



Standard Gas Sensor

INTRODUCTION

Hansen Technologies offers a complete line of industrial quality Gas Detection Sensors, Monitors and Alert Systems for refrigerants and other common gases. These state-of-the-art gas detection products utilize a range of sensing technologies to suit a given application. Available in several configurations to meet various application requirements with optimum accuracy and reliability.

APPLICATIONS

Hansen Gas Sensors are suitable for use in industrial refrigeration engine rooms, cold storage rooms, processing rooms, truck docks, and for relief valve vent lines. They are also suitable for use in supermarkets, and large institutional and commercial buildings.

Typical gas detection applications include Ammonia, Carbon Dioxide (CO₂), Hydrocarbons, HFCs, HCFCs and CFCs.

ADVANTAGES

Hansen uses a wide variety of sensing technologies including electrochemical, semiconductor and infrared sensors to selectively detect most gases. These sensors continuously determine the level of gas present in the surrounding environment. The analog outputs (4-20mA or 0-10V DC) can interface with nearly any existing monitor, computer or PLC controller.

The sensing elements (except Basic and Extreme Gas Sensors) are mounted externally on the enclosure. This helps to provide quick response to potential leaks, particularly in still air. Electronics are sealed in a NEMA4 enclosure (except Basic Gas Sensor) which protects them from moisture, dust and the surrounding gases, which in the case of ammonia can shorten the life of electronics. The sensing elements are easily replaced.

Gas Sensors have built-in visual and audible alarms. An auxiliary one amp SPDT relay output is standard. Testing and recalibration procedures are simple.

Specifications, Applications, Service Instructions & Parts

GAS DETECTION SENSORS, MONITORS & ALERT SYSTEMS

For Refrigerants and other Common Gases



KEY FEATURES—GAS SENSORS

- Accurate, fast responding
- Linear 4-20mA or 0-10V DC output
- Audible alarm
- Power indicator
- SPDT alarm relay (Fail Safe Operation)
- 24V AC/DC low voltage power
- Shipped factory calibrated and tested
- CE approved
- CSA (Electrical Features Only)

KEY FEATURES—MONITORS

- Visual alarm
- Audible alarm
- Power indicator
- Low level alarm relay
- High level alarm relay
- Fault relay (HLM6 only)
- Economical
- CE approved

KEY FEATURES—GAS ALERT SYSTEM

- Provides local display and alarm based on measured target gas level via gas sensor
- Visual alarm, Amber LED light
- Audible alarm (mutable)
- Power indicator, Green
- Numeric PPM reading
- Bright LED Display
- Shipped factory calibrated and tested

SELECTING GAS SENSOR TYPES

Hansen Gas Sensors are available in several types of enclosures to match the environmental and operating conditions.



Standard Gas Sensor

For operating temperatures down to 0°F (-17°C). NEMA4 (IP65) watertight enclosure. Mountable indoors or outdoors. Enclosure is ABS material with a gasketed cover; single 1/2" conduit knockout is provided.



Harsh Environment Gas Sensor

For operating temperatures down to -40°F (-40°C) for wet/humid areas. Mountable indoors or outdoors. Enclosure is NEMA4 (IP65) ABS material; conduit connection must be vaporproof.



Extreme Environment Gas Sensor

For operating temperatures down to -60°F (-51°C). Features a stainless steel metal enclosure and equipped with an integral heater and thermostat for low temperature operation. Mountable indoors or outdoors. Enclosure is NEMA4X (IP65); conduit connection must be vaporproof.

Note: Auxilliary power required when used with Hansen monitors HLM2 and HLM6 and Gas Alert System.



Vent Line Gas Sensor

For operating temperatures down to -40°F (-40°C). Mountable indoors or outdoors. Enclosure is NEMA4 (IP65) ABS material. Gas sensing element is in a separate carbon steel housing with an 1" NPT threaded connection; cable is 10 feet (3 meters).



Explosion Proof Gas Sensor

For operating temperatures down to -40°F (-40°C). Mountable indoors or outdoors. Enclosure is NEMA7 Aluminum. Used where regulations and codes specify; consult factory with specific requirements. Class I, Div II, Group C and D.



Basic Gas Sensor

For operating temperatures down to 32°F (0°C). For commercial applications such as supermarket refrigeration systems and air conditioning chillers. Enclosure is NEMA1 (IP30) ABS material for indoor installations. Low voltage cable wiring only. (Not available for Ammonia).

PORTABLE GAS DETECTION UNIT

Portable Gas Detection unit includes the handheld unit, battery charger, extension wand, spare filters, voltage output cable, accessories for calibration, and sensor module keeper for four sensors in a carrying case. Sensor modules sold separately. Portable Unit, HEP1.



GAS SENSOR ACCESSORIES

Sensor Element Shield

The Sensor Element Shield can be screwed on to the end of the gas sensor to help protect the sensor from rain, dust, hose directed water, and debris floating in the air. It can be installed on the Standard, Harsh and Extreme gas sensors. The shield may slow response time slightly depending on the surrounding air flow conditions. Shield, p/n 31-1002.



Harsh Model with Shield

Quick Disconnect Plug Kit

The Quick Disconnect Plug Kit can be added to the gas sensor to provide a means of easily removing the gas sensor for recalibration. This feature comes in handy for gas sensors installed in blast cells, low temperature rooms and hard-to-reach places. The gas sensor cable can be quickly disconnected and the entire gas sensor removed or replaced with a bench recalibrated gas sensor. The gas sensor can then be brought to an alternate location for recalibration or sensing element replacement. Quick Disconnect Plug Kit, p/n 31-1001. Option only available for field installation. Supplied cable is 2 feet (0.6 meters) in length.



Harsh Model with Quick Disconnect Plug Kit

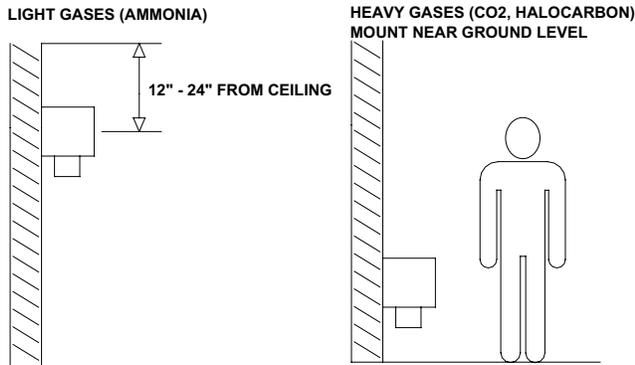
GAS SENSOR LOCATION

Sensors should be located in an accessible area for maintenance and testing, but away from moving equipment that could accidentally come in contact with the sensor. Avoid thermal extremes (close to heaters) and do not place unprotected in direct, strong drafts/airflows, near exit doors, or areas where falling water or condensing moisture are present. If high humidity is always present, power up the unit as soon as possible, as long term exposure can shorten the life of the gas sensing element. Select the unit for harsh environments where a condensing atmosphere may be present. In blast freezers, mount the gas sensor below the coil to avoid high moisture and steam during defrost.

The two generally accepted methods of locating sensors are "Point" and "Perimeter" detection. "Point" detection is where sensors are located near the most likely sources of leakage. "Perimeter" detection is where sensors completely surround the area in question. The size and nature of the area will help to decide which method is the most appropriate. Air flow should be considered in a ventilated room. Place sensors downstream of potential leak points.

Any sensor which is to be used for detecting a gas with a vapor density greater than one (i.e. heavier than air) should generally be located nearer ground level. Conversely, for any lighter than air gases such as ammonia, the sensor needs to be located higher up.

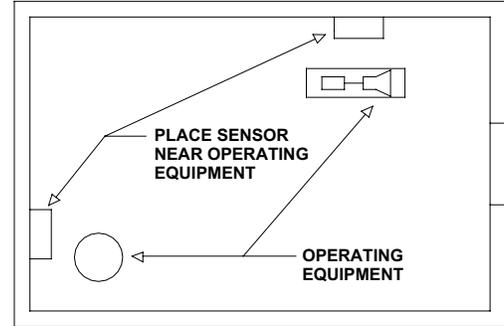
MOUNTING HEIGHT OF SENSORS



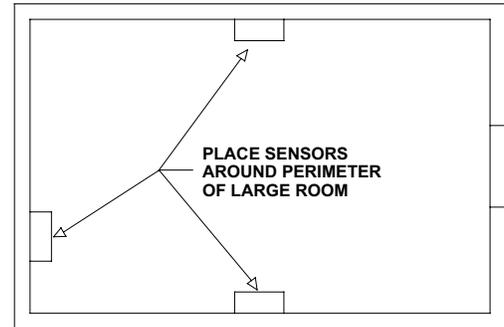
Typically ammonia sensors are mounted 12"-24" (.3 to .5m) from the ceiling. Sensors should not be located too close to the ceiling as hot air trapped under the ceiling may act to buffer the target gases from reaching the sensor.

The number of sensors in each area is a function of local codes and regulations and the customers' guidelines for gas detection.

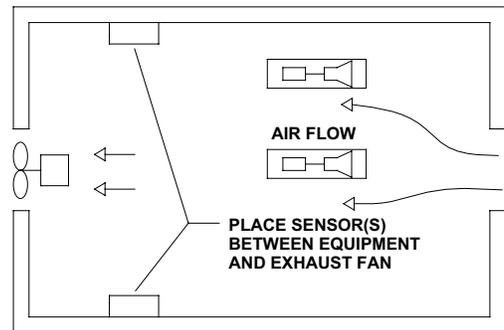
POINT DETECTION



PERIMETER DETECTION



VENTILATED ROOM



GAS SENSOR SPECIFICATIONS

	BASIC	STANDARD	HARSH	VENT LINE	EXPLOSION PROOF	EXTREME
OPERATING TEMPERATURE RANGE	0°F TO 122°F (-17°C TO 50°C)	0°F TO 122°F (-17°C TO 50°C)	-40°F TO 105°F (-40°C TO 40°C)	-40°F TO 122°F (-40°C TO 50°C)	-40°F TO 122°F (-40°C TO 50°C)	-60°F TO 105°F (-51°C TO 40°C)
OPERATING CURRENT @ 24V DC	230mA/6W	50mA/1W	280mA/7W	280mA/7W	280mA/7W	1900mA/46W
OPERATING CURRENT @ 24V AC	460mA/11VA	100mA/2VA	560mA/13VA	560mA/13VA	560mA/13VA	2100mA/50VA
VOLTAGE REQUIREMENTS	12-24V AC/DC* (-15%/+10%)					24V AC/DC*
HUMIDITY RANGE (NON-CONDENSING)	0-95%					0-100%
MAX LOOP RESISTANCE	1000 OHMS					
OUTPUT	4-20mA, 0-5V, 1-5V, 0-10V, 2-10V DC					
4-20mA SIGNAL OUTPUT	Isolated, 2 wire					
ALARM RELAY	SPDT, 1 A, 120V					
TRUE ALTITUDE	2000M					
POLLUTION DEGREE	2	4				
EQUIPMENT CLASS	3					
INSTALLATION CATEGORY	3	1				
DUTY CYCLE	100%					

*Approved Class2/SELV; -5%/+10% voltage tolerance. AC or DC voltage user selectable. See pages 6 and 7 for configuration.

DO NOT SUBSTITUTE OR MODIFY

Because of the danger of introducing additional hazards, do not install substitute parts or perform unauthorized modifications to the equipment listed herein. Return the equipment to the factory for service and repair to ensure that the safety features are maintained.

CLEANING/DECONTAMINATION EXTERNAL SURFACE

The external surface, excluding the sensing element, can be cleaned using light detergent and water. Do not allow any of the solution to come in contact with the sensing element sintered surface.

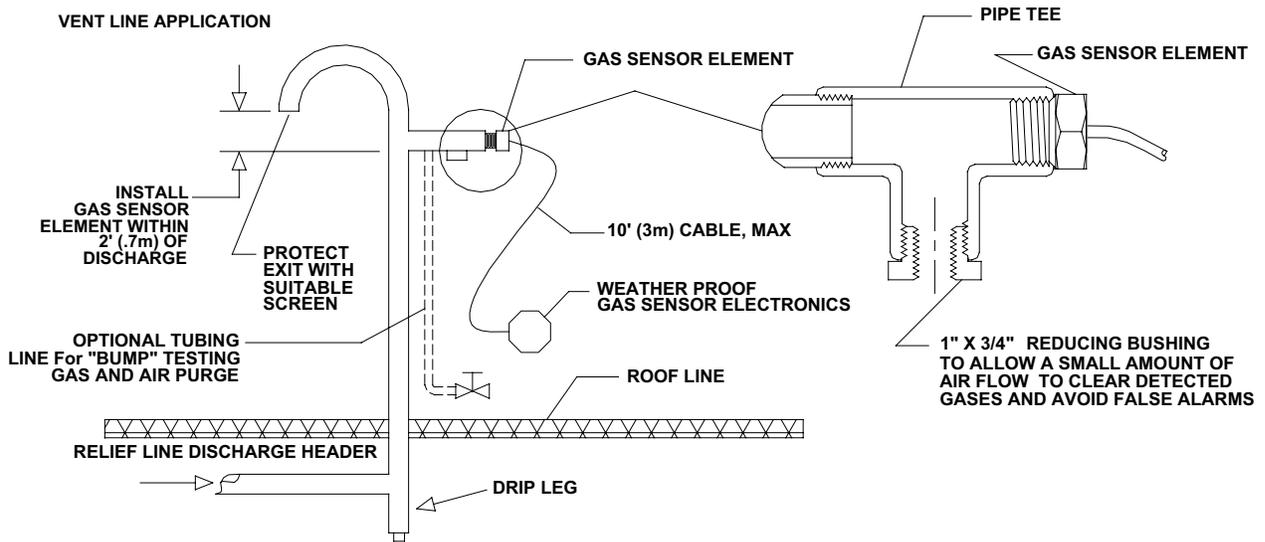
GAS DETECTION SYSTEM CONFIGURATIONS

There are a number of typical installation configurations to meet national and local codes.

RELIEF VALVE VENT LINE

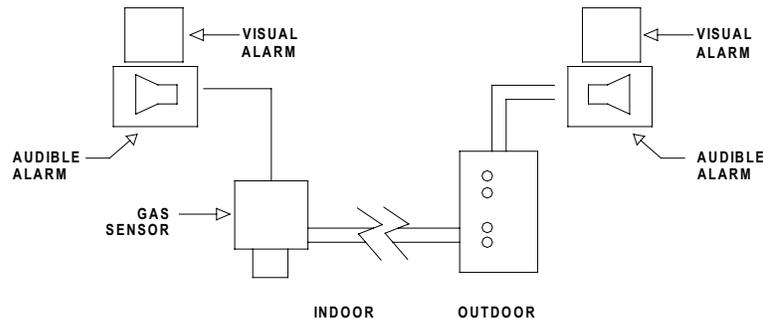
Often the vent line is extended high above the ground or roof. The sensor element can be installed near the outlet of the vent line and the gas sensor electronics mounted at a convenient height for servicing. A small length of tubing can be run for injecting test gas near the sensor element. Install a plug with a small opening to allow a small air flow to clear fugitive gases and detected gas after a release. Hansen recommends the alarm setting at 5000 PPM.

For water diffuser systems where the relief valve vent piping is diverted into a water diffusion tank, install the vent line sensor on the diffusion tank exhaust vent, not on the piping to the diffusion tank.



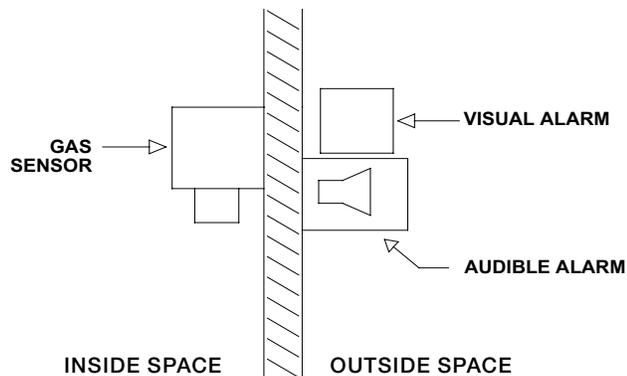
LOCAL AND REMOTE VISUAL/AUDIBLE ALARM

Sometimes it may be advantageous to have both local and remote displays and alarms. A display/alarm control inside or just outside of a room can be monitored and the same display/alarm or a Hansen monitor in the control room can also alert the operator to an abnormal condition in the plant.



STAND ALONE CONTROL

The Hansen Gas Sensor can operate as a stand alone device. All that is needed is a 24V AC/DC power supply for the gas sensor and auxiliary devices for light, horn or digital readout, such as the Hansen GAS Alert System.



WIRING GAS SENSORS

Install the Hansen Gas Sensor in an area where operating personnel can easily monitor the remote sensor. Refer to **Gas Sensor Location** on page 3 for suggestions on proper placement of Remote Sensors.

Use three-wire (VDC supply voltage), twisted pair shielded cable such as Belden 8770 or equivalent to connect the gas sensor to the gas monitor (page 15), GAS Alert System (page 19), customer supplied PLC or computer (page 20). When powering the gas sensor from a VAC power supply use four-wire, twisted pair shielded cable, such as Belden 82418 or equivalent. Connect the power input wires to terminals 0V and +V. Set applied voltage jumper to appropriate AC or DC position. Extreme Gas Sensor requires an additional external 24V AC or DC power supply wired with 18 AWG cable. Refer to Fig. K for wiring details. Connect the signal wire to terminal I for 4-20mA output or V terminal for 1-5 volt output. The 4-20mA output is best for long distances to the monitor and where electrical noise is a problem. The voltage output is for short distances within 10 feet (3 m) of the monitor. The maximum 4-20mA cable length is 1000 ft (300 m).

Under no circumstances should the gas sensor low voltage signal wires be in a common conduit, tray or wiring panel with power wiring over 48 volts. Do not run wires near variable frequency drive (VFD) equipment. When using the gas sensors connected directly to a customer supplied PLC or computer, refer to Fig. J for wiring details.

Hansen recommends backup of gas detection system with an uninterruptable power supply to provide battery backup in the event of a power failure.

INSTALLATION

Mounting the gas sensor varies by model. Refer to **Installation Dimensions** below for mounting requirements.

SENSING ELEMENT

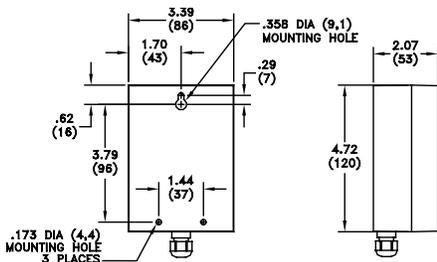
Typical sensor life is based on normal operating conditions. Exposure to high levels of the target gas will shorten these times. The typical sensor life of the electrochemical gas sensor element is 2-3 years; typical sensor life for semiconductor element is 7-8 years; and typical sensor life for infrared element is 8-10 years. Recalibration should be performed at least once a year. Calibration can be performed locally at sensor installation site. If desired results cannot be achieved or if signal reads 0.5mA, replacement of the sensor element may be required. See **Sensor Element Replacement** section for further instruction.

Note: Insurance companies, local and state agencies may require more frequent testing and calibration; refer to insurance carrier mandates as well as local and state codes.

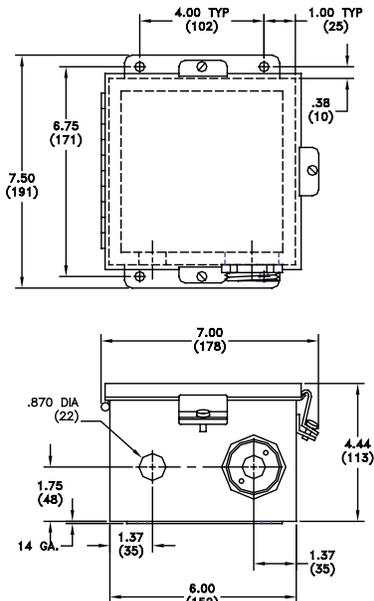
INSTALLATION DIMENSIONS

INCHES (MM)

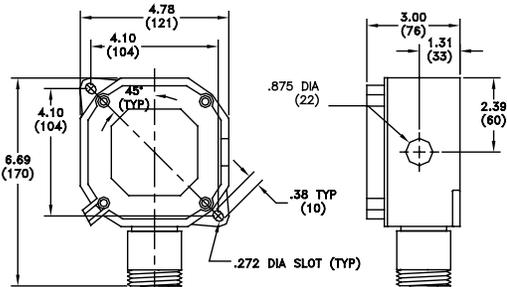
BASIC



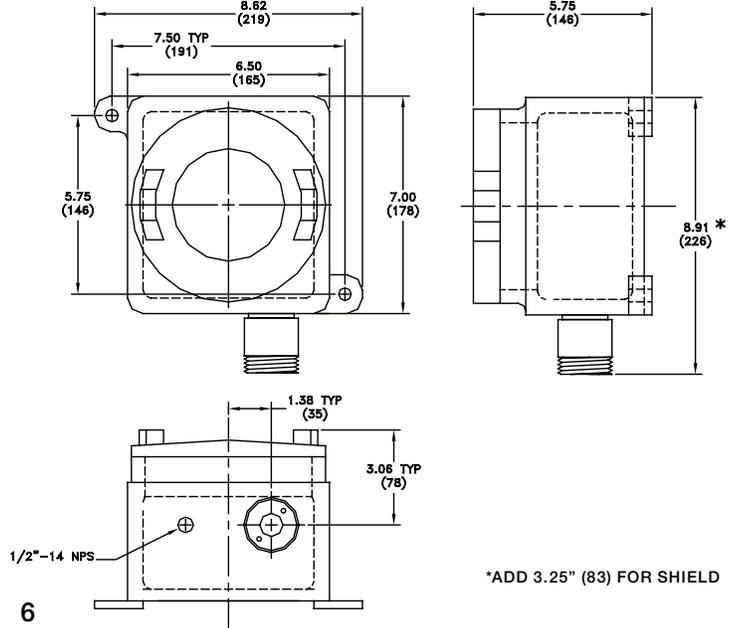
EXTREME



STANDARD & HARSH



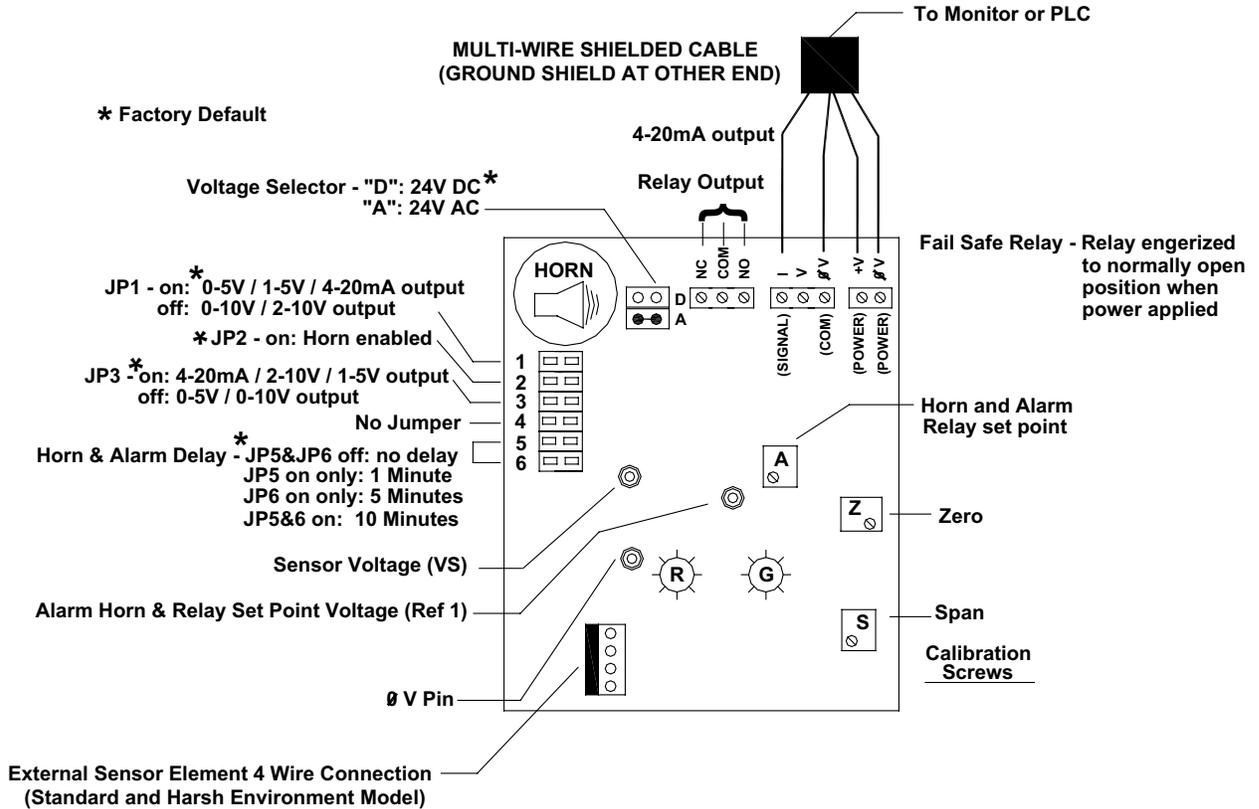
EXPLOSION PROOF



ELECTROCHEMICAL SENSOR—AC VOLTAGE

(SHOWN WIRED FOR 4-20MA OUTPUT)

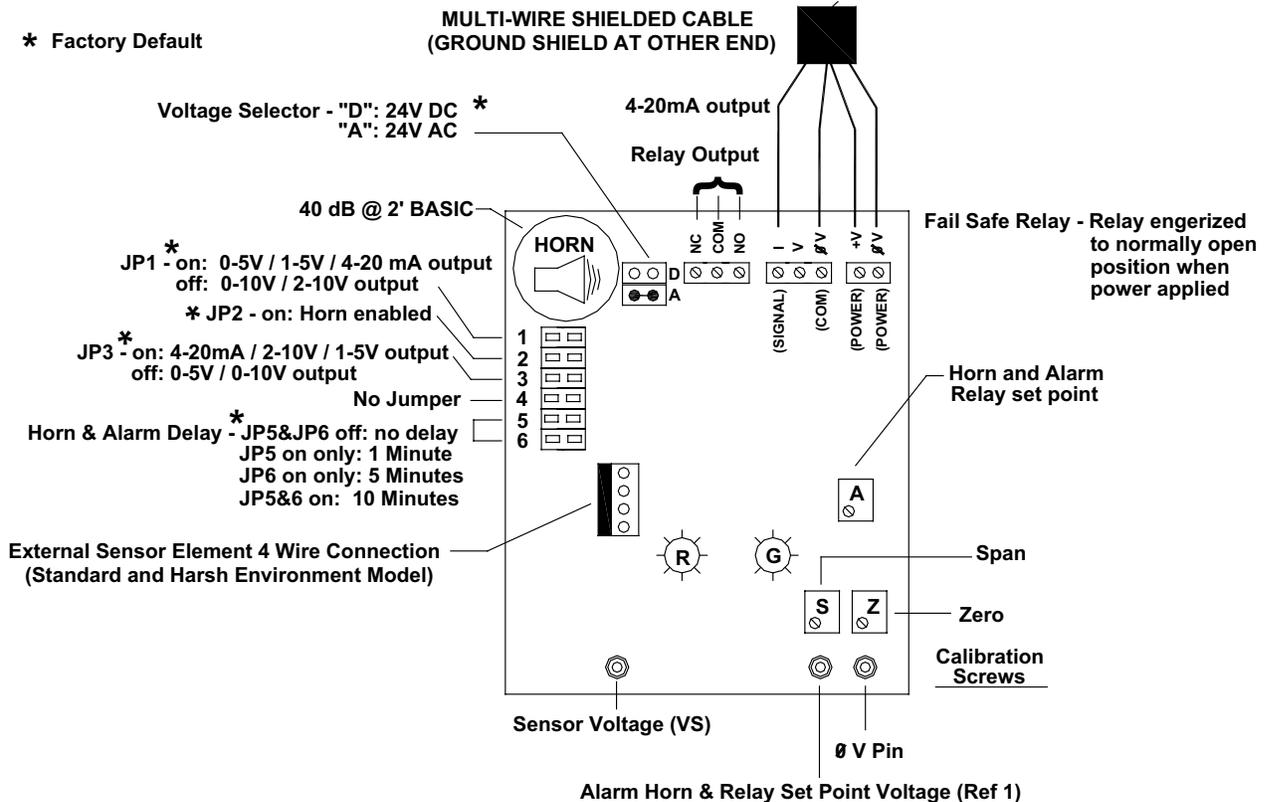
FIG. A



SEMICONDUCTOR SENSOR—AC VOLTAGE

(SHOWN WIRED FOR 4-20MA OUTPUT)

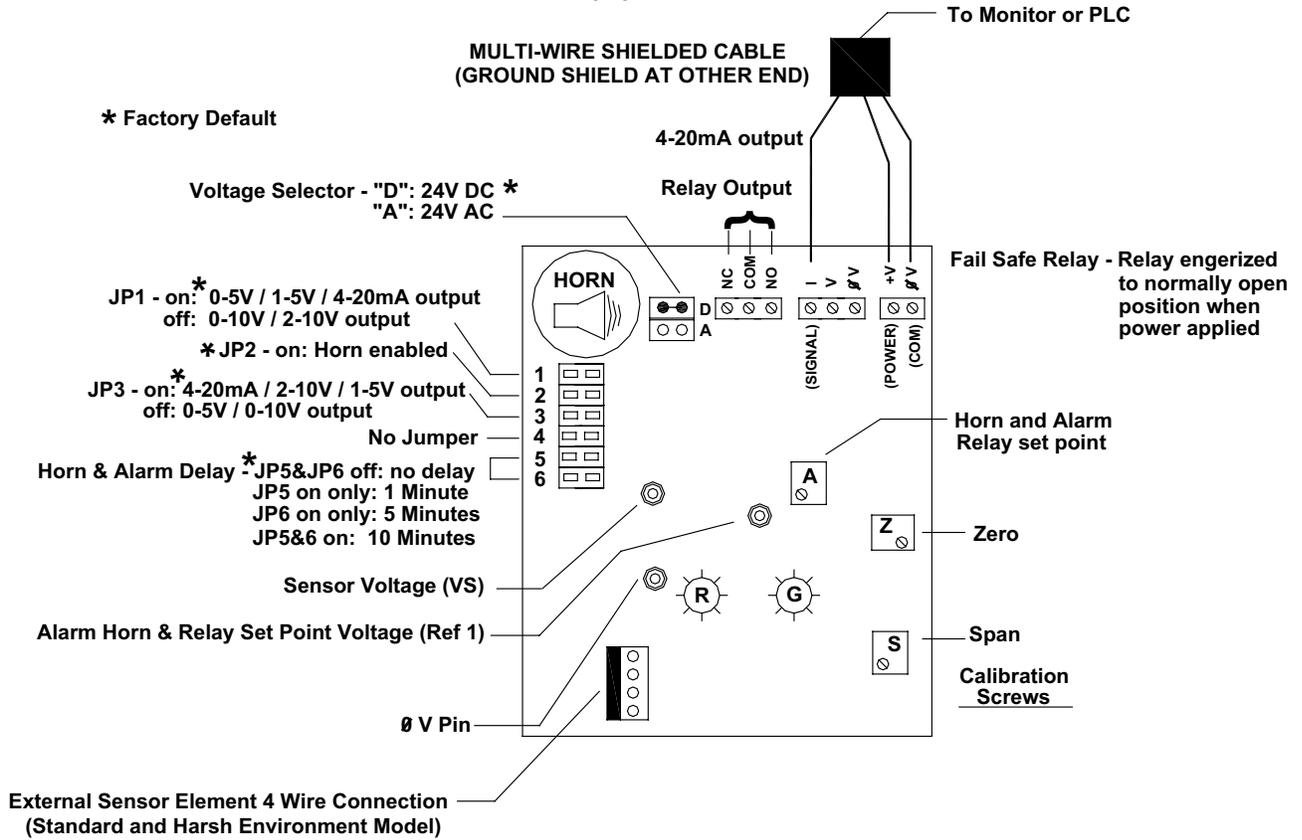
FIG. B



ELECTROCHEMICAL SENSOR—DC VOLTAGE

(SHOWN WIRED FOR 4-20MA OUTPUT)

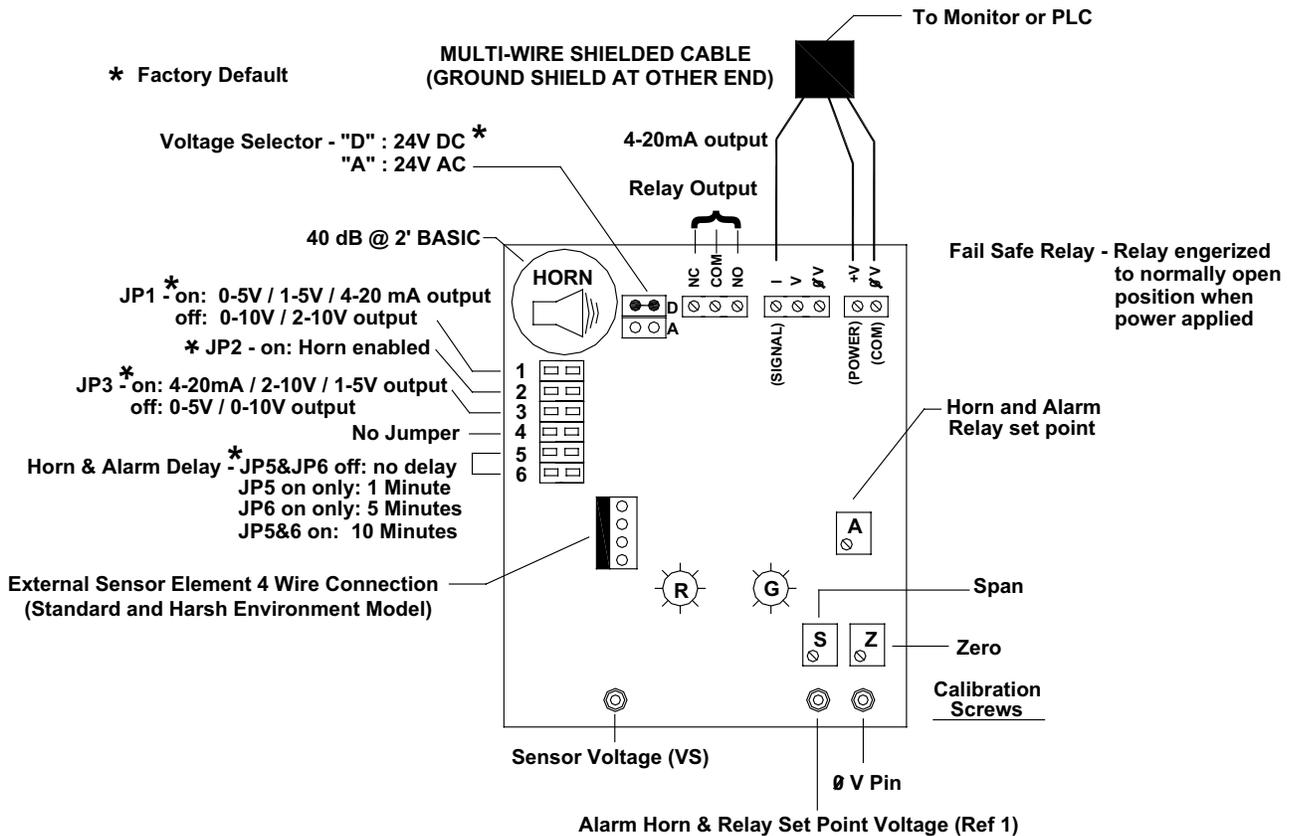
FIG. C



SEMICONDUCTOR SENSOR—DC VOLTAGE

(SHOWN WIRED FOR 4-20MA OUTPUT)

FIG. D



SETTING ADJUSTMENTS OF SENSORS

There are several selectable features included in the Hansen Gas Sensor. Refer to pages 7 and 8 for the adjustable features. Note the adjustment screws on the circuit board for the electrochemical sensor have a different layout than the semiconductor sensor. The jumpers may be moved without shutting off the power. With the use of a 12-24V AC/DC power source, these sensors can be set to the customer's specifications prior to mounting the gas sensor in the engine room or refrigerated area.

Relay and Horn Set Point

The adjustment screw A sets the trip point for the relay and the alarm horn. A 0-5V scale measures the full sensing range of the Gas Sensor. The trip point voltage can be measured at points ØV and REF1 located on the board. Refer to pages 7 and 8 for location of the reference pin REF1. A 100 PPM range gas sensor reading 2.5 volts at the reference pin would be equivalent to half the range or 50 PPM. **Default factory setting is 50% of range. Note that the set point of the relay is independent of the set points to the Gas Detection Monitor.** To assist in selecting the correct voltage for the desired PPM set point, refer to **Table 1** below.

VOLTAGE	PPM RANGE				
5	100	250	500	3000	10,000
4	80	200	400	2400	8000
3	60	150	300	1800	6000
2	40	100	200	1200	4000
1	20	50	100	600	2000
.5	10	25	50	300	1000

TABLE 1

Setting Minimum or Maximum Relay Set Point

There is a practical limit for setting the minimum or maximum relay set point. There is the tolerance of the electronic board and the test meter. It is recommended to keep the relay set point between 10% and 95% of the range.

Time Delay

A time delay for the operation of the relay and alarm horn can be selected using jumpers JP5 and JP6. **Default factory setting is zero.**

Alarm Horn

Alarm horn is 40dB at 2 feet for Basic Sensor; all other models not audible with cover closed. The alarm horn can be disabled using jumper JP2. **Default factory setting is enabled.**

Adjustment of the Detection Range

Adjustment Screw Z sets the zero (0 PPM) and Adjustment Screw S sets the span. (full range = 1000 PPM, for instance). The output of the sensor circuit can be monitored via test points ØV and VS. The full range equals 5 volts DC. See **Calibration Procedures** for further details.

GAS SENSOR OPERATION

On power up the internal relay will energize switching from the normally closed position to the normally open position. In addition, the sensor will go through an initial warm-up delay for five minutes. At this time, the

I and V outputs are 0. This is indicated by the green LED flashing approximately every second. After five minutes, the green LED stays on continuously, indicating power to the gas sensor and ready for service. The gas sensor also sends a milliamp output signal to the gas detection monitor, PLC, or computer. This output signal is proportional to the amount of the specific gas being monitored in the air around the gas sensor. If signal reads 0.5mA, it is an indication the sensing element has failed or disconnected. Verify proper installation and refer to testing and calibration procedures.

Fail Safe Operation

Hansen Gas Sensors feature a one amp SPDT alarm relay for fail safe operation. In the event of a sensor element failure, power loss or gas leak detection, the internal relay will be de-energized. This relay can be used to trigger an external alarm.

Start Up Test

Once the installation of the gas sensors and monitors is complete, the entire gas sensor system should be tested. Normally, two people are required—one person using a small amount of the target gas to “bump” each sensor in turn, a second person at the monitor location to verify the sensor is connected to the correct input, responds to the target gas and causes the lights and alarms to respond.

Gas Sensor Testing

Field testing of the gas sensor is normally done for three reasons. The first is to determine if the gas sensor is responding to the specific gas. This test is sometimes called a “bump” test. The frequency of the test is usually stated in the facilities Process Safety Management (PSM) document, but not less than every six months.

The second reason for gas sensor testing is to be sure the gas sensor is properly calibrated. Depending on the sensing element type, the sensor sensitivity will change with time. In particular, electrochemical sensors use a material that is depleted with time. The length of time varies depending on the amount of exposure to the target gas, the ambient temperature and humidity, and changes to temperature and humidity range. Atmospheres that are very dry or very humid will shorten the life of a sensing element.

The third reason is to be sure the gas sensor output triggers the alarms on the monitor, PLC, Gas Alert System, horn or lights. Gas sensors should be recalibrated at least once a year or sooner where the gas sensor is frequently exposed to low concentrations of the target gas. Semiconductor and infrared sensors should be checked annually. All sensor types should be recalibrated immediately after exposure to a large concentration of the target gas.

Note: Insurance companies, local and state agencies may require more frequent testing and calibration; refer to insurance carrier mandates as well as local and state codes.

Calibration of Electrochemical Sensors

Read the calibration instructions completely before proceeding. If in doubt about a procedure, please contact Hansen Technologies for further assistance.

LED LOGIC

GAS SENSOR LED INDICATORS	
LED OPERATIONS	RESULT
Green LED Flashing / Red LED off	Warming up \approx 5 min
Green LED on / Red LED off	Ready to detect gas
Green LED on / Red LED on	Gas level above gas sensor trip point
Green LED off / Red LED on	Sensor element failure or sensor disconnected
Green LED off / Red LED flashing	Low supply voltage or low supply current

CALIBRATION PROCEDURES

Refer to Fig. E for calibration of Hansen sensors.

Equipment required:

Hansen calibration kit, stopwatch, hex wrench; 5/32", long nose pliers, 24V AC/DC power supply, voltmeter, 2 minigrabber voltmeter leads and calibration gas for the specific sensor.

Setup:

1. Be sure the system is made safe during calibration. The 4-20mA output and internal relay will be active during calibration.
2. Be sure the gas sensor has been powered up for a minimum 24 hours to stabilize the sensing element.
3. Verify the green LED is illuminated and the red LED is off.
4. Disable the internal horn by removing JP2 jumper.

Zero Calibration:

5. Set the voltmeter to the appropriate DC range. The sensor element output is measured in DC volts; zero volts equals zero PPM and 5 volts equals the gas sensor PPM rating. (i.e. 100 PPM, 250 PPM). Attach the voltmeter leads to the VS, (+) lead from the voltmeter, V0, (-) lead of the voltmeter.
6. Be sure the ambient atmosphere around the gas sensor is free of the target gas.
7. Adjust the zero potentiometer (Z) until the voltage reading on the voltmeter reads between zero volts and \pm 0.090VDC.

Span Calibration:

1. Always perform the zero calibration before doing the span calibration.
2. Place the boot over the sensor element. Use the correct concentration of calibration gas for the full range of the sensor. In other word, for a gas sensor with a range of 0 to 250 PPM, use a 250 PPM calibration gas when setting the span. If full range calibration gas is not available, a calibration gas of less than full range can be used then adjust to the corresponding output voltage. This may result in some loss of accuracy.

3a. Gas sensors (except Vent line).

Start the flow of gas. Observe the output, it should begin to increase after 5 seconds. Leave the gas flow on and observe the voltage. The sensor voltage will slowly climb toward 5VDC. When the voltage does not change by more than \pm 0.010 volts per 15 seconds the sensor output voltage is considered to be stable. Adjust the span potentiometer (S) so the output voltage reads between 4.95 to 5.00 volts DC.

3b. Vent line gas sensors.

Start the flow of gas. Observe the output, it should begin to increase after 5 seconds. Leave the gas flow on and observe the voltage. The sensor voltage will ramp up very quickly crest then decrease quickly. At this point, adjust the span potentiometer (S) so the output reads between 4.95 to 5.00 volts DC.

4. Stop the flow of gas and remove the boot from the sensor element. Verify the sensor voltage output begins to decrease.
5. Do not attempt to re-adjust the zero or span calibration until another 24 hours of powered operation has passed.
6. Enable system. Verify proper operation.
7. Enable the internal horn by installing JP2 jumper.

Electrochemical Sensor Only (Zero Offset)

If the gas sensor is calibrated in the environment for which it will be used a final zero adjustment will not be necessary. If the gas sensor will be calibrated at one temperature (70°F, 21°C) then moved to its operating environment (-4°F, -20°C) a maximum zero offset of 2% will occur. If unacceptable, adjust the zero point as described in section **Calibration Procedures, Zero Calibration**. At (-40°F, -40°C), a maximum zero offset of 12% will occur. If unacceptable, adjust the zero point as described in section **Calibration Procedures, Zero Calibration**.

CALIBRATION GAS CYLINDERS

Warning: Refer to Material Safety Sheet supplied with gas cylinder and local safety precautions for proper usage, handling and disposal.

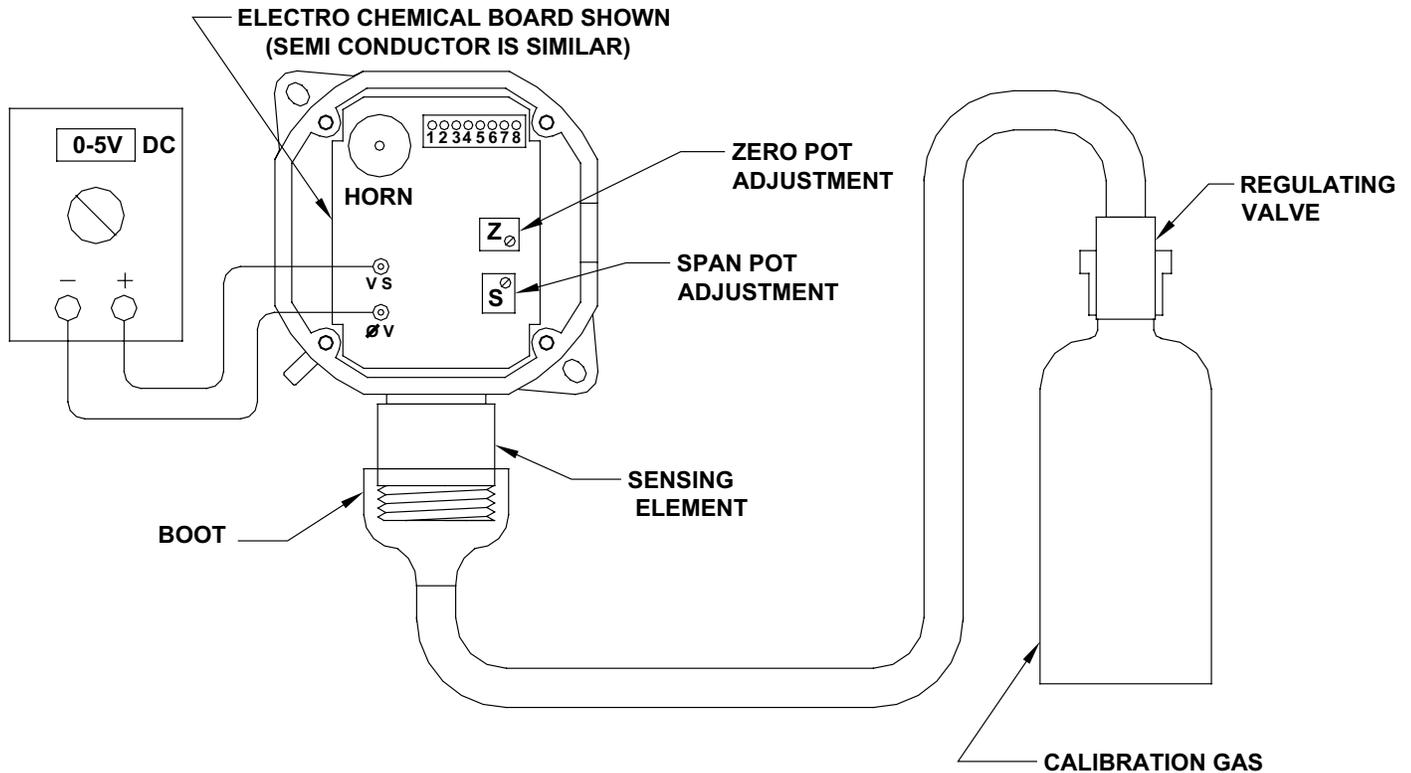
Hansen calibration gas standards are traceable to NIST (National Institute of Standards and Technology) and analysis data is available on request.

A variety of calibration refrigerant gases and PPM ranges are available, refer to Page 23. For special mixtures, consult factory. Calibration gas should be stored in a cool area, 65°F/75°F. Shelf life labeled on cylinder—one year from date of manufacture.

Calibration gas must be shipped according to Department of Transportation Hazardous Gas Regulations. Special shipping charges will apply. Shipping only available in the continental USA. For shipments outside the USA, consult Hansen for local distributors.

CALIBRATION OF SENSORS

FIG. E



SENSING ELEMENT REPLACEMENT

Basic Sensors

The Basic Gas Sensor uses a three pin plug-in element for Ammonia Sensors and six pin plug-in element for Halocarbon Sensors which is internally mounted to the circuit board. To replace, disconnect power and open the enclosure. The sensing element is removed by hand; lifting it off the circuit board. Install the new sensor element by lining up the pins and press firmly into place. Connect power and allow the sensor element to stabilize for 24 hours. Recalibrate and install the cover. Note: Infrared sensing element (CO₂) is not replaceable.

Standard, Harsh and Explosion Proof Sensors

Standard, Harsh and Explosion Proof Sensing Elements are externally mounted to the enclosure. To replace, disconnect power, open enclosure and disconnect cable wire from the circuit board. Unscrew sensor element from enclosure. Install new sensor element. Connect power and allow sensor element to stabilize for 24 hours. Recalibrate and install the cover.

Extreme Sensors

Extreme Sensing Elements are internally mounted to the enclosure. To replace, disconnect power, remove nut and gasket from sensing element at the base of the unit, open enclosure and disconnect cable wire from the circuit board. Remove sensor element from enclosure. Install new sensor element in reverse order. Connect power and allow sensor element to stabilize for 24 hours. Recalibrate and install the cover.

Note for 250 PPM sensors only: Special kits are available which include both the new circuit board and appropriate 250 PPM sensing element. Refer to page 24 for special replacement kits.



HLM6 - Six Channel Monitor



HLM2 - Two Channel Monitor

KEY FEATURES—MONITORS

- 120 or 230V AC power
- Audible alarm
- Visual power indicator
- (2) alarm and (1) fault relay outputs - Model HLM6
- (2) alarm relay outputs - Model HLM2
- CE approved

TYPICAL SPECIFICATIONS

Two Level Monitors: Model HLM2 and Model HLM6

Low-level Alarm:

- Visual Warning Yellow LED
- Audible Warning Intermittent
- Relay SPDT Energized

High level alarm:

- Visual Warning Red LED
- Audible Warning Continuous
- Relay SPDT Energized

The Model HLM2 two channel monitor has the alarm built in.

The Model HLM6 six channel monitor has an externally mounted horn. A device rated up to 12V DC at 100mA maximum may be connected to CN11, see Fig. G. The high level SPDT relay may be set for Normal Operation (normally closed position with no power) or Fail-Safe Operation (relay energized when power to monitor is applied). The Fail-Safe Operation is initialized by setting Jumper JP1 over pins 2 and 3.

Low level alarms reset automatically when the detected gas dissipates. High level alarm condition requires a manual reset (user to press the reset button on the topside of the monitor). Please note that a high level alarm condition can only be reset 30-60 seconds after the gas clears from the sensor.

The audible alarm produced by the horn may be disabled by turning the key switch off. The key switch is located on the topside of the monitor.

TECHNICAL SPECIFICATIONS—MONITORS

Operating Temperature Range: 32°F (0°C) to 125°F (50°C)

Output: 2 SPDT dry contact relays (alarms) - 10 amp @ 230V AC

1 SPDT dry contact relay (fault output) - 10 amp @ 230V AC (HLM6 Model only)

Power Required: 120V AC (230V AC available)

Power Consumption:

300mA @ 120V AC, 50/60 Hz (HLM6)

150mA @ 230V AC, 50/60 Hz (HLM6)

100mA @ 120V AC, 50/60 Hz (HLM2)

50 mA @ 230V AC, 50/60 Hz (HLM2)

Audible Alarm:

HLM2 - internal 80 dB

HLM6 - external 110 dB/12V DC

INSTALLATION INSTRUCTIONS

The Hansen Technologies Gas Detection Monitor should be located in an accessible area, away from moving equipment that could accidentally come in contact with the unit. Avoid thermal extremes (close to heaters). Monitor must be protected from direct strong drafts/airflows and areas where falling water or condensing moisture is present.

WIRING OF GAS DETECTION MONITORS

Install the Hansen Gas Detection Monitor on a wall or in an electrical panel in an area where operating personnel will easily monitor the leak detection system. There are three mounting holes on the back of the panel. Remove the front cover and disconnect the grounding wire to access the mounting holes. Attach the monitor to the wall using the appropriate mounting screws.

Hansen Gas Detection Monitors are available for use with two or six sensors. For larger systems, use multiple Gas Detection Monitors. Alternately, the gas sensors can be used directly with a customer supplied computer or PLC and software.

Connect specified AC power to the Gas Detection Monitor. Size the circuit for a minimum 5 amps for 120V or 2 amps for 230V. Use two wire plus ground with minimum 18 gauge wire (.823mm sq.) for 120V service or .75mm sq. wire for 230V service. Bring power into the bottom of the enclosure. Seal any excess conduit or cable entries. See page 14 and 15 for terminal connections.

Extreme Gas Sensor requires an additional external 24V AC or DC power supply. Refer to Fig. K for wiring details.

Maximum Power Wiring Length to a Monitor

	120V System		230V System		Wire Size	Maximum Ohms/Wire
	Length		Length			
	Ft	m	Ft	m		
HLM2	200	60.9	120	40	22 Gauge 7/.2mm	3.52
	500	150	300	100	18 Gauge 7/.386mm	
HLM6	500	150	300	100	22 Gauge 7/.2mm	8.8
	1300	430	700	230	18 Gauge 7/.386mm	

TABLE 2

Note: There is a 5 minute delay before the green power light on the gas monitor is energized. This is to allow the Gas Sensor to stabilize and not give off false information.

The Hansen models HLM2 and HLM6 have both low level alarm and high level alarm single pole double throw (SPDT) relays. HLM2 low level alarm relay is on the CN5 terminal and the high level alarm relay is on the CN4 terminal.

The Hansen model HLM6 has the low level alarm on CN10 terminal and the high level alarm on CN9 terminal. In addition, model HLM6 has a fault output on CN12.

The HLM6 includes two additional outputs on terminal block CN11. CN11 (+12V and BUZZ) are used to drive an external alarm horn (included). CN11 (+12V and 0V) is an uncommitted, fuse (FS8) protected, voltage output (12V DC@100mA) available to power external relays, etc. It may be used in conjunction with the low level, high level and/or fault output to provide a switched 12V DC output.

In addition to the power line fuses or circuit breakers, each monitor has an internal power line fuse. The fuse rating is listed in **Table 3** below.

MONITOR	120V AC	230V AC
HLM2	100mA	50mA
HLM6	315mA	160mA

TABLE 3

RELAY SET POINTS FOR GAS DETECTION MONITORS

Gas Detection Monitors are equipped with two relays—low level and high level. Shipped from the factory, the relays are set for 20% and 60% of the output of the sensor. In other words, a 250 PPM sensor will activate the low level alarm at 50 PPM and the high level alarm at 150 PPM. The relay settings can be field adjusted. Refer to page 13 for details.

CALIBRATING HLM6 MONITOR

Use a voltmeter to monitor the voltage on the calibration pins. The voltage range is from 0.4V DC to 2.0V DC. The voltage range corresponds to the 4-20mA range. (ie. 0.4V DC equals 4mA, 2.0V DC equals 20mA).

For the low level alarm relay setting, measure the voltage across Calibration Pins 2 and 4. Set the desired low

level alarm relay using the Low Level Alarm Pot which is located closest to the calibration pins. This setting applies to the six channels.

For the high level alarm relay setting, measure the voltage across Calibration Pins 1 and 4. Set the desired high level alarm relay using the High Level Alarm Pot which is located furthest from the calibration pins. This setting applies to the six channels.

CALIBRATING HLM2 MONITOR

Use a voltmeter to monitor the voltage on the calibration pins. The voltage range is from 0.4 V DC to 2.0V DC. The voltage range corresponds to the 4-20mA range. (i.e. 0.4V DC equals 4mA, 2.0V DC equals 20mA).

For the low level alarm relay setting, measure the voltage across Calibration Pins 2 and 4. Set the desired low level alarm relay using the Low Level Alarm Pot which is located closest to the calibration pins. This setting applies to both channels.

For the high level alarm relay setting, measure the voltage across Calibration Pins 1 and 4. Set the desired high level alarm relay using the High Level Alarm Pot which is located furthest from the calibration pins. This setting applies to both channels.

HLM6/HLM2 RELAY OPERATION

EVENT	LOW LEVEL RELAY	HIGH LEVEL RELAY	FAULT RELAY (CN12)
No Power			*
Fail Safe ON (No Alarms)			
Fail Safe ON (Low Level Alarming)			
Fail Safe ON (High Level Alarming)			
Fail Safe ON (Low & High Level Alarming)			
Fail Safe OFF (No Alarms)			
Fail Safe OFF (Low Level Alarming)			
Fail Safe OFF (High Level Alarming)			
Fail Safe OFF (Low & High Level Alarming)			

■ = Relay Energized

* Fault Relay (CN12) normally open contacts are closed with no power.

The High Level Relay (CN9) is the only relay linked to the Fail Safe. Fault Relay (CN12) only available on the HLM6. Use Fail Safe OFF events for HLM2.

There is a 5 minute delay before the green Power LED on the monitor is energized. During the delay, if the input current to any channel is less than 0.9mA the High Alarm LED and the Fault Output Relay (HLM6 only) will be energized.

(HLM6) After the delay, if the input current to any channel is less than 0.9mA

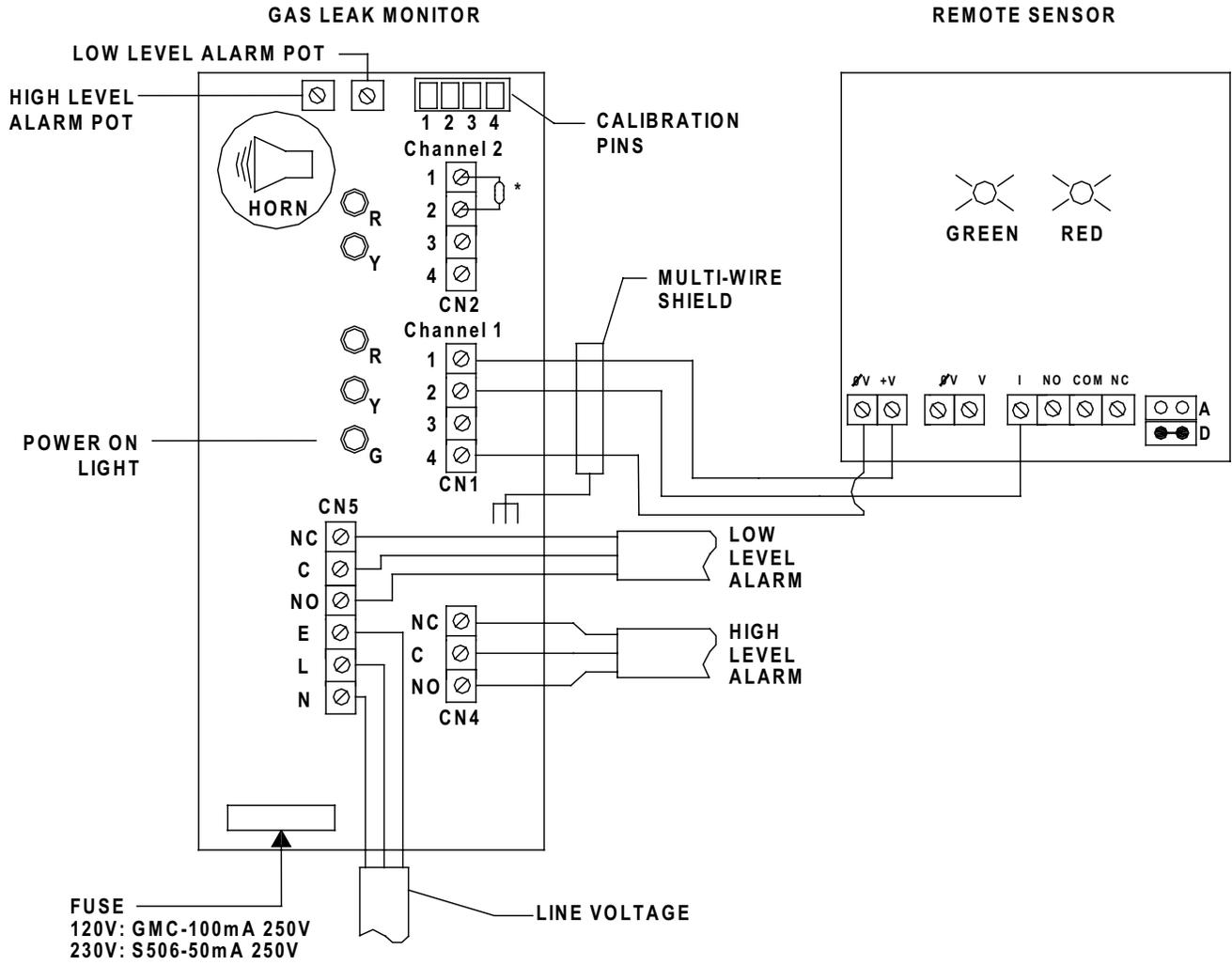
Fail Safe jumper "ON": High Level Relay energized
Fail Safe Relay energized
High Level Alarm LED energized
Audio output not active

Fail Safe jumper "OFF": High Level Alarm LED energized
Fail Safe Relay energized
Audio output not active

(HLM2) After the delay, if the input current to any channel is less than 0.9mA the High Level Alarm LED is energized and no audio output.

HLM2 WIRING DIAGRAM

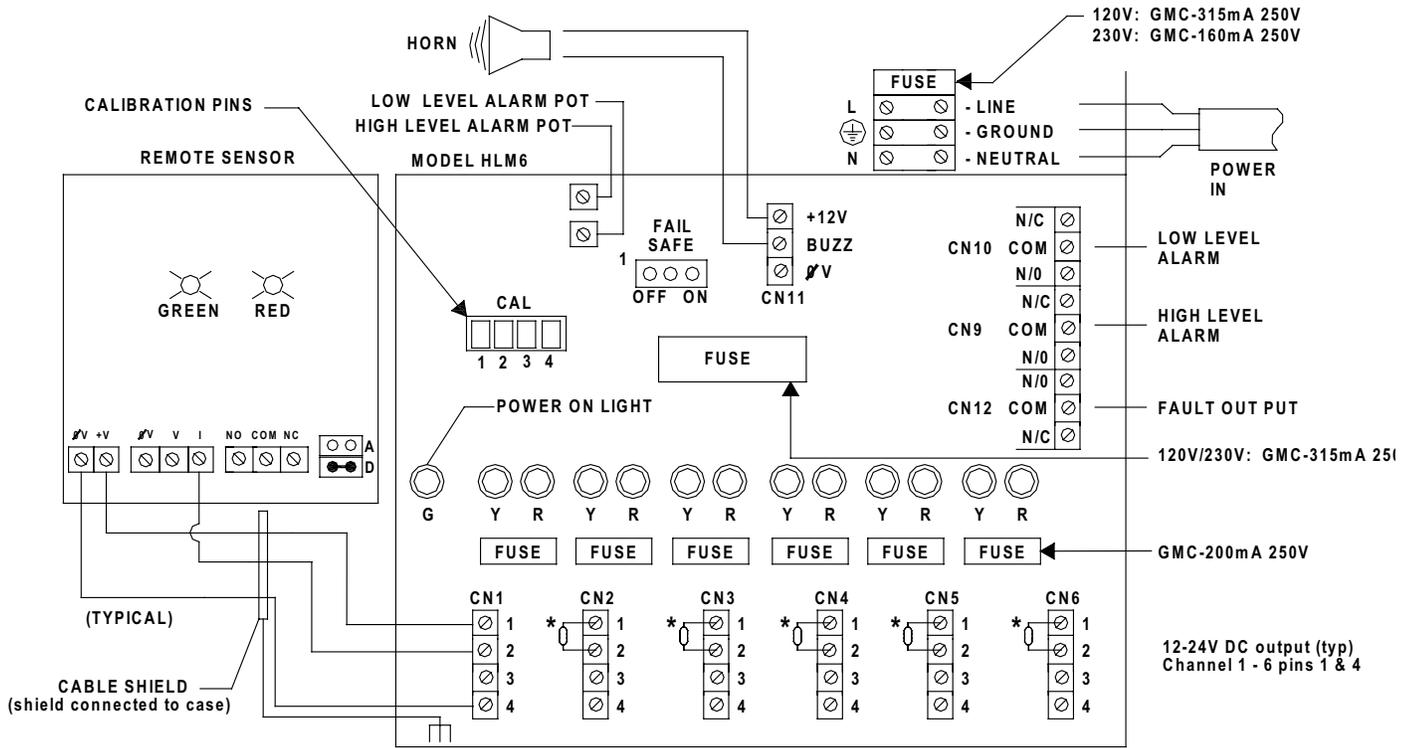
FIG. F



* Remove Resistor when connecting a sensor
Value: 3.3K OHM

HLM6 WIRING DIAGRAM

FIG. G



* Remove Resistor when connecting a sensor
Value: 3.3K ohm

TROUBLESHOOTING GAS MONITORS

Symptom: No lights displayed on panel.

Cause:

1. Power failure. Check incoming line.
2. Tripped circuit breaker or blown fuse on electrical supply.
3. Unit warming up. It takes 3-5 minutes after power is switched on.

Symptom: Red light is on, but no alarm condition is active. (i.e. No horn or no relay operation after 3 minutes).

Cause:

1. Check to be sure the horn has not been deactivated by Key switch.
2. Possible wiring or sensor fault. Check wiring and connections for continuity.
3. Check calibration for proper alarm levels.
4. Resistor missing from unused sensor channel. Install 3.3K ohm resistor across terminal 1 and 2.

TROUBLESHOOTING GAS SENSORS

Symptom: Sensor green light is off.

Cause:

1. Possible wiring fault between controller and sensor. Check power supply to Controller. Check connections between the controller and the sensor. Check wires are connected to the proper number terminal.
2. On HLM6 monitor, check the fuse corresponding to the particular sensor.
3. Sensor possibly damaged. Check by installing another sensor to confirm sensor fault.

Symptom: Output from sensor is 0.5mA (for 4-20mA output). Output from sensor is 0 V or .5V (for 0-10, 0-5, 1-10, 1-5 output signals).

Cause:

1. Sensing element is disconnected from printed circuit board.
2. Sensing element failed.

Check: Check wiring and check sensor element for proper installation.

3. Electronics do not match replacement sensing element (250 PPM only).

Check: Electronics revision identification label on the circuit board located inside the enclosure should be "3E100 1.0" or later. See Special Element Replacement section on page 24.

Symptom: Zero fluctuations without the presence of target gas.

Cause:

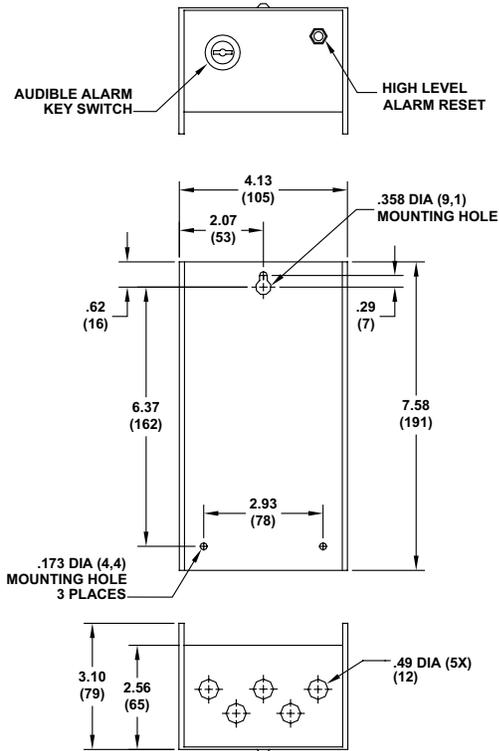
The sensitivity characteristics of the sensing element can be altered by changes in atmospheric temperature and humidity.

1. Following a change in temperature/humidity allow 2-3 hours for the sensor to stabilize. Small changes of +/-1% or less should be considered normal and know further action is required.

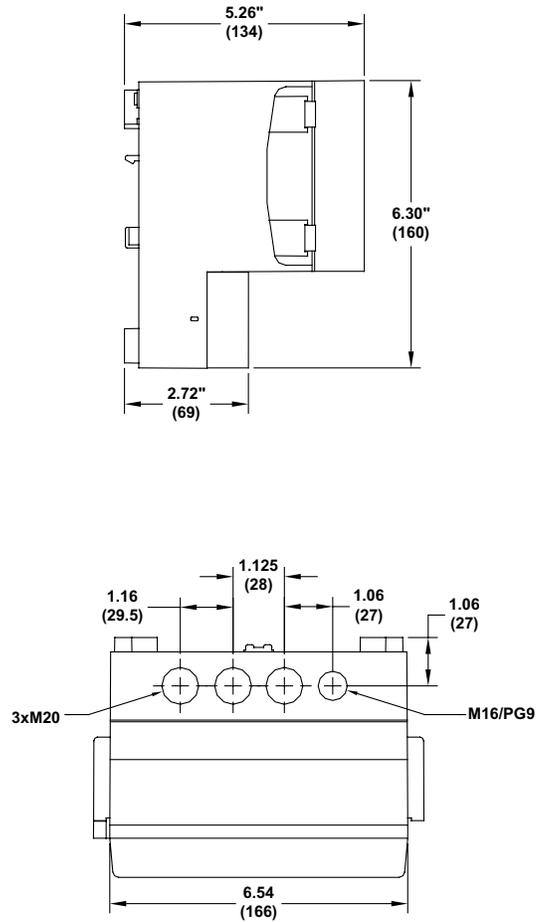
INSTALLATION DIMENSIONS

INCHES (MM)

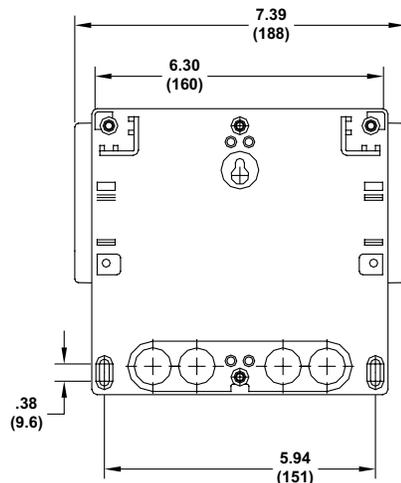
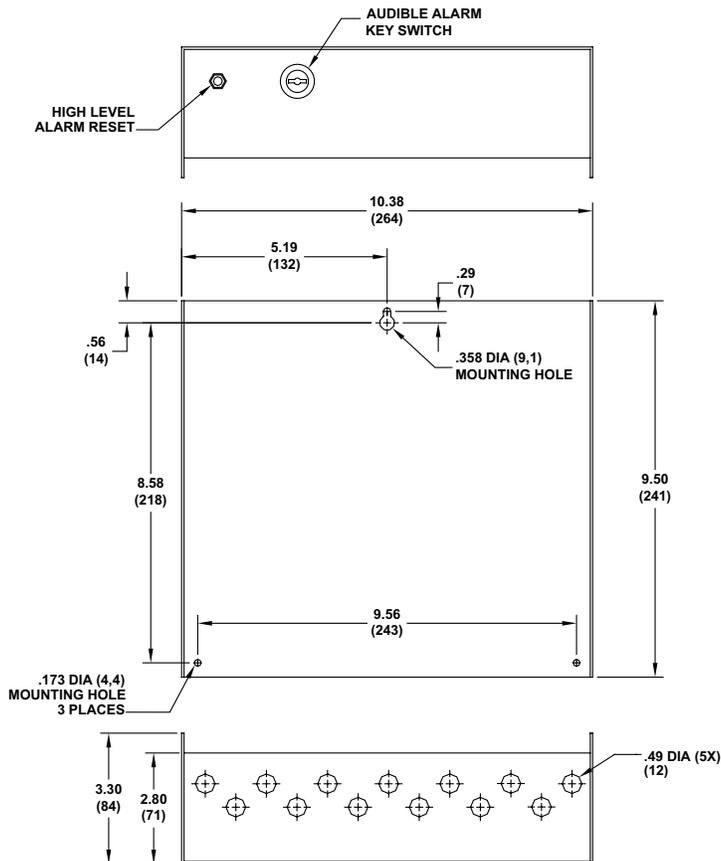
HLM2



GAS ALERT SYSTEM



HLM6





GAS Alert System

KEY FEATURES—GAS ALERT SYSTEM

- Provides local display and alarm based on measured target gas level
- Visual alarm, Amber LED light
- Audible alarm (mutable)
- Power indicator, Green
- Numeric PPM reading
- Bright LED display
- Shipped factory calibrated and tested

TECHNICAL SPECIFICATIONS

Operating Temperature Range: -10°F (-23°C) to 125°F (50°C)

Humidity Range (Non-condensing): 0-95%

Voltage Requirements: 24V AC/DC, 50/60 Hz

Display: LED, Red

Loop Resistance: 100 ohms

Power Requirements at 24V AC, 50/60Hz with sensor: 11.4VA

Power Requirements at 24V DC with sensor: 247mA

Audible Alarm Sound Pressure: 97dB at 2 feet

Tone Type: Continuous, 2900 Hz

Muted Sound Pressure: 60dB at 2 feet

Visual Alarm, LED Lamp: Amber, 38 lumens

Enclosure: Watertight, NEMA4X (IP65)

Pollution Degree: 4

True Altitude: 2000M

Installation Category: 1

Duty Cycle: 100%

Equipment Class: 3

INSTALLATION OF GAS ALERT SYSTEM

The GAS Alert System is shipped factory calibrated and tested; ready to use. Mount in a location safe and easily accessible. Avoid thermal extremes and areas where falling water or condensation moisture is present.

The GAS Alert System can be mounted to any solid flat surface. See installation dimensions on page 17. Two options are available for mounting; screw the base to a solid flat surface or clip-on to a DIN-rail. The lower cover must be removed to access the two mounting holes for screw mounting. Attach to the wall with the appropriate mounting screws. Replace the cover when complete.

WIRING GAS ALERT SYSTEM

The GAS Alert System can be used as a standalone, locally monitored system or as part of a larger gas monitoring and signaling system. The lower cover to the terminal compartment must be removed to gain access for wiring. Knockouts are available for ¼" and ½" conduit or liquid tight cable clamps. To use as a standalone system one gas sensor is required. The gas sensor is powered via the GAS Alert System. The gas sensor 4-20mA signal is fed back to the GAS Alert System to allow for a numeric readout of the actual PPM value measured. The gas sensor internal relay is wired to the GAS Alert System to trigger the signaling lamp and sounder. The GAS Alert System signal lamp and sounder will clear when the gas level as detected by the gas sensor drops below the adjusted trip point. The default setting from the factory for a specified gas sensor is half the total range. For typical wiring refer to page 19.

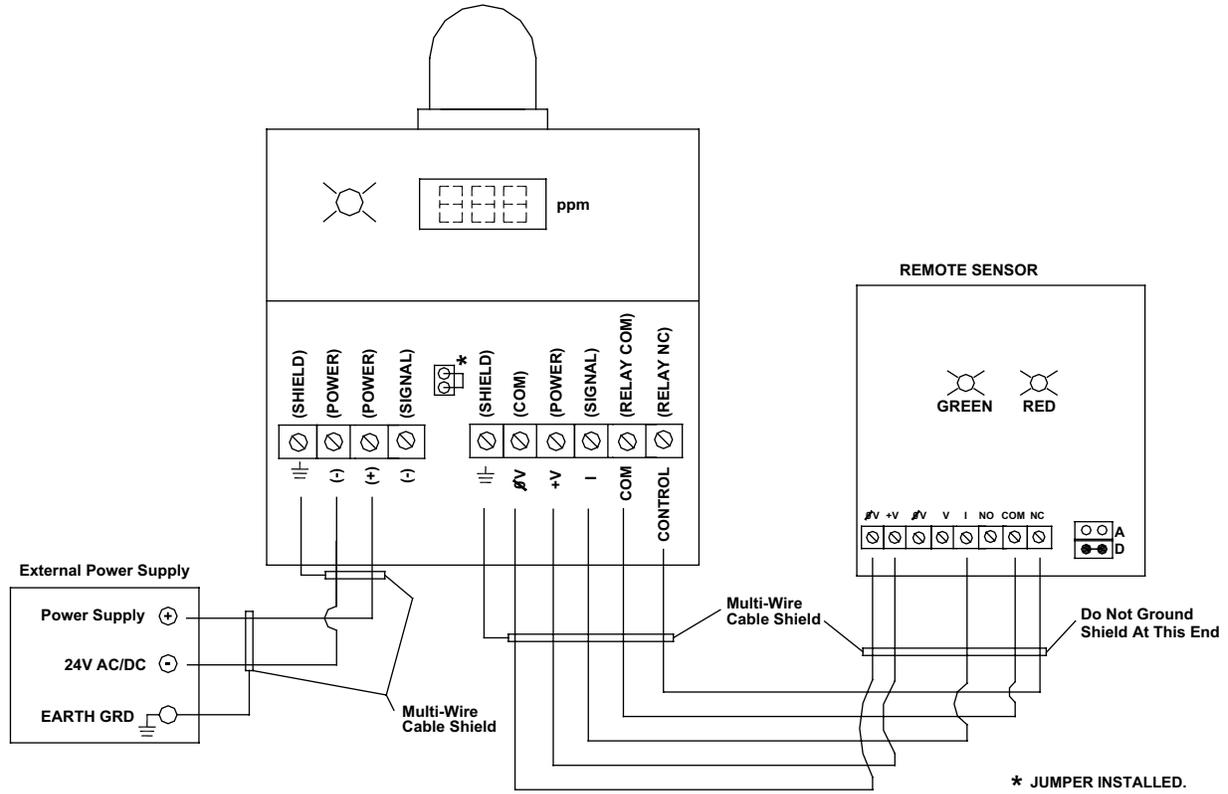
To use as part of a larger gas monitoring and signaling system, each GAS Alert System will be mated with a gas sensor. The 4-20mA signal can be used to drive the GAS Alert System device, plus a larger monitoring system or PLC monitoring signaling system. For typical wiring refer to Fig. 1.

Due to system irregularities the Gas Alert System LED display, when connected to a gas sensor with no target gas present, the display may not read at zero. If this is not acceptable, the user can adjust the LED display in the Gas Alert System or adjust the zero setting in the gas sensor. Refer to pages 7 and 8 for adjusting the gas sensor zero setting.

To adjust the Gas Alert System LED display, open the clear cover and remove the LED display panel by removing the 4 screws. On the backside of the LED display, adjust the potentiometer labeled Z until the display reads 0 PPM. Reverse procedure to assemble.

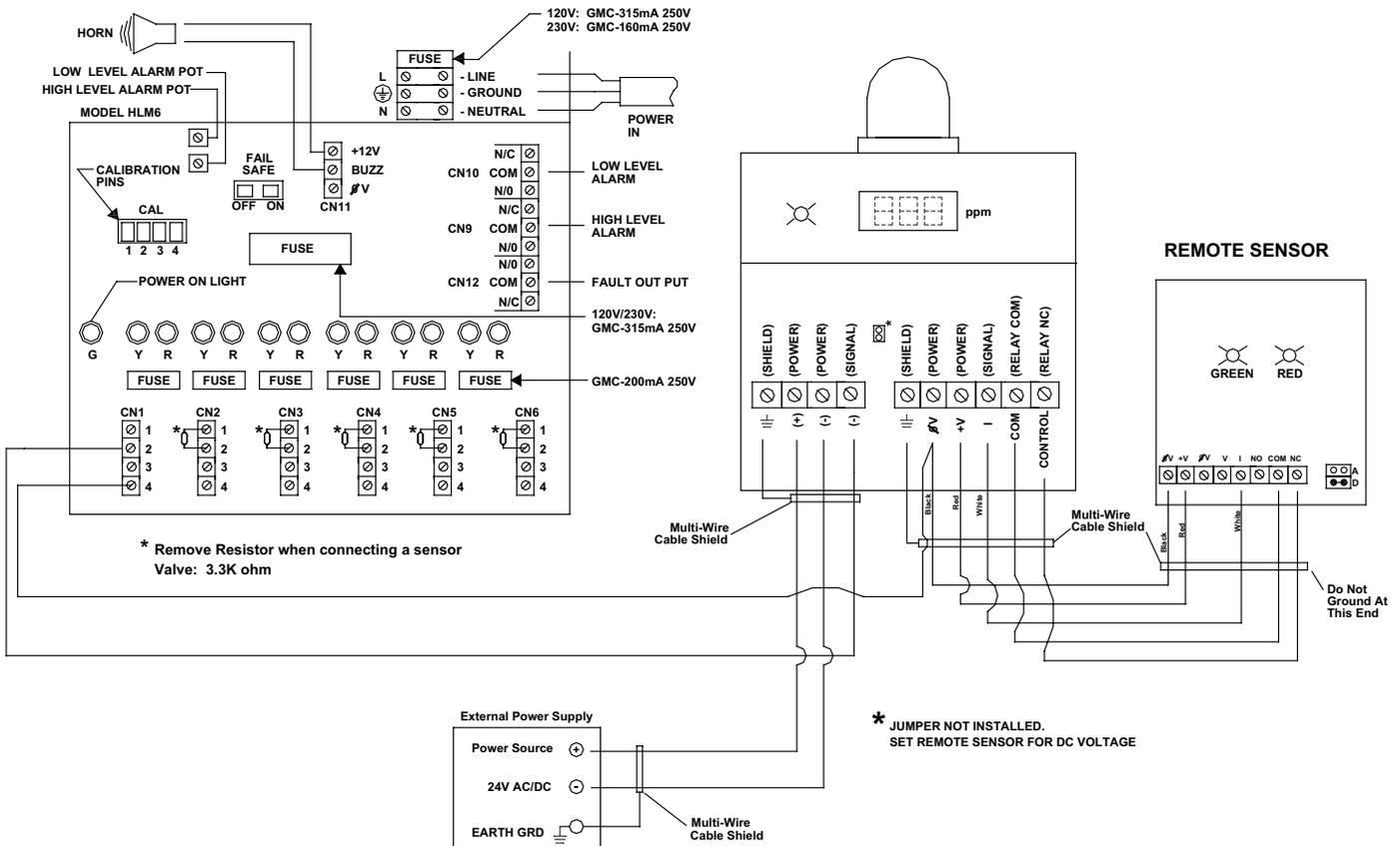
TYPICAL WIRING DIAGRAM WITH LOCAL POWER SOURCE

FIG. H



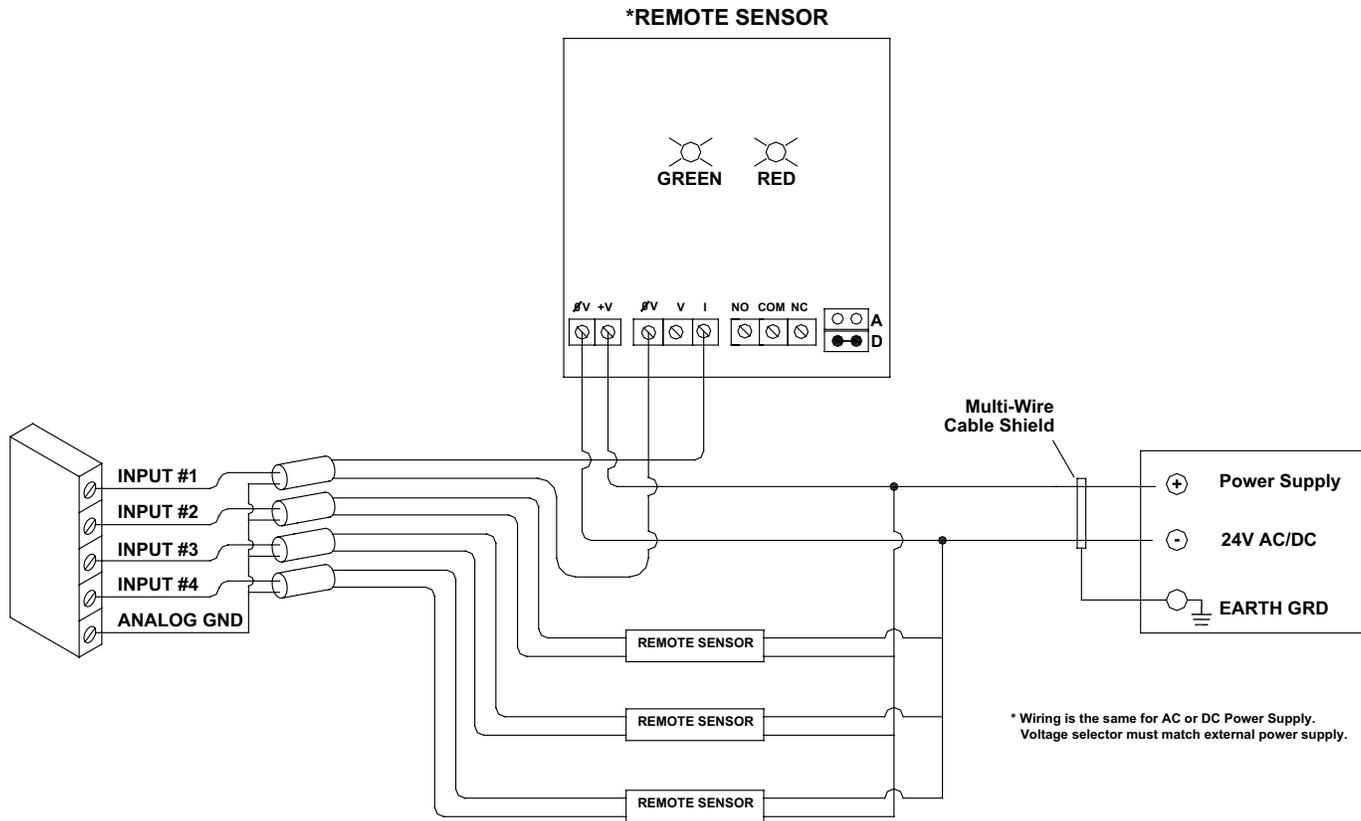
TYPICAL WIRING DIAGRAM WITH HANSEN HLM6 MONITOR

FIG. I



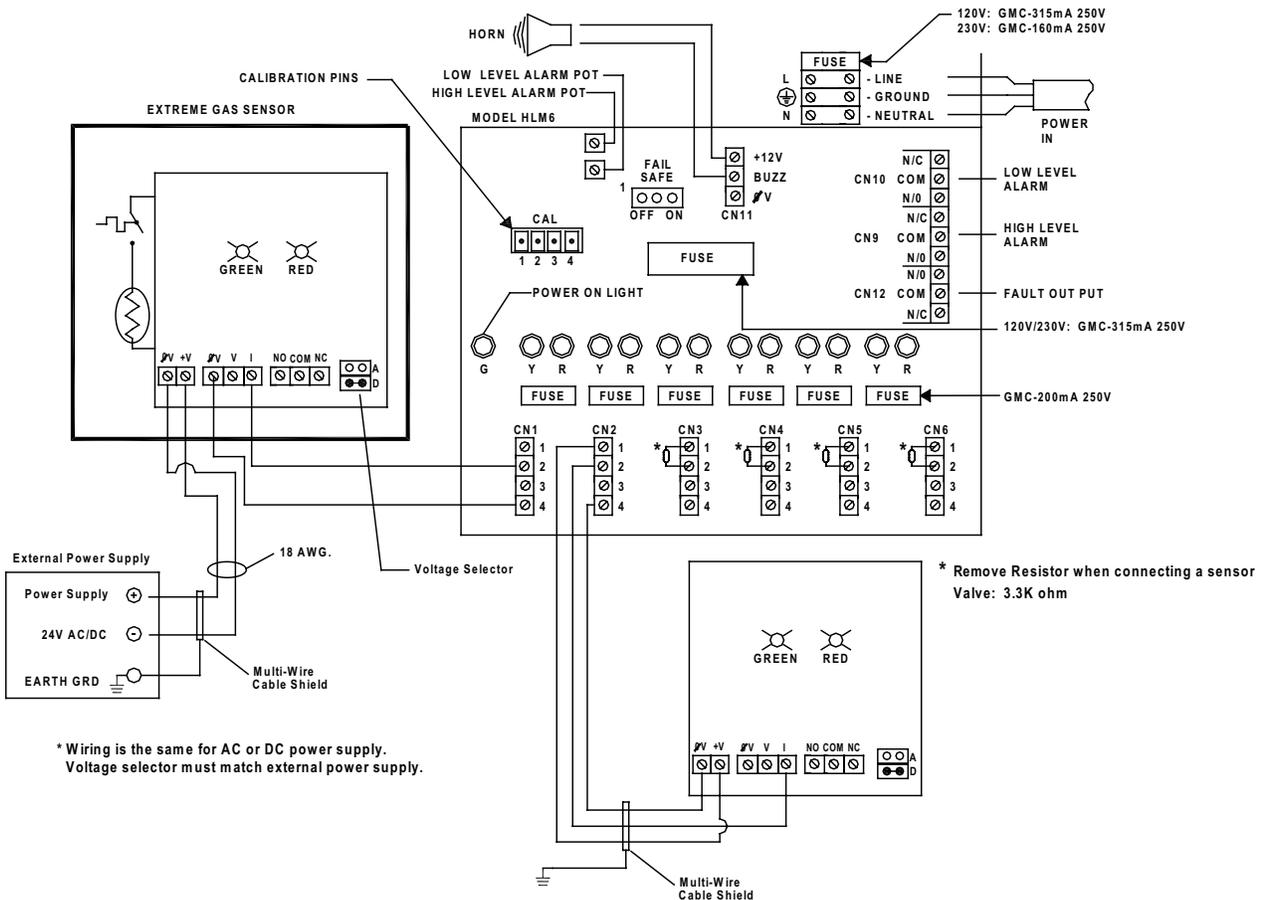
PLC 4 PT. ANALOG IN MODULE (CURRENT)

FIG. J



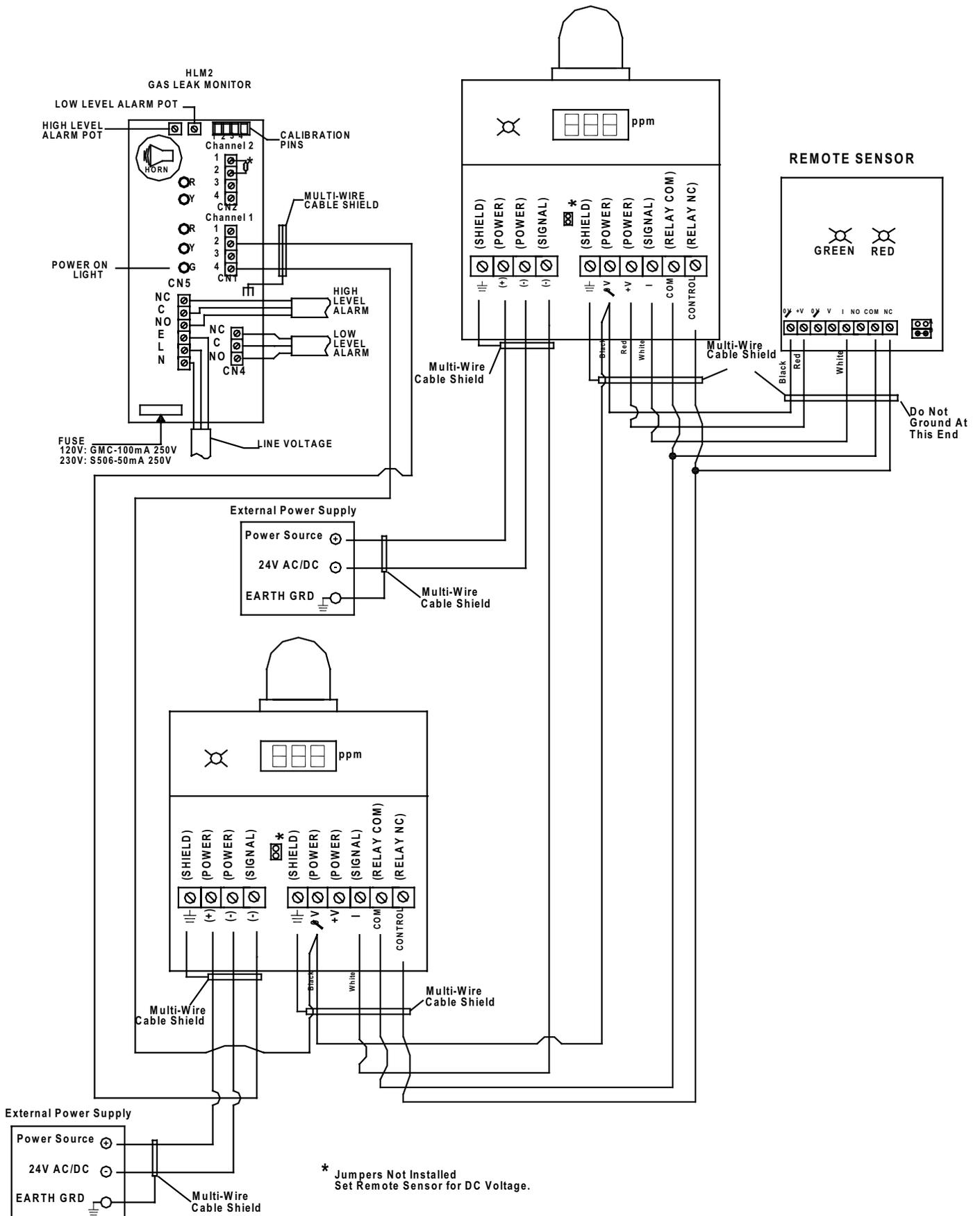
TYPICAL WIRING DIAGRAM HLM6 TO EXTREME GAS SENSOR

FIG. K



TYPICAL WIRING DIAGRAM WITH LOCAL POWER SOURCE

FIG. L



Gas Detection Test Certificate



Product Description: _____

Serial Number: _____

Date of First Calibration: _____

Date of Last Calibration: _____

Type/Range of Test Gas: _____

1. Carry out "Bump Test" (Set delay to zero) *Initial the following, encircle "OK" when completed.*

Power (Green LED) _____ OK

Visual Alarm (Red LED) _____ OK

Audible Alarm Operating _____ OK

Relay Operating _____ OK

Remote Systems if connected
to relay _____ OK

**Check Analog Output in Use,
e.g. 0-5V, 4-20 mA** _____ OK

2. On-Site Gas Calibration *Initial the following, encircle "OK" when completed.*

System Passed _____ OK

If the Gas Sensor did not respond correctly and could not be recalibrated due to age, exposure to gas etc, then either the Gas Sensor or the sensing element should be replaced (and recalibrated.)

System Failed _____

I hereby certify that the above specified test procedure has been performed.

The Hansen Gas Sensor (is)/(is not) performing as specified. *Encircle the appropriate conclusion.*

Test Performed by: _____
Signature

Date

ORDERING INFORMATION: GAS DETECTION SENSORS & MONITORS

AMMONIA			Sensor Type	Range (PPM)
Standard to 0°F(-17°C)	Harsh to -40°F(-40°C)	Extreme to -60°F(-51°C)		
HEC4-N100	HEC4H-N100	HEC4E-N100	Electrochemical	0-100
HEC4-N250	HEC4H-N250	HEC4E-N250	Electrochemical	0-250
HEC4-N1K	HEC4H-N1K	HEC4E-N1K	Electrochemical	0-1,000
HSC4-N10K	HSC4H-N10K	HSC4E-N10K	Semiconductor	0-10,000

Note: For Explosion Proof model, substitute X for 4 in model number (i.e. HECX-N100).

VENT LINE		Sensor Type	Range (PPM)
Standard to -40°F(-40°C)	Refrigerant		
HVSC4-F5K*	Halocarbon	Semiconductor	0-5,000
HVSC4-N10K	Ammonia	Semiconductor	0-10,000

* Specify refrigerant (R22, R507, R134a, R404, R410).

HALOCARBON			Sensor Type	Range (PPM)
Basic to 32°F(0°C)	Harsh to -40°F(-40°C)	Extreme to -60°F(-51°C)		
HSC1-F3K/R22	HSC4H-F3K/R22	HSC4E-F3K/R22	Semiconductor	0-3,000
HSC1-F3K/R507	HSC4H-F3K/R507	HSC4E-F3K/R507	Semiconductor	0-3,000
HSC1-F3K/R134a	HSC4H-F3K/R134a	HSC4E-F3K/R134a	Semiconductor	0-3,000
HSC1-F3K/R404	HSC4H-F3K/R404	HSC4E-F3K/R404	Semiconductor	0-3,000
HSC1-F3K/R410	HSC4H-F3K/R410	HSC4E-F3K/R410	Semiconductor	0-3,000

Note: Gas Sensors available for additional refrigerants; consult factory.

CO ₂			Sensor Type	Range (PPM)
Basic to 32°F(0°C)	Harsh to -40°F(-40°C)	Extreme to -60°F(-50°C)		
HIR1-C10K	HIR4H-C10K	HIR4E-C10K	Infrared	0-10,000

PORTABLE GAS DETECTION UNITS

Catalog No.	Description
HEP1	Portable Handheld Gas Detector, Universal Charger, 100-240V, Sensor Type: Electrochemical
31-1012	Sensor Module, NH ₃ , 0-50/500 PPM
31-1013	Sensor Module, NH ₃ , 0-500/2000 PPM

Note: HEP1 does not include a sensor module.

GAS ALERT SYSTEM

Catalog No.	Range (PPM)
GAS-100	0-100
GAS-250	0-250
GAS-1K	0-1,000
GAS-3K	0-3,000
GAS-10K	0-10,000

GAS DETECTION MONITORS

Catalog No.	Description
HLM2	Two Channels; internal audible alarm
HLM6	Six Channels; external audible alarm

Note: Specify voltage 120V AC or 220V AC.

CALIBRATION GAS CYLINDERS

Refrigerant Gas	Range (PPM)	Catalog No.
Ammonia	100	31-0031
Ammonia	250	31-0032
Ammonia	1,000	31-0033
Ammonia	10,000	31-0034
CO ₂	10,000	31-0127
R22	3,000	31-0078
R404/R507	3,000	31-0079
R134a	3,000	31-0080
R401a	3,000	31-0081
R402a	3,000	31-0082

GAS SENSOR ACCESSORIES

Catalog No.	Description
31-1000	Sensor Calibration Kit
31-1001	Quick Disconnect Plug Kit
31-1002	Sensor Element Shield

ORDERING INFORMATION: GAS DETECTION ACCESSORIES

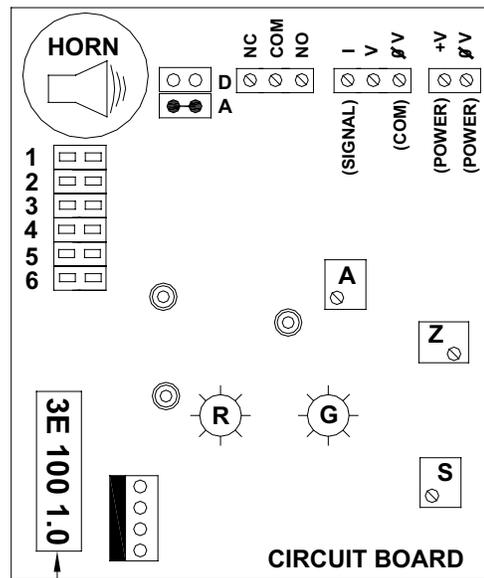
SENSING ELEMENT REPLACEMENT KITS

Kit No.	Sensing Element	For Gas Sensor (PPM)	Type
31-1024†	Standard, Ammonia	100, 250	Electrochemical
31-1003	Standard, Ammonia	1000	Electrochemical
31-1004	Standard, Ammonia	10,000	Semiconductor
31-1025†	Harsh/Extreme, Ammonia	100, 250	Electrochemical
31-1005	Harsh/Extreme, Ammonia	1000	Electrochemical
31-1006	Harsh/Extreme, Ammonia	10,000	Semiconductor
31-1007	Vent Line, Ammonia	10,000	Semiconductor
31-1008	Basic, Halocarbon	3000	Semiconductor
31-1009	Harsh/Extreme, Halocarbon	3000	Semiconductor
31-1015	Vent Line, Halocarbon	5000	Semiconductor
31-1016	Explosion Proof, Ammonia	10,000	Semiconductor
31-1017	Explosion Proof, Halocarbon	3000	Semiconductor
31-1018	Explosion Proof, Ammonia	100, 250, 1000	Electrochemical
31-1019*	Ammonia	100, 250, 1000	Electrochemical
31-1020*	Ammonia	10,000	Semiconductor

* Board mounted sensing element for obsolete standard gas sensor.

† See Special Element Replacement section below.

SPECIAL ELEMENT REPLACEMENT KITS (250 PPM GAS SENSOR ONLY)



REVISION IDENTIFICATION LABEL "3E 100 1.0"

Gas Sensors (250 PPM only) shipped prior to April 2013 may have older style circuit boards that will not match the new replacement sensing element. The proper circuit board can be identified by the electronics revision identification label of "3E100 1.0" or later, located inside the enclosure. If this revision identification label is present, use kit number 31-1024 for the 250 PPM Standard Gas Sensor, and 31-1025 for the 250 PPM Harsh/Extreme Gas Sensor. Otherwise, use special kit that includes replacement sensor and electronics: number 31-1026 for the 250 PPM Standard Gas Sensor, and 31-1027 for the 250 PPM Harsh/Extreme Gas Sensor.

CAUTION

Hansen Gas Detection Sensors, Monitors and Alert Systems have been designed for industrial and commercial refrigeration systems. These instructions must be completely read and understood before selecting, using or servicing Hansen gas detection equipment. Only knowledgeable, trained refrigeration personnel should install, operate, or service this gas detection equipment. Stated temperature and voltage limits should not be exceeded. See Safety Precautions in current List Price Bulletin and Safety Precautions Sheet supplied with product.

WARRANTY

All Hansen products, except electronics, are guaranteed against defective materials or workmanship for one year F.O.B. factory. Electronics are guaranteed against defective materials or workmanship for 90 days F.O.B. factory. No consequential damages or field labor is included.

HANSEN

Hansen Technologies Corporation
 400 Quadrangle Dr, Suite F
 Bolingbrook, Illinois 60440 USA
 Tel: 630.325.1565 Fax: 630.325.1572 Toll: 866.4HANSEN
 Email: sales@hantech.com Web: www.hantech.com
 USA · Asia · Europe · India · Latin America · Middle East
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