Environmental Supply Company, Inc.

Source Sampling Systems

Quality Source Sampling Systems & Accessories
Environmental Supply Company, Inc.

2142 East Geer Street, Durham, NC 27704 USA
800-STACKS-5 (782-2575) 919-956-9688 Fax: 919-682-0333
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To our valued customers

Our Commitment To You

At Environmental Supply Co., Inc., it is our foremost objective to set and maintain the highest standard of quality for reliable instrumentation and the highest standard of excellence in customer service in the industry. Our systems are in use around the world and are relied upon by the largest and most successful source testing companies. We will be proud to provide strong references from world recognizable companies for every system that we manufacture.We would like to extend our sincere appreciation to all in the environmental testing community who have shown us their confidence by choosing Environmental Supply Co., Inc. as your supplier of choice. Our dramatic growth worldwide since we opened our doors and the loyal patronage of our customers allows us to continue to realize our objective.

Our Guarantee

We guarantee customer satisfaction in the equipment, information and customer service that we provide. Our designers, engineers, assembly technicians, metal fabricators, electrical technicians, and customer support professionals possess a unique commitment to excellence in providing quality equipment, reliable performance, competitive pricing and responsive service.

Our Standard Equipment and Systems

ESC manufactures source testing equipment that fulfills or surpasses the technical and operational requirements specified by the U.S. EPA in the Stationary Source Testing Methods. Our systems are designed for reliability, ease of use and long operating life. We stock standard equipment ready to ship when an order is placed. Most orders can be shipped within 24 hours.

Custom Solutions

At ESC we are in the business of delivering solutions to your specific requirements in a timely manner. We specialize in the design, development and manufacture of unique equipment and custom systems to fulfill special applications. Our intention is to provide the system or system components that conform to YOUR specifications and/or YOUR design. Alternatively, we will be delighted to offer a design for you when requested.

Technical Support Information, Literature and Training

Our staff has extensive experience in design and manufacturing of portable and reliable equipment and systems for source sampling professionals worldwide. We are dedicated to providing the necessary technical information and literature that will assist our customers in environmental source testing. We provide training to familiarize customers new to source sampling in the use of our source testing systems to perform the EPA stationary source testing methods.

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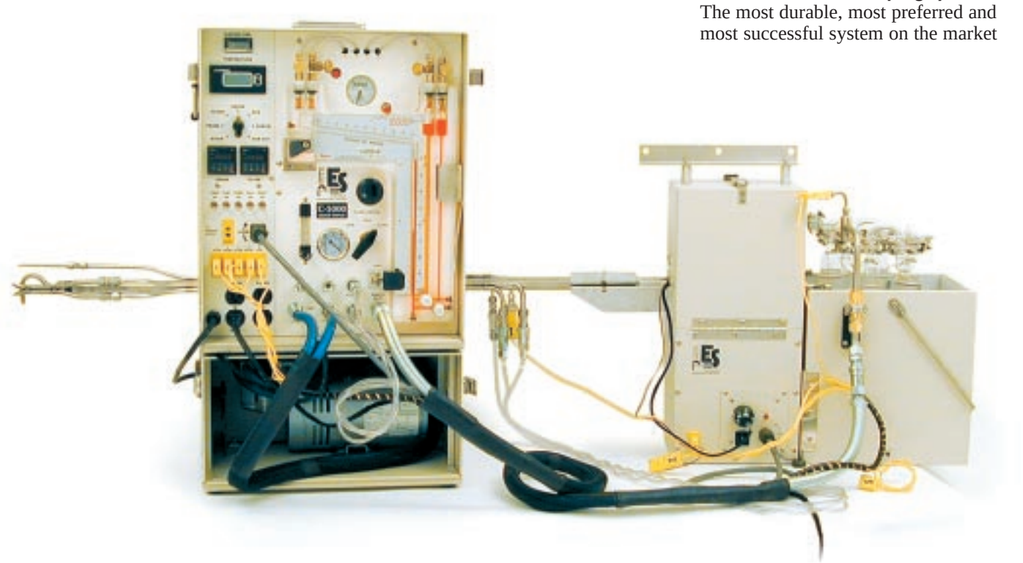
Method 5 Isokinetic Sampling System
The most durable, most preferred and most successful system on the market



Overview of EPA Source Testing Methods & Requisite Equipment

Following the enactment of the Clean Air Act of 1970 the EPA promulgated a series of stationary source testing methods introduced in the Code of Federal Regulations Title 40, Part 60, Appendix A. The initial EPA Methods 1-4 define the conventions utilized to gather the primary information required to perform isokinetic source testing. This information includes traverse points, stack gas velocity, volumetric flow rate, moisture content, excess air and dry molecular weight of the stack emissions. This data is important for determination of nozzle size, sampling flow rate and other parameters required to adhere to isokinetic sampling principals.

Method 5 - Determination of Particulate Emissions from Stationary Sources is the major isokinetic sampling regulation that governs the procedures and apparatus necessary to collect a representative particulate sample from a source. With proper monitoring of flue gas velocity, temperatures and pressures a tester can correctly adjust the sample flow rate so that the flue gas and particle mixture entering the nozzle is at an equal velocity to that of the approaching flue gas. A comprehensive understanding of these first five test methods is critical to the proper performance of the test methods that follow Method 5, many of which are variations of this primary isokinetic test method.

Environmental Supply Company Solutions

ESC Isokinetic Sampling Systems are designed for longevity and ease of use. They are also designed for easy modification or adaptation to perform many of the non-isokinetic (or gaseous) sampling methods as well. Our Low Flow Sampling Console, the UNI-VOS-110, along with our array of miniature sampling trains, allows most of the remaining non-isokinetic sampling methods to be performed as well. Our systems have been in use at a variety of industrial and municipal sources all over the world with great success. We bundle complete systems for performing Method 5 as well as many of the other source testing methods. We also provide extension sets of equipment to augment the Method 5 sample train to test for individual parameters of interest in the remaining isokinetic stationary source test methods. We carry a complete line of standard and specialized equipment and components to perform all of the following test methods under extreme conditions such as high temperatures, corrosive environments and test sites with limited access.

Primary Stationary Source Sampling Methods

Methods	2, 2F, 2G 2H	Volumetric Flow Rate Measurement
Method	3	Gas Analysis for CO_2, O_2, Excess Air and Dry Molecular Weight
Method	4	Moisture
Method	4A	Moisture (Approximation Method)
Method	5	Particulate Emissions
Method	6	Sulfur Dioxide Emissions
Method	6A	Sulfur Dioxide, Moisture and Carbon Dioxide
Method	6B	Sulfur Dioxide and Carbon Dioxide
Method	7	Nitrogen Oxide
Method	8	Sulfuric Acid and SO_2
Method	10	Carbon Monoxide
Method	11	Hydrogen Sulfide in Petroleum
Method	12	Inorganic Lead
Methods	13A & 13B	Total Fluorides
Method	15A	Total Reduced Sulfur, Petroleum Refinery Sulfur Plants
Method	16A	Total Reduced Sulfur
Method	17	Particulate Emissions By In-Stack Filtration
Method	18	Gaseous Organic Compound Emissions By Gas Chromatography
Method	23	Dioxins and Furans
Method	26	Hydrogen Halides and Halogens
Method	26A	Hydrogen Halides and Halogens
Method	29	Multi-Metals
Method	106	Vinyl Chloride By Integrated Bag Sampling
Method	201A	PM-10 Emissions
Method	201B	(Proposed) PM-10 and PM-2.5 Emissions
Method	202	Condensible Particulate Matter
Method	206	Ammonia
Method	306	Chromium, Electroplating and Anodizing Industries
Method	308	Methanol
Method	316	Formaldehyde, Mineral Wool and Wool Fiberglass Industries
Method	0010	Semivolatile Organic Compounds
Method	0011	Formaldehyde, Other Aldehydes and Ketones
Method	0030	Volatile Organic Compounds (VOST - Volatile Organic Sampling Train)
Method	0031	Semi-Volatile Organic Compounds
Method	0040	Principle Organic Hazardous Constituents (POHCs) By Tedlar Bag Sampling
Method	0051	Hydrogen Chlorine and Chlorine
Method	0061	Hexavalent Chrome (Cr+6)
NCASI Method 8A		Sulfuric Acid Vapor or Mist and Sulfur Dioxide (Controlled Condensate)

■ Isokinetic Method ■ Non-Isokinetic Method

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Prices, Terms and Conditions

Environmental Supply Co. Inc. (ESC) product prices are subject to change without notice. Prices in effect at the time of order shall apply. All prices are F.O.B. Durham, North Carolina. When requested, ESC will furnish price quotes by phone, fax, mail or email. Payment terms are 2% 10 days, net 30 days to established accounts in the U.S.A. that are in good standing or by Visa, MasterCard or American Express. The 2% 10-day payment discount is not applicable to credit card orders. Prices in the Domestic Price List are for delivery in the U.S.A. Orders for export will be based upon the Export Price List and must be paid in advance via bank to bank wire transfer of funds for full invoice amount. A 1.5% per month finance charge may be applied to invoices over 30 days past due. We reserve the right to refuse any order.

Prices, terms, conditions, system components and specifications are subject to change without notice.

Ordering

Telephone orders are accepted for established accounts. Under most circumstances standard off-the-shelf products will be shipped within 24 hours, however the shipping date will be determined upon receipt of order. ESC will ship as soon as possible after receipt of an order via our preferred carriers unless otherwise requested. When requested, we will ship via any mode that you specify. Freight charges are prepaid and added to the invoice. ESC reserves the right to make partial shipments when circumstances beyond our control may delay a portion of the order.

Product Design Changes

ESC products that you receive may differ from catalog representations due to design changes and improvements. These alterations in the design are made in response to changes in regulatory requirements or for the purpose of improving performance, prolonging operating life, facilitating replacement of parts or expediting delivery.

Warranty

Equipment and parts manufactured by ESC and supplied hereunder are warranted to be free from defects in materials and workmanship for a period of one year after delivery. If such defects are discovered within this time period ESC shall, at its option, repair or replace such equipment or parts, excluding installation. ESC's obligation hereunder shall be limited to such repair and replacement, F.O.B., its factory, and shall be conditional upon ESC's receiving notice of any alleged defect within ten days after its discovery, and upon return of such equipment or parts to its factory. This warranty shall not apply to equipment or parts not manufactured by ESC. ESC's warranty obligations regarding equipment and parts manufactured by others shall in all respects conform and be limited to the warranty extended to us by our supplier. This warranty is void if equipment or parts have been repaired or altered by others, subject to negligence, accident, damage by circumstances beyond ESC's control, or improper operation, maintenance or storage, or to other than normal use or service.

Claims / Returns

If any damage is noted upon receipt of merchandise, first contact your shipping agent. Retain all cartons and packing material. Returns to Environmental Supply Company must have prior return authorization from the ESC Sales Department. Returns will not be accepted without return authorization, freight prepaid by purchaser and applicable shipping agent inspection reports. A restocking fee may be assessed. Custom manufactured items are not returnable.

Acceptance of Terms and Conditions

Orders placed or deliveries accepted for merchandise supplied by ESC shall constitute acceptance of the foregoing terms and conditions, the exclusive provisions under which ESC sells products. Terms and conditions of any offer, acceptance, or other contractual document shall not be binding to ESC.

Credit Cards Welcome

MasterCard VISA AMERICAN EXPRESS

Company Purchase Orders

Accepted Upon Credit Approval

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(800) 782-2575 or (919) 956-9688

Hours

7:00 am-6:00 pm (Eastern Time)
Phones monitored for messages
24 hours a day, 7 days a week!

24-Hour FAX

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Methods 2, 2F, 2G & 2H: Volumetric flow rate measurement

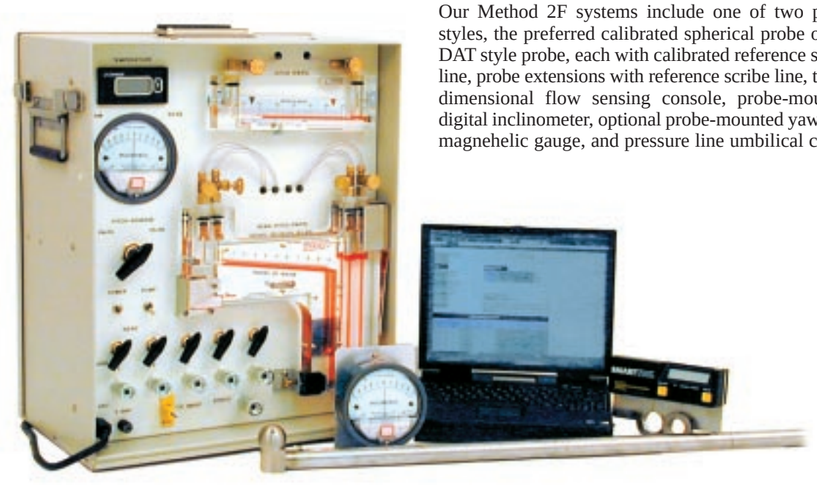
The ESC Three Dimensional Flow Sensing System and Type S Pitots were used in the flow study initiated by the EPA to evaluate new techniques in improving flow rate measurement under a wide range of flow and swirl conditions. The wind tunnel and field tests used in the study provided a technical basis for three new methods for velocity and volumetric flow rate determination in stacks or ducts, Methods 2F, 2G and 2H. At the time of development, the original Method 2 was principally used to ensure isokinetic accuracy through a particulate sampling run by determining average stack velocity under only axial conditions. Method 2 does not include procedures for measuring the yaw angles, pitch angles or wall effects of flow. As such Method 2 can overstate volumetric flow rate when cyclonic flow is present. Yaw angle (side to side), pitch angle (forward to back or vice versa) and wall effects (frictional influence of the stack wall on velocity) characterize the axial component of velocity that exits the stack under cyclonic flow conditions.

The final ESC system designs resulted from performance evaluation during the EPA field tests, recommendations of the test teams who operated the system, requirements specified in the new methods and continuing suggestions from field technicians who operate our systems.

Method 2F: Determination of stack gas velocity and volumetric flow rate (3-Dimensional Probe)

Three Dimensional Flow Sensing System

Our Method 2F systems include one of two probe styles, the preferred calibrated spherical probe or the DAT style probe, each with calibrated reference scribe line, probe extensions with reference scribe line, three-dimensional flow sensing console, probe-mounted digital inclinometer, optional probe-mounted yaw-null magnehelic gauge, and pressure line umbilical cable.



C-3D-MD

Three Dimensional Flow Sensing Consoles

The C-3D-MD three dimensional flow sensing console utilizes a 5" dual inclined manometer for velocity and pitch angle determination and a 0.25" inclined manometer for fine pitch angle pressure reading. A magnehelic pressure gauge reads the yaw-null position of the probe. This console includes a purge pump for reverse pressurization of all five pressure lines together or individually to clear the lines of particulate buildup.

The C-3D-MD-T three dimensional flow sensing console includes all components of the C-3D-MD as well as a pitch angle pressure transducer and a velocity pressure transducer in line with the manometer and may be linked to a data acquisition system. Special care has been taken in the console design to equalize the response time between the manometer and pressure transducers for ease of monitoring the system for the operator.

The Three Dimensional Spherical Probe

The ESC PPS-SPH-4 Spherical Probe provides superior velocity measurement when compared to other three dimensional probes. It is constructed of 316 stainless steel and is entirely welded to ensure long-term leak free performance. All pressure holes are exposed on the surface of the sphere for ease of leak checking. Wind tunnel tests have proven that the ESC Spherical Probe provides the most consistent and reliable calibration data of all three dimensional probes. Also, the spherical probe provides a greater differential pressure for the P4-P5 (pitch) measurement. This is critical as the readability decreases greatly at small pitch angles.

PPS-SPH-4

Wind Tunnel Calibration Services

ESC provides wind tunnel calibration services for a variety of probes at various flow conditions. ESC's onsite wind tunnel is certified to the requirements stated in Method 2F for calibration of three dimensional probes. The typical three dimensional probe calibration is performed at 60 and 90 feet per second velocities while moving the probe through simulated pitch angles. Calibration at a third velocity can be performed to improve the calibration data for lower test velocities. All probe calibrations are performed using electronic pressure transducers and computer data acquisition to obtain the best representation of probe pressures.

One Method 2F and two Method 2H calculation spreadsheets are included with each ESC 3D wind tunnel calibration.

PP-LV-DI

PPS-YAWMAG PPS-3D-CL-DI

Accessories

3D Pitot Extension	1.25" Stainless Steel Extension Sheath with Reference Scribe Line, 5 Pressure Lines, 5 Unions and Thermocouple Line.
PP-LV-DI	Digital Inclinometer, 6", 0.1° Increments
PPS-3D-CL-DI	Level Collar for Digital Inclinometer
PPS-3D-YAWMAG	Probe Mounted Yaw Magnehelic Gauge, 0.5" - 0 - 0.5"
UC-3D-( )	3-D Pressure and Temperature Umbilical: 6 Pressure Lines, 2 Thermocouple Lines and Full Length Strain Relief. (Typical lengths are 25', 50' and 75')

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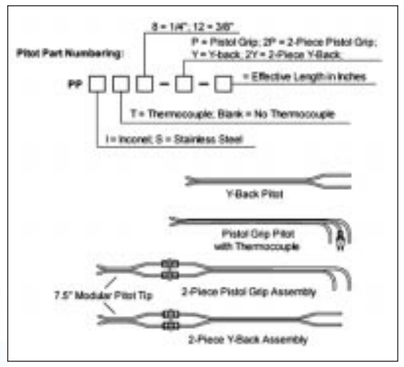
Method 2: Determination of stack gas velocity and volumetric flow rate (S-Type Pitot)

The Type S Pitot was designed to resist blockages and provide reliable velocity readings in sources saturated with particulate. All ESC Type S Pitot Tubes are manufactured according to the design specifications and dimensional requirements stated in Method 2. All Type S Pitots manufactured by ESC are regularly checked and verified to meet the minimum dimensional requirements that allow a baseline coefficient value of 0.84 to be assigned as stated in the calibration section of Method 2. Often a wind tunnel calibration will yield a lower and improved coefficient than the baseline coefficient allowed by dimensional calibration. Because we have an onsite approved wind tunnel we can provide rapid turnaround for pitot calibrations.



Type S Pitot

ESC Type S Pitots are available in several styles and are made from seamless 316 stainless steel or corrosion-resistant Inconel alloy 600 for temperatures exceeding 1200°F. ESC is experienced in fabricating Type S Pitots for unique applications.

Standard Pitot Tubes

ESC Standard Pitot Tubes are 5/16" stainless steel rated to 1500°F and provided with air velocity calculator and direct reading velocity charts. Standard Pitot Tubes are also available in 1/8" stainless steel.

PP-160-12	12" Standard Pitot Tube, 5/16"
PP-160-18	18" Standard Pitot Tube, 5/16"
PP-160-24	24" Standard Pitot Tube, 5/16"
PP-160-36	36" Standard Pitot Tube, 5/16"
PP-160-48	48" Standard Pitot Tube, 5/16"

Pressure & Temperature Measurement Accessories

The Handheld Digital Manometer is a convenient field measurement device that displays positive, negative or differential air pressure. The model PPM-475-1 (shown on right) has a 0-19.99 inches of water range and 0.01 inches of water resolution. Other models with a variety of pressure ranges are available.

The TK-51 Type K Thermocouple Readout is used to measure all temperatures associated with the Method 5 sampling train. This readout displays °C or °F in -200 to 1370°C range with 0.1°C resolution over the entire range. The unit contains a mini TC jack.

Magnehelic pressure gauges measure positive, negative and differential gas pressure and are available in a variety of sensitivity ranges with +/- 2% full scale accuracy.

MAG-2000-00	0-1/4" H2O	MAG-2005	0-1/2" H2O
MAG-2000-0	0-1/2" H2O	MAG-2010	0-10" H2O
MAG-2001	0-1" H2O	MAG-2060	0-60" H2O
MAG-2002	0-2" H2O	MAG-2301	0.5-0-0.5" H20

Method 2G: Determination of stack gas velocity and volumetric flow rate

Method 2G is a variation of Method 2 that uses a wind tunnel calibrated Type S Pitot to determine the yaw (side to side) angle of flow. Method 2G requires qualified wind tunnel calibration of the Type S Pitot to determine the calibration coefficient of the pitot and the yaw-null rotational offset angle of the reference scribe line. All ESC Method 2G Type S Pitots come with a 1" oversheath, a calibrated pitot coefficient and reference scribe line.

PPST12-2G-48	Method 2G Type S Pitot with Thermocouple 1" SS Sheath with Reference Scribe Line, 3/8" SS Pitot Tip and Lines and Thermocouple
PPS-2G-E#	Method 2G Pitot Extension (# = Length in Inches) 1" SS Sheath with Reference Scribe Line, 2 Pressure Lines, 2 Unions, Thermocouple Line.
CAL-2G-2V	Method 2G Wind Tunnel Calibration, 2 Velocity

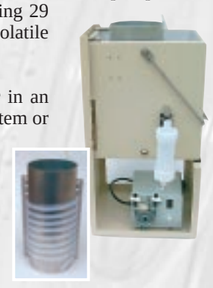
Method 3: Gas analysis for CO_2, O_2, excess air and dry molecular weight

This method provides for gas captured from a source to be delivered to a Tedlar bag at a constant flow rate. The bag contents is then analyzed for the gaseous parameters of interest. If a leak-free pump is placed in-line before the Tedlar bag, a moisture removal system must precede the pump for protection.

BR, BT, BRJ & BD Series Tedlar Bags

Intrinsically Safe Bag Sampling Systems

ESC Integrated Bag Sampling Systems include a bag vessel (10, 20, 30, 50 or 100 liter internal volumes), a pump module with rotameter, valve, vacuum gauge and a quick connect on the vacuum and pressure side of the pump. The bag vessel is intrinsically safe, capable of maintaining 29 inches of Hg vacuum, and can be used to sample in volatile areas where use of electricity is prohibited.



Condenser systems include either a coil condenser in an ice bath such as our GCU-1 Moisture Knockout System or a series of knockout impingers that comprise the condenser system used in Method 4. Coil condensers are available with FEP Teflon or stainless steel coils and include a peristaltic pump to evacuate collected condensate.

Method 4: Determination of moisture content in stack gases

M4-S1 Method 4 Sampling Train

The M4-S1 Method 4 Sampling Train is an abbreviated Method 5 system that provides all of the equipment necessary to determine moisture content with the addition of our M5-CB-PA Probe Support Panel and M5-JB-1 Power Distribution Box that mount directly to the cold box that holds the condenser set of impingers.

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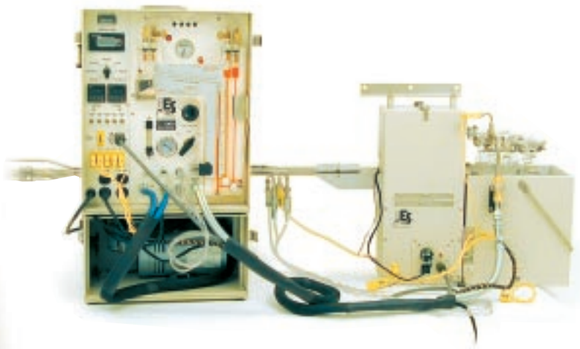
Method 5: Determination of particulate emissions from stationary sources

All of the ESC isokinetic sampling systems consist of the following primary components: nozzle set, heated probe assembly with type “S” pitot and stack thermocouple, modular sample case with heated filter box and chilled impinger box, filter and glassware set, impinger outlet adapter with thermocouple, umbilical cable, metering console, rotary vane vacuum pump and suspension rail system. The more advanced systems include a calibration orifice set, transport cases, professional multiple glassware sets, a cleanup and recovery kit, and probes and umbilical cables in a variety of lengths and styles.

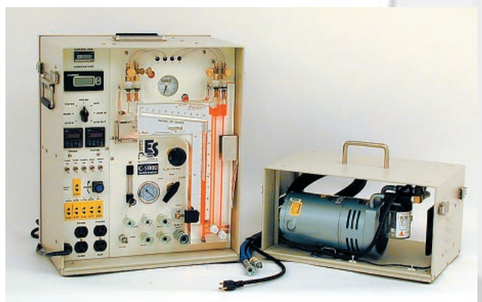


Method 5 Isokinetic Sampling System

Heated Probe Assembly, Nozzle Set, Heated Filter Box, Insulated Impinger Box, Filter & Impinger Set of Glassware, Outlet Impinger Adapter, Umbilical Cable, Console and Pump

The C-5000 Isokinetic Source Sampler

The intelligent, rugged and time-tested design of our C-5000 Series has provided years of reliable service for source sampling professionals worldwide. Our consoles are manufactured with only top quality components. The cabinet is designed with modular electrical and plumbing panels and easy-access front and rear removable doors. Dependable performance and long operating life is why this is the console of choice for source testing professionals who demand quality, reliability and easy maintenance accessibility. The metric C-5100 Series Console is our most popular export model with all of the same features as the C-5000 Series. 220V/50Hz operation is available on all models.



Method 5 Console Shelf

The open frame pump housing is equipped with fasteners that allow the addition of our M5-CSHELF hangers to create a rail-mounted console and pump shelf.

Standard C-5000 Features:

- Calibrated dry gas meter with 0.1 cu. ft. per revolution scale
- Individual probe and oven analog solid-state temperature controllers
- Dual 10" manometer with 1" incline and positive brass shutoff valves
- Backlit LCD temperature readout, easy to read in sunlight or in dark
- 7-station temperature selector switch
- Auxiliary thermocouple plug-in for handheld temperature readout
- Power, pump, timer, null solenoids and orsat pump switch controls
- 4-pin amphenol connector for umbilical power AND parallel 15 amp electrical outlets for standard extension cords
- Individually fused circuitry
- Resettable elapsed digital timer
- Modular electrical and plumbing panels
- Secondary oil filter to protect the dry gas meter
- Lightweight yet sturdy 0.090" aluminum housing
- Removable front and rear access doors
- Powerful, leak-free rotary vane vacuum pump

NOTE: The C-5100 Console features metric scales on the manometer (0.1mm resolution), dry gas meter (0.01 liter resolution) and temperature readout (°C). All other features are identical to the C-5000.

C-5000 & C-5100 Professional Options:

The following professional options are designated by adding the suffix indicated to the end of the part number (E.G. C-5000-SOF includes the first three options listed below)

- Stainless steel valves and quick connects (-S)
- Orsat pump, rotameter, valve and quick connects (-O)
- Programmable, digital solid-state probe and oven temperature controllers (-F)
- 220V/50Hz operation (-V)

Pumps & Housings

The P-0523-HS-SS fully enclosed rotary vane vacuum pump with stainless steel quick connects has been the workhorse of isokinetic source testing since the beginning. Our standard enclosed housing protects the pump from external conditions. Removable front and rear doors allow easy access for servicing. The 110cfm forced air fan produces more effective cooling than open-air operation. Our pumps are equipped with 6' vacuum hoses and nonreversible stainless steel or brass (part# P-0523-HS-BR) quick connects to eliminate the possibility of cross connection. Pumps are available for either 110V/60Hz or 220V/50Hz operation (add suffix -V for 220V/50Hz operation).

Our open frame, welded aluminum housing provides a lightweight and low-cost option (P-0523-OF-SS for stainless steel quick connects, P-0523-OF-BR for brass quick connects).

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Calibration Accessories & Services

All ESC console and dry gas meter calibration services conform to EPA Method 5 calibration criterion. Dry gas meter calibrations are performed on all outgoing ESC metering consoles. We offer 5 point pre-test, 3 point post-test and secondary reference meter calibration services. Replacement dry gas meters and secondary reference meters are also available.

Dry Gas Meter Calibration Services

CAL-M5-15 15 point calibration of secondary reference meter.
CAL-M5-5 5 point pre-test dry gas meter calibration
CAL-M5-3 3 point post-test dry gas meter calibration

Dry Gas Meters

X-METER-S110

Equimeter Dry Gas Meter, 110 cu. ft./hr. capacity, 0.10 cu.ft. per revolution, 0.001 cu. ft. resolution

X-METER-S110M

Equimeter Dry Gas Meter, 110 cu. ft./hr. capacity, One liter per revolution, 0.01 liter resolution

X-METER-S200

Equimeter Dry Gas Meter, 200 cu. ft./hr. capacity, 0.10 cu.ft. per revolution, 0.001 cu. ft. resolution

X-METER-S275

Equimeter Dry Gas Meter, 275 cu. ft./hr. capacity. 0.10 cu.ft. per revolution, 0.001 cu. ft. resolution

R-METER-( ) (S110, S200 or S275)

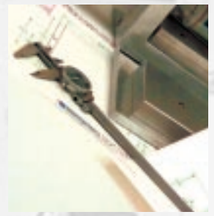
Secondary Reference Meter includes a 15-point calibration, thermocouple, 6' hose and 1/2" quick connect for connection to the metering console.

CO-QC8-SS-SET Calibration Orifice Set

ESC stainless steel critical orifices for dry gas meter calibration are calibrated according to EPA Method 5 protocols and are considered a calibration standard for calibrating a Method 5 dry gas meter. A calibration can be performed in minutes at the test location to ensure method compliance and maintain the integrity of the sampling runs. Each set contains 5 calibrated orifices in the 10 to 34 LPM nominal flow range mounted on a 1/2" quick-connect stem, an orifice calibration report, a calibration spreadsheet diskette, a recording log and a foam-lined carrying case. The critical orifice set is also available in brass (CO-QC8-B-SET).

CO-FA-( ) Flow Adapter

Convert your Method 5 metering console for low flow applications with the aid of these simple flow control devices. Orifice adapters are available in sizes ranging from 0.250 lpm to 34 lpm nominal flows. Low flow adapters contain a critical orifice housed in a 1/2" male quick connect for connection to the sample inlet of the console, preceded by a 0-30" Hg vacuum gauge and 1/4" female quick connect.



M5-AK-DC Dial Caliper

The dial caliper is used for fine measurement of nozzle diameter and dimensional verification of Type S pitot tubes. 0.001" accuracy

PP-LV2 Magnetic Angle Finder

The Magnetic Angle Finder is used for dimensional calibration of Type S pitot tube and yaw angle determination for verification of the absence of cyclonic flow at a sampling location.

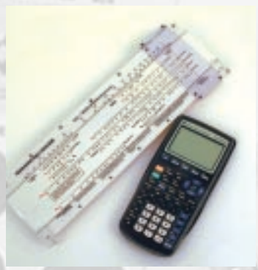
PP-LV3 Bull's Eye Level (not shown)

The Bull's Eye Level mounts directly to the Type S pitot tube for use in conjunction with the Angle Finder during dimensional calibration. This Level is also useful during sampling to indicate proper pitot orientation.

TK-CL300-2100F Thermocouple Simulator Source

This Type K Thermocouple Simulator Source is useful for inspection of temperature controllers and readouts on a Method 5 metering console. 0-2100°F temperature range, 22 precise setpoints.

Isokinetic Sampling Calculation Tools



M5-SRN Slide Rule Nomograph

The M5-SRN is a manual slide rule nomograph for determining proper nozzle size and isokinetic sampling rate. The slide rule nomograph is available in English (M5-SRN) or metric (M5-SRN-M) units.

M5-PC-TI83 Isokinetic Stack Calculator

The M5-PC-TI83 is a preprogrammed scientific calculator nomograph that allows you to enter critical data and perform instantaneous isokinetic sampling calculations. The immediate refresh allows you to revise changing parameters and check each run for method compliance. A loop feature allows you to enter only the data that might change at each traverse point, so point by point isokinetic determinations are possible.

Isokinetic Calculations Spreadsheet

The ESC Isokinetic Calculations Spreadsheet performs data reduction of test conditions information and critical data for integrated isokinetic source sampling. Worksheets with preprogrammed calculations required for performance of Methods 1-5 are included.

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Isokinetic Sampling Probes

ESC sampling probes are precision-made, modular assemblies that include the probe sheath, probe liner and heating mantle. Probe assemblies are available in numerous configurations and materials to accommodate any isokinetic sampling method or unusual conditions that you may encounter. All probe assemblies, sheaths, liners and heating mantles are ordered by effective length which is one foot shorter than overall length.

Probe Sheaths and Oversheaths

Made from stainless steel alloy 316 for standard applications or Inconel alloy 600 for high temperature and extremely corrosive applications. Each sheath includes a stack thermocouple, 1/4" Orsat sample line with 1/4" male quick connect, 3/8" pitot lines with modular pitot tip and 3/8" male quick connects, 1" sheath and 5/8" Teflon-coated stainless steel nozzle union.

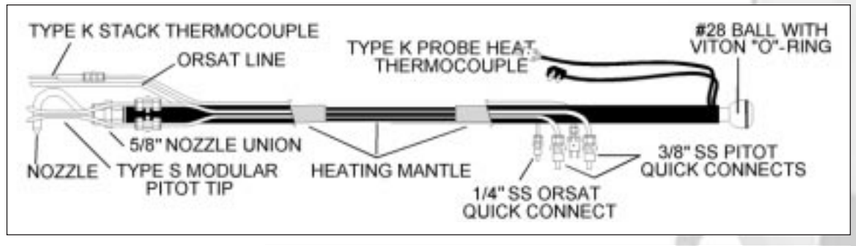
A 1.75" or 2" oversheath is recommended for long length probes for rigidity or for applications where a packing gland is required, such as high positive pressure, high negative pressure or highly toxic stacks.

Probe Liners

Available in Pyrex, Quartz, Stainless Steel, Inconel and Teflon. Standard liners are equipped with a #28 Ball with O-ring. Pyrex and Quartz liners are available with integrated nozzles either with or without the #28 Ball with O-ring. The GPA-B28-10 Ball adapter transforms a screw joint liner to a ball joint with O-ring end.

Probe Heating Mantles

Our heating mantles are hand-made assemblies that are completely removable from the probe sheath and the probe liner. Standard heating mantles are comprised of electrical resistance wire, electrical thermal insulation, integrated type K probe thermocouple and power cord. Available on a semi-rigid mandrel if desired.



Heated Probe Assemblies: PRA – ☐☐ = Effective Length in Feet
I = Inconel Liner; P = Pyrex Liner;
Q = Quartz Liner; S = Stainless Steel Liner;

Probe Sheath: PRS – ☐☐ = Effective Length in Feet
I = Inconel; S = Stainless Steel

Probe Liners: PRL – ☐☐ = Effective Length in Feet
I = Inconel; P = Pyrex; Q = Quartz; S = Stainless Steel

Probe Heating Mantles: PRM – ☐ = Effective Length in Feet

M17-SR Strain Relief

The M17-SR probe mounted strain relief adapter is used to hold the weight of heated or unheated sample transfer lines to relieve stress at the probe liner connection.

PRS-Handle

The PRS-HANDLE Probe Sheath Handle is useful for handling and maneuvering the probe in the absence of a suspension rail system for the sample case. The Handle is also useful while handling an extremely hot probe.

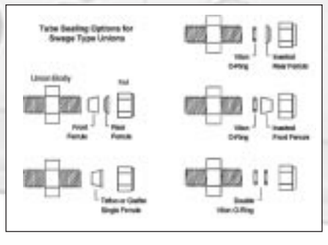
Isokinetic Sampling Nozzles & Nozzle Unions

ESC isokinetic sampling nozzles are buttonhook style nozzles available in Stainless Steel, Inconel, Pyrex, Quartz and Teflon-coated Stainless Steel. Standard nozzles have a 5/8" outlet shank and are designated by nominal ID of the tapered inlet in 1/32" increments (e.g. #4 nozzle = 4/32" = 1/8").

Nozzle Sets

Standard nozzle sets are comprised of 7 nozzles sized from #4 (1/8") to #16 (1/2") packed in a foam lined case. We will include any 7 standard nozzles of your choice in a set when requested.

PRNS-P	Pyrex Nozzle Set
PRNS-Q	Quartz Nozzle Set
PRNS-S	Stainless Steel Nozzle Set, includes 5/8" Stainless Steel nuts and ferrules
PRNS-ST	Teflon-Coated Stainless Steel Nozzle Set,
PRNS-I	Inconel Nozzle Set, sizes 6, 9, 10, 12, 14 & 17



Nozzle Unions

5/8" nozzle unions are available in Stainless Steel (PRN-10U), Teflon-coated Stainless Steel (PRN-10UTC for union body only), Glass-filled Teflon (PRN-TU-B for union, nuts, and single ferrules) and Inconel (PRN-IUB for Inconel union body only). Stainless steel unions are supplied with front and rear stainless steel ferrules. Teflon and Teflon-coated unions are available with a single Teflon ferrule. Inconel unions are available with Monel front and rear ferrules or single graphite ferrules. Other useful sealing arrangements include an inverted stainless steel rear ferrule with a Viton O-ring or a single graphite ferrule for use with Pyrex or Quartz nozzles. These arrangements can also be used to avoid the permanent locking of stainless steel front and rear ferrules.

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Sample Cases, Heated Filter Boxes, Impinger Boxes

ESC heated filter boxes, probe support adapters, impinger boxes, inlet strain reliefs and impinger outlet adapters can be arranged in numerous configurations to perform virtually any isokinetic and most non-isokinetic test methods. All are made of sturdy, lightweight aluminum and are properly insulated to maintain the temperatures required by EPA methodology. The impinger box slides on and locks directly to the rear of the heated filter box as a single unit and can be suspended with reliable balance from a suspension rail.

The **M5-HB-H/E** (shown on left) and **M5-CFB-H/E** Modular Heat and Electrical Assemblies are like a backup filter box!

M5-SC( ) Modular Sample Case

The modular sample case is an assembly of the M5-HB standard heated filter box and a choice of 4-impinger (M5-SC4), 6-impinger (M5-SC6) or 8-impinger cold box (M5-SC8).

M5-HB Heated Filter Box

The M5-HB heated filter box has a sturdy monorail attachment bracket, opposing doors for easy handling of the filter assembly, stainless steel hardware and a removable heavy-duty stainless steel probe support clamp. The innovative construction design eliminates stresses and flexing when a long probe is attached. The modular 700W heating and electrical assembly can easily be removed for replacement or service. An extra modular assembly on hand is like having a backup heated filter box. Outside dimensions: 9-1/2"L x 9-1/2"W x 231/2"H, probe support extends 7-1/2" from front.

M5-CFB Compact Heated Filter Box

The M5-CFB compact heated filter box is ideal for sampling in tightly constrained areas and is easily used at any traverse angle between horizontal and vertical. This versatile filter box is also equipped with a modular heat and electrical assembly. We carry a variety of outlet fittings that allow either direct connection of an umbilical cable or for passing a flexible Teflon line through the fitting for direct connection to the filter. Outside dimensions: 10"L x 8-3/4"W x 11-1/2"H, probe support extends 7-1/2" from front.

M5-CB-PA Probe Support Adapter Panel

The M5-CB-PA probe support adapter panel is the solution for test methods that do not require a heated filter box. The impinger box mounts to the rear of the panel and locks in place. Shown with M5-CB6 impinger box and M5-UA impinger outlet adapter. The inset is our M5-JB-1 power box that supplies auxiliary power and power to the probe.

Impinger Boxes

ESC impinger boxes are available in 4-impinger, 6-impinger and 8-impinger nominal sizes. Each has a stout handle with centering loop and mounting locations for the aluminum slide block on opposing sides for the impinger inlet strain relief and impinger outlet adapter. The impinger box insulation is waterproof to eliminate breakdown and the corners are fully welded to accommodate the extra weight of ice and water. Removable insulated impinger box covers are available.

		(outside dimensions)
M5-CB4	Holds 4-6 impingers	9-1/2"L x 9-1/2"W x 13"H
M5-CB6	Holds 6-8 impingers	12-1/2"L x 9-1/2"W x 13"H
M5-CB8	Holds 8-12 impingers	14-1/2"L x 9-1/2"W x 13"H

Umbilical Cables & Adapters

UC-( ) Standard Method 5 Umbilical Cables

ESC flexible umbilical cables include one high vacuum sample line with 1/2"quick connects, three vinly pressure lines for pitots and Orsat sample line, 5 type K thermocouple lines, one 5-conductor electrical cable with 4-pin amphenol connectors and one full length stranded nylon strain relief cable. Each line is sheathed with an abrasion resistance expandable braided jacket. Standard umbilical lengths are 25' (UC-25), 50' (UC-50), and 100' (UC-100). Standard cables have brass quick connects. Stainless steel quick connects are available (add extension -S to part number). Our popular EXT style umbilicals include 15 Amp extension cords in place of the power cable with amphenol connectors. No more soldering amphenols on the stack. Consoles and heated filter boxes must be equipped with suitable 3-prong connectors (standard on all C-5000 consoles).

Umbilical Extension Cables

Designed for use with the Compact Filter Box when the impinger box is separated from the filter. Each extension is equipped with a sample transfer line, 5-conductor electrical cable with 4-pin amphenol connectors, 3 pressure lines with quick connects, three type K thermocouple lines, and one full length stranded nylon strain relief cable. The sample line is available in the standard high pressure hose or optional 1/2" OD heavy wall FEP Teflon. Extension cord models are available.

Heated Sample Lines are available in short lengths with a variety of choices of Teflon tubing sizes. The Teflon tubing is removable from ESC heated sample lines. See the CEM & RATA section for further information.

M5-UA and M5-UA-X Umbilical Adapter

Umbilical adapters, also known as shower heads or goosenecks, have a #28 socket, thermocouple, 1/2" sample line male quick connect and support arm that inserts in the impinger box slide bracket. Our umbilical adapter can be ordered with (M5-UA) or without (M5-UA-X) a one-way check valve that prevents backflushing of the impinger contents.

M5-UAC Series Impinger Inlet Strain Relief Adapters

Impinger inlet adapters connect heated or unheated sample transfer lines to the inlet of the first impinger. Impinger inlet adapters come in a variety of sizes depending upon the size and type of transfer line used and with a choice of tube fittings or quick connects. Inlet adapters are available with or without a strain relief support arm that inserts in the impinger box slide bracket on the opposite side of the impinger box from the impinger outlet umbilical adapter.

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Glassware & Accessories

The ESC standard glassware style is top quality, heavy wall borosilicate glass with precision ground #28 ball with O-ring and socket connections. Precision ground connections are superior to unground connections because they provide a leak-free seal with or without the O-ring. Impinger stem-to-bottle taper joints are also precision ground with O-ring. Other styles of glassware are available.

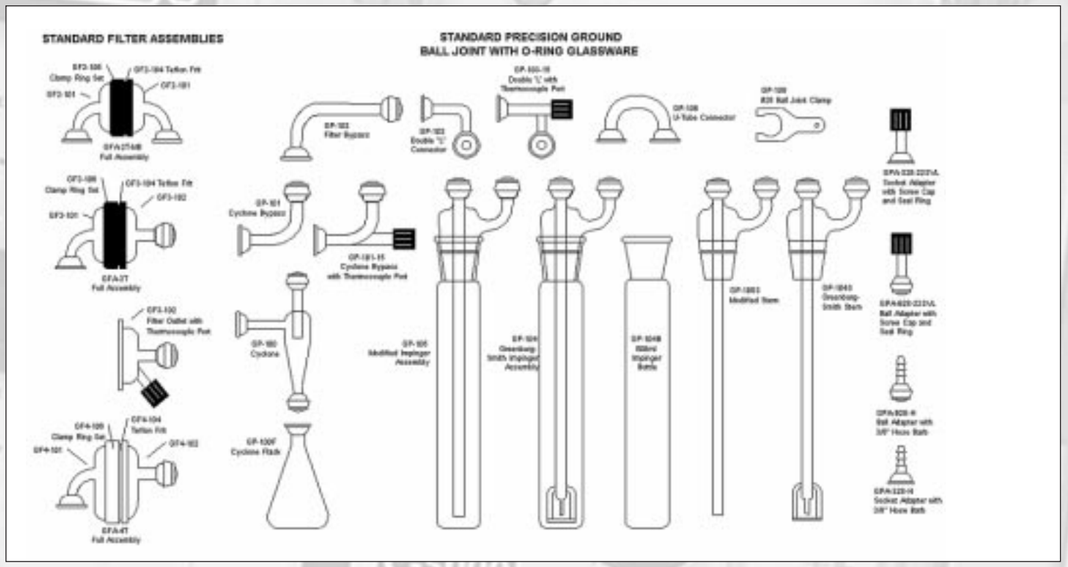
GP-100 Series: Standard precision ground ball joint with O-ring style glassware
GP-300 Series: Hybrid style glassware with #30 SVL stem-to-bottle seals and #28 ball joint with O-ring outlet arm
GP-400 Series: Screw joint style glassware

Professional Glassware Sets

The GPBO-3C Professional Ball Joint with O-ring Glassware Set and Transport Case provides the convenience and prudence of two complete trains of glassware plus additional 3" filter assemblies, impingers and all necessary connectors and ball joint clamps. Glassware trains can be swapped out quickly and the additional 3" filter assemblies allow for four sampling runs. All glassware is held firmly in soft foam inserts in the lockable transport case. The GPBO-4C Professional Glassware Set includes 4" (110mm) filter assemblies. Hybrid (GPHO Series) and Screw Joint (GPSJ Series) professional glassware sets are also available.

GPBO-3C Professional Ball Joint/O-ring Glassware Set, 3" Filter Assemblies and Transport Case

Qty	Part No.	Description
4	GP-101	Cyclone Bypass
4	GFA-3T	3" (82.6mm) Filter Assembly with PTFE Teflon Frit
4	GP-103	Double L Connector
3	GP-104	Greenburg Smith Impinger (with orifice), Stem & Bottle
7	GP-105	Modified Impinger (without orifice), Stem & Bottle
8	GP-106	U-tube Connector
25	GP-109	#28 Stainless Steel Ball Joint Clamp
28	GP-107-S	Silicone O-ring for #28 Ball
28	GP-107-T	Teflon Coated Viton O-ring for #28 Ball
10	GP-108-S	Silicone O-ring for Stem-to-Bottle Impinger Taper
10	GP-108-T	Teflon Coated Viton O-ring for Stem-to-Bottle Impinger Taper



Single Glassware Sets

Our most popular single glassware set is the GSBO-3 precision ground ball joint and O-ring glassware set with 3" (82.6mm) filter. The GSBO-4 Single Glassware Set includes a 4" (110mm) filter assembly. Hybrid (GSHO Series) and Screw Joint (GSSJ Series) single glassware sets are also available.

GSBO-3 Single Ball Joint/O-ring Glassware Set, 3" Filter Assembly

1	GP-101	Cyclone Bypass
1	GFA-3T	3" (82.6mm) Filter Assembly, PTFE Frit
1	GP-103	Double L Connector
1	GP-104	Greenburg Smith Impinger (with orifice)
3	GP-105	Modified Impinger (without orifice)
3	GP-106	U-tube Connector
12	GP-109	#28 Stainless Steel Ball Joint Clamp
10	GP-107-S	Silicone O-ring for #28 Ball
10	GP-107-T	Teflon Coated Viton O-ring for #28 Ball
4	GP-108-S	Silicone O-ring, Stem-Bottle Impinger Taper
4	GP-108-T	Teflon Coated Viton O-ring, Impinger Taper

Precision Ground Ball Joint with O-ring Glassware

GP-100	Cyclone for Heated Filter Box
GP-100F	Cyclone Flask
GP-101	Cyclone Bypass
GP-102	Filter Bypass
GP-103	Double L Connector
GP-104	Greenburg Smith Impinger (orifice)
GP-104B	500 ml Impinger Bottle, Ground Taper Joint
GP-104S	Greenburg Smith Impinger Stem (orifice)
GP-105	Modified Impinger (without orifice)
GP-105S	Modified Impinger Stem (without orifice)
GP-106	U-tube Connector
GP-107-S	Silicone O-ring for #28 Ball
GP-107-T	Teflon Coated Viton O-ring for #28 Ball
GP-107-V	Viton O-ring for #28 Ball
GP-108-S	Silicone O-ring, Impinger Taper
GP-108-T	Teflon Coated Viton O-ring, Impinger Taper
GP-108-V	Viton O-ring, Impinger Taper
GP-109	#28 Stainless Steel Ball Joint Clamp

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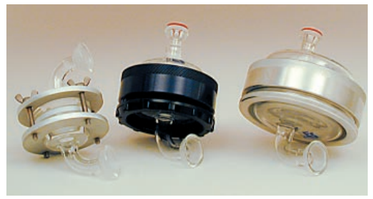
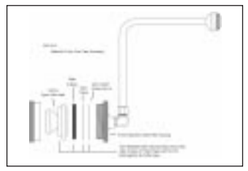




Filter Assemblies

Filter assemblies include Filter Inlet, Filter Outlet, Filter Support Frit and Clamp Ring Assembly

GFA-2T-M8	2" (47mm) Filter Assembly with Two #28 Socket Elbows, PTFE Frit
GFA-2-5I	2" (47mm) Method 5I Filter Assembly, Pyrex Inlet, SS Frit and Outlet Assembly
GFA-2-5I-P	2" (47mm) Method 5I Filter Assembly, Pyrex Inlet & Outlet, SS Frit, Clamp Ring
GFA-3T	3" (82.6mm) Filter Assembly, PTFE Frit
GFA-3G	3" (82.6mm) Filter Assembly, Sintered Pyrex Frit with Rubberized Edge
GFA-4T	4" (110mm) Filter Assembly, PTFE Frit
GFA-3G	4" (110mm) Filter Assembly, Sintered Pyrex Frit with Rubberized Edge

Individual Filter Parts

GF2-101	2" (47mm) Filter Inlet, #28 Socket
GF2-104	2" (47mm) PTFE Teflon Frit
GF2-106	2" (47mm) Clamp Ring Assembly
GF2-5I	2" (47mm) Filter Inlet, #28 Socket
GF2-5I-O	2" (47mm) Filter Outlet, Ball Joint
GF3-101	3" (82.6mm) Filter Inlet, #28 Socket
GF3-102	3" (82.6mm) Filter Outlet, Ball Joint
GF3-103	3" (82.6mm) Glass Frit, Silicone Edge
GF3-104	3" (82.6mm) PTFE Teflon Frit
GF3-105-T	Teflon-Coated Viton O-ring, 3" Frit
GF3-106	3" Clamp Ring Assembly
GF4-101	4" (110 mm) Filter Inlet, #28 Socket
GF4-102	4" (110 mm) Filter Outlet, Ball Joint
GF4-103	4" (110 mm) Glass Frit, Silicone Edge
GF4-104	4" (110 mm) PTFE Teflon Frit
GF4-105-T	Teflon-Coated Viton O-ring, 4" Frit
GF4-106	4" Clamp Ring Assembly

Ball and Socket Adapters

For all Ball and socket adapter tube fittings: 4=1/4", 6=3/8", 8=1/2", 10=5/8", L=Elbow

Pyrex

GPA-B28-H	Ground #28 Ball with O-ring to Hose Barb
GPA-S28-H	Ground #28 Socket to Hose Barb
GPA-B28-22SVL	Ground #28 Ball with O-ring to #22 Screw Joint Cap
GPA-SB28-22SVL	Ground #28 Socket to #22 Screw Joint Cap
GPA-B28-( )	Ground #28 Ball with O-ring to Straight Stem (Specify Tube Size or Elbow)
GPA-S28-( )	Ground #28 Socket to Straight Stem (Specify Tube Size or Elbow)

Stainless Steel

GPS-B28-( )	#28 Ball with O-ring to Tube Fitting (Specify Tube Size or Elbow)
GPS-S28-( )	#28 Socket to Tube Fitting (Specify Tube Size or Elbow)

Teflon Coated Stainless Steel

GPST-S28-10	#28 Socket to 5/8" Tube Fitting

Isokinetic Source Sampling Accessories

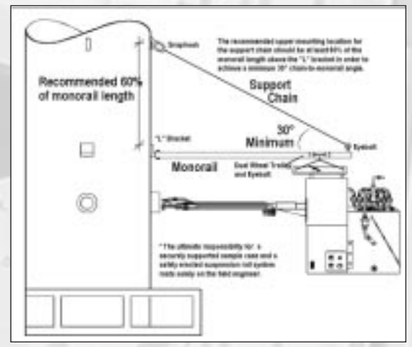
M5-AK Audit Tool Kit

The ESC Audit Tool Kit is a collection of our measuring, verification, calibration and calculation tools for inspection of sampling equipment and sampling location conditions. This kit is useful for a Method 2 pre-test survey as well as for auditing a source emissions test for method compliance. The kit includes the following:

M5-AK-DC	Dial Caliper	M5-BARMTR	Portable Barometer
PP-LV2	Magnetic Angle Finder	AK-PPST12	10' Modular Type S Pitot: 7.5" Pitot Tip, modular extensions, stainless steel unions
PP-LV3	Bull's Eye Level		
TK-CL300-2100F	Thermocouple Simulator Source	PPM-475-1	Handheld Digital Manometer
CO-QC8-SS-SET	Critical Orifice Calibration Set	TK-51	Handheld Digital Thermocouple Readout
M5-SPREADSHEET	Isokinetic Calculations Spreadsheet	AK-100	100' Stainless Steel Tape Measure
M5-PC-TI83	Isokinetic Stack Calculator	AK-CASE	Foam Lined Carrying Case
M5-SRN	Slide Rule Nomograph		

Suspension Rail System

The suspension rail supports the modular sample case and other sample trains with adjustable hangers to allow safe alignment and maneuvering of the probe into the port. The dual roller trolley rides on a 16 gauge galvanized steel rail that is 3' longer than the effective probe length. Equipped with snap hooks and rapid connections for quick setup and dismantling.

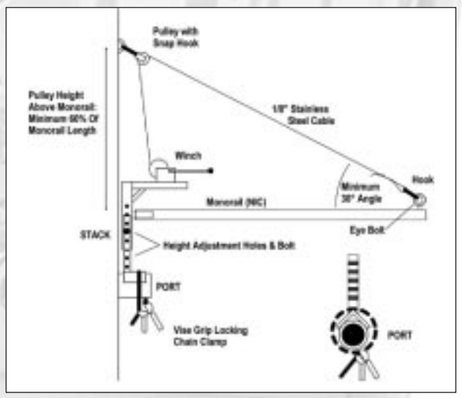


PA-UMP Port Mount Suspension Rail Support Bracket

The height-adjustable PA-UMP Universal Mounting Plate is a heavy gauge steel assembly that bolts to a standard 3", 4" or 6" port flange. The mounting holes are slotted for precise vertical alignment. It comes with a height-adjustable hinge to support the suspension rail.

PA-UPM Universal Port Mount Assembly

The fully adjustable PA-UPM universal port mount assembly provides the convenience of a ratchet winch for lifting and adjusting the cantilevered end of the suspension rail and includes a vise-grip chain fastening of the support arm to the port nipple.



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Sample Recovery

M5-CK Cleanup and Recovery Kit

The tools in our M5-CK Cleanup and Recovery Kit include everything necessary for efficient sample recovery. Each component of the kit is available separately. The kit includes:

Qty	Part No.	Description
2	M5-CK1	Glass Funnel
1	M5-CK2	Polypropylene Funnel
1	M5-CK3	Nylon Impinger Brush with Stainless Steel Handle
2	M5-CK4	1-Liter Polypropylene Wash Bottle
5	M5-CK5	18" Probe Brush Extensions
1	M5-CK7	12" Nylon Probe Brush with Stainless Steel Handle
1	M5-NBSET	Nylon Nozzle Brush Set:
	M5-CK6	1/2" Nozzle Brush
	M5-CK15	3/16" Nozzle Brush
	M5-CK16	5/16" Nozzle Brush
1	M5-CK8	Stainless Steel Spatula
1	M5-CK9	Stainless Steel Forceps
1	M5-CK12	Foam-Lined Carrying Case with Tool Tray

Methods 23 & 29 Teflon Cleanup and Recovery Tools

Teflon and Teflon-coated recovery tools are available for Method 23 and Method 29 sample recovery.

PRB-T8	All Teflon 1/2" Probe Brush
PRB-EXT-4	1/4" Teflon Probe Brush Extension with 3/8" Coupler, sold by the foot
M23-CK8	Teflon Coated Stainless Steel Spatula
M23-CK9	Teflon Coated Stainless Steel Forceps
M23-CK11	500 ml Teflon Wash Bottle
M23-CK1224	12" x 24" x .03" Virgin PTFE Sheet

M5-STC Sample Transport Caddy

The foam-lined transport caddy protects recovered sample for transport to the lab for analysis. The caddy includes:

3	M5-STC-1	32 oz. Glass Bottle with Teflon-Lined Cap
6	M5-STC-2	16 oz. Glass Bottle with Teflon-Lined Cap
3	M5-STC-3	8 oz. Nalgene Desiccant Bottles
6	M5-STC-4	4" Plastic Petri Dish

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Low Flow Metering Console (Non-Isokinetic) & Umbilical
for Methods 4, 6, 11, 18, 26, VOST, 0030, 0031 and more

UNI-VOS-110 Low Flow Metering Control Console

The UNI-VOS-110 is the ideal Metering Control Console for accurate volume measurements in the performance of low flow gas sampling methods requiring sample rates between 0.5 to 2 liters per minute. The flow rate adjustments, gauges and temperature readouts on the console and the 0.01 Liter resolution of the dry gas meter allow the tester to maintain a constant and accurate flow rate while monitoring gas meter pressure and temperature and five remote temperatures received from the sample caddy. Two digital temperature controllers are provided for maintaining probe and filter heat control where applicable.

The **UC-25U Low Flow Umbilical Cable with Connector Box** mounts directly on the sample caddy of each of our low flow systems to provide temperature, sample and power connection to the UNI-VOS-110 Control Console.

CO-FA-( ) Flow Adapters

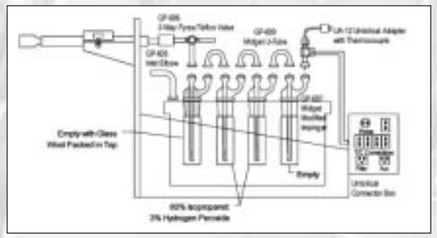
Convert a Method 5 metering console for low flow or controlled flow applications with the aid of these simple flow control devices. Orifice adapters are available in sizes ranging from 0.076 lpm to 80 lpm nominal flows (determined at standard conditions of 70°F, 29.93" Hg). Low flow adapters have a 1/4" female quick connect, a 0-30" Hg vacuum gauge, and a critical orifice housed in a 1/2" male quick connect. The adapter is placed between the low flow umbilical and the sample inlet of the Method 5 console. Call us for custom connections, options and styles.

Method 6: Determination of sulfur dioxide emissions from stationary sources

ESC M6-S1 Method 6 Sampling Train

An efficient low flow, non-isokinetic system for extracting a gas sample from the stack and separating the sulfuric acid mist, including sulfur trioxide, from the sulfur dioxide fraction that is to be measured using barium-thorin titration. This train is outfitted with a miniature, pyrex lined, heated probe assembly, a midget sample caddy with insulated glassware tray, a midget glassware set, the impinger outlet adapter with thermocouple and the UC-25U umbilical with connector box. The UNI-VOS-110 Low Flow Control Console is the preferred console for use with this train. Alternatively the C-5000 Isokinetic Control Console can be used with an appropriately sized CO-FA style flow adapter.

Our standard GSM-6B Midget Glassware Set is precision ground ball and socket joint with O-ring for leak-free performance. The stem to bottle taper joint is also a precision ground joint with O-ring seal.



GSM-6B Method 6 Midget Glassware Set:

1	GP-606	3-Way Pyrex Valve with Teflon Plunger
4	GP-607	Midget Impinger
1	GP-608	Midget Impinger with Orifice
4	GP-609	Midget U-Tube Connector
12	GP-611	Stainless Steel Pinch Clamp, #12

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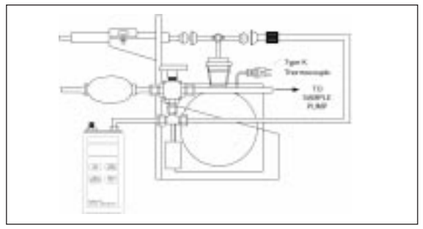
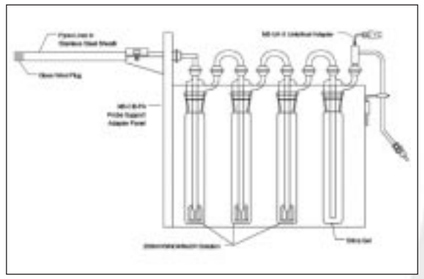
Method 7: Determination of nitrogen oxide emissions from stationary sources

Methods 7, 7A and 7B are variations of the non-isokinetic nitrogen oxide determination method that provide for three different analytical procedures of a grab sample that is collected in an evacuated 2 liter flask containing a dilute solution of sulfuric acid and hydrogen peroxide. Our M7-S1 Method 7 Sampling System consists of a heated, Pyrex lined probe assembly, a sample caddy, multiple evacuation flasks, a 3-way Pyrex valve, a hand purge pump, an evacuation pump, a 3-way pump selection valve, and digital manometer pressure sensor.



Methods 7C and 7D provide for nitrogen oxide determination by drawing a low flow (0.4-0.5 liter per minute) sample through a heated, Pyrex lined probe assembly and an arrangement of three standard size orifice impingers containing an alkaline-potassium permanganate solution and a dryer impinger. Our M7-S2 Sampler includes the probe assembly, a complete glassware set, an insulated impinger box with probe support panel and an outlet impinger adapter with thermocouple. The UNI-VOS-110 is the ideal control console to complete the system.

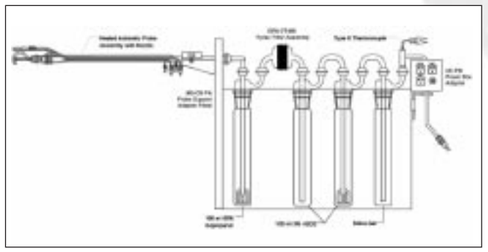


Method 8: Determination of sulfuric acid mist and sulfur dioxide emissions from stationary sources

Method 8 utilizes an isokinetic sampling system where the filter is unheated and is placed between the first and second impinger of a glassware set that alternates Greenburg Smith (orifice) impingers and modified (straight stem) impingers. We provide three accessories for the performance of Method 8 to replace the standard filter and heated filter box in the standard Method 5 sampling train.

Recommended Method 8 Accessories:

M5-CB-PA	Probe Support Adapter Panel, mounts to impinger box
GFA-2T-M8	2' (47mm) Filter Assembly, socket elbow inlet & outlet, 2" Teflon Support Frit
UC-PB	Power Box Adapter, distributes power in absence of a heated filter box.



Method 10: Determination of carbon monoxide emissions from stationary sources

This method provides two different sampling procedures, integrated sampling and continuous sampling.

BSS-100-PC Integrated Bag Sampler

Our BSS-100-PC Integrated Bag Sampling System is used to collect 60 to 90 liters of integrated sample in a Tedlar bag for analysis by NDIR. This lung system inflates the Tedlar bag with sample at a constant rate through an isolated sample pathway by evacuating the leak-free vessel that surrounds the Tedlar bag.

GCU-1 Sample Conditioner

Our GCU-1 conditioning system delivers a dry continuous sample directly to the analyzer. Sample exiting the probe passes through a Teflon coil condenser submerged in an ice bath. The excess moisture is captured in a Teflon collection vessel and removed by a peristaltic pump.

Method 17: Determination of particulate emissions from stationary sources (in-stack filtration method)

PRI-TO Stainless Steel & PRI-T-P Pyrex Thimble Filter Holders

Method 17 provides in-stack filtration of particulate and eliminates the requirement of the Method 5 heated filter box. Our PRI-TO Stainless Steel Thimble Filter Holder, used for high particulate loading, holds both 30mm x 100mm glass fiber thimbles and 34mm x 100mm Alundum thimbles. The PRI-T-P Pyrex Thimble Filter Holder holds 30mm x 100mm Glass or Quartz fiber thimbles and is predominantly used in applications where it is prohibited to have metal in the sample pathway. Our GFS-2-10 Stainless Steel 47mm Filter Holder holds flat 47mm diameter glass fiber filter paper and is for low particulate loading applications. Both filter holders have 5/8" union fittings on inlet and outlet ends for fastening directly between the nozzle and probe sheath.

A Method 17 sampling train can be set up with an isolated probe and flexible heated or unheated sample transfer line to the impingers, or with the probe directly linked to the impinger set using our probe support adapter panel mounted to the impinger box.

PRI-T-HOOK Shepherd's Hook

For vertical sampling, our PRI-T-HOOK is the ideal accessory to orient the thimble filter in an upright position, thus permitting gravity to assist the sample vacuum in keeping the particulate catch in the filter.

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Method 18: Measurement of gaseous organic compound emissions by gas chromatography

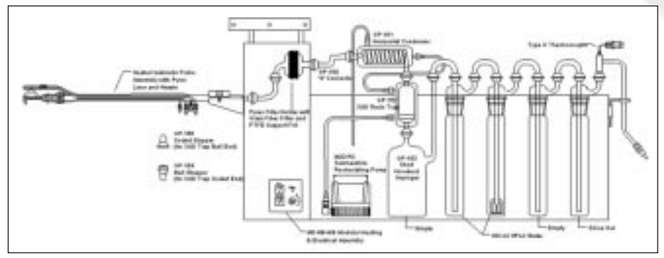
BSS-10 Intrinsically Safe Bag Sampling System

This method requires a Teflon or stainless steel pathway for integrated sampling into a Tedlar bag. Our Bag Sampling Systems, featuring our transparent bag vessels in 10, 15, 20 and 30 liter sizes, are used to collect an integrated sample in a Tedlar bag. The intrinsically safe vessel can be evacuated to 30"Hg vacuum prior to sampling and used in volatile areas where electrical equipment is prohibited. The system inflates the Tedlar bag with sample at a constant rate through the inert sample pathway by applying vacuum to the leak-free vessel that surrounds the Tedlar bag. The ideal bag connection for Method 18 is a double end shutoff quick connect stem, male adapter and Teflon nut that connects directly to a female stainless steel quick connect and 3-way valve assembly in the center of the vessel cover. The 3-way valve allows the probe to be purged before inflating the bag with sample. An additional female quick connect in the cover connects to a vacuum line that runs to either the pressure port of the pump for evacuating the Tedlar bag before sampling, or the vacuum port of the pump for evacuating the vessel during sampling. The integrated sample is analyzed for total gaseous organics by gas chromatography.

Method 23: Determination of polychlorinated dibenzo-p-dioxins and poly-chlorinated dibensofurans

ESC Method 23 (Modified Method 5) Source Sampling System

This system uses a standard Method 5 system augmented by our riserless Method 23 glassware. The essential riserless glassware consists of the “S” connector from the filter, horizontal Pyrex coil condenser, XAD sorbent trap and moisture knockout impinger. We also carry the vertical Pyrex coil condenser for use with a riser box that will accommodate the extra height required by the condenser and XAD trap mounted on top of the first impinger. Our 8-impinger coldbox is recommended to accommodate the required coolant recirculating pump, the standard Method 5 impinger set and the Method 23 supplementary glassware. This Method 23 Source Sampling System can also be used for Method 0010, Determination of Semi-volatile Organic Compounds.



Method 26: Determination of hydrogen chloride emissions from stationary sources

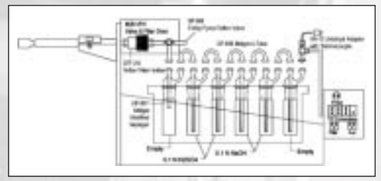
M26-S1-H Method 26 Sampler

The ESC M26-S1-H Method 26 Sampler includes a 6-impinger glassware set preceded by a heated 3-way Pyrex valve with Teflon plunger and Teflon filter holder attached at the outlet of the heated probe assembly. The M26-VFH valve and filter heater is a modular clamshell oven that mounts on our Method 6 and Method 26 midget sample caddy directly behind the probe support. The particulate matter and halide salts collected on the filter are usually discarded and the impinger solutions are analyzed by ion chromatography. The UNI-VOS-110 Low Flow Control Console is the console of choice to use with the M26-S1-H Sampler for a complete system.

Our standard GSM-26B Midget Glassware & Filter Holder Set is precision ground ball and socket joint with O-ring for leak-free performance. The PFA Teflon Filter Holder includes a PFA Teflon Nut with integrated ferrule for leak free attachment to probe liner at the inlet and Pyrex 3-way valve at the outlet.

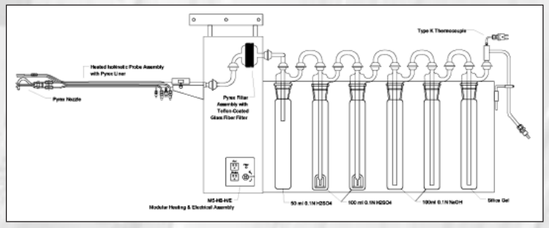
GSM-26B Method 26 Midget Glassware Set:

1	GFT-2-6 PFA	Teflon Filter Holder
1	GP-606	3-Way Pyrex Valve, Teflon Plunger
6	GP-607	Midget Impinger
5	GP-609	Midget U-Tube Connector
12	GP-611	SS Pinch Clamp, #12

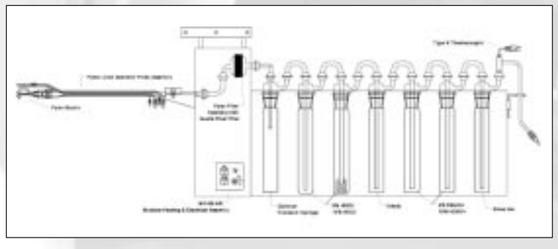


Method 26A: Isokinetic Determination of Hydrogen Halide Emissions

Method 26A is an isokinetic alternative to Method 26 that utilizes standard Method 5 equipment, but requires Teflon Coated Glass Fiber Filters to be used (GF3-107T 82.6mm filters; GF4-107T 110mm filters).



Method 29: Determination of metals emissions from stationary sources



The Method 29 sampling system is an augmented Method 5 sampling train that includes the addition of up to 3 impingers to the standard Method 5 glassware set. The expanded impinger set is necessary to hold solutions that are specific for up to 17 different metals and are analyzed by various spectroscopy methods. Quartz fiber filters without organic binder are required to avoid contamination and artifacts.

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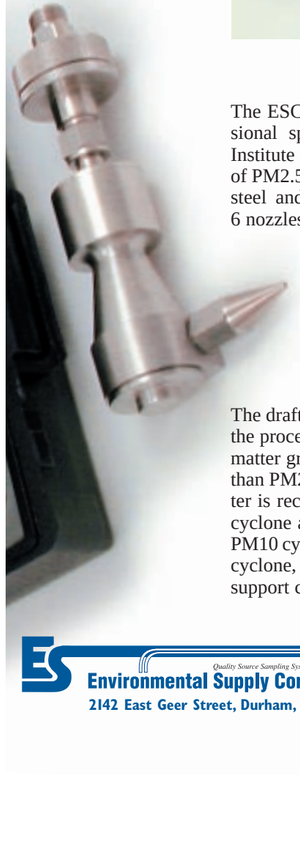
Method 201A: Determination of PM10 emissions (constant sampling rate procedure)

Draft Method 201B: Determination of PM10 and PM2.5 emissions (constant sampling rate procedure)

PM10-SS PM10 Cyclone and Nozzle Set

The ESC PM10 Cyclone and Nozzle Set is manufactured to the interior dimensional specifications defined by the USEPA in Method 201A for in-stack measurement of particulate matter 10 microns and less. Sets are available in stainless steel and Teflon-coated stainless steel and include the cyclone body, 11 nozzles and a 47mm in-line filter holder in a foam-lined case. The filter holder outlet mounts directly to a standard Method 5 probe assembly. The PPS12-Y-PM10 Modular Type S Pitot Tip is required to extend the pressure planes even with the cyclone inlet nozzle.

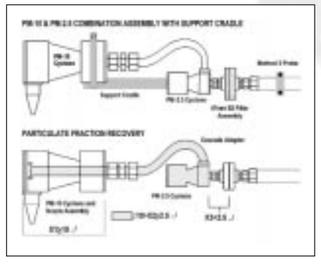


PM2.5-SS PM2.5 Cyclone and Nozzle Set

The ESC PM2.5 Cyclone and Nozzle Set is manufactured to the dimensional specifications defined by the USEPA and Southern Research Institute originally published in the Application Guide for Measurement of PM2.5 [and less] at Stationary Sources. The Set is available in stainless steel and Teflon-coated stainless steel and includes the cyclone body, 6 nozzles and a 47mm in-line filter holder in a foam-lined case.

PM10-2.5-SS Combination PM10 and PM2.5 Cyclone and Nozzle Set

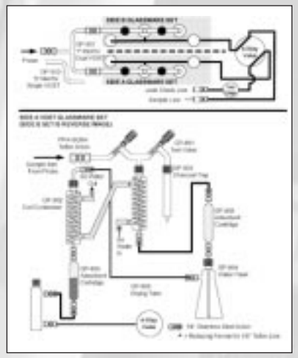
The draft method for determination of PM10 and PM2.5 specifies the procedure for simultaneous in-stack segregation of particulate matter greater than PM10, equal to or less than PM10 but greater than PM2.5, and equal to or less than PM2.5. The particulate matter is recovered from three clearly defined zones within the dual cyclone assembly. Each PM10-25-SS combination set includes a PM10 cyclone, 11 PM10 nozzles, a 47mm filter assembly, a PM2.5 cyclone, the cascade adapter linking device and full assembly support cradle.



VOST: Determination of volatile organic compounds in gaseous emissions from stationary sources. (SW-846 Methods 0030 and 0031)

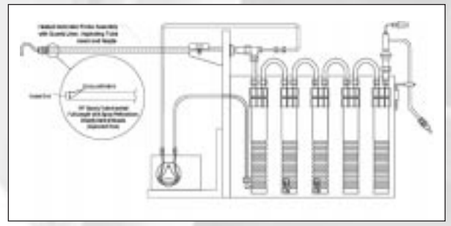
V-S1 Single VOST and V-S2 Dual VOST Samplers

The ESC Single and Dual VOST (Volatile Organic Sampling Train) Samplers are used in conjunction with the UNI-VOS-110 Low Flow Control Console to perform SW-846 Methods 0030 and 0031. Volatile organic compounds in the sample stream are passed through a Pyrex coil condenser followed by cartridges packed with Tenax, Tenax/charcoal or Anasorb adsorbent material. The cartridges are thermally desorbed prior to analysis of the volatile organics by gas chromatography/mass spectroscopy.



The V-S1 Single VOST Sampling System uses a single glassware set. The V-S2 Dual VOST Sampling System holds two glassware sets in a single caddy with a 4-way valve at the outlet end to allow continuous sampling. After a sample run the valve can be switched to the other glassware set for sampling while sorbent cartridges in the first set are changed and leak check is performed. Two separate pumps in the UNI-VOS-110 Console with dual pump option allow simultaneous sampling and leak checking.

Method 0061: Determination of hexavalent chromium from stationary sources



HC-S1 Hexavalent Chromium Isokinetic Sampler

The ESC HC-S1 Hexavalent Chromium Isokinetic Sampler is designed to aspirate the potassium hydroxide impinger solution behind the nozzle in order to impede molecular changes to the hexavalent chromium once sample is drawn from the source. The Sampler includes a heated, Teflon lined, isokinetic probe assembly with recirculating nozzle union, PFA Teflon Impinger Set, peristaltic recirculating pump, insulated cold box with probe support adapter and pump shelf, umbilical adapter with power distribution box and a PFA Teflon filter column. The filter column is used for filtration of hexavalent chromium samples prior to analysis.

The HC-S2 High Temperature Hexavalent Chromium Isokinetic Sampler

The HC-S2 High Temperature Hexavalent Chromium Isokinetic sampler is recommended for use on sources with temperatures above 300°F. This sampler replaces some Teflon components with either Pyrex or Quartz alternatives in order to eliminate exposure of Teflon components from the probe assembly and potassium hydroxide recirculation lines to the elevated stack temperature.

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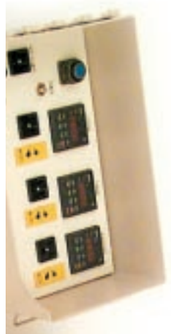
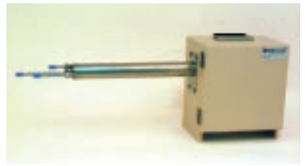


Continuous Emission Monitoring & Relative Accuracy Test Audit (RATA) Equipment:

The ESC CEM and RATA lines of equipment include RATA 3-Point Samplers, CEM probe assemblies, in-stack sintered filters, sample conditioners, heated sample lines and a variety of single and multi-station temperature controllers.

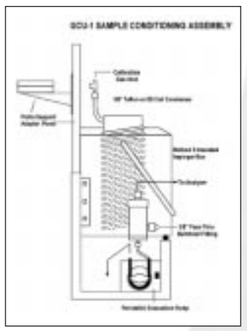


RATA 3-Point Samplers

The RATA-3 Valveless 3-Point Sampler (shown at left) utilizes an orifice manifold to equally control flow from three extraction points for simultaneous 3-point sampling. The manifold includes a calibration gas inlet fitting at the merge point of the three sample pathways within the manifold. The RATA-3.5M Manual 5-Way Valve Sampler and the RATA-3.5 Solenoid Actuated 5-Way Valve Sampler perform sequential, individual point sampling and calibration gas introduction without traversing. The RATA-3.5 Sampler includes a remote control module with control cable for remote valve actuation and valve position monitoring. Each sampler includes a heated 2" probe sheath and a heated valve/filter case with cylindrical filter holder and bulkhead fittings for sample line and calibration gas hookups.

GCU-1 and GCU-2 Sample Conditioners

The GCU line of sample conditioners include manual and thermoelectric sample conditioners. The GCU-1 Sample Conditioner includes a probe support adapter panel for stack mount traverse applications and the GCU-2 Sample Conditioner is a stationary assembly for flexible hookup between probe and conditioner. These conditioners include either a 3/8" TFEP Teflon or stainless steel coil condenser, insulated condenser ice bath box, Teflon condensate collection vessel, peristaltic pump for condensate removal and 25' TFEP sample and cal gas umbilical with power and thermocouple distribution box.



GCU-100 Thermoelectric Sample Conditioner

The GCU-100 Thermoelectric Sample Conditioner is capable of handling the most demanding sampling situation. The condenser completely removes moisture from sample gas with moisture content up to 100% without interfering with its composition. Sample gas dew point is maintained at a constant low level of 5°C by use of a proprietary high efficiency double U-tube heat exchanger.
The sample is pre-cooled to ambient temperature by fan driven high velocity air and is chilled by solid state thermoelectric elements. Intelligent microprocessor circuitry maintains constant output dewpoint, prevents freezing, issues alarms (e.g. sample over-temperature and condensate slip), controls sampling pump, and more. Teflon-coated stainless steel wetted parts are used in place of glass to eliminate breakage.

Heated Sample Lines

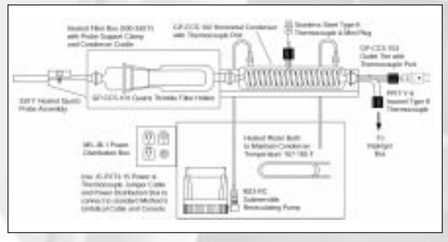
ESC heated sample lines are made in two configurations. The shorter length ESC heated sample lines are available in any length from 5' to 25'. These lines are constructed on a flexible inner sheath that allows the heated Teflon lines to be removable and can accommodate a variety of sizes of Teflon tubing. Each of these lines include a controllable heating grid, a flexible inner sheath, a choice of FEP Teflon removable internal lines, fiberglass insulation and flexible waterproof outer jacket with abrasion resistant expandable oversheath.

The 50' (HH-50-6/4-K) and 100' (HH-100-6/4-K) stock long length heated sample lines are constructed with a constant wattage heater, heated 3/8" Teflon sample line with stainless steel mesh sheath, unheated 1/4" cal gas line with stainless steel mesh sheath, fiberglass insulation and flexible polyurethane outer jacket. The Teflon lines are terminated with 3/8" and 1/4" stainless steel process tube stems. Other lengths and configurations are available by special order.

Heated Sample Lines M5-DC & M5-AC Style Temperature Control Stations

Temperature control stations are available with 1, 2, or 3 analog solid state or programmable digital solid state temperature controllers per station. Each temperature controller within each station is equipped with a 25 amp solid state output relay, a standard 3-prong receptacle per controller and combination mini and standard thermocouple jacks. Each station is further equipped with a 4-pin, 3-circuit amphenol power output jack wired in parallel to the individual 3-prong receptacles, a power control switch and an auxiliary power receptacle. All components are mounted in a weatherproof military style enclosure with a flexible silicone appendage to allow all power and thermocouple hookups to be maintained in foul weather.

NCASI Method 8A: Determination of sulfuric acid vapor or mist and sulfur dioxide emissions from kraft recovery furnaces



The ESC controlled condensate system utilizes a high temperature oven to house a thimble filter holder followed by a heated coil condenser that is carefully temperature controlled within very narrow tolerances to achieve separation of sulfuric acid vapor or mist (including sulfur trioxide) and sulfur dioxide. Both fractions are measured separately by the barium-thorin titration method. The system includes a heated quartz lined probe and high temperature oven each capable of maintaining 550°F, quartz thimble filter holder, Pyrex coil condenser with thermocouple port on recirculation jacket, Pyrex condenser exit adapter with thermocouple port and heated water bath with recirculating pump. The oven is equipped with hanging brackets, a probe support bracket on the inlet end and a condenser cradle on the outlet end so that all glassware is protected and securely supported. A flexible transfer line is used to carry the separated sample to a chilled Pyrex 3-impinger set.

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Whole Air Sampler, Canisters & Canister Cleaning System

The PWA-100 Portable Whole Air Sampler

The PWA-100 Portable Whole Air Sampler is a mass flow controlled sampler that provides constant flow rate sampling into an evacuated sample canister. Long sampling periods are possible, depending upon the application flow rate and the unit is battery powered for use at remote sites. Ideal for industrial hygiene applications, this compact unit mounts directly to the inlet valve on virtually any size of sample canister and is available with an optional AC adapter and battery charger. Sample canisters are available in 1.8 and 6 liter sizes.

C-9501 AutoPure Canister Purging System

The ESC C-9501 AutoPure Canister Purging System is the most reliable fully automatic 4-canister cleaning system available. Programmable moist, dry and heat cycles, and number of repeat cycles enables the system to be tailored to meet your specific processing and turnaround requirements. The C-9501 standard pump evacuates the canisters to 5 Torr, while the optional C-9501-MD molecular drag pump evacuates the canisters to 10^{-6} mbar. The high vacuum pump reduces the number of cleaning cycles required to achieve thorough cleaning and provides sample-ready canisters under greater vacuum. The addition of a C-9501-EU 4-Canister Expansion Unit allows 8 canisters to be cleaned simultaneously through the programmed cleaning cycles and automatic operation of the C-9501 host unit.

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