



**Quanex**

building products

Insulating Glass Systems

*Super Spacer*<sup>®</sup>  
**Gas Filling Manual**



**Disclaimer:**

Quanex provides this Gas Filling Manual as a service to customers in order to assist customers in the proper use of Quanex Super Spacer® Flexible Spacers. The Gas Filling Manual is designed to give basic information on argon gas filling procedures but should not be relied upon as a manufacturing procedure. By providing this manual, Quanex does not endorse, approve, sanction, and undertake to monitor, or take responsibility for its customer's use of Quanex Flexible Spacers, manufacturing processes, gas filling procedures, window design, or the products that customers manufacture. The Customer shall be solely responsible for its manufacturing processes, window design, and products, and Quanex shall have no liability or obligation therefore or arising there from. Customer shall not rely in any manner on Quanex to monitor its manufacturing processes. Quanex's recommendations, approvals, or other involvement will not alter the terms, conditions, or limitations of any agreement between Quanex and Customer.

# Super Spacer® Gas Filling Manual

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## 1. Introduction to gas filling.

### 1.1 Purpose of Gas Filling

Introducing heavy gases such as argon or krypton into the air space of an insulating glass unit with low-E glass is a cost effective way of further reducing thermal transmission through the IG/Window assembly. As a result windows using gas filled IG show improved U-values over similar windows made with non gas filled IG.

### 1.2 Minimum hardware requirements for gas filling.

1. In order to successfully gas fill IG units, you need an argon gas tank, a two stage pressure regulator, a flow meter capable of producing 30SCFH (14L/min), a stop watch or timer and proper hoses connectors etc. Proper IG storage racks are a must. See the Technical Reference at the end of this manual for details.
2. Gas filling machines that replace all the above except for the gas tank and regulator are sold by several vendors in this market. Please refer to the Technical Reference at the end of this manual for descriptions and sources for these items.
3. Chamber filling is offered by several vendors, usually attached to an automated applicator. Follow all instructions and maintenance requirements provided by each vendor.
4. It is each customer's responsibility to make sure that gas filling equipment is used properly and calibrated to the manufacturer specifications. All connections hoses and gas filling wands or lances should be checked for leaks and/or kinks.

### 1.3 Suggested Gas Filling setup.

The photo below gives a general idea of how to set up a gas filling system. The actual set up will vary depending on what equipment is used. Note that hoses are looped to prevent kinking or restricting gas flow. The overhead support keeps gas filling probes in place to prevent scratching of low-E glass.



## 1.4 Safety warning.

Argon tanks contain compressed gas or cryogenic liquified gas. All gas tanks should be secured to prevent a possible fall of a tank which could result in an explosive tank rupture. Contact your argon gas supplier for specific recommendations for securing gas tanks and working with compressed or liquified gas. Follow all OSHA and local safety requirements.

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## 2.0 Preparation of Super Spacer IG for gas filling

### 2.1 General preparation and hardware requirements

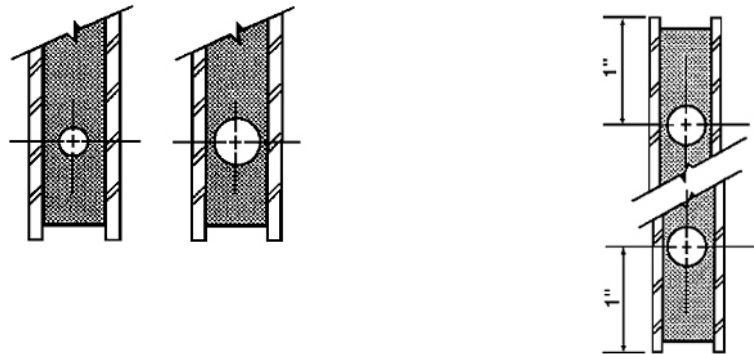
Prepare IG for gas filling in accordance with the procedures outlined in the *Super Spacer® Insulating Glass Manufacturing Manual*. For automated application systems, follow the procedures established by the manufacturer and the training provided by them and/or Quanex Building Products. To ensure maximum gas retention during IG fabrication, units must be compressed to ensure complete wet out of the acrylic adhesive. Although the adhesive acts as a temporary barrier to gas loss, the IG seal must be completed without delay. **Do not rack or store gas filled units waiting for sealant application.**

### 2.2 Holes and hole location

**Hole size:** with Super Spacer®, it is feasible to punch somewhat larger holes than with metal spacers. In the case of slow-fill equipment, these larger holes provide for increased capacity and efficiency. For high-speed equipment, these larger holes allow for in-line gas filling with resulting increased labor productivity.

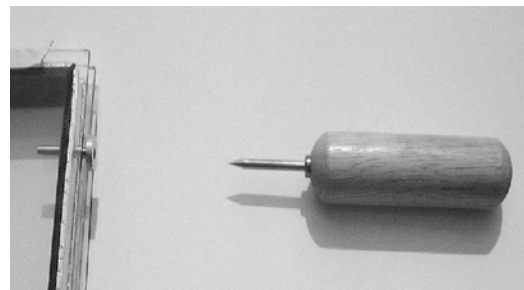
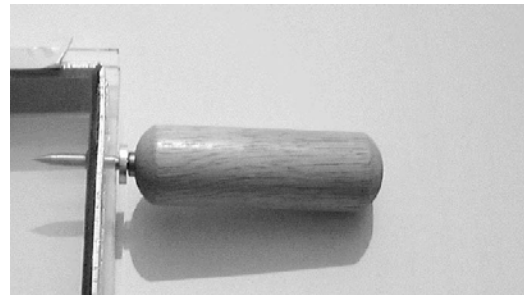
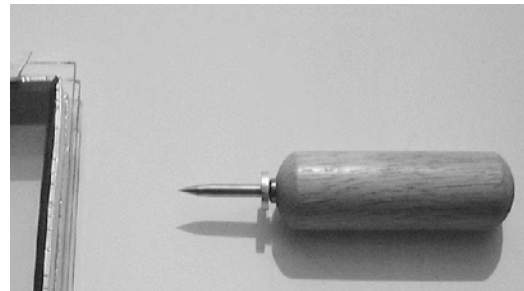
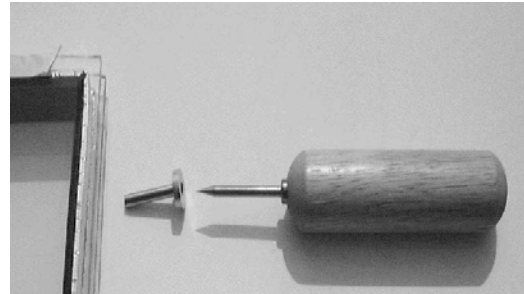
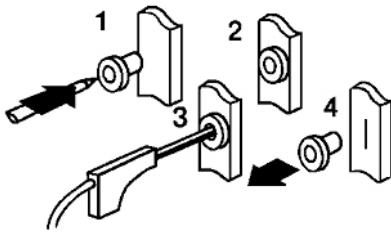
**Number of holes:** Super Spacer® IG units can be filled via one-hole or two-hole methods. The specific details of these methods can be found in Section 3.

**Location:** Typically, both the fill and exhaust holes (if needed) are on one of the two longest sides and located within 2" (50 mm) from the top and bottom corners.



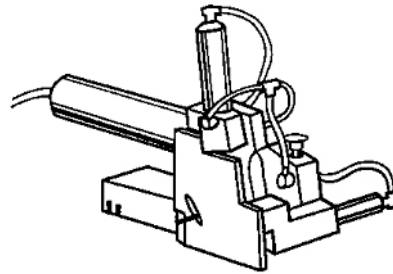
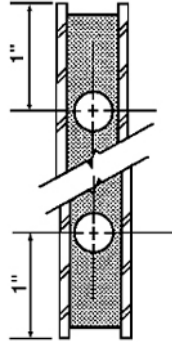
## 2.3 FDR Piercing Tool for use with Super Spacer® and TriSeal™

A special spacer piercing tool and bushing (**part numbers**) is available from FDR Design Inc. The awl-like tool pierces the spacer and installs a removable metal sleeve through which the sensor lance and filling lance can be inserted. After the metal sleeve is removed, the flexible foam springs back leaving no visible holes in the spacer.



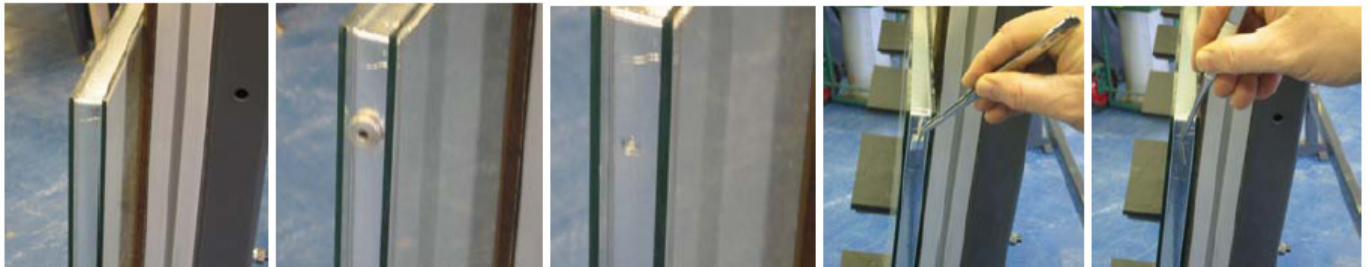
## 2.4 Super Spacer® Notching Kit for Super Spacer® and Super Spacer® nXt™

As an alternative to spacer piercing, a hole punching method may be used. The SuperShuttle notching kit is recommended. The pneumatic notcher punch makes a clean, precise and tapered hole, eliminating any debris from getting into the insulating glass unit. The standard diameter size hole for the gas notcher is 3-mm. Custom large-hole notching kits are also available.



## 2.5 Vapor Barrier Tapes-Standard VB and PIBVB

After gas filling, the gas-fill holes must be immediately sealed. Quanex Building Products provides rolls of barrier tape in various spacer widths. PIBVB tape is precut in 1.2" lengths, ready to apply. For VB tape use approximately 1". Apply hand pressure to "wet-out" the tape adhesive and ensure an adequate seal. All tapes must be applied to the spacer only and should not roll up onto the glass surfaces. **See the appendix for part numbers and sizes.**



## 2.6 Super Spacer® nXt™ requirements

Use VB tape as noted above. See section 3 below for more detail specific to gas filling nXt™.

## 2.7 Super Spacer® TriSeal™ requirements

When using TriSeal™ spacer, precut PIBVB tape is required for all **non-butyl** secondary sealants for both the final corner and gas fill holes. See the appendix for PIBVB tape part numbers.

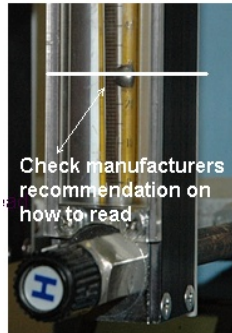


## 3.0 Gas Filling Procedures

### 3.1 Timer filling

#### Timer filling requirements

Timer filling of Super Spacer® IG units requires **two-holes**. Ensure that the flow meters or the argon gas filling machine are set to deliver 25.4 SCFH or 12L/min **of argon**; a conversion factor from air is usually needed. Since there are many different types of flow meters in use, please refer to the documentation that comes with your argon gas filling set up. See below for a typical flow meter setting. The gas filling equipment supplier or the flow meter supplier should provide a calibration chart or settings that correspond to the flow rates suggested above.



#### Procedure for Super Spacer® *but not nXt™ or TriSeal™*

Notch 2 holes using the Gas Notcher Assembly (Part #: E-10050000) one at bottom of the IG about 2" from corner to fill and a hole at the top of the IG no more than 2" from the top for venting. The final corner can be used as a vent. After filling is completed make sure VB tape is used to cover final corner and notched holes for argon retention.

#### Procedure for Super Spacer® and TriSeal™

Using the Piercing Tool (Part #: 1477) and bushings (Part #: 1478 for Short Bushings and 1483 for long bushings). Pierce one bushing at bottom of the IG about 2" from corner to fill and the other at the top of the IG no more than 2" from the top for venting. The final corner can be used as a vent. After filling is completed make sure VB tape (Or PIBVB tape if using Tri Seal) is used to cover final corner and pierced holes for argon retention.

#### Procedure for Super Spacer® nXt™

Notch 2 holes using the Gas Notcher Assembly (Part #: E-10050000) one at bottom of the IG about 2" from corner to fill and a hole at the top of the IG no more than 2" from the top for venting. The final corner can be used as a vent. The preferred method for nXt™ is as follows. After glass alignment and compression **back fill the IG with sealant, leaving gaps at the gas filling and vent holes**. After the sealant has been applied complete gas filling the IG. Apply VB tape onto final corner and notched holes as previously shown for argon retention. Then patch the gaps with sealant, making sure no voids or cold joints exist.

An alternative method for nXt™ is to use a plug of hot melt butyl that is injected using a glue-gun type tool with an appropriate-sized nozzle. This method can be quick but care is needed to prevent the butyl from being directly squirted into the IG cavity and to avoid sealant "blow-by".

## 3.2 Sensor Filling

A variety of sensor filling machines exist. Sensor filling employs methods which compare the inflow of gas to the outflow of air and gas. When calibrated properly they provide consistent high speed gas filling. It is the responsibility of the Window Manufacturer or IG Fabricator to do the following:

**Ensure the equipment is suitable for the application.**

**Quanex Building Products will be happy to assist customers with their choice of gas filling equipment**

**Set up and calibrate the equipment as per the manufacturer's instructions.**

**Follow all safety requirements**

**3.2.1 Slow-fill Equipment:** With slow-fill equipment, air is pushed out of the glazing cavity by the heavier incoming inert gas. The key to efficient gas filling is a laminar flow input lance.

**3.2.2 High Speed Equipment:** With high-speed equipment, gas is injected into the cavity at a high flow rate (~40L/min). The resulting gas/air mixture is exhausted from the cavity by means of a vacuum pump. It is critically important that the flow of incoming gas and the exit of the air/gas mixture are balanced such that the IG unit does not inflate or deflate. Glass breakage could result.



## 3.3 Two-hole vs one-hole sensor filling

See the procedures by product type below. Note that two-hole filling must be vertically oriented. Single-hole filling can be vertical or horizontal however this should be confirmed by the equipment manufacturer. Two-hole filling is generally faster but this can be offset by reduced processing when using the fourth corner as the single hole. Large IG (above 12ft<sup>2</sup>) should always be filled vertically.

## 3.4 Gas filling with Inagas equipment

Inagas gas filling machines are sensor based and offer advantages in self calibration, processing speed, gas filling accuracy and consistency. Follow the procedures by product type below.

## 3.5 Sensor filling procedures

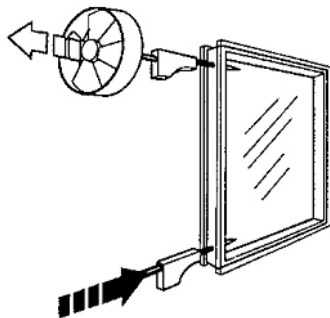
### 3.5.1 Two Hole Sensor Fill (IG must be Vertical).

#### Procedure for Super Spacer® *but not nXt™ or TriSeal™*

Notch 2 holes using the Gas Notcher Assembly (Part #: E-10050000) one at bottom of the IG about 2" from corner to fill and a hole at the top of the IG no more than 2" from the top for the sensor probe. The final corner can also be used to place the sensor probe. After filling is completed make sure VB tape is used to cover final corner and notched holes for argon retention.

#### Procedure for Super Spacer® and TriSeal™

Using the Piercing Tool (Part #: 1477) and bushings (Part #: 1478 for Short Bushings and 1483 for long bushings). Pierce one bushing at bottom of the IG about 2" from corner to fill and the other at the top of the IG no more than 2" from the top for the sensor probe. The final corner can be used instead to place sensor probes. After filling is completed make sure VB tape (Or PIB Strips if using Tri Seal) is used to cover final corner and pierced holes for argon retention.



#### Procedure for Super Spacer® nXt™

Notch 2 holes using the Gas Notcher Assembly (Part #: E-10050000) one at the top of the IG about 2" from corner to fill and a hole at the top of the IG no more than 2" from the top for the sensor probe. The final corner can be used as an area to place sensor probe instead of notching a hole. The preferred method for nXt™ is as follows. After glass alignment and compression **backfill the IG with sealant, leaving gaps at the gas filling and vent holes.** After the sealant has been applied complete gas filling the IG. Apply VB tape onto final corner and notched holes as previously shown for argon retention. Then patch the gaps with sealant, making sure no voids or cold joints exist.

An alternative for nXt™ is to use a plug of hot melt butyl that is injected using a glue-gun type tool with an appropriate-sized nozzle. This method can be quick but care is needed to prevent the butyl from being directly squirted into the IG cavity and to avoid sealant "blow-by".

### 3.5.2 Single Hole Sensor filling

For single hole filling IG can be filled vertically or horizontally, depending on the equipment. Contact the equipment supplier for their recommendations.

#### **Procedure for Super Spacer® *but not nXt™ or TriSeal™***

Notch a hole using the Gas Notcher Assembly (Part #: E-10050000) at the top of the IG at the Max of 2" from the final corner. You can also just use the final corner to place the probe into instead of notching a hole at the top. After filling is completed make sure VB tape is used to cover final corner and notched holes for argon retention.

#### **Procedure for Super Spacer® and TriSeal™**

Using the Piercing Tool (Part #: 1477) and bushings (Part #: 1478 for Short Bushings and 1483 for long bushings). Pierce one bushing at top of the IG about 2" from corner to fill. You can also just use the final corner to place the probe into. After filling is completed make sure VB tape (or PIB Strips if using Tri Seal) is used to cover final corner and pierced holes for argon retention.



#### **Procedure for Super Spacer® nXt™**

Notch a hole using the Gas Notcher Assembly (Part #: E-10050000) at the top of the IG at the Max of 2" from the final corner. You can also just use the final corner to place the probe into instead of notching a hole at the top. The preferred method for nXt™ is as follows. After glass alignment and compression **back fill the IG with sealant, leaving gaps at the gas filling and vent holes**. After the sealant has been applied complete gas filling the IG. Apply VB tape onto final corner and notched holes as previously shown for argon retention. Then patch the gaps with sealant, making sure no voids or cold joints exist.

An alternative for nXt™ is to use a plug of hot melt butyl that is injected using a glue-gun type tool with an appropriate-sized nozzle. This method can be quick but care is needed to prevent the butyl from being directly squirted into the IG cavity and to avoid sealant "blow-by".

## 3.6 Chamber Gas Filling

### 3.6.1 General Procedures for all Chamber Filling

Chamber filling does not require holes; however the final corner must be taped before entering the chamber and press. If automated tape applicators are not installed this procedure must be done by hand. **For TriSeal™ PIB VB tape is required.**



Chamber gas filling equipment is made by several manufacturers (Bystronic, Lisec, Forel). Typically this equipment is part of an automated or semi-automated IG assembly line. Each manufacturer will have procedures specific to their equipment to ensure adequate gas filling. It is the customer's responsibility to ensure that all maintenance and calibration is done according to the requirements set out by the manufacturer of chamber gas filling equipment. Follow all guidelines set out in this manual for the preparation of IG for chamber gas filling. Quanex Building Products Technical Service will be happy to assist customers and the equipment manufacturers with any aspect of IG manufacturing and preparation that may affect successful chamber gas filling.

## 4.0 Technical reference and Appendix

### 4.1 Typical components and hardware

#### Flow Meters

Cole Parmer, Inc. 1-800-323-4340

PART N-03293-34 (Brass)  
N-03216-34 (Aluminum)

DESCRIPTION: 65 MM FLOW METER

King Instrument Company (714) 841-3663  
Porter Instrument Co. (215) 723-4000

Specify flow meters for use with Argon Gas.

#### Argon Supply

Argon can be purchased through a local welding supply company or gas supplier. Most of these companies will also be able to supply an argon gas regulator as well as flow meters.

A two gauge regulator is required for use with argon gas filling set ups.

#### On off valves and solenoids

A manually operated petcock can be used between the second gauge and the meter manifold. A stopwatch should then be used to time the gas flow.

#### Timer Supplier

Automatic Timing & Control 1-800-441-8245 or (215) 337-5500 US  
Electrosonic, Inc. 416-494-1666 Canada

#### Control Valve Suppliers

Parker Hannifin: Contact Local dealer

Clippard Fluid Power (513) 521-4261

When ordering the Timers and Valves, specify your use and power supply available. The Timer signals the valve to open (a normally closed valve is required). When the timer has completed its cycle, it then signals the valve to close.

## 4.2 Technical Data and Conversion factors

Gas filling requires familiarity with units of length area and volume and volume flow rate. Some conversion factors are provided below.

### Volume Flow Rate

1 SCFH = 0.0471947 L/min  
1 L/min = 2.1188799 SCFH

### Area

1 ft<sup>2</sup> = 0.09290304 m<sup>2</sup>  
1 m<sup>2</sup> = 10.763910417 ft<sup>2</sup>

### Length

1 in = 25.4 mm  
1 mm = 0.03937 in

1 ft = 0.3048 m  
1 m = 3.280839 ft

### Volume

1 ft<sup>3</sup> = .0283168 m<sup>3</sup>  
1 m<sup>3</sup> = 35.3146 ft<sup>3</sup>

1 ft<sup>3</sup> = 28.316846 L  
1 L = 0.0353146 ft<sup>3</sup>

---

### 4.3 Vapor Barrier tape part numbers

TAPE	Part #
1/4"	001317
5/16	001319
3/8	001320
7/16	001321
1/2	001312
9/16	001313
5/8	001314
11/16	001315
3/4	001316
13/16	001519

**PIB VB tape for 1/2" Super Spacer® TriSeal™ part 002456**

**VB tape for automated lines:**

**Lisec 1/2" 002583**

**Forel 1/2" 003747**

Call your Quanex Building Products Customer Service representative to order.



## 4.4 Timer gas filling charts

For quick reference the gas filling charts below show time to fill 1ft<sup>2</sup> or 0.1m<sup>2</sup> at the recommended flow rate of 25.4 SCFH (12L/min).

On the following page is a sample of a customizable time gas filling chart. These provide times for different flow rates and fill factors. Please contact Quanex Building Products Technical Service in order to obtain these customizable charts.

Time to Fill 1ft <sup>2</sup> @ 25.4 SCFH	
Air Space	Time S
3/16"	8
1/4"	10
5/16"	12
3/8"	15
7/16"	17
1/2"	20
9/16"	22
5/8"	25
11/16"	28
3/4"	30
13/16"	33

Time to Fill 0.1m <sup>2</sup> @ 12 L/min	
Air Space	Time S
4.76	9
6.35	11
7.94	13
9.53	16
11.11	18
12.70	22
14.29	24
15.88	27
17.46	30
19.05	32
20.64	36

## TIME CHART FOR ARGON GAS FILLING

Chart for **0.500 in** Pane Spacing      Seconds to fill at **12 L/min**      **25.4 SCFH**  
**12.7 mm**      **Fill factor 3.5**  
**Glass length**

		Inches	6	12	18	24	30	36	42	48	54	60	66	72
Inches	mm	152	305	457	610	762	914	1067	1219	1372	1524	1676	1829	
	mm													
Glass length	6	152	5	10	15	21	26	31	36	41	46	52	57	62
	12	305	10	21	31	41	52	62	72	83	93	103	114	124
	18	457	15	31	46	62	77	93	108	124	139	155	170	186
	24	610	21	41	62	83	103	124	145	165	186	206	227	248
	30	762	26	52	77	103	129	155	181	206	232	258	284	310
	36	914	31	62	93	124	155	186	217	248	279	310	341	372
	42	1067	36	72	108	145	181	217	253	289	325	361	397	434
	48	1219	41	83	124	165	206	248	289	330	372	413	454	496
	54	1372	46	93	139	186	232	279	325	372	418	465	511	557
	60	1524	52	103	155	206	258	310	361	413	465	516	568	619
66	1676	57	114	170	227	284	341	397	454	511	568	625	681	
72	1829	62	124	186	248	310	372	434	496	557	619	681	743	

For additional product information,  
visit [www.Quanex.com](http://www.Quanex.com)



[www.Quanex.com/Service-and-Support/Technical-Library/Tech-Bulletins/](http://www.Quanex.com/Service-and-Support/Technical-Library/Tech-Bulletins/)

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