

InGuard In-Line Sample Pretreatment Cartridges



The InGuard™ line of sample pretreatment cartridges is designed to remove matrix interferences such as cations (including transition metals), anions, or hydrophobic substances that are encountered in many ion chromatography (IC) applications. The InGuard cartridge is installed in-line between the autosampler and the IC injection valve, facilitating immediate, automated sample pre-treatment.

Solve Tough Applications Problems

Automated in-line sample pretreatment using InGuard in-line sample pretreatment cartridges:

- Eliminates manual sample pretreatment steps
- Facilitates better separations
- Increases lifetimes of analytical columns
- Solves major matrix problems
- Achieves reproducible ppm-level determinations in concentrated matrices

Convenient and Easy to Use

Samples are automatically processed. After loading the sample onto an injection loop, the sample is pushed through one or more InGuard cartridges onto a concentrator column and is ready for analysis. The InGuard cartridges use standard 10-32 fittings for easy installation into an IC system. Depending on the exact chemistry and types of samples treated, some cartridges can be regenerated.



Passion. Power. Productivity.

Optimized Design and Manufacture

The InGuard hardware, illustrated in Figure 1, is designed with standard 10-32 connections for easy and secure installation in an IC system. The cartridge design eliminates leaks and channeling. The unique sample distribution frit maximizes complete resin bed usage. The cartridge hardware is optimized for the best possible performance in matrix removal applications.

Versatile Selection of Resins

- InGuard Ag
- InGuard H
- InGuard Na
- InGuard HRP
- InGuard Na/HRP

The InGuard family of sample pretreatment cartridges is available in a wide range of packings to fit your sample pretreatment needs. Table 1 summarizes the InGuard products and their typical applications.

Cartridges can be used singly or in series depending on the matrix interferences to be removed. Figure 2 illustrates the InGuard Ag and InGuard Na cartridges used in series to remove chloride and carbonate from a water sample prior to ppm-level determination of chloride.



Figure 1. InGuard cartridge design.

TABLE 1. INGUARD CARTRIDGE CHEMISTRIES AND TYPICAL APPLICATIONS.				
Cartridge	Functional Group(s)	Capacity (meq/cartridge)	Mode of Use	Example Applications
Ag	Ag ⁺ form sulfonate	5–5.5	Ion Exchange	Removal of halides by precipitation
H	H ⁺ form sulfonate	5–5.5	Ion Exchange	Removal of alkaline earth and transition metals; pH adjustment of basic samples
Na	Na ⁺ form sulfonate	5–5.5	Ion Exchange	Removal of alkaline earth and transition metals
HRP	Hydrophilic divinylbenzene	2 g resin	Adsorption, π - π bonding	Removal of hydrophobic species, azo-, and cyano-containing species
Na/HRP	Dual Functionality	50% Na / 50% HRP	Ion Exchange (Na) and Adsorption	Remove Ca ²⁺ (Na) and lipids (HRP) from dairy

Solve Your Matrix Problems

InGuard Ag

For the removal of:

- Chloride
- Bromide
- Iodide

The InGuard Ag resin is a styrene-based sulfonic acid resin in the silver form, the same material used in OnGuard II Ag cartridges. This cartridge removes chloride, bromide, and iodide from concentrated sample matrices such as brines. When using an InGuard Ag cartridge, an InGuard H or InGuard Na cartridge should be placed after the InGuard Ag cartridge to remove any residual silver ions.

Figure 2 demonstrates the use of an InGuard Ag cartridge for the removal of chloride from a 1.6% brine sample, followed by an InGuard Na cartridge to remove residual silver ions. Analysis using ion-exchange chromatography with suppressed conductivity detection shows a low baseline and good resolution of nitrite, nitrate, and sulfate from the chloride matrix.

InGuard H

For the removal of:

- Alkaline earth metals
- Transition metals
- High pH

The InGuard H cartridge contains styrene-based, sulfonic acid resin in the hydronium form, the same as that used in OnGuard II H cartridges. This resin is designed to have very high selectivity for polyvalent cations, such as calcium and transition metals. The cartridge is ideal for the removal of high levels of alkaline earth metals and transition metals from sample matrices. It is also used for the neutralization of highly alkaline samples such as sodium hydroxide or sodium carbonate. Carbonate can be reduced to very low levels following this pH reduction by passing the sample through a CRD 200.

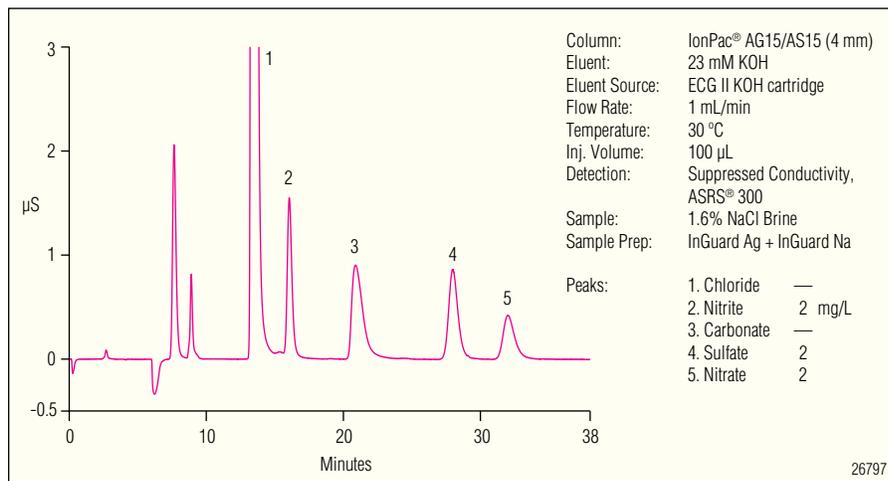


Figure 2. Analysis of 2 ppm nitrite, nitrate and sulfate in 1.6% NaCl Brine after on-line sample pretreatment with InGuard Ag and InGuard Na cartridges.

InGuard Na

For the removal of:

- Alkaline earth metals
- Transition metals

The InGuard Na cartridge contains styrene-based, sulfonic acid in the sodium form. The InGuard Na is used in the removal of high levels of alkaline earths and transition metals from sample matrices without acidifying the sample. This attribute ensures good recovery of acid-labile analytes such as nitrite. This resin is designed to have very high selectivity for multivalent cations such as calcium, magnesium, and transition metals.

InGuard HRP

For the removal of:

- Organic material

The InGuard HRP cartridge contains a hydrophilic reversed phase resin based on divinylbenzene. The material is water-wettable, thus 100% aqueous samples can be pretreated without disruption of the column bed. The InGuard HRP can be used to remove organic matrix material over a wide range of hydrophobicity, including fats from whole milk.

InGuard Na/HRP

For the removal of:

- Alkaline earth metals
- Transition metals
- Organic material

The InGuard Na/HRP cartridge contains a blend of sulfonated resin in the sodium form and HRP resin to provide the dual functionality of removing both cations including metals and organic contaminants from a sample. This cartridge is designed to provide general purpose cleanup of samples, such as foods, for anion analysis.

Preferred Configurations

Optimum performance is achieved when an InGuard cartridge(s) is used to treat the contents of an injection loop and the treated sample is then loaded onto a concentrator column.

The configuration shown in Figure 3 can be accomplished on any IC system with two 6-port, a 6-port and a 10-port, or two 10-port valves. By using a defined loop volume and a concentrator column, the need to time sample preparation to obtain an undiluted injection volume is avoided.

Figure 4 shows a plumbing configuration where the cell effluent is recycled for sample preparation. The Electrolytic Water Purifier (EWP) is used to clean the cell effluent water for trace analysis work.

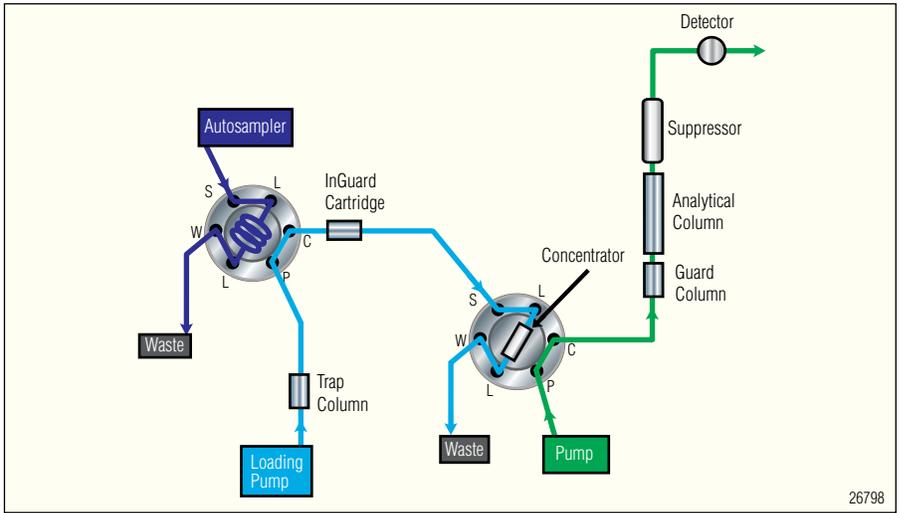


Figure 3. Preferred configuration 1: two 6-port valves and two pumps.

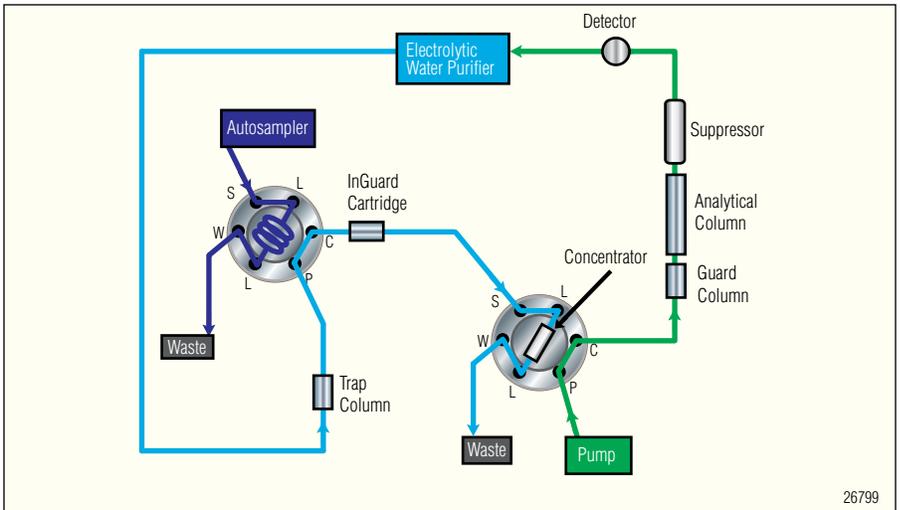


Figure 4. Preferred configuration 2: two 6-port valves, one pump, and an Electrolytic Water Purifier.

Figure 5 shows a plumbing configuration where a 10-port valve replaces the second of the 6-port valves in Figure 3. In this arrangement, water does not flow over the InGuard cartridges between runs, so the re-dissolution of silver halide precipitates (formed during the removal of halides in the matrix) is significantly reduced. This configuration is preferred when using the InGuard Ag cartridge.

The configuration shown in Figure 6 is used to minimize the sulfate blank.

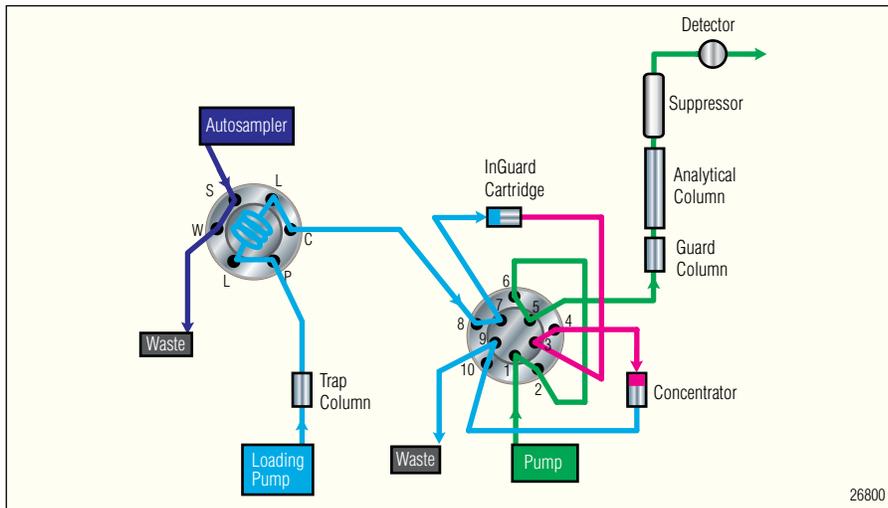


Figure 5. Preferred configuration 3: one 6-port and one 10-port valve, and two pumps with stopped flow.

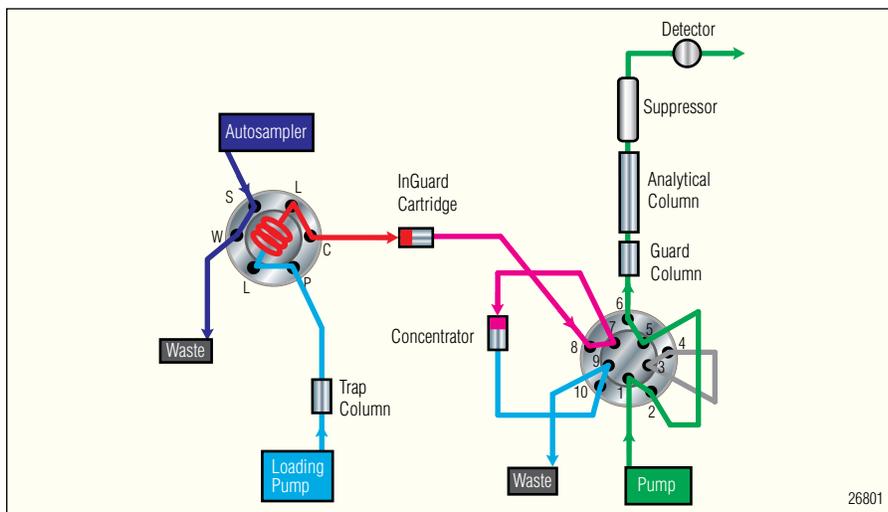


Figure 6. Preferred configuration 4: one 6-port and one 10-port valve, and two pumps with constant wash.

ORDERING INFORMATION

In the U.S. call 1-800-346-6390, or contact the Dionex Regional Office nearest you. Outside the U.S., order through your local Dionex office or distributor. Refer to the following part numbers.

InGuard Sample Pretreatment Cartridges	Part Number
InGuard Ag, pkg of 4	074038
InGuard H, pkg of 4	074037
InGuard Na, pkg of 4	074036
InGuard HRP, pkg of 4.....	074034
InGuard Na/HRP, pkg of 4.....	074035

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LPN 2399 PDF 12/09
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