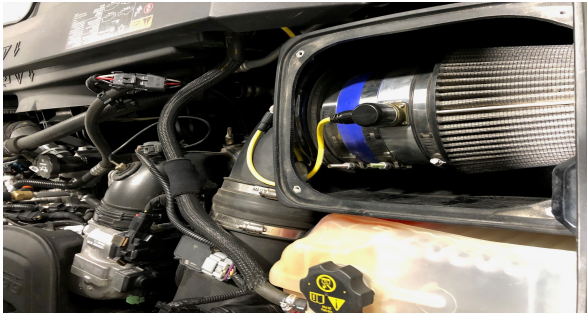




# ShockerEDGE

## EARLY DETECTION OF GAS EXPOSURE

**ShockerEDGE is the newest technology in more than 50 years to control a diesel engine runaway. ShockerEDGE is also the first of its kind to control a spark ignited gasoline engine.**



We install a state-of-the-art gas sensor in the air intake system of the engine, that reads flammable gases. Unlike Cat bead/Pellister type sensors, the gas sensor calibrates itself every 2.0 seconds using up to date ambient temperature, barometric pressure, and relative humidity. It does not require bump gas, docking stations or an instrument technician to recalibrate 4 times a year.

The sensor reads the chemical composition of the air being drawn into the engine, then transmits the data to the ShockerEDGE controller and the ShockerEDGE display.

Once the data is received by the controller, it can be programmed to turn the engine off at 7.5% LEL, long before a diesel engine runaway can occur, or a gasoline engine starts to backfire. The controller can also be programmed to activate your ShockerPASS air shutoff valve on a diesel engine.



The data is also sent to the display, giving you a real time display of the sensors findings.

### Main Screens

- Including:
- System and sensor status
  - Temperature, humidity, and barometric pressure
  - Settings tab
  - Gas status and identification
  - Concentration of gas detected
  - Alarm Status
  - Data logging

**Main**

Gas ID: **No Gas**

Concentration: **0.0 %LEL**

LEL Alarm: **Normal**

System State: **Monitoring**

RH 34% 21.3°C 93 kPa

**Less than 2.5% Gas Detected**

**Main**

Gas ID: **Medium Gas**

Concentration: **6.5 %LEL**

LEL Alarm: **Warning**

System State: **Monitoring**

RH 34% 21.3°C 93 kPa

**2.5% to 7.5% Gas Detected**

**Main**

Gas ID: **Medium Gas**

Concentration: **7.6 %LEL**

LEL Alarm: **Shutdown**

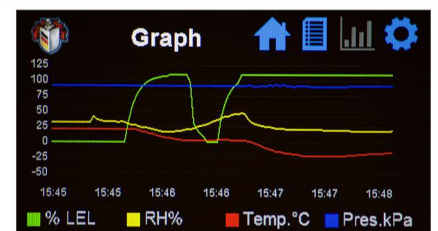
System State: **Monitoring**

RH 34% 21.3°C 93 kPa

**More than 7.5% Gas Detected**

**Event Log**

- 10/18/22 14:22:44: No Gas 0.0% NORMAL
- 10/18/22 14:22:20: Medium Gas 7.3% WARNING
- 10/18/22 14:21:43: Medium Gas 15.3% SHUTDN
- 10/18/22 08:56:50: MONITORING
- 10/18/22 08:56:27: STARTING
- 01/18/22 08:56:16: GAS SENSOR OFF
- 07/18/22 08:56:22: STARTING
- 01/18/22 08:56:31: GAS SENSOR OFF



**Details**

Screen Brightness: [Slider]

Screen Timeout: 10 min.

Date: 10/18/2022

Time: 15:51:03

Temperature unit:  °C  °F

Time format:  24h  12h

Date format:  YMD  MDY  DMY

**SV Test Log**

- 10/18/22 15:53:30: TEST MODE END
- 10/18/22 15:52:32: Medium Gas 36.5% SHUTDN
- 10/18/22 15:52:32: TEST MODE START
- 10/17/22 19:04:40: TEST MODE END
- 10/17/22 15:01:38: TEST MODE START
- 10/17/22 14:00:35: TEST MODE END
- 10/17/22 14:00:35: TEST MODE START
- 10/17/22 14:00:35: TEST MODE END

# GAS CLASSIFICATION

## CLASS 1: Hydrogen

Molecular Weight: 2.0 [g/mol]

Density: 0.09 [kg/m<sup>3</sup>]

Number of Carbons: 0



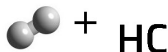
## CLASS 2: Hydrogen Mixture

Avg. Mol. Weight: 1-14 [g/mol]

Avg. Density: 0.1-0.6 [kg/m<sup>3</sup>]

Number of Carbons: varies

This classification is unique as it guarantees the presence of hydrogen and another flammable gas



## CLASS 3: Methane/Natural Gas

Avg. Mol. Weight: 16 to 19 [g/mol]

Avg. Density: 0.6-0.9 [kg/m<sup>3</sup>]

Typical Number of Carbons: 0-2

Gases having molecular properties similar to that of methane may be classified as methane (e.g. ammonia, acetylene)



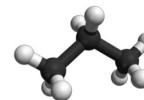
## CLASS 4: Light Gas (or Light Gas Mixture)

Avg. Mol. Weight: 25 to 75 [g/mol]

Avg. Density: 1.2-2.5 [kg/m<sup>3</sup>]

Typical Number of Carbons: 1-4

Example Gases: Ethane, Propane, Isopropanol



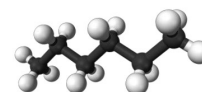
## CLASS 5: Medium Gas (or Medium Gas Mixture)

Avg. Mol. Weight: 50 to 120 [g/mol]

Avg. Density: 1.5-4.0 [kg/m<sup>3</sup>]

Typical Number of Carbons: 2-8

Example Gas: Pentane



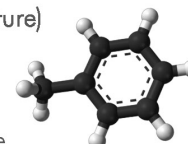
## CLASS 6: Heavy Gas (or Heavy Gas Mixture)

Avg. Mol. Weight: 80+ [g/mol]

Avg. Density: 3.5+ [kg/m<sup>3</sup>]

Typical Number of Carbons: 6+

Example Gases: Octane, Toluene, Xylene



# GASES

Gas	Formula	Class <sup>5</sup>	Detection Range [%LEL]	% Volume of gas at 100 %LEL (ISO 10156)	MPS Accuracy 0 to 50 %LEL (ISO 10156)	% Volume of gas at 100 %LEL (IEC60079-20-1)	MPS Accuracy 0 to 50 %LEL (IEC60079-20-1)
butane	C <sub>4</sub> H <sub>10</sub>	4	0-100	1.8 %VOL	±5 %LEL	1.4 %VOL	±5 %LEL
ethane	C <sub>2</sub> H <sub>6</sub>	4	0-100	3.0 %VOL	±5 %LEL	2.4 %VOL	±5 %LEL
hydrogen	H <sub>2</sub>	1	0-100	4.0 %VOL	±5 %LEL	4.0 %VOL	±7 %LEL
isobutane	HC(CH <sub>3</sub> ) <sub>3</sub>	4	0-100	1.8 %VOL	±5 %LEL	1.3 %VOL	±9 %LEL
isobutylene	C <sub>4</sub> H <sub>8</sub>	4	0-100	1.8 %VOL	±5 %LEL	1.8 %VOL	±5 %LEL
isopropanol	C <sub>3</sub> H <sub>8</sub> O	4	0-100	2.0 %VOL	±10 %LEL	2.0 %VOL	+20 %LEL
methane	CH <sub>4</sub>	3	0-100	5.0 %VOL	±3 %LEL	4.4 %VOL	±3 %LEL
MEK	C <sub>4</sub> H <sub>8</sub> O	5	0-100	1.4 %VOL	±5 %LEL	1.5 %VOL	+16 %LEL
pentane	C <sub>5</sub> H <sub>12</sub>	5	0-100	1.5 %VOL	±5 %LEL	1.1 %VOL	±6 %LEL
propane	C <sub>3</sub> H <sub>8</sub>	4	0-100	2.1 %VOL	±6 %LEL	1.7 %VOL	±8 %LEL
propylene	C <sub>3</sub> H <sub>6</sub>	4	0-100	2.4 %VOL	±5 %LEL	2.0 %VOL	±5 %LEL
acetone	C <sub>3</sub> H <sub>6</sub> O	5	0-100	2.5 %VOL	+20 %LEL	2.5 %VOL	+24 %LEL
ethylene	C <sub>2</sub> H <sub>4</sub>	4	0-100	2.7 %VOL	-12 %LEL	2.3 %VOL	-14 %LEL
heptane	C <sub>7</sub> H <sub>16</sub>	5	0-100	1.1 %VOL	±12 %LEL	0.85 %VOL	±15 %LEL
octane	C <sub>8</sub> H <sub>18</sub>	6	0-100	1.0 %VOL	±12 %LEL	0.8 %VOL	±15 %LEL
styrene	C <sub>8</sub> H <sub>8</sub>	6	0-100	1.1 %VOL	-20 %LEL	1.0 %VOL	-17 %LEL
toluene	C <sub>7</sub> H <sub>8</sub>	6	0-100	1.2 %VOL	±12 %LEL	1.0 %VOL	±13 %LEL
xylene	C <sub>8</sub> H <sub>10</sub>	6	0-100	1.1 %VOL	±12 %LEL	1.0 %VOL	±13 %LEL

HWS has confirmed the MPS to detect difluoroethane, and diesel fuel(60°C). The MPS is also confirmed to detect other gasses including hexane, ammonia, acetylene, ethanol and methanol. The MPS does not detect Carbon Monoxide(CO) or Hydrogen Sulfide(H<sub>2</sub>S).

©2022 Headwind Solutions. ALL RIGHTS RESERVED Every effort has been made to assure the accuracy of this document at time of printing. In accordance with the company's policy of continued product improvement Headwind Solutions reserves the right to make product changes without notice. The products are routinely subject to testing which may result in some changes in the characteristics quoted. Technical info contained in this document or otherwise provided by Headwind Solutions is based upon tests, or experience that the company believes to be reliable, but the accuracy, completeness, and representative nature of such information is not guaranteed.