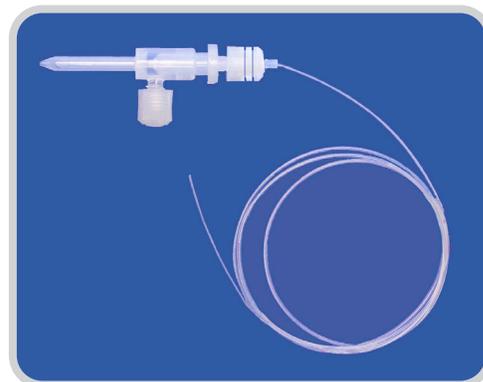


## C-Flow Model Types

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

### Semiconductor and Low Sample Volume Applications of ICP-MS (S-Type)

The s-type nebulizers combine the sensitivity and washout performance of an integrated uptake line nebulizer with the convenience of a demountable uptake line nebulizer. Available in 50, 100 and 250  $\mu\text{L}/\text{min}$  versions. The nebulizer body is the same in each version and different uptake lines can be used to change the uptake rate of the nebulizer. Uptake lines are available with a range of autosampler probes. Note that uptake rate specification is not guaranteed when the uptake line is changed but normally the uptake rate will remain in specification.



C100s Nebulizer

### General Purpose ICP-MS and ICP-OES (and MP-AES)

The C400d and C400e are general purpose nebulizers with 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 SavilleX uptake line while the C400e connects directly to an ESI ISTD kit line. The C700d is optimized for higher sample uptake rates (0.7-1.2 mL/min) typically used in ICP-OES and MP-AES. It has excellent high matrix sample handling capability and is also used with ICP-MS when maximum resistance to TDS is needed – for example in clinical applications running diluted whole blood.

### For Desolvators

C-Flow variants named “For Desolvators” are designed to be used with desolvation devices typically used with isotope ratio ICP-MS measurements. They are assembled and tested at 110°C for optimum performance in the desolvator. Desolvator nebulizers have a fixed uptake line. Care must be taken when installing and removing the nebulizer from the spray chamber to avoid damaging the uptake line since it cannot be replaced if damaged.

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.

## Initial Cleaning

For ultratrace sample analysis applications, for example use in semiconductor labs, a cleaning step prior to first use must be carried out. Aspirate dilute acid (high purity 5%  $\text{HNO}_3$ /2% HF) for at least eight hours or overnight before first installation on an ICP-MS. Do not recirculate the acid through the nebulizer – only aspirate fresh acid.

## 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<sup>th</sup> turn. O-ring type nebulizer ports should be no problem with the C-Flow.



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

## IMPORTANT! Insertion and Removal of the C-Flow from the Spray Chamber

Although C-Flows are more rugged than glass nebulizers, the C-Flow 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. In the case of the desolvator nebulizer, the uptake line is an extension of the capillary inside the nebulizer body, and although it 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. Nebulizers with demountable uptake lines have the benefit that if the uptake line is damaged it can simply be replaced and the nebulizer is not destroyed. If handled with care, however, the C-Flow will provide years of reliable service.

## 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 desolvators, which connect direct to the gas supply of the desolvator). The gas line connection kit includes:



Gas line connection kit contents.

- 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.

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

## Gas Flow Rate Settings

The s-type 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 optimized at 0.6 SLPM. ICPOES typically operate between 0.5-0.65 SLPM. All s-type and desolvator nebulizers 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 uptake line used in the lower uptake rate nebulizers.

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.



Clearing air gaps in an uptake line by backflushing.

## S-Type C-Flow Uptake Line ID

S-type C-Flow uptake lines feature a groove pattern on the uptake line connector nut to allow easy identification of uptake rate. The number of grooves denotes the uptake rate of the line, as shown in the diagram below.



50 uL/min



100 uL/min



250 uL/min

## Autosampler Probes

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

To learn more view our Nebulizer Selection Guide.

## Technical Support

For technical support, please contact Savillex by email at [info@savillex.com](mailto:info@savillex.com) or call 952.935.4100.