URG Systems Overview

Better Air.
Better Lives.

URG Corporation

CONTENTS

In addition to the manual sampling systems detailed in this overview, we also have time resolved direct measurement sampling systems. Detailed information can be found in the AIM Brochure and Performance & Collection Efficiency technical document.

Ambient Ion Monitor

Time Resolved Direct Measurement of Nitrate, Sulfate, Hydrogen Chloride, Nitric Acid, Nitrous Acid and Sulfur Dioxide

The 9000 Series Ambient Ion Monitors consist of several different configurations for your specific sampling needs. The Ambient Ion Monitor (AIM) System can be configured with one Ion Chromatograph (IC) to provide time-resolved direct measurements of Anion particulate Nitrate, Sulfate, Nitrite, Phosphate and Chloride found in PM-2.5, as well as gas phase Hydrogen Chloride, Nitric Acid, Nitrous Acid and Sulfur Dioxide. With the addition of a second IC, the Ambient Ion Monitor will also provide time-resolved direct measurements of Cation particulate Ammonium, Sodium, Calcium, Potassium and Magnesium, as well as gas phase Ammonia.

The AIM system uses a parallel plate denuder equipped with a pre-cut membrane. The stability provided by the denuder eliminates the potential for microbial growth within the denuder that exists in other systems that have rotating denuders with moving mechanical parts. In addition, unlike the other ICs, the Thermo Scientific™ Dionex™ ICs can be disconnected from the AIM and used separately from the system.

The analysis method for the AIM System is a Thermo Scientific™ Dionex™ ion chromatography system. Dionex Reagent-Free™ IC (RFIC™) systems produce eluents and regenerants electrolytically, so all you need to do is add water. The unique Dionex RFIC systems work seamlessly with the AIM System for accurate determinations of air contaminants. The accuracy of the IC analysis is verified by an internal “check” standard of Lithium Bromide that is injected with each sample.

The AIM driver for Chromeleon 7.2 allows for seamless control of the AIM with one powerful software program. Data is stored in a single database and can be exported using customizable report templates. You can completely control the AIM operation from one user-friendly home panel. From this home panel, users can quickly identify that the AIM is operating correctly. The pre-flight conditions automatically check the instrument methods to ensure that they are configured properly prior to operation. Once data has been QA’ed, the software automatically recalculates data to µg/m^3.

Specifications:

- Detection Limit Range of .05µg/m^3
- 3Lpm Sampling Rate
- Available as 115VAC or 220VAC
- Bidirectional RS232 Internal Data Storage
- Displays Data in µg/m^3
- Available as Free Standing or Rack Mountable Unit
- 19” x 16” x 36”
- 65-85 lb

Measurement Capabilities

- Designed to Meet USEPA's Compendium Method IO-4.2 Determination of Atmospheric Fine Particles and Gases in Ambient Air Using Annular Denuder Technology
- Accurate Method for Measuring
- *Gases:* HNO3, HONO, NH3, SO2, HCl *Particles:* NO3-, SO4=, NH4+
- Single Day Sampler

Analysis Method:

- Incorporates Proven Analysis Method of Ion Chromatographywhich is currently being used by USEPA
- Requires as Little as 4 Liters of Deionized Water for 10 Sample Days
- Can Collect and Analyze up to 14 Days Unattended

URG-9000D
Ambient Ion Monitor
Internal View

Annular Denuder System

Simultaneous Collection of Particles and Gases

The Annular Denuder System (ADS) collects both acidic and basic gases with little or no interference from sampling artifacts and concentrates samples for characterization by state-of-the-art analytical methods. The ADS is an efficient system which is currently being used in a wide range of research, industry and government studies.

Specifications for URG-3000C

- Temperature Regulated Sampling Box, 49.5" x 7" x 7", 28 lb
- Computerized Sampling Pump, 18" x 14.5" x 11", 40 lb
- 10Lpm Flow Rate, 2.5µm Cutpoint
- Available as 115VAC or 220VAC

URG-2000-01
Insulated
Sampling Box

Measurement Capabilities

- Designed to Meet USEPA's Compendium Method IO-4.2 Determination of Atmospheric Fine Particles and Gases in Ambient Air Using Annular Denuder Technology
- Accurate Method for Measuring
- *Gases:* HNO3, HONO, NH3, SO2, HCl *Particles:* NO3-, SO4=, NH4+
- Single Day Sampler

Research

- Epidemiological Programs to Assess the Impact of Strong Acid Aerosol Acidity on Respiratory Impairment
- Assessing the Impact of Particulate Nitrate and Sulfate on Visibility
- Quantifying the Impact of Acidic and Basic Air Pollutants on Issues Related to Acid Rain
- Enhancing Our Understanding of Atmospheric Chemistry

Industry

The ADS has been used in outdoor ambient air characterization studies.

EXAMPLE: Identifying possible contributin pollutants to negative changes in vegetation downwind of a chemical manufacturing facility. Once pollutants are characterized, appropriate scrubbers can be employed.

State Government

The ADS may be used to estimate the age of PM-2.5 to help identify the sources of pollution.

EXAMPLE: Annular Denuders can show if the polluted air has recently been emitted from sources or if it has had time to form secondary particulate matter. The ADS can collect both the gaseous and particulate stages of respirable particulate matter.

Components

URG-3000-02BA
Computerized
Sampling Pump

URG-3000-02Q
Computerized
Indoor Pump

47mm Teflon®
Filter Packs

PM-10
Inlet

Dry Gas
Meter

Annular
Denuder

Polyurethane Foam
Sampler (PUF)

How Annular Denuders Work

When air flows through a tube whose interior surface has been chemically coated to react with a particular gaseous species, the gases of interest are adsorbed or denuded from the air stream. As gases have diffusion coefficients that are significantly higher than particles, gases are denuded from the air flow while the particles proceed, unaffected, along the tube (Figure 1). A filter placed at the end of the tube collects the particles. This tube would have to be impractically long, however, to collect a sufficient sample, so scientists increased collection efficiency by developing the annular denuder configuration.

An Annular Denuder is an open-ended glass tube in which a closed glass cylinder is mounted (Figure 2). This inner cylinder increases the surface area, causing the gases to impact more frequently with the chemically coated interior. Subsequently, the required length of the collection tube is reduced.

URG improved upon this design by creating multichannel annular denuders. Multichannel annular denuders are composed of two or more concentric glass tubes with a closed cylinder in the center (Figure 3). The inner surface of these tubes are etched to provide greater surface area for coating.

The all glass annular denuder is economical because it is easily cleaned and can be reused to collect different chemical species. Unfortunately, it is also easily broken. URG has alleviated this problem, however, by sealing the multichannel annular denuders into a Teflon® coated stainless steel sheath. In URG's Annular Denuder System (ADS), two or more multichannel annular denuders are operated in a series to collect different gases or to increase the collection efficiency for some gases. Figure 4 shows the typical ADS configuration. Air is drawn through the ADS by a pump. The air flow initially enters a cyclone, which is essential to effectively remove coarse particles (>2.5µm in aerodynamic diameter). Whereas fine particles tend to move with the flow of the air stream, coarse particles often impact within the annular denuder assembly and introduce sampling artifacts. URG's cyclones undergo a unique Teflon® coating process which allows the cyclone to remove coarse particles without removing the gaseous species of interest.

Air leaves the cyclone and enters the first annular denuder, which in Figure 4 is coated to collect acidic gases. The second annular denuder is coated to collect alkaline gases.

The Teflon® coated stainless steel sheath not only prevents breakage but a portion of this sheath also serves as a flow straightening section. Air flow through the annular denuders must be laminar in order to ensure that the gases separate from the fine particles, so the concentric tubes are inset approximately 25 mm from one end of the annular denuder (Figure 3), allowing the airstream to become laminar before entering the reactive section. The flow straightener is always mounted facing the incoming airstream.

In a denuder, the majority of the gases are adsorbed the first third of the tube

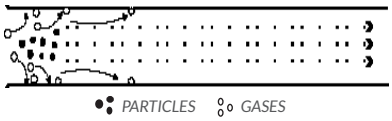


FIGURE 1

Cross-Sectional View of a Single Channel Annular Denuder

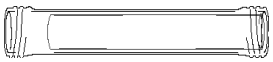


FIGURE 2

Cross-Sectional View of Multi-Channel Annular Denuder

FIGURE 3

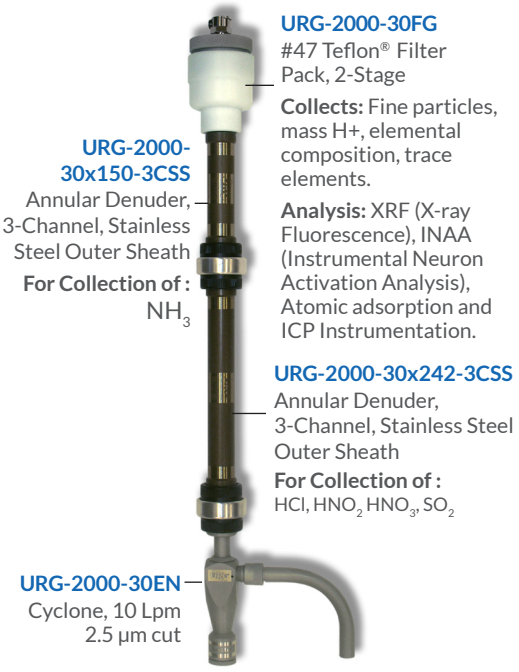


FIGURE 4

Finally, the fine particles are collected on the filter pack. URG's filter packs are also unique, as the filters do not come in contact with o-rings but are sealed via a novel o-ring arrangement (Figure 5). In addition, the filters are supported on a screen that has been coated with Teflon®. This allows uniform particle deposit which is important for trace metal analysis.

The ADS has been used successfully in a number of deposition studies due to its inherent ability to concentrate reactive gases onto a small surface area and be extracted into a minimum sample volume. Thus, the ADS can be used to analyze both background and urban pollution levels of SO_2, NH_3, HNO_3, HF, and HCl. As noted in Figure 4, SO_2 is in the form of sulfate when it is extracted from the denuders. Nitric acid is in the form of nitrate; HCL is in the form of chloride, and nitrous acid is in the form of nitrite. These aqueous carbonate extracts are analyzed by ion chromatography (IC) methods.

The filter may also be used to measure fine particle mass by weighing the filter before and after collecting the sample. The x-ray fluorescence analysis method (XRF) can reliably measure ng/m^3 levels of toxic metals for sampling periods of 12-24 hours. Also, after the XRF analysis, the filter may be extracted and analyzed for hydrogen ion, sulfate and nitrate concentrations.

A nylon filter placed behind the Teflon® filter will collect any HNO_3 that may evaporate from the Teflon® filter during sampling. The nylon filter may be extracted and analyzed by IC for nitrate. This analysis, combined with the nitrate measured from the Teflon® filter, provides the concentration of fine particle nitrate in the atmospheric sample.

Filter Pack Expanded View

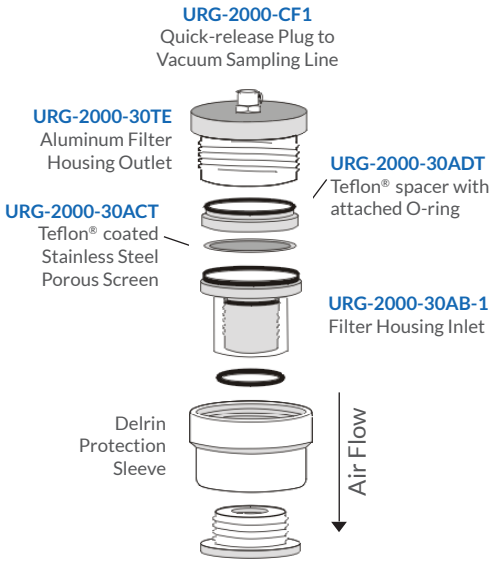


FIGURE 5

Cleaning, Coating & Drying Annular Denuders

Detailed instructions for cleaning, coating and drying annular denuders is located in the "USEPA Compendium Method IO-4.2" and can be found at www.URGcorp.com. Below is a brief description of how annular denuders are coated.

1. Fill clean denuder with coating solution.
2. Cap ends.
3. Rotate & flip denuder in all directions (Figure 6).
4. Decant coating solution.
5. Dry 10 minutes with clean dry air with URG drying train (Figure 7).
6. Cap annular denuder until ready to use.

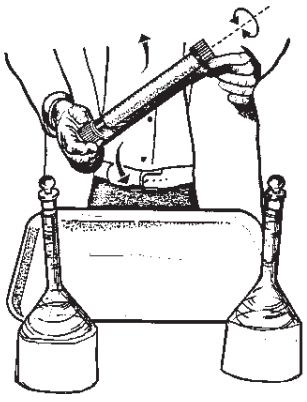


FIGURE 6

Drying Manifold Assembly

FIGURE 7

PUF Sampler Alternate Configuration

As Figure 8 demonstrates, the ADS system can be easily adapted for the collection of condensable and semivolatile organics. Typically, the PUF fine particle sampler is configured to operate at 10Lpm. The collection surface is a thermally purified 47mm diameter quartz filter. Following the quartz filter is a 3" x 1" diameter pre-cleaned polyurethane foam plug. The filter and PUF trap are typically extracted together and analyzed for PAH's, pesticides, and in some cases, PCB's and dioxin. An aliquot of the quartz filter may be removed prior to extraction and analyzed by thermal combustion methods for elemental carbon (Ce) and volatilizable carbon (Cv). The PUF plug, glass cartridge, and flow rate conforms to "ASTM Standard 4861, ASTM Standard 4947," and "EPA Method TO10: Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air."

URG-2000-30AE
PUF Adapter

PUF Sampler 80 mm x 32 mm, with **PUF** Insert.

Collects semivolatile and condensable organic Polynuclear Aromatic Hydrocarbons (PAH's). Samples collected on the PUF assembly can be extracted and analyzed for toxic organics by GC/MS, GC/FID, or GC/ECD.

Analysis can be done by High Performance Liquid Chromatography.

URG-2000-30FH
#47 Filter Pack, 1-Stage Quartz filter extracted and analyzed for toxic organics by GC/MS, GC/FID or GC/ECD. Depending on the filter medium, the filters can be analyzed for C org, C elem, Pb, Se, fine particle mass, inorganic anion concentrations and acidity.

URG-2000-30EN
Cyclone, @ 10Lpm, cut is 2.5µm. At 15-20Lpm the cyclone will remove particles greater than 2.0µm.

FIGURE 8

Sequential Sampling Component Options

Weekly Air Particulate Sampler & Dual Sequential Fine Particle Sampler

INLET: The inlet configuration for both of these systems is a PM-10 head followed by a cyclone. The PM-10 inlet is used prior to the cyclone to minimize losses of particles less than 10µm at wind speeds as high as 20-30 km/hr and to minimize ingestion of rain and insect debris. The PM-10 inlet transmits the PM-10 particles to the cyclone. The cyclone removes particles >2.5µm and transmits the PM-2.5 particles to the manifold. If the cyclone was removed and only PM-10 particles were to be collected, there would be some losses, due to impaction, of the 5-10µm particles to the manifold, and the PM-10 mass might be reduced by 5-10%. The inlets are Teflon® coated to minimize losses of reactive gases (SO_2, HNO_3, NH_3) to the inlet walls, so these gases can be collected with annular denuders for subsequent analysis. The Teflon® coating also extends the life of the inlet system by preventing the surface from oxidizing.

SAMPLING: The air sample stream exiting the inlet enters a Teflon® coated manifold and the aerosol sample is collected on the filter system. Samples collected on Teflon® filters are analyzed for mass and trace metals, and samples collected on quartz filters are typically analyzed for carbon content and/or polycyclic aromatic hydrocarbons and pesticides. Annular denuders may be installed between the manifold and filter pack to remove acidic or basic gases, and a PUF trap may be installed after the quartz filter to collect the semivolatile organic species.

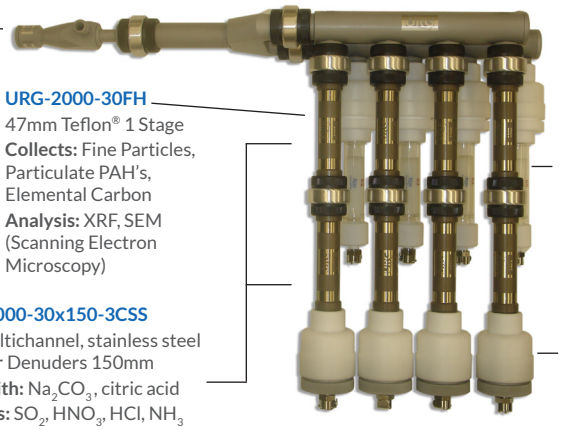
TIMERS: Typically, samples are collected at 24 hour intervals. A series of solenoids are activated and programmed by the operator to collect samples in the desired sequence.

After the first collection period, the first solenoid is automatically closed, the second solenoid is activated and the second sample is started. This continues in sequence until 4 parallel (Dual Sequential Fine Particle Sampler) or 8 sequential (Weekly Air Particulate Sampler) samples are collected.

PUMPS: The Weekly Air Particulate Sampler comes with one flow controlled pump. With a single pump, eight consecutive samples can be programmed for collection at preset time intervals. A Mass Flow Controller provides the flow readout. Two pumps and two mass flow controllers are provided with the Dual Sequential Fine Particle Sampler. Since there are two manifolds in this sampler, the second pump can be used to collect duplicate samples or to collect samples on different filter media.

HOUSING: The Teflon® coated cyclone, Teflon® coated manifold, sequential programmable timer and mass flow controller are housed in a temperature regulated insulated aluminum box. The temperature of the box is maintained at 2°C above the outside temperature to prevent water condensation in the manifold and filter pack assembly. When the temperature outside drops below 5°C the heater remains on to keep the housing warm. When the temperature is above 30°C, the heater is off and the blower efficiently circulates air to prevent loss of the sample. The front face plate of the sampler console below the timer has flow regulation solenoid valves and a flow readout for each channel. The mass flow controller is located in the sampler box behind the panel readout

Weekly Air Particulate Sampler Internals



URG-2000-30EH
#30 Teflon® coated aluminum cyclone 16.7Lpm, 2.5µm

URG-2000-30FH
47mm Teflon® 1 Stage
Collects: Fine Particles, Particulate PAH's, Elemental Carbon
Analysis: XRF, SEM (Scanning Electron Microscopy)

URG-2000-30x150-3CSS
#30 multichannel, stainless steel Annular Denuders 150mm
Coat with: Na_2CO_3, citric acid
Collects: SO_2, HNO_3, HCl, NH_3
Analysis: IC, colorimeter autoanalysis, selective electrodes.

URG-2000-30PUF
PUF Sampler, Includes PUF Material and Teflon® Lined End Caps
Collects: Semi-Volatile and Condensable Organic Polynuclear Aromatic Hydrocarbons (PAH's)
Analysis: High Pressure Liquid Chromatographic and Gas Chromatographic-Mass Spectrometry, GC/FID or GC/ECD

URG-2000-30FG
#47 Filter Packs, 1-stage
Collects: Fine particles, mass, H^+, elemental composition, trace elements
Analysis: XRF (X-ray fluorescence), INAA (instrumental neutron activation analysis), Atomic adsorption and ICP instrumentation

Weekly Air Particulate Sampler

Simultaneous Collection of Particles and Gases

Specifications for URG-2000-01J

- Temperature Regulated Sampling Box, 36” x 22” x 13 1/2”, 80 lb
- 16.7Lpm 2.5µm
- Available as 115VAC or 220VAC

Measurement Capabilities

- Low Maintenance - Ideal for Remote Areas
- System Can be Left Unattended for Up to Seven Days
- Programmable for Collection of Up to Eight Consecutive Samples at Pre Set Intervals
- Capable of Viewing & Programming Settings for Different Sampling Time Periods
- Internal Components are Interchangeable (Filter Packs, Annular Denuders and PUFs)
- Volumetric Flow Control and Constant Temperature Control

Dual Sequential Fine Particle Sampler

Simultaneous Collection of Particles and Gases

Specifications for URG-2000-01K

- Temperature Regulated Sampling Box, 36” x 22” x 13 1/2”, 80 lb
- 16.7Lpm 2.5µm
- Available as 115VAC or 220VAC

Measurement Capabilities

- Collects Four Pairs of Samples in Parallel
- Collects Aerosols, SVOC’s & Mass
- Low Maintenance - Ideal for Remote Areas
- Capable of Viewing & Programming Settings for Different Sampling Time Periods
- Internal Components are Interchangeable (Filter Packs, Annular Denuders and PUFs)
- Volumetric tFlow Control and Constant Temperature Control

Sequential Sampling System Uses

RESEARCH: Establishing preliminary assessment of air quality to serve as basis for designing monitoring plan full-scale study; providing data for identifying major sources of contaminants in air through receptor modeling; assessing the impact of particulate nitrate and sulfate on visibility; enhancing our understanding of atmospheric chemistry; and establishing a relationship between particulate levels and health effects

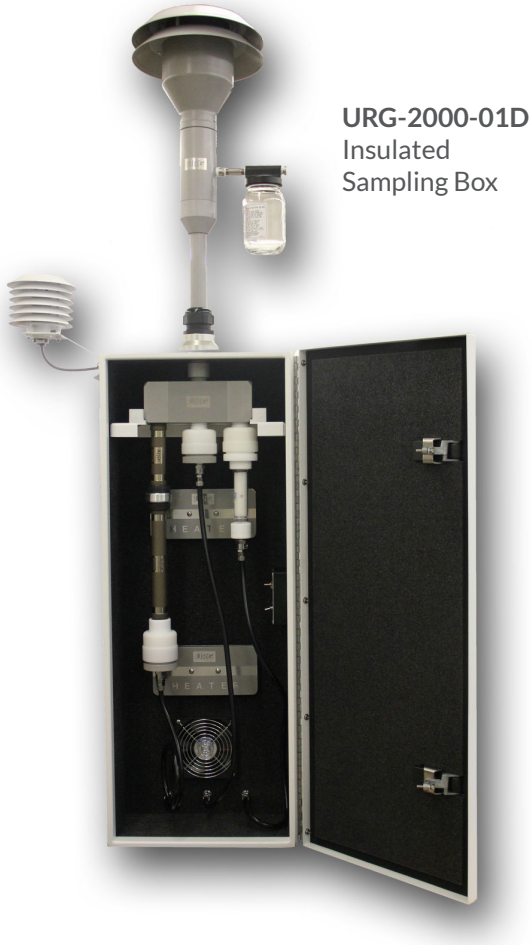
INDUSTRY: Determining respiratory effects of air emissions from a waste burning industrial furnace; comparing possible contributing pollutants to negative changes in vegetation downwind of a manufacturing facility; and determining background levels of acid aerosols to assess incoming industries effect on pollution

GOVERNMENT: Samples used to obtain information for source apportionment; determining source of air toxins; determining presence of air toxins in air shed; assessing concentrations of air pollutants that impact state and federal air quality standards; and determining ammonia concentrations in open waste sites

Versatile Air Pollutant Sampler

Simultaneous Collection of Fine and Coarse Particles (PM-10 & PM-2.5)

The Versatile Air Pollutant Sampler (VAPS) allows for the simultaneous measurement of a variety of air quality parameters. The virtual impactor used in the VAPS is a modification of the virtual impactor system approved by the USEPA for compliance monitoring of PM-10. The VAPS virtual impactor operates at 32Lpm. The coarse particles travel straight through the center channel and are collected on a filter. The fine particles travel through the left and right channels. Annular denuders on the left channel collect any reactive acidic and basic gases. A polyurethane foam sampler (PUF) on the right channel collects higher molecular weight organic vapors.



URG-2000-01D
Insulated
Sampling Box

Specifications for URG-3000K

- Temperature Regulated Sampling Box, 8" x 14" x 36", 40 lb
- Computerized Sampling Pump, 32" x 18" x 15", 80 lb
- 32Lpm Flow Rate, 2.5µm to 10µm Cutpoint
- Available as 115VAC or 220VAC

Measurement Capabilities

- Designed to Collect Both Coarse Particles (2.5µm to 10µm and Fine Particles with Little or No Interference from Sampling Artifacts
- Three Samples Taken Simultaneously
- Virtual Impactor Inlet
- Concentrates the Samples for Characterization by State-of-the-Art Analytical Methods, Ion Chromatography, XRF, HPLC, and GL

Uses

- Establishing Preliminary Assessment of Air Quality to Serve as a Monitoring Plan for a Full-Scale Study
- Providing Data for Identifying Major Sources of Contaminants in the Air Through Receptor Modeling
- Determing the Impact of Particulate Nitrate and Sulfate on Visibility
- Quantifying the Impact of Acidic and Basic Air Pollutants on Issues Related to Acidic Rain
- Enhancing Our Understanding of Atmospheric Chemistry

Components:

URG-3000-02G
Computerized Sampling Pump

47mm Teflon® Filter Packs

Polyurethane Foam Sampler (PUF)

PM-10 Inlet

Dry Gas Meter

Annular Denuder

URG-3000N Carbon Sampler

Collection of Elemental & Organic Carbon

The URG-3000N is designed to sample for organic and elemental carbon found in ambient PM2.5. The measurement of ambient carbon species is an important part of the United States PM2.5µm Chemical Speciation Network (CSN). The URG-3000N has been designed for the USEPA to acheive comparable data with the carbon measurements of the Interagency Monitoring of Protected Visual Environments (IMPROVE) PM2.5 carbon module.

Weather-Tight Alumnium Enclosure

Specifications for URG-3000N

- Weather-Tight Alumnium Enclosure, 64” x 21”x 18”, 135 lb
- 22Lpm Flow Rate
- Available as 115VAC or 220VAC
- Operates at -20°C to 45°C

Measurement Capabilities

- Collects PM-2.5 Particles on Quartz Filters. These Filters are Analyzed for Organic and Elemental Carbon using Thermal Optical Reflective (TOR) Analysis Method
- 1-in-3 Day or 1-in-6 Day Filter Sampling
- Active Volumetric Flow Control
- Self-Supporting Stand to Allow Easy Access to Sampler and Provide Protection in Field Operation
- User-Friendly Keypad for All Operator Interfacing

Internal View Module C Side

Internal View Controller Side

Semi-Volatile Organic Aerosol Sampler

Simultaneous Collection of Gases and Particle Phase Semi-Volatile Organics

Organic species in the atmosphere are typically present in two phases: gas and aerosol. Some of these organic species are in equilibrium between gas and aerosol phase depending on several factors, hence the name semi-volatile organic compounds (SVOC). These factors include temperature, concentration and chemical form. A few examples are hydrocarbons, aromatics, pesticides and oxygenated aldehydes. Models to determine the phase distribution of organic species in the atmosphere are at best an approximation of their true phase distribution. The phase distribution of SVOCs is used to determine the fate of SVOCs and their transport pathways in the atmosphere.

Specifications for URG-3000DB

- Temperature Regulated Sampling Box, 60" x 12" x 12", 20 lbs.
- 92Lpm, 2.5µm
- Available as 115VAC or 220VAC
- Interactive Process Control Software
- Maintains User Defined Settings for Flow and Temperature
- Monitors Ambient and Sample Conditions
- Data Logging Capable

Measurement Capabilities

- Direct Determination of the True Phase Distribution of SVOCs
- XAD-4 Coated Annular Denuder for Separation of SVOC Gases
- The Temperature Regulated Sampling Box Minimizes Volatilization of the SVOCs During Sampling and Protects the Collection System from Environmental Changes

Components:

92Lpm 2.5µm Sharp Cut Cyclone

Polyurethane Foam Sampler (PUF)

90mm Teflon® Filter Packs

8 Channel Annular Denuder

Medium Volume Particulate Sampler

Simultaneous Collection of PM-2.5 and PM-10

The Medium Volume Particulate Sampler allows for the simultaneous measurement of a variety of air quality parameters. This sampler collects (4) PM-2.5 and (4) PM-10 samples simultaneously, and the flow on all eight channels is controlled by critical orifices. The enclosure is designed to accomodate additional sampling components such as annular denuders and PUF samplers, making it an ideal sampler for many different sampling scenarios.

Specifications for URG-3000ABC

- Weather-tight Aluminum Enclosure, 24” x 20” x 12”, 20 lb
- 66Lpm Total Flow Rate
- Available as 115VAC or 220VAC
- Circle Timer for On/Off Settings
- Vaned Vacuum Pump Capable of 16” Vacuum at 66Lpm
- Resettable Elapsed Timer
- Total Vacuum Gauge

Measurement Capabilities

- Can Collect Multiple PM-2.5 and PM-10 Samples Simultaneously
- Eight Flow Rates Controlled by Critical Orifices
- Enclosure Has Sufficient Space for Multiple Sampling Configurations Including Annular Denuders, Filter Packs, and PUF Samplers

Mercury Sampling System

Simultaneous Collection of Gases and Particulate Mercury

Specifications for URG-3000M

- Insulated Sampling Box, 49 1/2” x 7” x 7”, 15 lb
- Computerized Sampling Pump, Seven Day Programmable, 18” x 14 1/2” x 11”, 40 lb 10Lpm, 2.5µm
- Available as 115VAC or 220VAC

Measurement Capabilities

- Speciated Measurements of Reactive Gas Phase Mercury (RGM) and Particulate Mercury
- Incorporates KCl Coated Quartz Annular Denuder
- Programmable for Collection of Up to Eight Consecutive Samples at Pre Set Intervals
- Insulated Sampling Box Maintains Temperature at Approximately 35 Degrees Celsius

Documentation

- **Complete URG Parts Catalog**
  Download at www.URGcorp.com

- **Individual URG Sampling System Specifications**

- **USEPA Publication 625/R-96/010a**
  Compendium of Methods for the Determination of Inorganic Compounds in Ambient Air IO-4.2 Determination of Reacitve Acidic and Basic Gases and Strong Acidity of Fine Particles.
  Download at www.epa.gov/ttnamti1/files/ambient/inorganic/mthd-4-2.pdf

- **Species Collection Data Sheets**
  Detailed information with sampling configuration for the collection of Ammonia/Particulate Ammonia, Acidic Inorganic Gases, Ammonia and Aerosol Composition, Aliphatic Amine/Aniline and Formaldehyde.
  Download at www.URGcorp.com *under "Documents and Resources"*

- **Individual Sampling System Operations Manual**
  Contact URG Corporation directly via phone or email to request specific operations manuals

- **Labratory Procedures**
  Explains the process of cleaning, coating and analyzing annular denuders.
  Contact URG Corporation directly via phone or email to request these procedures

- **Compilation of Research Papers**
  Documenting Annular Denuder System (ADS), Versatile Air Pollutant Sampler (VAPS) and Sequential Sampler Technology, 1983-present.
  Contact URG Corporation directly via phone or email to request this compilation

All the Above Documentation is Available at URG Corporation
Call 919.942.2753 or Email Requests at Info@URGcorp.com

URG is helping to ensure the air we breathe is the best it can be by being actively involved in the research and development of sampling instrumentation for a variety of ambient air measuring technologies. URG develops strong partnerships with our clients to address and solve ambient air measurement problems so that together we can share in the preservation of the world's health. We partner with our customers to meet their needs through innovation and engineered excellence.

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