Purge-and-Trap System Guide

When determining a problem in your purge-and-trap/GC system, methodical troubleshooting is a must. By following this simple, yet comprehensive process for finding and fixing purge-and-trap problems, you can quickly get your GC system back up and running. This bulletin also includes information on general purge-and-trap principles, trap replacement, indicators of performance decline, selecting the right purge trap, and an alphabetical listing of common problems. Supelco offers a comprehensive line of purge-and-trap, thermal desorption, and sample handling equipment. Our decades-long focus on adsorbent technology and scrupulous attention to detail enables us to serve you knowledgeably.

Key Words:
- purge-and-trap
- volatile organic compounds
- gas chromatography

Introduction to the Purge-and-Trap Process

Purge-and-trap is the method of choice for extracting and concentrating volatile organic compounds (VOCs) from almost any matrix. US EPA specifies guidelines for using purge-and-trap methods to process soil, sediment, and water samples. The technique is also used to extract VOCs from foods, beverages, vegetation, pharmaceuticals, petrochemicals, etc.

This procedure is particularly useful for concentrating VOCs that are insoluble or poorly soluble in water and have boiling points below 200°C. The procedure can also be used with water soluble VOCs, but quantification limits are generally much higher for these analytes, because of their poor purging efficiency. Generally, longer purging times and heating the sample are required to increase the purging efficiency of water soluble, often polar compounds.

The purge-and-trap procedure involves bubbling an inert gas, such as nitrogen or helium, through an aqueous sample (solids must be suspended in water) at ambient temperature. This liberates the VOCs, which are efficiently transferred from the aqueous phase to the vapor phase. During this **purge** step, the inert gas flow sweeps the vapor through a trap containing adsorbent materials which retain the VOCs.

A few systems offer the ability to **dry purge** the trap after the purging step. The dry purge step continues to pass the purging gas through the trap, bypassing the purge vessel, for a set time to remove water that may have accompanied the VOCs into the trap during the purging process.

Next, the adsorbent trap is rapidly heated to the **desorb** temperature and the valve is switched to align the carrier gas flow in-line with the trap. The trap is then held at the desorb temperature for an optimal time to thermally desorb the analytes into the carrier gas. The vaporized contents are swept into the GC column in a tight band, ensuring superior chromatographic separation of analytes.

Purge Trap Sorbent Theory

The tubes used in purge-and-trap analyses are generally packed with multiple beds of various sorbent materials (see "Product Information" for purge trap descriptions and a table listing EPA methods and recommended traps), so that a broad range of high and low molecular weight compounds, polar and nonpolar, can be trapped in a single tube. During the purge phase of sampling, lower molecular weight compounds pass through the initial adsorbent beds, but are trapped by succeeding beds. Each bed protects the next, increasingly active bed by preventing compounds from being held so strongly that they cannot be desorbed quickly without decomposition. During desorption, the carrier gas passes through the trap in the reverse direction of purge flow, so that higher molecular weight compounds never come in contact with the stronger (innermost) sorbents.

When selecting sorbents, an analyst's primary concern is the ability of the materials to efficiently trap and subsequently release the compounds to be monitored. An adsorbent material that traps and then releases a group of compounds efficiently will help provide high recoveries, sharp peaks, and good resolution, allowing accurate quantification of the analytes. The absence of interferences from contaminants or water vapor is also essential for accurate quantification.

VOCARB™ 3000 purge trap contains a combination of adsorbents that efficiently trap and release the broad range of analytes in US EPA Methods 502.2 and 524. Excellent thermal stability of the adsorbents in the trap allows higher desorption temperatures (250°C) than traps specified in the methods (180°C), providing more rapid transfer of analytes and improved chromatography.

VOCARB 4000 purge trap can be used for samples containing large molecular size compounds.

BTEXTRAP™ purge trap was designed for analyses of benzene, toluene, ethylbenzene, and the xylene isomers. The trap has low retention for methanol, which reduces the solvent interference in the chromatogram, and it can be baked at high temperatures, which makes for easier cleanup. Adsorbents in the trap are very stable and do not bleed compounds of interest.

VOCARB and BTEXTRAP purge traps contain hydrophobic adsorbents, which significantly reduce the dry purge time needed to remove moisture.

Other purge traps are available. See page 7 for a complete listing.

Systematic Troubleshooting for Your Purge-and-Trap System

Analyzing VOCs in various matrices using a purge-and-trap concentrator can be a demanding task, because of the many variables to be considered. Almost every analyst experiences problems from time to time — poor recoveries, aberrant peak shapes, unstable responses, and the disappearance of individual analytes from the chromatogram. When faced with one or more of these problems, the priority is to find and fix the problem quickly. This may prompt a random approach to troubleshooting, whereby maintenance and adjustments to instrument parameters are performed haphazardly without regard for isolating the source of the problem. The problem may be eliminated, but its cause is not found; therefore, it may reoccur.

Using a methodical approach to troubleshooting will help identify the source of a problem. The *purge trap* is the part of the GC system that is often first blamed for problems. The purge trap is one relatively simple component in a complex system, and easily can be determined or dismissed as the cause of a problem. Most important in tackling a purge-and-trap problem is the order of problem solving.

Step 1: Review and Document

Start by reviewing the instrument parameters and run conditions for your purge-and-trap unit and your GC. Most analysts have established sets of conditions that are known to produce good results. Verify and document that your operating parameters (flow rates, temperatures, ramp rates, etc.) are suitable for the analysis being performed. At this point initiate a simple troubleshooting log, in which each step you take is briefly recorded. Should consultation with Supelco's technical service chemists be necessary, this log will be an essential resource.

Step 2: Test the GC System

Make a direct injection of the standard into the GC, bypassing the purge-and-trap unit. Inject the same volume of standard you would ordinarily spike into a 5mL or 25mL volume of water in the purge-and-trap concentrator.

If the problem is still evident, the source of the trouble lies somewhere in the GC column, the detector, or the standard. Refer to the manufacturer's guide or to Supelco technical service for assistance.

If the chromatography looks good, the trouble lies somewhere else in the system — ahead of the column — so proceed upstream (see step 3).

Step 3: Test the Transfer Line and 6-Port Valve

Disconnect the purge trap at its outlet end (the end where analytes exit during the desorb mode). Next, inject the same volume of standard you would ordinarily spike into a 5mL or 25mL volume of water in the purge-and-trap concentrator directly into the outlet end of the trap, and reconnect the purge trap to the concentrator. Set the purge-and-trap unit directly to DESORB (do not dry purge), thereby initiating a run.

If the problem is still evident, the trouble likely is somewhere in the transfer line and/or the 6-port valve of the purge-and-trap unit. Refer to the operation manual of your concentrator for assistance.

If the problem is gone, it *may* be indicative that the purge trap, which is isolated by the process described in this step, is the cause. In this case, go on to step 4.

Step 4: Test the Purge Trap

Replace the purge trap with a new one of the same configuration. (Having spare purge traps in the lab at all times is prudent.) Run a standard through the purge-and-trap concentrator, as you normally would, with the system completely intact.

If the problem is still evident, the cause is likely somewhere in the purge-and-trap concentrator — between the purge vessel and the trap — so continue troubleshooting upstream. The troubleshooting section of your concentrator's operation manual should provide some valuable guidance.

If you are using an autosampler and the problem is still evident, proceed to step 5.

If the problem is gone, the original trap was probably the cause. See "How Long Should a Purge Trap Last?" (page 3).

Step 5: Test the Autosampler (if applicable)

Reroute the plumbing in your purge-and-trap concentrator so you can bypass the autosampler, thus isolating it from the rest of the system. Run a standard directly from the concentrator.

If the problem is still evident, the autosampler and its transfer line are not the cause. You can now focus troubleshooting efforts on the concentrator itself. The troubleshooting section of your concentrator operation manual should provide some valuable guidance.

If the problem is now gone, the trouble probably lies in the autosampler or the transfer line between it and the concentrator. In this case, try running standards on the various positions of the autosampler to isolate the problematic zones.

General Purge-and-Trap Recommendations

Make certain that your chemical standards are freshly made and properly diluted. Also, make the standards as concentrated as feasible, so that the least possible amount of methanol is present in samples to be purged. Excess methanol and water on the trap is one of the most common problems in purge-and-trap analysis — high concentrations tend to create signal response anomalies. Use Supelco™ water and hydrocarbon traps to ensure that your purge gas is dry and free of organic contaminants. Change these purification traps regularly, just as you would those on your GC carrier gas lines.

Extraneous peaks in your chromatogram is a common problem in trace analytical methods. When this occurs, you will need to determine if the cause is carryover (See *Carryover* on page 4), or another form of contamination originating in the lab. Carryover contamination results from previously-run samples not being fully desorbed from the adsorbent and migrating into the current sample run. It is usually a symptom of overloading the system. Impurities in the purge gas, or even volatiles in the laboratory air, also can be responsible for extra peaks. Make certain there is no solvent storage in the vicinity of the purge-and-trap lab, and see that all solvent operations (e.g., extractions) are performed as far from the purge-and-trap lab as possible.

Although they are not "delicate" items, purge traps should be handled and stored carefully. Purge traps should be stored so that they cannot freely roll around or bump into other objects. If dropped during handling, the trap should be discarded. Blows, excessive vibration, or other physical trauma can cause the adsorbent particles to fracture and settle unevenly, or can displace the adsorbent beds.

Using the correct ferrules with purge traps is important, because even a tiny leak can cause a large performance deficit. For traps that desorb at 220°C or less, Teflon® ferrules work well. When traps desorb at 240°C or higher, Teflon tends to shrink, and therefore leak, unless the ferrules are constantly retightened. We recommend graphite ferrules for higher temperature applications.

Problems with a *Newly Installed* Trap?

If you experience problems with your purge-and-trap system's performance immediately after installing a new purge trap *when no other instrument or run parameters have been changed*, do the following (also see "Installing a New Purge Trap," below). Remove the new purge trap and inspect it visually. Although extremely rare, a small crack in the stainless steel will cause trap failure. Reinstall the trap with new ferrules, paying particular attention to carefully seating the trap while tightening the connections. Then run a standard through the concentrator using the newly seated trap. If it is still not performing satisfactorily, remove the trap, reinstall the old one, and reanalyze the standard. If the problem is resolved, it is possible that the new trap was problematic — consult Supelco, or the trap's manufacturer.

Some of our customers keep "test traps" handy in their labs, one of each type of trap used. A test trap is an almost-new purge trap that has been installed and tested by you on your instrumentation, running *only standards and blanks*; and is known to produce excellent results. Test traps are for use in troubleshooting only. During troubleshooting, there's no substitute for having available a trusted system component that you *absolutely know* works well.

How Long Should a Purge Trap Last?

Purge traps are wearable components, and for a system to perform optimally, purge traps must be replaced prior to their losing an appreciable amount of effectiveness in capturing and releasing analytes. Wear and tear on trap adsorbents result from repeated heating and cooling cycles in the presence of contaminants, which originate mostly in complex sample matrices and, to a lesser degree, in carrier gas and standards. Over time, adsorbent surfaces become less and less able to be completely cleansed by a bake-out cycle.

There is no guideline to predict how long any purge trap should last. A single "bad" sample can kill a previously perfect trap. However, a trap that is part of a properly cared-for system and is used only for clean water samples, for example, can last for months, depending on sample throughput. Use common sense as your guide to knowing when to replace a trap. When you *begin* to see a change in response sensitivity or stability, especially in a system whose purge trap has seen a combination of high service time or contaminated samples, it is time to invest in a new purge trap before performance seriously deteriorates.

Installing a New Purge Trap

The *only good time* to install a new purge trap is at the first sign of decline in the trap presently in use, while the overall system is functioning well. This is so that the replacement of the purge trap is the only variable in the system maintenance. By not having to replace, adjust, or optimize any other part of the system at the same time, you have isolated the new purge trap as the single performance variable.

The *worst time* to install a new purge trap is when the concentrator has not been functioning properly, and the system is in need of systemic troubleshooting. Also, remember that whenever your purge-and-trap system's performance deteriorates *rapidly*, the cause is not likely to be the purge trap (unless you just ran a contaminated sample). Purge traps tend to show a linear pattern of wear, manifesting gradual performance decline.

Compounds as Indicators of Performance Decline

Most chemists using purge-and-trap techniques are testing samples for a sizable list of analytes, sometimes up to sixty or more compounds at a time. It is only logical that in any large collection of analytes, there will be a few that are the most difficult to assay. These most elusive analytes, therefore, are the best indicators of performance decline in purge traps. Table 1 lists some common chemical analytes notorious for indicating the first signs of trap wear and performance decline.

Take full advantage of your powers of observation. Start compiling a list of the compounds that consistently show the earliest performance decline in your particular applications — decline that is indicative of trap wear, as opposed to other sources. When you're confident you have identified the right compounds, keep an eye on them. You'll know exactly when a new trap is necessary by following their performance.

Table 1. Common Problem Indicators

Trouble with	May Indicate This Problem
vinyl chloride	ineffective moisture management in system — check dry purge setting
1,1,2,2-tetrachloroethane	active sites may have developed in the system; trap wear
bromoform	active sites; purge gas flow too slow; desorb temp too high
1,2-dichlorobenzene	(late eluter) desorb temp/time; leaky ferrule
2-chloroethylvinylether	active sites in system; trap wear
dibromofluoromethane	tailing peak may indicate trap wear
chloromethane	loss may indicate a too-agressive dry purge; trap wear
naphthalene	(late eluter) desorb temp/time; cold spots; leaky ferrule
2,2-dichloropropane	active sites may have developed; trap wear
bromomethane	moisture management (check dry purge); trap wear

Common Problems with Purge-and-Trap Systems

Baseline dip on PID

Methanol and water quench the photoionization detector signal. Try increasing the dry purge time to eliminate more water from the sample before it is introduced into the GC. Also, see *Methanol*.

Baseline elevated; column bleed

If the chromatogram baseline is rising, it is probably due to siloxane groups bleeding from the column or trap. If the problem is isolated to the purge trap (as opposed to the GC column), it is likely due to the silanized glass wool inside the trap. Further conditioning (baking) of the trap will eliminate this contamination.

Brominated compounds; low recoveries

These compounds can decompose on carbon-based traps if the desorb temperature is too high. Try lowering the desorb temperature in 5°C increments. Also check the purge flow rate, optimizing it to 35 – 40mL/minute for brominated compounds.

Carryover

Extraneous background peaks are most easily identified as carryover when they match the fingerprint pattern of a previous sample. Carryover frequently results from condensation on cold spots in the system or incomplete baking of the trap between runs, both of which usually occur after the system is overloaded with a large or highly concentrated sample. Increase the bake time to thoroughly cleanse the trap. Prevent reoccurrences by carefully screening subsequent samples, and diluting as necessary.

Chlorinated compounds; low or sporadic recoveries

Low or sporadic recoveries can be caused by active sites in the purge-and-trap system. After ruling out other causes (i.e., trap wear), consult your instrument operation manual for suggestions on a procedure to passivate these sites.

Conditioning

Purge traps should be conditioned prior to initial use. Supelco purge traps include recommendations on conditioning time and maximum operating temperature. You should lengthen the conditioning time between runs when extraneous peaks are present, after a sample foams over, or to purge stubborn contamination from the trap.

Foaming samples

Occasionally, because of their composition, samples foam, creating the potential for serious instrument contamination if the foaming sample carries over into the instrument. Add a defoaming agent, or dilute the sample to prevent this, and screen similar samples to prevent a reoccurrence. If foaming does occur, condition the purge trap.

Gaseous VOCs; loss of resolution

First, realize the loss of analyte peak resolution could be either analyte-recovery related or chromatographic in nature. Looking at recovery issues, check the dry purge time; it should be 2 to 4 minutes. Excessive dry purging can drive gaseous VOCs too far into the purge trap's stronger adsorbent beds, resulting in poor resolution and unusual peak shape upon desorption. Always try reducing the dry purge time to a minimum when analyzing gaseous VOCs. Make sure you are adequately focusing these difficult analytes by either optimizing cryofocusing conditions, or by using a suitable refocusing trap. Also, see "Selecting the Right Purge Trap."

Heavy analytes; diminished recoveries

Try increasing the desorb temperature and/or time. On Tekmar® units, check the heating jacket on the trap. It may have slipped down, and therefore would not be heating the entire trap. On O.I. Analytical units, verify that the trap is actually heating all the way around during the desorb mode. Verify that your transfer line and 6-port valve temperatures are rising to at least 100°C to prevent sample condensation on cold spots in the system. The cryofocusing temperature may be too cold; try elevating this temperature a degree or two.

High back-pressure

Usually high back-pressure indicates that the trap must be replaced. When running samples containing significant levels of heavy analytes (particularly PAHs/PNAs and styrene), incomplete desorption can cause a gradual back-pressure build-up. Try increasing the desorb time before resorting to installing a new trap.

Methanol

Excessive amounts of methanol interfere with both mass spectrometry and PID detector signals, affecting the quality of chromatography. Whenever possible, reduce the amount of methanol in your samples by making your standard solutions more concentrated. VOCARB purge traps are very efficient at focusing and delivering methanol so, if possible (when you are NOT analyzing for gases), switch to an alternate trap (such as a Tenax or BTEXTRAP trap) when methanol in your samples may be a problem. See "Selecting the Right Purge Trap."

Oxygenated compounds (alcohols, ketones, etc.)

Low recovery is the most common problem. These chemicals are very water soluble, so try the following combination of steps designed to optimize recovery. Increase the purge gas flow rate about 25%, while increasing purge time 2 to 4 minutes. You may elect to heat the sample slightly during purging (perhaps to about 40°C or 50°C). Finally, decreasing the desorb time slightly should lead to improved chromatography.

Water

Interference from water will cause aberrant peak shapes and poor recovery for early eluting compounds, as well as shorten the life of ELCD and Hall® detectors. On GC/MS systems, poor moisture management will lead to a noisy baseline in the vicinity of the water peak. By isolating the analysis from the concentrator vessel, the direct injection diagnostic test previously described in troubleshooting step 3 can help determine if your problem is due to water. If it is, invoke a dry purge cycle prior to desorbing, or increase your dry purge time by one or two minutes (up to a maximum of 6 minutes total dry purge time, or 4 minutes total when gases are being analyzed). Also see "Selecting the Right Purge Trap."

Product Information

Selecting the Right Purge Trap

Choosing the purge trap that is best suited to your intended list of analytes isn't always simple. Supelco's catalog includes a descriptive listing of each stock purge trap we manufacture, plus a comprehensive explanation of each adsorbent's functionality. Obviously, adsorbents (and combinations of adsorbents), carefully selected for functionality and synergy, are at the heart of purge trap performance. Traps are strategically configured to effect optimal adsorption, rapid release, and narrow-band focusing of analytes. Supelco's proprietary graphitized carbons and carbon molecular sieves have advanced the state of the art of purge-and-trap analysis. Having excellent thermal stability, traps packed with these materials (VOCARB® and BTEXTRAP traps) allow significantly higher desorption temperatures (~250°C) than the purge traps containing silica gel (~180°C), which were originally specified in EPA methods. See Table 2 for a listing of purge traps and EPA methods.

Moisture management and coping with the presence of methanol are central issues in choosing a purge trap. The adsorbents in VOCARB and BTEXTRAP traps are very hydrophobic, and retain much less water and methanol than Tenax®-silica gel-charcoal purge traps. Ironically, VOCARB and BTEXTRAP traps are very efficient at focusing what little water and methanol they retain, delivering these to the column in a narrow band, so even users of these traps can benefit from the suggestions listed under *Methanol* and *Water* in the "Common Problems" section above.

Table 2. Supelco Purge Traps for EPA Methods

EPA Method	Specified Trap*	Supelco Recommended Trap
502.1	E	I, K
502.2	E	K
503.1	G	K
524.1	E	K
601 E	K	
602 G	J	
603 G	G	
624 F	K	
1624F	K	
8010E	K	
8015—	K, J	
8020G	K	
8021G	K	
8030G	G, I	
8031G	K	
8240E	K	
8260E	K	
Contract Lab. Program (CLP)	B	B

* See descriptions on page 7.

If we don't have a stock purge trap to suit your unique application, we'll create one for you. Please don't hesitate to call our technical service chemists to discuss purge trap configurations and custom options.

Thermal Stripping Technology

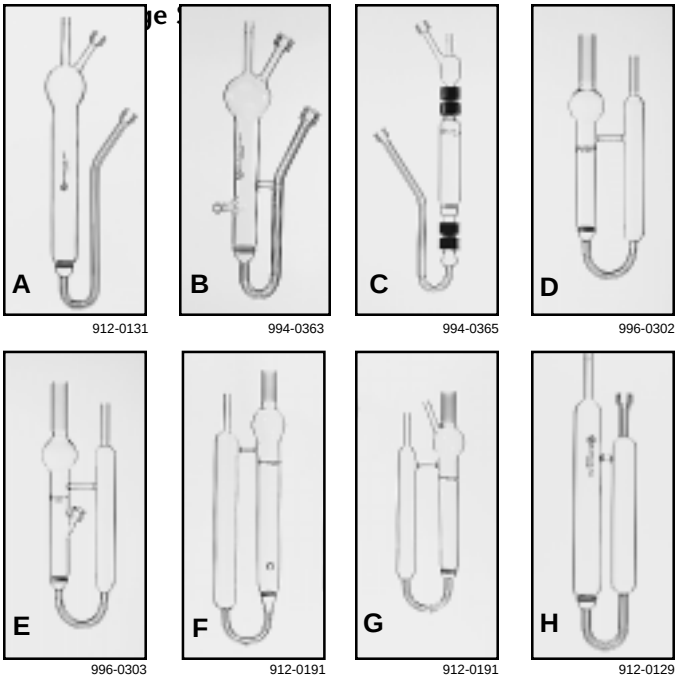
Using the purge-and-trap technique in combination with thermal stripping is advantageous for several reasons. Purge-and-trap sample preparation is extremely simple and fast, thermally stripped samples deliver sharp, symmetrical peaks, and, because the sample delivered to the GC column is undiluted, sensitivity is enhanced considerably compared to solvent extraction and solvent desorbed samples. See the last page of this bulletin for thermal stripping equipment.

We're Always Available to Help You

When these purge-and-trap troubleshooting tips aren't comprehensive enough to solve your problem, give Supelco a call. Our talented technical service chemists are always available to provide additional assistance, whether that means isolating your system's problem or helping you select the best purge trap for any application. Our 30 years of experience with adsorbent technologies, surface chemistry, and chromatographic applications makes Supelco your logical choice for qualified purge and trap support.

Ordering Information:

Purge-and-Trap Glassware and Accessories



Description	Tekmar Equiv.	Cat. No.
For Tekmar LSC-2 and LSC-3 Concentrators		
For Standard Aqueous Analysis (see A)		
5mL	14-0042-024	**22425**
25mL	14-0043-024	**22426**
For AquaTek 50 and 2050 Autosamplers (see B)		
5mL, right stem	14-3765-024	**22746**
25mL, right stem	14-3766-024	**22747**
Internal Standard Vessel	14-4487-024	**21994**
Modified for Easy Cleaning■ (see C)		
5mL	—	**64713**
Replacement Purge Columns, pk. of 4	—	**64714**
Microconnector, 13mm to 13mm, pk. of 6	—	**64699-U**
For Tekmar 2000/3000 Concentrators		
For Standard Aqueous Analysis (see D)		
5mL	14-2337-024	**22781**
25mL	14-2334-024	**22789**
With Injection Port — allows injections in liquid or gas form (see E)		
5mL	—	**22783**
25mL	—	**22791**
Fritless Glassware		
5mL	14-2336-024	**22780**
25mL	14-2333-024	**22788-U**
5mL	—	**22782**
25mL	—	**22790-U**
5mL, left stem	14-3544-024	**22743-U**
5mL, right stem	14-3544-124	**22742-U**
25mL, left stem	14-3546-024	**22745**
25mL, right stem	14-3546-124	**22744**
Internal Standard Vessel	14-4487-024	**21994**
For US EPA Method 603 Using AquaTek 50 and 2050 Autosamplers (see G)		
5mL, top stem	14-4006-024	**22748**
25mL, top stem	14-0007-024	**22749**
For Tekmar ALS Autosampler (see H)		
5mL	14-0956-024	**22429**
25mL	14-0957-024	**22430**
Septa for Purge Samplers		
half-hole, pk. of 100	—	**20668**

▲ **Note:** All 1/4" OD glass ends are ground glass.

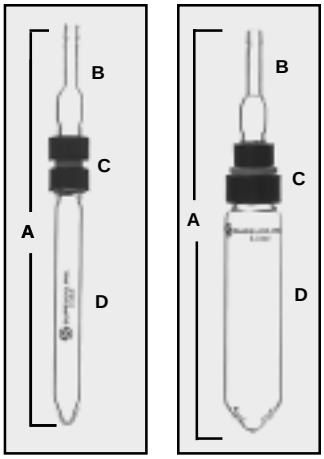
■ Described by the US EPA (Fed. Reg. 44, No. 233, Dec. 3, 1979) for easy cleaning. Order septa separately.

Needle Sparge Glassware

For LSC-2, LSC-3, 4000, and ALS concentrators

912-0133

One-Piece



912-0132

Two-Piece

One-Piece Design

Description	Tekmar Equiv.	Cat. No.
5mL/6"	14-2052-024	**22724**
25mL/8.25"	14-2053-024	**22725-U**
5mL/5.5"	—	**22682**
25mL/7.375"	—	**22683**

Two-Piece Design with Micro Connectors

This design allows easy cleaning of the sample chamber. Excellent when analyzing solids, slurries, and high viscosity samples.

Description	Cat. No.
A. Complete Sampler	
5mL	**22431**
25mL	**22432**
B. Replacement Adapter*	
Tekmar, 1/4" (top)	**64625-U**
Tekmar, 1/2" (top)	**64627-U**
OI Analytical, 6mm (top)	**64626**
OI Analytical, 12mm (top)	**64628-U**
C. Replacement Micro Connectors*	
For 5mL chamber connection	
13 x 13mm, pk. of 6	**64699-U**
For 25mL chamber connection	
13 x 20mm, pk. of 6	**64701-U**
D. Replacement Chamber	
5mL (1/4")	**64629-U**
25mL (1/2")	**64630-U**

* Use with Tekmar LSC-2, LSC-3, 4000, and ALS concentrators.

Glassware for ALS 2016/2032 Samplers

Description	Tekmar Equiv.	Cat. No.
Soil Sampler, 150mm	12-0507-024	**22718-U**
Purge Tube, 6mm x 223mm, needle	14-3913-024	**21996**
Purge Tube, 6mm x 223mm, frit	14-3913-124	**21997**

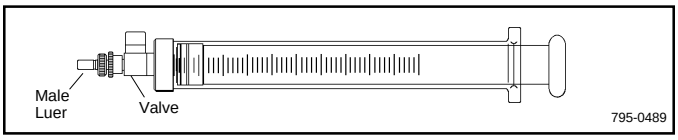
Replacement Sample Valve and Fittings

911-0145

Description	Tekmar Equiv.	Cat. No.
Sample Valve		
for Tekmar Concentrators**	14-0036-050	**20971**
Male Luer Connector	14-0122-016	**20941**
Female Luer Connector(shown)	14-0216-016	**20942-U**

**Order luer connector separately.

Purge-and-Trap Syringes

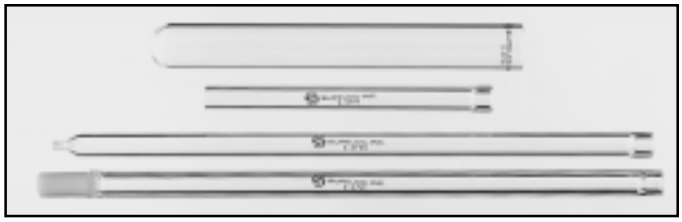


795-0489

This purge-and-trap version of the SampleLock syringe is designed for analyzing drinking water samples according US EPA purge-and-trap concentration techniques (EPA methods 502.1, 502.2, 503.1, 524.1, and 524.2).

Description	Tekmar Equiv.	Cat. No.
1005SLPT, 5mL (shown)		
for purge and trap)		**26294**
1701N, 10µL (for calibration)	12-0089-052	**20972**
1005 TLL, 5mL	14-0069-052	**20999**
1025 TLL, 25mL	14-0070-052	**20683**

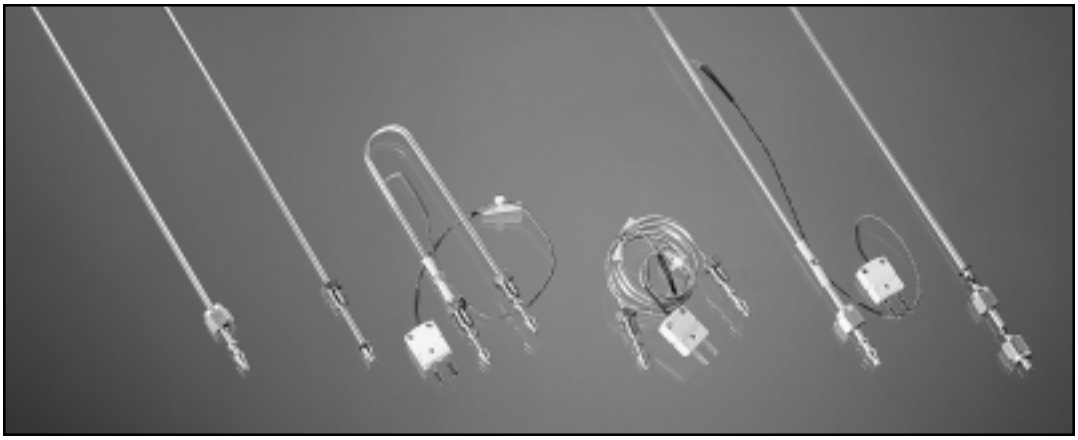
Glassware for 4100/4200 Heated Samplers



910-0592

Description	Tekmar Equiv.	Cat. No.
Sampler, 150mm	12-0507-024	**22718-U**
Short Headspace Tube	14-0978-024	**22719-U**
Heated Sampler Purge Tube		
Needle sparge	14-0977-024	**22720-U**
With frit	14-1346-024	**22721**

Traps for Purge-and-Trap Analysis



996-0294

All traps are constructed of 1/8" OD stainless steel and produced to the specifications of the instrument manufacturer. Each trap is stamped with a letter designation for easy identification of contents.

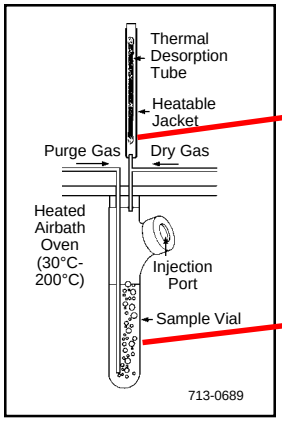
		Purge/Trap Apparatus: Manufacturer and Model					
Trap	Adsorbents	Tekmar LSC-1, LSC-2, LSC-2000, 4000 [1]	Tekmar 3000 [2]	OI Analytical 4460 [3]	OI Analytical 4560 [4]	Dynatech "Dyna" models [5]	CDS Peakmaster [6]
A	24cm Tenax TA	**21059-U**	**24910-U**	**21135**	**24930-U**	**21075-U**	**21148**
B	15cm Tenax TA 8cm silica gel 15	**21060-U**	**24911-U**	**21136**	**24931**	**21076**	**21149**
C	8.7cm Tenax TA 7.7cm silica gel 15 7.7cm activated charcoal	**21061-U**	**24912-U**	**21137**	**24932**	**21077**	**21150**
D	16cm Tenax TA 7.7cm activated charcoal	**21062-U**	**24913-U**	**21138**	**24933**	**21078**	**21151-U**
E	1cm 3% SP™-2100▲/ Chromosorb® W AW 7.7cm Tenax TA 7.7cm silica gel 15 7.7cm activated charcoal	**20294**	**24914**	**21139**	**24934**	**21079-U**	**21152**
F	1cm 3% SP-2100/ Chromosorb W AW 15cm Tenax TA 7.7cm silica gel 15	**20293**	**24915**	**21140**	**24935**	**21080-U**	**21153**
G	1cm 3% SP-2100/ Chromosorb W AW 23cm Tenax TA	**20295**	**24916**	**21141**	**24936**	**21081**	**21154**
H	7.6cm Carbopack™ B 1.3cm Carbosieve™ S-III●	**20321**	**24917**	**21142-U**	**24937**	**21082**	**21155-U**
I	VOCARB 4000 Trap 8.5cm Carbopack 10cm Carbopack B 6cm Carboxen™ 1000 1cm Carboxen 1001	**20308**	**24918**	**21143**	**24938**	**21083**	**21156**
J	BTEXTRAP Trap 7cm Carbopack C 1.2cm Carbopack B	**21064**	**24919**	**21145**	**24939**	**21084**	**21158**
K	VOCARB 3000 Trap 10cm Carbopack B 6cm Carboxen 1000 1cm Carboxen 1001	**21066-U**	**24920-U**	**21131-U**	**24940-U**	**21085-U**	**21159**

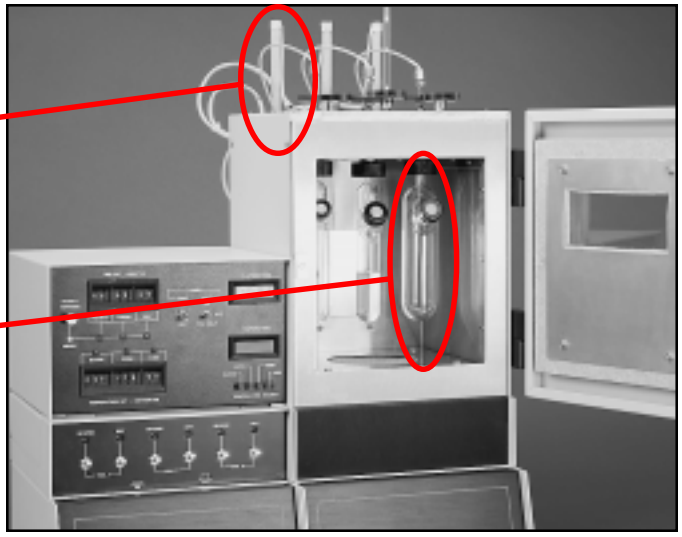
1. straight, 12"/30.5cm, Swagelok® fitting
2. straight, 12"/30.5cm, Valco® fitting
3. U-shaped, 11.5"/29.2cm, attached thermocouple
4. coiled, attached thermocouple
5. straight, 12"/30.5cm, attached thermocouple
6. straight, 11.25"/28.6cm

● German Pat. No. 1935500. Patent holder – Badische Anilin-& Soda-Fabrik Aktiengesellschaft.
▲ SP-2100 is equivalent to OV®-1.

Thermal Stripping Equipment

Dynamic Thermal Stripper




910-0096

The Dynamic Thermal Stripper thermally releases analytes from various environmental and other matrices at temperatures from ambient to 150°C — eliminating the large volumes of solvent needed for solvent extraction. These stripped volatile, semivolatile, or nonvolatile compounds are trapped on an 11.5cm x 6mm OD Supelco thermal desorption tube. The tube is then transferred to the ACEM 900/901-FF to be desorbed to a GC column. The Dynamic Thermal Stripper accommodates up to 3 aqueous samples simultaneously, in volumes of 10mL to 1000mL, or a single sample of 250mL to 1000mL.

- Largest available (1000mL) stripper vessel option on the market
- Adjustable sparging line allows you to adjust the purge gas to percolate thorough or above the sample
- Purge and dry flow rates of 5-200cc/min
- Oven temperature: ambient to 150°C
- Dry gas, added to the system during the thermal stripping process, prevents water vapor from condensing in the desorption tube
- Dry samples, such as polymers, construction materials, or environmental matrices, can be purged for dynamic headspace analysis

Description	Cat. No.
Dynamic Thermal Stripper*	
Model 1000, 115VAC	**22822**
Model 1001, 230VAC▲	**22827**

▲ Does not have CE mark.

Accessories for Dynamic Thermal Stripper and Purge-and-Trap Unit

Supeltex™ M-2A Replacement Ferrules	Cat. No.
For thermal tube, 6mm ID, pk. of 10	**22393**
For sample vial, 3/8" ID, pk. of 3	**22815-U**
For sparge line, 1/8" ID, pk. of 10	**22483-U**

Sample Vials	without Injection Port	with Injection Port
10mL	–	**22675**
20mL	**22671**	**22676**
40mL	**22672**	**22677**
100mL	**22674**	**22679**
250mL	**22727**	–
500mL	**22728**	–
1000mL	**22729**	–

Purge-and-Trap Unit Model 30


995-0131

The Model 30 Purge-and-Trap Unit efficiently purges volatile compounds from water samples at ambient temperatures onto a 11.5cm x 6mm OD Supelco thermal desorption tube. The tube is then transferred to the ACEM 900/901-FF for desorption to a GC column. The unit accommodates a single 10mL to 1000mL sample.

- Adjustable sparging line allows you to adjust the purge gas to percolate through or above the sample
- Purge and dry flow rates of 5-200cc/min
- Dry gas, added to system during the thermal stripping process, prevents eluent water vapor from condensing in the desorption tube
- Dry samples, such as polymers, construction materials, or environmental matrices, can be purged for dynamic headspace analyses

Description	Cat. No.
Purge-and-Trap Unit Model 30*	
115VAC	**22840-U**

* Manufactured by Dynatherm, Inc.