

Plasma gas control precision and unmatched dynamic range deliver key advantages

Unleashing the analytical power of ICP using Axetris MFCs

ICP-MS and ICP-OES are powerful analytical techniques where gas flow control plays a critical role in plasma generation and control. Axetris MFCs provide key advantages towards ensuring the highest analytical performance.

Powerful analytical technique

Inductively Coupled Plasma (ICP) combined with a Mass Spectrometer (ICP-MS) or an Optical Emission Spectroscope (ICP-OES) are extremely popular atomic spectroscopy techniques. Applications are wide-ranging within the environmental, food, pharmaceutical and semiconductor industries. Typically, ICP is an argon plasma reaching temperatures of up to 10'000 K, thereby allowing complete atomization of the analyte into elements for a complete analysis.

Gas flow control plays a critical role in maximizing analytical performance of ICP techniques:

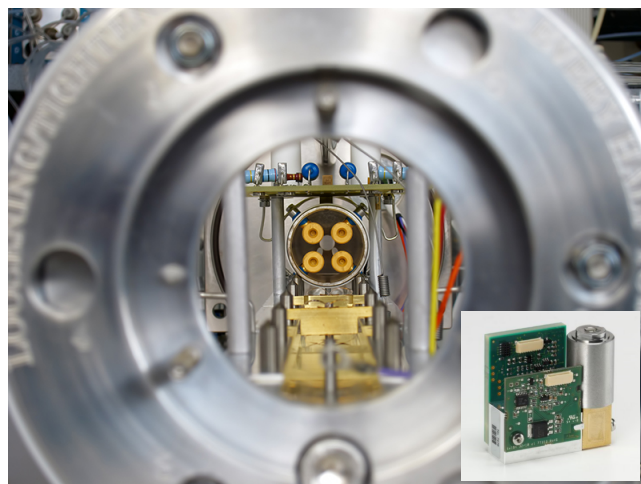
- Plasma and auxiliary flows support plasma generation and control. The quality of plasma is directly related to precision of gas flow control.
- Nebulizer gas flow should be highly reproducible to achieve high detection limits for the particular analyte.
- Coolant gas flow should provide enough control resolution across a wide dynamic range to maintain system stability.

Argon is the most common gas used for plasma generation and control (standard flow rates 0-2 slpm and 0-20 slpm). Depending on exact technique used for a certain element, a reaction gas such as ammonia, oxygen or methane may also be used.

Precise and reproducible gas flow control is a key requirement

Axetris mass flow solutions deliver a number of concrete advantages in ICP applications.

Precise gas flow control with no overshoot allows sensitive control of the plasma torch, and quick delivery of the collision and/or reaction gas to the MS collision cell. **Reproducible** gas flow control minimizes instrument drift.



ICP combined with a mass spectrometer (pictured: Quadrupole MS) can provide an extremely powerful analytical technique in a variety of applications. Inset: Axetris MFC2022 OEM Mass Flow Controller.

Axetris Advantages in ICP applications:

- ✓ Extremely high repeatability of typically < 0.15% O.R.
- ✓ Unmatched dynamic range (> 1000:1) to provide flexibility across wide flow range of 0-20 slpm
- ✓ Ultra low flow control for tight control of plasma and analytical process

The **unmatched dynamic range** and **low flow capability** means analytical flexibility without compromising on control resolution at low flows.

Quick settling time (150 ms) of the MFC supports rapid and dependable switching between different modes, e.g. vented cell and pressurized cell mode for mass spectrometers.

Minimal leak rate of 10^{-5} mbar l/s He through the solenoid valve offers excellent positive shut-off (though an additional positive shut-off valve is recommended to ensure leak tightness to the collision cell).

Axetris Mass Flow Meters and Controllers – the perfect fit for ICP applications

Performance benefits at a glance:

- ✓ Repeatability $\pm 0.15\%$ O.R.
typically for MFC
- ✓ Dynamic Range $> 1000:1$
- ✓ High Accuracy $\pm 0.2\%$ F.S. / $\pm 1\%$ O.R.,
whichever is greater
- ✓ Multigas Ar, He, H₂, N₂, Air, CO₂, O₂ etc.
- ✓ Dimensions 6.4 x 34 x 48.5 mm,
e.g. OEM Mass Flow Meter
- ✓ Reaction Time < 4 ms (mass flow sensor)
- ✓ Settling Time < 150 ms (mass flow controller)

O.R.: Of Reading; F.S.: Full Scale

For F.S. $> 15'000$ sccm:

- Specified repeatability is $\pm 0.2\%$ O.R.
- Specified accuracy is $\pm 2.5\%$ O.R.



Axetris Mass Flow Meters and Controllers can be flexibly integrated into multi-channel manifolds, e.g. for control of various gas flows in ICP applications.

About Axetris Mass Flow Meters and Controllers

Axetris offers OEM Mass Flow Meters (MFM) and Controllers (MFC) which offer outstanding value to the customer. The proprietary, platinum-based MEMS chip technology guarantees excellent accuracy and repeatability in combination with high speed and an extended dynamic range.

The Axetris mass flow technology is used by leading companies in the fields of gas chromatography, leak testing, thermal analytics, mass spectroscopy, thin film deposition, plasma engineering and more.



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