The Troubleshooting section explains problems that may occur when using BETE XA nozzles. "What you need to know when designing your XA system" covers considerations for selecting and configuring the system. "Trapped air" addresses a common issue. "Clogged atomizing air pressure is above 30 psi" discusses a pressure issue, while "Another solution" provides a method for removing material from the nozzle. "Calcium carbonate build-up" addresses a material issue. "Clear out loose deposits" advises cleaning the atomizing air pressure above 30 psi. "Natural solutions" suggests a method for removing material from the nozzle. "Check out our tips" offers advice for troubleshooting. "Liquid strainer" explains the benefit of using a strainer in the system. "BETEX Anozlles spray set-up may be used with hardware" advises using hardware for spray set-ups. "Mist atomizing system" explains how to use a mist atomizing system. "Humidification systems" discuss the use of humidification systems. "Temperature drop" explains the effect of temperature drop on the system. "Troubleshooting XA series nozzles" provides solutions for common issues. "X Components" explains the components of an XA system. "Example" shows examples of troubleshooting scenarios. "Flow of air through Schedule 40 steel pipe" and "Water and Air Flow Data" provide technical information for system design. "Filter, regulators, and valves" discusses the importance of these components in a system. "BETE recommends filters be used between the air and liquid lines supplying XA nozzles to minimize the potential for clogging. The air lines supplied with BETE nozzles have multiple automatic drain. The water returns particulates larger than 100 microns and can be held back by the automatic drain. Flash drain valve will remove accumulated deposits." "The standard liquid pressure regulators supplied on both the air and liquid lines of the XA series and the downstream pressure may fluctuate with variations in line pressure and the air temperature. The air regulators are rated for the maximum line pressure and pressures can be set right at the air supply according to the manufacturer’s specifications. In addition these are less sensitive to temperature changes. The producers handbook will answer the most frequent asked questions we receive. If you have further questions please do not hesitate to call our customer service department at 413-772-0846 or visit our website at www.bete.com. Thank you for your patron of BETE." "The XA series assemblies may consist of anything from 7 to 11 parts. Please be sure to read all instructions carefully before assembling or disassembling the nozzle. Damage to these assemblies will result in voiding all warranties. Please read these procedures in full before proceeding.

BETE FOG NOZZLE, INC.
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Assembly Instructions for A, B, C and D Hardware

Before disassembling or reassembling, please review the diagram on the left to make sure you have the parts necessary to complete your choice of set-up.

These instructions are applicable to the 00 and 03 body and hardware options A-D. For 05 and 06 bodies, please review the diagram on the left to make sure you have the parts necessary to complete your choice of set-up.

1. Attach gasket. Slide rear gasket onto A, B, C, or D hardware until it rests on the shoulder behind the threads (Figure 1).
2. Thread into body. Thread the hardware and gasket from step 1 into the back of the 00 or 03 body. Snug the hardware in place.
3. Attach fluid cap. Slide front gasket onto fluid cap until it rests on the shoulder behind the threads. Screw the fluid cap into the body and tighten to 75 in-lb [8.5 Nm] (Figure 2).
4. Attach air cap. Rest the air cap on the fluid cap and secure it in place with the cap nut (Figure 3).

Assembly Instructions for E and F Automatic Hardware

(WARNING) The needle assembly can be severely damaged if excessive torque is applied during disassembly or reassembly.

1. Install bushing and o-rings. Slide relief bushing onto cylinder rod with slotted side toward the cylinder body. Slide the two larger o-rings onto the cylinder rod. Push the bushing and the o-rings all the way down the rod (Figure A).
2. Attach adapter. For 00 and 03 bodies only, slide the adapter down the cylinder rod and thread it onto the cylinder body.
3. Install rear gasket and connect hardware. Slide the rear gasket down the cylinder rod, resting it on the shoulder behind the threads of the cylinder (01 and 02 bodies) or the threads of the adapter (00 and 03 bodies). Insert cylinder rod through body. HAND TIGHTEN into the body (Figure B).
4. Attach tip and small o-ring. Use supplied Loctite® per manufacturer’s directions to coat threads on end of cylinder rod as shown in Figure C. Screw the fluid cap into the body and tighten to 75 in-lb [8.5 Nm].
5. Attach fluid cap. Slide front gasket onto fluid cap until it rests on the shoulder behind the threads. Screw the fluid cap into the body and tighten to 75 in-lb [8.5 Nm].
6. Attach air cap. Rest the air cap on the fluid cap and secure it in place with the cap nut (Figure D).

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Loctite is a registered trademark of Henkel Corporation. BETE is a registered trademark of BETE Fog Nozzle, Inc.
Assembly Instructions for A, B, C and D Hardware

Before disassembling or reassembling, please review the diagram on the left to make sure you have the parts necessary to complete your choice of set-up.

These instructions are applicable to the 00 and 03 body and hardware options A, B, C, or D hardware. For the 00 body and the C hardware option.

1. **Attach gasket.** Slide rear gasket onto A, B, C, or D hardware until it rests on the shoulder behind the threads (Figure 1).

2. **Thread into body.** Thread the hardware and gasket from step 1 into the back of the 00 or 03 body. Snug the hardware in place.

3. **Attach fluid cap.** Slide front gasket onto fluid cap until it rests on the shoulder behind the threads. Screw the fluid cap.

4. ![Figure 1](image1.png)

5. **Attach fluid cap.** Slide front gasket onto fluid cap until it rests on the shoulder behind the threads. Screw the fluid cap into the body and tighten to 75 in-lb [8.5 Nm] (Figure 2).

6. **Attach air cap.** Rest the air cap on the fluid cap and secure it in place with the cap nut (Figure 3).

Assembly Instructions for E and F Automatic Hardware

**WARNING!** The needle assembly can be severely damaged if excessive torque is applied during disassembly or reassembly.

1. **Install bushing and o-rings.** Slide relief bushing onto cylinder rod with slotted side toward the cylinder body. Slide the two larger o-rings onto the cylinder rod. Push the bushing and the o-rings all the way down the rod (Figure A).

2. **Attach adapter.** For 00 and 03 bodies only, slide the adapter down the cylinder rod and thread it onto the cylinder body.

3. **Install rear gasket and connect hardware.** Slide the rear gasket down the cylinder rod, resting it on the shoulder behind the threads of the cylinder (01 and 02 bodies) or the threads of the adapter (00 and 03 bodies). Insert cylinder rod through body. HAND TIGHTEN into the body (Figure B).

4. **Attach tip and small o-ring.** Use supplied Locktite® per manufacturer's directions to coat threads on end of cylinder rod as shown in Figure C. Screw tip to cylinder rod. HAND TIGHTEN. Roll smaller o-ring onto tip (note that the smaller o-ring may already be installed on the tip at the factory).

5. **Attach fluid cap.** Slide front gasket onto fluid cap until it rests on the shoulder behind the threads. Screw the fluid cap into the body and tighten to 75 in-lb [8.5 Nm].

6. **Attach air cap.** Rest the air cap on the fluid cap and secure it in place with the cap nut (Figure D).

**WARNING!** Do not mar or gouge tip surface when assembling; be sure to keep tip surface smooth.
What you need to consider when designing your XA system

- Confirm that the correct nozzle flow rate, spray pattern, and operating pressures have been selected and supplied for the application, that the correct mounting and accessory hardware such as wall adaptors and clean out needles are installed on the nozzle and that the correct number of nozzles is available.
- The header (for a multiple nozzle installation) and supply lines should be sized generously to prevent imbalance between liquid and air pressures for each nozzle and excessive pressure losses along the header that could cause erratic nozzle operation.
- Size the header to accommodate the total flow to all the nozzles on the header. Headers that are longer than 10 feet or that have more than 10 nozzles may be fed from both ends to minimize pressure differences along their length.
- Be sure to account for the air pressure according to the instructions on the chart when sizing the air piping.
- The line supplying air to an automatic cylinder can usually be 1/8" even when multiple nozzles are used since the volume flow of air to the cylinders is very small.
- The line supplying air to an automatic cylinder and allow the spring to push the clean-out or clean-out/shut-off needle into place. Faster operation is usually possible when you control the cylinder separately using the 00, 02, or 03 body. Using the 01 body requires the air to be exhausted from the larger atomizing air supply piping to allow the cylinder to return to the closed position.
- A complete XA system diagram with filters, regulators and solenoid valves is shown to the right in the XA Accessories brochure.
- You must correctly size the supply piping to ensure that adequate air and water are supplied to the nozzle. Correct size is especially important in multi-nozzle systems where differences in air and water pressures from one nozzle to the next can cause erratic operation. Several charts are included to help you choose the correct pipe sizes.

Flow of air through schedule 40 steel pipe

For lengths of pipe other than 100 feet, the pressure drop is proportional to the length. Thus, for 50 feet of pipe, the pressure drop is one-half the value given in the table; for 300 feet, three times the given value, etc.

The cubic feet per minute of compressed air at any pressure is inversely proportional to the absolute pressure and directly proportional to the absolute temperature.

The pressure drop is also inversely proportional to the absolute pressure and directly proportional to the absolute temperature.

To determine the cubic feet per minute of compressed air at any temperature and pressure other than standard conditions, use the equation:

$$ \frac{(14.7 \ P + 14.7 \times 520)}{P + 14.7} \times (SCFM) = ACFM $$

Therefore, to determine the pressure drop for inlet or average pressure other than 100 psig and at temperatures other than 60°F, multiply the values given in the table by the ratio:

$$ \frac{100 + 14.7}{P + 14.7} \times (SCFM) = 520 $$

where:

- "P" is the inlet or average gauge pressure in pounds per square inch, and,
- T is the temperature in degrees Fahrenheit under consideration.

Example: Suppose you need to supply two XAP300 nozzles with 60 psi water and 50 psi air as shown in the diagram below.

Water

Total Flow = (59 gph) x 2 / 60 = 1.96 gpm

Select 3/8" or larger pipe

Air

Total Flow = (4.6) x 2 = 9.2 scfm

Note that tabulated pressure losses will need to be multiplied by

$$ \frac{100 + 14.7}{P + 14.7} = 1.77 $$

to obtain losses at 50 psi. Select 3/8" or larger pipe.

Water and Air Flow Data

FLOW OF WATER THROUGH SCHEDULE 40 STEEL PIPE

<table>
<thead>
<tr>
<th>Discharge</th>
<th>1/4&quot;</th>
<th>1/8&quot;</th>
<th>1/4&quot;</th>
<th>2&quot;</th>
<th>3&quot;</th>
<th>3 1/2&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCFM at 60°F</td>
<td>100</td>
<td>63</td>
<td>45</td>
<td>28</td>
<td>22</td>
<td>17</td>
</tr>
<tr>
<td>SCFM at 60°F &amp; 14.7 psia</td>
<td>100</td>
<td>63</td>
<td>45</td>
<td>28</td>
<td>22</td>
<td>17</td>
</tr>
<tr>
<td>Pressure at 60°F</td>
<td>100</td>
<td>63</td>
<td>45</td>
<td>28</td>
<td>22</td>
<td>17</td>
</tr>
<tr>
<td>Pressure at 60°F &amp; 14.7 psia</td>
<td>100</td>
<td>63</td>
<td>45</td>
<td>28</td>
<td>22</td>
<td>17</td>
</tr>
<tr>
<td>Pressure Drop per 100 feet and Velocity In Schedule 40 Pipe for Water at 60°F</td>
<td>100</td>
<td>63</td>
<td>45</td>
<td>28</td>
<td>22</td>
<td>17</td>
</tr>
</tbody>
</table>

FLOW OF AIR THROUGH SCHEDULE 40 STEEL PIPE

<table>
<thead>
<tr>
<th>Discharge</th>
<th>1/4&quot;</th>
<th>1/8&quot;</th>
<th>1/4&quot;</th>
<th>2&quot;</th>
<th>3&quot;</th>
<th>3 1/2&quot;</th>
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<td>22</td>
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<tr>
<td>SCFM at 60°F &amp; 14.7 psia</td>
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<td>63</td>
<td>45</td>
<td>28</td>
<td>22</td>
<td>17</td>
</tr>
<tr>
<td>Pressure Drop per 100 ft of Sch 40 Pipe For Air at 60°F and 100 psig</td>
<td>100</td>
<td>63</td>
<td>45</td>
<td>28</td>
<td>22</td>
<td>17</td>
</tr>
</tbody>
</table>

Filters, regulators and valves

BETE recommends that filters be used on both the air and liquid lines supplying XA nozzles to minimize the potential for clogging. The air filters supplied by BETE remove both water and particulates and are equipped with an automatic drain. The water filters remove particulates larger than 100 mesh and can be equipped with a quick flush drain valve to remove accumulated deposits.

Liquid striainers for siphon setups should have large areas to minimize pressure losses across the strainer itself. It is also preferable to install the strainer below the liquid level.

The standard liquid pressure regulators supplied by BETE are the unbalanced type and the downstream pressure may fluctuate with variations in inlet pressure regardless of the pressure setting. The air regulators are the relieving type and pressures can be set without the air actually flowing through the nozzles. In addition these are less sensitive to variations in upstream pressure.

We produced this booklet to answer the most frequently asked questions we receive. If you have further questions, please do not hesitate to call our customer service department at 413-772-0846 or visit our website at www.bete.com.

Thank you for purchasing your nozzles from BETE.