Important

These instructions are for experienced operators who know the general principles and safety precautions to be observed in handling compressed gases and electrical equipment. If you are not certain you fully understand the safety precautions for handling gases, we urge you to obtain and read the Material Safety Data Sheet (MSDS) for each gas being used.

Do not permit untrained persons to install, operate, or maintain these alarm boxes. Do not attempt to install or operate these alarm boxes until you have read and fully understand these instructions. If you do not fully understand these instructions, contact BEACONMEDAES.

Be sure this information reaches the operator. Your supplier has extra copies.

1- Safety Precautions

Protect yourself and others. Read and understand the following instructions before attempting to use this equipment. Failure to understand and follow these instructions could result in serious personal injury and/or damage to equipment. Because of the many potential hazards associated with gases, read the Material Safety Data Sheet for each gas you will be using.

- Know and understand the physical and chemical properties of the gas being used.
- Observe general precautions for the use of gases.
- Observe safety precautions for the gas being used.
- Read and follow precautions on cylinder labels.
- Never use these manifolds with gases not compatible with the materials of construction. The use of gases not compatible with the materials of construction may cause damage to equipment or injury to personnel.
- If flammable gases are used with this equipment do not locate it near open flames or any other source of ignition.
- If toxic or flammable gases are used with this equipment, emergency equipment applicable to the gases in use should be available in operating area.
- Many gases can cause asphyxiation by displacing oxygen in the atmosphere. Make certain the area where these manifolds are operated is well ventilated. Provide a device to warn personnel of oxygen depletion in the work area.
- Do not release toxic or flammable gases in the vicinity of personnel. Use this equipment only in well ventilated areas. Vent gases to the outside atmosphere, and in an area away from personnel. Be sure that venting and disposal methods are in accordance with Federal, State, Provincial and local requirements. Locate and construct vent lines to prevent condensation or gas accumulation. Be sure the vent outlet cannot be obstructed by rain, snow, ice, insects, birds, etc. Do not inter-connect vent lines; if more than one vent is needed, use separate lines.
- Relief devices should be installed and properly vented in all gas handling systems to protect against equipment failure and over-pressurization.
- Never connect this equipment to a supply source having a pressure greater than the maximum rated pressure. Refer to the Product Specifications for maximum inlet pressures.
- Never permit oil, grease, or other combustible materials to come in contact with cylinders, manifolds, and connections. Oil and grease may react and ignite when in contact with some gases – particularly oxygen and nitrous oxide.
- Cylinder, header, and master valves should always be opened very s-l-o-w-l-y. Heat of recompression may ignite combustible materials.
- Flexible hoses should never be kinked, twisted, or bent into a radius smaller than 3 inches. Mistreatment may cause the flexible hoses to burst.
- Do not apply heat. Some materials may react and ignite while in contact with some gases – particularly oxygen and nitrous oxide.
- Cylinders should always be secured with racks, chains, or straps. Unrestrained cylinders may fall over and damage or break off the cylinder valve which may propel the cylinder with great force.
- Oxygen manifolds and cylinders should be grounded. Static discharges and lightning may ignite materials in an oxygen atmosphere, creating a fire or explosive force.
- Welding should not be performed near nitrous oxide piping. Excessive heat may cause the gas to dissociate, creating an explosive force.
- Do not use leak test solution that contains ammonia. Solutions containing ammonia may cause brass tubing to crack.
- Always use oxygen compatible leak test solution on oxygen or nitrous oxide service equipment.

2- Abbreviations

C	Common
CGA	Compressed Gas Association
FT-LBS	Foot-Pounds
IN-LBS	Inch-Pounds
N/C	Normally Closed
N/O	Normally Open
NPT	National Pipe Taper
OSHA	Occupational Safety & Health Administration
PSIG	Pounds per Square Inch Gauge
SCFH	Standard Cubic Feet per Hour
VAC	Voltage, Alternating Current
VDC	Voltage, Direct Current
PCB	Printed Circuit Board

3- Disclaimer

BEACONMEDAES shall not be liable for errors contained herein or incidental or consequential damages in connection with providing this manual or the use of material in this manual.

4- Manufacturer Statement

The information contained in this instruction booklet has been compiled by BEACONMEDAES, from what it believes are authoritative sources, and is offered solely as a convenience to its customers. While BEACONMEDAES believes that this information is accurate and factual as of the date printed, the information including design specifications is subject to change without prior notice.

5- Description

The BEACONMEDAES Fixed Gas Monitor Series, with its microprocessor-based system, features a high quality, stand-alone controller providing all the necessary hardware for the continuous monitoring of a variety of toxic and combustible gases. This unit is primarily geared towards providing alarm activated relays for simple applications such as cylinder storage rooms.

The FGM employs the best sensing technologies available: infrared, electrochemical and pellistor cells. These quality components provide virtually instantaneous detection of targeted gases and deliver long-term trouble-free operation.

Installed within the monitored space, the FGM Series Fixed Gas Monitors target gas concentration rates and automatically operates the mechanical ventilation system of a facility. Upon detection of low levels of hazardous and flammable gases the ventilation system is energized thereby protecting occupants, personnel and gas-sensitive goods and products.

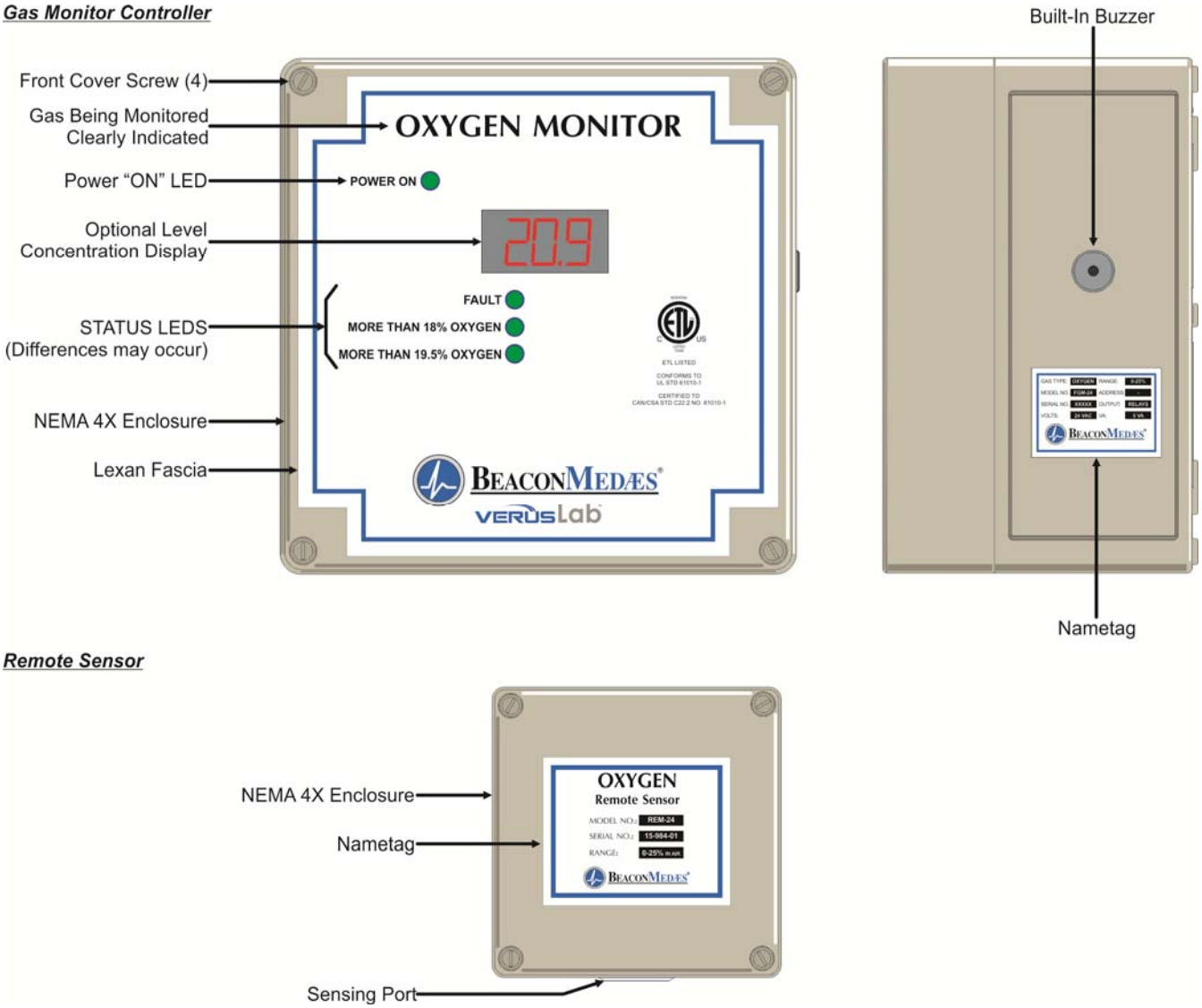


Figure 1: Overview

6- Ordering Information

FGM — ☐ — ☐ — ☐ — ☐

Gas	Inscribe
Ammonia	NH3
Carbon Monoxide	CO
Carbon Dioxide	CO2
Chlorine	CL2
Hydrogen	H2
Hydrogen Sulfide	H2S
Methane	CH4
Nitrogen Dioxide	NO2
Oxygen	O2
Propane	C3H8

Line Voltage	Inscribe
24 VAC 50/60 Hz	24
110 VAC 50/60 Hz	110
240 VAC 50/60 Hz	240

Options	Inscribe
Remote Sensor	RS
Local Display	LCD

Output	Inscribe
2 Relays (Standard)	Leave Blank
3 Relays	3R
4 Relays	4R
4-20 mA, 500 Ohm Max	420
0-1 VDC, 10 KOhm Min	001
0-5 VDC, 10 KOhm Min	005
0-10 VDC, 10 KOhm Min	010

7- Specifications

Technical Specifications		
Gases Detected		Refer to Ordering Information
Sensor Technology	Carbon Dioxide Oxygen Toxic Gases Flammable Gases	Non-Dispersive Infrared Electrochemical Cell Electrochemical Cell Catalytic Pellistor
Sensing Method		Diffusion
Power Requirements		24 VAC, 110 VAC, 240 VAC 50/60 Hz
Output Relay Rating		Relay, Dry Contact Rating 3 Amp @ 120 VAC inductive
Optional Analog Output		One of the following: 4-20 mA, 0-1 VDC, 0-5 VDC, 0-10 VDC
Operating Temperature		-4F to 120F (-20C to 50C)
Humidity Range		15-90% Relative Humidity
Accuracy	Non-Dispersive Infrared Electrochemical Cells Catalytic Pellistor	+/- 2% of calibrated value +/- 5% of calibrated value +/- 1% of calibrated value as Methane
Repeatability		2% of Signal
Response Time (90%)		20-40 Seconds
Expected Sensor Lifetime	Infrared (Carbon Dioxide) Oxygen (Electrochemical) Toxic Gases (Electrochemical) Flammable Gases (Catalytic Pellistor)	10 Years 1 Year 2 Years 10 Years
Enclosure	Rating Color Installation	Nema 1 Light Grey Surface Mounting
Approvals	Canada United States	CAN/CSA C22.2 No. 61010-1:2004 ANSI/UL 61010-1:2004
Audible Alarm		65 dBa at 3 feet

*The manufacturer of the **Catalytic Pellistor** recommends to replace this sensing element every 36 months.*

8- Dimensions

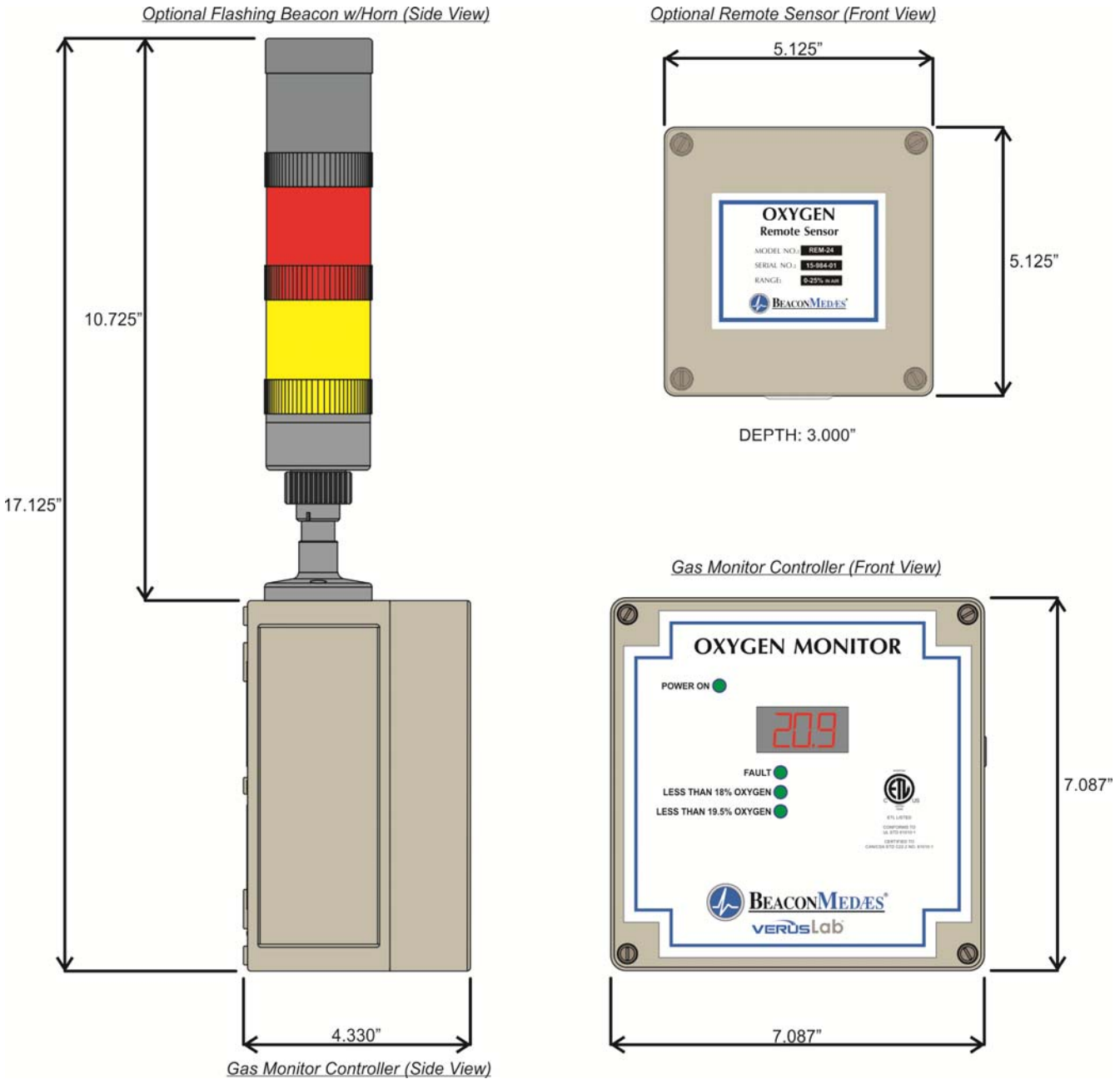


Figure 2: Dimensions

9- Wall Installation & Locations

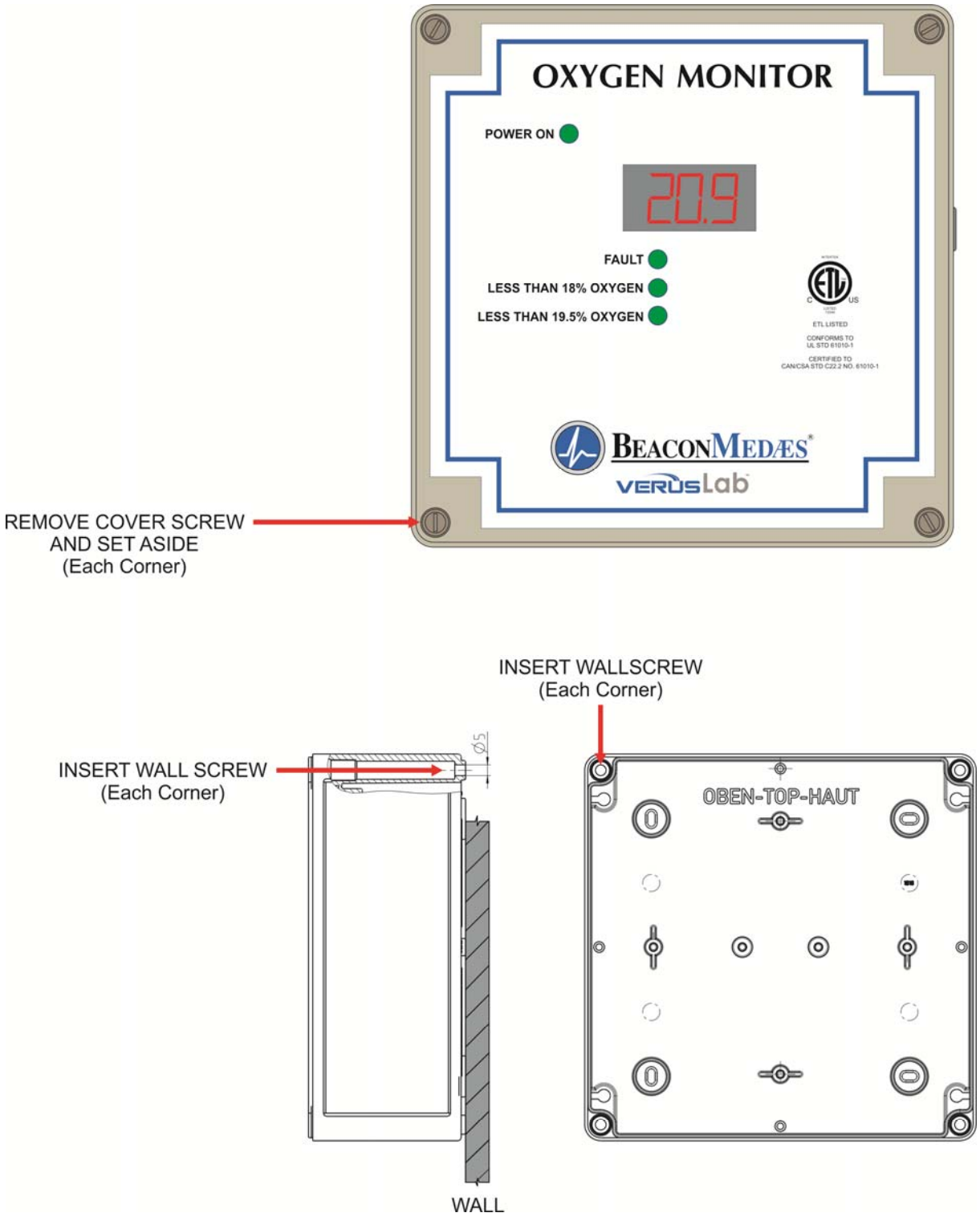


Figure 3: Installation

Gas	Primary Hazards					Metals					Plastics				Elastomers			Explosive Limits		Toxicity Levels		Physical Properties		
	Asphyxiant	Toxic	Flammable	Corrosive	Oxidizer	Aluminum	Brass	Copper	Monel	Stainless Steel	Kel-F	Teflon	Tefzel	Kynar	Viton	Buna-N	Neoprene	LEL (% in Air)	UEL (% in Air)	TLV-TWA (ppm in Air)	TLV-STEL (ppm in Air)	SPECIFIC VOLUME (ft³/lb)	BOILING POINT @ 1 atm (°F)	SPECIFIC GRAVITY (Air = 1)
ACETYLENE	X		X			S	S	U	S	S	S	S	S	S	S	S	S	2.5	100	-	-	14.77	-119.6	0.899
AIR					X	S	S	S	S	S	S	S	S	S	S	S	S	-	-	-	-	12.55	-317.8	1.000
AMMONIA		X	X	X		S	U	U	S	S	S	S	S	U	U	S	S	15.0	28.0	25	35	22.49	-28.3	0.588
ARGON	X					S	S	S	S	S	S	S	S	S	S	S	S	-	-	-	-	9.68	-302.5	1.379
ARSINE		X	X			-	S	S	S	S	S	S	S	S	S	S	S	-	-	0.05	-	4.91	-79.9	2.691
BORON TRICHLORIDE		X		X		U	D	D	S	S	S	S	S	-	-	-	-	-	-	-	-	3.18	55.1	4.045
BORON TRIFLUORIDE		X		X	X	-	D	D	S	S	S	S	S	-	-	-	-	-	-	1C	-	5.68	-147.5	2.341
BROMINE TRIFLUORIDE		X		X		D	D	D	S	S	D	D	S	U	U	U	U	-	-	-	-	415.1	258.2	4.727
1,3-BUTADIENE		X	X			S	S	S	S	S	S	S	S	S	S	S	S	2.0	12.0	2	-	6.98	23.7	1.868
n-BUTANE	X		X			S	S	S	S	S	S	S	S	S	S	S	S	1.8	8.4	800	-	6.45	31.0	2.007
1-BUTENE			X			S	S	S	S	S	S	S	S	S	S	S	S	1.6	10.0	-	-	6.70	21.1	1.937
cis-2-BUTENE			X			S	S	S	S	S	S	S	S	S	S	S	S	1.7	9.7	-	-	6.61	53.1	1.937
trans-2-BUTENE			X			S	S	S	S	S	S	S	S	S	S	S	S	1.7	9.7	-	-	6.62	47.3	1.937
CARBON DIOXIDE	X					S	S	S	S	S	S	S	S	S	S	D	D	-	-	5000	30000	8.74	-126.5	1.519
CARBON MONOXIDE		X	X			S	S	S	S	S	S	S	S	S	S	S	S	12.5	74.0	25	-	13.80	-312.7	0.967
CHLORINE		X		X	X	U	U	U	S	S	S	S	S	S	S	U	U	-	-	0.5	1	5.39	-28.8	2.448
CHLORINE TRIFLUORIDE		X		X		U	-	-	S	S	D	D	S	U	U	U	U	-	-	-	-	4.09	53.1	3.192
DEUTERIUM	X		X			S	S	S	S	S	S	S	S	S	S	S	S	4.9	75.0	-	-	96.00	-417.0	0.139
DICHLOROSILANE		X	X	X		U	-	-	S	S	S	S	S	S	-	-	-	4.1	98.8	-	-	3.72	46.7	3.487
DI-, MONO-, AND TRIMETHYLAMINES		X	X	X		U	U	U	S	S	S	S	S	S	U	U	-	-	-	-	-	-	-	-
DISILANE			X			S	S	S	S	S	S	S	S	S	S	S	S	-	-	-	-	6.01	6.7	2.148
ETHANE	X		X			S	S	S	S	S	S	S	S	S	S	S	S	3.0	12.4	-	-	12.76	-127.5	1.038
ETHYL CHLORIDE			X			S	S	S	S	S	S	S	S	S	S	S	S	3.8	15.4	100	-	5.82	54.0	2.227
ETHYLENE	X		X			S	S	S	S	S	S	S	S	S	S	S	S	2.7	36.0	-	-	13.71	-154.8	0.969
FLUORINE		X		X	X	D	D	D	S	S	D	D	D	D	U	U	U	-	-	1	2	10.18	-306.8	1.312
HALOCARBON- 14						S	S	S	S	S	S	S	S	S	S	S	S	-	-	-	-	-	-	-
HALOCARBON- 23	X					S	S	S	S	S	S	S	S	S	S	S	S	-	-	-	-	5.48	-115.9	2.917
HALOCARBON-116	X					S	S	S	S	S	S	S	S	S	S	S	S	-	-	-	-	2.77	-108.7	4.765
HELIUM	X					S	S	S	S	S	S	S	S	S	S	S	S	-	-	-	-	96.67	-452.0	0.138
HYDROGEN	X		X			S	S	S	S	S	S	S	S	S	S	S	S	4.0	75.0	-	-	191.95	-423.2	0.070
HYDROGEN BROMIDE		X		X		U	U	U	S	S	S	S	S	S	S	U	U	-	-	3C	-	4.74	-88.0	2.794
HYDROGEN CHLORIDE		X		X		U	U	U	S	S	S	S	S	S	S	U	U	-	-	5C	-	10.55	-120.8	1.259
HYDROGEN FLUORIDE		X		X		U	U	U	S	S	S	S	S	S	U	U	U	-	-	3C	-	5.65	-108.7	4.765
HYDROGEN SULFIDE		X	X	X		S	S	-	S	S	S	S	S	S	U	S	S	4.0	44.0	10	15	11.26	-74.9	1.176
ISOBUTANE	X		X			S	S	S	S	S	S	S	S	S	S	S	S	1.8	8.4	-	-	-	-	-
ISOBUTYLENE	X		X			S	S	S	S	S	S	S	S	S	S	S	S	1.8	9.8	-	-	-	-	-
KRYPTON	X					S	S	S	S	S	S	S	S	S	S	S	S	-	-	-	-	4.61	-244.1	2.893
METHANE	X		X			S	S	S	S	S	S	S	S	S	S	S	S	5.0	15.0	-	-	24.06	-258.7	0.554
METHYL CHLORIDE		X	X			U	S	S	S	S	S	S	S	S	S	U	U	7.0	17.4	50	100	4.83	-11.2	1.740
METHYL FLUORIDE		X	X			S	S	S	S	S	S	S	S	S	-	-	-	-	-	-	-	11.23	-109.0	0.170
NEON	X					S	S	S	S	S	S	S	S	S	S	S	S	-	-	-	-	19.18	-410.9	0.697
NITROGEN	X					S	S	S	S	S	S	S	S	S	S	S	S	-	-	-	-	13.80	-320.4	0.967
NITROGEN DIOXIDE		X		X	X	S	U	U	U	S	S	S	-	-	U	U	U	-	-	3	5	-	-	-
NITROGEN TRIFLUORIDE		X			X	-	S	S	S	S	S	S	S	S	S	-	-	-	-	10	-	5.43	-200.2	2.451
NITROUS OXIDE					X	S	S	S	S	S	S	S	S	S	S	S	S	-	-	50	-	8.74	-128.3	1.520
OCTAFLUOROCYCLOBUTANE	X					S	S	S	S	S	S	S	S	S	S	S	S	-	-	-	-	1.87	21.2	6.906
OCTAFLUOROPROPANE	X					S	S	S	S	S	S	S	S	-	-	S	S	-	-	-	-	2.01	-34.3	6.491
OXYGEN					X	D	S	S	S	D	S	S	S	S	D	U	D	-	-	-	-	12.08	-297.4	1.105
PHOSPHINE		X	X			S	-	-	S	S	S	S	S	-	-	-	-	-	-	0.3	1	11.30	-126.0	1.174
PROPANE	X		X			S	S	S	S	S	S	S	S	S	S	S	S	2.1	9.5	-	-	8.62	-43.7	1.522
PROPYLENE	X		X			S	S	S	S	S	S	S	S	S	S	S	U	2.4	11.0	-	-	9.06	-53.8	1.453
SILANE			X			S	S	S	S	S	S	S	S	S	S	S	S	-	-	5	-	11.98	-170.4	1.109
SILICON TETRACHLORIDE		X		X		U	U	U	S	S	S	S	S	S	U	U	U	-	-	-	-	8.25	136.6	5.866
SILICON TETRAFLUORIDE		X		X		U	U	U	S	S	S	S	S	S	U	U	U	-	-	-	-	3.69	-148.3	3.593
SULFUR DIOXIDE		X		X		S	U	S	S	S	S	S	S	S	S	U	U	-	-	2	5	5.95	13.8	2.212
SULFUR HEXAFLUORIDE	X					S	S	S	S	S	S	S	S	S	S	S	S	-	-	1000	-	2.62	-90.8	5.042
SULFUR TETRAFLUORIDE		X		X		U	U	U	S	S	S	S	S	S	U	U	U	-	-	-	-	3.53	-53.5	3.731
TUNGSTEN HEXAFLUORIDE		X		X		U	U	U	S	S	S	S	S	S	U	U	U	-	-	-	-	1.26	63.0	10.283
XENON	X					S	S	S	S	S	S	S	S	S	S	S	S	-	-	-	-	2.93	-162.6	4.533

S = Satisfactory
- = Insufficient Data or Not Applicable
U = Unsatisfacory
D = Suitability depends on condition of use
C = Ceiling value
X = Indicates primary hazard

LOCATION OF SENSORS

The location of a gas sensor is determined by the density of the gas to be detected compared to the density of air.

Gases Lighter than Air - For all gases lighter than air, the sensors will be located at ceiling level (12" - 18" from the ceiling).

Gases Heavier than Air - For all gases heavier than air, the sensors will be located at floor level (12" - 18" from the floor).

Specific Gravity (Sg) - The measurement unit for gas density is called Specific Gravity (Sg). The specific gravity is the ratio of the weight of any volume of another substance taken against the standard (for gases the standard is air, which has a specific gravity = 1).

Oxygen and Carbon Monoxide - For oxygen and carbon monoxide, sensors should be located at eye level as their specific gravity is about the same as the air.

Relation Between (Sg) & Sensor Location

Gas	Specific Gravity (Sg)	Location
Air	1	
Carbon monoxide	0.967	Eye
Hydrogen	0.070	Ceiling
Freon 22	2.980	Floor

QUANTITY OF SENSORS

The radius of surveillance for a given detector is determined by various factors:

a) the mobility of the gas source (like a car or a truck)
b) the specific gravity of the gas to be detected
c) the mechanical ventilation
d) the application

The minimum radius a gas monitor can cover is 20 ft. Some applications may require different coverage based on the above mentioned criteria.

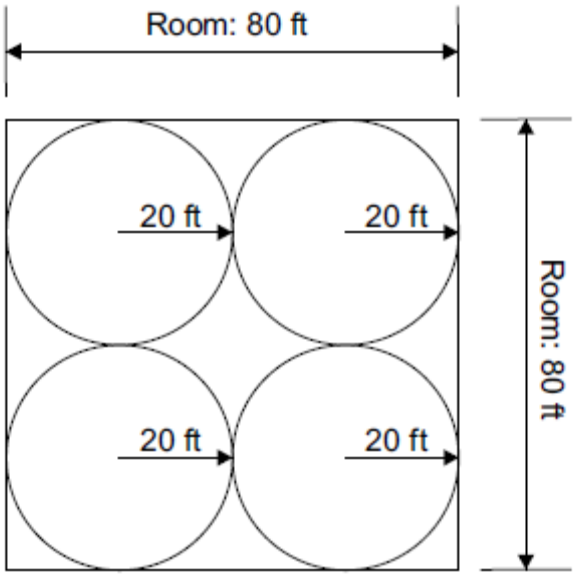


Figure 4 – Sensor Coverage Example

10- Alarm Levels and Detection Ranges

Sensing Element, Detection Ranges & Alarm Levels			
Gas *[Sensing Element]*	**Full Scale Range**	**First Alarm Level** Factory Default	**Second Alarm Level** Factory Default
Ammonia *[Electrochemical Cell]*	0-100 ppm	25 ppm (TLV-TWA)	35 ppm (TLV-STEL)
Carbon Dioxide *[Non-Dispersive InfraRed]*	0-50,000 ppm	5,000 ppm (TLV-TWA)	30,000 ppm (TLV-STEL)
Carbon Monoxide *[Electrochemical Cell]*	0-500 ppm	25 ppm (TLV-TWA)	35 ppm (TLV-STEL)
Chlorine *[Electrochemical Cell]*	0-10 ppm	0.5 ppm (TLV-TWA)	1 ppm (TLV-STEL)
Hydrogen *[Catalytic Beads]*	0-100 % LEL	1% in Air (25% LEL)	2% in Air (50% LEL)
Hydrogen Sulfide *[Electrochemical Cell]*	0-50 ppm	10 ppm (TLV-TWA)	15 ppm (TLV-STEL)
Methane/ Natural Gas *[Catalytic Beads]*	0-100 % LEL	1.25% in Air (25% LEL)	2.5% in Air (50% LEL)
Nitrogen Dioxide *[Electrochemical Cell]*	0-10 ppm	3 ppm (TLV-TWA)	5 ppm (TLV-STEL)
Oxygen Enrichment *[Electrochemical Cell]*	0-25% in Air	19.5% (Low Level)	23.5% (High Level)
Oxygen Depletion *[Electrochemical Cell]*	0-25% in Air	19.5% (Low Level)	18% (Very Low Level)
Propane / LPG *[Catalytic Beads]*	0-100% LEL	0.5% in Air (25% LEL)	1% in Air (50% LEL)

11- Power Supply Connection

The BEACONMEDAES Oxygen Depletion Monitor must be permanently connected to an AC power supply circuit.

For 120VAC model: (see Fig. 5)
Bring AC power to the Monitor from a dedicated uninterruptible 120V, 50/60Hz 5A circuit either from the top or bottom through the provided ½" pipe knockouts.
Run POWER wires inside of the electrical conduits.
Make power connection to terminals L & N and make a true ground connection to the ground lug provided.

For 24VAC model: (see Fig. 6)
Bring AC power to the Monitor from a dedicated uninterruptable 24V, 50/60Hz 5A circuit either from the top or bottom through the provided ½" pipe knockouts.
Run POWER wires inside of the electrical conduits.

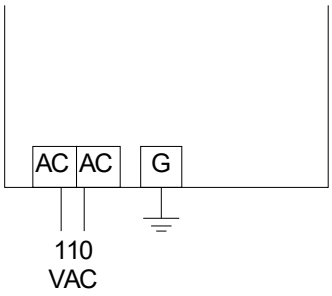


Figure 5 – 110 VAC Unit Power Supply Connection

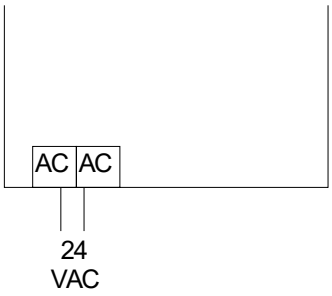


Figure 6 – 24 VAC Unit Power Supply Connection

IMPORTANT

All BEACONMEDAES systems are operated at the factory for a minimum of one week prior to factory calibration. The unit must be powered from a 120 VAC, 1 PH, 60 Hz dedicated constant power source.

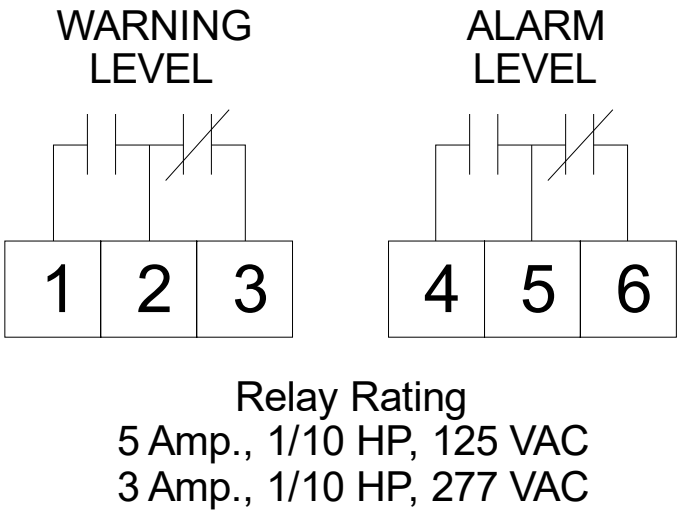


Figure 7 – Relay Rating

12- Fuse and Fuse Replacement

IMPORTANT

The circuit controlled by the dry contacts must be fused at
5A @ 120V or
2A @ 240V

CAUTION

For continued protection against fire, replace only with a fuse of the specified voltage and current ratings:
250V, 1A (BUSSMAN GMA 5 mm x 20 mm or Equivalent)

13- Installing the Remote Sensor – Oxygen Monitor Only

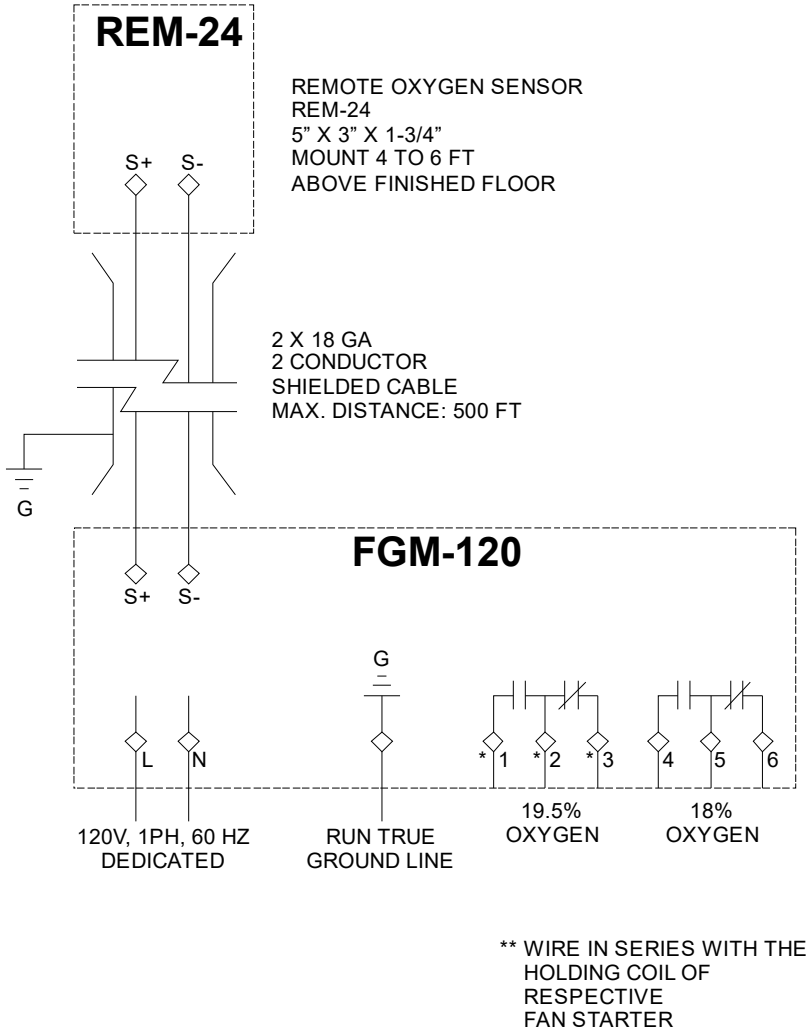


Figure 8: Remote Sensor Wiring Diagram

The oxygen depletion monitor with remote sensor option consists of one (1) controller and one (1) remote oxygen sensor as shown in Figure 4. Oxygen sensors are of the electrochemical cell type and have a measuring range of 0-25%. The oxygen sensors have a life expectancy of 2 years. The sensor must be discarded and replaced upon expiration of its life span.

A digital readout displays the reading of the sensor.

There are two (2) on-board relays with status LEDs that are energized at 19.5% and at 18% of oxygen. The threshold values for the two (2) on-off levels are field adjustable (see the following section).

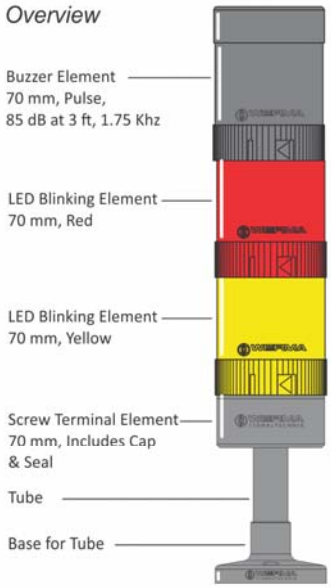
The two relay output contacts are SPDT and have a capacity of 3 Amp at 120 VAC.

A built-in buzzer is also activated at 19.5% oxygen.

14- Connecting the SFBH Series Flashing Beacon with Horn to the FGM Series Fixed Gas Monitor

FLASHING BEACON WITH HORN (SFBH)

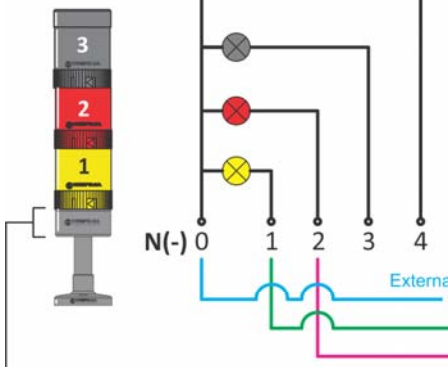
Overview



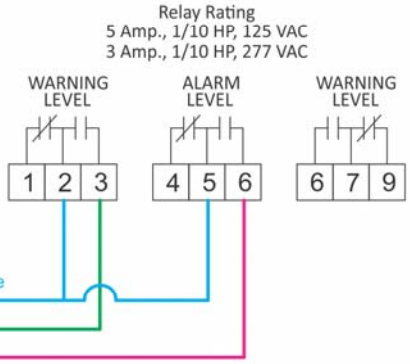
GAS MONITOR

Overview

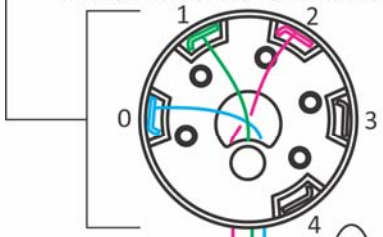
Wiring Diagram - SFBH



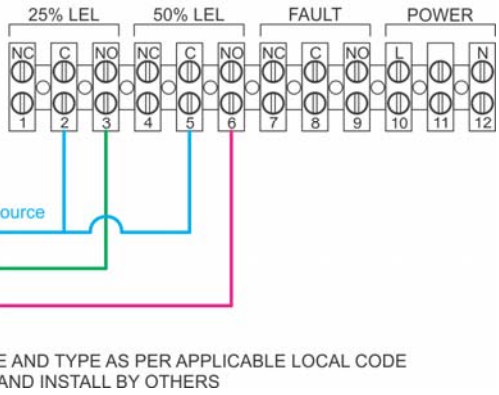
Wiring Diagram - Gas Monitor



Interior View of the Terminal Element



Interior View of the Gas Monitor



15- Jumper Configurations on the Monitor to Select Gas Type for the Channel (LK1-LK3 or LK-4-LK6)

Please note that your Monitor has been shipped to you with the proper jumper configurations and the illustration on Figure 3 below is provided for your reference only.

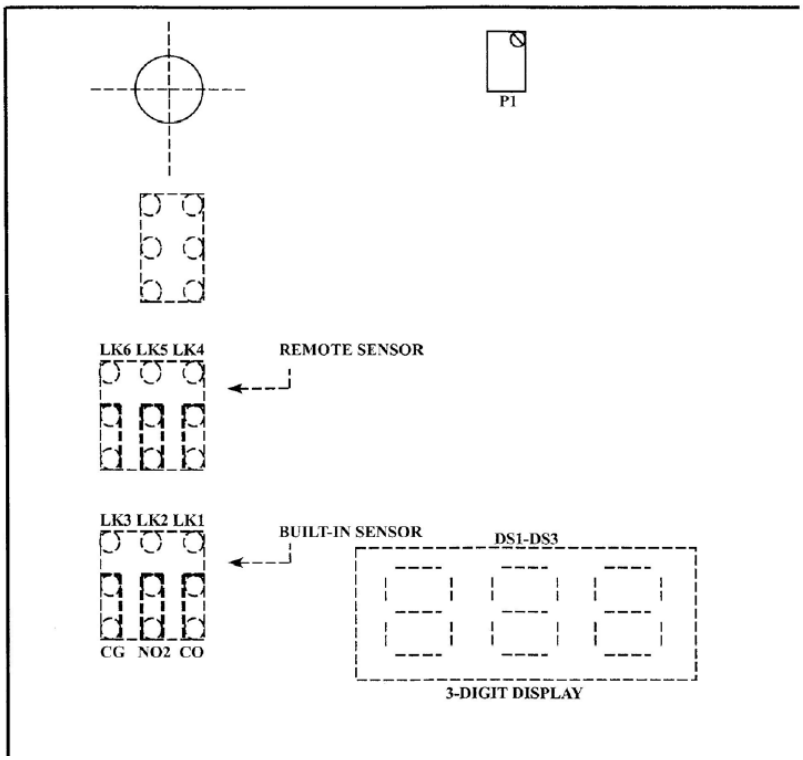


Figure93: Configuration straps and other key components on the Monitor Board (upper-left quadrant)

16- Calibration Instructions – Oxygen Monitor Only

Please note that your monitor has been shipped to you factory calibrated and under normal conditions it should not need to be field-calibrated for a period of 12 months following initial power-up. It is recommended that your monitor be calibrated annually using the procedure outlined below. The sensors must be discarded and replaced upon their expiration date.

Please call ***BEACONMEDAES*** to order your replacement sensors.

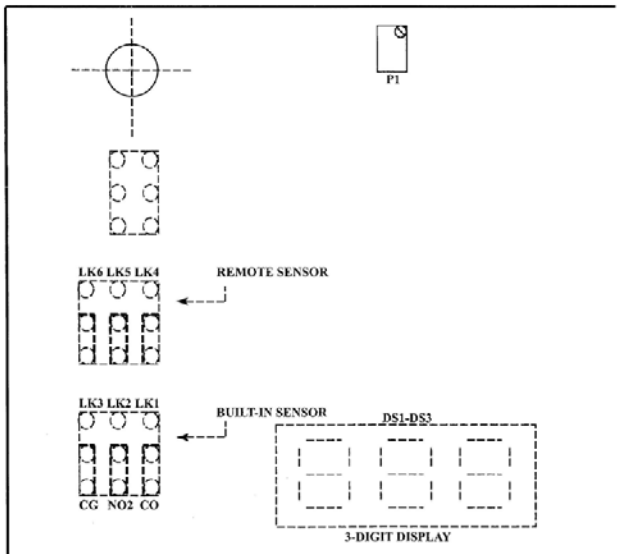


Figure 10: Calibration potentiometer and other key components on the Monitor Board (upper-left quadrant shown)

A. CALIBRATION OF THE BUILT-IN OXYGEN SENSOR

1. Gain access to the circuit board inside the main controller by removing the 4 cover screws.

2. Turn the cover over and secure one corner onto the enclosure using one of the screws, leaving your hands free. Refer to Figure 5 for orientation.

3. Remove existing jumper from the remote sensor's configuration strap (note position before removing LK4, LK5 or LK6). This way the reading on the 3-digit display will be from the built-in sensor only.

4. Inject a known concentration of the target gas to the sensor via a nozzle at a flow rate of 1 SCFH. Note that the concentration of the gas injected should be 20.8% oxygen balance nitrogen.

5. Wait about 30 seconds to get the full reaction from the sensor; at the end of the 30 seconds the reading on the 3-digit display should be equal to the concentration value of the target gas. If it is NOT, turn the potentiometer P1 to obtain the correct reading.

6. Reinsert the jumper back to its original position. This ends the calibration procedure.

B. CALIBRATION OF THE OXYGEN REMOTE SENSOR

The oxygen electrochemical sensor is supplied calibrated, and the sensitivity of the device should not drift by more than 2% of the full signal per month. A potentiometer for routine adjustment is located on the circuit board (see Fig. 5 below).

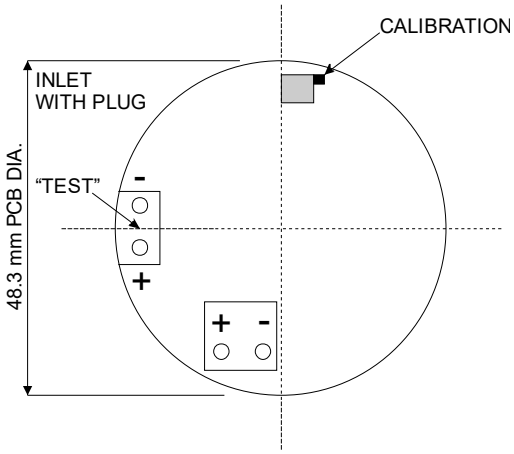


Figure 11: Oxygen Sensor PCB Board

For calibration, the signal may be monitored using a volt meter connected across terminals "TEST". A small nonmetallic screwdriver, with a 1.2 x 0.5 mm tip, is required to adjust the potentiometer. Calibration can be carried out in ambient air by simply adjusting the calibration potentiometer until a reading of 17.4 mA is shown, or 174 mV across "TEST", corresponding to 20.9% on a scale of 1-25%.

17- Step-by-Step Instructions to Change Settings, Time Delays and Buzzer Activation Options on the BEACONMEDAES Oxygen Depletion Monitor

1. Gain access to the circuit board inside the main controller by removing the 4 cover screws.

2. Turn the cover over and secure one corner onto the enclosure using one of the screws, leaving your hands free. Familiarize yourself with the circuit board. Observe the row of 4 mini push-buttons located above the row of 4 relays at the lower left quadrant. These 4 push-buttons, numbered #4 to #1 from left to right, see Figure 6, are all that you need to change the settings. The function of each push-button in the set-up mode is explained as follows:

Push-button #4: Save & Exit from the set-up mode
Push-button #3: Change setting "**DOWN**" button
Push-button #2: Change setting "**UP**" button
Push-button #1: Advance to next parameter

3. To enter the set-up mode, press and hold down push-button #4. While push-button #4 is being held down, press push-button #1 once – then release push-button #4.

(Please note that you may save settings and exit anytime by pressing push-button #4 or skip steps by pressing push-button #1 repeatedly.)

4. The first reading displayed on the 3-digit readout is the **LOW** level on-off output (Relay 1) threshold for the built-in sensor (always CO) expressed in PPM (parts per million). Use the "UP" or "DOWN" push-buttons (#2 or #3) to set the desired PPM value.

5. Press push-button #1 to advance to the next parameter. This is the **TIME DELAY** setting associated with the **LOW** level on-off output expressed in minutes. Again, use the UP or DOWN push-buttons (#2 or #3) to set the desired time delay on the display. Leave the setting at "00" if no time delay is desired.

6. Press push-button #1 to advance to the next parameter. This is the option that allows the user to have the buzzer activated at the **LOW** level. Set the display to "1" using the "UP" push-button (#2) to have the buzzer activated – otherwise leave it at "0" using the "DOWN" push-button (#3).

7. Press push-button #1 to advance to the **HIGH 1** level on-off output (Relay 2) parameters associated with the built-in sensor. Repeat steps 4 through 6.

8. Press push-button #1 to advance to the **HIGH 2** level on-off output (Relay 3) parameters associated with the built-in sensor. Repeat steps 4 through 6.

9. Press push-button #1 to advance to the **ALARM** level on-off output (Relay 4) parameters associated with the built-in sensor. Repeat steps 4 through 6.

10. Press push-button #1 to advance to the parameter settings of the remote sensor. Repeat steps 4 through 9 as required. Please note that if the remote sensor is for **combustible** gases, the concentration displayed on the 3-digit readout is expressed in **% LEL** (lower explosive limit) values.

11. Press push-button #4 to **save** and **exit** when finished.

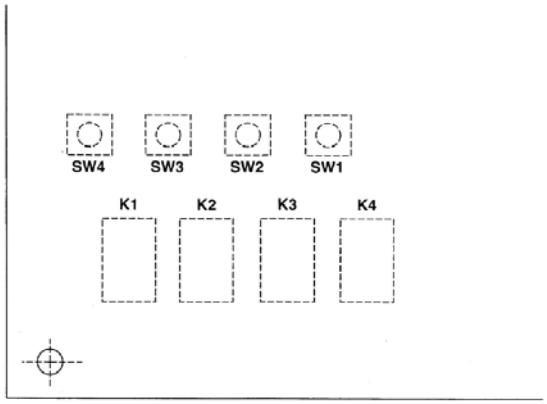


Figure 12. Switch position on the Monitor Controller Board

18- Hydrogen Gas Monitor – Electrical Schematic

This drawing is provided for reference only. It shows how the different boards are connected to the main gas detection monitor board.

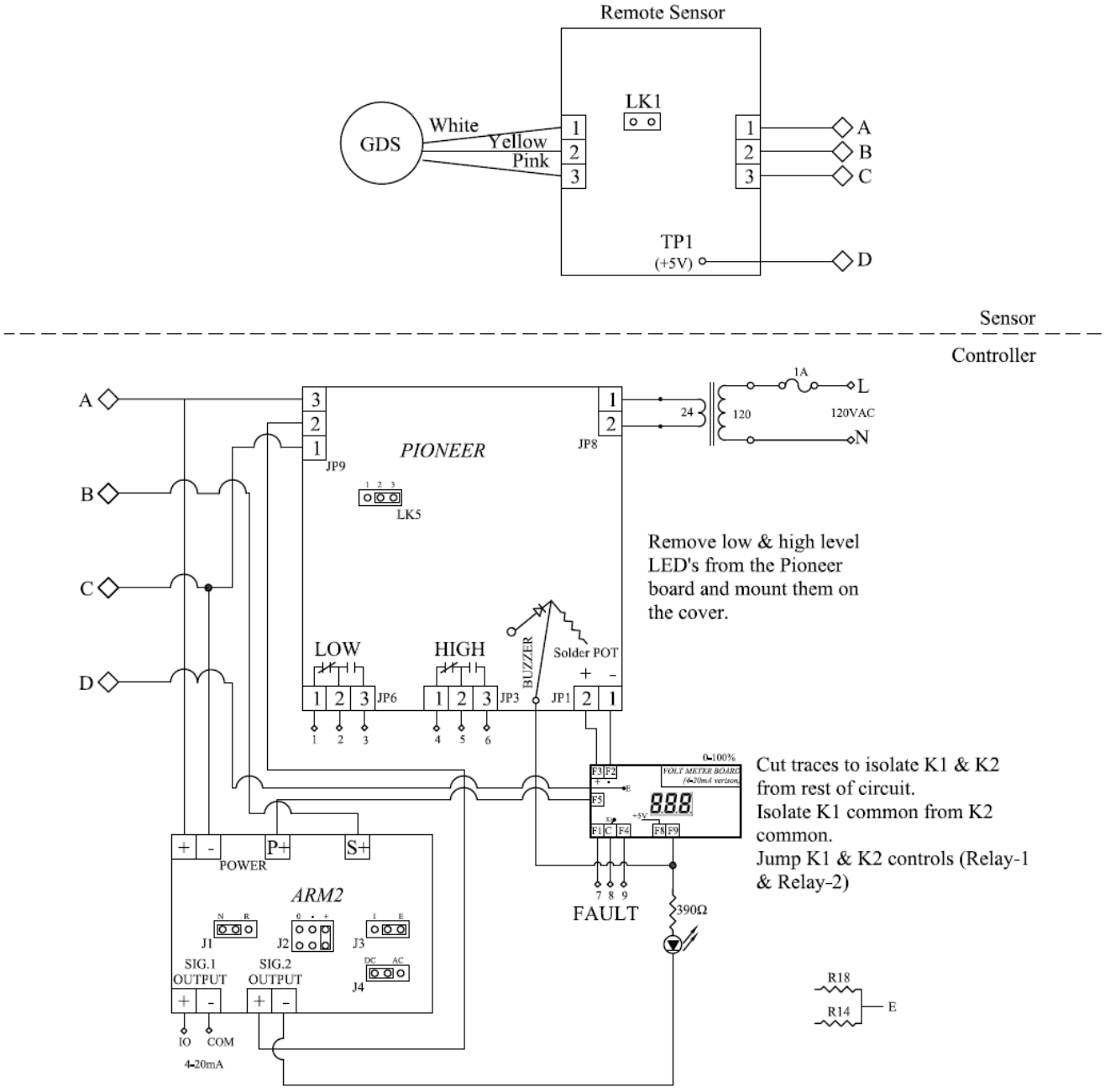


Figure 13. Electrical Wiring Schematic – Hydrogen Monitor with the Remote Sensor Option

19- Hydrogen Gas Monitor with Remote Sensor Option – Field Wiring Diagram

This Section provides the installer all necessary instructions and information on how to properly connect and wire in the field the hydrogen gas monitor with the remote sensor option.

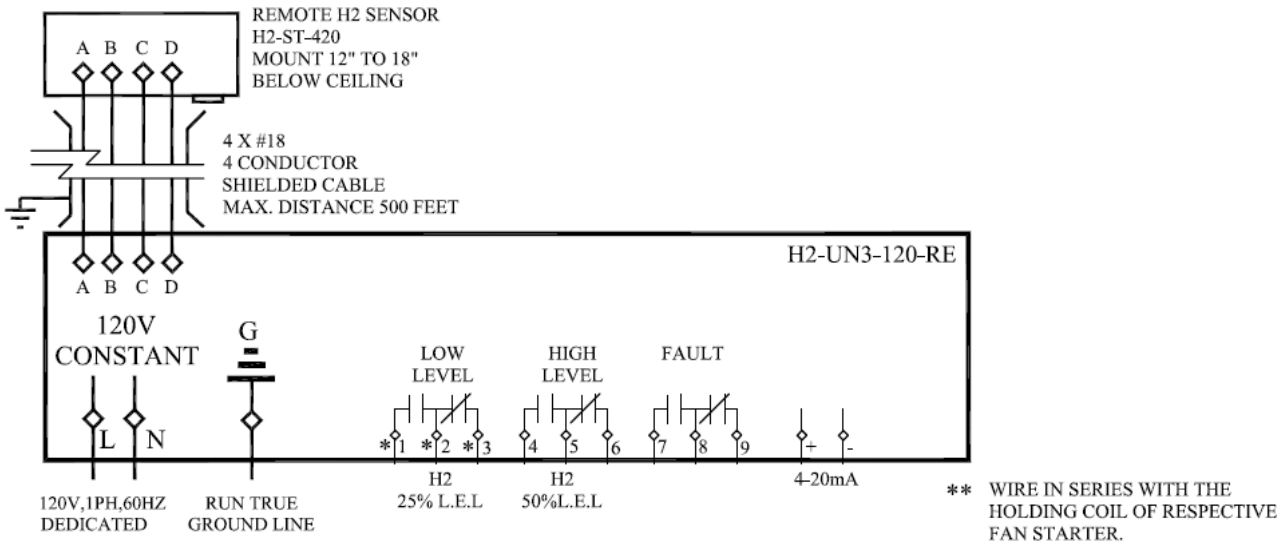


Figure 14. Electrical Field Wiring Diagram

This model FGM-H2-110 (H2-UN3) gas monitor consists of one (1) controller and one (1) remote hydrogen sensor as shown on the above diagram. The hydrogen sensor is a catalytic pellistor and has a measuring range of 0-100% LEL. The hydrogen sensor has a life expectancy of 3 years. The sensor must be discarded and replaced upon expiry of its life span. Some units come with a digital readout that displays the reading from the sensor.

Most units come with three on-board relays with status LEDs on the front of the enclosure: LOW, HIGH and FAULT. The threshold values for the relays (levels) are user-settable (see next section for details).

The relay output contacts are SPDT and have a capacity of 3 Amp. at 120 VAC. A built-in buzzer is also activated at LOW, HIGH and FAULT levels.

IMPORTANT

All systems are operated at the factory for a minimum of one week prior to factory calibration.

The unit must be powered from 110 VAC, 1PH, 60 Hz dedicated constant power source.

20- Remote Hydrogen Sensor Calibration

ABOUT THE CALIBRATION

The calibration of the FGM Series hydrogen monitor is about calibrating the sensing element located in the remote sensor enclosure (shown below) and not the controller itself.

Figure 15. External View of the Hydrogen Remote Sensor

LOCATING THE DIFFERENT COMPONENTS

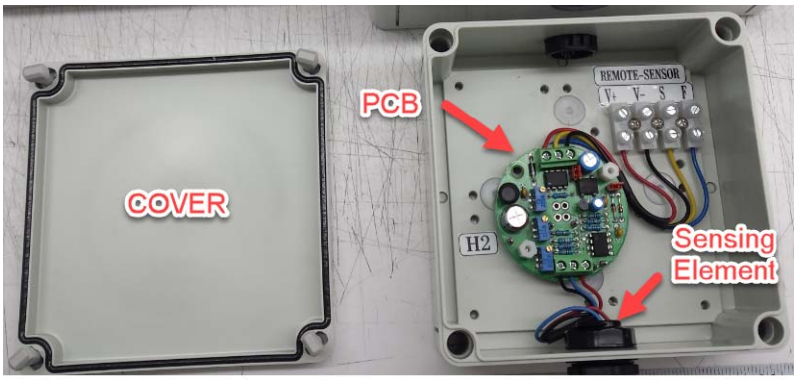


Figure 16. Internal View of the Hydrogen Remote Sensor

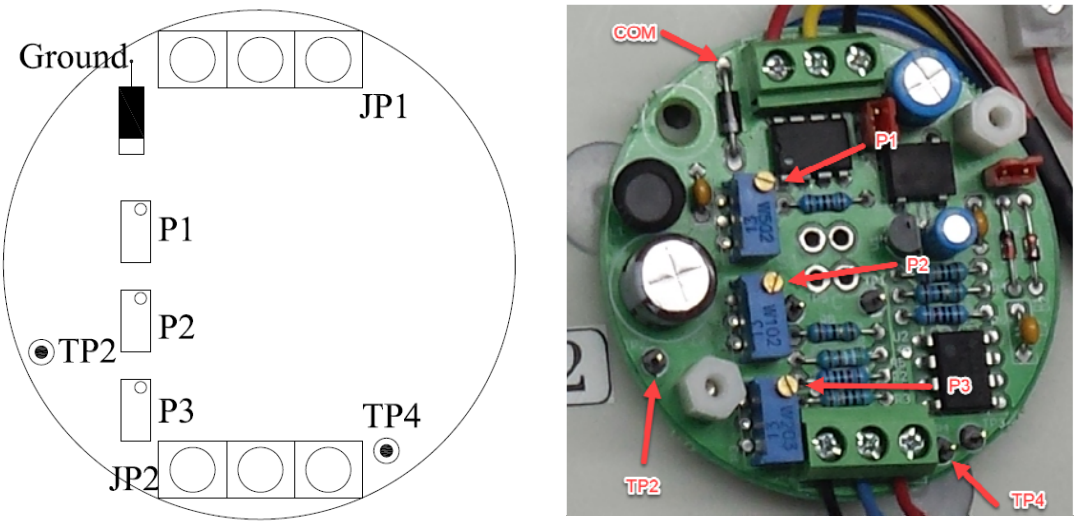


Figure 17. Identification of Important Components During the Calibration Process

TOOLS AND ACCESSORIES REQUIRED

A calibration kit is available at BeaconMedaes for purchase. The calibration kit (part number: FGM-CALKIT-H2) is composed of the following items:

Real appearance may differ from images.

The end user shall provide the following tools.

Screwdriver:	Flat head, instrumentation type (small)
Measurement device:	Voltmeter / multimeter

NOTE

Before adjusting the calibration of a sensor, verify That the age of the sensor does not exceed the life expectancy.
Hydrogen sensing elements shall be calibrated every year.
Hydrogen sensing element life expectancy is approximately three (3) years)

INSTRUCTION BEGINS

I. Open the hydrogen remote sensor enclosure so that you can access the round printed circuit board inside the enclosure.

II. Using a voltmeter, measure the sensor wheatstone bridge voltage across test points TP2 and COM. Voltage should be 2.60V DC. Else, adjust potentiometer **P1**:

- For an observed drift resulting in a displayed value that is BELOW the expected reading, slowly turn the trim screw on potentiometer P1 CLOCKWISE until the correct value is displayed.

III. Connect your voltmeter across test points TP4 and COM to measure the sensor response.

IV. Pull the calibration cylinder out of its carrying case.

V. Screw the regulator inlet into the calibration cylinder. Make sure the valve of the regulator is closed.

VI. Install the ¼" Tygon tubing on the serrated nozzle of the regulator outlet.

VII. Install the other ¼" Tygon tubing in the sensing element tube located at the bottom of the sensing element enclosure.

VIII. Link the ¼" Tygon tubes with the 1/8" green tubing.

IX. Verify sensor response voltage across test points TP4 and COM.

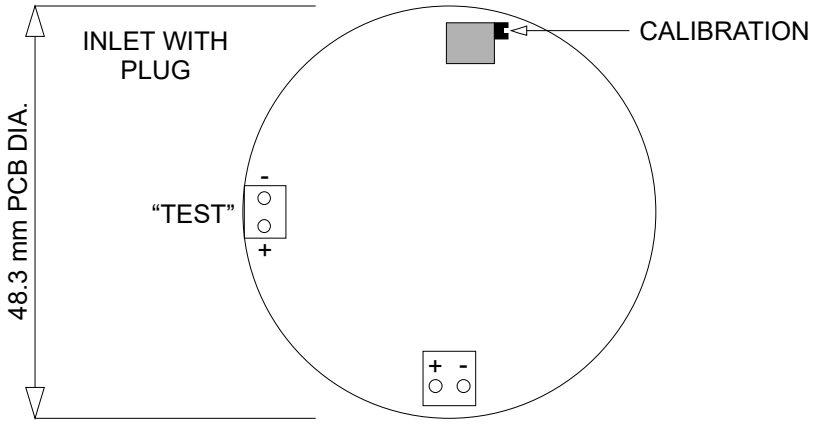
X. Inject 40% L.E.L. gas at 1~2 CFH (0.5~1 LPM) to the gas sensing cell. The sensor response voltage should rise to = 1.052V DC.. Else, adjust potentiometer P3:

- For an observed drift resulting in a displayed value that is BELOW the expected reading, slowly turn the trim screw on potentiometer P3 CLOCKWISE until the correct value is displayed.

The sensor is calibrated. Replace the cover to the sensor enclosure. Turn off the regulator needle valve. Remove the regulators from the gas cylinder. Remove the tubing from the sensor adaptor. Replace everything into the carrying case and store adequately for the next calibration.

21- Oxygen Sensor Field ReplacementDesign Changes

OXYGEN SENSOR



The usable life expectancy of an oxygen electrochemical cell is about 2 years. During that two year period, this sensing element has used up about the entire chemical that reacts with oxygen. The sensing element becomes erratic in reading and it is much more sensitive to a point where it is in alarm mode all the time. If your oxygen monitor is behaving that way, it is now time for you to replace the electrochemical cell.

You can buy the electrochemical cell from your BEACONMEDAES representative.. The oxygen electrochemical cell is supplied pre-calibrated and the sensitivity of the device should not drift by more than 2% of the full signal per month. A potentiometer for routine adjustment is located on the circuit board (see Figure above).

For calibration, the signal may be monitored using a voltmeter connected across terminals "TEST". A small nonmetallic screwdriver, with a 1.2 x 0.5 mm tip is required to adjust the potentiometer. Calibration can be carried out in ambient air by simply adjusting the calibration potentiometer until a reading of 17.4 mA is shown, or 174 mV across "TEST". This correspond to 20.9% oxygen (which is the normal level of oxygen in air) on a scale of 1-25%.

22- Design Changes

In line with our commitment to continuous improvement, BEACONMEDAES reserves the right to make design modifications or discontinue manufacture of any equipment without prior notice.

22- Warranty

The Seller expressly warrants that the products manufactured by it will be free from defects in material, workmanship and title at the date of shipment. This warranty is exclusive and is IN LIEU OF ALL IMPLIED OR STATUTORY WARRANTIES (INCLUDING WITHOUT LIMITATION, WARRANTIES AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, OR ARISING FROM COURSE OF DEALING OF USAGE OR TRADE) or any other express or implied warranties or representations. All claims under this warranty must be made in writing and delivered to the seller prior to the expiration of 1 year from the date of shipment from the factory, or be barred. Upon receipt of a timely claim, the seller shall inspect the item or items claimed to be defective, and seller shall, at its option, modify, repair, or replace free of charge, any item or items which the seller determines to have been defective at the time of shipment from the factory, excluding normal wear and tear. Inspection must be performed at the seller's plant and in such event, freight for returning items to the plant shall be paid by Buyer. Seller shall have no responsibility if such item has been improperly stored, installed, operated, maintained, modified and/or repaired by an organization other than the seller. Adjustment for products not manufactured by Seller shall be made to the extent of any warranty of the manufacturer or supplier thereof. The foregoing shall be the Seller's sole and exclusive liability and buyer's sole and exclusive remedy for any breach of warranty or for any other claim based on any defect in, or non-performance of, the products whether based on breach of contract or in tort, including negligence or strict liability.

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