Critical Environment Technologies™

Operation Manual



Rev. B | 2020.05

ESH-A Remote Sensor

www.critical-environment.com

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1 POLICIES

1.1 Important Note

Read and understand this manual prior to using this instrument. Carefully read the warranty policy, service policy, notices, disclaimers and revisions on the following pages.

This product must be installed by a qualified electrician or factory trained technician and according to instructions indicated in this manual. This instrument should be inspected and calibrated regularly by a qualified and trained technician. For more information, refer to Section *8 Calibration* and Section *10 Maintenance* of this manual.

This instrument has not been designed to be intrinsically safe. For your safety, **do not** use it in classified hazardous areas (explosion-rated environments).

INSTRUMENT SERIAL NUMBER:

_____

PURCHASE DATE:

_____

PURCHASED FROM:

_____

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1.2 Warranty Policy

Critical Environment Technologies Canada Inc. warrants the products we manufacture (excluding sensors, battery packs, batteries, pumps, and filters) to be free from defects in materials and workmanship for a period of two years from the date of purchase from our facility. As a reminder, sensors are consumable items and once they leave our factory, we cannot reuse or resell them. As such, all sensor sales are final. Should the sensor itself be faulty, there is a one-year pro-rated warranty that would apply from the date of purchase from our facility.

The warranty status may be affected if the instrument has not been used and maintained as per the instructions in the manual or has been abused, damaged, or modified in any way. The product is only to be used for the purposes stated in the manual. Critical Environment Technologies is not liable for auxiliary interfaced equipment or consequential damage.

All returned goods must be pre-authorized by obtaining a Returned Merchandise Authorization (RMA) number. All goods must be shipped to Critical Environment Technologies freight prepaid. Contact the manufacturer for an RMA number and procedures required for product transport.

Due to ongoing research, development, and product testing, the manufacturer reserves the right to change specifications without notice. The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of this data.

1.3 Service Policy

CETCI maintains an instrument service facility at the factory. Some CETCI distributors / agents may also have repair facilities; however, CETCI assumes no liability for service performed by anyone other than CETCI personnel.

Repairs are warranted for 90 days after date of shipment (sensors have individual warranties). Should your instrument require non-warranty repair, you may contact the distributor from whom it was purchased or you may contact CETCI directly.

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Prior to shipping equipment to CETCI, contact our office for an RMA #. All returned goods must be accompanied with an RMA number.

If CETCI is to do the repair work, you may send the instrument, prepaid, to:

Attention: Service Department
Critical Environment Technologies Canada Inc.
Unit 145, 7391 Vantage Way
Delta, BC, V4G 1M3

You must include your Returned Merchandise Authorization (RMA) number, address, telephone number, contact name, shipping / billing information, and a description of the defect as you perceive it. You will be contacted with a cost estimate for expected repairs, prior to the performance of any service work. Pack the equipment well (in its original packing if possible), as we cannot be held responsible for any damage incurred during shipping to our facility. All incurred shipping charges, duties and taxes are your responsibility.

For liability reasons, CETCI has a policy of performing all needed repairs to restore the instrument to full operating condition.

1.4 Copyrights

This manual is subject to copyright protection; all rights are reserved. Under international and domestic copyright laws, this manual may not be copied or translated, in whole or in part, in any manner or format, without the written permission of CETCI.

1.5 Disclaimer

Under no circumstances will CETCI be liable for any claims, losses or damages resulting from or arising out of the repair or modification of this equipment by a party other than CETCI service technicians, or by operation or use of the equipment other than in accordance with the printed

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instructions contained within this manual or if the equipment has been improperly maintained or subjected to neglect or accident. Any of the forgoing will void the warranty.

Under most local electrical codes, low voltage wires cannot be run within the same conduit as line voltage wires. It is CETCI policy that all wiring of our products meet this requirement.

It is CETCI policy that all wiring be within properly grounded (earth or safety) conduit.

1.6 Revisions

This manual was written and published by CETCI. The manufacturer makes no warranty or representation, expressed or implied including any warranty of merchantability or fitness for purpose, with respect to this manual.

All information contained in this manual is believed to be true and accurate at the time of printing. However, as part of its continuing efforts to improve its products and their documentation, the manufacturer reserves the right to make changes at any time without notice. Revised copies of this manual can be obtained by contacting CETCI or visiting www.critical-environment.com

Should you detect any error or omission in this manual, please contact CETCI at the following address:

Critical Environment Technologies Canada Inc.
Unit 145, 7391 Vantage Way, Delta, BC, V4G 1M3, Canada
Toll Free: +1.877.940.8741
Telephone: +1.604.940.8741
Fax: +1.604.940.8745
Email: marketing@cetci.com
Website: www.critical-environment.com

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In no event will CETCI, its officers or employees be liable for any direct, special, incidental or consequential damages resulting from any defect in any manual, even if advised of the possibility of such damages.

2 INTRODUCTION

2.1 General Description

Thank you for purchasing our ESH-A Remote Sensor. The ESH-A Remote Sensor offers flexible location monitoring of combustible or PID TVOC gases in non-hazardous, non-explosion rated commercial and light industrial applications.

The ESH-A Remote Sensor communicates with a controller or transmitter using a current loop into a 100 ohm load or a voltage signal of 0.40 to 2 volts. **Each ESH-A is given the same serial number as the device it is being connected to. Make sure to connect the ESH-A to the controller or transmitter that has the same serial number or the system won't work.** It can be located at a maximum distance of 200 ft (61 m) from the controller / transmitter. **The ESH-A is not a standalone device.**

The sensor is protected in our standard water/dust tight, corrosion resistant ABS/poly-carbonate enclosure which also provides easy mounting components. An optional splash guard may be installed to further protect the remote sensor in water spray or wash down applications.

All ESH-A Remote Sensors operate by diffusion. The sensors utilized in this device are accurate enough to measure to Occupational Health & Safety (OHS) hazardous levels for toxic gases.

If after reading through the manual, you have any questions, please do not hesitate to contact our Technical Service Department for technical support at help@cetci.com or
Toll Free: +1.877.940.8741
Telephone: +1.604.940.8741

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2.2 Key Features

- Allows remote location monitoring of combustible (catalytic) or PID TVOC gases
- 12 - 24 VDC power (nominal)
- Current or voltage output signal
- Communicates with CETCI's controllers and transmitters
- Standard water / dust tight, corrosion resistant enclosure (drip proof). With the optional splash guard installed it is IP54 rated, for splash or hose-down applications.
- RoHS compliant circuit boards
- Easy to install and maintain

3 INSTRUMENT SPECIFICATIONS

3.1 Technical Specifications

GAS TYPE	
Combustible (catalytic)	Hydrogen (H_2), Methane (CH_4), Propane (C_3H_8)
PID	TVOCs
Infrared	Propane (C_3H_8)

MECHANICAL	
Enclosure	ABS / Polycarbonate, IP54 rated with optional splash guard installed. Copper coated interior to reduce RF interference.
Weight	340 g (12 oz)

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Size	127 mm x 127 mm x 53 mm / 5.0″ x 5.0″ x 2.1″

ELECTRICAL

Power Requirement	16-30 VDC, 1W, Class 2 12-27 VAC, 50-60 Hz, 1VA, Class 2
Outputs	current or voltage
Wiring	VDC four conductor shielded 18 awg (or larger) stranded within conduit (refer to Section *6.7.1 Wire Gauge vs. Run Length)*

ENVIRONMENTAL

Operating Temperature	-20°C to 40°C / -4°F to 104°F
Operating Humidity	15 - 90% RH non-condensing

COMPATIBLE WITH THESE CETCI PRODUCTS

Controllers	SCC Self Contained (single or dual channel) DCC Dual Channel (single or dual channel)
Transmitters	LPT-A Analog (single channel) LPT-P Car Park Digital (single, dual or three channel) LPT-M Modbus (single, dual or three channel) LPT-B BACnet (single, dual or three channel)

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CERTIFICATION

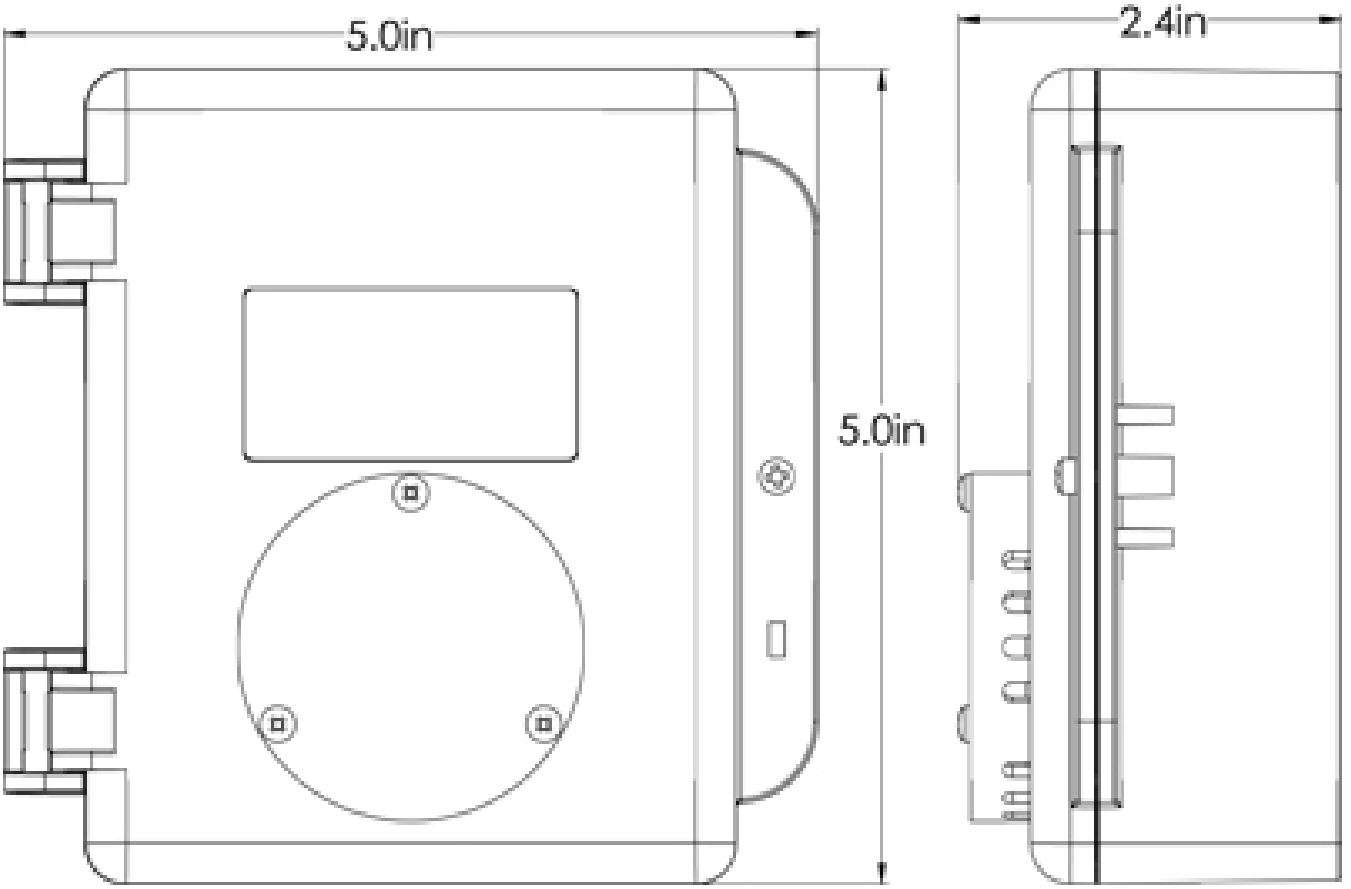
Model: ESH-A-XXXX
S/N: same serial# as controller or transmitter connected to
Rating: 16-30 VDC, 1W, Class 2
12-27 VAC, 50-60 Hz, 1VA, Class 2

CERTIFIED FOR ELECTRIC SHOCK & ELECTRICAL FIRE HAZARD ONLY. LA CERTIFICATION ACNOR COUVRE UNIQUEMENT LES RISQUES DE CHOC ELECTRIQUE ET D'INCENDIE D'ORIGINE ELECTRIQUE.

Conforms to: CSA-C22.2 No. 205-12, UL508 (Edition 17):2007
Conforms to: EMC Directive 2004/108/EC, EN 50270:2006, Type 1, EN61010
Conforms to: FCC. This device complies with part 15 of the FCC Rules, Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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3.2 Standard Enclosure Dimensions



Above dimensions are shown with optional splash guard. Without splash guard, thickness is 53.34 mm (2.1″). The area required for enclosure door to be open 90 degrees is 155.7 mm (6.13″) or 243.84 mm (9.6″) for fully open. With the splash guard, the enclosure has an IP54 rating.

NOTE: Response time will be slower with a splash guard installed.

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4 SENSOR SPECIFICATIONS

4.1 List of Available Remote Sensors

ESH-A Remote Sensors - Combustible (Catalytic)			
Hydrogen (H_2)	ESH-A-CH2-100	0 - 100% LEL	~5 years
Methane (CH_4)	ESH-A-CH4-100	0 - 100% LEL	~5 years
Propane (C_3H_8)	ESH-A-C3H8-100	0 - 100% LEL	~5 years
ESH-A Remote Sensors - TVOC PID			
TVOC PID	ESH-A-SPL	0 - 30 ppm	usage / application dependent
TVOC PID	ESH-A-SPH	0 - 300 ppm	
ESH-A Remote Sensors - Infrared			
Propane (C_3H_8)	ESH-A-JET	0 - 100% LEL	~8 years

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5 FEATURES & FUNCTIONS

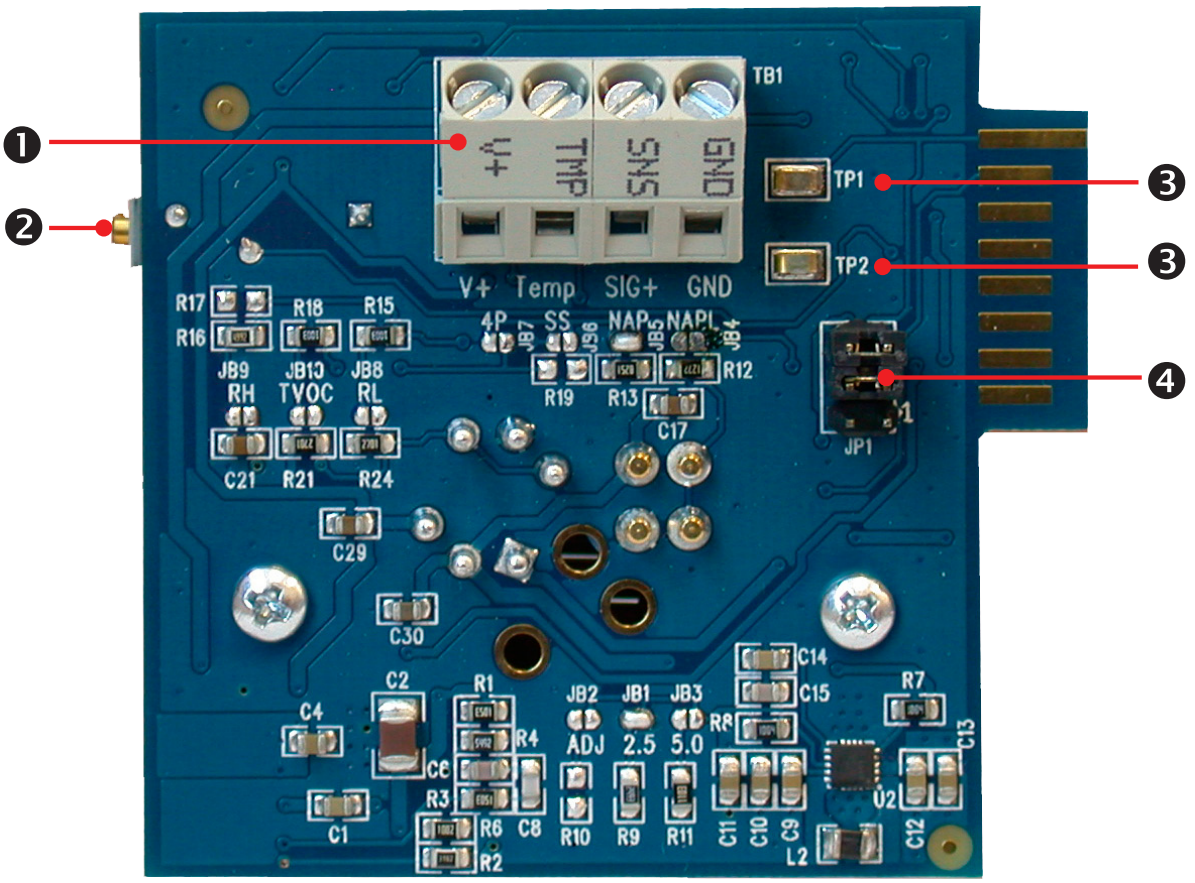
5.1 Exterior Enclosure



NUMBER	FEATURE	FUNCTION
❶	Door Hinge	Secures door
❷	Gas Type	Indicates sensor gas type
❸	Door Screw	Secures door
❹	Sensor Opening	Allows gas diffusion into sensor
❺	Padlock Opening	For security padlock

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5.2 Interior System Layout



NUMBER	FEATURE	FUNCTION
❶	Wiring Terminal	V+ is the 12 - 24 VDC power supply TMP/Temp is for the temperature signal output to the controller/ transmitter SNS/SIG+ is the signal output to the controller/transmitter GND is the ground connection
❷	POT RN1 (Potentiometer)	Used for Zero calibration of a new or replacement sensor. TP1 and TP2 calibrate to 0.40 VDC with Null gas applied.
❸	Test Points: TP1 & TP2	For adjusting a new or replacement sensor to Zero. TP1 and TP2 calibrate to 0.40 VDC with Null gas applied.

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❹	JP1 Jumper Bank Pin 1 - internal load resistor Pin 2 - resting position Pin 3 - external connection	JP1-1 and JP1-2 are used to calibrate a new sensor JP1-1 and JP1-3 are used to set the voltage output JP1-2 and JP1-3 are used to set the current output

6 INSTALLATION

6.1 General Safety Warnings

The ESH-A Remote Sensor is intended for indoor use, permanently mounted at a height that is appropriate for the type of gas being monitored. See Section *6.5 Sensor Mounting Heights*. The ESH-A Remote Sensor should be protected from extreme weather conditions.

The ESH-A Remote Sensor requires no assembly and virtually no maintenance other than regular calibration of the sensor and ensuring that excess water or dust is not somehow entering the enclosure and physically damaging the circuit board or internal components. There are no serviceable elements other than the calibration instructions outlined in this manual. There are no replaceable components except the sensors.

6.2 Protection Against Electrical Risks

Disconnect all power before servicing. Power is supplied by the controller or transmitter and may have a building installed circuit breaker / switch that is suitably located and easy to access when servicing (disconnecting power to the controller or transmitter). Appropriate markings should be visible at the circuit breaker / switch that is supplying power to the controller or transmitter.
This device may interfere with pacemakers. Modern pacemakers have built-in features to protect them from most types of interference produced by other electrical devices you might encounter in your daily routine. If you a have a pacemaker, follow your healthcare provider's instructions about being around this type of equipment.

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6.3 Protection Against Mechanical Risks

The door of the enclosure can be removed if absolutely necessary to facilitate installation of the base but it is not recommended on this version. Extreme care and caution must be exercised when removing the door to avoid damaging the hinges. The door should only be removed when absolutely required. Any damage occurring from door removal procedure will not be covered under warranty.

Simply grasp the door with one hand, being careful not to make contact with any of the internal components (circuit board), grasp the base with your other hand. Tug on the base and pull straight apart. **DO NOT TWIST**. The section of the hinges located on the base should "snap" apart from the part of the hinges located on the door.

After installation, simply locate the lid hinges over the installed base hinges and pull toward you. The hinges should easily "snap" back into place.

The enclosure has one screw securing the door to the base for electrical safety and provides an opening to allow the user to apply a padlock or tie wrap if they desire the transmitter to be locked. See Section *5.1 Exterior Enclosure*.

Be aware that the hinged door that could potentially pinch fingers and the sharp edges and/or jumper pins on the board could potentially prick or cut fingers if not handled carefully.

6.4 System Installation

The ESH-A Remote Sensor should be installed on a flat vertical surface using the four 4.4 mm (0.175") diameter mounting holes provided to maintain water tight status. Care should be taken to ensure that the face of the enclosure and specifically the vent opening is not obstructed in order to maximize the sensor's exposure to the environment being monitored.

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Two 12.7 mm (½") conduit entry points are provided in the enclosure. Both are located in the enclosure base. One in the rear of the base and one on the bottom edge of the base. See Section *6.6 Enclosure Mounting Components*.

The clearance from the PCA to the base enclosure is 12.7 mm (½"). **Do not use a conduit connector that has more than 12.7 mm (½") of thread length.**

NOTE: When mounting the enclosure, allow enough room to allow the end user to open the door fully to access the internal adjustments.

6.4.1 Wet Environment Considerations

If the ESH-A is to be installed in a potential hose-down application or any application whereby liquid could be directed towards the sensor opening, the ESH-A should be ordered with an optional attached splash guard (factory installed).

If used in a wet or wash down application, the conduit hub entering the ESH-A enclosure must be liquid tight type.

Any water or physical damage to the transmitter that occurs from the installer drilling their own installation holes will not be covered under warranty.

6.4.2 EMI and RF Interference Considerations

All electronic devices are susceptible to EMI (Electromagnetic Interference) and RFI (Radio Frequency Interference). Our detectors have been designed to reduce the effects of these interferences and we meet CSA FCC and CE requirements for these type of devices. However there are still circumstances and levels of interference that may cause our equipment to respond to these interferences and cause them to react as if there has been gas detected.

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There are some installation procedures that will reduce the likelihood of getting faulty readings:

1. Locate the detectors and controllers out of the way from normal foot traffic and high energy equipment.
2. Confirm the devices are properly grounded using conduit and shielded cabling.
3. Inform operators and technical staff working in the surrounding area to be aware of these possible conditions and that two way radios, Bluetooth enabled devices, cell phones and other electrical equipment may interfere with the response of the gas detectors.

6.5 Sensor Mounting Heights

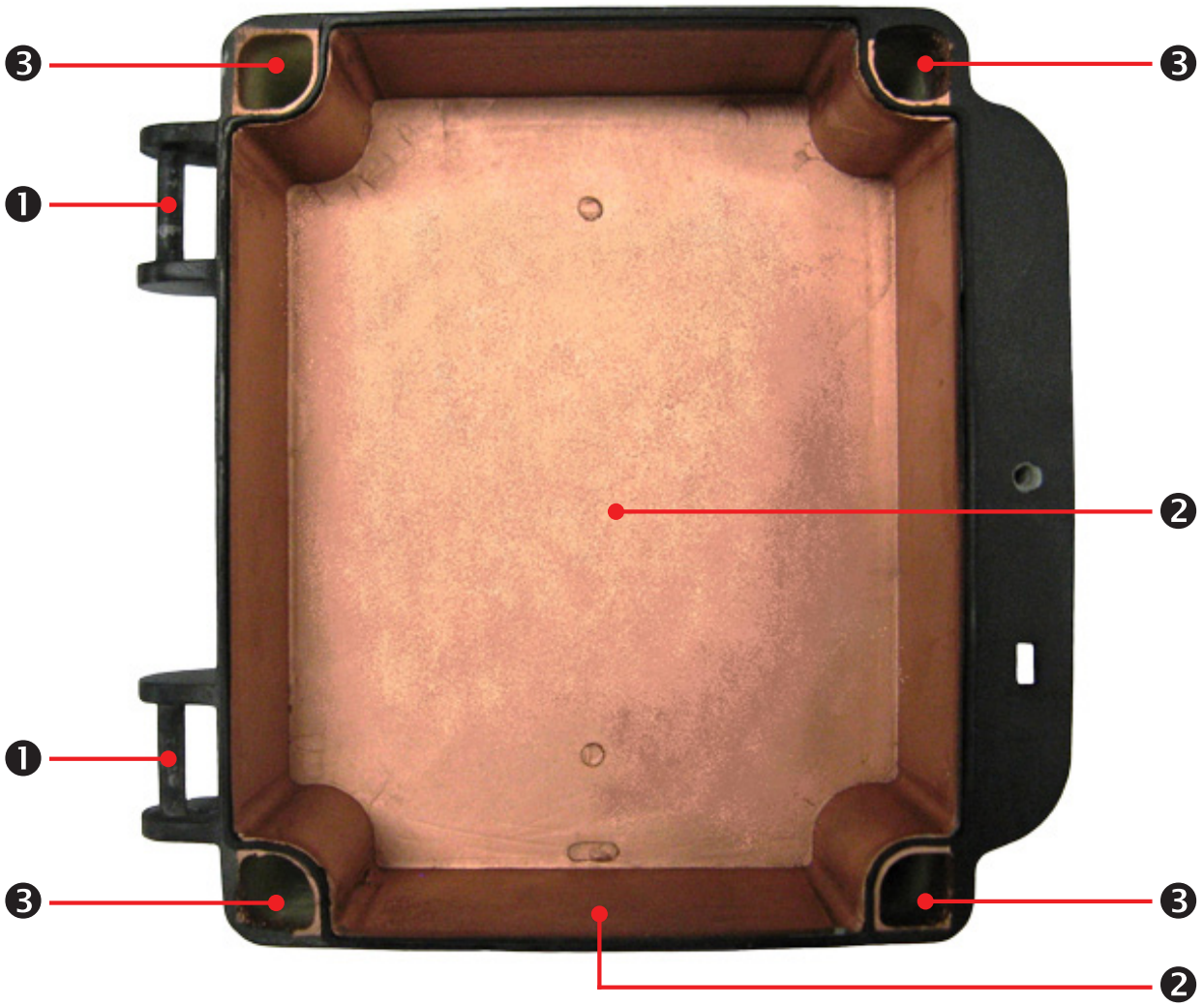
The sensor mounting height depends on the density of the gas relative to air. Heavier than air gases should be detected 15.24 cm (6") from the floor, lighter than air gas sensors should be placed on or near the ceiling, and gases which have a density close to that of air should have sensors installed in the "breathing zone" 1.22 - 1.83 m (4 - 6 ft) from the floor. The breathing zone refers to the area 1.22 - 1.83 m (4 - 6 ft) from the floor, where most human breathing takes place. This is a good default location for sensors, as many gases are often well dispersed in air.

GAS	APPLICATIONS / TYPES	SUGGESTED MOUNTING HEIGHT
Propane (C_3H_8)	Propane fueled vehicles	15.24 cm (6") above the floor
Methane (CH_4)	buildings built on landfill sites	near the ceiling
Hydrogen (H_2)	electric vehicle or equipment charging stations	near the ceiling
TVOCs	various	target gas dependent

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6.6 Enclosure Mounting Components

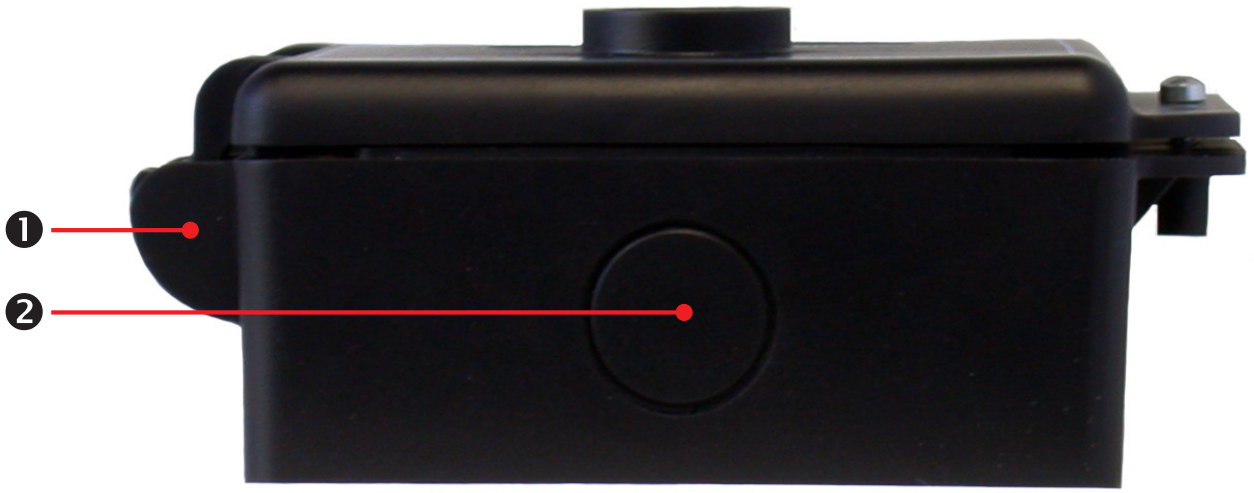
6.2.1 Enclosure Base



NUMBER	FEATURE
1	Door hinge
2	12.7 mm (1/2") conduit entry knockout
3	Mounting holes

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6.2.2 Enclosure Bottom



NUMBER	FEATURE
❶	Door hinge
❷	12.7 mm (1/2″) conduit entry knockout

6.7 Wiring Connections

NOTE: Refer to the Operation Manual of the controller or transmitter you are connecting the ESH-A Remote Sensor to for specific wiring instructions.

IMPORTANT: Each ESH-A is given the same serial number as the device it is being connected to. Make sure to connect the ESH-A to the controller or transmitter that has the same serial number or the system won't work.

All wiring should be run within properly grounded (earth or safety) conduit. Signal output and supply should be in shielded cable. The cable shield should be connected to earth ground at the controller/transmitter that is providing power for the ESH-A Remote Sensor.

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The ESH-A Remote Sensor is a low voltage powered device. Any application of operating voltages higher than indicated in the specification may result in damage.

Under most local electrical codes, low voltage wires cannot not be run within the same conduit as line voltage wires.

Four-conductor, 16-18 AWG stranded shielded cable is required for the ESH-A Remote Sensor wiring. This wiring should be run in a conduit, separate from the signal output, and should not exceed 61 m / 200 ft.

The voltage at the remote sensor (Red V+ to Black GND) should be 12 - 24 VDC. If this voltage is not met after installation, the wrong gauge wire may have been used or the wiring run is too long.

NOTE: WARRANTY MAY BE VOID IF DAMAGE OCCURS TO CIRCUIT BOARD COMPONENTS FROM THE USE OF SOLID CORE WIRE ATTACHED DIRECTLY TO THE WIRING TERMINALS. When using solid core wiring for distribution (in the conduit), use stranded wire pigtails 18 awg within the enclosure to connect to the circuit board. The rigidity of solid-core wire can pull a soldered terminal strip completely off a circuit board and this will not be covered under warranty.

The wiring terminal strips on the ESH-A Remote Sensor circuit board are mounted on a 30 degree angle, making the wiring connections easier to install.

Device must be used with rated equipment. External power to the ESH-A is supplied by the controller or transmitter it is connected to.

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6.7.1 Wire Gauge vs Run Length

SUPPLY VOLTAGE	MAXIMUM LOAD (Wire + Termination Resistor) (ohms)	WIRE GAUGE (AWG)	MAXIMUM CABLE LENGTH (feet)
12 - 24 VDC	100	14 - 18	200

7 OPERATION

7.1 System Operation

Upon application of power, there is a warm-up period (typically five minutes, but varies with sensor type) the output signal is fixed at 4.0 mA (current) or 0.40 volts (voltage). After the warm up period, the system may exhibit gas alarm condition if the sensor has not completely stabilized during the warm up period. This is normal and the length of time the gas alarm exists is dependent upon the length of time since the unit was last powered up and the state of the environment it is installed in.

NOTE: A new or replacement sensor will require a warm-up period of 48 hours upon first installation /calibration. Refer to Section *8.2 Zero Calibration of a New or Replacement Sensor*

During normal operation, the gas level will be reported through the current loop (or voltage) output back to the controller or transmitter.

7.2 Fault Detection

In the event of a problem with the measurement circuitry or dead or damaged sensor, the signal between the ESH-A Remote Sensor and the controller or transmitter may drop and the controller/ transmitter may indicate a fault condition on the display (if equipped with one) or via the Fault LED. Normal operation will resume once the fault condition has been rectified.

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7.3 Selecting the Output Signal

The default signal output mode is a current loop. Zero concentration gas will output 4.0 mA and full scale gas concentrations will depend on the sensor age and output.

The output can be changed to voltage (0.4 - 2.0 volt) **only if directed by CETCI**, by moving the jumper at JP1 from the JP1-1 to the JP1-3 position. The voltage signal will swing from 0.4 volts to indicate no gas detected, to 2.0 volts (depending on age of sensor) to indicate full scale gas detected.

8 CALIBRATION

There are two different processes for calibrating an ESH-A Remote Sensor. One process is for a properly functioning (responsive) sensor and the other is for a new or replacement sensor.

8.1 Zero Calibration of a Responsive Sensor

If the sensor does not need to be replaced and is responding correctly, the Zero and Span calibrations will need to be done at the controller or transmitter that the ESH-A is connected to.

Make sure both the Controller or transmitter and the ESH-A Remote Sensor are powered up and have warmed up for a 24 hour period prior to calibration. Place the Channel select jumper on the controller or transmitter on the channel assigned to the ESH-A and follow the instructions in the Calibration section of the Operation Manual for the controller or transmitter the ESH-A is connected to, **with the exception that the gas should be applied to the ESH-A sensor opening instead of the transmitter or controller's sensor opening.**

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8.2 Zero Calibration of a New or Replacement Sensor

If a new replacement sensor has been installed, the ESH-A will require a Zero calibration of its sensor. This process will normally be required if the sensor has been replaced or there is concern that the sensor is not responding correctly.

Power up the ESH-A Remote Sensor and leave it on; the new sensor should be allowed to warm-up for a 24 hour period prior to calibration.

1. Move the jumpers from their resting position to JP1-1 and JP1-2.
2. Apply the correct Null gas for the type of sensor installed, for a minimum of 2 minutes.
3. Attach a volt meter to TP1 and TP2.
4. Using the POT RN1 potentiometer (located on the left underside of the board), adjust the voltage to read 0.40 VDC.
5. Return the jumpers to their original positions.

9 ACCESSORIES

9.1 Splash Guard (p/n/: S)

The splash guard attaches to the front of the enclosure to protect the sensor during water spray or washdown applications. It is factory installed and when attached the enclosure meets IP54 standards.



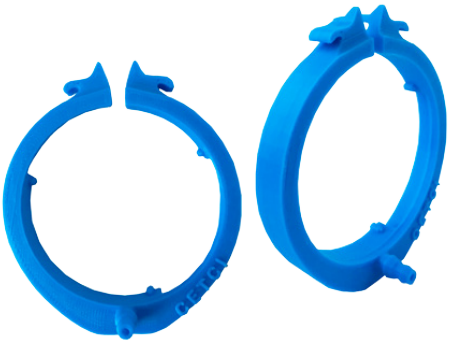
NOTE: The splash guard will slow down the response time of the sensor.

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9.2 Calibration Adapter Clip "Cal Clip" (p/n: CET-SGC)

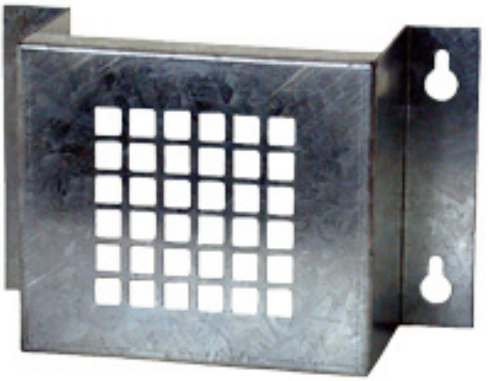
To calibrate an ESH-A with a factory installed splash guard (Option -S), attach the Cal Clip around the splash guard. The small barb hose fitting accommodates standard or Teflon tubing of 1/8" (3.175 mm) ID and 3/16" (4.762 mm) ID. The Cal Clip **must be removed during normal operation** or else the gas readings will not be accurate.





9.3 Metal Protective Guard (p/n: SCS-8000-RSG)

The metal protective guard is made of heavy duty metal and helps to protect against abrasive damage, theft and vandalism to the transmitters. It is made from 16-gauge galvanized steel and has 13 mm (½") square openings in the front to allow gas and air to flow through to the sensor. With only four slotted mounting holes, installation and removal for equipment servicing is easy.



Enclosure	16 gauge galvanized steel
Weight	800 g (28 oz)
Size	178 mm W x 160 mm H x 91 mm D (7.0" W x 6.3" H x 3.6" D)

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9.4 Calibration Kit (p/n: CET-715A-CK1)

The Calibration Kit contains the items necessary for common field and shop calibrations. It comes in a durable, hard plastic carrying case and includes a regulator, adapters, humidification chamber, brass fitting, hand tools and tubing. It does not include cylinders of gas. These must be ordered separately.



Calibration Kits and gases are available from the CETCI factory. Many gases, but not all are carried in inventory. Check with any CETCI authorized distributor for availability of specific gas types. **Gas cylinders cannot be shipped from Canada to other countries, including the USA.** For more information check out our website: https://www.critical-environment.com/products/options-accessories/calibration-kit

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10 MAINTENANCE

The ESH-A Remote Sensor requires virtually no maintenance other than regular calibration.

The device should be monitored for possible damaging conditions.

- The sensor port should be kept free of dirt or soot build up.
- If in a damp location, source of water should be shielded from contacting the top of the device.
- If located in a working area, the front of the device should be kept clear.
- If painting is to be conducted in close proximity, the device needs to be protected from over spray and the sensor port should not receive paint fumes as these fumes may damage or reduce the life of the sensor.

11 TROUBLE SHOOTING

ESH-A won't power up.

Check the connections. Is the ESH-A properly connected to the controller or transmitter and is the controller or transmitter connected properly to a power supply?

Controller or transmitter shows a fault.

Check the ESH-A remote sensor. The signal will drop if the sensor fails.

After suggested warm up period, controller or transmitter shows readings that don't make sense.

Check to make sure the ESH-A that is connected to the transmitter or controller matches the serial number of said transmitter/controller. Each ESH-A is given the same serial number as the device it is being connected to. Make sure to connect the ESH-A to the controller or transmitter that has the same serial number or the system won't work properly.

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