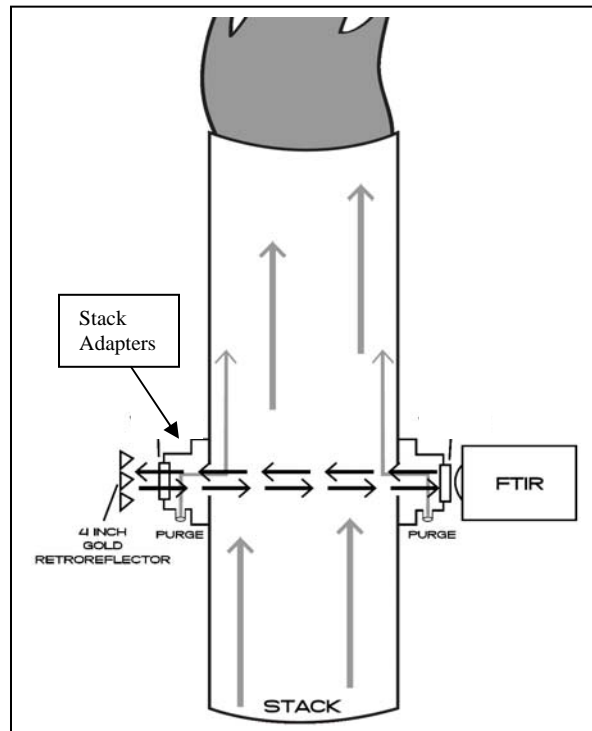


Product Information – Cross-Stack FTIR Multi-gas Stack Monitor System

Cerex Monitoring Solutions, LLC is pleased to submit the following information regarding our AirSentry Portable FTIR Insitu Stack Analyzer system. The system is capable of multigas analysis and can be moved to various stacks. The AirSentry utilizes a cross-stack beam of infrared light to detect and quantify the gases of interest. The system quoted is a real-time air monitoring system that can provide detections for 400 compounds, but is particularly suited to highly corrosive gas species such as HCl, HF, HBr, etc. The system can be used on stacks w



The AirSentry FTIR will project a 50mm beam of infrared light across the diameter of the stack to the reflector and then back again.



The Cerex AirSentry uses broadband IR spectroscopy for detection. The system is sensitive from 2 to 14 microns...or about 650 to 4200 wavenumbers.

Stack Adapters

The analyzer requires that a 50mm beam of light pass through the center diameter of the stack. This will require cutting two ports at the height in which the monitor will be used.

As these ports are cut, also for this project, Cerex will supply adapters to cover the ports. This will allow clean room (ambient) air to be drawn into the port by the natural updraft created by the stack gas. This mechanism will act to keep any particulates or gas from coming in contact with either the FTIR or the retroreflector.

Two of these adapters will be provided for each stack.

Optional QA Cell

The calibration of the FTIR is fixed and inherent in the quality of the library spectra. However, we understand that the user may have the requirement to challenge the instrument from time to time. For these customers we offer an optional QA Cell. This cell is 15cm in pathlength, and mounts internally to the FTIR main enclosure. The Cell is placed permanently in the beam path. The user has access to the cell via quick-disconnect fittings located on the main body of the FTIR. From these fittings, a cylinder of analyzed gas can be flowed, and the FTIR response confirmed.

Summary Elements of CEREX Open Path FTIR Air Monitoring System

- | | |
|----------------------------|--|
| ➤ System Cost | Complete turnkey system includes base unit, retroreflector, gas spectral library. |
| ➤ Current Spectral Library | Standard compound library has over 380 gases. Spectra for each of the 5 compounds identified will be provided |
| ➤ Regulatory Uses | Used by various Local, State, and Federal agencies for industrial and community-based monitoring. |
| ➤ Long term maintenance | Proposed 10,000 hour cryocooler insures long operation, and no need for liquid nitrogen to be hauled to the monitoring site. |
| ➤ Portable | System can be installed and producing data in less than 10 minutes. |

Cerex's AirSentry is a "Monostatic" system whereby the emitter and receiver are co-located within the same housing at one end of the measurement path. The retroreflector is required at the other end of the path to complete the optical beampath.

Cerex's AirSentry utilizes an ultra-sensitive MCT (mercury-cadmium-telluride) detector element that requires cooling to cryogenic temperatures (77 kelvin) to be fully responsive to the low levels of Infrared Radiation. The cooling can be accomplished with an automated stirling engine cryocooler or a liquid nitrogen filled dewar. These cryocooler devices were originally developed for use in missile technology, and have since been adapted to commercial detector cooling applications. Cerex is one of two manufacturers of open path FTIR's that has successfully integrated cryocooler technology into our systems without suffering the negative effects of degraded signal to noise ratio.

Model 5K

- Cryocooler provided with a warranty of 5,000 hours or 1 year (whichever comes first)
- manufacturer states the observed average running time exceeds 10,000 hours
- recommend re-pumping with helium every year to extend the life of the compressor
- compressor is replaced at a modest cost – approx. \$5500 (comes with a renewed warranty)
- Lower initial cost

Given the nature of the project for which this equipment will be used, we believe the automated cooling system alternative proposed will save time and money over the life of the project.

Advantages of the CEREX AirSentry Op-FTIR Air Monitoring System:

- ❖ **Modulated Light Beam:** Modulating the light at this point in the optical design acts to allow AirSentry to remain immune from the effects of changes in ambient infrared energy. These effects manifest themselves in other systems as “baseline shifts” in the data. Such shifts are so erratic, that accurate unattended real-time processing is nearly impossible, and an “expert” (experienced PhD or other highly skilled individual) is nearly always required to post-process the data set. Since AirSentry eliminates these effects through a better design, our system allows accurate concentration data to be calculated by the analytical software in real-time.
- ❖ **Optically Stable Interferometer:** The Cerex AirSentry interferometer is manufactured by Bomem, and employs a unique corner-cube design. The corner-cube enables optical stability, and freedom from spectral shifting that other systems experience as a result of temperature fluctuations. No “dynamic alignment” or other added equipment is required to further improve stability. As a result MTTF (Mean Time To Failure) is vastly improved.
- ❖ **Ease of Setup and Alignment:** Since the system is “monostatic”, meaning the source, and receiver are co-located, the optical beampath is completed with the FTIR and retroreflector optics. The infrared beam is collimated with a 50mm lens, and a very intense beam is created. The retroreflector offers the absolute easiest, fastest alignment possible under working field conditions.
- ❖ **Saves Raw Spectra and Performs Real-time Quantification:** Single Beam raw data is sent from AirSentry to the PC via ethernet data stream.

The output of the system is both raw spectroscopic, and also computer-aided analysis (concentration value) data. .

Cerex supports the use of this equipment for this project for the following reasons;

- ❑ portability (can be set up in a fixed location or with a tripod mount)
- ❑ low minimum detection levels for the compounds specified
- ❑ quality, traceable, legally defensible data
- ❑ advanced, automated software, thus reducing the costs associated with data analysis
- ❑ low cost-of-ownership due to low maintenance, no consumables
- ❑ minimal training due to easy user-interface

The specific item and part numbers associated with the AirSentry Op-FTIR are as follows:

P/N 282000 Cerex AirSentry Open Path Air Analyzer. The following components and accessories are included in this system:

- AirSentry Spectrometer (includes emitter and receiver)
- ZnSe Beamsplitters
- Power/Signal Cables
- PC Laptop Controller
- Continuous Monitoring Software
- Spectral Library Database
- Advanced Cryocooled MCT detector system

P/N 282333 50mm Square CornerCube Retroreflector Array (2 meters maximum recommended pathlength)

P/N 282305 Tripod Mounts for FTIR

P/N 282307 Optional Internal QA Cell