

# SafEye®

## Optical Open Path Gas Detectors



COMBUSTIBLES



TOXICS



Open Path technology has proven to be the most cost effective and reliable technology for detecting combustible and toxic gas leaks in many applications. SafEye infrared and ultraviolet open path gas detectors lead the industry in providing unparalleled reliability and false-alarm prevention, while monitoring for the presence of toxic or combustible vapors over paths up to 450 ft. in length. By providing large-area coverage in or around industrial facilities, SafEye becomes an important tool in helping to protect facility personnel and property, while offering substantial overall cost-of-ownership benefits.

### Advanced Gas Detection Technology

SafEye detectors utilize a triple lens optics system that protects against false gas readings and alarms due to partial beam blockage. The three lens system also dramatically improves instrument alignment tolerances so that system setup is made easier than other less sophisticated open path detectors currently available.

SafEye's ability to accurately identify and

measure a gas cloud is a result of the patented lamp source technology, and advanced proprietary mathematical algorithms. These technologies combine to continuously analyze the IR or UV spectrum along the instrument's path and identify the unique "finger print" of the target gas.

### Highest Reliability and Lowest Maintenance

SafEye's sophisticated on-board diagnostics and reference beam technology provide fault indication for all known failure mechanisms, and ensure the highest reliability when compared to other combustible gas detectors. Its MIL-SPEC components and Xenon flash source, with a life expectancy of greater than 6 years, provide long, trouble-free instrument operation.

SafEye's low maintenance optical technology cannot be poisoned or "burned out" due to gas exposure, and never requires span calibration - eliminating the need for costly calibration gases.

*(continued back page..)*

## Features

### *Three Lens Design*

False alarms due to partial beam blockage are virtually eliminated.

### *Patented Xenon Flash Source*

False alarms caused by solar radiation or black body heat sources are eliminated.

### *Highest Reliability*

Reference beam technology provides fault indication for all known failure mechanisms.

### *Cost Effective*

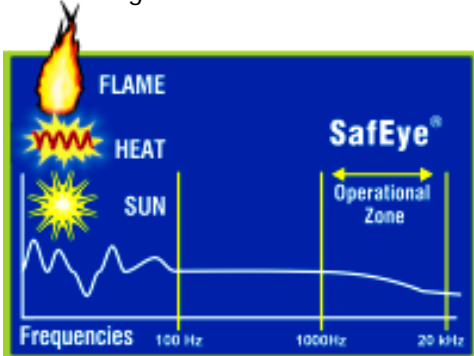
One SafEye system can replace many single point gas transmitters.

### *Low Maintenance*

System maintenance is minimal, requiring very little routine support from personnel or equipment.

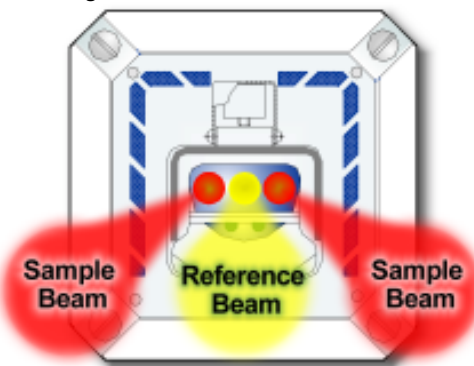
## Patented Xenon Lamp Source

SafEye Model's 200 and 400 incorporate a patented Xenon flash source that provides the state-of-the-art solution to false alarm prevention. Unlike other open path detectors equipped with lower frequency IR lamps, the special Xenon flash source allows SafEye to operate at frequencies far above the spectral band where solar or heat radiation is found. This allows SafEye to completely eliminate false alarms caused from infrared sources such as direct or reflected sunlight, flare stacks, and modulating heat sources.



## Unique Three Lens Technology

Instruments with only one reference and one sample lens can easily go into alarm when the instrument's beam path is partially blocked. SafEye's unique three lens technology makes false alarms from partial beam blockage extremely unlikely. The redundant system of optics helps keep SafEye fully functional even in rain, fog, or snowstorms that result in *up to 90% signal obscuration or partial beam blockage!*

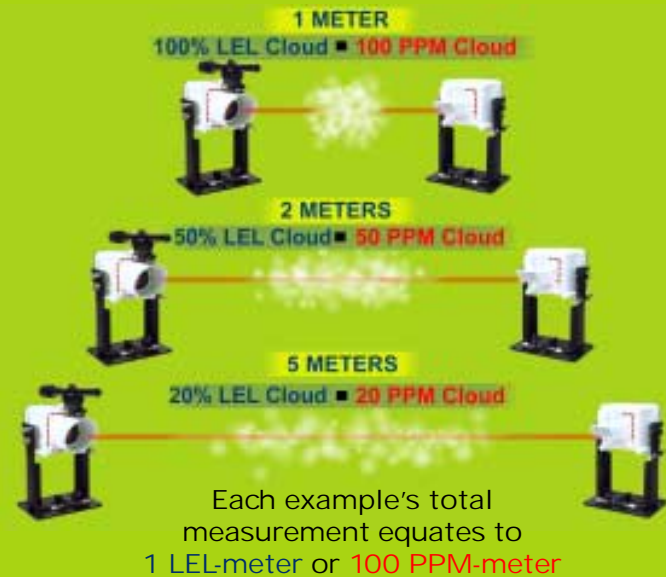


## The LELMeter / PPM-Meter Concept

### Open Path Measurement of Gas Leaks

Unlike conventional single-point detectors that measure gas concentration in %LEL or PPM, open path detectors measure the *total gas concentration over the entire length of the optical path*. This concept, illustrated below, is expressed in LEL-meter or PPM-meter. Open path detectors do not distinguish between small highly concentrated gas clouds or large clouds of lower concentration, rather they simply measure for the presence of a gas leak over the instrument's line-of-sight.

The illustration below depicts three different gas leak scenarios that provide an example of the LEL-meter/PPM-meter concept.



## A Cost Effective Solution

SafEye's ability to cover large "line-of-sight" areas will render substantial cost benefits to a facility's overall gas detection program. It is an ideal complimentary component to large area gas detection applications where, when combined with single-point gas detectors, will provide maximum coverage, response, and safety. SafEye is also an excellent alternative in line-of-sight applications where several single point detectors would otherwise be used, or where extreme environmental conditions do not permit usage of a single point monitor.

In addition, SafEye significantly reduces system installation and maintenance costs, eliminates the need for calibration gases, and simplifies routine maintenance and calibration requirements.



SOURCE

# Three Models to Suite Your Application Needs

## Model 200

For detecting hydrocarbon-based combustible gases, the Model 200 is designed to monitor line-of-sight paths up to 450 ft long.

The Model 200 utilizes Xenon lamp source technology and is the preferred instrument in applications where the potential for false alarms from sunlight, flame, or other blackbody radiation sources exist.

Field selectable response times, and four calibration curves for various combustible gas mixtures [common to the oil and gas industry] are standard. As an option, the Model 200 can be factory calibrated to a specific gas mixture, providing maximum accuracy for your facility's specific needs.

Some typical applications...

- Offshore, Oil & Gas drilling and production.
- Petrochemical and chemical storage and production areas.
- Storage and loading of hazardous materials and waste areas.
- LNG-LPG storage, pumping and filling.
- Fence-line emission monitoring.
- Storage "Fence-line" protection

## Model 300

For detecting hydrocarbon-based combustible gases, the Model 300 can monitor along a path up to 98 ft long. It is typically used indoors or in duct mount applications, such as air intakes or turbine engine exhaust ducts where there is a limited chance of interference from other radiation sources.

In duct mount applications under 21 ft (7m) across, the Model 300 has an extremely quick 1/2 second response time when exposed to combustible gas(s).

Four field selectable calibration curves for various combustible gas mixtures common to the oil and gas industry are standard. As an option, the Model 300 can be factory calibrated to a specific gas mixture providing maximum accuracy for your facility's specific needs.

Some typical applications...

- Engine and turbine air intake and exhaust modules.
- Paint-booths and paint production.
- Bus terminals (switching from diesel to natural gas)
- Petrochemical and chemical storage and production areas.
- Storage and loading of hazardous materials and waste areas.

## Model 400

For detecting ammonia or hydrogen sulfide gases, the Model 400 is designed to monitor line-of-sight paths up to 325 ft long.

The Model 400 utilizes Xenon lamp source technology that eliminates false alarms from sunlight, flame, or other blackbody radiation sources.

Response times are field selectable.

Some typical applications...

- Toxic chemical storage sites and hazardous waste disposal areas.
- Detection of H<sub>2</sub>S in desulfurization processes at refineries, oil platforms, pipelines, refueling stations and fuel storage facilities.
- Ammonia production, storage and transportation.
- Air conditioning, refrigeration and agriculture application areas for ammonia and derivatives.

	Model 200	Model 300	Model 400
Lamp Type	Pulsating Xenon (IR) eliminates false alarms from sun, flame, and heat sources	Ultra IR-Lamp eliminates false alarms from most IR radiation sources	Pulsating Xenon (UV) eliminates false alarms from sun, flame, and heat sources
Gas Type	Combustible Hydrocarbons	Combustible Hydrocarbons	Ammonia Hydrogen Sulfide
Range	3.3 to 459ft [1 to 140m]	2 to 98ft [0.6 to 30m]	3.1 to 325ft [1 to 100m]
General Areas of Usage	Outdoor /Indoor	Indoor/Ducts/Areas free from spurious radiation	Outdoor /Indoor
Alignment Tolerance	1.0	1.5	0.5

# Ordering Information

## Model 2AA - B - C - D - E

### AA: Range

- 01: 1 to 4 m (3 to 13 ft.)
- 02: 3 to 12 m (9 to 36 ft.)
- 03: 10 to 40 m (31 to 130 ft.)
- 26: 30 to 90 m (93 to 290 ft.)
- 27: 50 to 140 m (155 to 450 ft.)

### \*250 Series- For Ethylene & LPG applications

- 51: 1 to 4 m (3 to 13 ft.)
- 52: 3 to 12 m (9 to 36 ft.)
- 53: 10 to 40 m (31 to 130 ft.)
- 56: 30 to 90 m (93 to 290 ft.)
- 57: 50 to 140 m (155 to 450 ft.)

### B: Mounting Configuration

- S: Standard
- D: Duct.

### C: Enclosure Type

- D: Standard
- E: Close Coupled Terminal Box.

### D: Enclosure Material

- AL: Aluminum
- ST: 316SS

### E: Approval

- C: CENELEC
- U: UL

## Model 3AA - B - C - D - E

### AA: Range

- 01: 6 to 3.5 m (2 to 11 ft.)
- 02: 3 to 15 m (10 to 50 ft.)
- 12: 7 to 30 m (23 to 97 ft.)

### \*350 Series- For Ethylene & LPG applications

- 51: 6 to 3.5 m (2 to 11 ft.)
- 52: 3 to 15 m (10 to 50 ft.)
- 53: 7 to 30 m (23 to 97 ft.)

### B: Mounting Configuration

- S: Standard
- D: Duct
- E: Close Coupled Terminal Box

### D: Enclosure Material

- AL: Aluminum
- ST: 316SS

### E: Approval

- C: CENELEC
- U: UL

## Model 4AA - B - C - D - E

### AA: Range

- Hydrogen Sulfide
- 10: 1 to 4m (3 to 13 ft.)
- 11: 2 to 8m (6.5 to 26 ft.)
- 12: 7 to 25 (23 to 81 ft.)
- 13: 15 to 50m (50 to 162 ft.)
- 14: 30 to 100m (100 to 325 ft.)
- Ammonia
- 20: 1 to 4 m (3 to 13 ft.)
- 21: 2 to 8 m (6.5 to 26 ft.)
- 22: 7 to 25 m (23 to 81 ft.)
- 23: 15 to 50 m (50 to 162 ft.)
- 24: 30 to 100 m (100 to 325 ft.)

### B: Mounting Configuration

- S: Standard
- D: Duct.

### C: Enclosure Type

- D: Standard
- E: Close Coupled Terminal Box.

### D: Enclosure Material

- AL: Aluminum
- ST: 316SS

### E: Approval

- C: CENELEC
- U: UL

## Accessories & Spare Parts

Description	Part No.
Swivel Mount Assembly <sup>NOTE 1</sup>	794765
Tilt Mounting Assembly <sup>NOTE 1</sup>	794635
Duct Mount Adaptor	794716
Telescope Alignment Kit (Duct)	794246
Calibration Test Filter (Duct)	794220
Calibration Test Filter (IR)	794260
Telescope Alignment Kit	794110
Calibration Cell	796170
Magnetic Mode Selector	790285

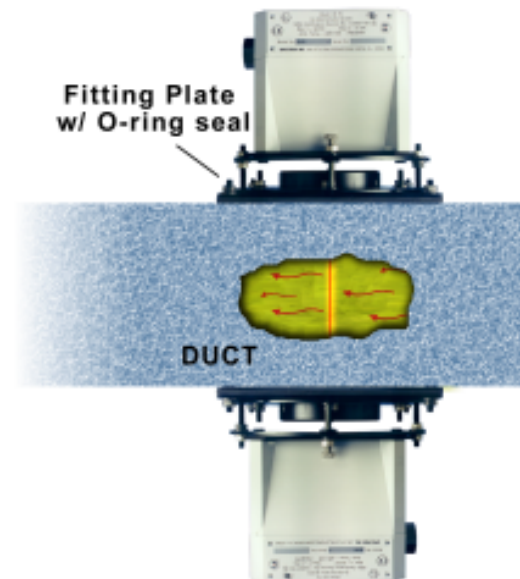
\*LPG typical ingredients are : 40% Butene (Butylene) , 27% Propene (Propylene), 16% Isobutane, 10% Propane.  
NOTE 1: Two are required for each SafEye system

## Air Intake and Duct Mount Applications

Used in applications such as air ducts on FPSO's and offshore rigs, and for turbine air intakes and exhausts, the SafEye Duct Mount (SDM) System helps protect facilities from the potential penetration of combustible and toxic gas clouds into environmentally controlled areas. The SDM System is specially designed to perform under extreme conditions such as high speed air flows, high temperatures, extreme humidities, and corrosive environments.

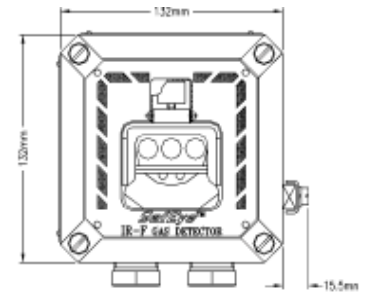
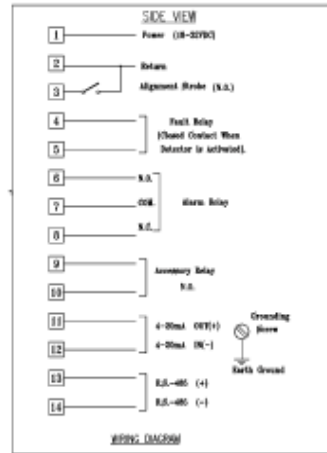
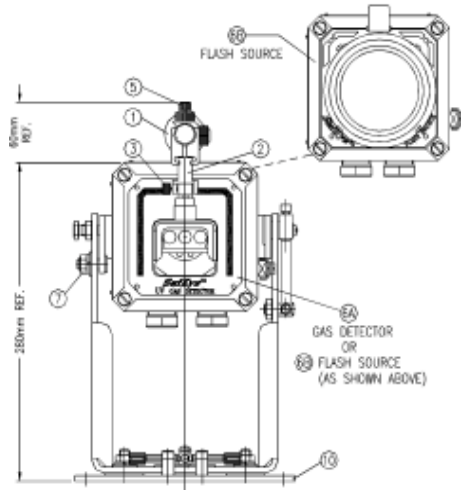
The SDM System provides ultra-fast response times - typically 5 to 10 times faster than other open path systems, and 20 to 50 times faster than a point detector. For example, a duct mount installation smaller than 21 ft (7m) using the Model 300 has only a 0.5 second response time!

A special optics design provides for an alignment tolerance of  $\pm 2^\circ$  in all directions, and protects against false gas readings and alarms which are caused by partial obscuration and blocking, misalignment, vibration, flexing or tilts.

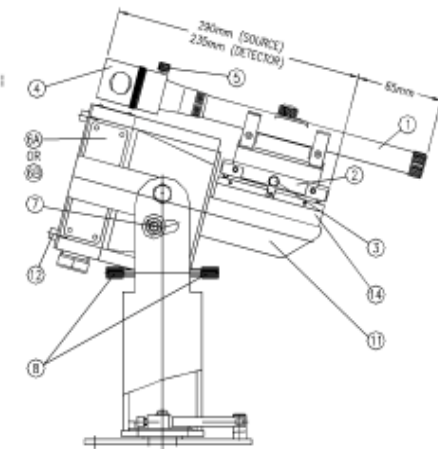
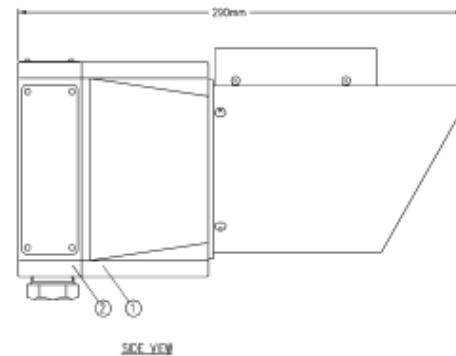
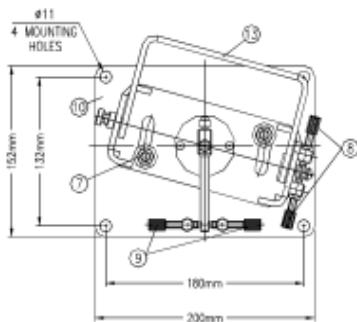
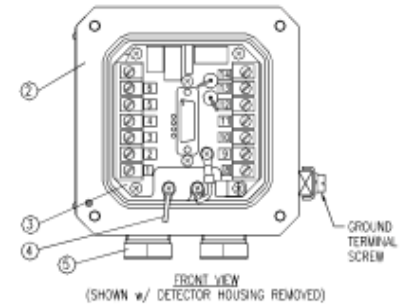


**RECEIVER**  
(Tilt mount assembly shown)

# Dimensions



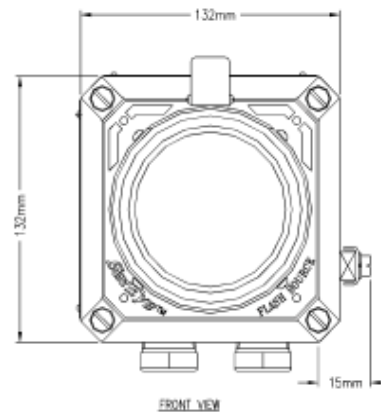
- LEGEND:
1. DETECTOR HOUSING
  2. HOUSING COVER
  3. TERMINAL BOARD
  4. SECURING CABLE
  5. 3/4" NPT FLAMEPROOF PLUG FRONT VIEW



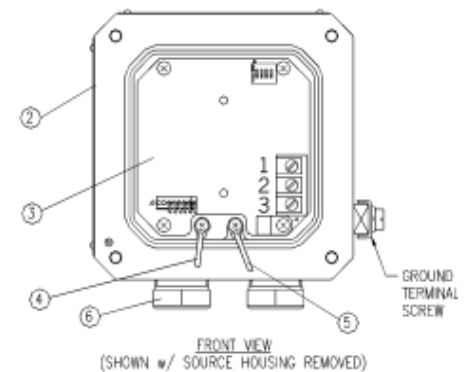
Note  
Tilt mount device to be  
soundly mounted on a  
non-moving support  
structure.

## LEGEND

- |                                    |                                       |
|------------------------------------|---------------------------------------|
| 1. TELESCOPE ASSY                  | 10. TILT DEVICE SECURING PLATE        |
| 2. SIGHT MOUNTING                  | 11. PROTECTIVE FRONT PANEL            |
| 3. TELESCOPE FASTENING SCREW       | 12. DETECTOR MOUNTING SCREW (4)       |
| 4. PERISCOPE                       | 13. TILT DEVICE MOUNTING PLATE        |
| 5. PERISCOPE FASTENING SCREW       | 14. SPACER                            |
| 6A. DETECTOR HOUSING               | 15. PROTECTIVE SIGHT COVER SCREWS (4) |
| OR                                 | 16. PROTECTIVE SIGHT COVER            |
| 6B. SOURCE HOUSING                 |                                       |
| 7. LOCKING NUT (3)                 |                                       |
| 8. VERTICAL ADJUSTMENT SCREW (2)   |                                       |
| 9. HORIZONTAL ADJUSTMENT SCREW (2) |                                       |



- LEGEND:
1. FLASH SOURCE HOUSING
  2. HOUSING COVER
  3. FLASH SOURCE TERMINAL BOARD
  4. SECURING CABLE
  5. GROUNDING WIRE
  6. 3/4" NPT FLAMEPROOF PLUG M25x1.5 (optional fitting)



Flash Source Terminal #	Description
1	+24V IN
2	-24V OUT
3	NOT USED

# Specifications

Response Times (varies with adjustable flash rate setting)	
Model 200 _____	3 to 30 seconds
Model 300 _____	0.5 to 10 seconds
Model 400 _____	2 to 24 seconds
Spectral Response	
Model 200 _____	3.0 to 4.0µm
Model 300 _____	3.0 to 4.0µm
Model 400 _____	200 to 300µm
Sensitivity Range	
Model 200 _____	0-5 LEL x M / 0-2 LEL x M
Model 300 _____	0-5 LEL x M / 0-2 LEL x M / 0-1 LEL x M (optional)
Model 400 _____	0-200 PPMxM / 0-500 PPMxM
Displacement/Misalignment Tolerance	
Model 200 _____	± 1°
Model 300 _____	± 1.5°
Model 400 _____	± 0.5°
Drift _____	Long term ± 5% of full scale
Temperature Range	
Models 200 and 400 _____	-40°F (-40°C) to 131°F (55°C)
Model 300 _____	-40°F (-40°C) to 158°F (70°C)
Power Supply _____	Standard - 24 VDC (18-32 VDC)
Power Consumption _____	Detector: 150mA @ 24 VDC (200 mA Peak); Source: 100mA @ 24 VDC (220 mA Peak)
Electric Input Protect _____	According to MIL-STD-1275:
Electromagnetic Compatibility _____	EMI/RFI protected CE Marked
Outputs _____	4-20mA; RS - 485
Relays _____	
Alarm _____	SPDT; (NO, NC) 2A@30Vdc (0.5@250Vac)
Accessory _____	SPDT; (NO) 5A@30Vdc or 250Vac
Fault _____	SPDT; (NC) 5A@30Vdc or 250Vac
Approvals _____	UL Approved Class I Div. 1 Groups C and D and Class II Div. 1 Groups E, F and G CENELEC approved SCS No. Ex96D1067: EExd IIB + H2 T6 per En 50014 & En 50018; SCS No. Ex 98E1119: EExde IIB + H2 T5 per En50014 & En50018 & E50019 FM -
Electrical Connection _____	Two ¾" - 14NPT conduits. Optional: Two M25 x 1.5 conduits
Dimensions _____	5.2" (132mm) x 5.2" (132mm) x max. 11" (280mm)
Weight _____	Alum. Encl.: (Detector) max 8.8 lb (4 kg); (Source) max 10.78 lb (4.9 kg) St. Steel Encl.: (Detector) max 14.3 lb (6.5 kg); (Source) max 16.72 lb (7.6 kg)
IP Rating _____	IP66 and IP67
Environmental _____	Meets MIL-STD-810C
Humidity _____	Method 507.1 - IV
Salt & Fog _____	Method 509.1 - I
Vibration _____	Method 514.2 - VII
Mechanical shock _____	Method 516.1 - I
High Temp. _____	Method 501.1 - II
Low Temp. _____	Method 502.1 - I

The only maintenance SafEye systems require is limited to a simple zero calibration every 6 months, occasional cleaning of the optics, and a functional test using a calibration test filter.

## Rugged Construction for Maximum Protection

SafEye's rugged construction is combined with world-class engineering to make an instrument that can be deployed for operation virtually anywhere in the world and under even the most adverse environmental conditions. Source and detector housings are made from anodized aluminum with a 316 stainless steel option available. Back covers are sealed with special o-rings that prevent intrusion from dust, salt, and sprays. Internal circuit boards are protected from vibration, moisture and corrosion. SafEye detectors are currently installed and functioning in areas such as the North Sea, Alaska, Saudi-Arabia, and Indonesia.

## Easy Installation

The swivel or tilt mounting assemblies (constructed of epoxy coated 316L stainless steel) and the telescopic alignment kit make the SafEye's installation quick and effective. SafEye's alignment utilizes on-board LEDs to indicate when the system is optimally aligned. In addition, SafEye offers the widest alignment tolerances available in any open path device.