

SAMPLE-DRAW AMMONIA SENSOR FOR CONTROLLED ATMOSPHERE ROOMS





Installation and Operation Manual

Warning

Use this product only in the manner described in this manual. If the equipment is used in a manner not specified by Calibration Technologies, the protection provided by the equipment may be impaired.

This equipment should be installed by qualified personnel.

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For technical support, contact:

Calibration Technologies

920 N Trade Winds Pkwy Columbia, MO 65201 phone: 866-394-5861 email: sales@ctiengineeing.com website: ctiengineering.com

General Description

The SD2-NH3 is a single-point sample-draw ammonia sensor. This design helps the sensor survive in continuous-exposure applications where other diffusion-type electrochemical sensors simply fail and die.

This ammonia sensor utilizes proven electrochemical sensor technology for accuracy. It is designed with special pump/valve sequencing to refresh the cell with clean air to prevent ammonia saturation and extend the cell life. An automatic reverse purge routine also helps self-clean the micron filter.

The SD2-NH3 has a 10-minute sampling rate, and the sample-draw cycle is as follows:

2-minute sample time from the room being monitored. At the end of the two minutes, the sample data is stored and held for the next 10 minutes also while being transmitted via 4-20 mA output to the controller or PLC.

2-minute fresh air purge from outside fresh air source.

6-minute pump shut-off phase.

The standard detection range (0-50 ppm) of the SD2-NH3 sensor provides monitoring of ammonia concentrations accurately down to 5 ppm without false alarms.

The SD2-NH3 sensor provides an industrial standard linear 4/20 mA output signal compatible with most gas detection systems and PLCs. The output signal is not affected by drastic temperature and moisture variations.

All circuit boards are sealed in potting compound, protecting sensitive electronic components and copper tracing from corrosion.

An external fresh-air sample tube and hardware are included with the SD2-NH3. Tube length provided is five feet.

Installation

Locating the SD2-NH3

An important consideration when installing the SD2-NH3 is that it must be easily accessible for occasional maintenance, and protected from physical damage.

The sample air port should be mounted on the inside of the CA room and penetrate through the CA room wall. The SD2-NH3 detector will connect to it on the other side of the wall (see **Figure 1** on next page).

The fresh air port is located on the bottom the SD2-NH3 enclosure. This will be the source of fresh air necessary for proper monitoring and longer cell life.

The SD2-NH3 sensor can adequately monitor 1,200 sq feet.

Installation Guidelines:

- Do not mount sample air port any farther then the supplied tubing and hardware allows.
- Mount sensor on a solid surface with minimal vibration.
- Mount sensor thru the holes in the mounting flanges of the enclosure.
- Mount sensor in a general-purpose location only. Do not install in a hazardous environment.
- Mount sensor away from electromagnetic interference.
- Always mount sensor vertically with the sampling port at the bottom.
- · Take air movement and ventilation patterns into account.
- Keep sensor and wire runs away from mercury vapor lights, variable speed drives, and radio repeaters to prevent electrical interference.
- More than one sensor should be installed for highly critical locations.

Installing the Sample Air Port

If the SD2-NH3 is mounted as recommended on an wall outside of the CA room, attach the sample air port, tubing and hardware as follows: (see Figure 1)

- 1. Drill 1/2" hole through the exterior wall approximately 4" below the sensor enclosure.
- 2. Install 1/2" conduit through the hole, ensuring that the at least 1" of the conduit extends on both side to be able to connect to the conduit bodies.
- 3. Remove covers from all of the conduit bodies.
- 4. Attach the 1/2" conduit to the conduit body (A).
- 5. Attach the conduit body (A) to the sample air inlet port (B) at the bottom of the sensor enclosure.
- 6. Take the finished subassembly and line up the 1/2" conduit with the 1/2" hole in the wall and insert into the hole. Now mount the sensor enclosure to the wall with four wall screws or bolts.
- 7. Attach the sample air inlet (C) conduit body to the 1/2" conduit.
- Feed the 1/4" black flexible tubing through both conduit bodies and attach to the hose barbs on both the sample air inlet port (B) and the sample air inlet filter (D), cutting off any excess black flexible tubing.
- 9. Replace all conduit body covers.
- 10. If neccesary, seal around 1/2" conduit hole.



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Wiring

Electrical wiring must comply with all applicable codes.

Electrical Power: 24 VDC regulated, 600mA.

Output: Linear 4/20 mA output. Monitoring equipment may have a maximum input impedance of 700 ohms.

Cable Recommendation: 18/3 shielded, stranded cable (General Cable C2535A or equivalent). Length of cable to sensor should be no greater than 1,000 feet.

Monitoring: Monitoring equipment must be configured to indicate a fault if the signal is below 1 mA. All signals over 20 mA must be considered high gas concentrations.

Wiring Guidelines:

- Always use 3-conductor, insulated, stranded, shielded copper cable.
- Do not pull sensor wiring with AC power cables. This can cause electrical interference.
- If cable runs cannot be made without a splice, all splice connections should be soldered.
- Ground the shield at the main control panel. Connect the shield wire in the sensor terminal block labeled *SHLD*.
- Always disconnect power at the controller before performing any wiring at the sensor.
- To maintain NEMA/IP rating of the enclosure, conduit fittings of the same rating or better must be used.

Terminal Block Plug (Field Wiring):

SHLD: To case (earth) ground of monitoring equipment GND: To ground terminal of power supply +24V: To +24V terminal of power supply SIG: To signal input of monitoring equipment





Figure 2

Operation

Start-Up

Sensor can be response tested and/or span calibrated immediately after power up. Allow 60 seconds for power up time delay of sensor to end (green power LED will flash during power up).

Once the unit is powered up, the SD2-NH3 starts the 10-minute sampling rate, and the sample-draw cycle is as follows:

- 2-minute sample tube drying cycle.
- 2-minute sample time from the room being monitored. At the end of the two minutes, the sample data is stored and held for the next 10 minutes also while being transmitted via 4-20 mA output to the controller or PLC.
- 2-minute fresh air purge from outside fresh air source.
- 4-minute pump shut-off phase.

LED Functions (see Figure 3 on page 8)

Calibration

The SD2-NH3 sensor comes factory calibrated and should require only minimal adjustment after installation. There are two pots on the preamp that are used for calibration (see Figure 3).

Note: Never measure sensor output in mA. Always use mVDC or VDC voltmeter settings.

Bottom back board calibration mode:

Since the sample data is stored and held for 10 minutes during the sampledraw cycle, the real-time 4-20mA signal is only accessible on the upper testpoints. Follow this procedure to output the real-time 4-20mA signal on the lower testpoints.

- 1. Locate zero adjustment pot on sensor backboard. It can be found on the left side below the pump and status LEDs. (see Figure 3)
- 2. Turn pot 1/4 turn clockwise and back again. Successful entry into calibration mode will be indicated by the Power (green) LED blinking twice per second and the real-time signal is now active and can be viewed on connected monitoring equipment or voltmeter connected to the lower testpoints. Real-time mode will time out after 4 minutes.

Zero Calibration: After the sensor is installed and has been powered up for a minimum of 8 hours, the unit can be zero calibrated by the following:

Note: Place bottom back board in calibration mode and connect voltmeter to lower testpoints (see Figure 3).

- 1. Remove the ammonia cell from the aluminum housing. Wiggle cell back and forth while pulling upwards (see Figure 3).
- 2. Be sure the unit is in clean air.
- 3. Adjust the zero pot on the bottom back board until the sensor outputs 40 mV from Test [-] to Test [+] (see Figure 3). **Note:** To zero the sensor immediately after power up or cell replacement, unplug cell from the transmitter and adjust signal to 40 mV.

Span Calibration: DO NOT ADJUST THE SPAN POT WITHOUT CERTIFIED CALIBRATION GAS! If span adjustment is required, use this procedure:

Note: Place bottom back board in calibration mode and connect voltmeter to lower testpoints (see Figure 3).

- 1. Remove the ammonia cell from the aluminum housing. Wiggle cell back and forth while pulling upwards (see Figure 3).
- 2. Apply span gas at 0.5 to 0.8 L/min (span gas must be in air, not nitrogen or other carrier).
- 3. Sensor should react to gas within 15 seconds.
- 4. Once the output signal has peaked (or 2 minutes maximum) adjust the Span pot on the top sensor board until the correct output is achieved (see Figure 3). With full-scale span gas, the calculated span value is 200 mV. ((span gas / sensor range * 16 + 4) (mA output))
- 5. Reinsert ammonia cell back into its aluminum housing. Press downwards firmly until it snaps into place.

Note: Below are a few response characteristics which may be an indication that the gas sensor is at or near the end of its useful life. If any of these characteristics are observed, the cell should be replaced.

- Slow response to / recovery from calibration gas.
- Failure of the output to reach 50% of the calibration gas value prior to span adjustment.
- Unable to achieve correct output during span.



Maintenance

The SD2-NH3 sensor is designed for long life and minimal maintenance.

The sensor should be calibrated with certified calibration gas once every six months. At this interval, all functions and outputs should be tested and verified. Keep an operation log of all maintenance and calibrations.

Inspect the filters periodically - every six months or when the room is accessible - and clean or replace if necessary. Replacement filters are available from CTI.

To clean the controller, use a mild cleaning solution and soft cloth.

Maintenance Guidelines:

- The sensor is shipped with a factory calibration.
- Sensor should be calibrated 6 months from purchase date.
- Calibrate the detector at least once every 6 months.
- Calibration should be performed with certified calibration gas. Calibration kits and replacement cylinders are available from CTI.
- All calibrations should be logged.
- During every calibration interval, disassemble the inlet filters and clean with compressed air.
- Always disconnect power at the controller before performing any wiring at the sensor.
- Remove power from unit when not in use to extend sensor and pump life.

Sensor Life: The electrochemical cells are extremely reliable but they get less sensitive over time, and require calibration to regain sensitivity.

When the cell becomes depleted, the unit will give no indication of failure other than the sensor will not respond. For this reason, it is essential that the sensor be calibrated on a regular basis. Typical cell life is 2 to 3 years. When the cell becomes depleted, a replacement cell can be obtained from CTI. Simply unplug the cell's ribbon cable from the transmitter, pull the old cell from the aluminum sensor housing, discard the old cell and replace with a new one.

The new cell can be span-calibrated immediately. However, an 8 hour warmup period is required before zeroing, if necessary.

Specifications

Input Power: +24 VDC, 600mA Detection Principle: Electrochemical Detection Method: Sample-draw Gases: Ammonia (NH3) Ranges: 0/50 Output Signal: Linear 4/20 mA (max input impedance: 700 Ohms) **Response Time:** New sample every ten minutes Accuracy: +/- 5% of full-scale, but dependent on calibration gas accuracy and time since last calibration Zero Drift: Less than 0.1% of full-scale per month, non-cumulative Span Drift: Application dependent, but generally less than 3% per month **Linearity:** +/- 0.5% of full-scale Repeatability: +/- 1% of full scale Wiring Connections: 3-conductor, shielded, stranded, \geq 18 AWG cable (General Cable C2535A or equivalent) up to 1000 ft Terminal Block Plug (Field Wiring): 26-12 AWG, torque 4.5 lbs-in Enclosure: Fiberglass Reinforced Polyester NEMA 4X, IP 66, with polyurethane gasket. Continuous stainless steel hinge. Captive screws in lid. For non-classified areas. **Temperature Range:** 32°F to +122°F (0°C to +50°C) Humidity Range: 5% to 100% condensing **Dimensions:** 9.5" high x 6.7: wide x 3.8" deep

Weight: 10.0 lbs

Limited Warranty & Limitation of Liability

Calibration Technologies, Inc. (CTI) warrants this product to be free from defects in material and workmanship under normal use and service for a period of 2 years, beginning on the date of shipment to the buyer. This warranty extends only to the sale of new and unused products to the original buyer. CTI's warranty obligation is limited, at CTI's option, to refund of the purchase price, repair, or replacement of a defective product that is returned to a CTI authorized service center within the warranty period. In no event shall CTI's liability hereunder exceed the purchase price actually paid by the buyer for the product.

This warranty does not include:

a) routine replacement of parts due to the normal wear and tear of the product arising from use;

b) any product which in CTI's opinion, has been misused, altered, neglected or damaged by accident or abnormal conditions of operation, handling or use;

c) any damage or defects attributable to repair of the product by any person other than an authorized dealer or contractor, or the installation of unapproved parts on the product

The obligations set forth in this warranty are conditional on:

a) proper storage, installation, calibration, use, maintenance and compliance with the product manual instructions and any other applicable recommendations of CTI;

b) the buyer promptly notifying CTI of any defect and, if required, promptly making the product available for correction. No goods shall be returned to CTI until receipt by the buyer of shipping instructions from CTI; and

c) the right of CTI to require that the buyer provide proof of purchase such as the original invoice, bill of sale or packing slip to establish that the product is within the warranty period.

THE BUYER AGREES THAT THIS WARRANTY IS THE BUYER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. CTI SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, WHETHER ARISING FROM BREACH OF WARRANTY OR BASED ON CONTRACT, TORT OR RELIANCE OR ANY OTHER THEORY.



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