

## EQUIPMENT SPECIFICATIONS

### Nitrogen Dioxide (NO<sub>2</sub>) Analyzer

These specifications describe the minimum acceptable quality and/or performance level of the equipment to be purchased. Superior alternatives will be considered as compliant to the specifications. Unless otherwise defined in these specifications, technical terms and testing procedures shall be interpreted as defined in Title 40 of the Code of Federal Regulations (CFR), Part 53.23.

#### A. GENERAL SPECIFICATIONS

1. Equipment Description - Each Nitrogen Dioxide (NO<sub>2</sub>) analyzer shall continuously monitor concentrations of NO<sub>2</sub> in ambient air using the Cavity Attenuated Phase Shift (CAPS) spectroscopy analysis technique.
2. EPA Designation - Each analyzer must be designated as an automated reference or equivalent method for the measurement of concentrations of Nitrogen Dioxide (NO<sub>2</sub>) in ambient air by the United States Environmental Protection Agency (U.S. EPA) as defined in 40 CFR Part 53. Each analyzer shall meet all performance specifications listed herein while operating in the equivalent mode as approved by the US-EPA.
3. Operating and Service Manuals - Two (2) copies of the operating and service manual shall be provided for each analyzer purchased. Each manual shall contain installation, operation and maintenance procedures, detailed flow schematics and complete electrical drawings. Each manual shall also contain a complete list of spare parts and recommended spare parts storage levels. The manuals shall give detailed instructions for the use of the delivered analyzers with all options. The manuals shall be of the same quality as required by the U.S. EPA for reference and equivalent analyzers.
4. Guaranty - The vendor shall provide a written guaranty covering the equipment, including components, parts and field service. The guaranty period shall be for two years.
5. Technical Support - The vendor shall provide free unlimited telephone and email technical support by instrument manufacturer for the life of each analyzer without any pre-conditions (e.g. training). Technical support by telephone shall include:

- a. Responding in a timely manner, even if just to acknowledge receipt of the request;
  - b. Providing technical support during the hours of 8 am to 12 pm HST, minimum;
  - c. Providing technical support from someone who has the technical expertise and the necessary skills to help troubleshoot and solve advanced technical issues;
  - d. Communicating technical solutions clearly and concisely.
6. Training - The vendor shall be able to provide manufacturer's technical and service training at the manufacturer's facility and on-site in Hawaii.
  7. Service and Repairs - The vendor shall be able to provide manufacturer's service and repairs at the manufacturer's facility.
  8. Web Site - The vendor's web site shall have web-based support tools for service and support from the manufacturer.

B. PHYSICAL SPECIFICATIONS

1. Each analyzer shall be modular in design fully enclosed in a metal cabinet, allowing for easy access for servicing. It shall be supplied with all the hardware, including slides and brackets, necessary for mounting in a 19" wide by 25" deep instrument rack. Telescoping slides must provide a safety-locking device to hold empty rails in-place during installation to prevent personnel injuries and damage to the analyzer.
2. The A.C. input power cord shall be 3 conductor and at least 6 feet in length with a standard 3-prong grounded plug. The A.C. input to each analyzer shall be at the rear of each analyzer. The connectors shall be wired so that the "hot" terminal (black wire) is connected to the brass terminal throughout. The supply voltage shall be nominal,  $115 \pm 10$  VAC,  $60 \pm 3$  Hz, single phase.
3. The front panel of each analyzer shall include all the controls necessary to operate and calibrate the analyzer.
4. Each analyzer shall have an analog output voltage proportional to the ambient concentration of NO<sub>2</sub> and shall be accessible at the rear of the analyzer.
5. Each analyzer shall have an alphanumeric display on the front panel which shows:

- a. The actual concentration of NO<sub>2</sub> being measured by the analyzer in the currently selected units of measure;
  - b. Information such as warning messages, operational data, test function values, and response messages during interactive tasks;
  - c. Analyzer status indicating if the unit is operating in sample, calibration, or fault modes.
6. All tubing in each analyzer shall have connections, controls, and fittings that are designed for rapid, easy, and repeated disassembly and reassembly as may be required for cleaning and repair. All tubing, connections, fittings, and controls shall be constructed of materials which will not react with atmospheric or higher concentrations of NO<sub>2</sub>. External sample port and exhaust bulkhead fittings shall be stainless steel 1/4 inch Swagelock, Parker Hannifir, or equivalent. The materials, design, and construction of tube fittings shall be such that no leaks will develop as a result of repeated disassembly and reassembly. All gas handling systems and components shall be free of leaks.
7. Each analyzer shall be microprocessor controlled with software capable of viewing test variables during operation.
8. Each analyzer shall display a label or sticker indicating the reference designation number assigned by U.S. EPA to show that the instrument is acceptable for use in air quality surveillance systems by U.S. EPA.
9. All components in each analyzer shall be mounted so that they can be easily and quickly serviced, removed and reinstalled. All units and subunits shall be interchangeable and shall be of modular construction. All modules shall be capable of replacement with maximum service of 30 minutes using only basic hand tools.
10. Each analyzer shall utilize a flow control assembly to maintain a constant flow rate of sample gas through the instrument.
11. Each analyzer shall be equipped with an internal pump and must include one spare pump for future replacement.
12. Each analyzer shall be equipped with a particulate filter assembly for the sample stream and also include spare particulate filters, for periodic replacement, sufficient for two years of continuous operation.
13. Each analyzer shall have RS-232 serial communications and Ethernet ports.

14. Each analyzer shall have an internal data logging capability with programmable averaging periods.

C. PERFORMANCE SPECIFICATIONS

1. The full-scale range of each analyzer shall be selectable from 0 to 1 ppm. Each analyzer shall be U.S. EPA approved for operation on the 0 - 200 ppb range.
2. The measurement units of each analyzer shall be in ppm or ppb, user selectable.
3. The analog output voltage ranges of each analyzer shall be 1V, 5V, 10V user selectable and proportional to the selected analyzer range.
4. The lower detectable limit of each analyzer shall be equal to or less than 0.04 ppb.
5. The response of each analyzer shall be linear, with an inaccuracy of no more than 1 percent of full scale.
6. The span (at 80 percent of full-scale) response of each analyzer shall not drift more than  $\pm 0.5$  percent of reading in 24 hours.
7. The zero response of each analyzer shall not drift more than  $\pm 0.1$  ppb in 24 hours.
8. The response time of each analyzer shall be such that the digital display on the front panel and the analog output voltage reach 95 percent of the final concentration within 30 seconds after the air sample being measured is introduced into the sample inlet port.
9. Each analyzer shall be equipped with a diagnostic test function which displays analyzer operating parameters on the front panel digital display.
10. Each analyzer shall automatically display warning messages on the front panel display.
11. Each analyzer shall include a Windows 10 compatible software program that will allow users to:
  - a. Establish a link from a remote location to the analyzer through direct cable connection via RS-232 or Ethernet;
  - b. View the instrument's front panel and remotely access all functions that could be accessed manually on the instrument;

- c. Remotely edit system parameters and set points;
  - d. Download, view, graph and save data for predictive diagnostics or data analysis;
  - e. Retrieve, view, edit, save and upload analyzer data acquisition system configurations;
  - f. Check on system parameters for troubleshooting and quality control.
12. Each analyzer shall be able to communicate via RS232 serial connection to a Windows PC based data acquisition system running the Envitech Ltd. Envidas Ultimate software for continuous collection of NO<sub>2</sub> data and diagnostic parameters.
13. Each analyzer shall be unaffected by normal vibration associated with air monitoring instrument operation and vibration of normal transport.