FieldMaster™ Resistive Glass Products

FieldMaster™ Resistive Glass Products control the speed and direction of ions by generating a uniform electric field.

RGPs are proprietary lead silicate glass structures specially processed to create a resistive glass layer at the surface. Resistivity can be varied over several orders of magnitude to suit the specific application requirements.

Typical RPG applications include capillary inlet tubes, ion guides, drift tubes, ion mirrors, reflectron lenses, conversion diodes, collision cells and voltage dividers.

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PHOTONIS Resistive glass products easily control speed and direction of charged particles

Unique process creates uniform fields in a wide variety of configurations

Resistive Glass Products (RGPs) are geometric glass structures with resistive properties that can be used to create uniform electric fields to guide or direct charged particles. In our patented process, this alkali-doped lead silicate glass has been reduced in a hydrogen atmosphere to make its surface a semiconductor. RGPs can be produced in various sizes and shapes and are well suited for use in high vacuum systems

Cross Section of Reduced Glass

- Hydrogen firing creates an integral semiconductive layer on the surface, not simply a coating.
- This reduced lead silicate layer is typically several hundred angstroms thick.
- All surfaces (ID, OD, ends) are reduced

Wide range of robust formats

Resistive Glass Products are available in a wide variety of shapes and sizes, including capillary tubes, cylinders, sheets, washers and custom shapes:

- Can be machined, fritted, metalized or sandblasted.
- Easily cleaned with water, acetone, methanol or IPA without degrading performance.
- Resistant to scratches from light to moderate abrasions.
- Circular plates up to 90mm (3.5") in diameter.
- Rectanglar or rounded plates up to 150mm (6") x 90mm (3.5").
- Resistive washers up to 71mm (2.8”) diameter.

Resistance tuned to optimize performance

The resistance of these patented products can be varied over many orders of magnitude to suit the specific application. The starting glass material is selected to optimize low (10^5-$10^9\Omega$) or high (10^9-$10^{11}\Omega$) resistance requirements.

Characteristics of Resistive Glass

Property	High Resistance Glass	Low Resistance Glass
Softening Temperature	642°C	613°C
Operating Temperature Range	-20°C to 400°C	-20°C to 400°C
Density	4.44 g/cm^3	5.07 g/cm^3
Annealing Temperature	480°C	482°C
Temperature Coefficient of Resistivity	~ -0.85% /°C	~ -0.65% /°C
Thermal Expansion Coefficient	78x10^{-7}/°C	82x10^{-7} /°C
Typical Device Resistance Range	10^9-$10^{11}\Omega$	10^5-$10^9\Omega$

PHOTONIS RGPs are protected under patent numbers 7,154,086 and 7,081,618.

Unique capabilities for analytical instruments

For mass spectrometry, structures and assemblies made from resistive glass can be used as ion guides, inlet tubes, drift tubes, and reflectron lenses, with significantly simpler construction than their traditional metal analogues. Other applications include ion mirrors, collision cells for chemical ionization or linear reaction cells, conversion diodes, and voltage dividers.

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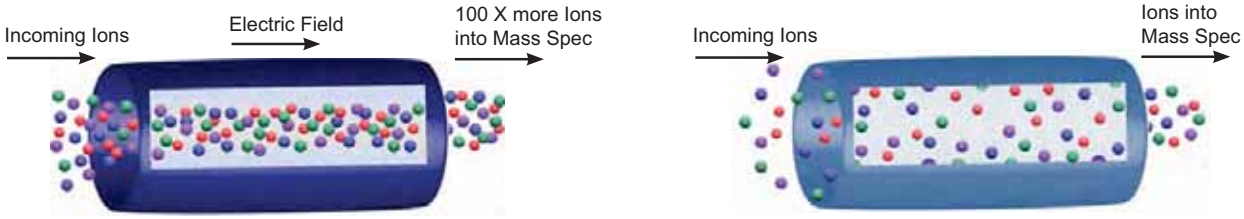
Capillary Inlet Tubes improve ion transmission

Resistive Glass Capillary Inlet Tubes improve ion transmission in atmospheric pressure ionization applications. The voltage applied across the tube creates an electric field that preferentially attracts either positive or negative ions, increasing the number of ions drawn into the mass spectrometer. This significantly improves ion transfer efficiency when compared to traditional quartz inlet tubes, in addition, the resistive glass prevents collisions with other ions and the tube walls, reducing ion loss, and results in a more efficient sample transfer.

The use of Resistive Glass Capillary Inlet Tubes also enables polarity switching to occur at a much higher rate, further enhancing the efficiency of the analysis.

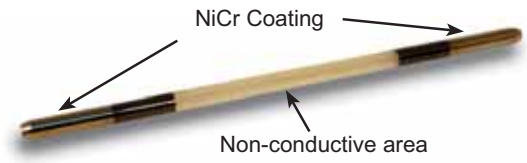
Resistive Glass Inlet Tube vs Conventional Inlet Tube



Multicapillary Inlet Tubes provide increased sensitivity

Resistive Glass Multicapillary Inlet Tubes further improve ion transmission when compared to single capillary inlet tubes. Using a multi-bore extrusion process, developed at PHOTONIS, the tubes are manufactured to create a circular array of six individual channels, which act as singular inlet tubes, providing a 6-10X increase in ion transfer efficiency.

Multicapillary Inlet Tubes can provide an increase in ion transmission of up to 1000X compared to conventional quartz tubes.



Typical single capillary tube
with OD 6.5 mm and ID 0.6 mm

Cross section of multicapillary inlet tube

RGP Drift Tubes improve Ion Mobility Spectrometry

FieldMaster™ Drift Tubes have demonstrated an improvement in ion transmission when compared to conventional tubes. They can be easily removed and cleaned without degradation in performance. The single-piece, solid tube design provides containment for counter-flow gas, eliminating the need for an additional enclosure.

RGP Reflectron Tubes simplifyTime-of-Flight Mass Spectrometers

FieldMaster™ Resistive Glass Reflectron Tubes provide a simple replacement for a complex, multi-piece stacked ring reflectron. In a direct comparison, the FieldMaster™ Resistive Glass Reflectron Tube provided equal or better performance in an orthogonal TOF system. This comparison also showed lower FWHM values, indicating better energy focus, while spectra between the two were nearly identical. FieldMaster™ Resistive Glass Reflectron Tubes can be ordered in a variety of standard lengths for a simple, low-maintenance replacement solution.

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