

# IC-Chelate and IC-Chelate Plus Devices

## Introduction

Maxi-Clean™ and Extract-Clean™ IC devices are solid-phase extraction devices used to eliminate matrix interferences from samples prior to analyses by ion chromatography. Each device consists of either 0.5mL or 1.5mL of polystyrene-based packing sandwiched between polyethylene frits within an injection-molded medical-grade polypropylene housing (Figure 1). Samples and wash solvents are passed through the packing using a luer hub syringe (for Maxi-Clean™ devices) or a vacuum manifold (for Extract-Clean™ devices). As the sample comes in contact with the packing, specific chemical interactions take place that selectively retain certain components of the matrix in the device while the remaining components pass through the device outlet. The chemical characteristics of the packing dictate which sample components are retained. Seven chemistries are currently available.

Proper application of IC devices requires:

- 1) proper conditioning of the device prior to sample application,
- 2) application of the sample at a rate slow enough to allow the chemical interaction to take place while the sample is in the device, and
- 3) control of sample size to keep within the device's capacity.

The following information provides general recommendations for the use of IC-Chelate devices. Please note that the removal of polyvalent metal ions is a function of pH.

### NOTICE

The Alltech Maxi-Clean™ and Extract-Clean™ IC-Chelate Devices must be stored in an air-tight container to prevent dehydration of the resin.

## General Information

Maxi-Clean™ and Extract-Clean™ IC-Chelate devices provide a reliable method for the removal of polyvalent metal ions from samples prior to analysis by ion chromatography. They may also be useful for preconcentrating polyvalent metal ions from dilute samples. IC-Chelate devices contain either 0.5mL or 1.5mL of styrene divinylbenzene copolymer containing iminodiacetate ions, which act as chelating groups in binding polyvalent metal ions. Its selectivity is very high for divalent ions and transition metals. The quantity of metals absorbed onto the resin is function of pH; absorption is very low below pH2, it increases sharply from pH2 to pH4, and it reaches a maximum above pH4. The sodium contained on the packing will be displaced by the metals from the sample. The amount of metals removed is equivalent to the amount of sodium originally on the resin. Anions and nonmetallic ions that do not form a complex with the chelating resin may be retained through simple ion exchange mechanisms.

## Flow Rate

The devices have a number of flow-dependent parameters that may affect results. In general, high flow rates, particularly in the sample loading step, will decrease the performance while low flow rates will improve the extraction process. Low flow rates allow the sample to diffuse into the packing, thus increasing capacity and improving the efficiency. The recommended flow rate for sample loading is 1mL/minute or less.

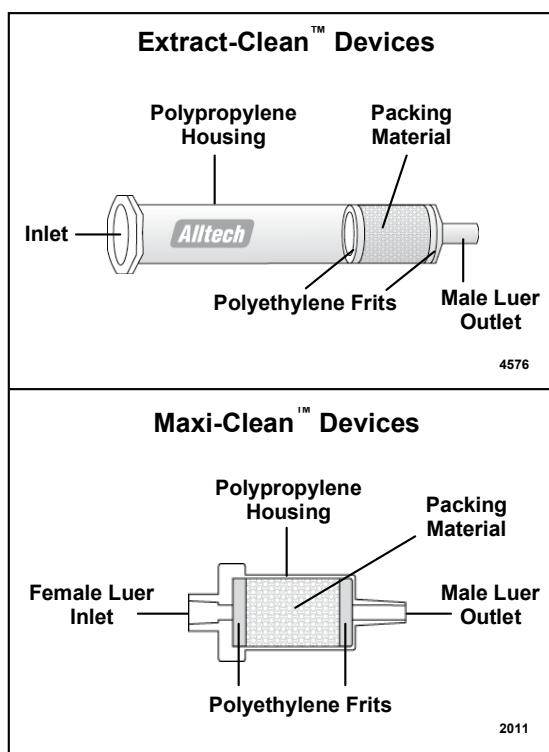


Figure 1

## Sample Mass

Each device contains either 0.2 or 0.5 milliequivalents of sodium (for the 0.5mL or 1.5mL device, respectively), which under ideal conditions will remove an equal volume of polyvalent cations from the sample. In practice, this maximum capacity may not be realized. The nature of the sample (concentration, ionic strength, solvent) and the rate at which the sample is loaded into the device will affect the capacity. Where possible, adjust sample size to use 50% or less of the device's absolute capacity. Larger volumes of polyvalent cations may be removed by using two or more Maxi-Clean™ cartridges in series. If the volume of polyvalent cations in the sample is unknown, a test extraction should be performed to determine the correct sample size.

## Sample Volume

The internal volumes of the different devices include the flow passages and interstitial packing volume. Although it is possible to recover all but 100 $\mu$ L (for the 0.5mL devices) or 150 $\mu$ L (for the 1.5mL devices) of sample with an air purge, best results are obtained when the sample volume greatly exceeds the internal volume of the cartridge.

Device	Bed Size	Internal Volume
Maxi-Clean™	0.5mL	300 $\mu$ L
Maxi-Clean™ Plus	1.5mL	650 $\mu$ L
Extract-Clean™	0.5mL	2.5mL
Extract-Clean™ Plus	1.5mL	1.5mL

## General Procedure

- 1. Precondition the Device.** Pass 5 to 10mL of IC grade water through the device. This removes interstitial contaminants and wets the packed bed. For trace analysis work, repeat the rinsing procedure until the eluant is free from interferences.
- 2. Load the Sample.** Load the entire sample at 1mL/minute or less. The total amount of polyvalent cations contained in the sample should not exceed the device capacity and preferably should be below 50% of total capacity. Discard the first 1mL of eluate. Collect the remaining eluate for analysis.

## Applications

Maxi-Clean™ and Extract-Clean™ IC-Chelate devices may be used to remove transition metals prior to organic acid analysis by ion exclusion chromatography. These transition metals may irreversibly retain on the strong cation exchanger of the packing, thus deactivating the ion exchange sites of the column.

Maxi-Clean™ and Extract-Clean™ IC-Chelate devices may also be used to preconcentrate transition metals from dilute samples. This is accomplished by passing a large volume of sample (with low transition metals concentration) through the device and eluting the retained ions in a smaller volume.

Maxi-Clean™ and Extract-Clean™ IC-Chelate devices may also be used for ultra purification of buffers for studying the effect of metals on biological systems.

## Other IC Devices

Device	Retains
IC-RP:	Hydrophobic Components
IC-OH:	Anions (pH increase)
IC-H:	Cations (pH reduction)
IC-Ag:	Chloride, Iodide, Bromide
IC-Ba:	Sulfate
IC-Na:	Cations (no pH change)
IC-Chelate:	Polyvalent Metal Ions
IC-Mixed Mode RP-OH:	Hydrophobic Components and Anions (pH increase)
IC-Mixed Mode RP-H:	Hydrophobic Components and Cations (pH reduction)

## IC-Chelate Devices

Description	Volume	Qty	Part No.
Maxi-Clean™ IC-Chelate	0.5mL	50	30250
Maxi-Clean™ IC-Chelate Plus	1.5mL	25	30265
Extract-Clean™ IC-Chelate	0.5mL	50	40250
Extract-Clean™ IC-Chelate Plus	1.5mL	30	140265

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