL: Identifies an additional source of information within this bookset.
	EARTH GROUND - Functional Earth Connection: This connection shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.

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Introduction

This manual has been prepared to help in the use and installation of the Manning IR-F4-NH₃ (Infrared Ammonia) Sensor. This manual will convey the operating principles 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 Manning IR-NH₃ 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

The Manning IR-F4-NH₃ is a high level ammonia sensor which is intended to provide ammonia concentration indication in the percent range for extreme environments.

Gas detection by the infrared method is based on the principle that most gases absorb infrared energy at a characteristic frequency. In this instrument, a broad band infrared source emits energy which is then filtered to produce a narrow range of frequencies characteristic of the ammonia absorption spectra. The band pass filter is chosen to match a strong absorption band of ammonia, while avoiding absorption bands from other gases which may be present. Any ammonia in the gas sample cell selectively absorbs energy reaching the detector. This reduction in energy is detected, amplified and sent to the signal processing portion of the system.

The Manning IR Sensor is a three-wire, 4/20 mA sensor for ammonia available in a range of 0–2%.

The unit exhibits excellent accuracy and precision, with negligible response to common interference gases and dramatic changes in relative humidity. The unit exhibits extremely high reliability with no moving parts.

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. All signals over 20 mA must be considered a high gas concentration.

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

System Specifications

Electrical Power: 24 Volts DC regulated, 500 mA. If ATMOS equipped[®], up to 1.5 amps @ 24 VDC

Output: Linear 4/20 mA output into a load resistor of 250 ohm maximum

Cable Recommendation: Always use three conductor, stranded, shielded cable with drain wire, all enclosed in a vinyl jacket. For cable runs up to 200 feet use #18 AWG (Belden #8770 or equivalent). For cable runs up to 1,000 feet use #16 AWG (Belden #8618 or equivalent). If sensor is SUPER HEAT equipped (–15°F and below), contact Honeywell Analytics for cable recommendations.

Cable Length to Sensor: 1,000 feet maximum

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



NOTE: The standard IR is for use in non-classified areas only.

Sensor Specifications

Type: Ammonia selective infrared gas sensor/transmitter IR-F4-NH₃

Method of Detection: Infrared energy absorption

Range Available: 0–2%

Trip Points: Do not set trip points below 5,000 ppm

Accuracy: ± 3% of full scale

Operating Humidity: 0-100% RH (condensing). ATMOS equipped[®] enviro-adaptive technology option required for condensing conditions or refrigerated areas

Operating Temperatures: –50° F to +120° F. ATMOS equipped[®] enviro-adaptive technology option required for refrigerated areas or outdoors

Gas Sampling: Diffusion

Weight: 4 lbs.

Dimensions: 8" high x 6" wide x 3.5" deep

2 Installation

A Locating the Sensor



Because each sensor can only “report” what it is seeing at the moment, **it is very important that the sensor be located where leaks are most likely to occur.** Because ammonia vapor is about one-half the weight of ambient air, the sensor should normally be located near the ceilings of equipment rooms, cold rooms, etc. Figure 1 presents mounting dimensions for the IR-NH₃ sensor.

Note that the minimum operating temperature is +40° F unless the sensor enclosure is ATMOS equipped®.

If the primary application is **personnel protection** (representative concentration reading that an employee would be exposed to), mount the sensor at a height in the breathing zone of the employees. It would typically be about five feet off the ground, which also allows easy access.

If the primary application is the **fastest possible leak detection**, mount the sensor near the potential leak source(s). In the case of ammonia, this is usually near the ceiling as ammonia vapor is lighter than air. In doing this, be aware that the indicated concentration will not be representative of personnel exposure and easy access for the required calibration and maintenance could be compromised.

No matter where the sensor is mounted, it must be easily accessible.

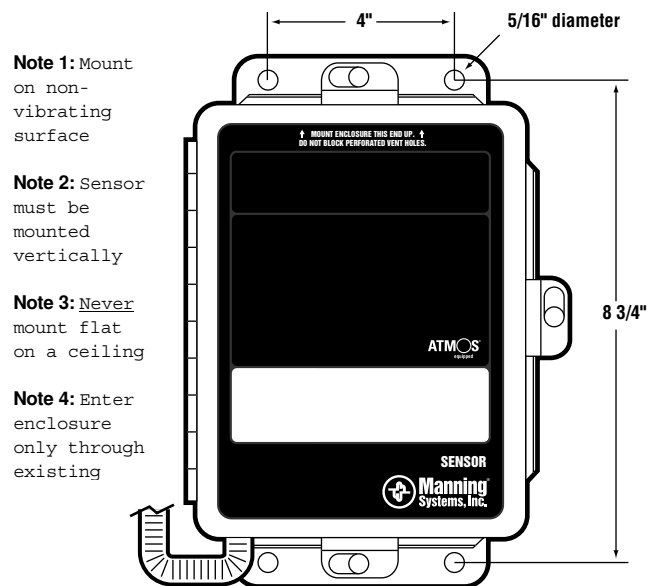
General Mounting Considerations: The location should be chosen to protect the sensor from water, excessive humidity, and vibration. Most sensor replacement is due to vibration damage! Protect sensors from hose-down by maintenance crews.



As a general rule, locate sensors **no closer** than 3 feet from walls or 1 foot from the ceiling. Take air movement and ventilation patterns into account when locating sensors. **Always** mount the sensor vertically as marked on the enclosure.

- Must be easily accessible for calibration and maintenance.
- **Never** mount the sensor flat on a ceiling.
- Mount the sensor close to the potential leak source.
- If personnel protection is the primary application, mount in the “breathing zone.”
- Protect sensor from vibration, water, excessive humidity, and wash-down.
- Take air movement and ventilation patterns into account.
- To prevent electrical interference, keep sensor and wire runs away from mercury vapor lights, variable speed drives, and radio repeaters.
- Protect sensor from physical damage (fork lifts, etc.).
- For highly critical locations, more than one sensor should be installed in each room.

Figure 1: Mounting dimensions for the IR-NH₃ Sensor



2 Installation continued

Evaporators: Do not mount the sensor in front, back, or on top of evaporators. When installing sensors near evaporators in refrigerated spaces, keep the air flow past the sensor below 1,200 feet/minute and away from any moisture created during defrost. The best location is usually on the piping/control side three to four feet from the evaporator and within 1 1/2 to 2 feet from the top of the coil. Don't mount sensors any closer to evaporators than 3 feet. Do not mount the sensor on evaporators because vibration will damage the sensor.

Do not mount the sensor over a door in a refrigerated area.

Blast Freezers: Never mount sensor above the coil. The ideal location, when possible, is below the bottom of the coil. Try to put in return air and protect the unit from being damaged by product loading and unloading. Keep it away from warm, moist air during defrost.

B Wiring

Figure 2 presents wiring information for the IR 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.

Nearly 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.

Make drip loops for cables going into sensor housings. When ATMOS equipped® enclosures are used, 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 on a non-vibrating surface.

Electrical Power: 24 VDC regulated, 500 mA. If ATMOS equipped® enclosures are utilized, current draw can be as much as 1.5 amps.

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: Use #18/3 (Belden #8770) for cable runs up to 200 feet. Use #16/3 (Belden #8618) for cable runs up to 1,000 feet. If sensor is SUPER HEAT equipped, contact Honeywell Analytics for cable recommendations. Use only the existing punched holes for connections to the sensor.

Monitoring: The IR ammonia 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. A failed sensor will output a steady 0.5 mA signal.



2 Installation continued

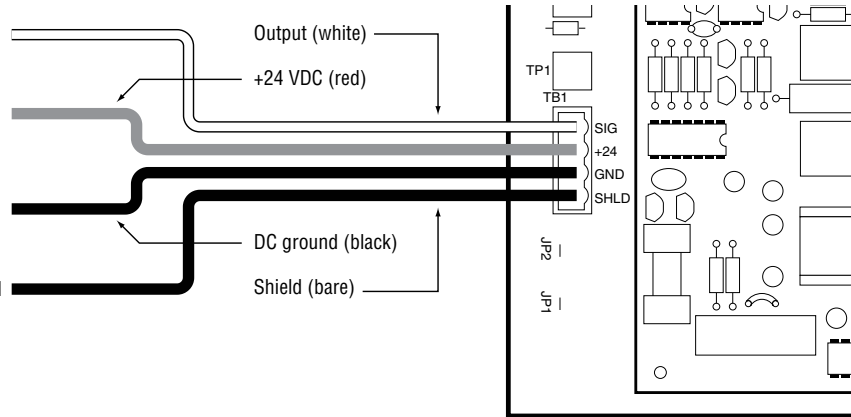
Figure 2: Wiring Diagram

White connects to signal input of monitoring equipment

Red connects to 24 VDC power supply positive side

Black connects to 24 VDC ground side

Bare wire wrap connects to case ground at monitoring equipment (earth ground)



3 Operation

A Start-Up Procedure

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 IR sensor comes factory calibrated and should require minimal adjustments after installation. There are only two pots on the pre-amp that are used for calibrations. All other pots are factory set and must never be adjusted. They can only be properly adjusted at the factory.

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

- Confirm that no ammonia is present at the sensor location.
- Press the CAL button on the right side of the back board (see Figure 3). The CAL LED should begin to flash.

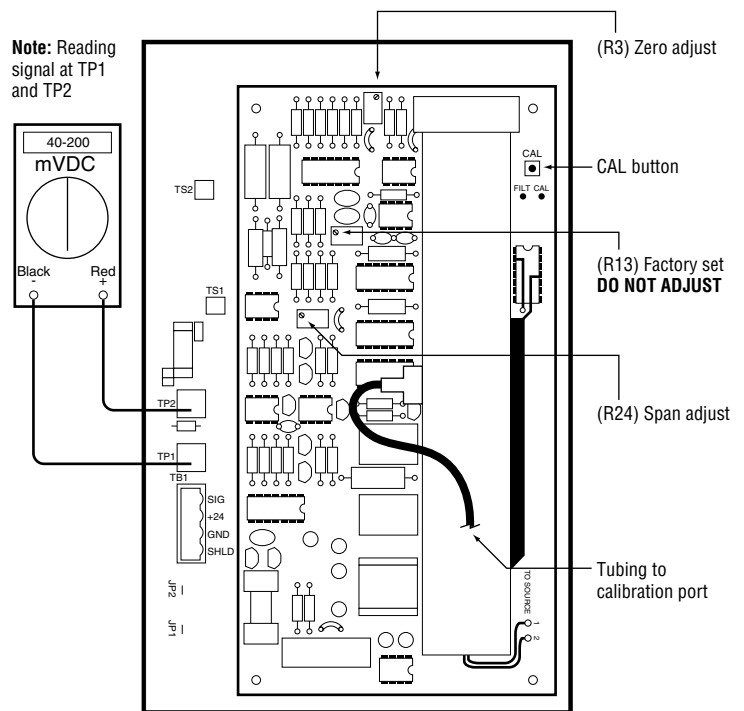
- Adjust the zero pot until the sensor outputs 40 mV between TP1 and TP2 (see Figure 3).



Make small adjustments and wait for the output to respond because adjustment response is highly damped.

- Press the CAL button. The CAL LED should stop flashing. If the CAL button is not pushed, the unit will automatically leave the calibration mode after 10 minutes.

Figure 3: Zero and span adjustments on the IR-NH₃



3 Operation continued

Span Calibration: The unit is factory calibrated and normally does not need to be spanned. 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.
- Press the CAL button. The CAL LED should begin flashing.
- Apply span gas at 1.0 L/min.*
- After span gas has been on sensor for two minutes, adjust the span pot until the correct output is achieved (see Figure 3). **Make small adjustments and wait for the output to respond because adjustment response is highly dampened.**



- Press the CAL button. The CAL LED should stop flashing. If the CAL button is not pushed, the unit will automatically leave the calibration mode after 10 minutes.

Calibration kits are available from Honeywell Analytics.

c Troubleshooting

Electrical Interference: This sensor has been designed to be highly resistant to EMI/RFI using multiple stages of filtering and protection. However, in extreme environments, some noise pickup can occur directly through the sensor. Be certain that the bare shield wire of the instrument cable is properly connected at the readout unit

If the sensor output is 0 mA: First, verify +24 VDC at the sensor terminal block (see Figure 4, Note 2).

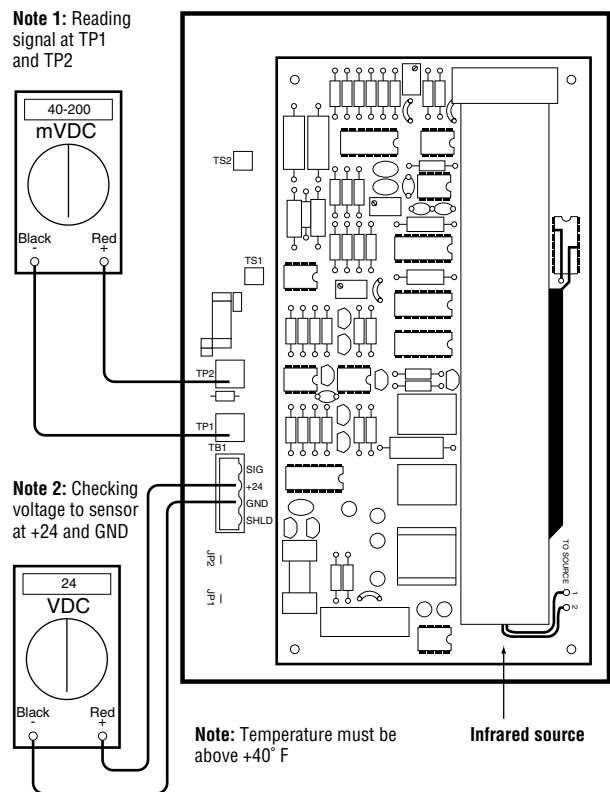
Second, check signal voltage between TP1 and TP2 (see Figure 4, Note 1). Voltage should be in the range of 40 mV to 200 mV corresponding to an actual current flow of 4 to 20 mA. If this voltage is 0 mV, the signal has no path to ground. Check monitoring equipment connections and configuration. Input impedance must be 250 ohms or less.

If the Sensor output is less than 2 mA: The sensor element will begin to shut down if its temperature is less than +40° F. Environments below +40° F require that the sensor be ATMOS equipped®.

If the IR source fails, the unit will output a steady signal of approximately 0.5 mA. Contact Honeywell Analytics for repair.

If sensor output indicates a gas concentration when no ammonia is present: Performing a zero and a span calibration using certified calibration gas will correct the sensor's reading.

Figure 4: Troubleshooting the IR-NH₃ Sensor



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

3 Operation continued

D Maintenance

Expose each sensor to test gases monthly to verify that the sensor has a normal response. This will also check the alarm lights and relay action of the monitoring equipment.



It is essential that signal voltages be taken and logged on a consistent basis – at least monthly. Periodically, sensors should be exposed to ammonia sample and the results logged.

For proper operation it is essential that the test and calibration schedule be adhered to. Honeywell Analytics recommends the following maintenance schedule:

- Calibration should be performed with certified calibration gas every six months. Calibration kits are available from Honeywell Analytics.
- All tests and calibrations must be logged. It is highly recommended that certified calibration gas be used every six months.

E Replacement Parts

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

4 Limited Warranty

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.

5. Limitation of Liability

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