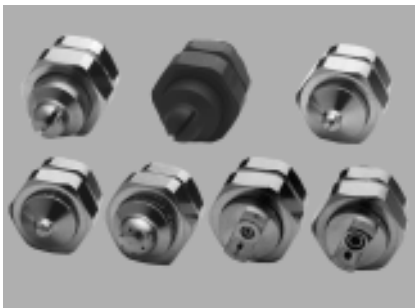


AIR-ATOMIZING NOZZLES



The PNR line of standard air-atomizing nozzles and accessories are described in this section. These devices break liquid into drops by the shearing action of high velocity air.

In order to satisfy a wide variety of applications, several options are available that allow customization for specific requirements.



SET-UP TYPES

The set-up is the part of the nozzle that produces the atomization. The liquid and air streams interact to create the spray.

A set-up consists of both a liquid cap and an air cap, matched such that specific flow rates, spray shapes, and spray angles are produced.

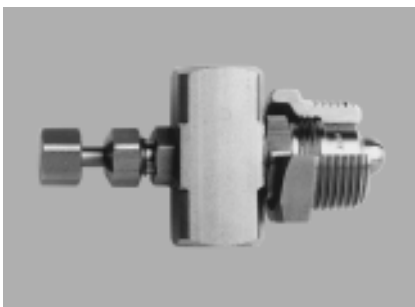
Several types of set-ups are available, as described on the following pages.



BODY TYPES

The nozzle body serves to connect the set-up to the feed lines. It may contain other features such as shut-off or orifice cleaning needles, either manually or automatically operated.

Our standard range of manual and automatic bodies, including several options, are described on pages 52 and 59.



ACCESSORIES

Complete specifications for accessories will be found in the Accessories section of the catalog.

MATERIALS

Nickel-plated brass and 303 stainless steel suit most requirements, while 316 stainless steel, Lucite, and PVC are used in special applications.

MATERIAL CODES

- B1 - 303 stainless steel
- B3 - 316 stainless steel
- D1 - PVC
- E6 - Lucite
- T8 - Nickel-plated brass

AIR-ATOMIZING NOZZLES

AIR-ASSISTED ATOMIZATION

Many industrial processes require liquids to be atomized into fine drops. This can be achieved using standard hydraulic nozzles when the liquid is forced through a very small orifice under high pressure. However, producing fine drops by this method is only possible with very small orifices, a factor that severely limits flow rates. In addition, small orifices are easily clogged, thereby reducing reliability.

In most applications requiring small drops, air-atomizing nozzles are used in which compressed air provides the energy required to break up the liquid into fine drops.

This technique makes it possible to obtain small drops over a wide range of flow rates.

The following should be considered when designing a system based upon air-atomizing nozzles:

Installation of a filter in the liquid supply line is advisable since the internal passages and orifice dimensions are relatively small.

Spray pattern widths are less than can be achieved using hydraulic nozzles.

AIR-ATOMIZING NOZZLES

Two types of air-atomizing nozzles are used by the industry in a variety of applications.

STANDARD AIR-ATOMIZING NOZZLES

These devices atomize liquid by a simple shearing action provided by a high velocity air stream impacting on a liquid vane.

They are a convenient solution for most applications requiring the special attributes of air-assisted atomization.

A wide range of spray patterns, accessories and nozzle types is available to suit a variety of requirements.

ULTRASONIC NOZZLES

These devices provide liquid atomization through a two-step process:

First, liquid is distributed through a number of orifices into the nozzle outlet channel, where a high velocity air stream provides a shearing force to break up the liquid.

Then, the stream carrying the drops collides with a resonator placed in front of the nozzle outlet channel that generates a field of high frequency, ultrasonic sound waves. Their exposure to this field causes the drops to break up into an even finer spray.

Air-actuated ultrasonic nozzles produce very fine drops within a limited mean diameter range. Flow rates range up to 46 gph.

The audible noise produced by these devices is high. This restricts their use to areas where high noise levels are not an issue. They should not be employed in areas where personnel will be exposed to the noise generated on a continuing basis.

For specifications and descriptions of PNR ultrasonic nozzles, refer to page 74 of the Special Products section of this catalog.

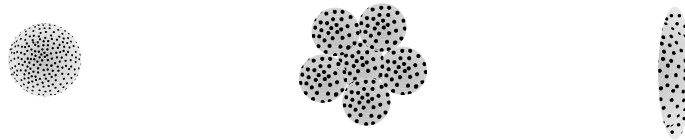
Ultrasonic nozzles that are electrically driven operate on an entirely different principle. A titanium nozzle body vibrates at ultrasonic frequencies, ranging from 25 to 120 kHz, driven by an electronic power generator. Drop size is dependent on the operating frequency. Higher frequencies produce smaller drops. The median diameter of drops at 120 kHz is approximately 17 microns. The atomization process is virtually unpressurized. The liquid is delivered through the nozzle to an atomizing surface where the device's ultrasonic vibrational energy is concentrated. The liquid film created on this surface is ejected as small drops.

The principal features of this technique are finer drops than can be produced by pressure atomization methods, very low drop velocity (about 1/100th the velocity of the spray from hydraulic or air-assisted nozzles), very low flow rate capabilities (as low as a few microliters per minute), narrow spray patterns (as small as 0.070 inches wide), and freedom from clogging.

Please contact us to receive a catalog describing this class of ultrasonic nozzles or visit the website: www.sono-tek.com.

A spray set-up consists of two parts, an air cap and a liquid cap, which are mated together to form the spray mechanism.

The number, size, and profile of the orifice(s) determine the characteristics of the atomized spray produced by a particular set-up. A few examples of spray patterns achievable are shown below.

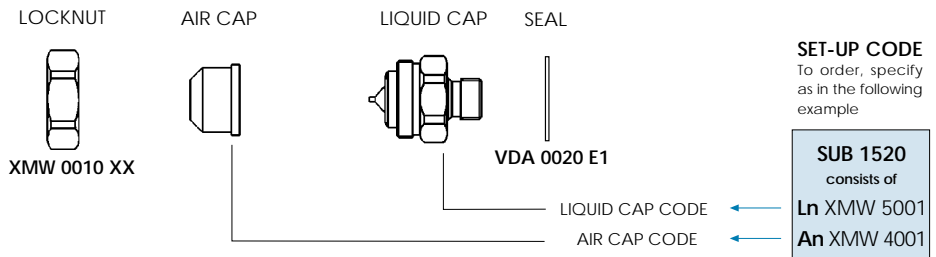


A spray set-up can be further divided into **internal** or **external** mix types, depending on whether the mixing of liquid and air occurs within the device (internal) or outside it, beyond the front of the assembly (external). In addition, set-ups are classified by liquid delivery method: either pressure or siphon. (See the next page.)

In the tables that follow, the performance for each set-up is characterized by the flow rate as a function of air and liquid pressure. In addition, other properties of a spray, which also are pressure dependent, such as the spray pattern dimensions, spray angle, maximum throw, and the distance over which the pattern remains stable, are presented where appropriate.

To order a set-up as a complete unit, use the set-up code (SUx) plus the material code as shown below.

Any set-up component (air cap, liquid cap, locknut, and seal) can be ordered individually by specifying its part number.



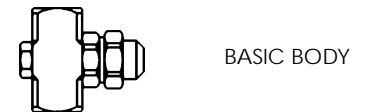
To order a set-up only, the following code is required: **SUB 1520 B1**

B1 = 303 STAINLESS STEEL
D1 = PVC
E6 = LUCITE
T8 = NICKEL-PLATED BRASS

ASSEMBLY CODE FOR A COMPLETE NOZZLE

Ordering a complete nozzle assembly consists of specifying the set-up, the body type, and any of the available options. There are two types of bodies available on which a set-up can be assembled:

The **basic body** serves to connect the set-up to the air and liquid feed lines. The plug on the back can be replaced by optional devices, such as shut-off and/or cleaning needles.



The **automatic body** contains a pneumatic cylinder, which allows for remote control of spray on/off operation. The optional devices compatible with this unit are the shut-off needle and the cleaning/shut-off needle.

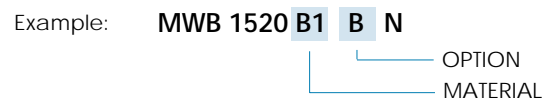


To order a complete assembly:

Replace the first two letters in the set-up code (SU) with the body code (MW for basic or MX for automatic body).

Add the material code.

Add the options code, if any. Be certain to include the letter 'N' at the end of the code.



See page 53 (low capacity nozzles) and page 60 (high capacity nozzles) for further details on body types, materials, and options.

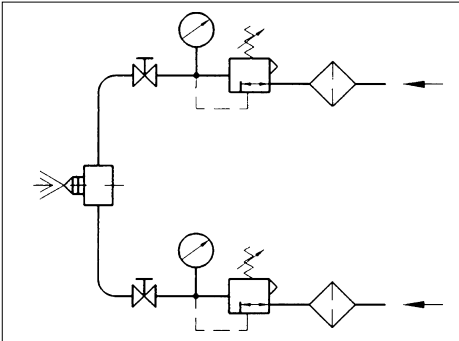
AIR-ATOMIZING NOZZLES

AIR-ATOMIZING NOZZLES

LIQUID DELIVERY

Liquid delivery systems for air-atomizing nozzles can be configured in two ways. The most common method is to supply the liquid under positive pressure from a closed vessel. The other method consists of drawing liquid from an open container, using either gravity-feed or the siphoning effect produced by the pressure reduction within the set-up resulting from the airflow.

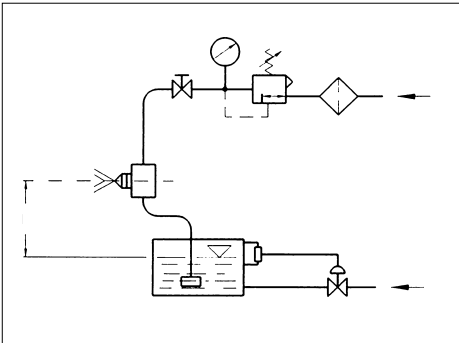
Different types of set-ups are used for pressure and gravity-feed/siphon systems.



PRESSURE SYSTEMS

This method of liquid delivery provides a high degree of flexibility for spray-shaping and for flow rate and drop size control.

The liquid and air pressure can be adjusted over a wide range to produce the desired results.



GRAVITY-FEED/SIPHON SYSTEMS

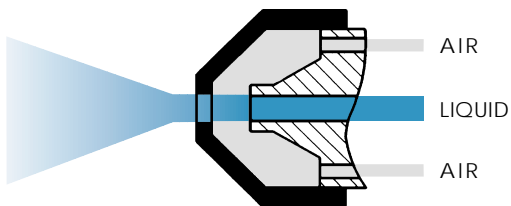
This technique is often used because of its simplicity. Liquid is delivered to the nozzle from an open container. Flow rate is controlled by the height differential between the nozzle and the liquid reservoir. The height of the reservoir relative to the nozzle determines the flow rate. Placing the reservoir below the nozzle (siphon mode) produces the lowest flow rates.

In both the gravity-feed and siphon modes, the flow rate is also controllable by varying the air pressure.

INTERNAL/EXTERNAL MIX SET-UPS

Set-ups are configured as either **internal mix** or **external mix**. Internal mix set-ups are designed such that the liquid and air mixing occurs within the set-up body.

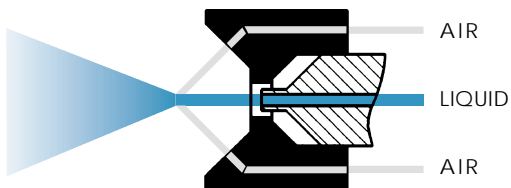
For external mix set-ups, the liquid and air are ejected through separate orifices and mixed in a region beyond the front of the nozzle.



INTERNAL MIX SET-UPS

This type of set-up is the most common because of its flexibility. A wide range of flow rates, spray patterns, and drop sizes can be produced by adjusting the liquid and air pressures. The liquid and air pressure settings are interactive.

For example, raising the air pressure will induce a higher liquid flow rate and will also produce finer drops.



EXTERNAL MIX SET-UPS

Because the two fluids exit from separate orifices, pressure values can be independently adjusted and flow rates can be easily controlled.

Viscous materials or materials that tend to harden when mixed with air can be atomized, since there is no mixing chamber and the risk of clogging is greatly reduced.

In addition, it is possible to obtain finer atomization with this type of set-up than with the internal mix set-up because of the ability to increase air pressure while maintaining the desired flow rate.

A drawback is that external mix set-ups can only generate flat spray patterns.

MW

BASIC BODY

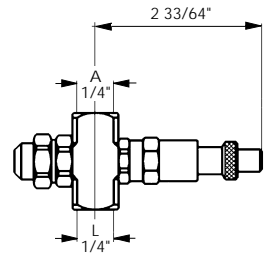
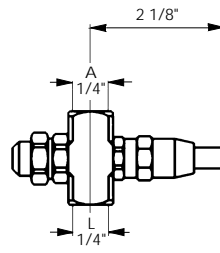
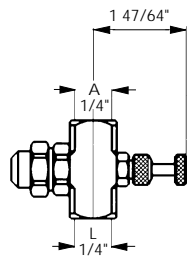
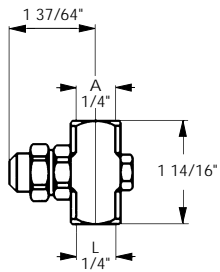
A = AIR INLET (1/4")
L = LIQUID INLET (1/4")

MWB 1520 B1 B

MATERIALS
B1 = 303 STAINLESS STEEL
D1 = PVC
E6 = LUCITE
T8 = NICKEL-PLATED BRASS

OPTIONS

A		STANDARD
B		SHUT-OFF NEEDLE
C		CLEANING NEEDLE
D		CLEANING AND SHUT-OFF NEEDLE



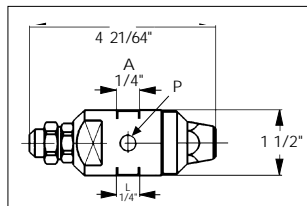
MX

AUTOMATIC BODY

MXB 1520 B1 B N

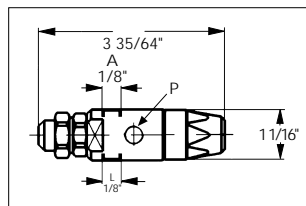
MATERIALS
B1 = 303 STAINLESS STEEL
T8 = NICKEL-PLATED BRASS

OPTIONS
A SHUT-OFF NEEDLE
B CLEANING NEEDLE
MA SHUT-OFF NEEDLE, MINIATURE
MB CLEANING NEEDLE, MINIATURE



STANDARD SIZE

A = AIR INLET (1/4")
L = LIQUID INLET (1/4")
P = AIR CYLINDER INLET (1/8")



MINIATURE SIZE

A = AIR INLET (1/8")
L = LIQUID INLET (1/8")
P = AIR CYLINDER INLET (1/8")

MX automatic bodies contain a pneumatic cylinder, which controls the on/off flow of liquid by opening and closing a needle using an external air source for controlling operation.

AIR-ATOMIZING NOZZLES

DRIP-FREE NEEDLE

Most available shut-off needles tend to leak after a while because of the tight tolerances between the mating metal parts. Any wear will generally result in dripping.

PNR engineers have developed a needle that eliminates this problem, assuring drip-free operation. All PNR air-atomizing nozzles incorporate this design.

