AtmosBags - Inflatable Polyethylene Isolation Chambers

Store at Room Temperature
Technical Bulletin AL-211

TECHNICAL BULLETIN

Product Description
AtmosBags are flexible, inflatable, polyethylene chambers with built-in gloves that allow work in a totally isolated and controlled environment.

In the laboratory, they are an inexpensive, portable alternative to the glove box and are well suited to a variety of tasks and materials.

For field sampling, AtmosBags slip over the tops of cans and drums to isolate vapors and dusts during sampling operations and blanket them with inert gas, if desired. This minimizes worker exposure and preserves the integrity of the sampled bulk material. They also serve as a portable laboratory for conducting tests, crime scene investigations, and other applications where a clean, isolated chamber is needed.

For emergency isolation procedures, AtmosBags assist in preventing the gross contamination of an environment when inspecting or testing unknown or suspicious materials, and for the temporary containment of leaking containers. Workers can quickly enclose, isolate, and seal a work area using an AtmosBag.

AtmosBag Properties
- Constructed of sturdy 0.003 in. gauge polyethylene that is polished for good clarity.
- Seams are heat sealed for strength and inflation tested to be leak free.
- Inlet ports are provided on each side for laboratory gas, vacuum, and electrical lines.
- Non-sterile and ethylene oxide treated
- Two-hand and four-hand configurations
- Choose a secure zipper-lock closure for repeated entry or a tape seal closure for extra security
- AtmosBags are not fire retardant nor intended for prolonged contact with solvents, vapors, or chemicals.

Other Applications for AtmosBags
Anaerobic chamber - A continuous purge of dry, inert gas prevents any traces on moisture or oxygen diffusion into an AtmosBag.

Botany and Life Science - Create a controlled environment for growing plants or seedlings, for insect and pesticide studies, anesthesia studies, or use as an incubator for fetal studies and animal research.

Desiccating and constant-humidity chambers - Use as a low-humidity desiccator for storing glassware, reagents, or bulky items by inflating Zipper-lock AtmosBag with dry nitrogen and placing a container of desiccant inside to absorb traces of moisture that may diffuse into the bag. For high-humidity chambers, place a saturated solution of salt and water inside the AtmosBag. To work with different relative humidities, use a constant purge technique with T-connectors to blend dry nitrogen gas with moisturized nitrogen gas (via water bubbler) into the AtmosBag.

Dust-free environments - Inflate an AtmosBag with filtered air or inert gas to perform delicate operations typical in the electronics and aerospace industries.

Environmental studies – An AtmosBag can serve as a portable laboratory in the field, isolating and protecting samples, and providing a clean environment for conducting tests and inspections.

Manipulation of air and moisture-sensitive materials - Operations such as material transfer and packaging, sampling, weighing, and even reactions can be conducted inside of an AtmosBag under a blanket of dry inert gas such as nitrogen, argon, or helium to prevent decomposition.
Forensics – An AtmosBag isolates crime scene evidence from contamination and permits inspection and manipulation without direct contact.

Sample preparation in the lab - Place grinding equipment such as mixers, blenders, and mortars and pestles inside an AtmosBag to protect samples from the atmosphere during preparation and to contain dusts and powdered materials from infiltrating the laboratory.

Microscopy - Place a microscope inside the AtmosBag and cut a port to accommodate the eyepiece, then seal with tape prior to purging.

Weighing operations - Analytical and top-loading balances may be placed inside an AtmosBag for weighing air and moisture-sensitive materials, and odoriferous materials. The AtmosBag permits weighing operations inside a fume hood for added safety. Air currents that would interfere with weighing are eliminated inside of AtmosBag.

Selection Guide

### 2-Hand Front Entry Atmosbags

<table>
<thead>
<tr>
<th>Catalog Number</th>
<th>Description</th>
<th>Closure</th>
<th>Overall W x L (in.)</th>
<th>Approx. gas vol.</th>
<th>Opening diameter (in.)</th>
<th>Number of ports</th>
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### 2-Hand Side Entry Atmosbags

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<th>Description</th>
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<th>Overall W x L (in.)</th>
<th>Approx. gas vol.</th>
<th>Opening diameter (in.)</th>
<th>Number of ports</th>
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<td>2</td>
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<td>1.75 ft³</td>
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### 4-Hand Atmosbags

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<th>Closure</th>
<th>Overall W x L (in.)</th>
<th>Approx. gas vol.</th>
<th>Opening diameter (in.)</th>
<th>Number of ports</th>
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<td>Zipper-lock</td>
<td>45 x 58</td>
<td>500 L</td>
<td>29.5</td>
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</table>
Precautions and Disclaimer
This product is for R&D use only, not for drug, household, or other uses. Please consult the Safety Data Sheet for information regarding hazards and safe handling practices.

Storage/Stability
Store AtmosBags at room temperature.

Procedures
Instructions For Laboratory Use
Warning! When handling toxic materials use only in a fume hood or other controlled system to prevent and protect against exposure in case of leakage. When handling any hazardous material all proper personal protective equipment should be employed. See Sigma-Aldrich website for a complete listing of these items. AtmosBag will minimize the amount of possible contamination or exposure should a hazardous substance be released inside the bag.

Purge Gas Requirements
- Inert gas applications: 99.99+% pure nitrogen is an acceptable inert atmosphere for many applications. For more rigorous requirements, use a higher purity grade of nitrogen such as extra dry, prepurified, ultra high purity, or oxygen free. The inert gas can also be passed through a Drierite gas-drying unit to remove trace amounts of water (see the Accessories section).
- Other gas applications: Dust-free filtered air, helium, oxygen, moisturized nitrogen, ordinary air, and carbon dioxide are examples of gases that may be used inside an AtmosBag to suit particular experimental requirements.

Note: Inflation pressure - Do not over inflate an AtmosBag with gas as this will make insertion of hands into gloves difficult. Inflate an AtmosBag like a very soft pillow. Alternatively, a continuous gas purge may be employed by connecting the AtmosBag to an oil bubbler as a pressure-relief device that maintains a constant pressure inside bag.

1. Select appropriate work area - Unfold the AtmosBag with open end towards you and place on a non-porous bench top or inside a fume hood when handling toxic materials to prevent and protect against exposure resulting from leakage (see Figure 1). Check operation of Zipper-lock (if equipped) to ensure that track opens and closes properly.
   Note: Zipper-lock track can distort if creased or folded excessively, making closure of the bag difficult. Track distortion will usually self-correct if Zipper-lock is closed and allowed to remain flat for a period of time.

   Figure 1.
   Opened AtmosBag

2. Stabilize the AtmosBag - It is safe practice to stabilize the AtmosBag to prevent movement during operations. Portable lattice supports and flat polyethylene bases may be used for this purpose (see Figure 2 and Accessories section). Alternatively, double-sided tape can be used to secure the AtmosBag to non-porous bench tops.
   Note: Use tape sparingly as it may be difficult to remove adhesive from bag and from bench top.

   Figure 2.
   Two-hand AtmosBag with optional PE benchtop base and Benchrack lattice system
3. Connect purge gas, vacuum, and power lines - Inlet ports are located on each side of the bag for these connections. PE connectors are available for making gas and vacuum connections with flexible tubing. Tape, wrap-it ties, or rubber bands are used to seal tubing connections on the AtmosBags (see Figure 3).

Note: A 3-way stopcock may be installed at the bag inlet to control both vacuum and purge gas from a single point. An oil bubbler may be installed at an inlet for continuous purge operation (see step 5 for details).

Installing tubing connectors for AtmosBags:
   a. Snip end of inlet port with scissors to make a very small opening.
   b. Separate two-piece tubing connector. Position one end inside of port inlet and the other outside of inlet.
   c. Push connector pieces together firmly.
   d. Connect AtmosBag to purge gas source and to aspirator or house vacuum with flexible tubing.

Installing tubing for AtmosBags:
   a. Snip end of bag inlet with scissors to make a small opening.
   b. Insert flexible tubing and secure to inlet with tape, wrap-it tie, or rubber band.
   c. Connect AtmosBag to purge gas source and to aspirator or house vacuum.

Installing power lines for all AtmosBags:
   a. Snip end of bag inlet with scissors to make a small opening.
   b. Place anti-static device, balance, microscope, or other electrical device inside the AtmosBag and push plug and power line out of inlet. Secure line to inlet with tape, wrap-it tie, or rubber band.

6. Load AtmosBag - Turn on purge gas and allow gas to gently flow out of front opening during loading. Place all necessary equipment inside of the AtmosBag including items such as samples, sampling and transfer equipment, wipers, anti-static products, over-gloves, etc. Empty bottles can be purged with gas prior to loading to save time. Figure 4 shows the AtmosBag inside a fume hood with optional stabilizing PE base and a portable lattice support for clamping bottles and apparatus.

Figure 4.
Two-hand AtmosBag inside a fume hood with optional PE base and lattice system

7. Purge AtmosBag:
Vacuum/inert gas purge - For work with air and moisture-sensitive materials, a series of 3-5 vacuum/inert gas purge cycles is recommended (see Figure 5).

a. Seal open end of the AtmosBag. For Zipper-lock bags, slide track closed, then fold end over two times and clip. For Tape-seal bags, seal opening with strip of removable tape by folding it along the length of the opening. Fold taped end over two times and clip.

Note: Folding the end of the AtmosBag over two times and securing with clips prevents accidental opening due to sudden excessive pressure situations or over inflation.

b. Evacuate bag, then turn off vacuum.

c. Inflate bag, then turn off inert gas. Do not over inflate. Repeat evacuation/inflation cycle 3-5 times, finally inflating bag with inert gas to a very soft pillow level that allows easy insertion of hands. Turn off inert gas.

Note: A 3-way stopcock may be installed at the bag inlet to control both vacuum and inert purge gas from a single point.

d. Ensure the bag maintains inflation pressure over several minutes, then go to step 6. If bag deflates, correct leakage and repeat steps b. and c. until inflation pressure is maintained.
Inert gas only purge - When a source of vacuum is unavailable, use the following procedure to purge the AtmosBag with inert gas (see Figure 6).

a. Seal open end of AtmosBag. For Zipper-lock bags, slide track closed. For Tape-seal bags, seal opening with strip of removable tape by folding it along the length of the opening.

b. Inflate bag, then turn off inert gas.

c. Open end of bag slightly to allow gas to escape. Deflate the AtmosBag by pushing down on bag with hands to force gas out. Seal open end of AtmosBag. Repeat inflation/deflation cycle 3-5 times, finally inflating bag with inert gas to a very soft pillow level that allows easy insertion of hands. Turn off inert gas.

d. Fold end over two times and clip.

   Note: Folding the end of the AtmosBag over two times and securing with clips prevents accidental opening due to sudden excessive pressure situations or over inflation.

e. Ensure the bag maintains inflation pressure over several minutes, then go to step 6. If bag deflates, correct leakage and repeat steps b., c., and d. until inflation pressure is maintained.

Continuous gas purge

a. To prevent the diffusion of air into AtmosBag over long periods of use, a continuous inert gas purge may be used.

b. Seal open end of AtmosBag. For Zipper-lock bags, slide track closed, then fold end over two times and clip. For Tape-seal bags, seal opening with strip of removable tape by folding it along the length of the opening. Fold end over two times and clip.

   Note: Folding the end of the AtmosBag over two times and securing with clips prevents accidental opening due to sudden excessive pressure situations or over inflation.

c. Select an inlet to connect AtmosBag to an oil bubbler to maintain a constant pressure inside bag as inert gas flows continuously during use.

d. Turn on inert gas to inflate AtmosBag, then adjust to a very low flow rate to maintain pressure.

Other gas purges - A variety of gases such as dust-free filtered air, helium, oxygen, moisturized nitrogen, ordinary air, and carbon dioxide may be used to purge the AtmosBag. Modify the previous purge procedures to suit experimental requirements.
8. Don a pair of cotton glove liners prior to insertion of hands into the gloves of the AtmosBag. These liners absorb moisture and permit easy removal of hands from the gloves of the AtmosBag. Chemically-resistant “over-gloves” may be worn inside the AtmosBag for extra protection when handling corrosive or toxic materials. For extra dexterity, wear a pair of disposable nitrile gloves inside AtmosBag.

Note: Be sure to place “over-gloves” inside the AtmosBag prior to purging (see the Accessories section for listing of gloves).

9. Storage and disposal - Clean AtmosBags may be evacuated and folded flat for storage. Use care not to crease or damage Zipper-locks. Dispose of contaminated bags as required.

Instructions For Field Sampling

Warning! User should be aware of hazards that may be present when sampling materials in the field or in remote locations. The safety data sheet (SDS) for a material that is to be sampled must be read and understood by the user prior to use of AtmosBag. When handling any hazardous material all proper personal protective equipment should be employed. See Sigma-Aldrich website for a complete listing of these items. AtmosBag will minimize the amount of possible contamination or exposure should a hazardous substance be released inside the bag.

Purge Gas Requirements

- Inert gas applications: 99.99+% pure nitrogen is an acceptable inert atmosphere for many applications. Note: Materials that are extremely air or moisture-sensitive should be sampled in a laboratory using the vacuum/inert gas purge cycle procedures described in the Instructions for Laboratory Use section.
  a. Select an AtmosBag that fits the container to be sampled.
  b. Minimize headspace inside the AtmosBag. Roll the top of the AtmosBag down and clip to eliminate extra headspace while allowing sufficient room to work. This step can significantly reduce the amount of purge gas required.
  c. Use nitrogen to blanket the container in a single purge.

- Other gas applications: There are a number of ways to inflate an AtmosBag when a dry, inert atmosphere is not required. A portable automobile tire inflator will provide an air environment. A handful of dry ice chips placed inside a sealed AtmosBag will inflate the bag with carbon dioxide.

Note: Inflation pressure - Do not over inflate an AtmosBag with gas as this will make insertion of hands into gloves difficult. Inflate an AtmosBag like a very soft pillow.

Tips for Field Use

- Sampling techniques for containers: Place containers inside the AtmosBag, seal or slip bag over the top of large cans and drums, and tape bag to the container to seal. Blanket with inert gas. The integrity of the sampled bulk material is thus maintained. AtmosBag isolates vapors and dusts during the sampling process to minimize direct exposure.

- Portable laboratory use: Use the AtmosBag as a portable laboratory in the field, isolating and protecting samples or evidence, and providing a clean environment for conducting tests and inspections. Use a portable lattice system inside AtmosBag to stabilize bag during operations as well as support the bag when inflation is not required.

1. Select appropriate work area - Choose a well ventilated area to perform sampling operations or perform work outside. Unfold the AtmosBag with open end towards you and place on a flat, level surface (see Figure 1). Check operation of Zipper-lock (if equipped) to ensure that track opens and closes properly.

Note: Zipper-lock track can distort if creased or folded excessively making closure of the bag difficult. Track distortion will usually self-correct if Zipper-lock is closed and allowed to remain flat for a period of time.

2. Stabilize AtmosBag - It is safe practice to stabilize the AtmosBag to prevent movement during operations. Portable lattice supports and flat polyethylene bases are suitable for this purpose (see Accessories section). Alternatively, double-sided tape can be used to secure the AtmosBag to non-porous surfaces.

Note: Use tape sparingly as it may be difficult to remove adhesive from bag and from bench top.
3. Connect purge gas and power lines - Inlet ports are located on each side of the bag for these connections. PE connectors are available for making gas connections with flexible tubing. Tape, wrap-it ties, or rubber bands are used to seal tubing connections on the AtmosBags (see Figure 3).

Installing tubing connectors for AtmosBags:
   a. Snip end of inlet port with scissors to make a very small opening.
   b. Separate two-piece tubing connector. Position one end inside of port inlet and the other outside of inlet.
   c. Push connector pieces together firmly.
   d. Connect AtmosBag to purge gas source and to aspirator or house vacuum with flexible tubing.

Installing tubing for AtmosBags:
   a. Snip end of bag inlet with scissors to make a small opening.
   b. Insert flexible tubing and secure to inlet with tape, wrap-it tie, or rubber band.
   c. Connect AtmosBag to purge gas source and to aspirator or house vacuum.

Installing power lines for all AtmosBags:
   a. Snip end of bag inlet with scissors to make a small opening.
   b. Place anti-static device, balance, microscope, or other electrical device inside the AtmosBag and push plug and power line out of inlet. Secure line to inlet with tape, wrap-it tie, or rubber band.

4. Load AtmosBag - Place all necessary equipment inside of the AtmosBag including containers to be sampled, sampling and transfer equipment, tools, wipers, antistatic products, over-gloves, etc.

For cans and drums that don’t fit inside the AtmosBag: Loosen drum plug with a wrench or remove cover of open head drums first, place sampling equipment on or inside container, then slip the AtmosBag over top of container and tape to container to seal (see Figure 7).

5. Inert gas purge (see Figure 6)
   a. Seal open end of the AtmosBag. For Zipper-lock bags, slide track closed, then fold end over two times and clip. For Tape-seal bags, seal opening with strip of removable tape by folding it along the length of the opening. Fold taped end over two times and clip. Follow sealing procedure for large cans and drums described in step 4.
   Note: Folding the end of the AtmosBag over two times and securing with clips prevents accidental opening due to sudden excessive pressure situations or over inflation.
   b. Inflate bag to a very soft pillow level that allows easy insertion of hands, then turn off inert gas. Do not over inflate.
   Note: Other methods to inflate AtmosBag - There are a number of ways to inflate AtmosBag when a dry, inert atmosphere is not required. A portable automobile tire inflator will provide an air environment. A handful of dry ice chips placed inside a sealed AtmosBag will inflate the bag with carbon dioxide. Work can be performed inside AtmosBag without gas inflation if desired. The use of a portable lattice system inside AtmosBag provides bag support and room to work.
   c. Ensure the bag maintains inflation pressure over several minutes, then go to step 6. If bag deflates, correct leakage and repeat steps a. and b. until inflation pressure is maintained.
6. Don a pair of cotton glove liners prior to insertion of hands into the gloves of the AtmosBag. These liners absorb moisture and permit easy removal of hands from the gloves of the AtmosBag. Chemically-resistant “over-gloves” may be worn inside the AtmosBag for extra protection when handling corrosive or toxic materials. For extra dexterity, wear a pair of disposable nitrile gloves inside AtmosBag. 

   **Note:** Be sure to place “over-gloves” inside the AtmosBag prior to purging (see the Accessories section for listing of gloves).

7. Storage and disposal - Clean AtmosBags may be evacuated and folded flat for storage. Use care not to crease or damage Zipper-locks. Dispose of contaminated bags as required.

**AtmosBag Accessories**

**Anti-static equipment**

Anti-static Ionizer - Place inside the AtmosBag and turn on to eliminate static charges within 36 in. of unit. Excellent when working with electrostatic powders. Virtually maintenance-free. Compact 4 1/4 × 2 1/2 × 5 in. footprint. UL and CE compliant.

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<th>AC Volts</th>
<th>Plug</th>
<th>Catalog Number</th>
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<td>US Plug</td>
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<td>220–240</td>
<td>UK plug</td>
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**Instructions For Emergency Isolation – Zipper-Lock Bags**

**Warning:** Use of this product is not intended to replace applicable safety policies or practices. An AtmosBag is not fire-retardant nor intended for prolonged contact with solvents, vapors, or chemicals. For single-use only. Please dispose of used bag properly.

1. Unfold AtmosBag and spread out with open end toward you.
2. Place suspect item inside bag and close Zipper-lock.
3. Contact appropriate personnel.

Nalgene is a registered trademark of Thermo Fisher Scientific or its subsidiaries.

Drierite is a trademark of W.A. Hammond Drierite Co., LTD.

JB.MAM 03/16-1

Zerostat Anti-static Instrument - Squeeze the trigger to neutralize static charge on sample vials, spatulas, and weighing equipment. Non-radioactive and does not require electrical power supply or batteries.

Catalog Number Z108812
Glove Liners
Cotton Glove Liners - Lightweight 100% cotton, form fitting, disposable style. Ambidextrous. Each packages contains 12 pr. 8 in. L.

<table>
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<td>M/L</td>
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Gas Equipment
Drierite™ gas drying unit - Ensures thorough drying of inert purge gases for work with moisture-sensitive materials. Molded-acrylic column (2 5/8 o.d. × 11 3/8 in. H) filled with 1 lb of 8 mesh indicating Drierite. Water-vapor capacity: 50 g. Safe for working pressures up to 90 psig. Flow rate should be 200 L/h or 0.1 scfm for maximum efficiency. Regenerate by heating granules on a tray for 1 h at 200 °C.
Catalog Number Z112879

Stabilizing Bases and Supports
Polyethylene stabilizing bases - Rigid thick white polyethylene base keeps the AtmosBag in place and provides a chemically-resistant work surface.

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<th>Dimensions (in.)</th>
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<td>Z112852</td>
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<td>L</td>
<td>24 × 34 1/2</td>
<td>Z106917</td>
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Size in table corresponds to AtmosBag size.

Portable lattice system - System fits inside medium and large size AtmosBags to provide stable support for clamping equipment and to support bag when inflation gas is not required. Solid 5/8 in. diameter aluminum lattice rod sections, 11 3/4 in. L, screw into each other for extra height. Nonslip rubber feet on base.
Catalog Number Z22,565-7

Polypropylene tape - Excellent for sealing custom cut openings in AtmosBag and for sealing AtmosBag to the outside of drums during sampling.
3 in. × 60 yd. Roll
Catalog Number Z106925
Tubing, Connectors, and Valves

PVC purge tubing – 1/4 i.d. × 3/8 in. o.d. × 100 ft
Catalog Number Z280372

Tubing quick-disconnects - Consists of two serrated connectors, which are joined securely through a male-female center taper. Connector of one size can be interchanged with other sizes to produce reducing combinations. PE.

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<td>Z104361</td>
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Tubing connectors - The “five-in-one” fits 5 sizes of tubing and will connect the same size tubing on both ends or act as a reducer for any combination within the range. The inside diameter increases with notch size when unneeded length is cut off for unrestricted flow. The molded PP connectors are steam autoclavable at 121 °C (250 °F). Ring diameter: 9/16, 1/2, 7/16, 3/8 and 5/16 in.

<table>
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<tr>
<td>Straight, 90 mm L</td>
<td>Z178470</td>
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<td>“T”, 118 × 67 mm</td>
<td>Z178489</td>
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Nalgene® stopcocks - PP with TFE plug. Serrated tubulation on each end. For use with 1/4 to 5/16 in. i.d. tubing. Autoclavable.

<table>
<thead>
<tr>
<th>Bore (mm)</th>
<th>Catalog Number</th>
</tr>
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<tr>
<td>2</td>
<td>Z286435</td>
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<tr>
<td>4</td>
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</table>

Nalgene 3-way stopcocks - PP with TFE plug. Serrated tubulations arranged in a T-shape. For use with 1/4 to 5/16 in. i.d. tubing. Autoclavable.

<table>
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<tr>
<th>Bore (mm)</th>
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