



Product Guide 2017

UV Sentry Open Path Multi-Gas Analyzer



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UV Sentry Open Path Multi-Gas Analyzer

Description

The Cerex UV Sentry allows near real time, continuous monitoring of nearly 40 different gas species, so flexibility for a wide variety of monitoring projects is simplified and comes at no additional cost. The UV Sentry operates by sending a beam of UV light through the open air to a retro-reflector cube (mono-static) which returns the beam to the analyzer. The UV light intensity is recorded as a “single beam” spectrum file consisting of the light intensity of 2048 discrete wavelengths. As defined by USEPA TO-16 methodology, Cerex CMS software uses Beer’s Law to calculate a sample absorbance spectrum. A classical least squares regression analysis algorithm compares the sample absorbance spectrum to calibrated reference absorbance spectra files to identify and quantify gases in the beam path. The length of the total sample path determines the minimum detection limits of the analyzer. Data output is near real time, and raw spectral data is always saved.

Far faster and less expensive than both FTIR and GCMS technology, and requiring no additional chemical consumables or associated analytic laboratory or sample handling costs, the UV Sentry offers a variety of features available in no other technology. Unlike PID, FID and sacrificial sensor technology, the UV Sentry cannot be poisoned, is not affected by humidity, needs no ongoing calibration, is unaffected by humidity, fails to safe, offers extremely low detection limits for modest sample path lengths and has only two consumable parts. Drift associated with common box type analyzers is inherently mitigated through design. As well, the analyzer is equipped with integrated Ethernet. It may be provisioned with a variety of optional data output formats to meet your precise requirements. In comparison to maintenance intensive traditional sensor arrays, the UV Sentry offers a low cost, low maintenance and high performance ambient, perimeter and leak detection monitoring solution per meter in terms of both initial investment and ongoing operation.

Detectable Compounds

Using UVDOAS technology, Sentry series analyzers are capable of identifying PPB levels of individual species of gases which are reported by other technologies as “VOC” aggregate concentrations only at and above PPM concentrations. For the full list of detectable compounds please see supporting documentation.

The UV Sentry is available with either a Xenon source or a Deuterium source. The different sources are not interchangeable. Deuterium equipped analyzers offer higher sensitivity than Xenon when monitoring several important gases such as ammonia, 1,3 butadiene, nitrogen oxide and nitrogen dioxide, which have absorption features in the deep UV. Due to rapid absorption of deep UV wavelengths by atmospheric oxygen, deuterium based analyzers are limited to sample path lengths of approximately 225 meters when monitoring such gases.

Xenon equipped analyzers operate in higher UV and visible wavelengths and offer high optical power and excellent long path monitoring opportunities for a wide variety of gases at part per trillion and part per billion concentrations across sample paths exceeding 1 km.

Due to the different spectral characteristics of each source the detectability and minimum detection limits for some gases differ between the sources. Table 1 highlights these differences.

For assistance determining which source is most applicable for your monitoring needs contact Cerex.

Minimum Detection Limits

In The minimum detection limits for the Sentry-MS are reported in two forms: Path Integrated MDLs, and Path Averaged MDLs. All minimum detection limits are published as a single gas measured in otherwise clean air with 400 or more integration cycles (40 second acquisition time at 100mS integration time and 75% of fullscale intensity). The path integrated minimum detection limits define the concentrations of gases required for detection in a path one meter in length and is expressed in units of part per million meter (PPM-m). The path integrated minimum detection limit may be used to determine the path averaged minimum detection limits for a specific installation. To determine the path averaged MDL in units of PPB, divide path integrated MDL by the total sample path length in meters, then multiply the by 1000. Since the retro-reflector creates a double pass of the beam through the same sample, the total sample path is always twice the distance between the analyzer and retro-reflector. The path averaged MDL represents the concentration of gas required to be present everywhere in the sample path for detection to occur.

Mono-static Path Averaged Detection Limits

$$\text{Path Averaged MDL PPB} = \frac{\text{Path Integrated MDL PPM} \times \text{Retroreflector METERS}}{2 \times \text{Distance}} \times 1000$$

Table 1 UV Sentry single gas detection limits for Xenon and Deuterium sources.

UV Sentry Single Gas Minimum Detection Limits for Deuterium and Xenon Source: PATH INTEGRATED		
	Path Integrated MDL (PPM-m)	
Compound	Xenon Source	Deuterium Source
Ammonia (NH ₃)	0.6*	0.20
Acetaldehyde (C ₂ H ₄ O)	3.20	3.00
Acrolein (C ₃ H ₄ O)	8.2	8.2
1,3 Butadiene (C ₄ H ₆)	Non-detect	0.20
Benzene (C ₆ H ₆)	0.27	0.27
Carbon Disulfide (CS ₂)	13.31	13.31
Chlorine (Cl ₂)	5.00	5.00
Ethylbenzene (C ₆ H ₅ CH ₂ CH ₃)	0.30	0.30
Formaldehyde (CH ₂ O)	3.20	3.20
Mercury (Hg)	0.00002	0.00002
Naphthalene (C ₁₀ H ₈)	0.20	0.20
Nitrogen Oxide (NO)	0.29*	0.29
Nitrogen Dioxide (NO ₂)	3.04*	3.04

Ozone (O ₃)	2.00	2.00
Phenol (C ₆ H ₅ OH)	0.30	0.30
Styrene (C ₈ H ₈)	0.60	0.60
Sulfur Dioxide (SO ₂)	0.68	0.32
Toluene (C ₇ H ₈)	0.84	0.84
m-Xylene (C ₈ H ₁₀)	0.35	0.35
o-Xylene (C ₈ H ₁₀)	3.77	3.77
p-Xylene (C ₈ H ₁₀)	0.24	0.24

*Detection with Xenon requires shorter path lengths and/or increased acquisition time.

Installation

The system requires installation of the UV Sentry and the Retro-reflector array with a clear line of sight between the two components.

Cerex recommends placing a protective structure over and around the UV Sentry as well as the retro-reflector. This structure does not need to be complex. A simple structure to protect the analyzer and reflector from direct heating, snow, rain and wind is generally sufficient. For long path fixed mount installations the mounting structure should be protected from insolation.

The UV Sentry analyzer utilizes a heavy-duty gear driven, precision pan and tilt mounting head P/N 282264 to allow precise alignment with the retro-reflector. The pan and tilt head has a 1.75" O.D. mounting post and may be mounted to heavy duty tripod P/N 282265 for rapid deployment and mobility, or it may be mounted to a fixed adapter P/N 88475 to allow installation on a concrete column, or it may be mounted to a user supplied 1.75" I.D. pole. Custom mounting adapters are available to allow mounting to superstructure or walls.

The analyzer mounts to the pan and tilt head via a sliding dovetail mount. An option for an automated servo driven pan and tilt positioner is also provided in the event that one UV Sentry is to be used to monitor multiple sample paths sequentially.

Retro-reflectors are typically mounted to concrete columns using fixed mount adapters (PN 17775) for fixed applications or to standard duty tripod (PN 282265) for temporary monitoring. Retro-reflectors should be mounted perpendicular to the UV beam to maximize signal return. Retro-reflectors are available with optional heated, filtered purge air blowers to reduce the potential for condensation formation on optical surfaces. This improves signal throughput; however, AC power is required at the retro-reflector installation location.

Custom mount adapters are available to allow alternative mounting options. For installations in which the IR will not be within 15 degrees of normal to the retro-reflector, the retro-reflector should be angled via the mounting structure or a pan and tilt alignment mechanism.

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UV Sentry and Retro-reflector Installation Options		
Component	Mounting Options	Pan and Tilt Head Required

UV Sentry Analyzer	Standard Duty Tripod (P/N 282265) Mobile applications	Standard Duty Pan and Tilt Head (P/N 15003) Mobile applications
	Heavy Duty Tripod (PN 282265)	Heavy Duty Pan and Tilt Head (P/N 282264) 6
	Fixed Mount Adaptor (P/N 88475)	
	User Supplied 1.75" I.D. Pole	
7, 19 and 25 Cube Retro-reflector Arrays	Standard Duty Tripod (P/N 15004)	Standard Duty Pan and Tilt Head (P/N 15003) or Manual Pan and Tilt Head (P/N 15003A) required ONLY for installations in which the angle of the incoming beam is not within 15 degrees of normal.
	Fixed Mount Adaptor (P/N 17775)	
	User Supplied 1.75" O.D. Pole	
	Wall or Superstructure Mount	
19 and 25 Cube Heated, Purged Retro-reflector Arrays	Fixed Mount Adaptor (P/N 88475)	Heavy Duty Pan and Tilt Head (P/N 282264) required ONLY for installations in which the angle of the incoming beam is not within 15 degrees of normal.
	User Supplied 1.75" I.D. Pole	
	Custom Mount Assembly	

To mitigate the potential effects of electrically noisy environments the UV Sentry utilizes a line filter and transient voltage suppression system as well as circuit breaker protection. Integrated internal ferrite chokes provide noise suppression for Input / Output and Communications ports. Fully shielded conduit is specified for cable connections to ancillary instruments for installation in electrically noisy areas. Please specify the line voltage when ordering.

Figure 1 Hazloc equipped UV Sentry.

Corrosive or HAZLOC Atmospheres

In corrosive atmospheres the UV Sentry and retro-reflector may be installed in shelters. For HAZLOC installation the instrument enclosure must be equipped with an optional Z-Purge (requires continuous, clean, dry factory air supplied at 0.1 - 3.5 SCFH at 5-120 PSI), as well as classified area thermoelectric air conditioning to allow operation in Class 1, Division 2, Groups A-D or ATEX Zone 2 locations. Retro-reflectors without heated purge air may be installed in hazardous locations, however heated and purged units are for general classification areas only.



Calibration and Quality Assurance Audit

Calibration of Cerex UVDOAS analyzers is inherent in the calibrated reference files used by the analyzer's CLS gas detection and quantification routine. Reference files are created under

controlled laboratory conditions by measuring the absorption spectra due to precisely known concentrations of individual gases in air.

The UV Sentry is supplied with calibrated reference files and further calibration is unnecessary however Cerex offers several optional calibration cells that may be used for insitu calibration or for quality assurance audits.

1.) The standard UV Sentry is equipped with a permanently mounted, flow through cell installed at the time of manufacture. The cell is equipped with ports to allow the operator to challenge the analyzer with certified calibration gas.

Figure 2 The silver ring mounted to the front of the UV Sentry is a short path flow through QA cell.



2.) 0.5 meter external linear cell (P/N 18101) may be used in lieu of the standard QA cell. The cell is placed in the beam path between the analyzer and retro-reflector and flooded with certified calibration gas. This cell is tripod mounted and useful for calibrating multiple analyzers as it is portable.

Figure 3 The external flow through cell is placed directly in the beam path for QA audit.



3.) Slide on QA Cell (P/N 18102) may be filled with certified calibration gas prior to use, then affixed to the front of the analyzer for QA bump testing.



Consumable

The UV Sentry utilizes only three consumable items: The UV source, and air filters. Both Deuterium and Xenon UV sources are warranted with a 2000 hour half-life. After 2000 hours of continuous operation the source will produce at least 50% of its original light intensity. In typical operation, sources last 3000 or more hours before needing replacement. The intake filter element lifetime depends upon site conditions, and the amount of particulate present. Both the UV source and filter elements are user-serviceable in the field in a matter of minutes.

Items

- UV Source (2000 hour half-life warranty)
- Cooling Fan Filters (as required)
- Air Filter (as required)

Routine Maintenance

The UV Sentry requires minimum maintenance. The retro-reflector optics and analyzer windows may be cleaned as necessary with household glass cleaner.

- Clean retro-reflector optics - monthly or as needed
- Clean analyzer window - monthly or as needed
- Change UV source - quarterly or less

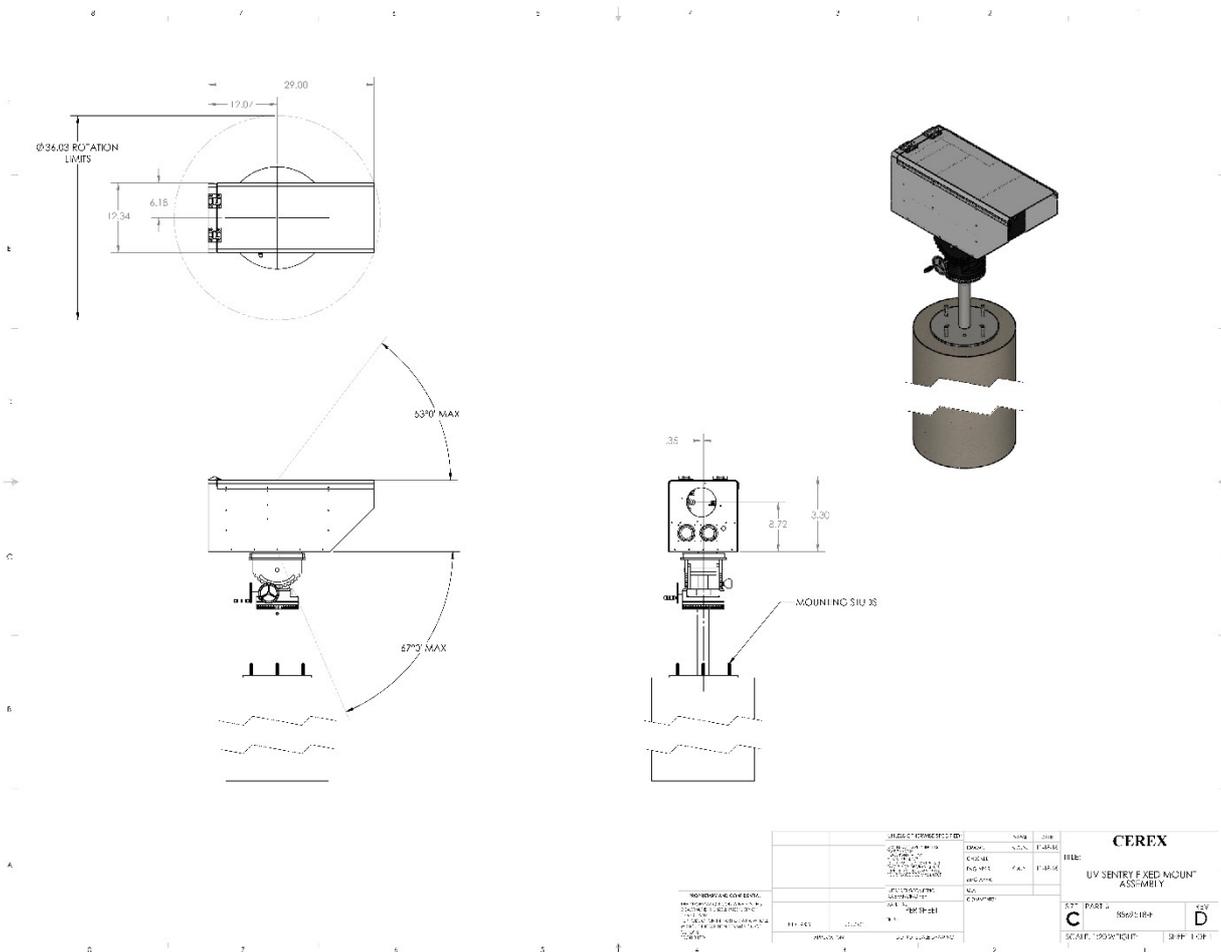
- Change air filters and fan filters – quarterly

If Hazardous location model include:

- Air Conditioner Exterior Heat Sink Cleaning – Every 6 months
- Air Conditioner Interior Heat Sink Cleaning – Annually

UV Sentry Dimensions

Figure 4 UV Sentry Dimensions (inches)



Key Features of the UV Sentry

Simplified Installation Logistics

- Power and overhead shelter are required only at the transceiver end of the installation.

- Minimal infrastructure requirements.
- Heavy duty pan and tilt heads offer high stability for fixed mount installations.
- Corner Cube optics modulate ambient optical noise and require no alignment as in the case of bi-static systems.
- Gapless open path monitoring ensures narrow, high concentration plumes do not escape detection.

Simplified Operation

- **No special technical knowledge is required.** The software and user-interface automatically perform all functions.
- **Data is archived** to allow easy summary reports to be generated.
- **Data may be stored on a local USB drive or backup network location.** The drive is simply replaced, and the original removed, and taken to your office for an easy view of the results.
- **No external PC or communications required.** The “brains” of the system are an advanced controller housed within the instrument. This can be easily accessed with any pc via Ethernet or using the integrated touchscreen interface.
- **Direct Integration with SAFER Systems Measured Source Data Modeling.**

Industry Leading Monitoring Performance

- **Continuous Detection** – Acquisition cycles are user configurable.
- **Low minimum detection limits (MDL's)**
- **Gapless perimeter monitoring**
- **Automated zeroing with natural and synthetic zero operation** – The UV Sentry may simultaneously use natural and synthetic zeroing on a compound by compound basis. Zeroing is fully automated and intelligent, allowing the analyzer to perform absolute measurements regardless of the presence of target gases in the atmosphere. There is no need to wait for favorable wind conditions to zero the analyzer or concern for offset of concentration measurements due to the presence of target gases.
- **Cannot be poisoned** - Exposure to large concentrations of target gas will not permanently damage the analyzer's measurement ability even if saturation occurs. Unlike competing technologies, the UV Sentry fails to safe.

- **Immunity to water vapor** - Ambient humidity will not affect detection performance. Most installations even maintain operational signal intensity during rain.
- **Species specific detection** - The unique absorption fingerprints of target gases are chosen to avoid false positive detection due to the presence of gases which typically interfere with measurements when using other technologies.
- **Inherent calibration** - Ongoing span calibrations are unnecessary for maintenance of system performance. The system uses digital references for identification and quantification of target gases. Zeroing is fully automated and user configurable.
- **High accuracy and precision** - Typically within 5% of reading.
- **Multi-peak analysis** - The UV Sentry is capable of simultaneous multi-peak analysis to increase the dynamic range for a variety of compounds.

Remote Access and Simplified Networking

- **Cellular modem capability** - Any peripheral suitable for use with a personal computer may be used with the UV Sentry. With network installation:
 - o Alarms may be automatically sent via email to multiple recipients in real time.
 - o Data may be emailed based on operator defined schedule.
 - o Remote maintenance - when system has alignment or other issues, automatic email notifications are generated and sent to maintenance personnel.
 - o The UV Sentry analyzer may be accessed remotely by any pc connected to the internet or intranet (with login credentials). This allows viewing of real time data and on demand download of archived data as well as full remote control of the instrument.

Legal protection

The raw spectroscopic data is always saved. This data is a permanent record of the gases in the air at the time of monitoring. Since the spectral signatures for each compound are unique, there will be no question as to the presence (or lack thereof) and quantity of gas crossing the beam. This type of data has been used to support lawsuits as truly legally-defensible. Concentration measurements may be evaluated and confirmed by third party at any time in the future.