

C-Flow Model Types

The C-Flow nebulizer model range consists of three main types.

Microconcentric

These nebulizers have fixed, integrated uptake lines and are designed to be used with ICP-MS, typically in free aspiration mode. Uptake rates range from 200 uL/min down to 35 uL/min or lower for custom versions. There are versions for both regular (standard) sample introduction systems, and desolvators (these are named C-Flow for Aridus II), which are assembled and tested at 110° C.

Note: Regular and desolvator versions are not interchangeable – regular versions cannot be used with desolvators and desolvator types cannot be used with regular sample introduction systems.

Demountable Type – for ICP-MS

The C400d and C400e are general purpose nebulizers with removable (demountable) uptake lines which can be conveniently replaced if damaged. Both of these nebulizers are designed for ICP-MS use and while they will free aspirate, they are designed to be pumped. The C400d includes a Saville uptake line while the C400e connects to an ESI ISTD kit line.

Demountable Type – for ICP-OES (and MP-AES)

The C700d is also a general purpose nebulizer with removable (demountable) uptake line, but is designed for ICP-OES. It is optimized for the lower gas flow (0.6 SLPM) and higher sample uptake rate (0.7-1.2 mL/min) typically used in ICP-OES. It also has higher TDS capability for high matrix samples. It can also be used with MP-AES.

The C-Flow PFA body design is common to all nebulizer versions – all have a 6 mm OD body and an integrated gas connector with threaded ferrule nut giving a secure gas line connection. The PFA construction prevents breakage and allows for virtually universal chemical compatibility.

Installation

All C-Flows will fit any spray chamber (Scott type, cyclonic or desolvator) that accepts a 6 mm OD nebulizer. Depending on the instrument, the nebulizer port may seal with an o-ring or, more typically, a threaded ferrule nut. While a seal must be made between nebulizer body and spray chamber, it is important that the nebulizer body is not gripped too tightly or the body may deform slightly, affecting the aerosol pattern. This may cause a loss in sensitivity. Take care not to overtighten the spray chamber ferrule nut when installing. For correct installation, tighten the ferrule until it contacts the nebulizer body and then tighten a further 1/8 turn. O-ring type nebulizer ports should be no problem with the C-Flow.

Insertion and Removal of the C-Flow from the Spray Chamber

Although C-Flows are more rugged than glass nebulizers, the C-Flow microconcentrics can be damaged during insertion and removal if care is not taken. Always handle the nebulizer by only gripping the body and never tug, grip or pull on the uptake line to withdraw the nebulizer. Although the uptake line (which is an extension of the capillary inside the nebulizer body) is tightly retained in the nebulizer body, it is possible to withdraw the capillary from its critical position by pulling hard on it. If this occurs the nebulizer is destroyed and can't be repaired. If handled with care, the C-Flow will provide years of reliable service.



Correct method for removing the C-Flow from the spray chamber end cap. Grasp the nebulizer body only, and not the uptake line.

Initial Cleaning

C-Flows are supplied ready for use and do not require initial cleaning. However for ultratrace sample analysis in semicon labs, it is always good practice to aspirate dilute acid (high purity 2% HNO₃/1% HF is recommended) for 1-2 hours before first installation on an ICP-MS.

Gas Line Connection

The C-Flow body features a reliable and secure threaded connector that accepts 4 mm OD nylon or PTFE gas line. Simply insert the gas line into the threaded connector on the side of the C-Flow body and tighten the 4 mm ferrule nut. Most ICP-MS use 4 mm OD nebulizer gas line. For easy connection to the various gas lines found in different ICP-OES instruments, a gas line connection kit is included with each C-Flow (except C-Flow for Aridus II). The connection kit includes:

- One meter of 4 mm OD PTFE gas line (connects to the threaded connector on the C-Flow body)
- One Festo 4 mm/6 mm push fit connector (connects the supplied 4 mm OD PTFE gas line to the 6 mm OD nylon gas line used in some instruments)
- One barbed connector. The plain end of this fitting inserts into the threaded connector on the C-Flow body. The barbed end accepts a Tygon gas line, which is commonly used on ICP-OES instruments



Gas line connection kit contents.

Additional gas line connection kits can be ordered using Savillex part number 830-051.

Gas Flow Rate Settings

The microconcentric C-Flows and C400d/C400e are designed to be operated over the range of 0.6-1.1 SLPM nebulizer gas flow (argon). Depending on the ICP-MS used, 0.7-1.0 SLPM is typical, and 1.0 SLPM is typical for desolvators (desolvator version C-Flows only). The C700d is designed for ICP-OES and MP-AES and is optimized at 0.6 SLPM. ICP-OES typically operate between 0.5-0.65 SLPM. All microconcentrics ship with a checkout certificate which shows sample uptake rate between 0.6 and 1.1 SLPM.

Optimization

For ICP-MS, where a make up gas line is fitted, increased sensitivity can be obtained in some cases by adding a small amount of make up gas (typically 0.1 – 0.2 SLPM when using 1.0 SLPM nebulizer gas, or 0.4 SLPM make up gas when using 0.7 SLPM nebulizer gas).

Troubleshooting

C-Flows are extremely resistant to clogging, despite the smaller ID capillary used in the lower uptake rate microconcentrics. This is because the capillary has a uniform ID all the way to the orifice, with no reduction in ID inside the nebulizer body. Generally, if a particle is small enough to enter the uptake line, then it will be able to exit the nebulizer orifice.

Stopping aspiration (stop flow) is sometimes confused with clogging. Stop flow can occur with free aspiration nebulizers when a number of air bubbles are trapped in the uptake line, for example if the end of the uptake line is moved in and out of the sample rapidly in succession. The additional "drag" caused by these air gaps is enough to stop the nebulizer aspirating. This can be easily fixed by backflushing the nebulizer. With the nebulizer gas switched on, a gloved finger is lightly placed over the nebulizer tip: this forces gas back down the uptake tube, clearing the uptake line of air gaps. The nebulizer will then aspirate normally. Because the capillary is supported at the tip, it is not damaged by backflushing.



Clearing air gaps in an uptake line by backflushing.

Autosampler Probes

Microconcentric C-Flows are available with different probes to suit different autosamplers. Those versions without probe have an uptake line with the last 10 cm straightened. This helps prevent the uptake line curling up out of the sample solution when used manually. Polyimide and carbon probes are also available. Both are fully encapsulated to prevent contamination or pockets which could cause memory problems. The different autosamplers used in ICP require different probe OD and length for correct fitment.

To learn more view our Microconcentric Nebulizer Selection Guide.

Technical Support

For technical support, please contact Savillex by email at info@savillex.com or call (+1) 952.935.4100.



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