

Product Information

ASI Static Mixers from Supelco

- Reduce baseline noise
- Increase sensitivity
- Improve gradient accuracy
- Increase reaction efficiency in post column derivatization
- Interchangeable cartridges*

A highly efficient cross-flow shearing mechanism in the ASI static mixer produces vortex mixing over a wide range of flow rates.

Selecting the Right Housing

Use the binary input housing to combine two flowpaths into one, such as in postcolumn or gradient mixing applications. Use the in-line housing when additional mixing is needed in a single flowpath. Within each product series, (micro, low and high volume) the mixer cartridges are interchangeable.

Selecting the Right Size Mixer Cartridge

ASI offers static mixers with volumes that range from 2 micro liters to 1,000 micro liters. Choosing the right size is a trade off between delay volume, mixing noise, and step gradient definition and repeatability.

The following observations will provide some guidelines to help choose the right size mixer.

- For any given flow rate, the more the mixing volume the better the mixing, and the lower the baseline noise.
- The smaller the mixing volume, the better the definition and sharpness of step gradients.
- Multi-pump gradient systems typically require far less mixing volume than low pressure single pump gradient systems.
- A 150µL in-line static mixer can be added after a dynamic mixer to further reduce mixing noise.

ASI Static Mixers

Micro-Mixer Cartridge, Stainless Steel	
2µL	56661-U
5µL	56662-U
10µL	56663-U
25µL	56664-U
Micro-Mixer Housing, Stainless Steel	
In-Line	56665-U
Binary Input	56666-U
Ternary Input	56667-U
Low Volume Mixer Cartridge, Stainless Steel	
50µL	57545
150µL	57546
250µL	57547
Low Volume Mixer Cartridge, PEEK	
50µL	500445
150µL	500453
250µL	500461
Low Volume Housing, Stainless Steel	
In-Line	57548
Binary Input	57549
Ternary Input	500488
Low Volume Housing, PEEK	
In-Line	500496
Binary Input	500518
Ternary Input	500526
High Flow Mixer	
In-Line, 350µL	500534
In-Line, 500µL	500550
Binary, 350µL	500542
Binary, 500µL	500569

*Cartridges are ONLY interchangeable within a given product series (Micro, Low, High Volume)



Multi-Pump High Pressure Gradient Systems

Step Gradients

It is necessary to choose a mixer volume that is smaller than or equal to the flow rate. This will result in the sharpest step definition and reproducibility, with minimum baseline noise. For example, if the flow rate is 25 μ L/min, then use a 10 μ L mixer volume.

Please refer to Table 2 for specific recommendations.

Linear Gradients

Larger mixing volume can be tolerated for a particular flow rate, with the larger the volume, the lower the mixing noise. The upper limits to mixing volume will be the maximum delay time that can be tolerated, and possible distortion (tailing) of the gradient at the beginning and end of the gradient. The lower limit will be defined by the amount of mixing noise that can be tolerated.

Please refer to Table 3 for specific recommendations.

Binary or Ternary – Steady State Composition

Always select the largest volume that will still provide an acceptable delay volume. In general, the more mixing volume, the better the mixing will be. For most pump systems, a 150 μ L cartridge will provide adequate mixing.

Examples of this type of pump system include: Shimadzu 10 AD and 10 ADVP, Beckman System Gold[®], Gilson[®] Model 305, Hewlett Packard[®] Model 1100 binary

Single-Pump Low Pressure Mixing Gradient Systems

Step Gradients

In this case, the required mixing volume is determined by the speed or frequency that the proportioning valves meter solvent at the intake. This is usually a small fraction of the piston displacement, so the required mixer volume can be rather small, comparable to a multi-pump high pressure gradient system. We recommend using a mixer volume equal to the flow rate, for example, 50 μ L for 50 μ L/min. If the mixing noise is still excessive, then use the next size larger mixer cartridge available.

Please refer to Table 1 for specific recommendations.

Linear Gradients

These systems generally require more mixing volume to perform linear gradients than multi pump high pressure systems. The following will explain why this is the case. In a low pressure system the composition can only be changed once every pump stroke. Since the pump stroke volume of most pumps is 100 μ L, and it takes a mixer volume that is about 3 times the batch volume to provide adequate mixing, we need 350 μ L of mixer volume, at least, to do adequate mixing. More insoluble combinations may require even more mixing volume.

In general, choose the largest size mixer cartridge that will still provide an acceptable delay volume. For most applications this will be at least 350 μ L.

Binary or Ternary – Steady State Composition

Always select the largest volume that will still provide an acceptable delay time. In general, the more mixing volume, the better the mixing will be. For most applications this will be at least 350 μ L.

Examples of this type of pump system include: Hewlett Packard 1090, Perkin Elmer series 200, TSP Spectra Vision[®], Waters model 626, Varian Star[®] 9000

Table 1. Step Gradients - Low Pressure Mixing

Flow (mL/min)	Mixer Cartridge Volume (mL)
0-25	25
25-50	50
50-150	150
150-500	250 or 350
500+	500

Table 2. Step Gradients - High Pressure Mixing

It is usually important to retain a well defined and repeatable step shape when performing step gradients. Using a mixing volume that is too large will cause the step shape to lose the sharp definition, while too little volume will not provide adequate mixing. The following cartridge volumes are recommended for the range of flow rates listed below.

Flow (mL/min)	Mixer Cartridge Volume (mL)
0-7	2
7-15	5
13-35	10
35-50	25
50-150	50
150-500	150
500+	250

Table 3. Linear Gradients - High Pressure Mixing

Larger mixing volume can be tolerated for a particular flow rate, with the larger the volume the lower the mixing noise. The upper limits to mixing volume will be the maximum delay time that can be tolerated, and possible distortion (tailing) of the gradient at the beginning and end of the gradient. The lower limit will be defined by the amount of mixing noise that can be tolerated. The following cartridge volumes are a compromise between these two limits.

Flow (mL/min)	Mixer Cartridge Volume (mL)
0-5	5
5-10	10
10-20	25
20-150	50
150-500	150
500+	250

Trademarks

Beckman System Gold - Beckman Instruments, Inc.
Gilson - Gilson, Inc.
Hewlett Packard - Agilent Technologies

Perkin-Elmer - Perkin-Elmer Corp.
TSP Spectra Vision - Thermoquest
Varian Star - Varian Analytical Instruments

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