SIMCO ION™
An ITW Company

TECHNICAL NOTE

In-line Gas Ionization Manifold Considerations

Model 4210

In-Line Gas Ionization

Most high technology manufacturers rely on air ionization to control problems associated with static charge—thus increasing yields, minimizing down-time and microprocessor lockup and reducing cost of ownership. Unfortunately, mini-environments and process equipment prevent ceiling-mounted ionizers from reaching one of the most important production areas—the inside of process equipment. In the heart of process equipment, where limited space or proximity to sensitive products makes ionizing bars impractical, Simco-Ion' 4210 pipes compressed ionized gas for balanced charge neutralization. Either Clean Dry Air (CDA) or nitrogen can be ionized, depending on process requirements. The ionized gas is plumbed to the static-sensitive product or fixture through thin (6-10 mm) ultraclean Teflon™ tubing, bathing the area in conductive gas. Manifolds can be routed through the equipment to the desired area, while staying clear of moving products and robotics.

The 4210 Family of In-line Gas Ionizers

Versions of the 4210 are available for use with both CDA and nitrogen, using either ultraclean single crystal silicon emitter points or high output tungsten alloy points. The following table provides a product family overview:

	4210	4210u	4210un
Environment	Class 100	Class 1	<Class 1
Gas ionization	CDA/N2	CDA	N2
Emitter point materials	Tungsten alloy	Silicon	Silicon

The 4210 family is part of Simco-Ion' Equipment Ionization Program (EIP), which includes equipment ionization consulting and engineered solutions. Contact Simco-Ion for program details.

Manifold Rules Summary

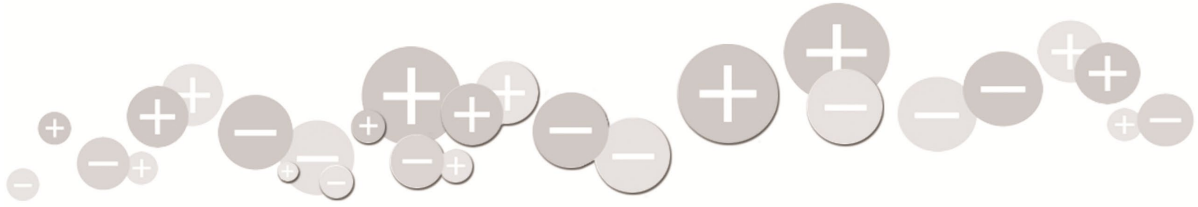
A few basic design rules followed at the beginning of the manifold design process will help speed a successful manifold design. Ion production, ion recombination, and ion concentration at the delivery zone are the parameters which are controlled with careful manifold design.

Manifolds are delivery systems for ionized gas. Even the best manifold will have losses due to ion charge recombination. Approximately 50% ion loss occurs in a two foot long manifold. Whenever possible, minimize the ion loss effects of the manifold by minimizing the length.

Low ion recombination rates ensure more ion delivery to the charged surface and faster discharge times. Narrow diameter tubing means higher flow velocity and shorter residence time and through the manifold. The shorter the manifold and the fewer the number of bends and fittings, the better.

Delivery tubing should be made of TeflonTM wherever possible, but stainless steel may also be used with an expected increase in discharge time of approximately 30%. Experience has shown that 3/8 inch inside diameter (9.5 mm) works best for use with nitrogen and 1/4 inch (6 mm) is preferred for CDA. Manifold outlet holes should not be smaller than 0.1 inch in diameter.

Ion production begins when the flow rate through the 4210 reaches 1 cfm, but for good results, higher flow



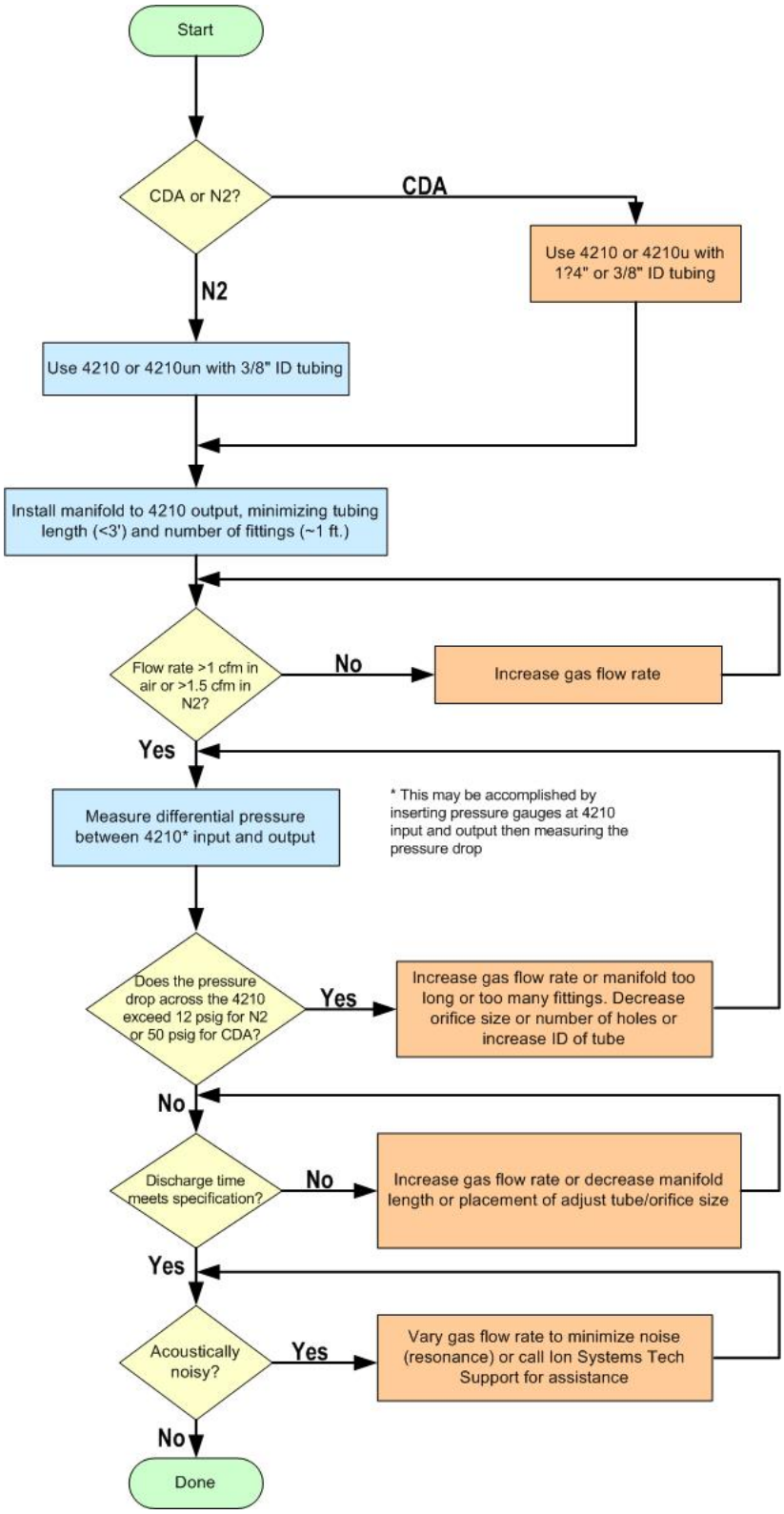
rates in the range of 1.5 to 3.5 cfm are recommended. Higher flow rates always produce better discharge times up to the limit at which the back-pressure inside 4210 exceeds specifications. Ion production can only take place at a relatively low manifold backpressure (measured at the outlet of the 4210).

With nitrogen, the limit is 12 psig and with air (CDA), the limit is 50 psig (measured at the outlet of the 4210).

Operating manifolds may tend to whistle. Acoustical considerations include optimizing pressure, flow rate, tube diameter and length. Call Simco-Ion for advice on controlling excessively noisy manifolds

Design Rules Summary

1. Select the right gas. Ionized air is more effective than ionized nitrogen. Use nitrogen only when the quality of the air supply is suspect (CDA is required) or your process specifically requires nitrogen.
2. Select the right ionizer. The 4210 comes in three versions. The 4210un is an ultraClean nitrogen ionizer. The 4210u is an ultraClean air ionizer. The 4210 is for ionizing air (CDA) and nitrogen in Class 100 environments or environments not requiring clean standards better than Class 100.
3. Select the right mounting location for the 4210 in order to minimize the path length of ionized gas to the charged surface.
4. Use the pre-designed manifolds from Simco-Ion whenever possible. Simco-Ion will also supply a manifold development kit for custom manifold applications. Call Simco-Ion for details.
5. Use the correct tubing. Use 3/8 inch (9.5 mm) ID tubing for nitrogen and 1/4 inch (6 mm) ID tubing for air (CDA).
6. Select the right manifold material. Teflon is preferred for most UltraClean applications. Stainless steel is acceptable, but will cause approximately 30% increase in discharge time.
7. Minimize the number of bends in the manifold.
8. Ideally, design the manifold as a straight pipe with an open end.
9. If a manifold is designed with side holes along its length, make the holes at least 0.1 inch in diameter. Punch up to 12 holes of 0.1 inches in diameter along a 3/8 ID tube. Punch up to 9 holes of 0.1 inches in diameter along a 1/2 in ID tube. For more even flow, space the holes far apart near the beginning of the manifold and closer near the end. Hole spacing of 1 to 2.5 inches is common.
10. Punch fewer holes and space them farther apart near the ion source. Punch more holes spaced closer together near the end. A two foot manifold should be divided into four spacing increments.
11. Avoid manifolds longer than 3.3 ft. (1 m). Ideally, manifolds should be under 2 ft. (.6 m) long.
12. Choose the gas flow rate and manifold pressure (measured at the outlet of the 4210) such that the flow rate is greater than 1.5 cfm and the manifold pressure is below 12 psig for nitrogen and below 50 psig for air (CDA).
13. Wipe the outside surface of the manifold with wetted cleanroom wipes. Take the manifold into the cleanroom and repeat external cleaning. In the cleanroom, clean the inside of the manifold with high velocity CDA or nitrogen for 30 seconds. Choose an air flow velocity that exceeds the velocity expected during normal use. Flex and periodically tap the manifold against a hard surface during blow-off. Tapping should exceed actual use conditions. Blow the outside surface for 30 seconds while continuing mechanical stress. Direct air through each or the holes. Store in double cleanroom bags. After installation, allow gas to flow through the manifold for 10 minutes before using in a clean process.
14. If the manifold is noisy, try adjusting the flow rate. Contact Simco-Ion if you require technical assistance.



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