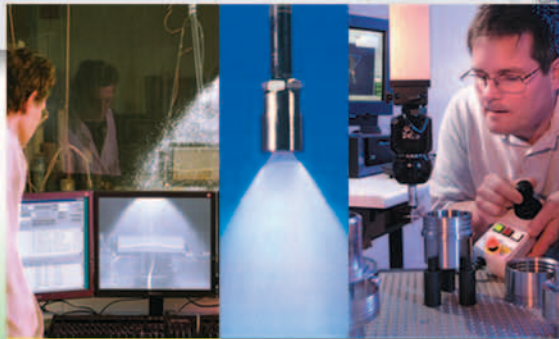


# BETE®

ENGINEERED  
SPRAYING SOLUTIONS

NOZZLES FOR INDUSTRY, POLLUTION CONTROL AND FIRE PROTECTION



PERFORMANCE THROUGH ENGINEERING

This catalog is English language with metric units

[www.bete.com](http://www.bete.com)

# Table of Contents



**W**ith thousands of different spray nozzles available in hundreds of different materials, it's often hard to know where to start. So, we've incorporated a number of unique charts and other aids into this catalog to simplify your selection process.

## Nozzle Selection Guide

There are many ways to select a nozzle. Which way is right for you?

### → BY SPRAY PATTERN....PP. 2, 3

**Do you know the spray pattern, but not the type of nozzle?.....**see pages 2, 3

This section introduces you to the several types of spray nozzles and the spray patterns available from each.

### → BY NOZZLE TYPE....PP. 4, 5

**Do you know what style of nozzle is right for you but need help differentiating between the many nozzle series in each style?.....**see pages 4, 5

Organized by nozzle style, this section briefly describes each nozzle series

### → BY APPLICATION....PP. 6-12

**Want to see what nozzles excel at your specific application?.....**see pages 6-12

An alphabetical list of common applications and the nozzles that are used most frequently for each.

Still not sure? Don't have time to look? **Call us.** BETE's Customer Service Representatives and Application Engineers will listen to your problem and guide you to the nozzle you need. Let our expertise save you time and keep your process running at peak efficiency.

Still unsure of which nozzle to use? We can help. Use the BETE Application Intake Sheet on page 109 to describe your application to our engineers. We'll put our years of experience to work on your problem and respond quickly with a recommendation.

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**PERFORMANCE THROUGH ENGINEERING**

**Innovation is a BETE hallmark and we are proud that over 60% of the nozzles we ship have been customized to meet your needs.**

**If you don't see your nozzle listed, please call BETE.**

**Special flow rates and angles are available for most nozzle series.**

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# ...by NOZZLE TYPE

## SPIRAL

- High energy efficiency
- Fine atomization
- Clog-resistant
- High discharge velocity
- Small physical size
- Full and hollow cone spray patterns
- 50° to 180° spray angles
- 0.534 to 10,700 l/min

### TF

The standard spiral line, available in a wide range of flows, angles, and materials. 1/8" - 4" pp. 18, 19



### TFXP

Same as the TF plus maximum free passage. 3/8" - 4" p. 20



### TFXPW

A wide coverage 2-turn spiral designed for fire protection 1" - 1 1/2" p. 21



### TF29-180

Ultra-wide fire protection nozzle has full cone spray coverage close to the nozzle 1/2" p. 22



### ST

A Cobalt Alloy tip and 316 stainless connection for spraying abrasive liquids. 1/4" - 4" p. 23



### STXP

Same as the ST with extra rugged construction plus maximum free passage. 3/8" - 4" p. 24



### LEM

A special tank washing assembly with omnidirectional spray. 3/4" & 1" p. 25



### N

Specially designed for fire protection. Factory Mutual approved. 1/2" - 1 1/2" pp. 26, 27



### L

A low-flow, hollow cone spiral nozzle. 1/8" & 1/4" p. 28



## WHIRL

- Complete line of full and hollow cone spray patterns
- Uniform distribution
- Medium to coarse atomization
- Relatively large free passage
- 15° to 140° spray angles
- 0.125 to 36,100 l/min

### CW\*

Low flow rate full or hollow cone, 3-piece construction with optional strainer and cover. 1/8" - 3/8" p. 51



### CLUMP

A tank washing manifold with 6 large free passage MaxiPass nozzles. 3/4" - 1" p. 40



### MaxiPass

Patented MaxiPass "S"-shaped vanes for superior distribution and largest free passage. 3/8" - 4" pp. 38, 39



### NC

Complete line of full cone nozzles available in a variety of plastic materials. 3/4" - 6" pp. 330, 31



### NCFL

Large plastic nozzles with high flow rates for applications where flanged connections are required. 4" - 12" p. 29



### NCJ\*/NCK

Narrow spray angle injector. NCJ is hollow cone, NCK is full cone. 3/4" - 6" pp. 32, 33



### NCS

"Stubbies"; short NC-type nozzles for use where space is at a premium. 1" - 4" p. 34



### SC

Metal full cone nozzles available in a range of alloys. 3/4" - 6" pp. 36, 37



### TC

High capacity full cone metal nozzles. 6" - 12" p. 35



### WL

Low flow rate full cone nozzles. 1/8" - 1" p. 50



Full Cone

Hollow Cone

\* CW is also a hollow cone, NCJ is hollow cone, NCK is full cone

### WTZ

Tangential full cone nozzle with 3-piece construction. 1/4" - 1/2" p. 41



### Twist & Dry

Stainless steel, FDA-compliant nozzles for food processing and spray drying applications. 1/4" - 3/4" p. 52-55



### TDL

Stainless steel, FDA compliant nozzles with low flow rates for food processing and spray drying applications. 1/8" - 3/8" p. 56



### TH

Larger one-piece tangential hollow cone nozzle 1" - 3" pp. 46, 47



### THW

Same as TH, with wide spray pattern. 1" - 3" pp. 48, 49



### WT

Tangential hollow cone nozzle with 2-piece construction. 1/8" - 3/4" pp. 42, 43



### WTX

Similar to WT, with design features for extended life. 1/8" - 3/4" pp. 44, 45



**FAN**

- Complete line of uniform flat fan sprays
- High impact coarse spray
- 0° to 145° Spray angle
- 0.01 to 2810 l/min.

**NF**

Standard fan nozzle featuring high impact fan or straight-jet spray. 1/8" - 2" p. 57



**NFD**

Flat fan nozzle with self-aligning dovetail connection and interchangeable tips. 1/4" - 1 1/4" p. 58



**NFS**

Stubby fan nozzle for use where space is at a premium. 1/4" - 2" p. 59



**FF**

Deflector-style; extra-wide angle flat fan spray. 1/8" - 1" pp. 60, 61



**BJ**

Low flow nozzle with interchangeable tips; fan spray. 1/8" - 3/8" p. 62, 63



**SPN**

Deflector-style; high impact, narrow fan spray. 1/4" - 3/4" p. 64



**MISTING**

- High energy efficiency
- Finest atomization in direct pressure nozzles

**P**

Liquid "impinges" on pin for extra-fine atomization. 1/4" p. 68



**PJ**

Combines small size and super-fine atomization. 1/8" & 1/4" p. 65



**MicroWhirl MWH**

Low profile and super-fine atomization. 1/8", 1/4", 3/8"-24UNF p. 64



**MWH**

Low flow super-fine atomization, misting head 1/2" p. 67



**UltiMist**

Misting nozzles produce high number of droplets under 60 microns. 1/8" - 1/4" p. 69



**AIR ATOMIZING**

- Extremely fine atomization
- Replaceable wear components
- Full range of spray patterns

**SpiralAir**

Two-fluid nozzles for high flow applications. 2-80 l/min pp. 70, 71



**SAM**

External mix/flat fan or narrow round variable coverage, fine control of drop-size. 2.7-174 l/h pp. 72, 73



**XA**

Two-fluid nozzles for low flow applications. 1.0-280 l/h pp. 74-90



**SPECIAL PURPOSE & ACCESSORIES**

- Designed to meet specific customer requirements

**SJ**

Swivel joint allow custom alignment of nozzles without piping changes. 1/4" - 3/4" p. 91



**EZ**

Quick connection system, ramped engagement for automatic alignment. 1/8" - 1/2" p. 92-95



**FINZ**

High impact air fan nozzle, versatile cleaning nozzle. 1/4" p. 96



**IS**

Mounted in pairs for rectangular coverage. 1/16" - 1 1/2" p. 97



**LP**

Self-aligning, interchangeable family of shower nozzles. p. 98



**PSR**

Small physical size, hard driving high velocity, straight jet 9/16" - 24 UNEF p. 100



**RTW**

Self-propelled rotating tank and drum washing nozzle with hard driving fan tips. 3/4" p. 101



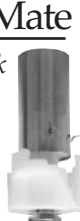
**SF**

Snap release nozzle system features clamp-on adapters for easy installation. 1" - 2" p. 102, 103



**ScrubMate**

Rotary tank and drum washing nozzle for food processing. 1/2" - 1 1/2" p. 104



**SS**

Durable nozzle with multiple fan patterns to provide dense fog 3/4" - 1 1/4" p. 106



**TurboMix**

A special tank-mixing eductor nozzle. 3/8" - 8" p. 105



**TW**

A special tank washing spiral design that sprays both forward and back. 3/8" & 1" p. 99



**Accessories**

Strainers, bushings, adapters, couplings and flanges to complete your installation. p. 108



**Lances & Custom Nozzles**

Spray lances and custom nozzles when an off-the-shelf nozzle just won't do. p. 107



# ...by APPLICATION

Choosing the correct nozzle for your application from BETE's 20,000+ products can be daunting. To help, here is a list of some of the more common uses for spray nozzles. Each application is followed by several BETE nozzle series which have been used in this application. The series used most often is listed first.

The operating pressures, flow rate, and spray angle ranges are typical for each application. The full operating range for each series is generally broader. If you don't see your application, or need advice making a nozzle selection, please **call us** at 413-772-0846.

## Absorption

Scrub hydrofluoric acid, ammonia, and other highly soluble gases

### TF

3.5-7 bar  
2-10 l/min  
90°-120°

pp. 18, 19

### TFXP

3.5-7 bar  
2-10 l/min  
90°-120°

p. 20

### TH

0.5-1 bar  
371-2230 l/min  
54°-95°  
SNBSC avail.  
pp. 46, 47

### MaxiPass

0.5-1 bar  
371-2230 l/min  
90°-120°  
lumpy liquids  
pp. 38, 39

### NC

0.5-1 bar  
371-2230 l/min  
90°-120°

pp. 30, 31

### SC

0.5-1 bar  
371-2230 l/min  
90°-120°  
metal nozzle  
pp. 36, 37

## Additives

Apply small volumes of a solution onto moving product or into a mixture

### SAM

0.7-1 bar  
20°-70°  
0.8-7.2 Nm<sup>3</sup>/h

pp. 72, 73

### XA

1.5-4 bar  
0.4-7 l/h  
20°-60°  
2.4-14 Nm<sup>3</sup>/h  
pp. 74-90

### NF

4-7 bar  
0.1-0.4 l/min  
65°-120°

p. 57

### BJ

4-7 bar  
0.03-0.4 l/min  
50°-80°

pp. 62, 63

## Color Code:

 Spiral

 Whirl

 Fan

 Misting

 Air Atomizing

 Special

## Aeration

Aerate waste water treatment, fish ponds, and impoundment ponds

### TF

1.5-3.5 bar  
10-40 l/min  
90°-120°

pp. 18, 19

### TFXP

1.5-3.5 bar  
10-40 l/min  
90°-120°  
lumpy liquids  
p. 20

### MaxiPass

0.7-3 bar  
5-40 l/h  
90°-120°  
lumpy liquids  
pp. 38, 39

## Air and Steam

Clean or dry product moving past nozzle; inject gases and odorants into process lines; sparging; bubbling

### NF (D,S)

3-5 bar  
4.0-102 l/min  
0.6-90 Nm<sup>3</sup>/h

pp. 58, 59

### FF

3-5 bar  
4.0-102 l/min  
0.3-90 Nm<sup>3</sup>/h

pp. 60, 61

### SPN

3-5 bar  
4.0-102 l/min  
0.6-90 Nm<sup>3</sup>/h

p. 64

## Air Conditioning

Cooling air at gas turbine inlets

### PJ

4-70 bar  
0.05-5.34 l/h  
90°

p. 65

### MicroWhirl

70-200 bar  
0.04-0.60 l/min  
20°-70°

p. 66

### XA

1.5-4 bar  
0.4-7 l/h  
20°-60°  
2.4-14 Nm<sup>3</sup>/h  
pp. 74-90

## Air Nozzle

Blowoff nozzle uses compressed air only

### FINZ

0.7-6 bar  
7-65 Nm<sup>3</sup>/h

p. 96

## Blow-off Nozzles

Remove water or dust from strips and conveyors

### NF

3-5 bar  
4.0-102 l/min  
0.6-90 Nm<sup>3</sup>/h

p. 57

### FF

3-5 bar  
4.0-102 l/min  
0.3-90 Nm<sup>3</sup>/h

pp. 60, 61

### SPN

2-30 bar  
3.2-100 l/min  
0.6-90 Nm<sup>3</sup>/h

p. 64

### FINZ

0.7-6 bar  
7-65 Nm<sup>3</sup>/h

p. 96





**Corrosion Resistant Nozzles**  
 Cast metal or PTFE nozzles designed for maximum life in harsh environments

<b>TF</b>
0.5-20 bar 2.3-10700 l/min 50°-180° pp. 18, 19

<b>MaxiPass</b>
0.2-5 bar 2.6-3540 l/min 30°-120° super alloys pp. 38, 39

<b>NC</b>
0.2-1.5 bar 11-13250 l/min 60°-120° PTFE pp. 34, 35

**Debarking**  
 Remove bark from logs prior to pulping

<b>NF</b>
3-70 bar 4-5250 l/min 30°-90° p. 57

<b>SPN</b>
3-4 bar 7.9-91.2 l/min 35°-50° p. 64

**Disposal: Evaporative**  
 Evaporate tailing ponds or volatile waste

<b>TFXP</b>
3-8 bar 10-265 l/min 90°-120° lumpy liquids p. 20

<b>TF</b>
3-8 bar 10-265 l/min 90°-120° pp. 18, 19

<b>MaxiPass</b>
3-8 bar 21-246 l/min 90°-120° lumpy liquids pp. 38, 39

<b>SS</b>
3-7 bar 20-400 l/min 35°-145° p. 106

**Distribution**  
 Distribute fluids uniformly onto packing, trickle bed media, and horticultural beds; VOC stripping

<b>NC</b>
0.2-1.5 bar 11-13250 l/min 90°-120° plastic nozzle pp. 30, 31

<b>SC</b>
0.2-1.5 bar 7.6-1597 l/min 90°-120° metal nozzle pp. 36, 37

<b>MaxiPass</b>
0.2-1.5 bar 4-1930 l/min 90°-120° lumpy liquids pp. 38, 39

<b>TC</b>
0.1-0.7 bar 820-13250 l/min 60°-120° p. 41

<b>IS</b>
0.05-0.7 bar 2-435 l/min used in pairs lumpy liquids p. 97

<b>WL</b>
0.3-1.5 bar 4-57 l/min 90°-120° p. 50

**Drying**  
 Remove excess water after washing or rinsing

<b>NF</b>
3-5 bar 0.6-90 Nm³/h p. 57

<b>FF</b>
3-5 bar 0.3-90 Nm³/h pp. 60, 61

<b>SPN</b>
3-5 bar 0.6-90 Nm³/h p. 64

<b>FINZ</b>
0.7-6 bar 7-65 Nm³/h p. 96

**Dust Control: Air-handling Ducts**  
 Suppress stone, coal, and other dust in vent ducts; control paint spray carry-over

<b>TF</b>
2-5.5 bar 4.5-43 l/min 90°-120° pp. 18, 19

<b>TFXP</b>
2-5.5 bar 19.5-43 l/min 90°-120° lumpy liquids p. 20

<b>MaxiPass</b>
3-5.5 bar 9-47 l/min 90°-120° lumpy liquids pp. 38, 39

<b>TF150</b>
2-5.5 bar 19.5-57 l/min 150° wide coverage pp. 18, 19

<b>L</b>
3-5.5 bar 1-13 l/min 90° very fine dust p. 28

<b>P</b>
3-5.5 bar 0.25-14.5 l/min 90° very fine dust p. 68

<b>MicroWhirl</b>
70-200 bar 0.09-0.28 l/min 90° p. 66

**Dust Control: Area**  
 Suppress dust at conveyor transfer points, dump pits and loading hoppers

<b>TF</b>
2-5.5 bar 4.6-43 l/min 90°-120° pp. 18, 19

<b>TF150</b>
2-5.5 bar 20-57 l/min 150° wide coverage pp. 22, 23

<b>MaxiPass</b>
3-5.5 bar 9-47 l/min 90°-120° lumpy liquids pp. 38, 39

<b>TFXP</b>
2-5.5 bar 20-57 l/min 90°-120° lumpy liquids p. 20

<b>TF170</b>
2-5.5 bar 20-57 l/min 170° wide coverage pp. 18, 19

<b>L</b>
3-5.5 bar 1-14.5 l/min 90° transfer point p. 28

**Etching: Electronics**  
 Wash and rinse circuit boards and wafers

<b>WL</b>
0.7-3 bar 0.5-15.1 l/min 60°-120° p. 50

<b>NF (D,S)</b>
0.7-3 bar 0.5-26.5 l/min 50°-120° pp. 58, 59

<b>SPN</b>
0.7-3 bar 1.8-15 l/min 35°-50° p. 64

<b>FF</b>
0.2-1.5 bar 0.05-14 l/min 145° pp. 60, 61

**EZ Change 1/4 Turn Nozzles**  
 Quick change-out nozzle base assembly with 1/4 turn ramped engagement

<b>EZ</b> FF, NF, SPN
0.2-35 bar 0.05-162 l/min 0°-145° pp. 92, 93

<b>EZ</b> WL, TF, WT
0.2-35 bar 0.13-206 l/min 30°-120° pp. 94, 95









# MATERIALS

BETE manufactures nozzles in hundreds of different materials and combinations of materials. The chart on this page shows the 40 materials most often specified. If you don't know which material is best for your application, BETE Applications Engineering can help you with your selection. Some factors that influence the nozzle material selection process are:

**Temperature.** Melting or softening of material establishes maximum temperature limits. However, these temperature limits must be reduced when corrosion, oxidation, or chemical attack are also present. See column in blue for general temperature limits for various materials.

**Corrosion.** Plastics offer superior corrosion resistance at relatively low cost, but can only be used in low-temperature applications. In general, metals can be ranked in the following order of corrosion resistance (from lowest to highest): cast iron, brass, stainless steels, nickel-based alloys, refractory metals and precious metals. Ceramics have excellent corrosion resistance except in very high pH environments.

**Chemical attack.** There are few general guidelines to this complex subject, but the material used for piping may provide a useful indicator of a suitable nozzle material. If the environment of your

application is known to contain substances which may attack the spray nozzle, contact BETE Applications Engineering for advice. **Abrasion.** Hardened stainless steel, Cobalt Alloy 6, tungsten carbide, and ceramics are commonly used in applications where abrasive fluids are sprayed.

**Cost.** There are exceptions, but materials can generally be ranked in the following order in terms of cost (from lowest to highest): brass, cast iron, plastics, stainless steels, cobalt-base alloys, nickel-base alloys, ceramics, refractory metals and precious metals.

Material Description	BETE Material No. (MN)	(DIN) Description	Temp. Rating (° C)	Trade Name*	U.S. ASTM or AMS Cast Specification	U.S. ASTM Bar Specification
Brass	4	Messing	230°		B30 C85700	B16 C36000
Naval Brass	64		400°		B21 C46400	
Bronze		Bronze	400°		B30 C95400	B103 C54400
L.C. Steel	72	C-Stahl	210°			A108 Gr 12L14
Cast Iron	28	Gusseisen	230°			
303	5	1.4305	430°		A 743 CF-16F	A582 S30300
304	6	1.4301	430°		A 743 CF-8	A276 S30400
304L		1.4306	430°		A 743 CF-3	A276 S30403
316	7	1.4401	430°		A 743 CF-8M	A276 S31600
Tungsten Carbide	7H					
Alumina	26					
316L	20	1.4404	430°		A 743 CF-3M	A276 S31603
317	21	1.4440	430°		A 743 CG-8M	A276 S31700
317L	22	1.4438	430°		A 743 CG-3M	A276 S31725
416		1.4005	430°			A582 S41600
904L	74	1.4539	430°			
Alloy 20	70	2.4660	490°	Carpenter® 20	A 743 CN-7M	B473 N08020
Nickel Alloy M30C	37	2.4360/2.4366	540°	Monel®	A 494 M-30C	B164 N04400
Nickel Alloy 600	35	2.4816	1100°	Inconel® 600		
Nickel Alloy 625	3B	2.4856	1100°	Inconel® 625	AMS 5402	B446 N06625
Nickel Alloy 800	33	1.4876	1010°	Incoloy® 800		B408 N08800
Nickel Alloy 825		2.4858	1010°	Incoloy® 825		B425 N08825
Nickel Alloy B	31	2.4800/2.4810	760°	Hastelloy® B w/2.5 Max. Co	A 494 N-12MV	B335 N10665
Nickel Alloy G	32	2.4619	1100°	Hastelloy® G	B 581 N06007	B581 N06007
Nickel Alloy G30	49	2.4603	1100°	Hastelloy® G30		B581 N06030
Nickel Alloy C276	81	2.4819	1100°	Hastelloy® C276		B574 N10276
Nickel Alloy C22	2A	2.4602	1100°	Hastelloy® C22	A 494 CX-2MW	B574 N06022
Nickel	38	Nickel	350°			B160 N02200
Titanium	11	Titan	540°			B348 Gr 2
Tantalum	40	Tantal	1500°			B708 R05200
Zirconium	61	Zirkonium	540°			B550 R60702
Cobalt Alloy 6	9		1050°	Stellite® 6	AMS 5387	
SNBSC ceramic	62		1660°	Refrax®		
RBSC ceramic	59		1380°			
PTFE	3	PTFE	150°	Teflon®		D1710 G1, T2, CA
PVDF	36	PVDF	120°	Kynar®		D3222 Tp 1, Cl 2
PVC	1	PVC	60°			
CPVC	16	CPVC	100°			
Polypropylene	2	Polypropylen	70°			
UHMW	17		80°			
Polyurethane	69		80°			
ABS	15		70°			

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# Since 1950 BETE has put nozzles into deep sea, deep space, and everywhere in between.

John Bete started the company in 1950 in a basement machine shop.

The headquarters are now in a 4,000-square-meter facility on 5.1 hectares, built in 1988.

Innovative BETE nozzles have made the company a worldwide leader in the pollution control industry.

The first shower in space was taken by a U.S. astronaut using a special BETE nozzle.

BETE nozzles provide life-saving fire protection on offshore oil rigs, clean compact disk masters between platings, cool off the hogs down on the farm, reduce SO<sub>2</sub> emissions at coal-fired generating stations and even spray relish into huge mixing vats at food processing plants.

Virtually every business uses nozzles—in equipment, manufacturing or fire protection. Their spray droplets can neutralize micron-size pollutants, extinguish fires, cool hot gases, coat delicate electronic components and much more.

BETE is a pioneer in all areas of nozzle manufacturing. The company was



Nozzles may be a rather small component of major systems. But they are absolutely critical to performance and efficiency.

formed to produce John Bete's unique spiral (corkscrew) nozzle which can deliver a fine, high velocity spray at the lowest possible pressure.

Later, BETE developed the industry's leading clog-resistant design: the MaxiPass™ full cone whirl nozzle, which boasts the maximum free passage possible.

More recently, BETE developed the SpiralAir™ series of air atomizing nozzles which use compressed air or steam to convert large volumes of liquid into a finely atomized fog.

In each case, these innovations have provided solutions to performance problems encountered with traditional nozzle designs. In fact, if there's one hallmark to



The BETE Difference it's the ability to respond quickly and effectively to any kind of spraying challenge—whether simple or complex—anywhere in the world.

Virtually any material that can be machined, cast or



molded can be used to make a nozzle. The selection depends on the fluid being sprayed and operating conditions such as temperature, abrasiveness, and corrosiveness.



# BETE is the only nozzle manufacturer with a complete in-house investment casting foundry.

BETE has always taken advantage of the latest developments in materials technology to create the most efficient nozzles possible. In the late 1960s, the company began experimenting with nozzles made from the ceramic Silicon Nitride Bonded Silicon Carbide (SNBSC) because of its excellent corrosion and abrasion resistance. Later, BETE made the first stronger Reaction Bonded Silicon Carbide (RBSC); making the production of ceramic spiral nozzles practical.



In the 1970s BETE pioneered the use of Cobalt Alloy 6, a cobalt-based alloy

with excellent corrosion and abrasion resistance, and has led the way in the use of engineering plastics, particularly PTFE, in nozzle manufacture.



In 1977 BETE made a significant new production commitment by setting up an in-house casting foundry. This established total control of quality and scheduling for orders requiring cast alloys such as Stainless Steel, Cobalt Alloy 6 and Nickel Alloy.



In the late '80s and early '90s BETE became one of the first foundries in the world to cast Nickel Alloy C-22®, a new chromium nickel-based alloy.

When evaluating various materials, it's important to consider the impact of nozzle life on plant efficiency. BETE can help you select the material for maximum effectiveness and operating life in your



application.

BETE uses three basic manufacturing processes: injection molding, machining from bar stock and investment casting. Injection molding is used for large quantities of nozzles made from plastics such as PVC, ABS and PVDF. Bar stock machining is often used for metal alloy and plastic nozzles which have relatively simple shapes or are made in small quantities. Investment casting offers a precise and economical way to produce complex shapes in alloys that are difficult or expensive to machine.

It takes eight minutes to heat 12.2 kg of stainless steel to the 1600°C required for casting.

BETE pioneered the use of many nozzle materials including PTFE and titanium.

Platinum is the most expensive material the company has ever used; every scrap was saved.

Traditional New England craftsmanship in a state-of-the-art manufacturing facility.

# BETE can perform every procedure in-house – from casting to machining to assembly.

BETE also does contract testing of nozzles and spray systems for many customers.

Complete in-house design and manufacturing mean on-time delivery.

A small change in a droplet's size, shape, or speed can have a major impact on performance.

When testing nozzles where far-reaching spray is critical, the 9 meter removable laboratory wall is opened



In addition, BETE offers many specialized processes. The welding department, which is fully qualified to ASME B & PV Code Section IX, has made a specialty of joining dissimilar metals. This makes it possible to design nozzles combining alloys having superior anti-abrasion or corrosion properties with those having excellent machinability or weldability. Other specialized processes include plasma spray coating, plating, heat treating, grinding, ceramic fabrication and filament winding of FRP.

BETE's advanced CIM (Computer Integrated Manufacturing) environment links CAD workstations, a CAM



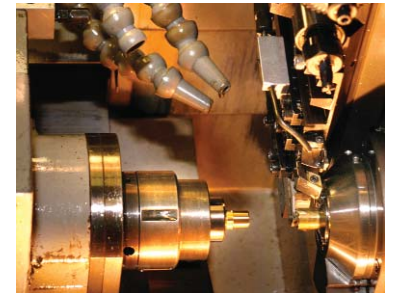
part programming system and CNC machine tools. The computerized scheduling system sequences every step in the production process, constantly adjusting the loads at each workstation to maximize throughput. This makes it possible to manufacture any one of thousands of products within a short time, while providing reliable delivery forecasts.

When a power company needed spray nozzles to keep



the windmill blades clean at their wind turbine farm, they called BETE. When an LPG facility in New Jersey needed to design a water deluge system that met the NFPA recommended coverage density, they called BETE.

Before you buy just any nozzle, give BETE a call. If it's a common application, the company's sales reps or customer service personnel will make sure you're aware of the latest developments and rec-



ommendations in the field. If it's a new application (or a new twist to an old one) BETE Applications Engineers will put their years of experience to work helping to determine the best way to provide the spray coverage and performance you need.

You see, BETE's mission goes far beyond just selling nozzles: it is to provide spraying solutions that meet or exceed customer expectations

# BETE is well known for its ability to find creative solutions to difficult spraying challenges.

in every detail. Extensive in-house capabilities—from CAD design through pattern testing—make it possible to offer the highest level of quality control throughout every phase of production while providing the most responsive customer service in the industry.

A nozzle's effectiveness is based on the size, shape, velocity and distribution of its droplets.

The goal of the BETE testing laboratory is to find new ways to help customers maximize performance while using less liquid and lower pumping pressure.



BETE's computer modeling optimizes nozzle selection by taking into consideration the effects of gravity, fluid pressure, gas velocity and distance on spray coverage.

BETE's advanced, computerized Droplet Analyzer can measure in-spray droplets from 2.5 to over 15,000 microns at high velocities. The spray images are illuminated by a strobe, displayed

on a monitor, analyzed, and stored—all in less than one-tenth of a second. Since droplet size has become so critical for many engineered

ness. BETE's high-speed "Patternator" provides detailed information on spray density and coverage at various locations in the spray



applications, the BETE Droplet Analyzer is often used from the prototype stage through final manufacture to make sure the design meets specifications.

Liquid distribution is just as critical to system design and overall nozzle effective-



area and is totally integrated with the Droplet Analyzer, permitting complete and precise measurement of spray performance.

Whether you're working on a new application or a modification, BETE's lab can quickly evaluate your requirements and develop an effective solution.

**BETE Application Engineers provide effective solutions to thousands of nozzle requests every year.**

**The Spiral TFXP and MaxiPass™ are the industry's two leading clog-resistant designs.**

**Computer terminals throughout the plant keep track of the status of your order.**

# TFE

## Wide Range of Flows and Angles

### DESIGN FEATURES

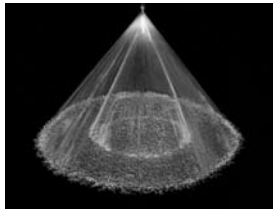
- The original spiral nozzle invented by BETE and continuously improved!
- High energy efficiency
- One-piece/no internal parts
- Clog-resistant performance
- High discharge velocity
- Male connection standard; female connection available by special order
- TF24-150 has FM approval

### SPRAY CHARACTERISTICS

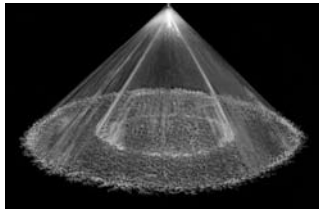
- Wide range of flow rates and spray angles
  - Fine atomization
- Spray patterns:** Full and Hollow Cone  
**Spray angles:** 50° to 180°  
**Flow rates:** 2.26 to 10700 l/min  
 (Higher flow rates available)



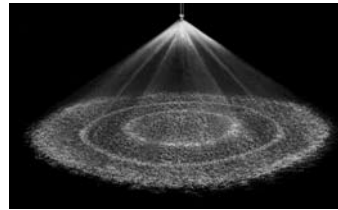
60°, 90°, 120° Metal



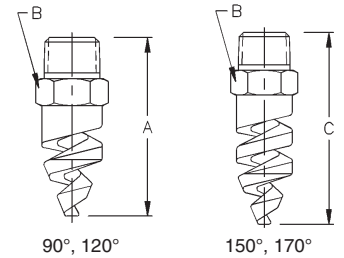
Full Cone 60° (NN)



Full Cone 90° (FCN)



Full Cone 150°/170°



Dimensions are approximate. Check with BETE for critical dimension applications

### TF Full Cone Flow Rates and Dimensions

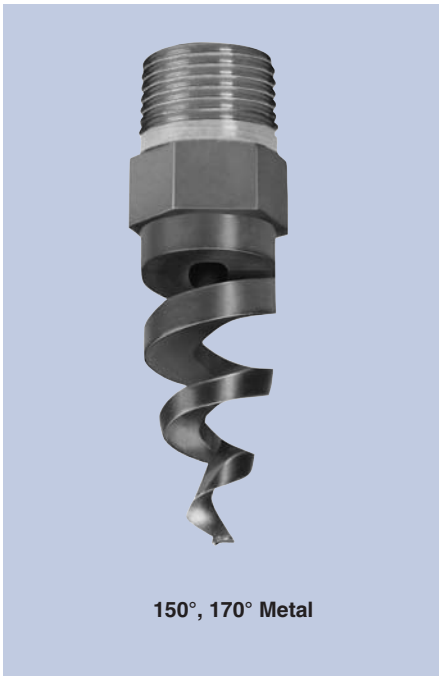
Full Cone, 60° (NN), 90° (FCN or FFCN), 120° (FC or FFC), 150° and 170° Spray Angles, 1/8" to 4" Pipe Sizes, BSP or NPT

Male Pipe Size	Nozzle Number	Available Spray Angles 60° 90° 120° 150° 170°	K Factor	LITERS PER MINUTE @ BAR							High Pressure Operation recom. for Metal Only	Approx. (mm)		Dim. (mm) for Metal Only*			Wt. (g)	
				0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	10 bar		20 bar	Orif. Dia.	Free Pass Dia.	A	B	C	60° 120°
1/8	TF6	60° 90° 120° 150° 170°	3.19	2.26	2.67	3.19	4.5	5.5	7.1	10.1	14.3	2.38	2.38	42.9	14.3	42.9	28	6
	TF8	60° 90° 120° 150° 170°	5.93	4.19	4.96	5.93	8.4	10.3	13.2	18.7	26.5	3.18	3.18	42.9	14.3	55.6		
1/4	TF6	60° 90° 120° 150° 170°	3.19	2.26	2.67	3.19	4.5	5.5	7.1	10.1	14.3	2.38	2.38	47.6	14.3	47.6	35	6
	TF8	60° 90° 120° 150° 170°	5.93	4.19	4.96	5.93	8.4	10.3	13.2	18.7	26.5	3.18	3.18	47.6	14.3	60.3		
	TF10	60° 90° 120° 150° 170°	9.12	6.45	7.63	9.12	12.9	15.8	20.4	28.8	40.8	3.97	3.18	47.6	14.3	60.3		
3/8	TF6	60° 90° 120°	3.19	2.26	2.67	3.19	4.5	5.5	7.1	10.1	14.3	2.38	2.38	47.6	17.5	60.5	46	7
	TF8	60° 90° 120°	5.93	4.19	4.96	5.93	8.4	10.3	13.2	18.7	26.5	3.18	3.18					
	TF10	60° 90° 120°	9.12	6.45	7.63	9.12	12.9	15.8	20.4	28.8	40.8	3.97	3.18					
	TF12	60° 90° 120° 150° 170°	13.7	9.67	11.4	13.7	19.3	23.7	30.6	43.2	61.1	4.76	3.18					
	TF14	60° 90° 120° 150° 170°	18.5	13.1	15.4	18.5	26.1	32.0	41.3	58.4	82.6	5.56	3.18					
	TF16	60° 90° 120° 150° 170°	24.2	17.1	20.2	24.2	34.2	41.8	54.0	76.4	108	6.35	3.18					
1/2	TF24	60° 90° 120° 150° 170°	54.9	38.8	46.0	54.9	77.7	95.1	123	174	246	9.53	4.76	63.5	22.2	77.7	85	14
	TF28	60° 90° 120° 150° 170°	75.2	53.2	62.9	75.2	106	130	168	238	336	11.1	4.76					
3/4	TF32	60° 90° 120° 150° 170°	95.7	67.7	80.1	95.7	135	166	214	303	428	12.7	4.76	69.9	28.6	88.9	156	25
1	TF40	60° 90° 120° 150° 170°	153	108	128	153	216	264	341	483	683	15.9	6.35	92.1	34.9	111	241	71
	TF48	60° 90° 120° 150° 170°	217	153	181	217	306	375	484	685	968	19.1	6.35					
1 1/2	TF56	60° 90° 120° 150° 170°	294	208	246	294	416	509	657	930	1320	22.2	7.94	111	50.8	137	624	120
	TF64	60° 90° 120° 150° 170°	385	272	322	385	545	667	861	1220	1720	25.4	7.94					
	TF72	60° 90° 120° 150° 170°	438	309	366	438	619	758	978	1380	1960	28.6	7.94					
2	TF88	60° 90° 120° 150° 170°	638	451	534	638	902	1110	1430	2020	2850	34.9	11.1	143	63.5	175	1300	227
	TF96 <sup>1</sup>	60° 90° 120° 150° 170°	806	570	674	806	1140	1400	1800	2550	3600	38.1	11.1					
3	TF112 <sup>1</sup>	60° 90° 120° 150° 170°	1170	825	976	1170	1650	2020	2610	3690	5220	44.5	14.3	219	88.9	235	3230	567
	TF128 <sup>1</sup>	60° 90° 120° 150° 170°	1550	1090	1290	1550	2190	2680	3460	4891	6920	50.8	14.3					
4	TF160 <sup>1</sup>	60° 90° 120°	2390	1690	2000	2390	3380	4140	5350	7570	10700	63.5	15.9	257	114		4790	765

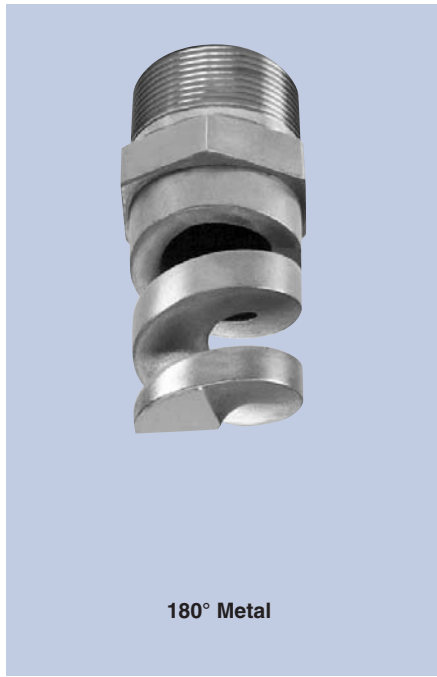
Flow Rate (l/min) =  $K \sqrt{\text{bar}}$  \*Dimensions are for bar stock, cast sizes may vary. \*\*60° nozzles slightly longer; call BETE for details <sup>1</sup>Three turn nozzles

Standard Materials: Brass, 316 Stainless Steel, PVC, Polypropylene and PTFE (Poly. not available for TF6 thru TF10).

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.



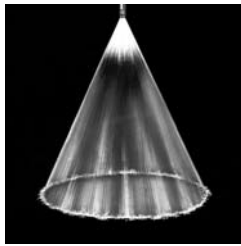
150°, 170° Metal



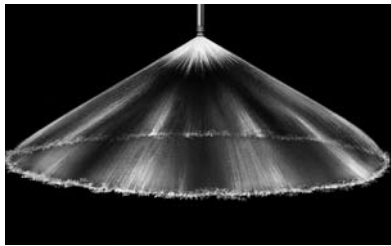
180° Metal



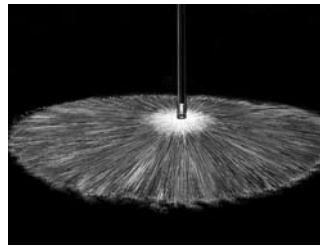
50° Metal



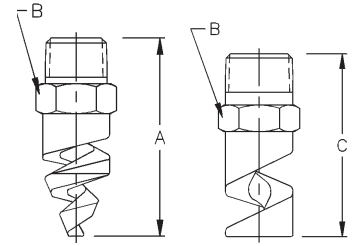
Hollow Cone 50° (N)



Hollow Cone 120° (W)



Hollow Cone 180° (XW)



50°, 60°, 90°, 120°

180°

Dimensions are approximate. Check with BETE for critical dimension applications

**TF Hollow Cone Flow Rates and Dimensions**

Hollow Cone, 50° (N), 60° (V), 90° (M), 120° (W), and 180° (XW) Spray Angles, 1/4" to 4" Pipe Sizes, BSP or NPT

Male Pipe Size	Nozzle Number	Available Spray Angles					K Factor	LITERS PER MINUTE @ BAR										Approx. (mm)		Dim. (mm) for Metal Only*			Wt. (g)	
		50°	60°	90°	120°	180°		0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	10 bar	20 bar	Orif. Dia.	Free Pass. Dia.	A	B	C	180° Metal Plas.			
1/4	TF6	50°	60°	90°	120°		3.19	2.26	2.67	3.19	4.5	5.5	7.1	10.1	14.3	2.38	2.38	42.9	14.3		35	21		
	TF8	50°	60°	90°	120°	180°	5.93	4.19	4.96	5.93	8.4	10.3	13.2	18.7	26.5	3.18	3.18	47.6	14.3	47.6				
	TF10	50°	60°	90°	120°	180°	9.12	6.45	7.63	9.12	12.9	15.8	20.4	28.8	40.8	3.97	3.18	47.6	14.3	47.6				
3/8	TF12	50°	60°	90°	120°	180°	13.7	9.7	11.4	13.7	19.3	23.7	30.6	43.2	61.1	4.76	3.18							
	TF14	50°	60°	90°	120°	180°	18.5	13.1	15.4	18.5	26.1	32.0	41.3	58.4	82.6	5.56	3.18	47.6	17.5 <sup>1</sup>	47.6	50	21		
	TF16	50°	60°	90°	120°	180°	24.2	17.1	20.2	24.2	34.2	41.8	54.0	76.4	108	6.35	3.18							
1/2	TF20	50°	60°	90°	120°	180°	37.6	26.6	31.5	37.6	53.2	65.1	84.1	119	168	7.94	3.18							
	TF24	50°	60°	90°	120°	180°	54.9	38.8	46.0	54.9	77.7	95.1	123	174	246	9.53	4.76	63.5	22.2	60.5	85	25		
	TF28	50°	60°	90°	120°	180°	75.2	53.2	62.9	75.2	106	130	168	238	336	11.1	4.76							
3/4	TF32	50°	60°	90°	120°	180°	95.7	67.7	80.1	95.7	135	166	214	303	428	12.7	4.76	69.9	28.6	76.2	85	28		
1	TF40	60°	90°	120°	180°		153	108	128	153	216	264	341	483	683	15.9	6.35	92.1	34.9	92.2	425	85		
	TF48	60°	90°	120°	180°		217	153	181	216	306	375	484	685	968	19.1	6.35							
1 1/2	TF56	60°	90°	120°	180°		294	208	246	294	416	509	657	930	1320	22.2	7.94							
	TF64	60°	90°	120°	180°		385	272	322	385	545	667	861	1220	1720	25.4	7.94	111	50.8	111	851	170		
	TF72	60°	90°	120°	180°		438	309	366	438	619	768	978	1380	1960	28.6	7.94							
2	TF88	60°	90°	120°	180°		638	451	534	638	902	1110	1430	2020	2850	34.9	11.1	143	63.5	127	1300	227		
	TF96	60°	90°	120°	180°		806	570	674	806	1140	1400	1800	2550	3600	38.1	11.1	176	63.5	127	1530	255		
3	TF112	60°	90°	120°			1170	825	976	1170	1650	2020	2610	3690	5220	44.5	14.3	219	88.9					
	TF128	60°	90°	120°			1550	1090	1290	1550	2190	2680	3460	4891	6920	50.8	14.3							
4	TF160	60°	90°	120°			2390	1690	2000	2390	3380	4140	5350	7570	10700	63.5	15.9	257	114					

Flow Rate ( $l/min$ ) =  $K \sqrt{\text{bar}}$  \*Dimensions are for bar stock, cast sizes may vary. <sup>1</sup> 25.4 mm for 180° Large plastic Spirals (above 2") should not be operated above 1 bar

Standard Materials: Brass, 316 Stainless Steel, PVC, Polypropylene and PTFE (Poly. not available for TF6 thru TF10)

TF 24 150° available in Factory Mutual-approved Brass

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

# TFXP

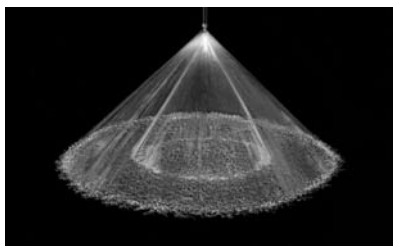
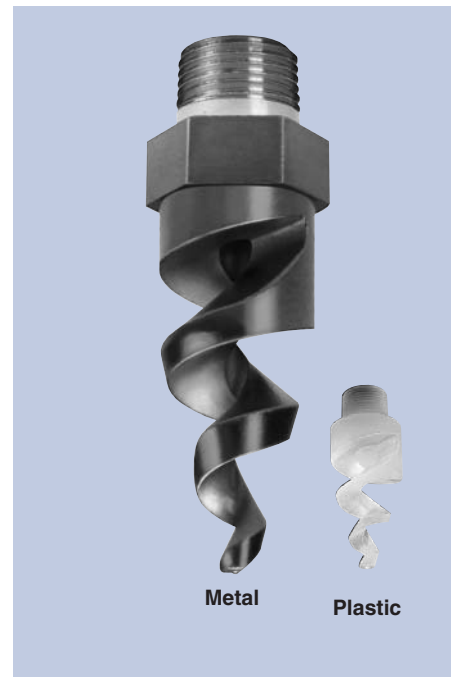
## Largest Free Passage

### DESIGN FEATURES

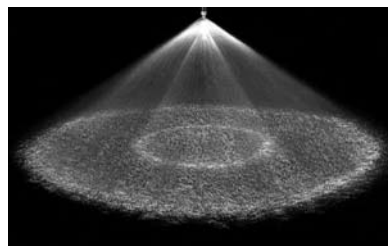
- Largest free passage in the original spiral nozzle invented by BETE and continuously improved!
- Passes particles equal to orifice size
- Clog-resistant
- One-piece, extra-heavy construction
- High energy efficiency
- Male connection

### SPRAY CHARACTERISTICS

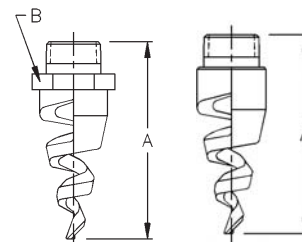
- Wide range of flow rates
  - Fine atomization
- Spray pattern:** Full Cone  
(Hollow Cone available by special order)
- Spray angles:** 90° and 120°
- Flow rates:** 9.67 to 10700 l/min



Full Cone 90° (XPN)



Full Cone 120° (XP)



Metal

Plastic

Dimensions are approximate. Check with BETE for critical dimension applications.

### TFXP Flow Rates and Dimensions

Full Cone, 90° (XPN) and 120° (XP) Spray Angles, 3/8" to 4" Pipe Sizes, BSP or NPT

Male Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR							Above 5 bar not recom. for PTFE	High Pressure Operation recom. for Metal Only		Approx. Free Pass. & Orifice Dia. (mm)	Approximate Dimensions (mm) For Metal Only		Wt. (kg)	
			0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	10 bar		20 bar	A		B	Metal	Plas.	
3/8	TF12	13.7	9.67	11.4	13.7	19.3	23.7	30.6	43.2	61.1	4.76	73.1	22.2	0.09	0.02		
	TF14	18.5	13.1	15.4	18.5	26.1	32.0	41.3	58.4	82.6	5.56	73.1	22.2				
	TF16	24.2	17.1	20.2	24.2	34.2	41.8	54.0	76.4	108	6.35	69.9	22.2				
	TF20	37.6	26.6	31.5	37.6	53.2	65.1	84.1	119	168	7.94	79.5	22.2				
1/2	TF24	54.9	38.8	46.0	54.9	77.7	95.1	123	174	246	9.53	88.1	26.9	0.19	0.03		
	TF28	75.2	53.2	62.9	75.2	106	130	168	238	336	11.1	88.9	26.9				
3/4	TF32	95.7	67.7	80.1	95.7	135	166	214	303	428	12.7	137	44.5	0.71	0.10		
1	TF40	153	108	128	153	216	264	341	483	683	15.9	133	50.8	0.71	0.11		
	TF48	216	153	181	216	306	375	484	685	968	19.1	168	50.8	0.93	0.21		
1 1/2	TF56	294	208	246	294	416	509	657	930	1315	22.2	177	63.5	1.81	0.27		
	TF64	385	272	322	385	545	667	861	1220	1720	25.4	176	63.5	1.11	0.24		
	TF72	438	309	366	438	619	758	978	1380	1960	28.6	188	63.5	1.27	0.24		
2	TF88	638	451	534	638	902	1110	1430	2020	2850	34.9	267	76.2	2.32	0.57		
	TF96	806	570	674	806	1140	1400	1800	2550	3600	38.1	279	76.2	2.86	0.57		
3	TF112	1167	825	976	1170	1650	2020	2610	3690	5220	44.5**	305	88.9	3.80	0.62		
	TF128	1547	1090	1290	1550	2190	2680	3460	4890	6920	50.8**	297	88.9	4.42	0.68		
4	TF160	2393	1690	2000	2390	3380	4140	5350	7570	10700	63.5**	305	114	7.08	0.85		

Flow Rate ( $l/min$ ) =  $K \sqrt{bar}$

\*\*Free passage is 38.1 mm

Large plastic spirals (above 2") should not be operated above 1 bar

Standard Materials: Brass, 316 Stainless Steel, PVC, Polypropylene and PTFE.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

TO ORDER: specify pipe size, connection type, nozzle number, spray angle, and material.

# TFXPW

## FireBēter Large Free Passage

### DESIGN FEATURES

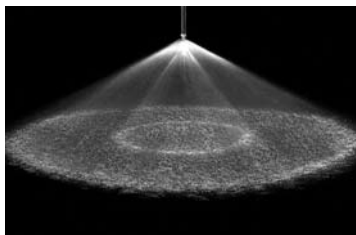
- Two-turn spiral nozzle
- Large free passage
- One-piece extra-heavy construction

### SPRAY CHARACTERISTICS

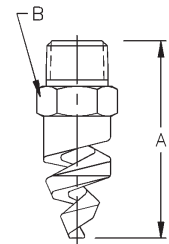
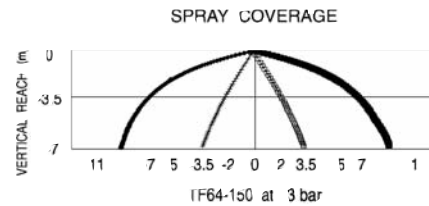
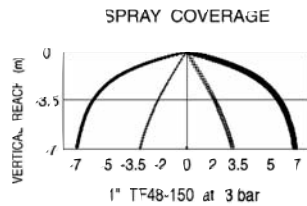
- Wide coverage
- Spray pattern:** Full Cone
- Spray angle:** 150°
- Flow rates:** 181 to 1720 l/min



SPIRAL



Full Cone 150°



Dimensions are approximate. Check with BETE for critical dimension applications.

### TFXPW Flow Rates and Dimensions

Full Cone, 150° Wide Spray Angle, 1" & 1-1/2" Pipe Size, BSP or NPT

Male Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR							Approx Free Pass Dia. (mm.)	Approx. Orifice Dia. (mm.)	Approx. Dim.(mm.)		Wt. (Kgs.)
			0.7 bar	1 bar	2 bar	3 bar	5 bar	10 bar	20 bar			A	B	
1	TF48XPW	217	181	217	306	375	484	685	969	19.4	24.0	165	57.2	0.94
1½	TF64XPW	385	322	385	545	668	862	1220	1720	25.8	31.0	171	63.5	1.11

$$\text{Flow Rate (l/min)} = K \sqrt{\text{bar}}$$

Standard Materials: Brass and 316 Stainless Steel.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

CALL 413-772-0846  
Call for the name of your nearest BETE representative.

# TF29-180

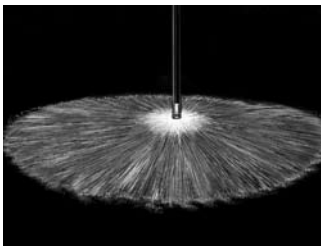
## FireBeter: Ultra-Wide Full Cone Coverage

### DESIGN FEATURES

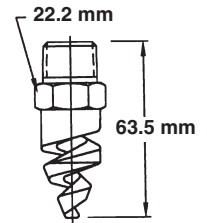
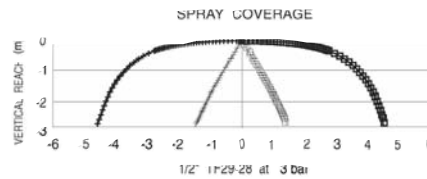
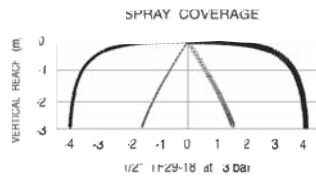
- Two-turn spiral
- Ultra-wide spray coverage very close to the nozzle
- One-piece design/no internal parts
- Excellent choice for deluge applications where there is little distance between nozzle and material being protected

### SPRAY CHARACTERISTICS

- Wide spray coverage
  - Fine atomization
- Spray patterns:** circular sheet with maximum coverage and excellent atomization
- Spray angle:** 180° extra-wide angle
- Flow rates:** 12.3 to 355 l/min



Full Cone 180°



Dimensions are approximate. Check with BETE for critical dimension applications.

### TF29-180 Flow Rates and Dimensions

Full Cone, 180° Extra Wide Spray Angle, 1/2" Pipe Size, BSP or NPT

Male Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR								Approx. Free Pass. & Orifice Dia. (mm)
			0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	10 bar	20 bar	
1/2	TF29-180-16	17.3	12.3	14.5	17.3	24.5	30.0	38.8	54.8	77.5	5.16
	TF29-180-18	27.4	19.4	22.9	27.4	38.7	47.4	61.2	86.5	122	6.35
	TF29-180-21	33.1	23.4	27.7	33.1	46.8	57.3	73.9	105	148	7.14
	TF29-180-24	43.3	30.6	36.3	43.3	61.3	75.1	96.9	137	194	8.33
	TF29-180-28	56.3	39.8	47.1	56.3	79.7	97.6	126	178	252	9.53
	TF29-180-32	79.4	56.1	66.4	79.4	112	137	177	251	355	11.1

$$\text{Flow Rate (l/min)} = K\sqrt{\text{bar}}$$

Standard Materials: Brass and 316 Stainless Steel.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

TO ORDER: specify pipe size, connection type, nozzle number, spray angle, and material.



# ST

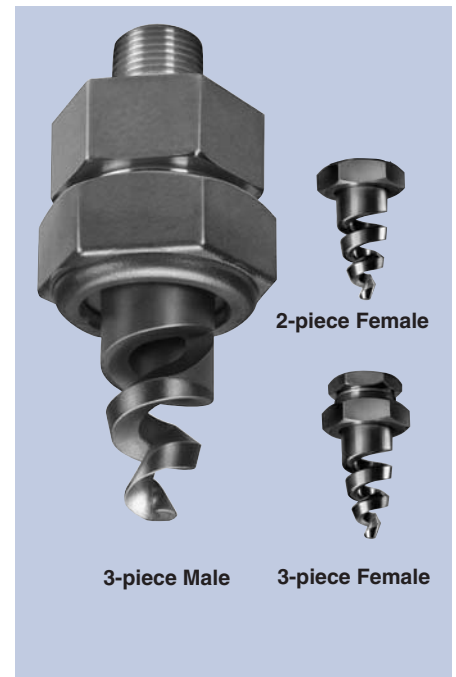
## Abrasion-Resistant

### DESIGN FEATURES

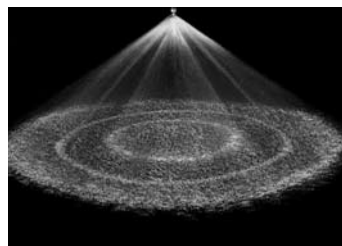
- Cobalt Alloy 6 or RBSC ceramic parts in high-wear areas
- High energy efficiency
- No internal parts
- Clog-resistant
- Male and female connections
- Flanged and special connections available as required

### SPRAY CHARACTERISTICS

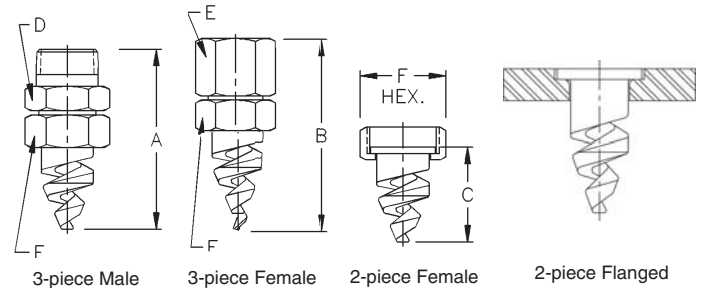
- Fine atomization
- Spray pattern:** Full Cone (Hollow Cone available by special order)
- Spray angles:** 90° and 120° standard
- Flow rates:** 2.26 to 10700 l/min (Higher flow rates available)



Full Cone 90° (FCN)



Full Cone 120° (FFC)



**Silicon carbide requests require review prior to quote/order acceptance. Please contact BETE for information.**

**Dimensions are approximate. Check with BETE for critical dimension applications.**

### ST Flow Rates and Dimensions

Full Cone, 90° (FCN or FFCN) and 120° (FC or FFC) Spray Angles, 1/4" to 4" Pipe Sizes, BSP or NPT

3 piece Male or Female Pipe Size	** 2 piece Female Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR								Approx. (mm)		Approximate Dimensions (mm)						Wt. (kg)
				0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	10 bar	20 bar	Orifice Dia.	Free Pass. Dia.	A	B	C	D	E	F	
1/4		ST6	3.19	2.26	2.67	3.19	4.5	5.5	7.1	10.1	14.3	2.38	2.38	63.5	65.0	30.0	17.5	17.5	20.6	0.09
		ST8	5.93	4.19	4.96	5.93	8.4	10.3	13.2	18.7	26.5	3.18	3.18	65.0	65.0	29.2	17.5	17.5	20.6	
		ST10	9.12	6.45	7.63	9.12	12.9	15.8	20.4	28.8	40.8	3.97	3.18	65.0	65.0	29.7	17.5	17.5	20.6	
3/8		ST12	13.7	9.67	11.4	13.7	19.3	23.7	30.6	43.2	61.1	4.76	3.18	74.7	74.7	33.3	23.9	23.9	28.7	0.14
		ST14	18.5	13.1	15.4	18.5	26.1	32.0	41.3	58.4	82.6	5.56	3.18	73.2	74.7	31.8	23.9	23.9	28.7	
		ST16	24.2	17.1	20.2	24.2	34.2	41.8	54.0	76.4	108	6.35	3.18	73.2	74.7	34.5	23.9	23.9	28.7	
		ST20	37.6	26.6	31.5	37.6	53.2	65.1	84.1	119	168	7.94	3.18	73.2	74.7	31.8	23.9	23.9	28.7	
3/4		ST24	54.9	38.8	46.0	54.9	77.7	95.1	123	174	246	9.53	4.76	90.4	95.3	30.2	35.1	35.1	38.1	0.28
		ST28	75.2	53.2	62.9	75.2	106	130	168	238	336	11.1	4.76	89.7	95.3	45.2	35.1	35.1	38.1	
		ST32	95.7	67.7	80.1	95.7	135	166	214	303	428	12.7	4.76	93.7	95.3	44.7	35.1	35.1	38.1	
1		ST40	153	108	128	153	216	264	341	483	683	15.9	6.35	116	116	61.0	47.8	44.5	50.8	0.57
		ST48	216	153	181	216	306	375	484	685	968	19.1	6.35	116	116	60.5	47.8	44.5	50.8	
1 1/2		ST56	294	208	246	294	416	509	657	930	1320	22.2	7.94	143	145	84.8	49.3	54.1	55.6	0.79
		ST64	385	272	322	385	545	667	861	1220	1720	25.4	7.94	143	145	85.6	49.3	54.1	55.6	
		ST72	438	309	366	438	619	758	978	1380	1960	28.6	7.94	143	145	83.8	49.3	54.1	55.6	
2	2 1/2 3	ST88	638	451	534	638	902	1110	1430	2020	2850	34.9	11.1	194	162	121	76.2	88.9	88.9	2.27
		ST96*	806	570	674	806	1140	1400	1800	2550	3600	38.1	11.1	229	210	143	92.2	102	102	3.18
3	3	ST112*	1170	826	977	1170	1650	2020	2610	3690	5220	44.5	14.3	251	168	92.2	102	102	4.08	
		ST128*	1540	1090	1290	1540	2180	2670	3450	4880	6900	50.8	14.3	270	185	92.2	102	102		
4	4	ST160*	2390	1690	2000	2390	3380	4140	5350	7570	10700	63.5	15.9	295	208	116	127	127	6.35	

Flow Rate (l/min) =  $K \sqrt{\text{bar}}$

\* Three turn nozzles    \*\* Parallel threads only

**Standard Materials: Base and Caps - 316 Stainless Steel; Tip - Cobalt Alloy 6 or RBSC Ceramic. (RBSC not available on nozzle numbers ST6 thru ST32).**

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

# STXP

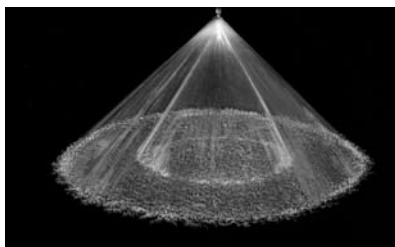
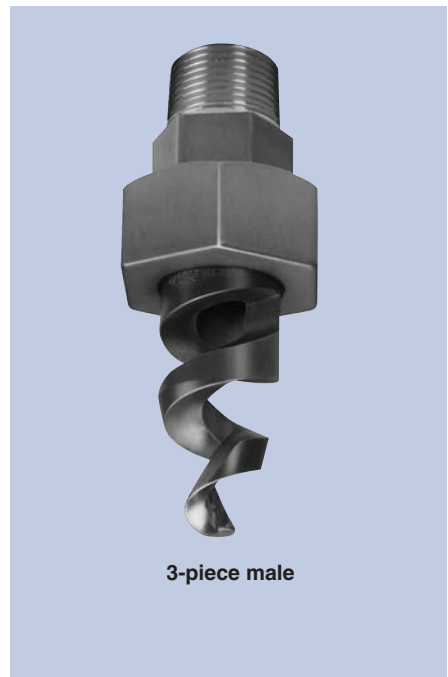
## Largest Free Passage

### DESIGN FEATURES

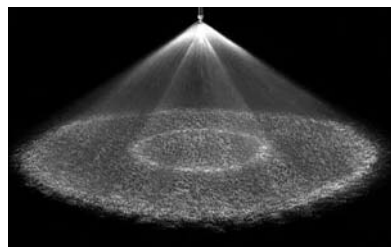
- Abrasion resistant
- Cobalt Alloy 6 or RBSC ceramic parts in high-wear areas
- High energy efficiency
- Largest free passage in spiral design
- Extra heavy, rugged construction
- Male and female connections
- Flanged and special connections available as required

### SPRAY CHARACTERISTICS

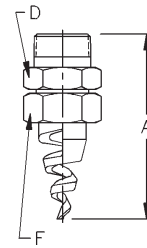
- Fine atomization
- Spray pattern:** Full Cone (Hollow Cone available by special order)
- Spray angles:** 90° and 120° standard
- Flow rates:** 9.67 to 10700 l/min (Higher flow rates available)



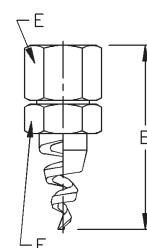
Full Cone 90° (XPN)



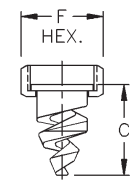
Full Cone 120° (XP)



3-piece Male



3-piece Female



2-piece Female

**Silicon carbide requests require review prior to quote/order acceptance. Please contact BETE for information.**

Dimensions are approximate. Check with BETE for critical dimension applications.

### STXP Flow Rates & Dimensions

Full Cone, 90° (XPN) and 120° (XP) Spray Angles, 3/8" to 4" Pipe Sizes, BSP or NPT

3 piece Male or Female Pipe Size	** 2 piece Female Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR								Approx. (mm) Orifice & Free Pass. Dia.	Approximate Dimensions (mm)						Wt. (kg) Metal	
				0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	10 bar	20 bar		A	B	C	D	E	F	Male	Fem.
3/8		ST12	13.7	9.67	11.4	13.7	19.3	23.7	30.6	43.2	61.1	4.83	100	85.9	54.1	35.1	35.1	38.1	0.23	0.23
		ST14	18.5	13.1	15.4	18.5	26.1	32.0	41.3	58.4	82.6	5.59	100	85.9	53.6	35.1	35.1	38.1		
		ST16	24.2	17.1	20.2	24.2	34.2	41.8	54.0	76.4	108	6.35	100	85.9	53.8	35.1	35.1	38.1		
		ST20	37.6	26.6	31.5	37.6	53.2	65.1	84.1	119	168	7.87	100	85.9	53.8	35.1	35.1	38.1		
3/4		ST24	54.9	38.8	46.0	54.9	77.7	95.1	123	174	246	9.65	114	96.8	68.1	30.2	30.2	44.5	0.51	0.51
		ST28	75.2	53.2	62.9	75.2	106	130	168	238	336	11.2	114	96.8	68.1	30.2	30.2	44.5		
		ST32	95.7	67.7	80.1	95.7	135	166	214	303	428	12.7	152	130	107	38.1	38.1	55.6		
1		ST40	153	108	128	153	216	264	341	483	683	16.0	160	135	103	47.8	47.8	69.9	1.36	1.19
		ST48	216	153	181	216	306	375	484	685	968	19.5	189	164	141	47.8	47.8	69.9		
1 1/2	2 1/2	ST56	294	208	246	294	416	509	657	930	1320	22.4	217	184	140	76.2	76.2	88.9	2.72	1.53
		ST64	385	272	322	385	545	667	861	1220	1720	25.4	217	184	145	76.2	76.2	88.9		
		ST72	438	309	366	438	619	758	978	1380	1960	28.7	224	194	146	76.2	76.2	88.9		
2	3	ST88	638	451	534	638	902	1110	1430	2020	2850	35.1	298	203	213	92.2	92.2	102	3.63	1.81
		ST96	806	570	674	806	1140	1400	1800	2550	3600	38.1	290	259	218	92.2	92.2	102		
3	3	ST112	1170	826	977	1170	1650	2020	2610	3690	5220	44.5*	301	300	217	92.2	102	102	4.54	2.67
		ST128	1540	1090	1290	1540	2180	2670	3450	4880	6900	50.8*	320	300	217	92.2	102	102		
4	4	ST160	2390	1690	2000	2390	3380	4140	5350	7570	10700	63.5*	330	330	254	127	127	127	5.44	4.54

Flow Rate ( $l/min$ ) =  $K \sqrt{\text{bar}}$  \*Free Passage is 38.1 mm \*\*Parallel threads only

**Standard Materials: Base and Caps - 316 Stainless Steel; Tip - Cobalt Alloy 6 or RBSC Ceramic. (RBSC not available on nozzle numbers ST6 thru ST32).**

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

TO ORDER: specify pipe size, connection type, nozzle number, spray angle, and material.

# LEM

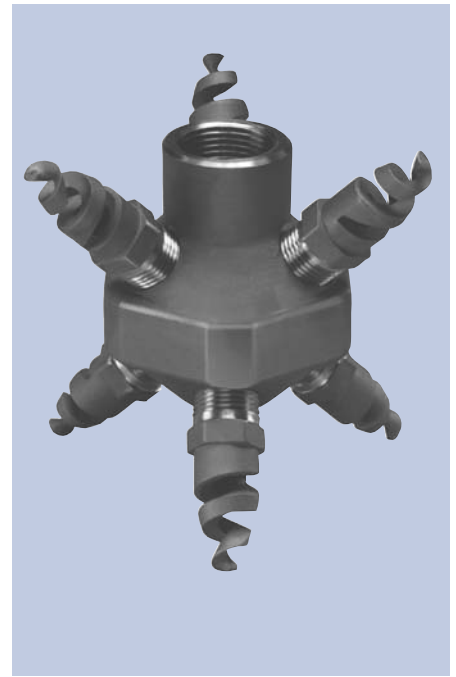
## Tank Washing Nozzle

### DESIGN FEATURES

- Each nozzle in the stationary cluster is a BETE clog-resistant spiral nozzle of the TF Series
- Can be supplied with various other BETE nozzles for any desired application
- Female connection

### SPRAY CHARACTERISTICS

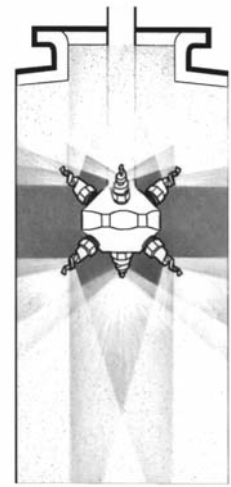
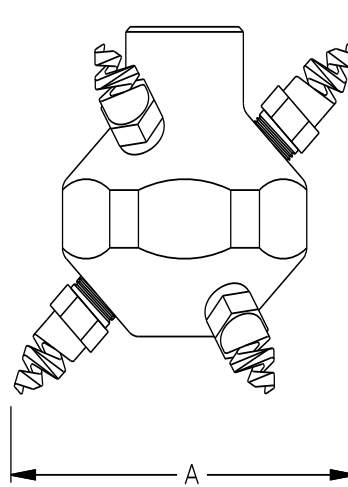
- Spherical omnidirectional coverage
  - Six nozzles arranged in cluster to project spray in all directions
- Flow rates:** 16.0 to 597 l/min  
(special flow rates available, special tips upon request)



SPIRAL

**LEM Coverage Chart**  
When Spraying at 3 - 4 BAR

Female Pipe Size	Nozzle Number	Scrubbing Diameter (mm)	Rinsing Diameter (mm)
3/4	LEM6	450	900
	LEM8	900	1800
	LEM10	1400	2700
1	LEM12	2000	4000
	LEM14	2100	4200
	LEM16	2200	4400
	LEM20	2400	4900



Typical LEM installation

Dimensions are approximate. Check with BETE for critical dimension applications.

### LEM Flow rates and dimensions

Spherical, 360° Spray Angle, 3/4" and 1" Pipe Sizes, BSP or NPT

Female Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR								Minimum Entrance Open. (mm) A	Weight	
			0.7 bar	1 bar	1.5 bar	2 bar	3 bar	4 bar	5 bar	7 bar		(kg) Metal	(g) Plas.
3/4	LEM6	19.1	16.0	19.1	23.4	27.1	33.2	38.3	42.8	50.6	114	1.02	170
	LEM8	36.5	30.5	36.5	44.7	51.6	63.2	72.9	81.5	96.5			
	LEM10	57.0	47.7	57.0	69.8	80.6	98.7	114	127	151			
1	LEM12	82.0	68.6	82.0	100	116	142	164	183	217	133	1.87	312
	LEM14	111	92.7	111	136	157	192	222	248	293			
	LEM16	144	120	144	176	203	249	287	321	380			
	LEM20	226	189	226	276	319	391	451	504	597			

$$\text{Flow Rate (l/min)} = K \sqrt{\text{bar}}$$

Standard Materials: Brass, 316 Stainless Steel, PVC and PTFE.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

CALL 413-772-0846  
Call for the name of your nearest BETE representative.

# N

## Fire Protection

### DESIGN FEATURES

- Simplicity of design
- One-piece/no internal parts
- Clog-resistant
- Three standard pipe sizes—1/2", 1", and 1-1/2"
- Male connection
- Factory Mutual, U.S. Coast Guard and Lloyd's Register approved models

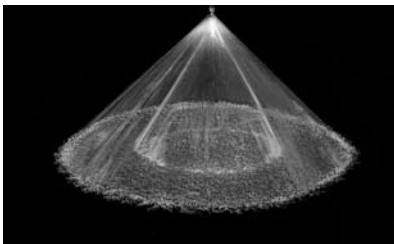
### SPRAY CHARACTERISTICS

- Two spray cones - an outer, wide-angle cone and a narrower, inner cone - combine to give full cone effect

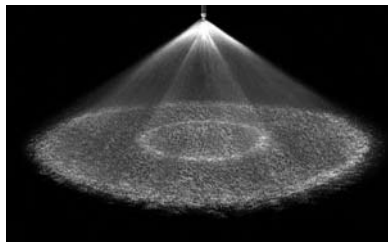
**Spray pattern:** Full Cone

**Spray angles:** 90° and 120° standard

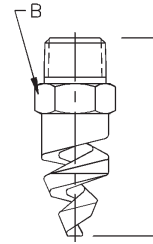
**Flow rates:** 9.67 to 1720 l/min



Full Cone 90°



Full Cone 120° (W)



Dimensions are approximate. Check with BETE for critical dimension applications.

### N Flow Rates and Dimensions

Full Cone, Medium 90° and Wide 120° (W) Spray Angles, 1/2" to 1 1/2" Pipe Sizes, BSP or NPT

Male Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR								Approx. (mm)		Approximate Dimensions (mm)		Wt. (g) Metal
			0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	10 bar	20 bar	Orifice Dia.	Free Pass. Dia.	A	B	
1/2	N1	13.7	9.67	11.4	13.7	19.3	23.7	30.6	43.2	61.1	4.76	3.18	63.5	22.4	85
	N2	24.2	17.1	20.2	24.2	34.2	41.8	54.0	76.4	108	6.35	3.18			
	N3	37.6	26.6	31.5	37.6	53.2	65.1	84.1	119	168	7.94	3.18			
	N4	54.9	38.8	46.0	54.9	77.7	95.1	123	174	246	9.53	4.76			
	N5	75.2	53.2	62.9	75.2	106	130	168	238	336	11.1	4.76			
	N6	95.7	67.7	80.1	95.7	135	166	214	303	428	12.7	4.76			
1	N6	95.7	67.7	80.1	95.7	135	166	214	303	428	12.7	4.76	92.2	35.1	241
	N7	153	108	128	153	216	264	341	483	683	15.9	6.35			
1 1/2	N8	216	153	181	216	306	375	484	685	968	19.1	6.35	111	50.8	765
	N9	294	208	246	294	416	509	657	930	1320	22.2	7.94			
	N10	385	272	322	385	545	667	861	1220	1720	25.4	7.94			

$$\text{Flow Rate (l/min)} = K \sqrt{\text{bar}}$$

**Standard Materials: Brass and 316 Stainless Steel.** All N series covers are available in Brass and Stainless Steel.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

TO ORDER: specify pipe size, connection type, nozzle number, spray angle, and material.



N6 nozzles protect a propane storage tank from fire and explosion.

### Fire Protection Approved

This **BETE** high-efficiency spiral was designed specifically with critical fire and explosion suppression applications in mind. These nozzles feature superior performance unequalled by traditional whirl nozzles.

### SUPERIOR PERFORMANCE CHARACTERISTICS

- Sprays composed of droplets 30% to 50% smaller than conventional designs at equivalent pressures
- Extraordinarily large surface area of spray enhances evaporation and cooling
- Rugged, compact design
- Multiple concentric cone spray, unique to spiral pattern, maximizes contact

### SUPERIOR FIRE/LOSS PREVENTION APPLICATIONS

- Gas wellhead protection
- Safeguarding ship-borne cargo
- Storage tank protection
- Secondary explosion protection in explosive, dusty environments
- Mitigation of HF and other toxic gas releases
- Roadway tunnel protection



All models  
Factory Mutual  
Approved



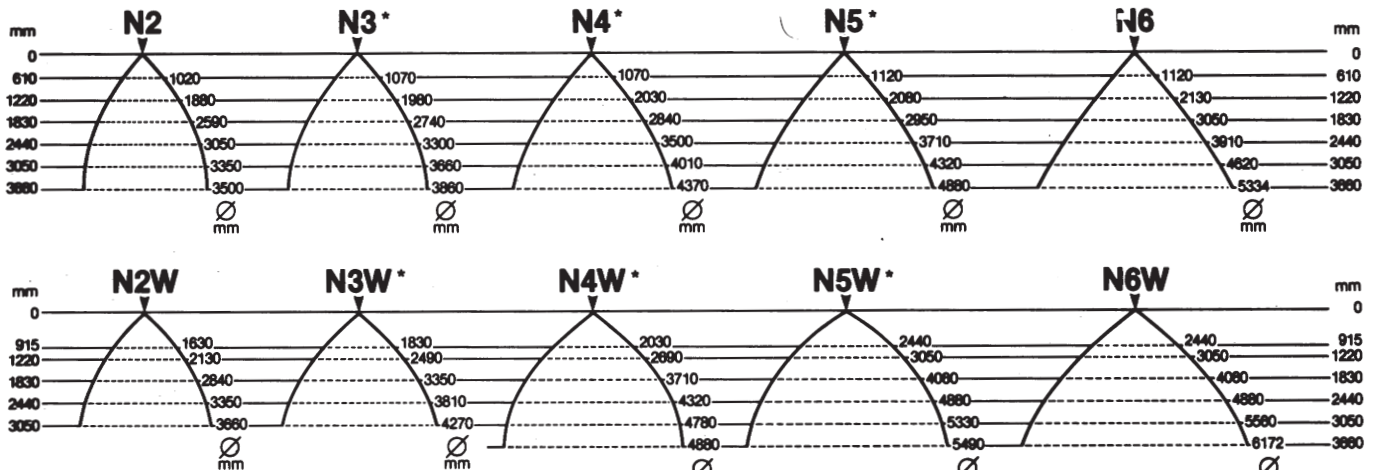
Certified for use  
on ships and  
offshore  
installations by  
Lloyd's Register



UL  
approved

TF 24 150° also available in Factory Mutual approved brass.

\*U.S. Coast Guard approved



CALL 413-772-0846  
Call for the name of your nearest BETE representative.

# L

## Low Flow

### DESIGN FEATURES

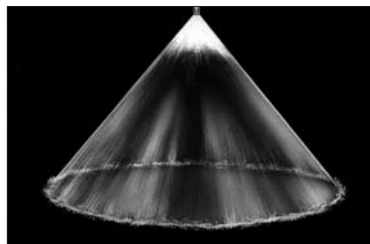
- A series of small spiral nozzles with orifice diameters of 1.02mm to 3.05mm
- Male connection

### SPRAY CHARACTERISTICS

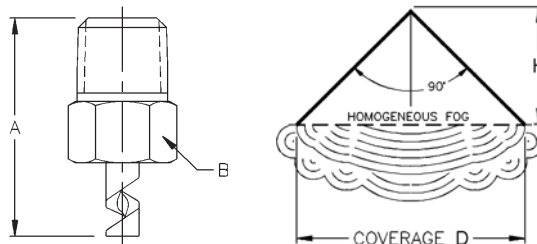
**Spray pattern:** Hollow Cone Fog, nearly as fine as P Series  
**Spray angles:** 90° standard (120° available by special order)  
**Flow rates:** 0.534 to 14.7 l/min



Metal



Hollow Cone 90°



Fog Pattern

Dimensions are approximate. Check with BETE for critical dimension applications.

### L Flow Rates

Hollow Cone, 90° Spray Angle, 1/8" and 1/4" Pipe Sizes, BSP or NPT

### L Dimensions BSP or NPT

Male Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR								High Pressure Operation recom. for Metal Only	Approx. Spray Dimensions (in.)		Male Pipe Size	Dimensions (mm)		Wt. (g) Metal
			0.7 bar	1 bar	1.5 bar	2 bar	3 bar	4 bar	5 bar	7 bar		Orifice Dia. (mm)	D		H	A	
1/8	L40	0.638	0.534	0.638	0.781	0.902	1.11	1.28	1.43	1.69	1.02	610	305	1/8"	28.4	14.3	17
	L48	0.912	0.76	0.91	1.12	1.29	1.58	1.82	2.04	2.41	1.22	690	345				
	L54	1.21	1.01	1.21	1.48	1.71	2.09	2.42	2.70	3.20	1.37	760	380				
1/4	L66	1.71	1.43	1.71	2.09	2.42	2.96	3.42	3.82	4.52	1.68	910	455	1/4"	33.3	14.3	21
	L80	2.46	2.06	2.46	3.01	3.48	4.26	4.92	5.50	6.51	2.03	1200	600				
	L120	5.54	4.63	5.54	6.78	7.83	9.59	11.1	12.4	14.7	3.05	1500	750				

$$\text{Flow Rate (l/min)} = K \sqrt{\text{bar}}$$

Standard Materials: Brass, 303 Stainless Steel, 316 Stainless Steel and PTFE (L40, L48, L54 not available in PTFE).

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

TO ORDER: specify pipe size, connection type, nozzle number, spray angle, and material.

# NCFL

## Flange Connection/Plastic Material

### DESIGN FEATURES

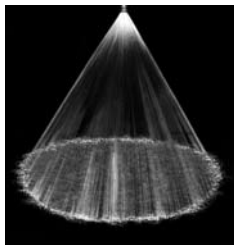
- Large internal passages
- Uniform spray coverage
- High flow rates with coarse atomization
- Variety of polymer materials available, offering high corrosion resistance
- For metal alloy nozzles refer to SC and TC pages 36, 37 and 35

### SPRAY CHARACTERISTICS

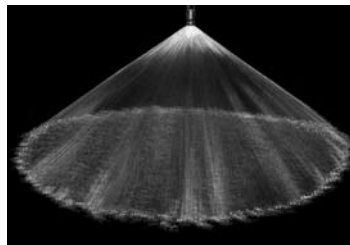
**Spray pattern:** Full Cone  
**Spray angles:** 60°, 90°, and 120°  
**Flow rates:** 350 to 19700 l/min  
 (Special flow rates available)



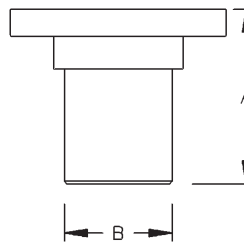
Plastic Flanged



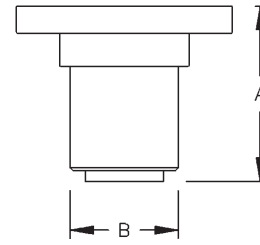
Full Cone 60° (N)



Full Cone 120° (W)



Flanged



Flanged 120°

Dimensions are approximate. Check with BETE for critical dimension applications.

### NCFL Flow Rates and Dimensions

Full Cone, Narrow 60° (N), Medium 90° (M) and Wide 120° (W) Spray Angles, Flanged Connection, BSP or NPT

Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR								Approx. Orifice Dia. (mm)	Approx. Free Pass. Dia. (mm)	Dim. (mm)		Wt. (kg) PVC
			0.2 bar	0.3 bar	0.4 bar	0.5 bar	0.7 bar	1 bar	1.5 bar	2 bar			A	B	
4	NCFL40140	746	350	424	485	539	631	746	903	1030	37.6	25.4	149	114	3.63
	NCFL40180	959	450	545	624	693	811	959	1160	1330	42.9	33.3			
	NCFL40250	1330	625	757	866	962	1130	1330	1610	1850	50.3	40.1			
6	NCFL60350	1860	876	1060	1213	1350	1580	1860	2260	2580	60.5	44.5	254	168	6.35
	NCFL60480	2560	1200	1450	1663	1850	2160	2560	3100	3540	69.9	50.0			
	NCFL60615	3280	1540	1860	2131	2370	2770	3280	3970	4540	79.0	42.2			
8	NCFL80665	3540	1660	2010	2300	2560	3000	3540	4290	4910	82.6	53.8	305	219	11.8
	NCFL80775	4130	1940	2350	2690	2980	3490	4130	5000	5720	89.4	60.5			
	NCFL80885	4720	2210	2680	3070	3410	3990	4720	5710	6530	95.3	66.5			
12	NCFL1201280	6820	3200	3870	4430	4930	5770	6820	8260	9450	114	73.2	457	323	31.8
	NCFL1201910	10200	4780	5780	6620	7350	8610	10200	12300	14100	140	82.6			
	NCFL1202665	14200	6670	8070	9230	10300	12000	14200	17200	19700	159	88.9			

$$\text{Flow Rate (l/min)} = K (\text{bar})^{0.47}$$

Standard Materials: PVC, Polypropylene and PTFE.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

CALL 413-772-0846  
Call for the name of your nearest BETE representative.

# NC

## Threaded Connection/Plastic Material



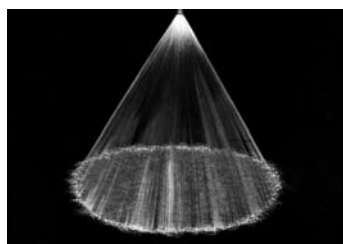
Male 120°

### DESIGN FEATURES

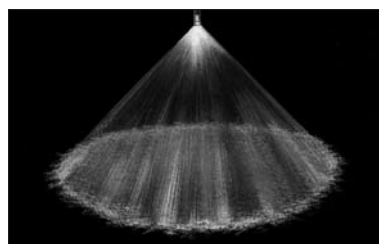
- Complete line of full cone nozzles made of plastic and some bar stock metal alloy materials
- Uniform coverage
- Male and female connections
- Flanged connection available in larger models—see NCFL (p.29)
- For metal alloy nozzles, refer to MaxiPass (pp. 39, 39), SC (pp. 36, 37), or TC (p. 35) Series

### SPRAY CHARACTERISTICS

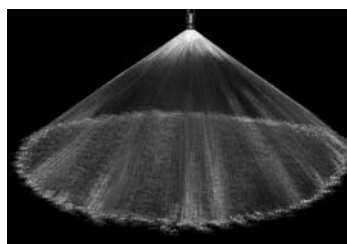
- High flow rates with coarse atomization
- Spray pattern:** Full Cone. For square patterns, please contact BETE.
- Spray angles:** 60°, 90°, and 120° standard
- Flow rates:** 7.50 to 8180 l/min (Higher flow rates available)



Full Cone 60° (N)



Full Cone 90° (M)



Full Cone 120° (W)

Dimensions are approximate. Check with BETE for critical dimension applications.

### NC Flow Rates and Dimensions

Full Cone, Narrow 60°(N), Medium 90°(M) and Wide 120° (W) Spray Angles, 3/4" to 6" Pipe Sizes, BSP or NPT

Male or Female Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR								Approx. Orifice Dia. (mm)	Approx. Free Pass. Dia. (mm)	Dimensions (mm)				Wt. Male PVC (g)
			0.2 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	7 bar			A	B	C	D	
3/4	NC 0703	16.0	7.50	11.5	13.5	16.0	22.1	26.8	34.1	39.9	6.35	4.06	44.5	28.4	53.8	38.1	28
	NC 0704	21.3	10.0	15.4	18.0	21.3	29.5	35.7	45.4	53.2	6.35	4.83					
	NC 0707	37.3	17.5	26.9	31.6	37.3	51.7	62.5	79.5	93.1	8.38	5.84					
1	NC 1009	48.0	22.5	34.6	40.6	48.0	66.4	80.39	102	120	9.65	6.35	55.6	34.9	63.5	44.5	35
	NC 1012	64.0	30.0	46.2	54.1	64.0	88.6	107	136	160	11.4	7.62					
1 1/4	NC 1214	74.6	35.0	53.9	63.1	74.6	103	125	159	186	11.9	8.64	82.6	44.5	82.6	50.8	106
	NC 1217	90.6	42.5	65.4	76.6	90.6	126	152	193	226	13.5	9.65					
1 1/2	NC 1516	85.3	40.0	61.6	72.1	85.3	118	143	182	213	12.7	9.65	108	50.8	108	63.5	191
	NC 1520	107	50.0	77.0	90.1	107	148	179	227	266	14.2	10.4					
	NC 1524	128	60.0	92.4	108	128	177	214	273	319	15.5	11.2					
2	NC 2017	90.6	42.5	65.4	76.6	91	126	152	193	226	13.5	9.65	148	63.5	148	76.2	361
	NC 2020	107	50.0	77.0	90.1	107	148	179	227	266	14.2	10.4					
	NC 2033	176	82.6	127	149	176	244	295	375	439	18.3	14.0					
	NC 2040	213	100	154	180	213	295	357	454	532	20.3	16.0					
	NC 2045	240	113	173	203	240	332	402	511	599	21.3	16.0					

$$\text{Flow Rate (l/min)} = K (\text{bar})^{0.47}$$

Standard Materials: PVC, Polypropylene, and PTFE.

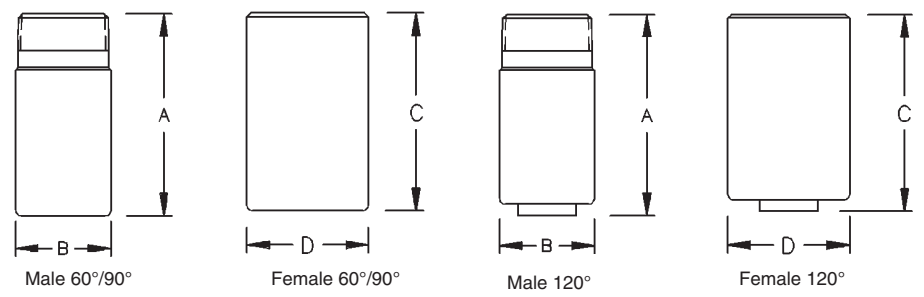
NOTE for PTFE nozzles: if operating temperature is to exceed 150° C or the operating pressure is to exceed the values listed in the table above, please contact BETE Applications Engineering for assistance.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.





Female 120°



Dimensions are approximate. Check with BETE for critical dimension applications.

**NC Flow Rates and Dimensions**  
 Full Cone, Narrow 60° (N), Medium 90° (M) and Wide 120° (W) Spray Angles, 3/4" to 6" Pipe Sizes, BSP

Male or Female Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR								Approx. Orifice Dia. (mm)	Approx. Free Pass. Dia. (mm)	Dimensions (mm)				Wt. Male PVC (kg)
			0.2 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	7 bar			A	B	C	D	
2	NC 2050	266	125	192	225	266	369	447	568	665	22.6	15.2	148	63.5	148	76.2	361
	NC 2060	320	150	231	270	320	443	536	681	23.9	16.0						
	NC 2065	346	163	250	293	346	480	581	738	25.4	17.0						
	NC 2070	373	175	269	316	373	517	625	795	26.7	17.3						
2 1/2	NC 2570	373	175	269	316	373	517	625	795	931	26.7	17.3	149	76.2	148	88.9	546
	NC 2580	426	200	308	361	426	591	715	909	1060	28.7	17.5					
	NC 2590	480	225	346	406	480	664	804	1020	1200	30.2	19.8					
3	NC 3058	309	145	223	261	309	428	518	659	772	24.1	16.0	149	88.9	148	102	645
	NC 3084	448	210	323	379	448	620	750	954	1120	29.7	22.4					
	NC 3096	512	240	369	433	512	709	858	1090	1280	28.4	24.1					
	NC 30117	624	293	450	527	624	864	1050	1330	1560	34.5	24.6					
4	NC 40125	666	313	481	563	666	923	1120	1420	1660	35.3	24.9	149	114	184	127	1320
	NC 40130	693	325	500	586	693	960	1160	1480	1730	35.3	24.9					
	NC 40180	959	450	693	811	959	1330	1610	2040	2390	42.9	33.3					
	NC 40250	1330	625	962	1130	1330	1850	2230	2840	3330	50.3	40.1					
6	NC 60350	1860	876	1350	1580	1860	2580	3130	3980	4660	60.5	43.2	241	168	279	178	3680
	NC 60480	2560	1200	1850	2160	2560	3540	4290	5450	6390	69.9	44.5					
	NC 60615	3280	1540	2370	2770	3280	4540	5490	6980	8180	79.0	50.0					

Flow Rate (l/min) = K (bar)<sup>0.47</sup>

Standard Materials: PVC, Polypropylene, and PTFE.

NOTE for PTFE nozzles: if operating temperature is to exceed 150° C or the operating pressure is to exceed the values listed in the table above, please contact BETE Applications Engineering for assistance.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

CALL 413-772-0846  
 Call for the name of your nearest BETE representative.

# NCJ

## Hollow Cone/Narrow Angle Injector



Metal

WHIRL

### DESIGN FEATURES

- Narrow spray angles
- High velocity
- Male and female connections
- Flanged connections available
- Available in plastic and metal alloys

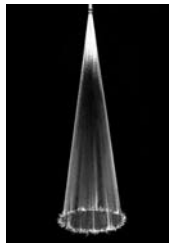
### SPRAY CHARACTERISTICS

- Spray is coarse and extremely hard-driving

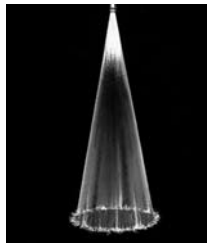
**Spray pattern:** Hollow Cone

**Spray angles:** 15°, 20° and 30°

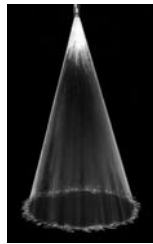
**Flow rates:** 23.1 to 4660 l/min  
(Special flow rates available)



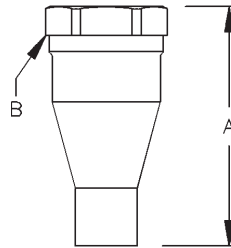
Hollow Cone 15°



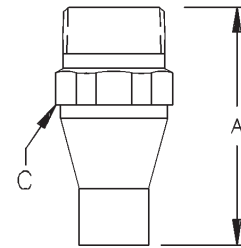
Hollow Cone 20°



Hollow Cone 30°



Female



Male

Dimensions are approximate. Check with BETE for critical dimension applications.

### NCJ Flow Rates and Dimensions

Hollow Cone, 15°, 20° and 30° Spray Angles, 3/4" to 6" Pipe Sizes, BSP or NPT

Male or Female Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR								Approx. Orifice Dia. (mm)	Dimensions for Metal Only (mm)			Wt. (kg)	
			0.5 bar	0.7 bar	1 bar	1.5 bar	2 bar	3 bar	5 bar	7 bar		A	B	C	PVC	Metal
3/4	NC 0706J	32.0	23.1	27.0	32.0	38.7	44.3	53.6	68.1	79.8	7.52	82.6	34.9	28.4	0.04	0.34
1	NC 1012J	64.0	46.2	54.1	64.0	77.4	88.6	107	136	160	10.3	88.9	44.5	35.1	0.06	0.45
1 1/4	NC 1218J	95.9	69.3	81.1	95.9	116	133	161	204	239	12.3	102	50.8	44.5	0.11	0.57
1 1/2	NC 1526J	139	100	117	139	168	192	232	295	346	15.1	127	63.5	50.8	0.20	1.02
2	NC 2048J	256	185	216	256	310	354	429	545	638	20.2	152	76.2	63.5	0.37	1.13
2 1/2	NC 2572J	384	277	325	384	464	532	643	818	958	24.6	178	82.6	76.2	0.62	2.61
3	NC 30105J	560	404	473	560	677	775	938	1190	1400	29.5	203	97.5	88.9	0.85	2.84
4	NC 40190J	1010	731	856	1010	1230	1400	1700	2160	2530	40.5	254	127	114	2.04	6.80
6	NC 60350J	1860	1380	1580	1860	2260	2580	3130	3980	4660	54.0	343	181	168	2.78	15.9

$$\text{Flow Rate (l/min)} = K (\text{bar})^{0.47}$$

Standard Materials: Brass, 316 Stainless Steel, PVC, Polypropylene and PTFE.

**NOTE for PTFE nozzles:** if operating temperature is to exceed 150° C or the operating pressure is to exceed the values listed in the table above, please contact BETE Applications Engineering for assistance.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

TO ORDER: specify pipe size, connection type, nozzle number, spray angle, and material.

# NCK

## Full Cone/Narrow Angle Injector

### DESIGN FEATURES

- Narrow spray angles
- High velocity
- Male and female connections
- Flanged connections available

### SPRAY CHARACTERISTICS

- Coarse and extremely hard-driving spray with even distribution
- Spray pattern:** Full Cone  
**Spray angles:** 15°, 20° and 30°  
**Flow rates:** 23.1 to 4660 l/min  
 (Special flow rates available)



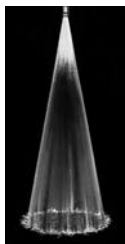
Plastic



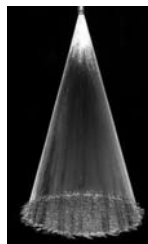
WHIRL



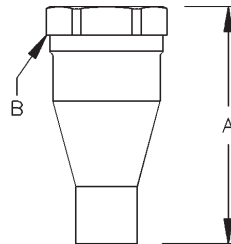
Full Cone 15°



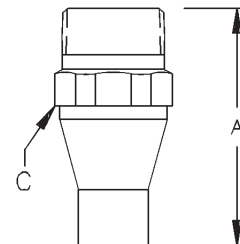
Full Cone 20°



Full Cone 30°



Female



Male

Dimensions are approximate. Check with BETE for critical dimension applications.

### NCK Flow Rates and Dimensions

Full Cone, 15°, 20° and 30° Spray Angles, 3/4" to 6" Pipe Sizes, BSP or NPT

Male or Female Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR								Approx. Orifice Dia. (mm)	Dimensions for Metal Only (mm)			Wt. (kg)	
			0.5 bar	0.7 bar	1 bar	1.5 bar	2 bar	3 bar	5 bar	7 bar		A	B	C	PVC	Metal
3/4	NC 0706K	32.0	23.1	27.0	32.0	38.7	44.3	53.6	68.1	79.8	7.52	82.6	34.9	28.4	0.04	0.34
1	NC 1012K	64.0	46.2	54.1	64.0	77.4	88.6	107	136	160	10.3	88.9	44.5	35.1	0.06	0.45
1 1/4	NC 1218K	95.9	69.3	81.1	95.9	116	133	161	204	239	12.3	102	50.8	44.5	0.11	0.57
1 1/2	NC 1526K	139	100	117	139	168	192	232	295	346	15.1	127	63.5	50.8	0.20	1.02
2	NC 2048K	256	185	216	256	310	354	429	545	638	20.2	152	76.2	63.5	0.37	1.13
2 1/2	NC 2572K	384	277	325	384	464	532	643	818	958	24.6	178	82.6	76.2	0.62	2.61
3	NC 30105K	560	404	473	560	677	775	938	1190	1400	29.5	203	97.5	88.9	0.85	2.84
4	NC 40190K	1010	731	856	1013	1220	1400	1697	2160	2530	40.5	254	127	114	2.04	6.80
6	NC 60350K	1860	1380	1580	1860	2260	2580	3126	3980	4660	54.0	343	181	168	2.78	15.9

$$\text{Flow Rate (l/min)} = K (\text{bar})^{0.47}$$

Standard Materials: Brass, 316 Stainless Steel, PVC, Polypropylene and PTFE.

NOTE for PTFE nozzles: if operating temperature is to exceed 150° C or the operating pressure is to exceed the values listed in the table above, please contact BETE Applications Engineering for assistance.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

CALL 413-772-0846  
 Call for the name of your nearest BETE representative.

# NCS

## Stubbies/Minimize Head Space

### DESIGN FEATURES

- Takes no more room than pipe plug, yet performs like full-size nozzle
- Small projection
- Can be used with standard pipe couplings to form female nozzle, with elbows to form right angle nozzle, or with tees or crosses for multiple installations
- Male connection
- Metal and plastic materials

### SPRAY CHARACTERISTICS

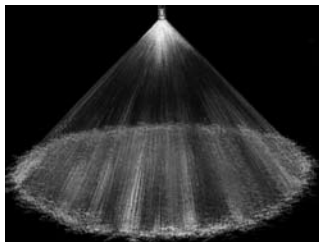
- Spray pattern:** Full Cone
- Spray angles:** 70°, 90° and 110° standard
- Flow rates:** 7.50 to 1596 l/min (Special flow rates available)



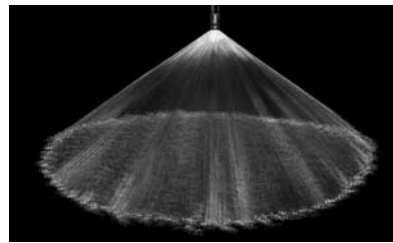
Plastic



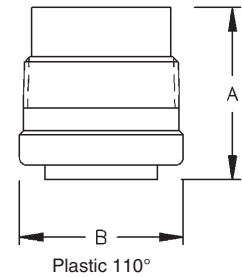
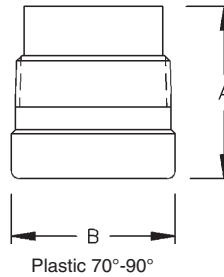
Metal



Full Cone 90° (M)



Full Cone 110° (W)



Dimensions are approximate. Check with BETE for critical dimension applications.

### NCS Flow Rates and Dimensions

Full Cone, Narrow 70° (N), Medium 90° (M) and Wide 110° (W) Spray Angles, 1" to 4" Pipe Sizes, BSP or NPT

Male Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR								Approx. Orifice Dia. (mm)	Approx. Free Pass. Dia. (mm)	Dim. (mm)		Wt. PVC (g)
			0.2 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	7 bar			A	B	
1	NCS1003	16.0	7.50	11.5	13.5	16.0	22.1	26.8	34.1	39.9	5.59	3.81	47.6	35.1	43
	NCS1005	26.6	12.5	19.2	22.5	26.6	36.9	44.7	56.8	66.5	7.11	5.59			
	NCS1007	37.3	17.5	26.9	31.6	37.3	51.7	62.5	79.5	93.1	8.38	5.33			
1 1/2	NCS1510	53.3	25.0	38.5	45.1	53.3	73.83	89.3	114	133	10.4	7.11	60.3	50.8	85
	NCS1513	69.3	32.5	50.0	58.6	69.3	95.97	116	148	173	11.4	9.65			
	NCS1516	85.3	40.0	61.6	72.1	85.3	118	143	182	213	12.7	9.14			
2	NCS2020	107	50.0	77.0	90.1	107	148	179	227	266	14.2	10.4	66.7	63.5	170
	NCS2025	133	62.5	96.2	113	133	185	223	284	333	16.3	11.4			
	NCS2030	160	75.0	115	135	160	221	268	341	399	17.5	13.2			
	NCS2035	187	87.6	135	158	187	258	313	397	466	19.1	14.0			
2 1/2	NCS2540	213	100	154	180	213	295	357	454	532	20.3	16.0	76.2	76.2	255
	NCS2545	240	113	173	203	240	332	402	511	599	21.3	16.0			
	NCS2550	266	125	192	225	266	369	447	568	665	22.6	16.0			
3	NCS3060	320	150	231	270	320	443	536	681	798	23.9	16.0	84.1	88.9	383
	NCS3070	373	175	269	316	373	517	625	795	931	26.7	14.7			
	NCS3085	453	213	327	383	453	628	759	965	1131	29.5	16.8			
4	NCS40100	533	250	385	451	533	738	893	1136	1330	31.8	24.1	102	114	567
	NCS40120	640	300	462	541	640	886	1072	1363	1596	35.1	25.4			

$$\text{Flow Rate (l/min)} = K (\text{bar})^{0.47}$$

Standard Materials: Brass, 316 Stainless Steel, Polypropylene, PVC and PTFE.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

# TC

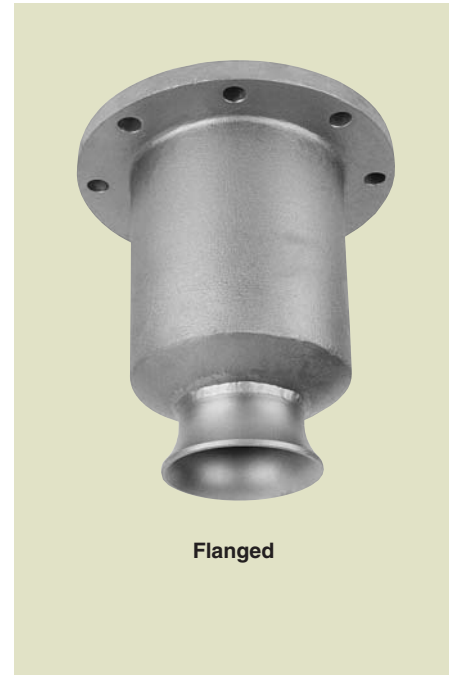
## High Flow Rate/Metal Alloy Line

### DESIGN FEATURES

- One-piece body with integral vanes
- Male, female and flanged connections available

### SPRAY CHARACTERISTICS

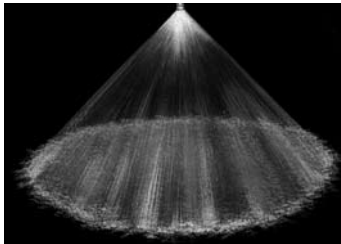
- Extremely high flow rates
- Spray pattern:** Uniform Full Cone  
**Spray angles:** 60°, 90°, and 120°  
**Flow rates:** 976 to 36100 L/min  
 (Special flow rates available)



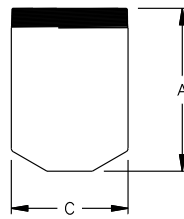
Flanged



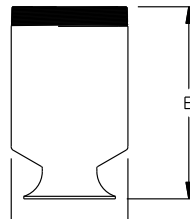
WHIRL



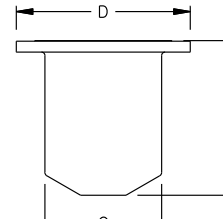
Full Cone 90° (M)



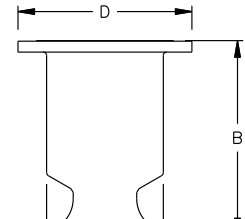
Male 60°/90°



Male 120°



60°/90° Flanged



120° Flanged

Dimensions are approximate. Check with BETE for critical dimension applications.

### TC Flow Rates and Dimensions

Full Cone, Narrow 60° (N), Medium 90°(M) and Wide 120°(W) Spray Angles, 6" to 12" Pipe Sizes, BSP or NPT, 12" Flanged

Male or Female Pipe Size	Nozzle Number	Available Spray Angles	K Factor	LITERS PER MINUTE @ BAR								Approx. Free Pass. Dia. (mm)	Dimensions (mm)				Wt. (kg)
				0.1 bar	0.3 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar		A	B	C	D	
6	TC 532	60° 90° 120°	2820	976	1620	2050	2390	2820	3870	4670	5900	44.5	259		168		11.3
	TC 588	90° 120°	3110	1080	1790	2260	2640	3110	4280	5160	6520		259		168		
	TC 827	90° 120°	4380	1520	2520	3180	3710	4380	6020	7250	9180		260	313	168		
8	TC 962	60° 90° 120°	5090	1770	2930	3700	4320	5090	7000	8440	10700	52.3	324		219		18.1
	TC 1120	90° 120°	5930	2060	3410	4310	5030	5930	8150	9820	12400		324		389 219		
	TC 1260	60° 90° 120°	6670	2310	3830	4850	5660	6670	9170	11100	14000		324		389 219		
	TC 1480	90° 120°	7830	2720	4500	5690	6650	7830	10800	13000	16400		389		219		
<b>Flanged Connection</b>																	
6	TCFL532	60° 90° 120°	2820	976	1620	2050	2390	2820	3870	4670	5900	44.5	238		168 279		27.2
	TCFL588	90° 120°	3110	1080	1790	2260	2640	3110	4280	5160	6520		238		168 279		
	TCFL827	90° 120°	4380	1520	2520	3180	3710	4380	6020	7250	9180		238	292	168 279		
8	TCFL962	60° 90° 120°	5090	1770	2930	3700	4320	5090	7000	8440	10700	52.3	303		219 343		38.6
	TCFL1120	90° 120°	5930	2060	3410	4300	5030	5930	8150	9820	12400		303		373 219 343		
	TCFL1260	60° 90° 120°	6670	2310	3830	4850	5660	6670	9170	11100	14000		303		373 219 343		
	TCFL1480	90° 120°	7830	2720	4500	5690	6650	7830	10800	13000	16400		303		373 219 343		
12	TCFL2070	60° 90°	11000	3800	6300	7960	9300	11000	15100	18200	23000	57.2	432		483		72.6
	TCFL2360	90°	12400	4310	7150	9040	10600	12400	17100	20600	26100		432		483		
	TCFL2510	90° 120°	13300	4610	7630	9660	11300	13300	18300	22000	27800		432		543 323 483		
	TCFL2660	90° 120°	14100	4880	8090	10200	11900	14100	19400	23300	29500		432		543 323 483		
	TCFL2960	90° 120°	15700	5430	9000	11400	13300	15700	21500	26000	32800		432		543 323 483		
	TCFL3250	90°	17200	5960	9880	12500	14600	17200	23700	28500	36100		432		483		

Flow Rate ( $L_{min}$ ) =  $K (bar)^{0.46}$

Standard Materials: 316 Stainless Steel.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

# SC

## Metal Alloy Line

### DESIGN FEATURES

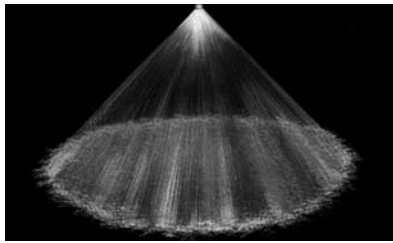
- Complete line of full cone nozzles made in cast metal alloys
- Internal removable vane
- Male and female connections
- Flanged connections available
- For plastic nozzles, see NC (pp. 30, 31), or MaxiPass (pp. 38, 39)

### SPRAY CHARACTERISTICS

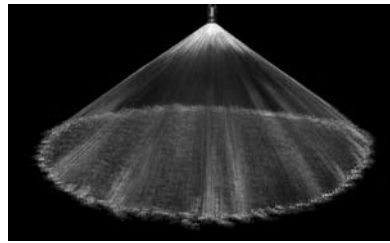
- **Spray pattern:** Full Cone with uniform distribution. For square spray patterns, please contact BETE.
- **Spray angles:** 60°, 90°, and 120°
- **Flow rates:** 6.25 to 8180 l/min



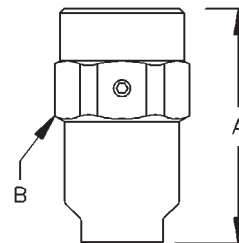
Male



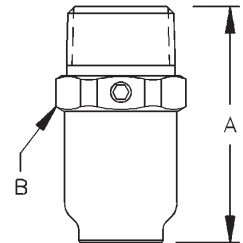
Full Cone 90°(M)



Full Cone 120° (W)



60° / 90° / 120° Female



60° / 90° / 120° Male

Dimensions are approximate. Check with BETE for critical dimension applications.

### SC Flow Rates & Dimensions

Full Cone, Narrow 60° (N), Medium 90° (M) and Wide 120° (W) Spray Angles, 3/4" to 6" Pipe Sizes, BSP or NPT

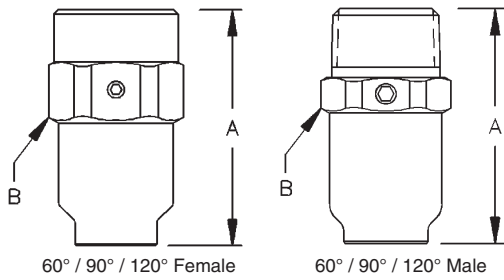
Male or Female Pipe Size	Nozzle Number	Available Spray Angles			K Factor	LITERS PER MINUTE @ BAR							Approx. Orifice Dia. (mm)	Approx. Free Pass. Dia. (mm)	Dim. (mm)		Wt. (kg) Metal	
		60°	90°	120°		0.2 bar	0.3 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar			7 bar	A		B
3/4	SC 2.5	60°	90°		13.3	6.25	7.57	11.3	13.3	18.5	22.3	28.4	33.3	4.76		50.8	31.0	0.23
	SC 3	60°	90°	120°	16.0	7.50	9.08	13.5	16.0	22.1	26.8	34.1	39.9	5.16				
	SC 4	60°	90°	120°	21.3	10.0	12.1	18.0	21.3	29.5	35.7	45.4	53.2	7.14	4.76			
	SC 6		90°	120°	32.0	15.0	18.2	27.0	32.0	44.3	53.6	68.1	79.8	7.54				
	SC 7		90°	120°	37.3	17.5	21.2	31.6	37.3	51.7	62.5	79.5	93.1	8.89				
1	SC 4.2	60°	90°		22.4	10.5	12.7	18.9	22.4	31.0	37.5	47.7	55.9	6.35	6.35	73.2	38.1	0.36
	SC 7	60°	90°	120°	37.3	17.5	21.2	31.6	37.3	51.7	62.5	79.5	93.1	8.33	7.94			
	SC 8	60°	90°	120°	42.6	20.0	24.2	36.1	42.6	59.1	71.5	90.9	106	8.89	7.94			
	SC 9	60°	90°	120°	48.0	22.5	27.2	40.6	48.0	66.4	80.4	102	120	10.2	7.94			
	SC 10	60°	90°	120°	53.3	25.0	30.3	45.1	53.3	73.8	89.3	114	133	10.7	7.94			
	SC 11	60°	90°	120°	58.6	27.5	33.3	49.6	58.6	81.2	98.3	125	146	11.2	7.94			
1 1/4	SC 12		90°	120°	64.0	30.0	36.3	54.1	64.0	88.6	107	136	160	11.7	7.94	88.9	47.6	0.59
	SC 6	60°	90°		32.0	15.0	18.2	27.0	32.0	44.3	53.6	68.1	79.8	7.62	7.62			
	SC 10	60°	90°		53.3	25.0	30.3	45.1	53.3	73.8	89.3	114	133	9.92	9.53			
	SC 12	60°	90°	120°	64.0	30.0	36.3	54.1	64.0	88.6	107	136	160	10.7	9.53			
	SC 14	60°	90°	120°	74.6	35.0	42.4	63.1	74.6	103	125	159	186	11.7	9.53			
	SC 16	60°	90°	120°	85.3	40.0	48.4	72.1	85.3	118	143	182	213	12.3	9.53			
SC 17	60°	90°	120°	90.6	42.5	51.5	76.6	90.6	126	152	193	226	13.5	9.53	88.9	47.6	0.59	
	SC 20		90°	120°	107	50.0	60.5	90.1	107	148	179	227	266	15.9				9.53

$$\text{Flow Rate (l/min)} = K (\text{bar})^{0.47}$$

Standard Materials: Brass, Cast Iron, Carbon Steel and 316 Stainless Steel.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

TO ORDER: specify pipe size, connection type, nozzle number, spray angle, and material.



Dimensions are approximate. Check with BETE for critical dimension applications.

### SC Flow Rates & Dimensions

Full Cone, Narrow 60° (N), Medium 90° (M) and Wide 120° (W) Spray Angles, 3/4" to 6" Pipe Sizes, BSP or NPT

Male or Female Pipe Size	Nozzle Number	Available Spray Angles 60° 90° 120°	K Factor	LITERS PER MINUTE @ BAR								Approx. Orifice Dia. (mm)	Approx. Free Pass. Dia. (mm)	Dim. (mm)		Wt. (kg) Metal
				0.2 bar	0.3 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	7 bar			A	B	
1 1/2	SC 10	60° 90°	53.3	25.0	30.3	45.1	53.3	73.8	89.3	114	133	9.92	9.53	98.6	55.6	0.82
	SC 16	60° 90° 120°	85.3	40.0	48.4	72.1	85.3	118	143	182	213	13.5	9.53			
	SC 20	60° 90° 120°	107	50.0	60.5	90.1	107	148	179	227	266	14.3	10.3			
	SC 24	60° 90° 120°	128	60.0	72.6	108	128	177	214	273	319	15.9	10.3			
	SC 29	90° 120°	155	72.5	87.8	131	155	214	259	329	386	17.5	10.3			
	SC 30	90° 120°	160	75.0	90.8	135	160	221	268	341	399	19.1	10.3			
2	SC 17	60° 90°	90.6	42.5	51.5	76.6	90.6	126	152	193	226	12.3	12.3	130	69.9	1.50
	SC 30	60° 90° 120°	160	75.0	90.8	135	160	221	268	341	399	16.3	14.3			
	SC 35	60° 90° 120°	187	87.6	106	158	187	258	313	397	466	18.3	14.3			
	SC 40	60° 90° 120°	213	100	121	180	213	295	357	454	532	19.8	14.3			
	SC 47	60° 90° 120°	251	118	142	212	251	347	420	534	625	24.6	14.3			
	SC 50	60° 90° 120°	266	125	151	225	266	369	447	568	665	27.9	14.3			
	SC 60	90° 120°	320	150	182	270	320	443	536	681	798	29.0	19.1			
2 1/2	SC 25	60° 90°	133	62.5	75.7	113	133	185	223	284	333	15.5	15.5	160	82.6	2.95
	SC 50	60° 90°	266	125	151	225	266	369	447	568	665	22.1	19.1			
	SC 60	60° 90° 120°	320	150	182	270	320	443	536	681	798	24.4	19.1			
	SC 70	60° 90° 120°	373	175	212	316	373	517	625	795	931	27.2	19.1			
	SC 80	60° 90° 120°	426	200	242	361	426	591	715	909	1060	29.2	19.1			
	SC 90	90° 120°	480	225	272	406	480	664	804	1020	1200	32.3	19.1			
3	SC 42	60° 90°	224	105	127	189	224	310	375	477	559	19.1	19.1	182	95.3	4.26
	SC 58	60° 90°	309	145	176	261	309	428	518	659	772	22.9	22.9			
	SC 80	60° 90° 120°	426	200	242	361	426	591	715	909	1060	27.9	25.4			
	SC 90	60° 90° 120°	480	225	272	406	480	664	804	1020	1200	30.6	25.4			
	SC 95	60° 90° 120°	506	238	288	428	506	701	849	1080	1260	28.6	25.4			
	SC 100	60° 90° 120°	533	250	303	451	533	738	893	1140	1330	34.1	25.4			
	SC 117	60° 90° 120°	624	293	354	527	624	864	1050	1330	1560	36.1	25.4			
	SC 120	60° 90° 120°	640	300	363	541	640	886	1070	1360	1600	38.1	25.4			
	SC 135	90° 120°	720	338	409	608	720	997	1210	1530	1800	41.7	25.4			
4	SC 125	60° 90°	666	313	378	563	666	923	1120	1420	1660	34.3		219	121	7.17
	SC 130	60° 90°	693	325	393	586	693	960	1160	1480	1730	35.1				
	SC 160	60° 90°	853	400	484	721	853	1180	1430	1820	2130	40.6				
	SC 180	60° 90° 120°	959	450	545	811	959	1330	1610	2040	2390	43.7	33.7			
	SC 188	60° 90° 120°	1000	470	569	847	1000	1390	1680	2140	2500	42.9				
	SC 200	60° 90° 120°	1070	500	605	901	1070	1480	1790	2270	2660	47.6				
	SC 210	60° 90° 120°	1120	525	636	947	1120	1550	1880	2390	2790	51.6				
	SC 250	90° 120°	1330	625	757	1130	1330	1850	2230	2840	3330	57.0				
6	SC 350	60° 90° 120°	1860	876	1060	1580	1860	2580	3130	3980	4660	66.0	35.1	*	*	*
	SC 480	90° 120°	2560	1200	1450	2160	2560	3540	4290	5450	6390	71.1	42.9	*	*	*
	SC 615	90° 120°	3280	1540	1860	2770	3280	4540	5490	6980	8180	76.2	42.9	*	*	*

Flow Rate ( $l_{min}$ ) =  $K (bar)^{0.47}$

\* Dimensions vary with spray angle ordered, please call for dimensions and weights

Standard Materials: Brass, Cast Iron, Carbon Steel and 316 Stainless Steel.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.



# MaxiPass™



Wide Angle Metal

## Maximum Free Passage

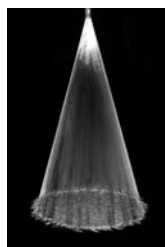
### DESIGN FEATURES

- Ultimate clog-resistant design with largest free passage available in a full cone nozzle
- Two unique S-shaped internal vanes allow free passage of particles
- High energy efficiency
- Easily handles dirty, lumpy liquids
- Male and female connections
- Flanged connection available
- U.S. Patent

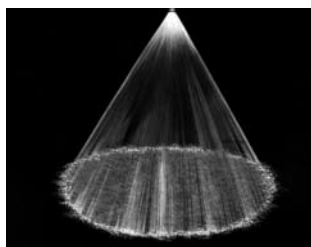
### SPRAY CHARACTERISTICS

- High reliability spray performance under the most difficult conditions
- Spray pattern:** Full Cone\* (Square patterns to special order)
- Spray angles:** 30°, 60°, 90° and 120°
- Flow rates:** 2.60 to 3540 L/min (Flow rates up to 17,000 L/min available; call BETE Applications Engineering for details.)

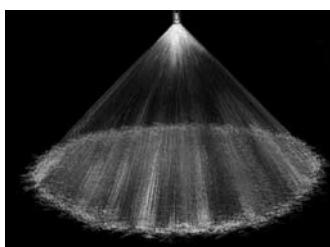
Design pressure 1.4 bar. Spray pattern data varies with pressure. Call BETE with any questions.



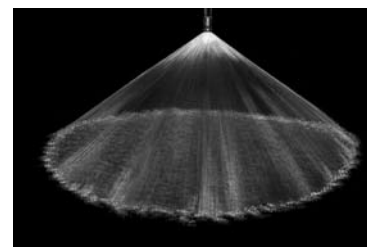
Full Cone 30° (NN)



Full Cone 60° (N)



Full Cone 90° (M)



Full Cone 120° (W)

Dimensions are approximate. Check with BETE for critical dimension applications.

### MaxiPass Flow Rates and Dimensions

Full Cone, 30° (NN), 60° (N), 90° (M) and 120° (W) Spray Angles, 3/8" to 4" Pipe Sizes, BSP or NPT

Male or Female Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR								Approx. Free Passage Dia. (mm)	Approx. Dimensions (mm)					Wt.** (kg) Metal	
			0.2 bar	0.3 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar		Overall Length						
												30° A	60° A	90° A	120° A	B		
3/8	MP125	5.53	2.60	3.14	3.99	4.68	5.53	7.66	9.27	11.8	3.18	76.2	38.1	38.1	38.1	22.2		0.09
	MP156	8.79	4.13	4.99	6.35	7.43	8.79	12.2	14.7	18.7	3.97							0.09
	MP187	12.7	5.96	7.21	9.17	10.7	12.7	17.6	21.3	27.1	4.76							0.07
1/2	MP187	12.7	5.96	7.21	9.17	10.7	12.7	17.6	21.3	27.1	4.76	102	47.6	47.6	47.6	25.4		0.13
	MP218	20.2	9.48	11.5	14.6	17.1	20.2	28.0	33.9	43.0	5.56							0.11
	MP250	22.7	10.7	12.9	16.4	19.2	22.7	31.4	38.0	48.4	6.35							0.11
3/4	MP281	27.9	13.1	15.8	20.1	23.6	27.9	38.6	46.8	59.4	7.14	102	63.5	60.3	63.5	31.8		0.23
	MP312	33.8	15.9	19.2	24.4	28.6	33.8	46.8	56.6	72.0	7.94							0.23
	MP343	41.4	19.4	23.5	29.9	35.0	41.4	57.3	69.4	88.2	8.73							0.20
	MP375	48.8	22.9	27.7	35.2	41.3	48.8	67.6	81.8	104	9.53							0.20
1	MP375	48.8	22.9	27.7	35.2	41.3	48.8	67.6	81.8	104	9.53	111	74.6	74.6	74.6	38.1		0.35
	MP406	58.5	27.5	33.2	42.2	49.2	58.5	81.0	98.0	125	10.3							0.33
	MP437	68.4	32.1	38.8	49.4	57.8	68.4	94.7	115	146	11.1							0.33
1 1/4	MP437	68.4	32.1	38.8	49.4	57.8	68.4	94.7	115	146	11.1	137	85.9	85.9	85.9	50.8		0.61
	MP500	87.9	41.3	49.9	63.5	74.3	87.9	122	148	187	12.7							0.61
	MP531	97.6	45.8	55.4	70.5	82.5	97.6	135	164	208	13.5							0.61
	MP562	107	50.2	60.8	77.3	90.5	107	148	179	228	14.3							0.61
1 1/2	MP562	107	50.2	60.8	77.3	90.5	107	148	179	228	13.97	184	111	111	111	57.2		0.91
	MP593	122	57.3	69.3	88.1	103	122	169	205	260	15.1							0.91
	MP625	130	61.0	73.8	93.9	110	130	180	218	277	15.9							0.91
	MP656	158	74.2	89.7	114	134	158	219	265	337	16.7							0.91
	MP687	166	77.9	94.3	120	140	166	230	278	354	17.5							0.91

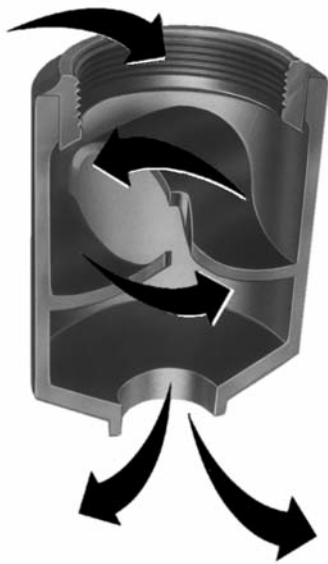
Flow Rate (l/min) = K (bar)<sup>0.47</sup> \*\* Weights given are for 60°, 90° and 120°

**Standard Materials: Brass, 316 Stainless Steel, PVC, Polypropylene, and PTFE.** (PTFE not available in 3/8" and 1/2" sizes).

\*The spray angle of wide and medium angle whirl nozzles is affected by increasing pressure. Contact BETE Applications Engineering when using the MaxiPass above 3 bar (40 PSI).

TO ORDER: specify pipe size, connection type, nozzle number, spray angle, and material.





A cutaway view of the MaxiPass nozzle showing the S-shaped vanes that enable the nozzle to successfully handle large particles without clogging.

To correct flow for fluids with a Specific Gravity other than 1, use this formula:

$$\left(\frac{Q_2}{Q_1}\right) = \sqrt{\frac{SG_1}{SG_2}}$$

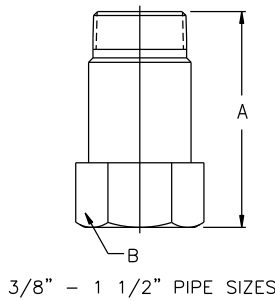


MaxiPass™ Free Passage



Traditional Full Cone Free Passage

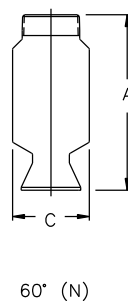
A comparison of the free passage available with the BETE MaxiPass nozzle compared to the free passage of a traditional full cone nozzle. The BETE MaxiPass is designed to pass solid particles that are 2-3 times larger in diameter than particles that will pass through a traditional full cone nozzle.



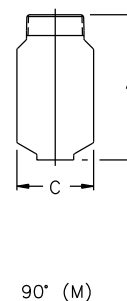
3/8" - 1 1/2" PIPE SIZES



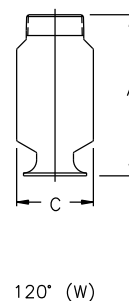
30° (NN)



60° (N)



90° (M)



120° (W)

For plastic dimensions, please call BETE Customer Service.

Dimensions are approximate. Check with BETE for critical dimension applications.

**MaxiPass Flow Rates and Dimensions**

Full Cone, 30°(NN), 60°(N), 90°(M) and 120°(W) Spray Angles, 3/8" to 4" Pipe Sizes, BSP or NPT

Male or Female Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR								Approx. Free Passage Dia. (mm)	Approx. Dimensions (mm) Overall Length					Wt.** (kg) Metal
			0.2 bar	0.3 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar		30° A	60° A	90° A	120° A	C*	
2	MP750	202	94.8	115	146	171	202	280	339	430	19.1	210	178	146	159	66.8	1.59
	MP812	221	104	126	160	187	221	306	370	471	20.6	210	183	146	159	66.8	1.59
	MP875	273	129	155	197	231	273	378	458	582	22.2	210	183	146	159	66.8	1.59
	MP937	306	144	174	221	259	306	424	513	652	23.8	229	194	152	165	82.6	1.70
	MP1000	358	168	203	259	303	358	496	600	763	25.4	262	194	152	168	82.6	1.70
	MP1125	439	206	249	317	371	439	608	736	935	28.6	262	194	152	171	82.6	1.70
2 1/2	MP1000	358	168	203	259	303	358	496	600	763	25.4	262	194	152	168	82.6	2.04
	MP1125	439	206	249	317	371	439	608	736	935	28.6	267	213	165	178	82.6	2.04
	MP1250	527	247	299	381	446	527	730	883	1120	31.5	305	244	165	181	82.6	2.04
	MP1375	632	297	359	456	535	632	875	1060	1350	34.9	305	244	213	229	102	2.84
	MP1500	774	363	440	559	655	774	1070	1230	1650	38.1	330	267	213	229	102	2.84
3	MP1500	774	363	440	559	655	774	1070	1230	1650	37.1	343	279	229	248	121	3.29
	MP1625	911	428	517	658	770	911	1260	1530	1940	41.3	343	279	229	251	121	3.29
	MP1750	1040	488	591	751	880	1040	1440	1740	2220	44.5	343	279	229	251	121	3.29
4	MP1750	1040	488	591	751	880	1040	1440	1740	2220	44.5	406	356	225	248	121	3.63
	MP1875	1170	549	664	845	989	1170	1620	1960	2490	47.6	406	356	225	248	121	3.63
	MP2000	1370	643	778	989	1160	1370	1900	2300	2920	49.8	406	356	286	311	152	7.26
	MP2125	1530	718	869	1100	1290	1530	2120	2560	3260	54.0	406	356	286	311	152	7.26
	MP2250	1660	779	943	1200	1400	1660	2300	2780	3540	57.2	406	356	286	311	152	7.26

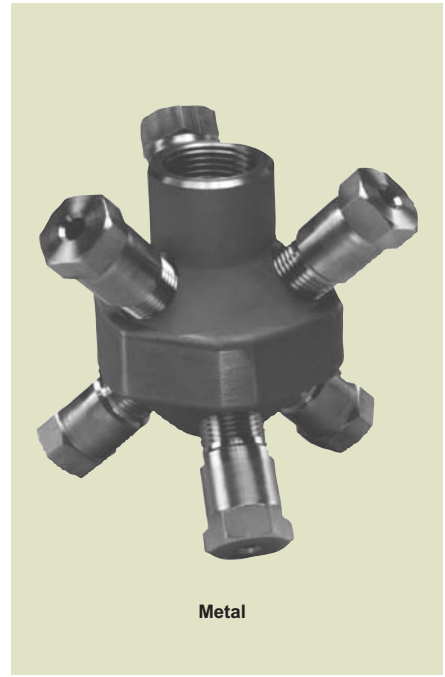
Flow Rate (l/min) = K (bar)<sup>0.47</sup> \*C dimension for 30° (NN) is larger \*\*Weights given are for 60°, 90° and 120°

Standard Materials: Brass, 316 Stainless Steel, PVC, Polypropylene, and PTFE.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

# CLUMP

## Tank Washing Nozzles



### DESIGN FEATURES

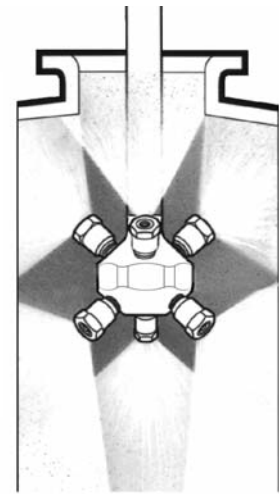
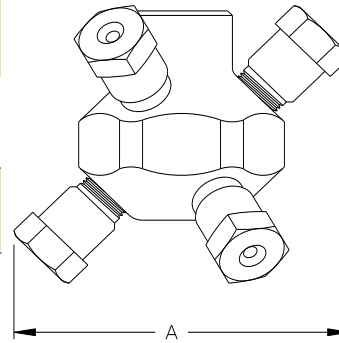
- Each nozzle in the stationary cluster is a BETE clog-resistant full cone nozzle of the MaxiPass™ series
- Can be supplied with various other BETE nozzles for any desired application
- Female connection

### SPRAY CHARACTERISTICS

- Spherical omnidirectional coverage
  - Six nozzles arranged in cluster to project spray in all directions
- Flow rates:** 28.1 to 290 l/min  
(Special flow rates available)

### CLUMP Coverage Chart When spraying at 3 bar

Female Pipe Size	Nozzle Number	Scrubbing Diameter (mm)	Rinsing Diameter (mm)
3/4"	CLUMP125	1200	2400
	CLUMP156	1200	3700
	CLUMP187	1800	4300
1"	CLUMP187	1800	4300
	CLUMP218	2400	4300
	CLUMP250	3000	4900



Typical CLUMP installation

Dimensions are approximate. Check with BETE for critical dimension applications.

### CLUMP Flow Rates and Dimensions

Spherical, 360° Spray Angle, 3/4" and 1" Pipe Size, BSP or NPT

Female Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR						Minimum Entrance Opening (mm) A	Weight (kg)	
			0.7 bar	1 bar	2 bar	3 bar	4 bar	5 bar		Metal	Plas.
3/4"	CLUMP125	33.2	28.1	33.2	46.0	55.6	63.7	70.8	120	1.29	0.22
	CLUMP156	52.7	44.6	52.7	73.2	88.2	101	112			
	CLUMP187	76.2	65.7	76.2	106	128	146	163			
1"	CLUMP187	76.2	65.7	76.2	106	128	146	163	146	2.34	0.40
	CLUMP218	121	103	121	168	203	232	258			
	CLUMP250	136	115	136	188	228	261	290			

$$\text{Flow Rate (l/min)} = K (\text{bar})^{0.47}$$

**Standard Materials: 316 Stainless Steel.** Other materials available on request. 3/4" CLUMP not available in PTFE.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

# WTZ

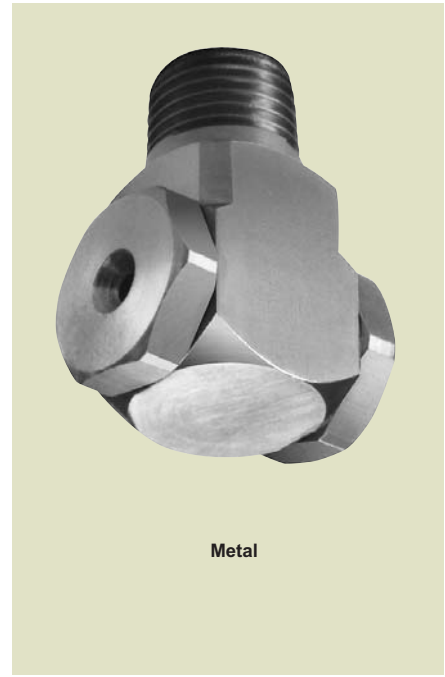
## Right Angle Full Cone

### DESIGN FEATURES

- No internal parts, clog-resistant
- Uniform distribution
- Male and female connections
- Large free passage

### SPRAY CHARACTERISTICS

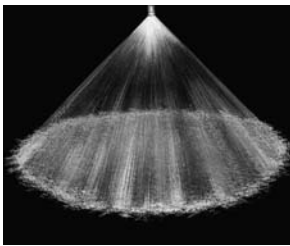
**Spray pattern:** Full Cone  
**Spray angle:** 90° and 110°  
**Flow rates:** 0.50 to 223 L/min



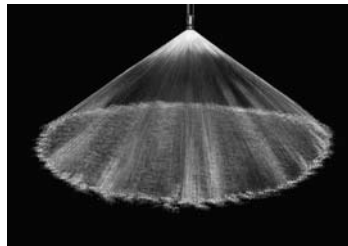
Metal



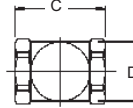
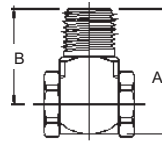
WHIRL



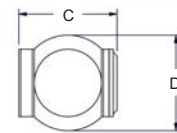
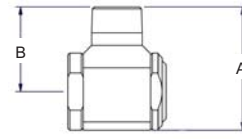
Full Cone 90°



Full Cone 110°



Metal



3/4" and 1"



3/4" and 1"

Dimensions are approximate.

Check with BETE for critical dimension applications.

### WTZ Flow Rates and Dimensions

Full Cone, 90° and 110° Spray Angles, 1/4", 3/8", 1/2", 3/4", and 1" Pipe Size, BSP or NPT

Male or Female Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR							Approx. Orifice Dia. (mm)	Dimensions (mm) Metal Only			
			0.5 bar	1 bar	2 bar	3 bar	5 bar	7 bar	10 bar		A	B	C	D
1/4"	WTZ 50	1.13	0.80	1.13	1.60	1.96	2.53	2.99	3.58	1.90	33	25	20	16
	WTZ 56	1.27	0.90	1.27	1.80	2.20	2.84	3.36	4.02	2.00				
	WTZ 62	1.41	1.00	1.41	2.00	2.45	3.16	3.74	4.47	2.10				
	WTZ 77	1.77	1.25	1.77	2.50	3.06	3.95	4.67	5.59	2.30				
3/8"	WTZ 98	2.23	1.58	2.23	3.15	3.86	4.98	5.90	7.05	2.60	38	28	30	19
	WTZ 120	2.83	2.00	2.83	4.00	4.90	6.33	7.48	8.95	3.00				
	WTZ 150	3.53	2.50	3.53	5.00	6.12	7.90	9.35	11.2	3.30				
	WTZ 170	3.96	2.80	3.96	5.60	6.86	8.86	10.5	12.5	3.50				
	WTZ 200	4.46	3.15	4.46	6.30	7.72	10.0	11.8	14.1	3.70				
	WTZ 250	5.66	4.00	5.66	8.00	9.80	12.7	15.0	17.9	4.15				
	WTZ 280	6.36	4.50	6.36	9.00	11.0	14.2	16.8	20.1	4.40				
	WTZ 310	7.07	5.00	7.07	10.0	12.3	15.8	18.7	22.4	4.65				
	WTZ 390	8.84	6.25	8.84	12.5	15.3	19.8	23.4	28.0	5.20				
WTZ 500	11.3	8.00	11.3	16.0	19.6	25.3	29.9	35.8	5.80					
1/2"	WTZ 620	14.1	10.0	14.1	20.0	24.5	31.6	37.4	44.7	7.30	47	35	38	25
	WTZ 780	17.7	12.5	17.7	25.0	30.6	39.5	46.8	55.9	8.00				
	WTZ 980	22.3	15.8	22.3	31.5	38.6	49.8	58.9	70.4	8.70				
	WTZ1120	25.5	18.1	25.5	36.1	44.2	57.1	67.5	80.7	9.87				
	WTZ1280	29.2	20.6	29.2	41.3	50.5	65.2	77.2	92.2	10.7				
	WTZ1440	32.8	23.2	32.8	46.4	56.8	73.4	86.8	103.8	9.93				
3/4"	WTZ1200**	27.3	19.3	27.4	38.7	47.4	61.2	72.4	86.5	8.51	76	51	51	51
	WTZ1500**	34.2	24.2	34.2	48.3	59.2	76.4	90.4	108	10.5				
	WTZ1900**	43.3	30.6	43.3	61.2	75.0	96.8	115	137	11.9				
1"	WTZ2200	50.1	35.5	50.1	70.9	86.8	112	133	159	12.7	81	56	65	63
	WTZ3100	70.6	50.0	70.7	99.9	122	158	187	223	13.5				

$$\text{Flow Rate (L/min)} = K \sqrt{\text{bar}}$$

Standard Materials: Brass, PVC, 303 Stainless Steel and 316 Stainless Steel.

\*Male threads ONLY. Female threads available on request. \*\*90° Spray Angle ONLY; other angles available on request.  
 Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

# WT

WHIRL

## Right Angle/Hollow Cone

### DESIGN FEATURES

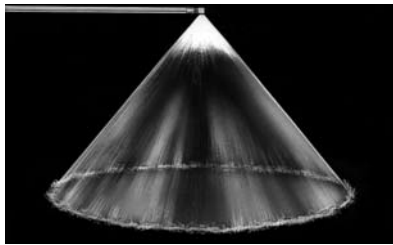
- Conventional design using tangential whirl method of atomization
- Durable
- Use where a circular pattern is required or in large area multiple installations where there is considerable overlapping of sprays
- Male and female connections
- Large free passage

### SPRAY CHARACTERISTICS

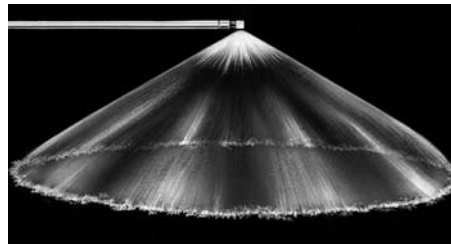
**Spray pattern:** Hollow Cone  
**Spray angles:** 70° to 120°  
**Flow rates:** 0.125 to 145 l/min



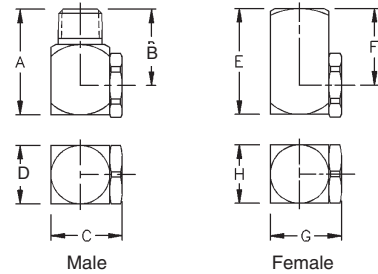
Male Metal



Hollow Cone 80°



Hollow Cone 120°



Male

Female

Dimensions are approximate. Check with BETE for critical dimension applications.

### WT Flow Rates and Dimensions

Hollow Cone, Medium and Extra Wide Spray Angles, 1/8" to 3/4" Pipe Sizes, BSP or NPT

Male or Female Pipe Size	Nozzle Number	Spray Angle	K Factor	LITERS PER MINUTE @ BAR								Approx. (mm)		Dimensions for Metal Only (mm)								Wt. (g)	
				0.3 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	7 bar	Inlet Dia.	Orifice Dia.	A	B	C	D	E	F	G	H	Metal	Plas.
1/8	WT10	70° 110°	0.228	0.125	0.161	0.191	0.228	0.322	0.395	0.510	0.603	1.02	1.17	28.4	22.4	16.0	12.7	22.4	16.0	16.5	12.7	28	14
	WT20	70° 115°	0.456	0.250	0.322	0.381	0.456	0.645	0.789	1.02	1.21	1.52	1.52										
	WT40	70°	0.912	0.499	0.645	0.763	0.912	1.29	1.58	2.04	2.41	2.29	2.29										
	WT50	115°	1.14	0.624	0.806	0.953	1.14	1.61	1.97	2.55	3.01	2.29	2.29										
	WT60	70° 115°	1.37	0.749	0.967	1.14	1.37	1.93	2.37	3.06	3.62	2.54	2.79										
	WT70	115°	1.60	0.874	1.13	1.33	1.60	2.26	2.76	3.57	4.22	2.54	2.79										
	WT80	120°	1.82	0.999	1.29	1.53	1.82	2.58	3.16	4.08	4.82	2.79	3.05										
	WT100	70° 115°	2.28	1.25	1.61	1.91	2.28	3.22	3.95	5.10	6.03	3.30	3.30										
	WT130	120°	2.96	1.62	2.09	2.48	2.96	4.19	5.13	6.62	7.84	3.56	3.56										
	WT160	70°	3.65	2.00	2.58	3.05	3.65	5.16	6.32	8.15	9.65	3.81	4.06										
	WT180	120°	4.10	2.25	2.90	3.43	4.10	5.80	7.10	9.17	10.9	4.32	4.06										
WT200	70°	4.56	2.50	3.22	3.81	4.56	6.45	7.89	10.2	12.1	4.32	4.83											
1/4	WT12	80°	0.273	0.150	0.193	0.229	0.273	0.387	0.474	0.611	0.724	1.02	1.27	33.3	25.4	20.1	16.0	28.4	20.6	20.1	16.0	85	21
	WT18	80°	0.410	0.225	0.290	0.343	0.410	0.580	0.710	0.917	1.09	1.52	1.52										
	WT20	70° 110°	0.456	0.250	0.322	0.381	0.456	0.645	0.789	1.02	1.21	1.52	1.52										
	WT27	80°	0.615	0.337	0.435	0.515	0.615	0.870	1.07	1.38	1.63	1.78	2.03										
	WT35	100°	0.798	0.437	0.564	0.667	0.798	1.13	1.38	1.78	2.11	2.03	2.29										
	WT40	70° 80°	0.912	0.499	0.645	0.763	0.912	1.29	1.58	2.04	2.41	2.03	2.29										
	WT42	120°	0.957	0.524	0.677	0.801	0.957	1.35	1.66	2.14	2.53	2.03	2.29										
	WT48	105°	1.09	0.599	0.773	0.915	1.09	1.55	1.89	2.45	2.89	2.29	2.79										

$$\text{Flow Rate } (l_{\min}) = K \sqrt{\text{bar}}$$

Standard Materials: Brass, 303 Stainless Steel and 316 Stainless Steel.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

TO ORDER: specify pipe size, connection type, nozzle number, spray angle, and material.

Dimensions are approximate. Check with BETE for critical dimension applications.

**WT Flow Rates and Dimensions**

Hollow Cone, Medium and Extra Wide Spray Angles, 1/8" to 3/4" Pipe Sizes, BSP or NPT

Male or Female Pipe Size	Nozzle Number	Spray Angle	K Factor	LITERS PER MINUTE @ BAR								Approx. (mm)		Dimensions for Metal Only (mm)								Wt. (g)	
				0.3 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	7 bar	Inlet Dia.	Orifice Dia.	A	B	C	D	E	F	G	H	Metal	Plas.
1/4	WT53	80°	1.21	0.662	0.854	1.01	1.21	1.71	2.09	2.70	3.20	2.29	2.79	33.3	25.4	20.1	16.0	28.4	20.6	20.1	16.0	85	21
	WT60	70°	1.37	0.749	0.967	1.14	1.37	1.93	2.37	3.06	3.62	2.54	2.79										
	WT68	120°	1.55	0.849	1.10	1.30	1.55	2.19	2.68	3.47	4.10	2.54	3.30										
	WT80	120°	1.82	0.999	1.29	1.53	1.82	2.58	3.16	4.08	4.82	3.30	3.30										
	WT100	70° 115°	2.28	1.25	1.61	1.91	2.28	3.22	3.95	5.10	6.03	3.30	3.56										
	WT130	120°	2.96	1.62	2.09	2.48	2.96	4.19	5.13	6.62	7.84	3.81	4.06										
	WT150	120°	3.42	1.87	2.42	2.86	3.42	4.83	5.92	7.64	9.04	4.06	4.32										
	WT160	70°	3.65	2.00	2.58	3.05	3.65	5.16	6.32	8.15	9.65	4.06	4.32										
	WT180	120°	4.10	2.25	2.90	3.43	4.10	5.80	7.10	9.17	10.9	4.57	4.57										
	WT200	70° 120°	4.56	2.50	3.22	3.81	4.56	6.45	7.89	10.19	12.1	4.57	4.83										
	WT220	120°	5.01	2.75	3.55	4.19	5.01	7.09	8.68	11.2	13.3	4.57	5.59										
	WT240	120°	5.47	3.00	3.87	4.58	5.47	7.73	9.47	12.2	14.5	5.08	5.08										
	WT260	80°	5.93	3.25	4.19	4.96	5.93	8.38	10.3	13.2	15.7	5.08	5.08										
	WT280	80°	6.38	3.49	4.51	5.34	6.38	9.02	11.1	14.3	16.9	5.08	5.59										
	WT300	70° 100°	6.84	3.74	4.83	5.72	6.84	9.67	11.8	15.3	18.1	5.08	5.59										
	WT340	80°	7.75	4.24	5.48	6.48	7.75	11.0	13.4	17.3	20.5	5.59	6.10										
	WT400	80°	9.12	4.99	6.45	7.63	9.12	12.9	15.8	20.4	24.1	6.35	7.11										
	WT480	80°	10.9	5.99	7.73	9.15	10.9	15.5	18.9	24.5	28.9	6.35	6.86										
	WT580	80°	13.2	7.24	9.35	11.1	13.2	18.7	22.9	29.6	35.0	6.86	7.62										
	WT640	80°	14.6	7.99	10.3	12.2	14.6	20.6	25.3	32.6	38.6	6.86	7.62										
WT680	80°	15.5	8.49	11.0	13.0	15.5	21.9	26.8	34.7	41.0	6.86	8.64											
WT800	80°	18.2	9.99	12.9	15.3	18.2	25.8	31.6	40.8	48.2	6.86	8.64											
3/8	WT100	70°	2.28	1.25	1.61	1.91	2.28	3.22	3.95	5.10	6.03	3.56	3.81	38.1	28.4	24.6	19.1	34.0	24.6	24.6	19.1	85	21
	WT130	120°	2.96	1.62	2.09	2.48	2.96	4.19	5.13	6.62	7.84	3.56	4.57										
	WT150	120°	3.42	1.87	2.42	2.86	3.42	4.83	5.92	7.64	9.04	4.32	4.57										
	WT160	70°	3.65	2.00	2.58	3.05	3.65	5.16	6.32	8.15	9.65	4.32	4.57										
	WT180	120°	4.10	2.25	2.90	3.43	4.10	5.80	7.10	9.17	10.9	4.32	4.83										
	WT200	70° 115°	4.56	2.50	3.22	3.81	4.56	6.45	7.89	10.2	12.1	4.83	5.08										
	WT220	120°	5.01	2.75	3.55	4.19	5.01	7.09	8.68	11.2	13.3	4.83	5.08										
	WT240	125°	5.47	3.00	3.87	4.58	5.47	7.73	9.47	12.2	14.5	4.83	5.08										
	WT260	120°	5.93	3.25	4.19	4.96	5.93	8.38	10.3	13.2	15.7	4.83	5.84										
	WT270	120°	6.15	3.37	4.35	5.15	6.15	8.70	10.7	13.8	16.3	5.08	5.84										
	WT300	70° 115°	6.84	3.74	4.83	5.72	6.84	9.67	11.8	15.3	18.1	5.08	5.84										
	WT350	115°	7.98	4.37	5.64	6.67	7.98	11.3	13.8	17.8	21.1	6.10	6.35										
	WT400	70° 105°	9.12	4.99	6.45	7.63	9.12	12.9	15.8	20.4	24.1	6.10	6.86										
	WT440	105°	10.0	5.49	7.09	8.39	10.0	14.2	17.4	22.4	26.5	6.60	7.62										
	WT500	70° 105°	11.4	6.24	8.06	9.53	11.4	16.1	19.7	25.5	30.1	6.60	7.11										
WT560	105°	12.8	6.99	9.02	10.7	12.8	18.0	22.1	28.5	33.8	6.60	7.87											
WT600	70°	13.7	7.49	9.67	11.4	13.7	19.3	23.7	30.6	36.2	7.87	7.87											
WT1000	70°	22.8	12.5	16.1	19.1	22.8	32.2	39.5	51.0	60.3	8.64	9.65											
1/2	WT500	70°	11.4	6.24	8.06	9.53	11.4	16.1	19.7	25.5	30.1	7.62	7.62	47.5	34.8	31.8	25.4	46.0	33.3	31.8	25.4	276	113
	WT600	70°	13.7	7.49	9.67	11.4	13.7	19.3	23.7	30.6	36.2	8.38	7.87										
	WT800	70°	18.2	9.99	12.9	15.3	18.2	25.8	31.6	40.8	48.2	9.14	9.14										
	WT1000	70° 110°	22.8	12.5	16.1	19.1	22.8	32.2	39.5	51.0	60.3	9.14	11.2										
	WT1200	70°	27.3	15.0	19.3	22.9	27.3	38.7	47.4	61.1	72.4	10.2	12.2										
3/4	WT800	70°	18.2	9.99	12.9	15.3	18.2	25.8	31.6	40.8	48.2	9.14	9.65	57.2	41.1	38.1	31.8	55.6	39.6	38.1	31.8	397	227
	WT1000	70°	22.8	12.5	16.1	19.1	22.8	32.2	39.5	51.0	60.3	10.2	11.2										
	WT1200	70°	27.3	15.0	19.3	22.9	27.3	38.7	47.4	61.1	72.4	11.2	11.2										
	WT1400	80°	31.9	17.5	22.6	26.7	31.9	45.1	55.3	71.3	84.4	11.9	12.2										
	WT1600	80° 115°	36.5	20.0	25.8	30.5	36.5	51.6	63.2	81.5	96.5	12.2	13.0										
	WT1800	80°	41.0	22.5	29.0	34.3	41.0	58.0	71.0	91.7	109	12.7	14.2										
	WT2000	90°	45.6	25.0	32.2	38.1	45.6	64.5	78.9	102	121	13.2	15.0										
	WT2200	90°	50.1	27.5	35.5	41.9	50.1	70.9	86.8	112	133	13.5	16.0										
WT2400	90°	54.7	30.0	38.7	45.8	54.7	77.3	94.7	122	145	14.0	17.5											

Flow Rate ( $l_{min}$ ) =  $K\sqrt{bar}$

Standard Materials: Brass, 303 Stainless Steel and 316 Stainless Steel.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.



WHIRL

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# WTX



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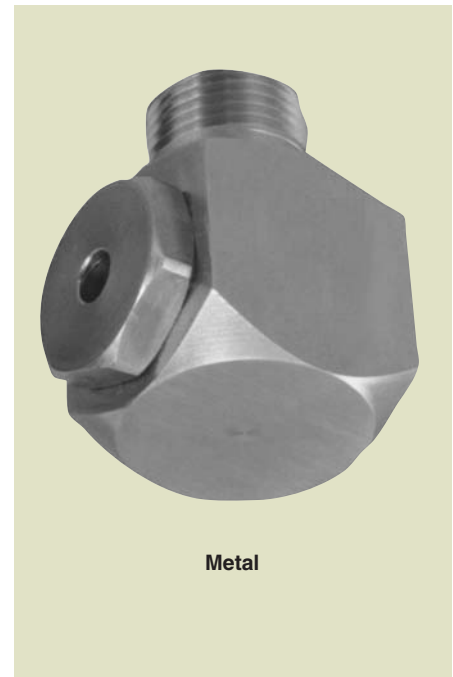
## Extended Life/Hollow Cone

### DESIGN FEATURES

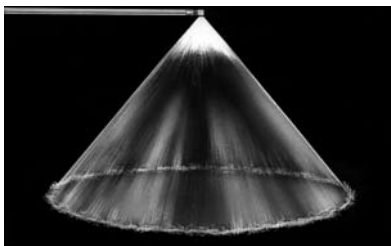
- Tangential whirl
- Oversized body for extended life
- Male and female connections
- Large free passage

### SPRAY CHARACTERISTICS

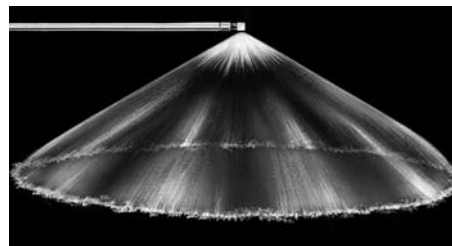
- Spray pattern:** Hollow Cone
- Spray angles:** 70° to 140°
- Flow rates:** 0.125 to 145 l/min



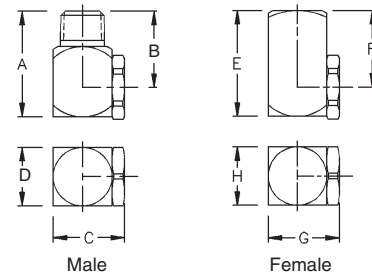
Metal



Hollow Cone 80°



Hollow Cone 120°



Male

Female

Dimensions are approximate. Check with BETE for critical dimension applications.

### WTX Flow Rates and Dimensions

Hollow Cone, Medium and Extra Wide Spray Angles, 1/8" to 3/4" Pipe Sizes, BSP or NPT

Male or Female Pipe Size	Nozzle Number	Spray Angle	K Factor	LITERS PER MINUTE @ BAR								Approx. (mm)		Dimensions for Metal Only (mm)								Wt. (g) Metal
				0.3 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	7 bar	Inlet Dia.	Orifice Dia.	A	B	C	D	E	F	G	H	
1/8	WTX10	70° 110°	0.228	0.125	0.161	0.191	0.228	0.322	0.395	0.510	0.603	1.02	1.17	28.4	22.4	22.4	19.1	25.4	19.1	22.4	19.1	32
	WTX20	70° 115°	0.456	0.250	0.322	0.381	0.456	0.645	0.789	1.02	1.21	1.52	1.52									
	WTX40	70°	0.912	0.499	0.645	0.763	0.912	1.29	1.58	2.04	2.41	2.29	2.29									
	WTX50	115°	1.14	0.624	0.806	0.953	1.14	1.61	1.97	2.55	3.01	2.29	2.29									
	WTX60	70° 115°	1.37	0.749	0.967	1.14	1.37	1.93	2.37	3.06	3.62	2.54	2.79									
	WTX70	115°	1.60	0.874	1.13	1.33	1.60	2.26	2.76	3.57	4.22	2.54	2.79									
	WTX80	120°	1.82	0.999	1.29	1.53	1.82	2.58	3.16	4.08	4.82	2.79	3.05									
	WTX100	70° 115°	2.28	1.25	1.61	1.91	2.28	3.22	3.95	5.10	6.03	3.30	3.30									
	WTX130	120°	2.96	1.62	2.09	2.48	2.96	4.19	5.13	6.62	7.84	3.56	3.56									
	WTX160	70°	3.65	2.00	2.58	3.05	3.65	5.16	6.32	8.15	9.65	3.81	4.06									
	WTX180	120°	4.10	2.25	2.90	3.43	4.10	5.80	7.10	9.17	10.9	4.32	4.06									
WTX200	70°	4.56	2.50	3.22	3.81	4.56	6.45	7.89	10.2	12.1	4.32	4.83										
1/4	WTX12	80°	0.273	0.150	0.193	0.229	0.273	0.387	0.474	0.611	0.724	1.02	1.27	33.3	25.4	22.4	19.1	33.3	25.4	22.4	19.1	74
	WTX18	80°	0.410	0.225	0.290	0.343	0.410	0.580	0.710	0.917	1.09	1.52	1.52									
	WTX20	70° 110°	0.456	0.250	0.322	0.381	0.456	0.645	0.789	1.02	1.21	1.52	1.52									
	WTX27	80°	0.615	0.337	0.435	0.515	0.615	0.870	1.07	1.38	1.63	1.78	2.03									
	WTX35	100°	0.798	0.437	0.564	0.667	0.798	1.13	1.38	1.78	2.11	2.03	2.29									
	WTX40	70° 80°	0.912	0.499	0.645	0.763	0.912	1.29	1.58	2.04	2.41	2.03	2.29									
	WTX42	120°	0.957	0.524	0.677	0.801	0.957	1.35	1.66	2.14	2.53	2.03	2.29									
	WTX48	105°	1.09	0.599	0.773	0.915	1.09	1.55	1.89	2.45	2.89	2.29	2.79									

$$\text{Flow Rate (l/min)} = K \sqrt{\text{bar}}$$

Standard Materials: Brass, 303 Stainless Steel and 316 Stainless Steel.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

TO ORDER: specify pipe size, connection type, nozzle number, spray angle, and material.

Dimensions are approximate. Check with BETE for critical dimension applications.

**WTX Flow Rates and Dimensions**

*Hollow Cone, Medium and Extra Wide Spray Angles, 1/8" to 3/4" Pipe Sizes, BSP or NPT*

Male or Female Pipe Size	Nozzle Number	Spray Angle	K Factor	LITERS PER MINUTE @ BAR								Approx. (mm)		Dimensions for Metal Only (mm)								Wt. (g) Metal
				0.3 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	7 bar	Inlet Dia.	Orifice Dia.	A	B	C	D	E	F	G	H	
1/4	WTX53	80°	1.21	0.662	0.854	1.01	1.21	1.71	2.09	2.70	3.20	2.29	2.79	33.3	25.4	22.2	19.1	33.3	25.4	25.4	19.1	74
	WTX60	70°	1.37	0.749	0.967	1.14	1.37	1.93	2.37	3.06	3.62	2.54	2.79									
	WTX68	120°	1.55	0.849	1.10	1.30	1.55	2.19	2.68	3.47	4.10	2.54	3.30									
	WTX80	120°	1.82	0.999	1.29	1.53	1.82	2.58	3.16	4.08	4.82	3.30	3.30									
	WTX100	70° 115°	2.28	1.25	1.61	1.91	2.28	3.22	3.95	5.10	6.03	3.30	3.56									
	WTX130	120°	2.96	1.62	2.09	2.48	2.96	4.19	5.13	6.62	7.84	3.81	4.06									
	WTX150	120°	3.42	1.87	2.42	2.86	3.42	4.83	5.92	7.64	9.04	4.06	4.32									
	WTX160	70°	3.65	2.00	2.58	3.05	3.65	5.16	6.32	8.15	9.65	4.06	4.32									
	WTX180	120°	4.10	2.25	2.90	3.43	4.10	5.80	7.10	9.17	10.9	4.57	4.57									
	WTX200	70° 120°	4.56	2.50	3.22	3.81	4.56	6.45	7.89	10.19	12.1	4.57	4.83									
	WTX220	120°	5.01	2.75	3.55	4.19	5.01	7.09	8.68	11.2	13.3	4.57	5.59									
	WTX240	120°	5.47	3.00	3.87	4.58	5.47	7.73	9.47	12.2	14.5	5.08	5.08									
	WTX260	80°	5.93	3.25	4.19	4.96	5.93	8.38	10.3	13.2	15.7	5.08	5.08									
	WTX280	80°	6.38	3.49	4.51	5.34	6.38	9.02	11.1	14.3	16.9	5.08	5.59									
	WTX300	70° 100°	6.84	3.74	4.83	5.72	6.84	9.67	11.8	15.3	18.1	5.08	5.59									
	WTX340	80°	7.75	4.24	5.48	6.48	7.75	11.0	13.4	17.3	20.5	5.59	6.10									
	WTX400	80°	9.12	4.99	6.45	7.63	9.12	12.9	15.8	20.4	24.1	6.35	7.11									
	WTX480	80°	10.9	5.99	7.73	9.15	10.9	15.5	18.9	24.5	28.9	6.35	6.86									
	WTX580	80°	13.2	7.24	9.35	11.1	13.2	18.7	22.9	29.6	35.0	6.86	7.62									
	WTX640	80°	14.6	7.99	10.3	12.2	14.6	20.6	25.3	32.6	38.6	6.86	7.62									
WTX680	80°	15.5	8.49	11.0	13.0	15.5	21.9	26.8	34.7	41.0	6.86	8.64										
WTX800	80°	18.2	9.99	12.9	15.3	18.2	25.8	31.6	40.8	48.2	6.86	8.64										
3/8	WTX100	70°	2.28	1.25	1.61	1.91	2.28	3.22	3.95	5.10	6.03	3.56	3.81	38.1	28.4	26.9	22.2	34.0	25.4	24.6	22.2	99
	WTX130	120°	2.96	1.62	2.09	2.48	2.96	4.19	5.13	6.62	7.84	3.56	4.57									
	WTX150	120°	3.42	1.87	2.42	2.86	3.42	4.83	5.92	7.64	9.04	4.32	4.57									
	WTX160	70°	3.65	2.00	2.58	3.05	3.65	5.16	6.32	8.15	9.65	4.32	4.57									
	WTX180	120°	4.10	2.25	2.90	3.43	4.10	5.80	7.10	9.17	10.9	4.32	4.83									
	WTX200	70° 115°	4.56	2.50	3.22	3.81	4.56	6.45	7.89	10.2	12.1	4.83	5.08									
	WTX220	120°	5.01	2.75	3.55	4.19	5.01	7.09	8.68	11.2	13.3	4.83	5.08									
	WTX240	120°	5.47	3.00	3.87	4.58	5.47	7.73	9.47	12.2	14.5	4.83	5.08									
	WTX260	120°	5.93	3.25	4.19	4.96	5.93	8.38	10.3	13.2	15.7	4.83	5.84									
	WTX270	120°	6.15	3.37	4.35	5.15	6.15	8.70	10.7	13.8	16.3	5.08	5.84									
	WTX300	70° 115°	6.84	3.74	4.83	5.72	6.84	9.67	11.8	15.3	18.1	5.08	5.84									
	WTX350	115°	7.98	4.37	5.64	6.67	7.98	11.3	13.8	17.8	21.1	6.10	6.35									
	WTX400	70° 105°	9.12	4.99	6.45	7.63	9.12	12.9	15.8	20.4	24.1	6.10	6.86									
	WTX440	105°	10.0	5.49	7.09	8.39	10.0	14.2	17.4	22.4	26.5	6.60	7.62									
WTX500	70° 105°	11.4	6.24	8.06	9.53	11.4	16.1	19.7	25.5	30.1	6.60	7.11										
WTX560	105°	12.8	6.99	9.02	10.7	12.8	18.0	22.1	28.5	33.8	6.60	7.87										
WTX600	70°	13.7	7.49	9.67	11.4	13.7	19.3	23.7	30.6	36.2	7.87	7.87										
WTX1000	70°	22.8	12.5	16.1	19.1	22.8	32.2	39.5	51.0	60.3	8.64	9.65										
1/2	WTX500	70°	11.4	6.24	8.06	9.53	11.4	16.1	19.7	25.5	30.1	7.62	7.62	47.5	34.8	38.1	31.8	47.8	35.1	38.1	31.8	320
	WTX600	70°	13.7	7.49	9.67	11.4	13.7	19.3	23.7	30.6	36.2	8.38	7.87									
	WTX800	70°	18.2	9.99	12.9	15.3	18.2	25.8	31.6	40.8	48.2	9.14	9.14									
	WTX1000	70° 110°	22.8	12.5	16.1	19.1	22.8	32.2	39.5	51.0	60.3	9.14	11.2									
	WTX1200	70°	27.3	15.0	19.3	22.9	27.3	38.7	47.4	61.1	72.4	10.2	12.2									
3/4	WTX800	70°	18.2	9.99	12.9	15.3	18.2	25.8	31.6	40.8	48.2	9.14	9.50	57.2	41.1	44.5	38.1	55.6	39.6	44.5	38.1	460
	WTX1000	70°	22.8	12.5	16.1	19.1	22.8	32.2	39.5	51.0	60.3	10.2	11.2									
	WTX1200	70°	27.3	15.0	19.3	22.9	27.3	38.7	47.4	61.1	72.4	11.2	11.2									
	WTX1400	80°	31.9	17.5	22.6	26.7	31.9	45.1	55.3	71.3	84.4	11.9	12.2									
	WTX1600	80° 115°	36.5	20.0	25.8	30.5	36.5	51.6	63.2	81.5	96.5	12.2	13.0									
	WTX1800	80°	41.0	22.5	29.0	34.3	41.0	58.0	71.0	91.7	109	12.7	14.2									
	WTX2000	90°	45.6	25.0	32.2	38.1	45.6	64.5	78.9	102	121	13.2	15.0									
	WTX2200	90°	50.1	27.5	35.5	41.9	50.1	70.9	86.8	112	133	13.5	16.0									
WTX2400	90°	54.7	30.0	38.7	45.8	54.7	77.3	94.7	122	145	14.0	17.5										

$Flow\ Rate\ (l_{min}) = K\sqrt{bar}$

**Standard Materials: Brass, 303 Stainless Steel and 316 Stainless Steel.**

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.



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# TH

## Tangential Inlet/Right Angle



Metal

WHIRL

### DESIGN FEATURES

- Large free passage
- Clog-resistant; nozzles have no internal parts
- One-piece construction
- Female connection
- Flanged connection available
- U.S. Patent 4,231,524
- Inlet and outlet are in-line

### SPRAY CHARACTERISTICS

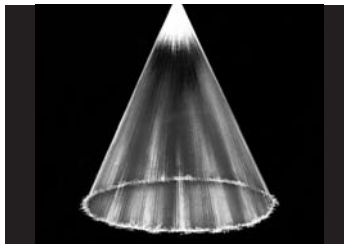
- Patented geometry designed to give the most uniform liquid distribution around the periphery of the spray.

**Spray pattern:** Hollow Cone

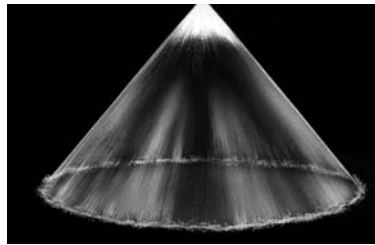
**Spray angles:** Narrow to Medium

**Flow rates:** 15.3 to 2230 l/min

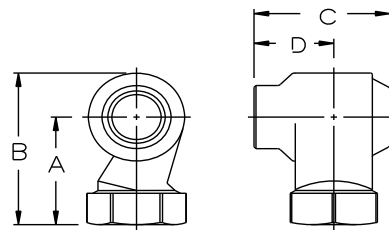
**Silicon carbide requests require review prior to quote/order acceptance. Please contact BETE for information.**



Hollow Cone - Narrow Angle



Hollow Cone - Medium Angle



Dimensions are approximate. Check with BETE for critical dimension applications.

### TH Flow Rates and Dimensions

Hollow Cone, Narrow to Medium Spray Angles, 1" to 3" Pipe Sizes, BSP or NPT

Female Pipe Size	Nozzle Number	Spray Ang.			K Factor	LITERS PER MINUTE @ BAR							Approx. Orifice Dia. (mm)	Free Pass. Dia. (mm)	Dimensions (mm)				Wt. (kg)	
		0.3 bar	1 bar	3 bar		0.2 bar	0.3 bar	0.5 bar	0.7 bar	1 bar	1.5 bar	2 bar			3 bar	A	B	C		D
1	THF1508	54°	54°	54°	34.2	15.3	18.7	24.2	28.6	34.2	41.9	48.3	59.2	8.73	8.73	58.7	79.2	50.8	26.9	0.18
	THF1808	56°	56°	56°	41.0	18.3	22.5	29.0	34.3	41.0	50.2	58.0	71.0	9.53	9.53					
	THF2308	63°	66°	66°	52.4	23.4	28.7	37.1	43.9	52.4	64.2	74.1	90.8	11.1	11.1					
	THF2708	66°	70°	70°	61.5	27.5	33.7	43.5	51.5	61.5	75.4	87.0	107	11.9	11.9					
	THF3208	68°	72°	71°	72.9	32.6	39.9	51.6	61.0	72.9	89.3	103	126	13.9	13.9					
	THF 3808	68°	72°	71°	86.6	38.7	47.4	61.2	72.5	86.6	106	122	150	15.2	15.2					
1 1/4	THF3210	66°	66°	66°	72.9	32.6	39.9	51.6	61.0	72.9	89.3	103	126	13.9	13.9	73.1	97.8	66.5	38.1	0.54
	THF3810	68°	70°	70°	86.6	38.7	47.4	61.2	72.5	86.6	106	122	150	15.9	15.9					
	THF4110	73°	74°	74°	93.4	41.8	51.2	66.1	78.2	93.4	114	132	162	16.7	16.7					
	THF5210	79°	80°	80°	119	53.0	64.9	83.8	99.1	119	145	168	205	19.8	19.8					
	THF7010	83°	85°	85°	160	71.3	87.4	113	133	160	195	226	276	26.2	22.6					
1 1/2	THF6112	58°	60°	60°	139	62.2	76.1	98	116	139	170	197	241	19.4	19.4	74.7	104	81.8	47.8	1.00
	THF7012	63°	65°	65°	160	71.3	87.4	113	133	160	195	226	276	21.4	21.4					
	THF7712	63°	66°	66°	175	78.5	96.1	124	147	175	215	248	304	23.4	23.4					
	THF9012	67°	70°	70°	205	91.7	112	145	172	205	251	290	355	26.2	26.2					
	THF12712	75°	80°	80°	289	129	159	205	242	289	354	409	501	32.9	27.0					
	THF14512	80°	80°	83°	330	148	181	234	276	330	405	467	572	36.1	27.0					

$$\text{Flow Rate } (V_{\min}) = K \sqrt{\text{bar}}$$

**Standard Materials: Brass, Carbon Steel and 316 Stainless Steel.**

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

TO ORDER: specify pipe size, connection type, nozzle number, spray angle, and material.





Silicon Carbide, Flanged

For more effective distribution of multiple nozzle arrays, BETE junction boxes can be used. See page 108 for more detailed information.

Junction Box



**Silicon carbide requests require review prior to quote/order acceptance. Please contact BETE for information.**

Dimensions are approximate. Check with BETE for critical dimension applications.



Call for the name of your nearest BETE representative.  
CALL 413-772-0846

**TH Flow Rates and Dimensions**  
Hollow Cone, Narrow to Medium Spray Angles, 1" to 3" Pipe Sizes, BSP or NPT

Female Pipe Size	Nozzle Number	Spray Ang.			K Factor	LITERS PER MINUTE @ BAR							Approx. Orifice Dia. (mm)	Free Pass. Dia. (mm)	Dimensions (mm)				Wt. (kg)	
		0.3 bar	1 bar	3 bar		0.2 bar	0.3 bar	0.5 bar	0.7 bar	1 bar	1.5 bar	2 bar			3 bar	A	B	C		D
2	THF8516	63°	65°	65°	194	86.6	106	137	162	194	237	274	336	21.8	21.8	91.9	130	106	62.7	1.81
	THF10516	65°	67°	67°	239	107	131	169	200	239	293	338	414	25.4	25.4					
	THF12516	68°	70°	70°	285	127	156	201	238	285	349	403	493	29.0	29.0					
	THF14516	74°	79°	79°	330	148	181	234	276	330	405	467	572	32.1	32.1					
	THF17016	77°	80°	80°	387	173	212	274	324	387	474	548	671	35.3	35.3					
	THF19216	77°	80°	80°	438	196	240	309	366	438	536	619	758	38.5	36.5					
	THF20516	77°	83°	83°	467	209	256	330	391	467	572	661	809	41.3	36.5					
	THF23016	76°	83°	83°	524	234	287	371	439	524	642	741	908	44.5	36.5					
2 1/2	THF17020	85°	85°	85°	387	173	212	274	324	387	474	548	671	33.7	33.7	125	172	133	77.7	2.90
	THF19020	70°	73°	73°	433	194	237	306	362	433	530	612	750	36.1	36.1					
	THF20520	72°	75°	73°	467	209	256	330	391	467	572	661	809	37.3	37.3					
	THF23020	76°	78°	78°	524	234	287	371	439	524	642	741	908	40.1	40.1					
	THF28020	79°	80°	80°	638	285	349	451	534	638	781	902	1105	46.0	44.5					
	THF32020	83°	85°	85°	729	326	399	516	610	729	893	1031	1263	51.2	44.5					
	THF34020	87°	90°	90°	775	347	424	548	648	775	949	1096	1342	53.2	44.5					
	THF43520	92°	95°	95°	991	443	543	701	829	991	1214	1402	1717	61.9	44.5					
3	THF18524	58°	58°	58°	422	189	231	298	353	422	516	596	730	32.5	32.5	145	200	153	88.9	4.08
	THF23024	65°	65°	65°	524	234	287	371	439	524	642	741	908	36.5	36.5					
	THF28024	70°	70°	70°	638	285	349	451	534	638	781	902	1110	41.3	41.3					
	THF32024	65°	70°	70°	729	326	399	516	610	729	893	1030	1260	45.2	45.2					
	THF34024	68°	70°	70°	775	347	424	548	648	775	949	1100	1340	46.8	46.8					
	THF41224	75°	78°	78°	939	420	514	664	786	939	1150	1330	1630	53.6	53.6					
	THF46924	75°	80°	80°	1070	478	585	756	894	1070	1310	1510	1850	57.9	54.0					
	THF52624	78°	80°	80°	1200	536	657	848	1000	1200	1470	1700	2080	63.1	54.0					
THF56424	78°	80°	80°	1290	575	704	909	1080	1290	1570	1820	2230	65.9	54.0						

Flow Rate ( $l_{min}$ ) =  $K \sqrt{bar}$

**Standard Materials: Brass, Carbon Steel and 316 Stainless Steel.**

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

# THW

## Tangential Inlet/Wide Spray Band



Metal

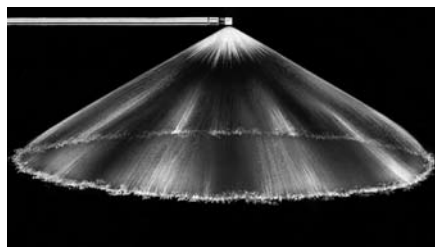
### DESIGN FEATURES

- Large free passage
- Clog-resistant; nozzles have no internal parts
- Wide spray band
- Female connection
- Flanged connection available
- U.S. Patent 4,231,524
- Inlet and outlet are in-line

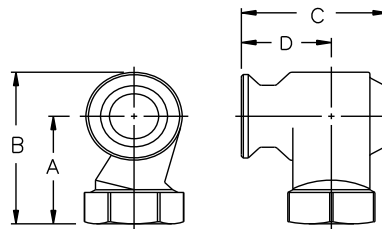
### SPRAY CHARACTERISTICS

- Spray pattern:** Hollow Cone
- Spray angle:** Wide
- Flow rates:** 15.3 to 2230 l/min

**Silicon carbide requests require review prior to quote/order acceptance. Please contact BETE for information.**



Hollow Cone - Wide Angle



Dimensions are approximate. Check with BETE for critical dimension applications.

### THW Flow Rates and Dimensions

Hollow Cone, Wide Spray Angles, 1" to 3" Pipe Sizes, BSP or NPT

Female Pipe Size	Nozzle Number	Spray Angles			K Factor	LITERS PER MINUTE @ BAR								Approx. Orifice Dia. (mm)	Free Pass. Dia. (mm)	Dimensions (mm)				Wt. (kg)
		0.3 bar	1 bar	3 bar		0.2 bar	0.3 bar	0.5 bar	0.7 bar	1 bar	1.5 bar	2 bar	3 bar			A	B	C	D	
1	THFW1508	100°	100°	100°	34.2	15.3	18.7	24.2	28.6	34.2	41.9	48.3	59.2	8.73	8.73	58.7	79.2	58.7	35.0	0.18
	THFW1808	115°	115°	115°	41.0	18.3	22.5	29.0	34.3	41.0	50.2	58.0	71.0	9.53	9.53					
	THFW2308	120°	120°	120°	52.4	23.4	28.7	37.1	43.9	52.4	64.2	74.1	90.8	11.1	11.1					
	THFW2708	120°	120°	120°	61.5	27.5	33.7	43.5	51.5	61.5	75.4	87.0	107	11.9	11.9					
	THFW3208	120°	120°	120°	72.9	32.6	39.9	51.6	61.0	72.9	89.3	103	126	13.9	13.9					
	THFW3808	125°	125°	125°	86.6	38.7	47.4	61.2	72.5	86.6	106	122	150	15.2	15.2					
1 1/4	THFW3210	120°	120°	120°	72.9	32.6	39.9	51.6	61.0	72.9	89.3	103	126	13.9	13.9	73.1	97.8	73.1	44.4	0.54
	THFW3810	125°	125°	125°	86.6	38.7	47.4	61.2	72.5	86.6	106	122	150	15.9	15.9					
	THFW4110	125°	125°	125°	93.4	41.8	51.2	66.1	78.2	93.4	114	132	162	16.7	16.7					
	THFW5210	125°	125°	125°	119	53.0	64.9	83.8	99.1	119	145	168	205	19.8	19.8					
	THFW7010	125°	125°	125°	160	71.3	87.4	113	133	160	195	226	276	26.2	22.6					
1 1/2	THFW6112	110°	110°	110°	139	62.2	76.1	98.3	116	139	170	197	241	19.4	19.4	74.7	104	91.9	58.4	1.00
	THFW7012	112°	115°	115°	160	71.3	87.4	113	133	160	195	226	276	21.4	21.4					
	THFW7712	117°	120°	120°	175	78.5	96.1	124	147	175	215	248	304	23.4	23.4					
	THFW9012	117°	120°	120°	205	91.7	112	145	172	205	251	290	355	26.2	26.2					
	THFW12712	117°	120°	120°	289	129	159	205	242	289	354	409	501	32.9	27.0					
	THFW14512	117°	120°	120°	330	148	181	234	276	330	405	467	572	36.1	27.0					

$$\text{Flow Rate } (l/min) = K \sqrt{\text{bar}}$$

**Standard Materials: Brass, Carbon Steel and 316 Stainless Steel.**

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

TO ORDER: specify pipe size, connection type, nozzle number, spray angle, and material.

WHIRL

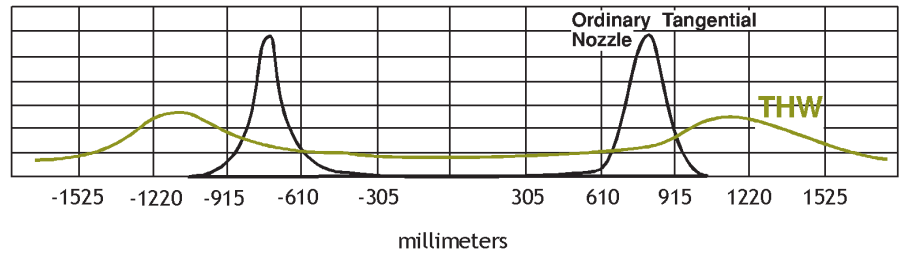




Silicon Carbide, Flanged

Silicon carbide requests require review prior to quote/order acceptance. Please contact BETE for information.

Note: spray angles are for cast alloy nozzles only; not SNBSC.



Dimensions are approximate. Check with BETE for critical dimension applications.

**THW Flow Rates and Dimensions**

Hollow Cone, Wide Spray Angles, 1" to 3" Pipe Sizes, BSP or NPT

Female Pipe Size	Nozzle Number	Spray Angles			K Factor	LITERS PER MINUTE @ BAR								Approx. Orifice Dia. (mm)	Free Pass. Dia. (mm)	Dimensions (mm)				Wt. (kg)
		0.3 bar	1 bar	3 bar		0.2 bar	0.3 bar	0.5 bar	0.7 bar	1 bar	1.5 bar	2 bar	3 bar			A	B	C	D	
2	THFW8516	112°	115°	115°	194	86.6	106	137	162	194	237	274	336	21.8	21.8	91.9	130	114	70.6	1.81
	THFW10516	120°	122°	122°	239	107	131	169	200	239	293	338	414	25.4	25.4					
	THFW12516	119°	122°	122°	285	127	156	201	238	285	349	403	493	29.0	29.0					
	THFW14516	122°	125°	125°	330	148	181	234	276	330	405	467	572	32.1	32.1					
	THFW17016	125°	125°	125°	387	173	212	274	324	387	474	548	671	35.3	35.3					
	THFW19216	125°	125°	125°	438	196	240	309	366	438	536	619	758	38.5	36.5					
	THFW20516	125°	125°	125°	467	209	256	330	391	467	572	661	809	41.3	36.5					
	THFW23016	125°	125°	125°	524	234	287	371	439	524	642	741	908	44.5	36.5					
2 1/2	THFW17020	117°	120°	120°	387	173	212	274	324	387	474	548	671	33.7	33.7	125	172	143	88.1	2.90
	THFW19020	117°	120°	120°	433	194	237	306	362	433	530	612	750	36.1	36.1					
	THFW20520	117°	120°	120°	467	209	256	330	391	467	572	661	809	37.3	37.3					
	THFW23020	123°	125°	125°	524	234	287	371	439	524	642	741	908	40.1	40.1					
	THFW28020	128°	130°	130°	638	285	349	451	534	638	781	902	1110	46.0	44.5					
	THFW32020	128°	130°	130°	729	326	399	516	610	729	893	1030	1260	51.2	44.5					
	THFW34020	128°	130°	130°	775	347	424	548	648	775	949	1100	1340	53.2	44.5					
	THFW43520	128°	130°	130°	991	443	543	701	829	991	1210	1400	1720	61.9	44.5					
3	THFW18524	122°	122°	122°	422	189	231	298	353	422	516	596	730	32.5	32.5	145	200	173	109	4.08
	THFW23024	122°	122°	122°	524	234	287	371	439	524	642	741	908	36.5	36.5					
	THFW28024	122°	122°	122°	638	285	349	451	534	638	781	902	1110	41.3	41.3					
	THFW32024	125°	125°	125°	729	326	399	516	610	729	893	1030	1260	45.2	45.2					
	THFW34024	125°	125°	125°	775	347	424	548	648	775	949	1100	1340	46.8	46.8					
	THFW41224	128°	130°	130°	939	420	514	664	786	939	1150	1330	1630	53.6	53.6					
	THFW46924	129°	132°	135°	1070	478	585	756	894	1070	1310	1510	1850	57.9	54.0					
	THFW52624	129°	132°	135°	1200	536	657	848	1000	1200	1470	1700	2080	63.1	54.0					
	THFW56424	129°	132°	135°	1290	575	704	909	1080	1290	1570	1820	2230	65.9	54.0					

Flow Rate ( $l/min$ ) =  $K \sqrt{\text{bar}}$

Standard Materials: Brass, Carbon Steel and 316 Stainless Steel.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.



WHIRL

CALL 413-772-0846  
Call for the name of your nearest BETE representative.

# WL

WHIRL

## Low Flow/Full Cone

### DESIGN FEATURES

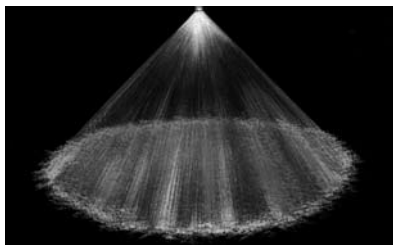
- Advanced whirl plate design produces extremely uniform coverage
- Male and female connections

### SPRAY CHARACTERISTICS

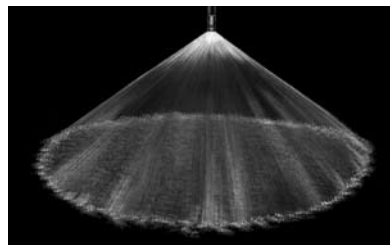
- Medium to coarse atomization
- Spray pattern:** Full Cone. Square pattern available
- Spray angles:** 30°, 60°, 90°, and 120° standard
- Flow rates:** 0.497 to 192 l/min



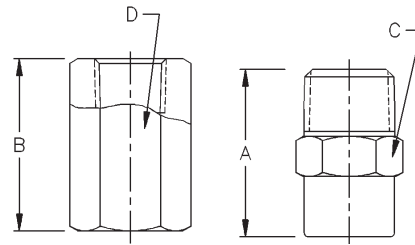
Metal



Full Cone 90°



Full Cone 120°



Female Metal

Male Metal

Dimensions are approximate. Check with BETE for critical dimension applications.

### WL Flow Rates and Dimensions

Full Cone, 30°, 60°, 90° and 120° Spray Angles, BSP or NPT

Male or Female Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR								Approx. Orifice Dia. (mm)	Dimensions for Metal Only (mm)				Wt. (g) Metal Plas.	
			0.7 bar	1 bar	2 bar	3 bar	5 bar	10 bar	15 bar	20 bar		A	B	C	D		
1/8	WL 1/4	0.587	0.497	0.587	0.814	0.984	1.25	1.73	2.10	2.40	1.09	22.2	28.6	11.1	14.3	28.4	7.1
	WL 1/2	1.17	0.993	1.17	1.63	1.97	2.50	3.47	4.19	4.80	1.40						
	WL 3/4	1.76	1.49	1.76	2.44	2.95	3.75	5.20	6.29	7.20	1.83						
1/4	WL 1	2.35	1.99	2.35	3.25	3.94	5.01	6.93	8.39	9.60	2.08	27.0	34.9	14.2	17.5	42.5	10.6
	WL 1 1/2	3.52	2.98	3.52	4.88	5.91	7.51	10.4	12.6	14.4	2.77						
3/8	WL 2	4.70	3.97	4.70	6.51	7.87	10.0	13.9	16.8	19.2	3.18	31.8	38.1	17.5	22.2	56.7	14.2
	WL 3	7.05	5.96	7.05	9.76	11.8	15.0	20.8	25.2	28.8	3.96						
	WL 4	9.40	7.95	9.40	13.0	15.7	20.0	27.7	33.6	38.4	4.78						
1/2	WL 5	11.7	9.93	11.7	16.3	19.7	25.0	34.7	41.9	48.0	5.16	38.1	50.8	22.2	28.6	85.1	28.4
	WL 6	14.1	11.9	14.1	19.5	23.6	30.0	41.6	50.3	57.6	5.56						
	WL 7	16.4	13.9	16.4	22.8	27.6	35.0	48.5	58.7	67.2	5.79						
3/4	WL 8	18.8	15.9	18.8	26.0	31.5	40.0	55.5	67.1	76.8	5.94	44.5	54.0	28.6	34.9	170	42.5
	WL 10	23.5	19.9	23.5	32.5	39.4	50.1	69.3	83.9	96.0	7.14						
	WL 12	28.2	23.8	28.2	39.0	47.2	60.1	83.2	101	115	7.92						
1	WL 15	35.2	29.8	35.2	48.8	59.1	75.1	104	126	144	8.33	55.6	60.3	34.9	41.3	397	99.2
	WL 20	47.0	39.7	47.0	65.1	78.7	100	139	168	192	9.53						

$$\text{Flow Rate (l/min)} = K (\text{bar})^{0.47}$$

Standard Materials: Brass, 303 Stainless Steel, 316 Stainless Steel, PVC, Polypropylene and PTFE (1/8" PTFE and Polypropylene not available in 120°).

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

TO ORDER: specify pipe size, connection type, nozzle number, spray angle, and material.

# CW

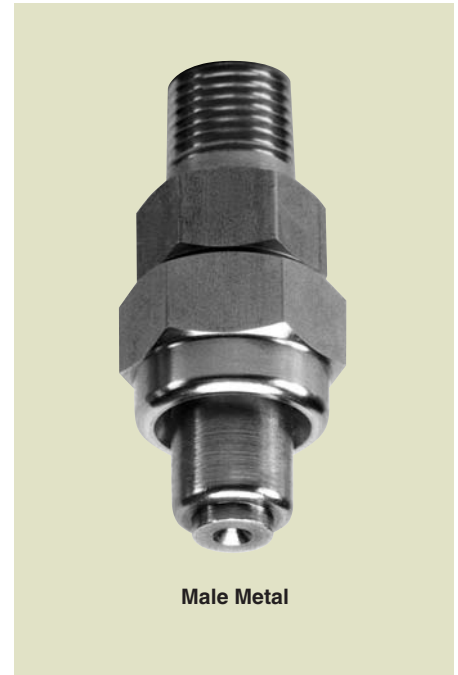
## Low Flow

### DESIGN FEATURES

- Standard 3-piece construction
- Optional 50- or 100-mesh strainer (refer to page 108 for additional information)
- Protective cover available
- Male and female connections
- Interchangeable spray tips

### SPRAY CHARACTERISTICS

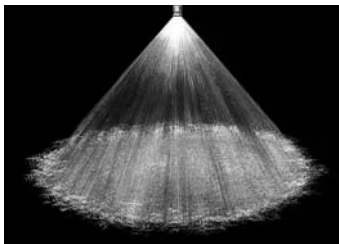
**Spray patterns:** Full (F) or Hollow Cone (H)  
**Spray angles:** 80° and 120°  
**Flow rates:** 0.424 to 8.39 l/min



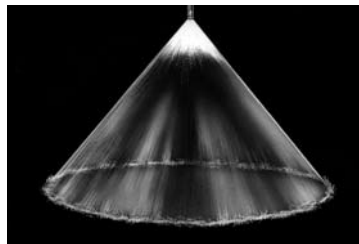
Male Metal



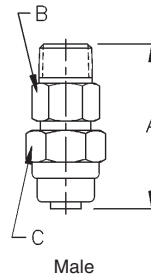
WHIRL



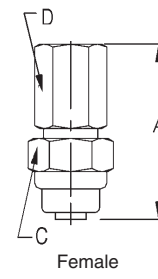
Full Cone 80° (F)



Hollow Cone 80° (H)



Male



Female

Dimensions are approximate. Check with BETE for critical dimension applications.

### CW Flow Rates and Dimensions

Full and Hollow Cone, 80° and 120° Spray Angles, 1/8" to 3/8" Pipe Sizes, BSP or NPT

Male or Female Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR								Approx. Orifice Dia.(mm)	Male or Female Pipe Size	Dimensions (mm)				Wt. (g) Metal
			0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	10 bar	15 bar			A	B	C	D	
1/8 or 1/4 or 3/8	CW25	0.587	0.424	0.497	0.587	0.814	0.984	1.25	1.73	2.10	1.14	1/8-1/4	52.3	17.5	20.6	17.3	71
	CW50	1.17	0.848	0.993	1.17	1.63	1.97	2.50	3.47	4.19	1.37	3/8	52.3	17.5	20.6	20.6	
	CW75	1.76	1.27	1.49	1.76	2.44	2.95	3.75	5.20	6.29	1.60						
	CW100	2.35	1.70	1.99	2.35	3.25	3.94	5.01	6.93	8.39	2.18						

$$\text{Flow Rate (l}_{\text{min}}) = K (\text{bar})^{0.47}$$

Standard Materials: Brass, 303 Stainless Steel and 316 Stainless Steel.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

Call for the name of your nearest BETE representative.

CALL 413-772-0846

# Twist & Dry™

## Twist & Dry™ Component System

WHIRL

The Twist & Dry™ component system was developed for the spray dryer industry. The TD-K was next developed as an innovative solution to expand spray dryer capacity up to 689 bar. The patented locking system locks components into place prior to installation. There are many interchangeable swirls and orifice disks available for varying the flow rates of the nozzles. Many materials are also available to allow for high temperature usage without leakage.

### SPRAY SET-UPS

Twist & Dry nozzles have almost 1,000 different combinations of swirl and orifice discs to provide exactly the right flow rate and angle for your needs. The spray angle and flow rate are determined by the "swirl/orifice set-up"—a specific combination of one swirl disc and one orifice. To locate the right swirl and orifice combination refer to the following TD-K, Twist & Dry, and TDL pages.

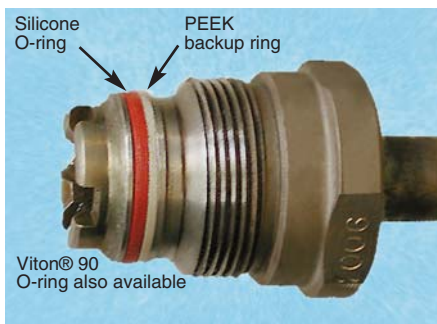
Spray angle is determined by the orifice geometry. Carriers and bodies differ in both material and design to accommodate both high temperature and pressure. The robust design allows for many material choices and combinations.



TDL Low Flow Twist & Dry™ Assembly

### TD-K High Pressure Series

The TD-K is a high pressure nozzle in the Twist & Dry series. The series includes models TD-7K rated up to 483 bar and the TD-10K rated up to 689 bar.



Side View: TD-K body with PEEK backup ring

Often higher pressures can increase yield and save money. **Please visit [www.bete.com/td-k.html](http://www.bete.com/td-k.html).**

### Twist & Dry Series

The Twist & Dry is a BETE original design that answers the needs of the spray drying industry. The BETE design offers superior performance as well as an innovative patented locking mechanism. Replace the wear parts of your spray dry nozzles without turning the lances upside down.

The BETE Twist & Dry is designed with the operator in mind. If you operate and maintain a spray dryer, you know just how difficult it can be to replace the nozzle wear parts.

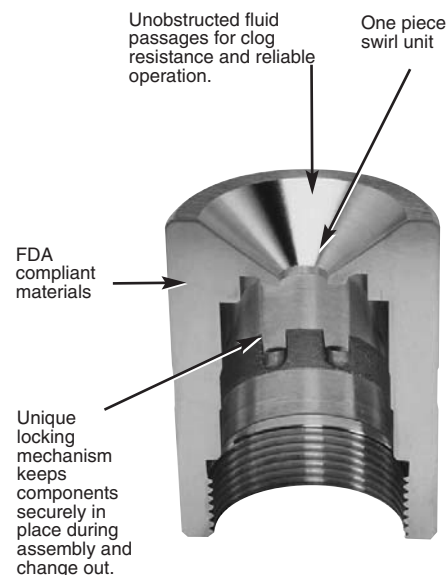


TD swirl disc



TD orifice disc

These unique features of the Twist & Dry design makes this chore much easier: fewer parts; rugged design—one piece swirl unit greatly reduces breakage of tungsten carbide pieces; easy assembly—the BETE Twist & Dry locking system keeps the swirl chamber and orifice "locked" into position during assembly; Materials—corrosion-resistant 303 Stainless Steel carrier, Tungsten Carbide swirl unit and orifice disk, Viton® O-rings, other materials are available. BETE provides software support, also: users of the Twist & Dry receive free-of-charge computer software that greatly simplifies selecting the correct swirl unit and orifice disk.



Cutaway view of the Twist & Dry carrier

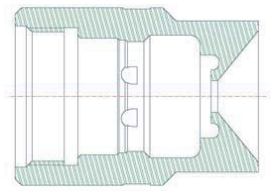
TO ORDER: specify pipe size, connection type, nozzle number, and material.

# Twist & Dry™ Components & Options

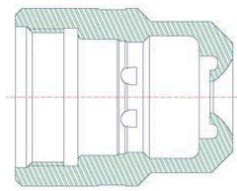


WHIRL

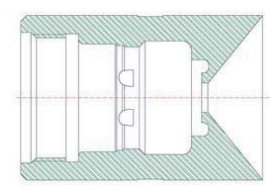
Pressure		Temperature		
bar	psi	up to 250°F (121°C)	up to 400°F (204°C)	up to 450°F (232°C)
689	10,000	TD 10K Viton 90 O-ring w/ PEEK Backup Ring Carrier in Duplex 2205 TD 10K only available in Carriers 5 and 11	TD 10K Viton 90 O-ring w/ PEEK Backup Ring Carrier in Duplex 2205 TD 10K only available in Carriers 5 and 11	TD 10K Silicone O-ring w/ PEEK Backup Ring Carrier in Duplex 2205 TD 10K only available in Carriers 5 and 11
483	7,000	TD 7K Viton 90 O-ring w/ PEEK Backup Ring	TD 7K Viton 90 O-ring w/ PEEK Backup Ring	TD 7K Silicone O-ring w/ PEEK Backup Ring
345	5,000	TD Viton 90 O-ring	TD Viton 90 O-ring	TD Silicone O-ring
241	3,500			
55	800			



Carrier 1 (C11) (shown)  
Carrier 11 (C111) - without lugs



Standard TD Carrier  
Carrier 2 (C112) (shown)  
Carrier 5 (C115) - without lugs



Carrier 10 (C110) (shown)  
Carrier 12 (C112) - without lugs

## To Order: Spray Set-up Number

**1/4 TD 2 - 025 - C11 - 7K - 45 - B @ 7H**

pipe size	series	swirl number	orifice	carrier style	thread	material
				omit for TDL, or standard carrier, model #2	omit if NPT	
				pressure		temperature
				omit for TDL or if pressure is less than or equal to 3,500 psi (241 bar)		omit if temperature is less than or equal to 400°F (204°C)
				<b>7K</b> if pressure is greater than 3,500 psi and less than or equal to 7,000 psi; needs PEEK backup ring		<b>45</b> if temperature is greater than 400°F and less than or equal to 450°F (232°C); needs Silicone O-ring
				<b>10K</b> if pressure is greater than 7,000 psi and less than or equal to 10,000 psi; needs PEEK backup ring + Duplex 2205 carrier material		

PEEK™ is a registered trademark of Victrex.

CALL 413-772-2166  
 Call for the name of your nearest BETE representative.

# TD/TD-K



WHIRL

## Twist & Dry™ Hollow Cone

### DESIGN FEATURES

- Patented locking mechanism for quick and easy change-out and maintenance
- Choose TD-K to operate at high pressures for greater yield capacity
- PEEK backup ring with Viton® 90 O-rings or Silicone (for higher temperatures)
- Female-threaded or butt weld pipe connections
- Easy assembly, no special tools required

- Orifice size: 0.864mm through 3.99mm
- Interchangeable swirl and orifice discs for variable patterns and flow rates
- Please visit [www.bete.com/td-k.html](http://www.bete.com/td-k.html) for more information on the TD-K nozzle

### SPRAY CHARACTERISTICS

- Hollow Cone
- **Flow rates:** 35.3 to 5,970 l/hr
- **Spray angle:** 50°, 55°, 60°, 65°, 70°, 75°, 80°



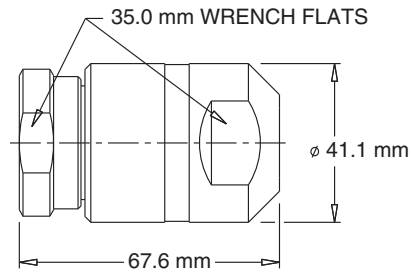
Female



70° Hollow Cone



Cutaway view of carrier showing lugs and BETE's unique locking design



Pipe Size	Weight (g)
1/4"	539
3/8"	524
1/2"	510
3/4"	482

Dimensions are approximate. Check with BETE for critical dimension applications.

### Twist & Dry Flow Rates and Dimensions

Hollow Cone, 50° to 80° Spray Angles, 1/4", 3/8", 1/2" and 3/4" Pipe Size NPT, BSP or Welded

Female Pipe Size	Nozzle Number	Spray Angle	Orifice Swirl (mm)	K Factor	LITERS PER HOUR @ BAR												
					15 bar	35 bar	50 bar	70 bar	90 bar	100 bar	120 bar	150 bar	175 bar	200 bar	275 bar	350 bar	
1/4"	TD2-34	70°	SW2 0.864	9.12	35.3	53.9	64.5	76.3	86.5	91.2	99.9	112	121	129	151	171	
	TD1-37	80°	SW1 0.940														
OR	TD2-40	75°	SW2 1.02	11.4	44.1	67.4	80.6	95.3	108	114	125	140	151	161	189	213	
	TD1-49	85°	SW1 1.24														
3/8"	TD4-34	60°	SW4 0.864	13.7	53.0	80.9	96.7	114	130	137	150	167	181	193	227	256	
	TD3-40	70°	SW3 1.02														
OR	TD5-34	50°	SW5 0.864	16.0	61.8	94.4	113	133	151	160	175	195	211	226	265	298	
	TD4-40	65°	SW4 1.02														
1/2"	TD4-43	65°	SW4 1.09	18.2	70.6	108	129	153	173	182	200	223	241	258	302	341	
	TD3-49	75°	SW3 1.24														
OR	TD6-37	50°	SW6 0.940	20.5	79.4	121	145	172	195	205	225	251	271	290	340	384	
	TD5-40	60°	SW5 1.02														
3/4"	TD4-46	70°	SW4 1.17	22.8	88.3	135	161	191	216	228	250	279	301	322	378	426	
	TD3-55	75°	SW3 1.40														
OR	TD6-40	50°	SW6 1.02	25.1	97.1	148	177	210	238	251	275	307	332	355	416	469	
	TD5-49	60°	SW5 1.24														
3/4"	TD4-58	70°	SW4 1.47	25.1	97.1	148	177	210	238	251	275	307	332	355	416	469	
	TD3-67	80°	SW3 1.70														

Flow Rate (l/hr) = K √ bar

Standard Materials: 316 Stainless Steel, Tungsten Carbide. Other materials available.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

TO ORDER: specify pipe size, connection type, nozzle number and material.



Dimensions are approximate. Check with BETE for critical dimension applications.

**Twist & Dry Flow Rates and Dimensions**

*Hollow Cone, 50° to 80° Spray Angles, 1/4", 3/8", 1/2" and 3/4" Pipe Size NPT, BSP or Welded*

Female Pipe Size	Nozzle Number	Spray Angle	Dia Swirl (mm)	K Factor	LITERS PER HOUR @ BAR												
					15 bar	35 bar	50 bar	70 bar	90 bar	100 bar	120 bar	150 bar	175 bar	200 bar	275 bar	350 bar	
	TD6-46 TD5-52 TD4-61 TD3-70	55° 65° 75° 80°	SW6 1.17 SW5 1.32 SW4 1.55 SW3 1.78	27.4	106	162	193	229	259	273	300	335	362	387	453	512	
	TD6-52 TD5-58 TD4-70	55° 65° 75°	SW6 1.32 SW5 1.47 SW4 1.78	31.9	124	189	226	267	303	319	349	391	422	451	529	597	
	TD7-49 TD6-55 TD5-64 TD4-76	50° 60° 70° 80°	SW7 1.24 SW6 1.40 SW5 1.63 SW4 1.93	36.5	141	216	258	305	346	365	399	447	482	516	605	682	
	TD7-52 TD6-61 TD5-70	50° 60° 70°	SW7 1.32 SW6 1.55 SW5 1.78	41.0	159	243	290	343	389	410	449	502	543	580	680	767	
	TD7-58 TD6-64 TD5-76 TD4-91	55° 65° 75° 80°	SW7 1.47 SW6 1.63 SW5 1.93 SW4 2.31	45.6	177	270	322	381	432	456	499	558	603	645	756	853	
	TD7-61 TD6-70 TD5-82	55° 65° 75°	SW7 1.55 SW6 1.78 SW5 2.08	50.1	194	297	355	419	476	501	549	614	663	709	831	938	
	TD7-64 TD6-76 TD5-88	55° 65° 75°	SW7 1.63 SW6 1.93 SW5 2.24	54.7	212	324	387	458	519	547	599	670	724	773	907	1020	
	TD8-67 TD7-76 TD6-88 TD5-109	50° 60° 70° 80°	SW8 1.70 SW7 1.93 SW6 2.24 SW5 2.77	68.4	265	404	483	572	649	684	749	837	904	967	1130	1280	
	TD8-76 TD7-85 TD6-103	50° 65° 75°	SW8 1.93 SW7 2.16 SW6 2.62	82.0	318	485	580	686	778	820	899	1010	1090	1160	1360	1540	
	TD8-82 TD7-97 TD6-115	55° 65° 75°	SW8 2.08 SW7 2.46 SW6 2.92	95.7	371	566	677	801	908	957	1050	1170	1270	1350	1590	1790	
	TD9-82 TD8-91 TD7-106 TD6-127	50° 60° 70° 80°	SW9 2.08 SW8 2.31 SW7 2.69 SW6 3.23	109	424	647	773	915	1040	1090	1200	1340	1450	1550	1810	2050	
	TD9-88 TD8-100 TD7-118 TD6-142	50° 60° 70° 80°	SW9 2.24 SW8 2.54 SW7 3.00 SW6 3.61	123	477	728	870	1030	1170	1230	1350	1510	1630	1740	2040	2300	
	TD9-94 TD8-106 TD7-127	55° 65° 75°	SW9 2.39 SW8 2.69 SW7 3.23	137	530	809	967	1140	1300	1370	1500	1680	1810	1930	2270	2560	
	TD9-106 TD8-121 TD7-145	55° 65° 75°	SW9 2.69 SW8 3.07 SW7 3.68	160	618	944	1130	1340	1510	1600	1750	1950	2110	2260	2650	2980	
	TD10-103 TD9-115 TD8-133	50° 60° 70°	SW10 2.62 SW9 2.92 SW8 3.38	182	706	1080	1290	1530	1730	1820	2000	2230	2410	2580	3020	3410	
	TD10-118 TD9-127 TD8-145	55° 60° 70°	SW10 3.00 SW9 3.23 SW8 3.68	205	794	1210	1450	1720	1950	2050	2250	2510	2710	2900	3400	3840	
	TD9-136 TD8-157	65° 75°	SW9 3.45 SW8 3.99	228	883	1350	1610	1910	2160	2280	2500	2790	3020	3220	3780	4260	
	TD9-148	65°	SW9 3.76	251	971	1480	1770	2100	2380	2510	2750	3070	3320	3550	4160	4690	
	TD10-136 TD9-154	60° 70°	SW10 3.45 SW9 3.91	274	1060	1620	1930	2290	2590	2740	3000	3350	3620	3870	4540	5120	
	TD10-151	60°	SW10 3.84	296	1150	1750	2100	2480	2810	2960	3250	3630	3920	4190	4910	5540	
	TD10-157	65°	SW10 3.99	319	1240	1890	2260	2670	3030	3190	3500	3910	4220	4510	5290	5970	

Flow Rate (l/hr) = K √ bar

Standard Materials: 316 Stainless Steel, Tungsten Carbide. Other materials available.



CALL 1-413-772-2166  
Call for the name of your nearest BETE representative.

# TDL

## Twist & Dry™ Low Flow Hollow Cone

### DESIGN FEATURES

- Patented locking mechanism for quick and easy change-out and maintenance
- 2-piece body for easy maintenance
- Lower flow rates than the Twist & Dry series
- Female-threaded or butt weld pipe connections
- Orifice size: 0.457mm through 1.47mm
- Interchangeable swirl and orifice discs for variable patterns and flow rates

### SPRAY CHARACTERISTICS

- Hollow Cone
- Flow rates:** 11.3 to 469 l/hr
- Spray angle:** 70° - 75°

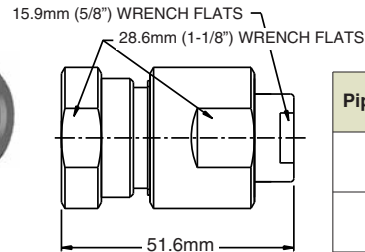


Female

WHIRL



70° Hollow Cone



Pipe Size	Weight (g)
1/4"	119
3/8"	107

Dimensions are approximate. Check with BETE for critical dimension applications.

### TDL Flow Rates and Dimensions

Hollow Cone, 70° to 75° Spray Angles, 1/4" and 3/8" Pipe Size NPT, BSP or Welded

Female Pipe Size	Nozzle Number	Dia. Swirl [mm]	K	LITERS PER HOUR @ BAR											
				15 bar	35 bar	50 bar	70 bar	90 bar	100 bar	120 bar	150 bar	175 bar	200 bar	275 bar	350 bar
1/4"	TDL4-18	SWL4 0.457	2.92	11.3	17.3	20.6	24.4	27.7	29.2	32.0	35.7	36.6	41.3	48.4	54.6
	TDL4-20	SWL4 0.508	3.10	12.0	18.3	21.9	25.9	29.4	31.0	34.0	38.0	41.0	43.8	51.4	58.0
	TDL4-22	SWL4 0.559	3.42	13.2	20.2	24.2	28.6	32.4	34.2	37.4	41.9	45.2	48.3	56.7	64.0
	TDL4-24	SWL4 0.610	3.92	15.2	23.2	27.7	32.8	37.2	39.2	42.9	48.0	51.9	55.4	65.0	73.3
	TDL4-27	SWL4 0.686	4.56	17.7	27.0	32.2	38.1	43.2	45.6	49.9	55.8	60.3	64.5	75.6	85.3
OR	TDL1-22	SWL1 0.559	5.01	19.4	29.7	35.5	41.9	47.6	50.1	54.9	61.4	66.3	70.9	83.1	93.8
	TDL1-24	SWL1 0.610	5.70	22.1	33.7	40.3	47.7	54.0	57.0	62.4	69.8	75.4	80.6	94.5	107
	TDL1-27	SWL1 0.686	6.61	25.6	39.1	46.7	55.3	62.7	66.1	72.4	80.9	87.4	93.5	110	124
	TDL1-30	SWL1 0.762	7.52	29.1	44.5	53.2	62.9	71.3	75.2	82.4	92.1	99.5	106	125	141
	TDL2-30	SWL2 0.762	9.12	35.3	53.9	64.5	76.3	86.5	91.2	100	112	121	129	151	171
	TDL2-33	SWL2 0.838	10.3	39.7	60.7	72.5	85.5	97.3	103	112	126	136	145	170	192
	TDL2-36	SWL2 0.914	11.4	44.1	67.4	80.6	95.3	108	114	125	140	151	161	189	213
	TDL2-38	SWL2 0.965	12.1	46.8	71.5	85.4	101	115	121	132	148	160	171	200	226
3/8"	TDL2-40	SWL2 1.02	13.2	51.2	78.2	93.5	111	125	132	145	162	175	187	219	247
	TDL2-42	SWL2 1.07	13.7	53.0	80.9	96.7	114	130	137	150	167	181	193	227	256
	TDL2-44	SWL2 1.12	14.1	54.7	83.6	100	118	134	141	155	173	187	200	234	264
	TDL2-46	SWL2 1.17	14.8	57.4	87.6	105	124	141	148	162	181	196	209	246	277
	TDL2-48	SWL2 1.22	16.0	61.8	94.4	113	133	151	160	175	195	211	226	265	298
	TDL2-50	SWL2 1.27	16.6	64.4	98.4	118	139	158	166	182	204	220	235	276	311
	TDL2-52	SWL2 1.32	18.0	69.7	107	127	151	171	180	197	220	238	255	298	337
	TDL2-54	SWL2 1.37	18.7	72.4	111	132	156	177	187	205	229	247	264	310	350
	TDL2-56	SWL2 1.42	19.1	74.1	113	135	160	182	191	210	234	253	271	317	358
	TDL3-50	SWL3 1.27	20.4	79.1	121	144	171	194	204	224	250	270	289	339	382
TDL3-52	SWL3 1.32	21.8	84.4	129	154	182	207	218	239	267	288	308	361	408	
TDL3-54	SWL3 1.37	23.0	89.1	136	163	193	218	230	252	282	304	326	382	431	
TDL3-56	SWL3 1.42	24.4	94.4	144	172	204	231	244	267	299	323	345	404	456	
TDL3-58	SWL3 1.47	25.1	97.1	148	177	210	238	251	275	307	332	355	416	469	

$$\text{Flow Rate (l/hr)} = K \sqrt{\text{bar}}$$

Standard Materials: Stainless Steel, Tungsten Carbide. Other materials available.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

TO ORDER: specify pipe size, connection type, nozzle number and material.

# NF

## Standard Fan Nozzle

### DESIGN FEATURES

- One-piece construction
- No internal parts
- Sizes for all applications
- Male connection

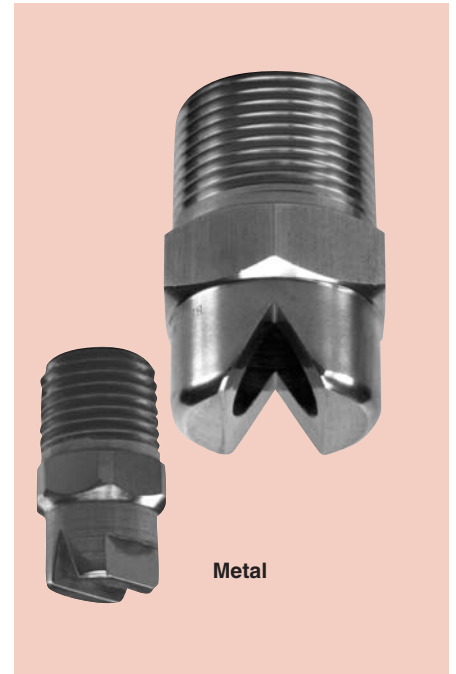
### SPRAY CHARACTERISTICS

- High impact
- Uniform distribution with tapered edges for overlapping sprays
- Extra-wide angles available

**Spray pattern:** Fan and Straight Jet

**Spray angles:** 0° to 120°

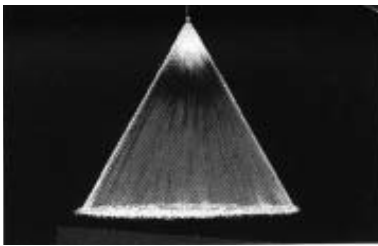
**Flow rates:** 0.161 to 3430 l/min



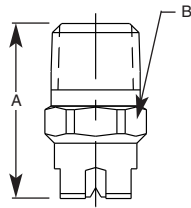
Metal



FAN



Fan 50°



3/8" - 2" Metal

Dimensions are approximate. Check with BETE for critical dimension applications.

### NF Flow Rates

Call BETE to verify spray angle performance at operating pressures above 5 bar.

Fan and Straight Jet, 0°, 15°, 30°, 50°, 65°, 80°, 90°, 110°, and 120° Spray Angles, 1/8" to 2" Pipe Sizes

### NF Dimensions BSP or NPT

Male Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR								Equivalent Orifice Dia. (mm)	Pipe Size	Dim. for Metal Only (mm)		Wt. (g) Metal Plas.	
			0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	10 bar	30 bar			A	B		
1/8 or 1/4	NF01	0.228	0.16	0.19	0.23	0.32	0.39	0.51	0.72	1.25	0.66	1/8	22.2	11.1	28.4	7.09
	NF015	0.342	0.24	0.29	0.34	0.48	0.59	0.76	1.08	1.87						
	NF02	0.455	0.32	0.38	0.46	0.64	0.79	1.02	1.44	2.49	0.91					
	NF025	0.569	0.40	0.48	0.57	0.81	0.99	1.27	1.80	3.12	1.02					
1/4 or 3/8	NF03	0.683	0.48	0.57	0.68	0.97	1.18	1.53	2.16	3.74	1.09	1/4	27.0	14.3	42.5	10.6
	NF04	0.911	0.64	0.76	0.91	1.29	1.58	2.04	2.88	4.99	1.32					
	NF05	1.14	0.81	0.95	1.14	1.61	1.97	2.55	3.60	6.24	1.45					
	NF06	1.37	0.97	1.14	1.37	1.93	2.37	3.06	4.33	7.49	1.57					
1/8 or 1/4 or 3/8	NF08	1.82	1.28	1.52	1.82	2.57	3.15	4.06	5.74	9.95	1.83	3/8	31.8	17.5	56.7	14.2
	NF10	2.28	1.61	1.91	2.28	3.22	3.95	5.10	7.21	12.5	2.03					
	NF15	3.42	2.42	2.86	3.42	4.83	5.92	7.64	10.8	18.7	2.38					
	NF20	4.56	3.22	3.81	4.56	6.45	7.89	10.2	14.4	25.0	2.78					
1/4 or 3/8	NF30	6.84	4.83	5.72	6.84	9.67	11.8	15.3	21.6	37.4	3.57	1/2	38.1	22.2	85.1	28.4
	NF40	9.12	6.45	7.63	9.12	12.9	15.8	20.4	28.8	49.9	3.97					
	NF50	11.4	8.06	9.53	11.4	16.1	19.7	25.5	36.0	62.4	4.37					
	NF60	13.7	9.67	11.4	13.7	19.3	23.7	30.6	43.2	74.9	4.76					
3/8 or 1/2	NF70	16.0	11.3	13.3	16.0	22.6	27.6	35.7	50.4	87.4	5.16	3/4	44.5	28.6	170	42.5
	NF60	13.7	9.67	11.4	13.7	19.3	23.7	30.6	43.2	74.9	4.76					
	NF70	16.0	11.3	13.3	16.0	22.6	27.6	35.7	50.4	87.4	5.16					
	NF80	18.2	12.9	15.3	18.2	25.8	31.6	40.8	57.7	99.9	5.56					
1/2 or 3/4	NF90	20.5	14.5	17.2	20.5	29.0	35.5	45.9	64.9	112	5.95	1	55.6	34.9	227	56.7
	NF100	22.8	16.1	19.1	22.8	32.2	39.5	51.0	72.1	125	6.35					
	NF120	27.3	19.3	22.9	27.3	38.7	47.4	61.1	86.5	150	6.75					
	NF150	34.2	24.2	28.6	34.2	48.3	59.2	76.4	108	187	7.54					
3/4 or 1	NF200	45.6	32.2	38.1	45.6	64.5	78.9	102	144	250	8.73	1 1/4	63.5	44.5	340	85.1
	NF300	68.4	48.3	57.2	68.4	96.7	118	153	216	374	10.7					
	NF400	91.2	64.5	76.3	91.2	129	158	204	288	499	12.7					
	NF750	171	121	143	171	242	296	382	540	936	17.5					
1 or 1 1/4	NF800	182	129	153	182	258	316	408	577	999	18.3	1 1/2	76.2	50.8	567	142
	NF1150	262	185	219	262	371	454	586	829	1440	21.8					
	NF1500	342	242	286	342	483	592	764	1080	1870	24.6					
	NF2250	513	362	429	513	725	890	1150	1620	2810	30.2					

Flow Rate ( $l/min$ ) =  $K \sqrt{\text{bar}}$  Standard Materials: Brass, 303 Stainless Steel, 316 Stainless Steel, PVC and PTFE (PTFE not available in nozzle numbers below NF025).

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

# NFD

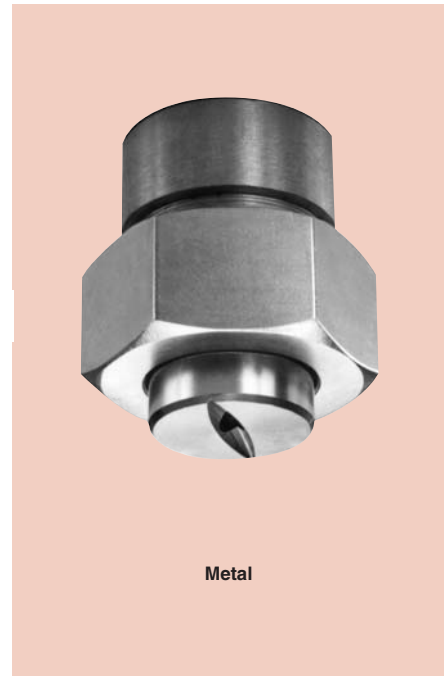
## Dovetail Flat Fan

### DESIGN FEATURES

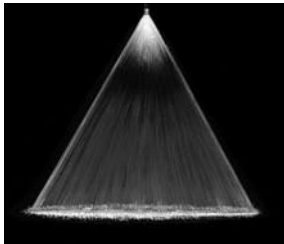
- Dovetail joint guarantees alignment of interchangeable tips
- Dimensionally compatible with other dovetail systems
- Tips offset 5° or 15° for overlapping spray patterns
- Tapered overlapping spray provides uniform coverage
- Male, female and welded connections
- Other sizes available upon request

### SPRAY CHARACTERISTICS

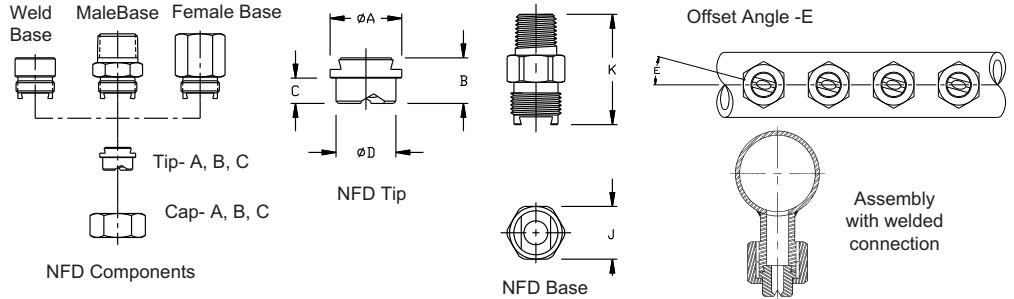
- **Spray pattern:** Flat Fan
- **Spray angles:** 20°, 30°, 45°, 60°, 90°, and 120°. Special angles are available on request
- **Flow rates:** 0.159 to 358 l/min



Metal



Fan 45°



Dimensions are approximate. Check with BETE for critical dimension applications.

### NFD Flow Rates and Dimensions

Fan, 20°, 30°, 45°, 60°, 90°, 120° Spray Angles, 1/4", 3/8", 1/2", 3/4" and 1-1/4" Pipe Size, BSP or NPT, or Welded Connections

Cap & Tip Size	Nozzle Number	Base Sizes* Available	K Factor	LITERS PER MINUTE @ BAR							Equiv. Orifice Dia. (mm)	Approximate Tip Dimensions (mm)				Wt. (g)	BSP NPT Pipe	Approx. Base Dim. (mm)		
				0.5 bar	1 bar	2 bar	3 bar	5 bar	7 bar	10 bar		A	B	C	D			E	J	K
A	NFD 010	1/4 3/8 1/2	0.225	0.159	0.225	0.318	0.390	0.503	0.596	0.712	0.700	14.8	5°	42	1/4"	17.5	36.5			
	NFD 014	1/4 3/8 1/2	0.318	0.225	0.318	0.449	0.550	0.710	0.840	1.00	0.900									
	NFD 019	1/4 3/8 1/2	0.445	0.314	0.445	0.629	0.770	0.994	1.18	1.41	1.00									
	NFD 031	1/4 3/8 1/2	0.704	0.498	0.704	0.996	1.22	1.58	1.86	2.23	1.20									
	NFD 039	1/4 3/8 1/2	0.883	0.625	0.883	1.25	1.53	1.98	2.34	2.79	1.35									
	NFD 050	1/4 3/8 1/2	1.13	0.800	1.13	1.60	1.96	2.53	2.99	3.58	1.50									
	NFD 059	1/4 3/8 1/2	1.34	0.947	1.34	1.89	2.32	3.00	3.54	4.24	1.65									
	NFD 077	1/4 3/8 1/2	1.77	1.25	1.77	2.50	3.06	3.95	4.67	5.59	2.00									
	NFD 097	1/4 3/8 1/2	2.22	1.57	2.22	3.14	3.85	4.97	5.88	7.03	2.20									
	NFD 12	1/4 3/8 1/2	2.82	2.00	2.82	3.99	4.89	6.31	7.47	8.93	2.50									
NFD 15	1/4 3/8 1/2	3.35	2.37	3.35	4.74	5.81	7.50	8.87	10.6	2.70										
B	NFD 20	3/4	4.45	3.15	4.45	6.30	7.71	10.0	11.8	14.1	3.00	24	15°	168	1/2"	22	44.5			
	NFD 25	3/4	5.65	4.00	5.65	7.99	9.79	12.6	15.0	17.9	3.50									
	NFD 31	3/4	7.04	4.98	7.04	9.96	12.2	15.8	18.6	22.3	4.00									
	NFD 39	3/4	8.83	6.25	8.83	12.5	15.3	19.8	23.4	27.9	4.50									
	NFD 50	3/4	11.3	8.00	11.3	16.0	19.6	25.3	29.9	35.8	5.00									
	NFD 62	3/4	14.1	10.0	14.1	20.0	24.5	31.6	37.4	44.7	5.50									
	NFD 77	3/4	17.7	12.5	17.7	25.0	30.6	39.5	46.7	55.9	6.00									
	NFD 87	3/4	19.8	14.0	19.8	28.0	34.3	44.3	52.4	62.6	6.40									
	NFD 104	3/4	23.7	16.7	23.7	33.5	41.0	52.9	62.6	74.9	7.20									
	NFD 124	3/4	28.3	20.0	28.3	40.0	49.0	63.3	74.8	89.5	8.00									
NFD 155	3/4	35.3	25.0	35.3	50.0	61.2	79.0	93.5	112	9.00										
NFD 195	3/4	44.5	31.4	44.5	62.9	77.0	99.4	118	141	10.0										
C	NFD 124	1-1/4	28.3	20.0	28.3	40.0	49.0	63.2	74.8	89.5	8.00	38.5	22	13.5	32	15°	224	1-1/4"	44.5	63.5
	NFD 195	1-1/4	44.5	31.4	44.5	62.9	77.0	99.4	118	141	10.0									
	NFD 309	1-1/4	70.4	49.8	70.4	100	122	158	186	223	12.0									
	NFD 496	1-1/4	113	80.0	113	160	196	253	299	358	15.0									

Flow Rate (l/min) =  $K \sqrt{\text{bar}}$  \* NPT, BSP, male or female or weldable connections. Dimensions are for male base, female and weldable vary.

Standard Materials: Brass, 303 Stainless Steel and 316 Stainless Steel. Weldable adapters also available in mild steel.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

TO ORDER: specify pipe size, connection type, nozzle number, spray angle, and material.

# NFS

## Stubby Flat Fan

### DESIGN FEATURES

- Extremely short length for minimum projection and maximum clearance
- Produces a flat fan spray pattern available in a variety of spray angles
- Available in straight (parallel) threads only, NPS and BSPP
- Requires gasket to seal connection

### SPRAY CHARACTERISTICS

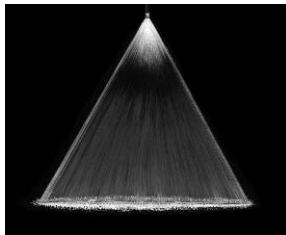
**Spray pattern:** Fan

**Spray angles:** 20°, 30°, 45°, 60°, 90° and 120° standard

**Flow rates:** 0.20 to 951 l/min



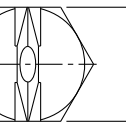
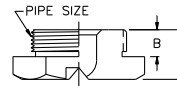
Metal



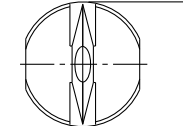
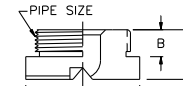
Fan 45°



Fan 90°



Metal



Plastic

Dimensions are approximate. Check with BETE for critical dimension applications.

### NFS Flow Rates and Dimensions

Flat Fan, 20°, 30°, 45°, 60°, 90° & 120° Spray Angles, 1/4" to 2" Pipe Sizes

** Male Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR							Equiv. Orifice Dia. (mm)
			0.5 bar	1 bar	2 bar	3 bar	5 bar	7 bar	10 bar	
1/4"	NFS 012	0.28	0.20	0.28	0.40	0.49	0.63	0.75	0.89	0.800
	NFS 019	0.44	0.31	0.44	0.63	0.77	0.99	1.18	1.41	1.00
	NFS 031	0.71	0.50	0.71	1.00	1.23	1.59	1.88	2.25	1.20
	NFS 039	0.88	0.62	0.88	1.25	1.53	1.98	2.34	2.79	1.35
	NFS 050	1.13	0.80	1.13	1.60	1.96	2.53	2.99	3.58	1.50
	NFS 059	1.35	0.95	1.35	1.90	2.33	3.01	3.56	4.25	1.65
	NFS 077	1.77	1.25	1.77	2.50	3.06	3.95	4.67	5.59	2.00
	NFS 098	2.23	1.58	2.23	3.15	3.86	4.98	5.90	7.05	2.20
	NFS 12	2.83	2.00	2.83	4.00	4.90	6.33	7.48	8.95	2.50
	NFS 15	3.36	2.38	3.36	4.75	5.82	7.51	8.89	10.6	2.70
1/4" or 3/4"	NFS 25	5.66	4.00	5.66	8.00	9.80	12.7	15.0	17.9	3.50
	NFS 31	7.10	5.02	7.10	10.0	12.3	15.9	18.8	22.5	4.00
	NFS 39	8.83	6.25	8.83	12.5	15.3	19.8	23.4	27.9	4.50
	NFS 50	11.3	8.00	11.3	16.0	19.6	25.3	29.9	35.8	5.00
	NFS 62	14.1	10.0	14.1	20.0	24.5	31.6	37.4	44.7	5.50
3/4"	NFS 77	17.7	12.5	17.7	25.0	30.6	39.5	46.7	55.9	6.00
	NFS 93	21.2	15.0	21.2	30.0	36.7	47.4	56.1	67.0	6.90
3/4" or 1-1/4"	NFS 124	28.3	20.0	28.3	40.0	49.0	63.3	74.8	89.5	8.00
	NFS 155	35.3	25.0	35.3	50.0	61.2	79.0	93.5	112	9.00
	NFS 185	42.1	29.8	42.1	59.6	73.0	94.2	112	133	9.50
	NFS 195	44.6	31.5	44.6	63.0	77.2	100	118	141	10.0
1-1/4"	NFS 309	70.4	49.8	70.4	100	122	158	186	223	12.0
	NFS 496	113	80.0	113	160	196	253	299	358	15.0
2"	NFS 557	127	89.8	127	180	220	284	336	402	16.0
	NFS 620	141	100	141	200	245	316	374	447	17.0
	NFS 775	177	125	177	250	306	395	467	559	19.0
	NFS 977	223	158	223	315	386	498	590	705	21.0
	NFS 1130	258	182	258	365	447	577	683	816	22.5
	NFS 1320	301	213	301	425	521	673	796	951	24.5

### NFS Dimensions and Spray Angles

Pipe Size	Nozzle Number	Spray Angles Available	Dimensions (mm)			
			A	B	C	D
1/4"	NFS 012 To NFS 39	20° 30° 45° 60° 90° 120°	11.9			
	NFS 50	20° 30° 45° 60° 90°		7.11		
	NFS 62	45° 60° 90°			17.5	
	NFS 77	45°				19.1
	NFS 25 To NFS 77	20° 30° 45° 60° 90° 120°	15.0			
3/4"	NFS 93*	120°		7.87		
	NFS 124	20° 30° 45° 60° 90° 120°				
	NFS 155	20° 30° 45° 60° 90° 120°			31.8	
	NFS 185	120°				
1 1/4"	NFS 195	20° 30° 45° 60° 90° 120°			35.1	
	NFS 309	20° 30° 45° 60° 90° 120°				
	NFS 124 To NFS 496	20° 30° 45° 60° 90° 120°	22.1	11.9	50.8	55.4
2"	NFS 557 To NFS 1320	20° 30° 45° 60° 90° 120°	31.8	20.1	69.9	76.2

Flow Rate (l/min) =  $K \sqrt{\text{bar}}$  \*NF93 available in 120° only \*\*Available in straight (parallel) threads only, NPS and BSPP

Standard Materials: Brass, 316 Stainless Steel, 303 Stainless Steel and PVC.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

# FF

## Extra-Wide Angle

### DESIGN FEATURES

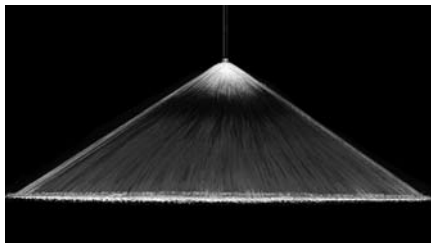
- One-piece construction
- Clog resistant
- Durable
- All 3/8" FFs in Brass have UL approval; 3/8" FF187145 in Brass has FM approval
- Male connection

### SPRAY CHARACTERISTICS

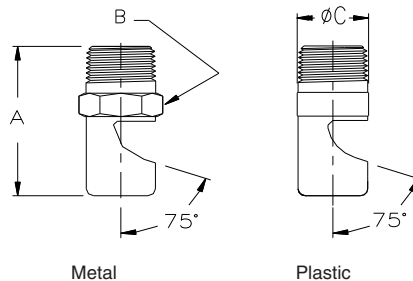
- Extra-wide 145° spray angle
  - Medium-impact spray
  - Spray discharge deflected 75° from inlet axis
  - Coarse atomization
- Spray pattern:** Flat Fan  
**Spray angle:** 105° and 145°  
**Flow rates:** 0.510 to 757 l/min



Plastic



Fan 145°



Metal

Plastic

Dimensions are approximate. Check with BETE for critical dimension applications.

### FF Flow Rates

Fan, 105° and 145° Spray Angle, 1/8" to 1" Pipe Sizes, BSP or NPT

Male Pipe Size	Nozzle Number	Spray Angle	K Factor	LITERS PER MINUTE @ BAR								Approx. Orifice Dia. (mm)
				0.2 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	10 bar	
1/8	FF016	105°	0.114	0.0510	0.0806	0.0953	0.114	0.161	0.197	0.255	0.360	0.406
	FF024	105°	0.228	0.102	0.161	0.191	0.228	0.322	0.395	0.510	0.721	0.610
	FF028	105°	0.342	0.153	0.242	0.286	0.342	0.483	0.592	0.764	1.08	0.711
	FF033	105°	0.456	0.204	0.322	0.381	0.456	0.645	0.789	1.02	1.44	0.838
	FF041	145°	0.684	0.306	0.483	0.572	0.684	0.967	1.18	1.53	2.16	1.04
	FF046	145°	0.912	0.408	0.645	0.763	0.912	1.29	1.58	2.04	2.88	1.17
	FF052	145°	1.14	0.510	0.806	0.953	1.14	1.61	1.97	2.55	3.60	1.32
	FF057	145°	1.37	0.611	0.967	1.14	1.37	1.93	2.37	3.06	4.32	1.45
1/8 or 1/4	FF065	145°	1.82	0.815	1.29	1.53	1.82	2.58	3.16	4.08	5.77	1.65
	FF073	145°	2.28	1.02	1.61	1.91	2.28	3.22	3.95	5.10	7.21	1.85
	FF093	145°	3.42	1.53	2.42	2.86	3.42	4.83	5.92	7.64	10.8	2.36
	FF104	145°	4.56	2.04	3.22	3.81	4.56	6.45	7.89	10.2	14.4	2.64
	FF116	145°	5.47	2.45	3.87	4.58	5.47	7.73	9.47	12.2	17.3	2.95
	FF125	145°	5.70	2.55	4.03	4.77	5.70	8.06	9.87	12.7	18.0	3.18
	FF129	145°	6.84	3.06	4.83	5.72	6.84	9.67	11.8	15.3	21.6	3.28
	FF141	145°	8.20	3.67	5.80	6.86	8.20	11.6	14.2	18.3	25.9	3.58
1/4	FF148	145°	9.12	4.08	6.45	7.63	9.12	12.9	15.8	20.4	28.8	3.76
	FF156	145°	10.0	4.48	7.09	8.39	10.0	14.2	17.4	22.4	31.7	3.96
	FF161	145°	10.9	4.89	7.73	9.15	10.9	15.5	18.9	24.5	34.6	4.09
	FF173	145°	12.3	5.50	8.70	10.3	12.3	17.4	21.3	27.5	38.9	4.39

### FF Dimensions

Pipe Size	Dim. (mm)			Wt. (g)	
	A	B	C	M	P
1/8	25.4	11.2	12.7	14	3
1/4	35.1	14.2	16.0	35	7.5

$$\text{Flow Rate (l/min)} = K \sqrt{\text{bar}}$$

**Standard Materials: Brass, 303 Stainless Steel, 316 Stainless Steel, PVC, and PTFE**

(PTFE and PVC not available in nozzles FF016 to FF028; PTFE not available in nozzles FF033 to FF065).

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

FAN

TO ORDER: specify pipe size, connection type, nozzle number, spray angle, and material.



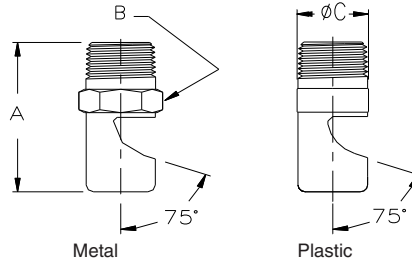
Metal



All 3/8" FFs in Brass have UL approval



3/8" FF187145 nozzles in Brass have FM approval



Dimensions are approximate. Check with BETE for critical dimension applications.

FF Flow Rates													FF Dimensions					
Fan, 105° and 145° Spray Angle, 1/8" to 1" Pipe Sizes, BSP or NPT																		
Male Pipe Size	Nozzle Number	Spray Angle	K Factor	LITERS PER MINUTE @ BAR								Approx. Orifice Dia (mm)	Pipe Size	Dim. (mm)			Wt. (g)	
				0.2 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	10 bar			A	B	C	M	P
3/8	FF187	145°	13.7	6.11	9.67	11.4	13.7	19.3	23.7	30.6	43.2	4.75	3/8	44.5	17.5	19.1	72	15
	FF196	145°	16.0	7.1	11.3	13.3	16.0	22.6	27.6	35.7	50.4	4.98						
	FF209	145°	17.0	7.6	12.0	14.2	17.0	24.0	29.4	38.0	53.8	5.31						
	FF221	145°	20.5	9.2	14.5	17.2	20.5	29.0	35.5	45.9	64.9	5.61						
1/2	FF209	145°	17.0	7.6	12.0	14.2	17.0	24.0	29.4	38.0	53.8	5.31	1/2	50.8	22.4	22.4	117	25
	FF218	145°	18.2	8.2	12.9	15.3	18.2	25.8	31.6	40.8	57.7	5.54						
	FF250	145°	23.9	10.7	16.9	20.0	23.9	33.8	41.4	53.5	75.7	6.35						
	FF256	145°	27.3	12.2	19.3	22.9	27.3	38.7	47.4	61.1	86.5	6.55						
	FF281	145°	31.9	14.3	22.6	26.7	31.9	45.1	55.3	71.3	101	7.14						
	FF312	145°	36.5	16.3	25.8	30.5	36.5	51.6	63.2	81.5	115	7.92						
	FF375	145°	54.7	24.5	38.7	45.8	54.7	77.3	94.7	122	173	9.53						
3/4	FF316	145°	41.0	18.3	29.0	34.3	41.0	58.0	71.0	92	130	8.03	3/4	66.8	38.1	38.1	345	73
	FF332	145°	45.6	20.4	32.2	38.1	45.6	64.5	78.9	102	144	8.43						
	FF348	145°	50.1	22.4	35.5	41.9	50.1	70.9	86.8	112	159	8.84						
	FF368	145°	54.7	24.5	38.7	45.8	54.7	77.3	94.7	122	173	9.35						
	FF406	145°	63.8	28.5	45.1	53.4	63.8	90.2	111	143	202	10.3						
	FF437	145°	72.9	32.6	51.6	61.0	72.9	103	126	163	231	11.1						
	FF453	145°	82.0	36.7	58.0	68.6	82.0	116	142	183	259	11.5						
	FF484	145°	95.7	42.8	67.7	80.1	95.7	135	166	214	303	12.3						
	FF500	145°	109	48.9	77.3	91.5	109	155	189	245	346	12.7						
1	FF578	145°	137	61.1	96.7	114	137	193	237	306	432	14.7	1	85.9	50.8	50.8	908	192
	FF625	145°	166	74.4	118	139	166	235	288	372	526	15.9						
	FF703	145°	205	91.7	145	172	205	290	355	459	649	17.9						
	FF750	145°	239	107	169	200	239	338	414	535	757	19.1						

$$\text{Flow Rate (L}_{\min}) = K \sqrt{\text{bar}}$$

Standard Materials: Brass, 303 Stainless Steel, 316 Stainless Steel, PVC, and PTFE.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.



FAN

CALL 413-772-0846  
Call for the name of your nearest BETE representative.

# BJ

## Low Flow



### DESIGN FEATURES

- Three-piece construction
- Interchangeable spray tips
- Integral strainer available (refer to page 108 for more information)
- Male and female connections

### SPRAY CHARACTERISTICS

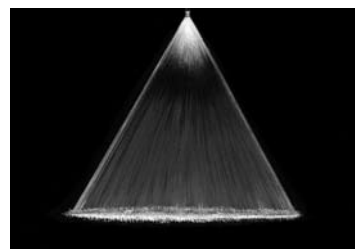
- Relatively coarse atomization
- Uniform distribution with tapered edges for use in overlapping sprays

**Spray pattern:** Flat Fan

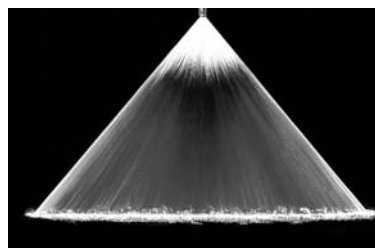
**Spray angles:** 0° to 110°

**Flow rate:** 0.011 to 101 l/min

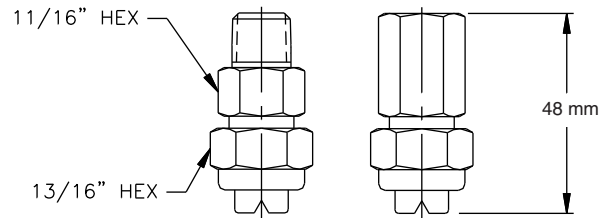
FAN



Fan 50°



Fan 80°



Dimensions are approximate. Check with BETE for critical dimension applications.

### BJ Dimensions

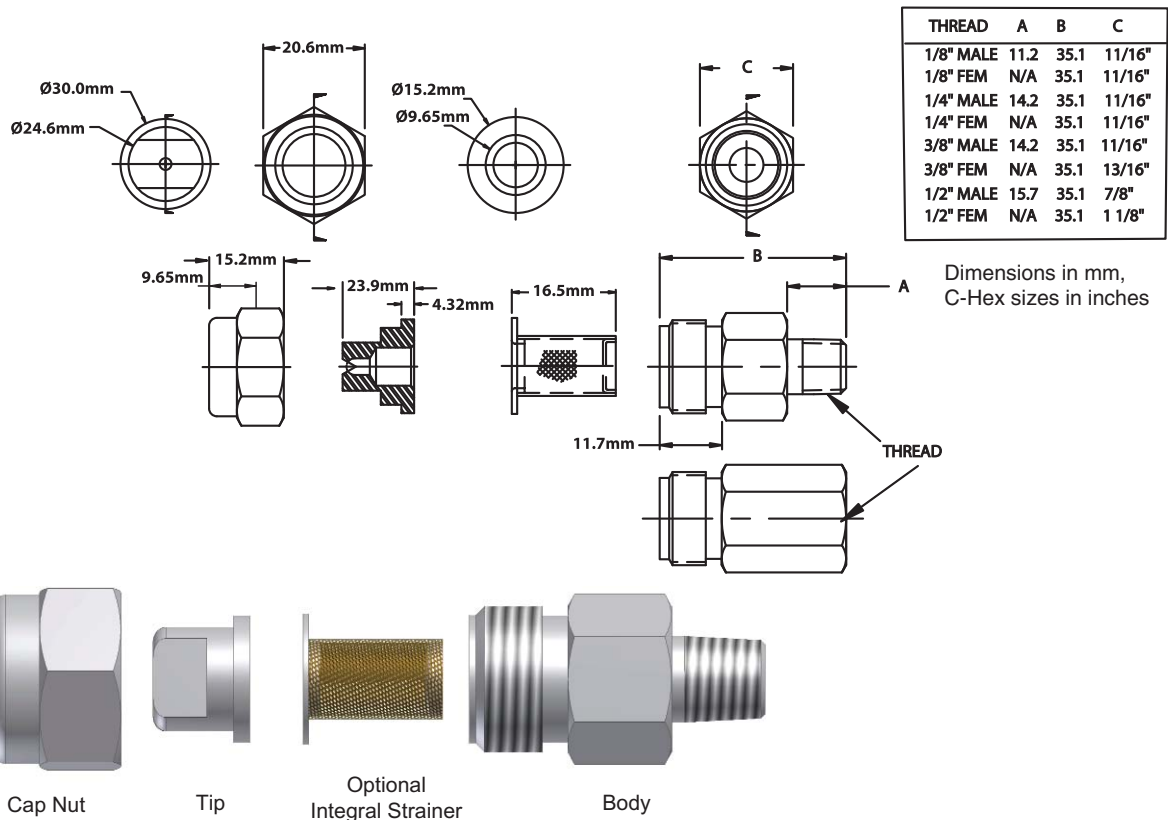
Fan, 0° to 110° Spray Angles, 1/8", 1/4" and 3/8" Pipe Size, Male and Female

Pipe Size	Nozzle Number	Flow Rate @ 3 bar	Available Spray Angle											Optional Strainer Mesh Size	Wt. (g)
			0°	15°	25°	40°	50°	65°	73°	80°	95°	110°			
1/8"	BJ 0009	0.04	0°											200	28
	BJ 0012	0.05	0°												
	BJ 0017	0.07		15°	25°	40°	50°	65°							
	BJ 0019	0.07	0°												
	BJ 0021	0.08	0°												
	BJ 0023	0.09							73°						
OR	BJ 0025	0.1		15°	25°	40°	50°	65°							
	BJ 0033	0.13		15°	25°	40°	50°	65°							
	BJ 0039	0.15							73°						
1/4"	BJ 005	0.2	0°	15°	25°	40°	50°	65°		80°			100	28	
	BJ 0067	0.26	0°	15°	25°	40°	50°	65°							
	BJ 0077	0.3							73°						
	BJ 01	0.39	0°	15°	25°	40°	50°	65°	73°	80°	95°	110°			
	BJ 0116	0.46							73°						
OR	BJ 015	0.59	0°	15°	25°	40°	50°	65°		80°	95°	110°	50	28	
	BJ 0154	0.61							73°						
	BJ 02	0.79	0°	15°	25°	40°	50°	65°		80°	95°	110°			
	BJ 0231	0.91							73°						
	BJ 03	1.81	0°	15°	25°	40°	50°	65°		80°	95°	110°			
	BJ 0308	1.22							73°						
OR	BJ 0385	1.52							73°				50	28	
	BJ 04	1.58	0°	15°	25°	40°	50°	65°		80°	95°	110°			
	BJ 0462	1.82							73°						
	BJ 05	1.97	0°	15°	25°	40°	50°	65°		80°	95°	110°			
	BJ 06	2.37	0°	15°	25°	40°	50°	65°		80°	95°	110°			
	BJ 0616	2.43							73°						
1/2"	BJ 077	3.04							73°				50	28	
	BJ 08	3.16	0°	15°	25°	40°	50°	65°		80°	95°	110°			
	BJ 0924	3.65							73°						
	BJ 10	3.95	0°	15°	25°	40°	50°	65°		80°	95°	110°			
	BJ 15	5.92	0°	15°	25°	40°	50°	65°		80°	95°	110°			
3/8"	BJ 20	7.89	0°	15°	25°	40°	50°	65°		80°	95°	110°	50	28	
	BJ 30	11.8	0°	15°	25°	40°	50°	65°		80°	95°	110°			
	BJ 40	15.8	0°	15°	25°	40°	50°	65°		80°	95°	110°			
	BJ 50	19.7		15°	25°	40°	50°	65°		80°	95°	110°			
OR	BJ 60	23.7		15°	25°	40°	50°	65°		80°	95°	110°	50	28	
	BJ 70	27.6		15°	25°	40°	50°	65°		80°	95°	110°			

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

TO ORDER: specify pipe size, connection type, nozzle number, spray angle, and material.





Dimensions are approximate. Check with BETE for critical dimension applications.

### BJ Flow Rates

Fan, 0°, 15°, 25°, 40°, 50°, 65°, 73°, 80°, 95°, 110° Spray Angles, 1/8", 1/4" and 3/8" Pipe Size, Male and Female

Pipe Size	Nozzle Number	Equiv. Orifice Dia. (mm)	K Factor	LITERS PER MINUTE @ BAR									
				0.3 bar	0.5 bar	0.7 bar	2 bar	4 bar	5 bar	10 bar	20 bar	30 bar	40 bar
1/8"	BJ 0009	0.20	0.021	0.011	0.015	0.017	0.029	0.041	0.046	0.065	0.092	0.11	0.13
	BJ 0012	0.25	0.027	0.015	0.019	0.023	0.039	0.055	0.061	0.086	0.12	0.15	0.17
	BJ 0017	0.28	0.039	0.021	0.027	0.032	0.055	0.077	0.087	0.12	0.17	0.21	0.25
	BJ 0019	0.30	0.043	0.024	0.031	0.036	0.061	0.087	0.097	0.14	0.19	0.24	0.27
	BJ 0021	0.33	0.048	0.026	0.034	0.04	0.068	0.096	0.11	0.15	0.21	0.26	0.30
	BJ 0023	0.33	0.052	0.029	0.037	0.044	0.074	0.10	0.12	0.17	0.23	0.29	0.33
	BJ 0025	0.33	0.057	0.031	0.04	0.048	0.081	0.11	0.13	0.18	0.25	0.31	0.36
OR	BJ 0033	0.38	0.075	0.041	0.053	0.063	0.11	0.15	0.17	0.24	0.34	0.41	0.48
	BJ 0039	0.41	0.089	0.049	0.063	0.074	0.13	0.18	0.20	0.28	0.40	0.49	0.56
	BJ 005	0.50	0.114	0.062	0.081	0.095	0.16	0.23	0.25	0.36	0.51	0.62	0.72
1/4"	BJ 0067	0.58	0.153	0.084	0.11	0.13	0.22	0.31	0.34	0.48	0.68	0.84	0.97
	BJ 0077	0.58	0.175	0.096	0.12	0.15	0.25	0.35	0.39	0.55	0.78	0.96	1.11
	BJ 01	0.71	0.228	0.12	0.16	0.19	0.32	0.46	0.51	0.72	1.02	1.25	1.44
	BJ 0116	0.71	0.264	0.14	0.19	0.22	0.37	0.53	0.59	0.84	1.18	1.45	1.67
OR	BJ 015	0.84	0.342	0.19	0.24	0.29	0.48	0.68	0.76	1.08	1.53	1.87	2.16
	BJ 0154	0.84	0.351	0.19	0.25	0.29	0.50	0.70	0.78	1.11	1.57	1.92	2.22
	BJ 02	0.99	0.456	0.25	0.32	0.38	0.64	0.91	1.02	1.44	2.04	2.50	2.88
3/8"	BJ 0231	1.02	0.526	0.29	0.37	0.44	0.74	1.05	1.18	1.66	2.35	2.88	3.33
	BJ 03	1.19	0.684	0.37	0.48	0.57	0.97	1.37	1.53	2.16	3.06	3.74	4.32
	BJ 0308	1.19	0.702	0.38	0.50	0.59	0.99	1.40	1.57	2.22	3.14	3.84	4.44
	BJ 0385	1.30	0.877	0.48	0.62	0.73	1.24	1.75	1.96	2.77	3.92	4.81	5.55
	BJ 04	1.40	0.912	0.50	0.64	0.76	1.29	1.82	2.04	2.88	4.08	4.99	5.77
	BJ 0462	1.42	1.053	0.58	0.74	0.88	1.49	2.11	2.35	3.33	4.71	5.77	6.66
	BJ 05	1.55	1.139	0.62	0.81	0.95	1.61	2.28	2.55	3.60	5.10	6.24	7.21
OR	BJ 06	1.70	1.367	0.75	0.97	1.14	1.93	2.73	3.06	4.32	6.11	7.49	8.65
	BJ 0616	1.70	1.404	0.77	0.99	1.17	1.99	2.81	3.14	4.44	6.28	7.69	8.88
	BJ 077	1.83	1.755	0.96	1.24	1.47	2.48	3.51	3.92	5.55	7.85	9.61	11.1
1/2"	BJ 08	1.88	1.823	1.00	1.29	1.53	2.58	3.65	4.08	5.77	8.15	9.99	11.5
	BJ 0924	1.98	2.106	1.15	1.49	1.76	2.98	4.21	4.71	6.66	9.42	11.5	13.3
	BJ 10	2.18	2.279	1.25	1.61	1.91	3.22	4.56	5.10	7.21	10.2	12.5	14.4
	BJ 15	2.72	3.418	1.87	2.42	2.86	4.83	6.84	7.64	10.8	15.3	18.7	21.6
	BJ 20	3.18	4.558	2.50	3.22	3.81	6.45	9.12	10.2	14.4	20.4	25.0	28.8
	BJ 30	3.67	6.837	3.74	4.83	5.72	9.67	13.7	15.3	21.6	30.6	37.4	43.2
3/8"	BJ 40	3.97	9.116	4.99	6.45	7.63	12.9	18.2	20.4	28.8	40.8	49.9	57.7
	BJ 50	4.37	11.394	6.24	8.06	9.53	16.1	22.8	25.5	36.0	51.0	62.4	72.1
1/2"	BJ 60	4.76	13.673	7.49	9.67	11.4	19.3	27.3	30.6	43.2	61.1	74.9	86.5
	BJ 70	5.16	15.952	8.74	11.3	13.3	22.6	31.9	35.7	50.4	71.3	87.4	101

$$\text{Flow Rate (l/min)} = K \sqrt{\text{bar}}$$

Standard Materials: Brass, 303 Stainless Steel and 316 Stainless Steel (for nozzle number BJ01 and higher).

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

# SPN

## High Impact/Narrow Fan Spray

### DESIGN FEATURES

- One-piece/heavy construction
- Straight-through orifice minimizes clogging
- Machined from bar stock to exacting standards
- Male connection

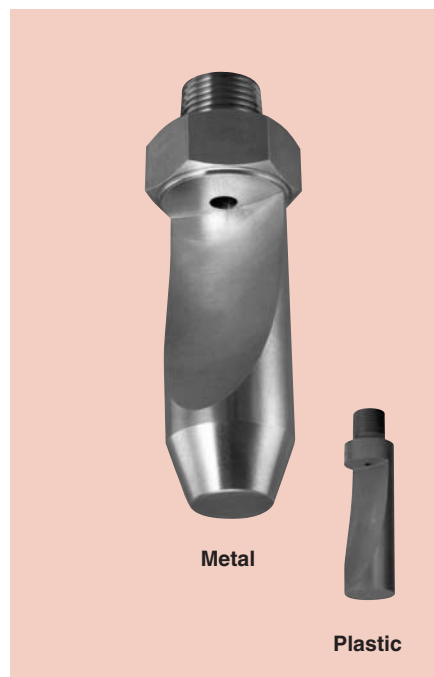
### SPRAY CHARACTERISTICS

- Yields highest impact, narrow, flat spray with least atomization
- Spoon-shaped deflector surface efficiently forms a hard driving spray

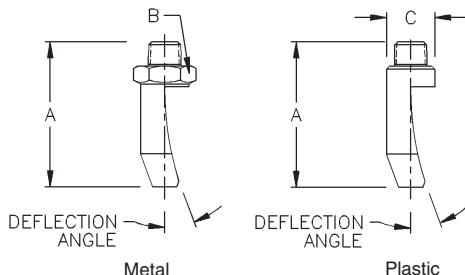
**Spray pattern:** Fan

**Spray angles:** 15°, 25°, 35°, 40°, 50°

**Flow rates:** 0.76 to 177 L/min



Fan 50°



Dimensions are approximate. Check with BETE for critical dimension applications.

### SPN Flow Rates and Dimensions

Fan, 15°, 25°, 35°, 40° and 50° Spray Angles, 1/4" to 3/4" Pipe Sizes, BSP or NPT

Male Pipe Size	Nozzle Number	Available Spray Angles	K Factor	LITERS PER MINUTE @ BAR								Approx. Orifice Dia. (mm)	Deflection Angle @ Spray Angle	Dimensions (mm) Metals Only		
				0.7 bar	1 bar	2 bar	3 bar	4 bar	5 bar	10 bar	15 bar			15°	25°	35°
1/8	SPN 04	35°	0.91	0.76	0.91	1.29	1.58	1.82	2.04	2.88	3.53	1.24	15°	17.8	12.7	14.2
1/4	SPN 10	15° 35°	2.28	1.91	2.28	3.22	3.95	4.56	5.10	7.21	8.83	1.98	5° 35°	50.8	22.4	19.1
	SPN 20	15° 35°	4.56	3.81	4.56	6.45	7.89	9.12	10.2	14.4	17.7	2.77	5° 35°			
	SPN 25	50°	5.70	4.77	5.70	8.06	9.87	11.4	12.7	18.0	22.1	3.05	50°			
	SPN 40	25° 50°	9.12	7.63	9.12	12.9	15.8	18.2	20.4	28.8	35.3	3.96	20° 45°			
3/8	SPN 20	35°	4.56	3.81	4.56	6.45	7.89	9.12	10.2	14.4	17.7	2.77	30°	76.2	28.7	25.4
	SPN 25	35°	5.70	4.77	5.70	8.06	9.87	11.4	12.7	18.0	22.1	3.05	28° 45°			
	SPN 30	15° 35°	6.84	5.72	6.84	9.67	11.8	13.7	15.3	21.6	26.5	3.18	5° 28°			
	SPN 40	15° 35° 40° 50°	9.12	7.63	9.12	12.9	15.8	18.2	20.4	28.8	35.3	3.96	5° 35° 35° 50°			
	SPN 50	35° 40°	11.4	9.53	11.4	16.1	19.7	22.8	25.5	36.0	44.1	4.34	23° 33°			
	SPN 60	15° 35° 40° 50°	13.7	11.4	13.7	19.3	23.7	27.3	30.6	43.2	53.0	4.75	5° 20° 33° 35°			
	SPN 70	40°	16.0	13.3	16.0	22.6	27.6	31.9	35.7	50.4	61.8	5.16	29°			
	SPN 80	15° 35° 40° 50°	18.2	15.3	18.2	25.8	31.6	36.5	40.8	57.7	70.6	5.31	5° 25° 26° 35°			
	SPN 90	40°	20.5	17.2	20.5	29.0	35.5	41.0	45.9	64.9	79.4	5.54	28°			
	SPN 100	15° 35° 40° 50°	22.8	19.1	22.8	32.2	39.5	45.6	51.0	72.1	88.3	5.94	5° 25° 28° 40°			
	SPN 120	15° 35°	27.3	22.9	27.3	38.7	47.4	54.7	61.1	86.5	106	7.14	5° 25° 40°			
	SPN 125	40°	28.5	23.8	28.5	40.3	49.3	57.0	63.7	90.1	110	6.76	38°			
SPN 160	50°	36.5	30.5	36.5	51.6	63.2	72.9	81.5	115	141	7.54	25° 37°				
SPN 200	50°	45.6	38.1	45.6	64.5	78.9	91.2	102	144	177	8.33	32°				
1/2	SPN 60	15° 35°	13.7	11.4	13.7	19.3	23.7	27.3	30.6	43.2	53.0	4.75	5° 27°	114	35.1	31.8
	SPN 80	15° 35°	18.2	15.3	18.2	25.8	31.6	36.5	40.8	57.7	70.6	5.31	5° 25°			
	SPN 100	15° 35°	22.8	19.1	22.8	32.2	39.5	45.6	51.0	72.1	88.3	5.94	5° 19°			
	SPN 140	15° 35°	31.9	26.7	31.9	45.1	55.3	63.8	71.3	101	124	7.52	5° 25° 40°			
	SPN 160	15° 35°	36.5	30.5	36.5	51.6	63.2	72.9	81.5	115	141	7.92	5° 25° 40°			
3/4	SPN 160	35°	36.5	30.5	36.5	51.6	63.2	72.9	81.5	115	141	7.92	23°	124	44.5	42.9
	SPN 200	15° 35°	45.6	38.1	45.6	64.5	78.9	91.2	102	144	177	8.33	5° 22°			

$$\text{Flow Rate (L/min)} = K \sqrt{\text{bar}}$$

Standard Materials: Brass, 303 Stainless Steel, 316 Stainless Steel, PVC and PTFE.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

FAN

TO ORDER: specify pipe size, connection type, nozzle number, spray angle, and material.

# PJ

**Smallest Physical Size**

### DESIGN FEATURES

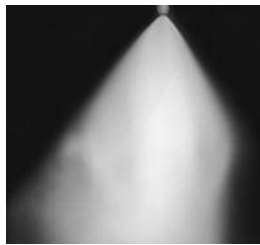
- High energy efficiency
- One-piece, compact construction
- No whirl vanes or internal parts
- 1/8" or 1/4" male connection
- 100-mesh screen, 10 micron paper filter or polypropylene filter optional

### SPRAY CHARACTERISTICS

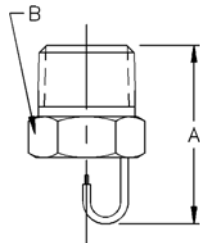
- Finest fog of any direct pressure nozzle
  - Produces high percentage of droplets under 50 microns
- Spray pattern:** Cone-shaped Fog  
**Spray angle:** 90°. For best 90° pattern operate nozzle at or above 4 bar  
**Flow rates:** 0.043 to 5.34 l/min



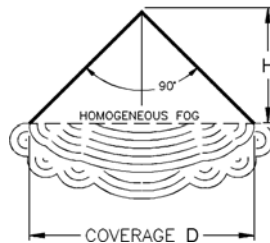
Metal



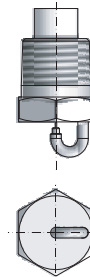
Fog



Male



Fog Pattern



PJ with polypropylene filter

Dimensions are approximate. Check with BETE for critical dimension applications.

### PJ Flow Rates and Dimensions

Impingement, 90° Spray Angle, 1/8" or 1/4" Pipe Sizes, BSP or NPT

Male Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR								Approx. Orifice Dia. (mm)	Approx. Cov. D (mm)	Approx. Spray Height H (mm)	Pipe Size	Dim. (mm)		Wt. (g) Metal
			2 bar	3 bar	5 bar	10 bar	20 bar	30 bar	50 bar	70 bar					A	B	
1/8	PJ6	0.0137			0.031	0.043	0.061	0.075	0.097	0.114	0.152	203	103	1/8	19.1	11.1	7
	PJ8	0.0259			0.058	0.082	0.116	0.142	0.183	0.217	0.203	254	127				
	PJ10	0.0387		0.067	0.087	0.123	0.173	0.212	0.274	0.324	0.254	254	127				
	PJ12	0.0524		0.091	0.117	0.166	0.234	0.287	0.371	0.439	0.305	254	127				
	PJ15	0.0843	0.119	0.146	0.189	0.267	0.377	0.462	0.596	0.705	0.381	254	127				
OR	PJ20	0.153	0.216	0.264	0.341	0.483	0.683	0.836	1.08	1.28	0.508	310	155	1/4	24.6	14.2	7
	PJ24	0.228	0.322	0.395	0.510	0.721	1.02	1.25	1.61	1.91	0.610	400	200				
	PJ28	0.296	0.419	0.513	0.662	0.937	1.32	1.62	2.09	2.48	0.711	460	230				
1/4	PJ32	0.410	0.580	0.710	0.917	1.297	1.83	2.25	2.90	3.43	0.813	560	280	1/4	24.6	14.2	7
	PJ40	0.638	0.902	1.11	1.43	2.02	2.85	3.49	4.51	5.34	1.02	610	305				

$$\text{Flow Rate (l/min)} = K \sqrt{\text{bar}}$$

Standard Materials: Brass, 303 Stainless Steel and 316 Stainless Steel.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.



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# MicroWhirl™

**NEW!  
FLOW RATES  
NOW TO  
1.413 l/min!**



Metal

## Fine Atomization

### DESIGN FEATURES

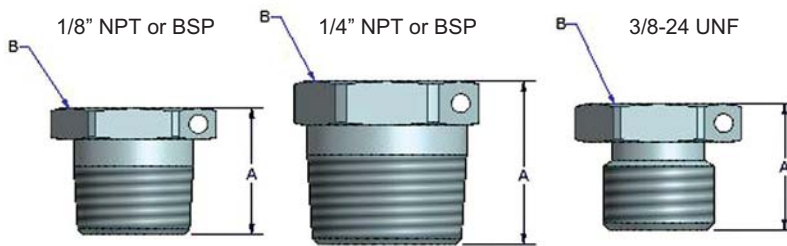
- Outstanding atomization
- Rugged pinless design
- Drip-free performance
- 70 micron polypropylene filter
- Safety wire hole available
- U.S. Patent #7198201
- Minimum operating pressure 7 bar

### SPRAY CHARACTERISTICS

- Mist at low pressure; fog at high pressure
- Spray pattern:** Cone-shaped Fog  
**Flow rates:** 0.032 to 1.413 l/min



Fog



Shown with optional 1.59mm (1/16") diameter safety wire hole

### Dimensions (mm)

Pipe Size	A	B
1/8"	12.3	11.1
1/4"	17.5	14.3
3/8-24UNF	10.8	12.7

Dimensions are approximate. Check with BETE for critical dimension applications.

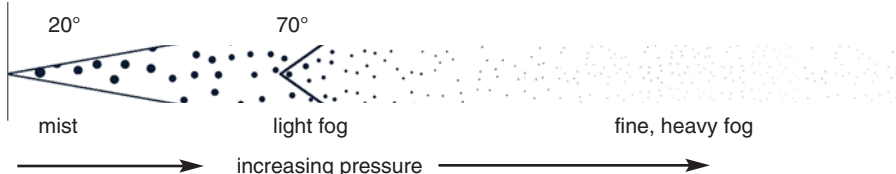
### MicroWhirl Flow Rates and Dimensions

Fogging, 70° Spray Angle, 1/8", 1/4" BSP or NPT or 3/8" - 24 UNF Pipe Sizes

Male Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR								Wt (g)
			7 bar	20 bar	40 bar	70 bar	100 bar	140 bar	170 bar	200 bar	
1/8"	MW085	0.0122	0.032	0.055	0.077	0.102	0.122	0.145	0.160	0.173	7.09
	MW105	0.0151	0.040	0.068	0.096	0.127	0.151	0.179	0.197	0.214	
	or MW125	0.0180	0.048	0.081	0.114	0.151	0.180	0.213	0.235	0.255	
1/4"	MW145	0.0209	0.055	0.093	0.132	0.175	0.209	0.247	0.272	0.296	
	or MW195	0.0281	0.074	0.126	0.178	0.235	0.281	0.332	0.366	0.397	
	MW275	0.0396	0.105	0.177	0.251	0.332	0.396	0.469	0.517	0.560	
3/8"-24UNF	MW695	0.09988	0.316	0.447	0.632	0.836	0.999	1.182	1.302	1.413	

### Nominal Angle

### Atomization Level



$$\text{Flow Rate (l/min)} = K \sqrt{\text{bar}}$$

Standard Materials: 303 and 316 Stainless Steel, Polypropylene filter (Viton O-ring seal supplied for 3/8"-24 UNF connection)

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

# MWH

## Low Flow MicroWhirl Misting Head

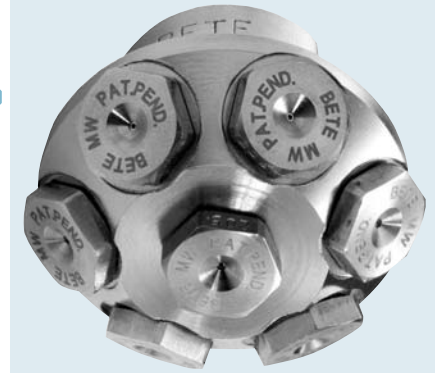
### DESIGN FEATURES

- Finest atomization of any direct pressure multi-nozzle
- Rugged construction
- Minimum operating pressure 70 bar
- Other manifolds and flow rates available

### SPRAY CHARACTERISTICS

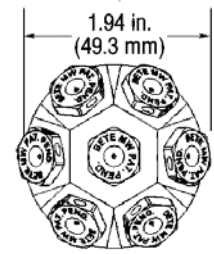
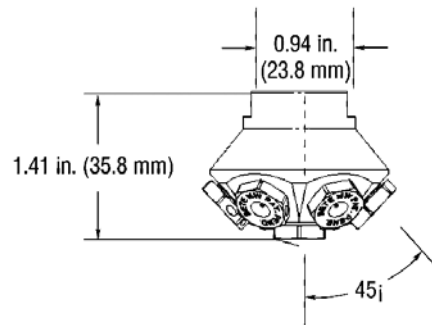
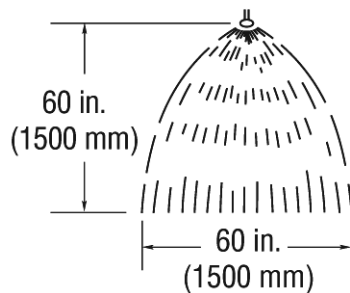
- Finest fog of any direct pressure nozzle
- Spray pattern:** Cone-shaped Fog  
**Flow rates:** 4.2 to 8.7 l/min

See the MicroWhirl (pg 66) for more information



Fog

Coverage at 1500 psi (100 bar)



Dimensions are approximate. Check with BETE for critical dimension applications.

### MicroWhirl Head Flow Rates and Dimensions Fogging, 90° Spray Angle

Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR			Approx. Orifice Dia. (mm)	Wt. (g)
			70 bar	150 bar	300 bar		
1/2"	MW1207	0.5	4.2	6.1	8.7	0.56	184

$Flow\ Rate\ (l/min) = K\sqrt{bar}$

Standard Materials: 316 Stainless Steel, Viton® O-ring.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.



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# P

## Fine Atomization

### DESIGN FEATURES

- High energy efficiency
- One-piece construction
- No whirl vanes or internal parts
- Highly efficient laminar jet impinges on target pin generating fine fog
- Male connection

### SPRAY CHARACTERISTICS

- Finest fog of any direct pressure nozzle
- Produces high percentage of droplets in the 25-400 micron range; ideal for dust suppression

**Spray pattern:** Cone-shaped Fog

**Spray angle:** 90°. For best 90° pattern operate nozzle at or above 4 bar

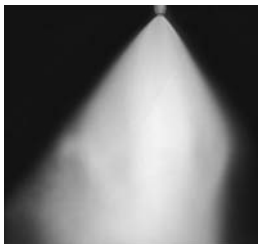
**Flow rates:** 0.153 to 30.3 l/min



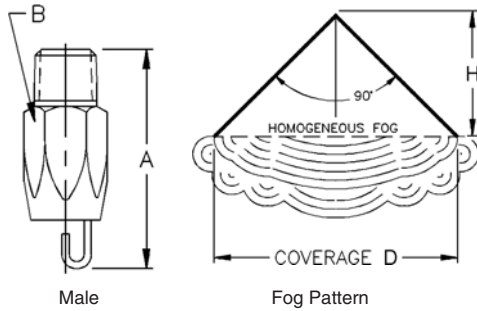
Metal



MISTING



Fog



Male

Fog Pattern

Dimensions are approximate. Check with BETE for critical dimension applications.

### P Flow Rates and Dimensions

Cone-Shaped Fog, 90° Spray Angle, 1/4" Pipe Size, BSP or NPT

Male Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR								Approx. Orifice Dia. (mm)	Approx. Coverage (mm) D	Approx. Spray Height H (mm)	Approx. Dim. (mm)		Wt. (g) Metal
			1 bar	2 bar	3 bar	5 bar	7 bar	10 bar	20 bar	30 bar				A	B	
1/4	P20	0.153	0.153	0.216	0.264	0.341	0.404	0.483	0.683	0.836	0.508	300	150	46.5	16.0	57
	P24	0.228	0.228	0.322	0.395	0.510	0.603	0.721	1.02	1.25	0.610	400	200			
	P28	0.296	0.296	0.419	0.513	0.662	0.784	0.937	1.32	1.62	0.711	460	230			
	P32	0.410	0.410	0.580	0.710	0.917	1.09	1.30	1.83	2.25	0.813	560	280			
	P40	0.638	0.638	0.902	1.11	1.43	1.69	2.02	2.85	3.49	1.02	610	305			
	P48	0.912	0.912	1.29	1.58	2.04	2.41	2.88	4.08	4.99	1.22	710	355			
	P54	1.21	1.21	1.71	2.09	2.70	3.20	3.82	5.40	6.62	1.37	760	380			
	P66	1.71	1.71	2.42	2.96	3.82	4.52	5.40	7.64	9.36	1.68	910	455			
	P80	2.46	2.46	3.48	4.26	5.50	6.51	7.78	11.0	13.5	2.03	1200	600			
P120	5.54	5.54	7.83	9.59	12.4	14.7	17.5	24.8	30.3	3.05	1500	750				

$$\text{Flow Rate (l/min)} = K \sqrt{\text{bar}}$$

Standard Materials: Brass, 303 Stainless Steel and 316 Stainless Steel.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

TO ORDER: specify pipe size, connection type, nozzle number, spray angle, and material.

# UltiMist™

## Misting Nozzles

### DESIGN FEATURES

#### Metal:

- 416 Stainless Steel tip
- Brass adapter
- 1/8" and 1/4" sizes
- Male or female connections
- Integral 100 mesh strainer

#### Plastic:

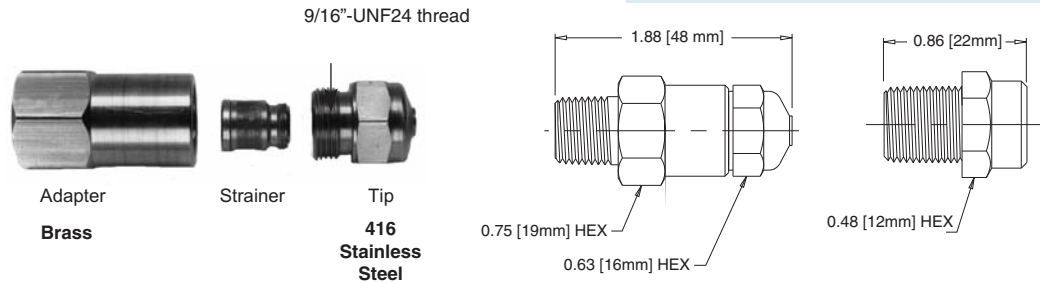
- All plastic construction
- 1/8" male connection

### SPRAY CHARACTERISTICS

- Very fine, fog-like mist
- Produces high number of droplets under 60 microns

**Spray pattern:** Hollow Cone  
Medium angle

**Flow rates:** Metal - 0.37 - 16.4 gph  
(1.5 - 61.1 l/hr)  
Plastic - 0.63 - 8.5 gph  
(2.5 - 32.6 l/hr)



Dimensions are approximate. Check with BETE for critical dimension applications.

### UltiMist Metal Flow Rates and Dimensions

Hollow Cone, Medium Spray Angle, 1/8" and 1/4" Pipe Sizes

NPT, BSP Male or Female Pipe Size	Nozzle Number	K Factor	LITERS PER HOUR @ BAR				
			3 bar	10 bar	40 bar	70 bar	80 bar
1/8	UM37M	0.84	1.5	2.7	5.3	7.1	7.5
	UM50M	1.14	2.0	3.6	7.2	9.5	10.2
	UM75M	1.71	3.0	5.4	10.8	14.3	15.3
or 1/4	UM100M	2.28	3.9	7.2	14.4	19.1	20.4
	UM150M	3.42	5.9	10.8	21.6	28.6	30.6
	UM200M	4.56	7.9	14.4	28.8	38.1	40.8
	UM250M	5.70	9.9	18.0	36.0	47.7	51.0
	UM300M	6.84	11.8	21.6	43.2	57.2	61.1

Flow Rate (l/hr) =  $K \sqrt{\text{bar}}$

Standard Material: 416 Stainless Steel Tip, Brass Adapter/Body

### UltiMist Plastic Flow Rates

Hollow Cone, Wide Spray Angle, 1/8" Pipe Size and Flange Connection

NPT Male Pipe Size	Nozzle Number	K Factor	LITERS PER HOUR @ BAR				
			3 bar	5 bar	10 bar	20 bar	70 bar
1/8	UML63M	1.44	2.5	3.2	4.6	6.4	12.1
	UML63W	1.44	2.5	3.2	4.6	6.4	12.1
	UML126M	2.88	5.0	6.4	9.1	12.9	24.1
	UML170M	3.89	6.7	8.7	12.3	17.4	32.6

Flow Rate (l/hr) =  $K \sqrt{\text{bar}}$

Standard Material: Polyacetal

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.



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# SpiralAir™

## High-flow Air Atomizing

### DESIGN FEATURES

- A two-fluid nozzle using any gas as the atomizing fluid
- Three-stage atomization for highest performance
- Designed for high reliability in extremely hostile environments
- Efficient design reduces compressed air consumption
- U.S. Patent #5,240,183

### SPRAY CHARACTERISTICS

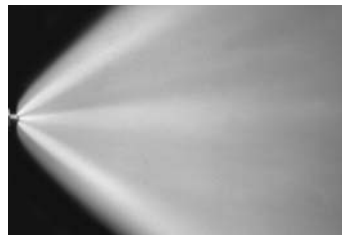
- Spray patterns:** Full Cone and Flat Fan  
**Spray angles:** 20° to 90°  
 (Other angles available by special order)  
**Flow rates:** 2.0 to 80 l/min



1 1/2" SA (Set-up #) - A - 00



Narrow Round 20°



Wide Round 90°

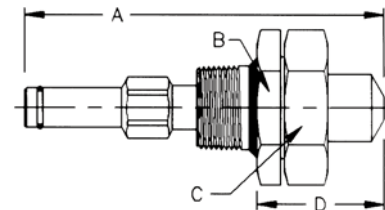


Flat Fan 60°

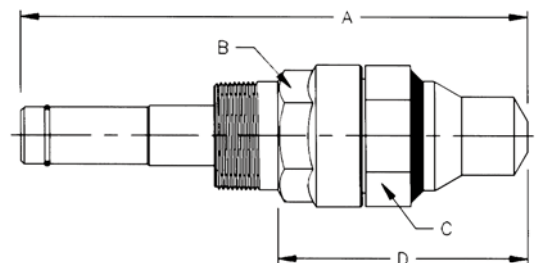
Dimensions are approximate. Check with BETE for critical dimension applications.

### SpiralAir Spray Set-up, Spiral Tip and Dimensions

Pipe Size	Spray Set-up No.	Spiral Tip No.	Spray Angle	Spray Type	Approx. Free Pass. Dia. (mm)	Pipe Size	Dimensions (mm)				Wt. (Kg)						
							A	B	C	D							
1"	SA 101	14	20°	Narrow Round	4.83	1	148	50.8	50.8	50.8	0.64						
	SA 308		90°	Wide Round	2.74												
	SA 310	60°	Round	2.74													
	SA 402	90°	Flat Fan	4.22													
	SA 404			60°	4.22												
	SA 103	20	20°	Narrow Round	7.14							1	148	50.8	50.8	50.8	0.64
	SA 307		90°	Wide Round	3.48												
SA 309	60°		Round	3.48													
SA 401	90°		Flat Fan	5.21													
SA 403				60°	5.21												
1 1/2"	SA 2100	28	20°	Narrow Round	9.27	1 1/2	229	50.8	55.6	113	1.5						
	SA 2300		90°	Wide Round	5.41												
	SA 2301		60°	Round	5.41												



1 SA (Set-up #) - A -00



1 1/2" SA (Set-up #) - A -00

Standard Materials: 316 Stainless Steel with Cobalt Alloy 6 wear components.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

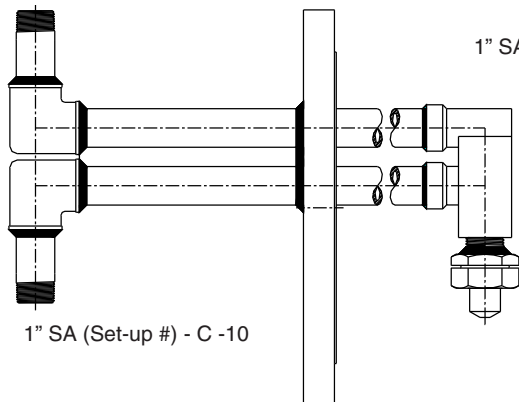
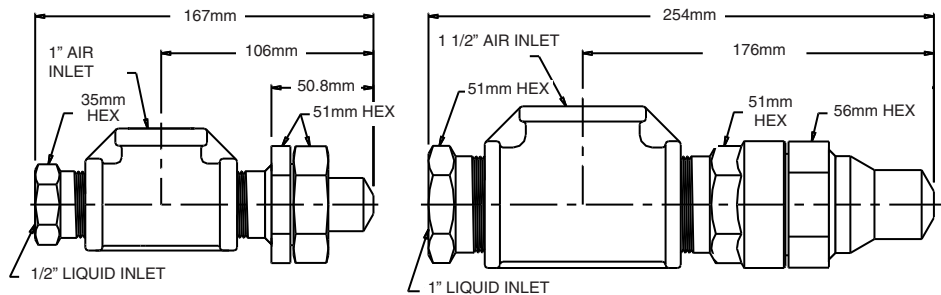
AIR ATOMIZING

TO ORDER: specify pipe size, spray set-up #, hardware and material.

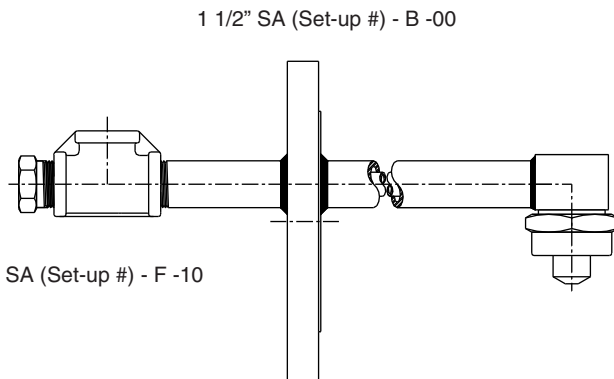


The SpiralAir can be configured to fit any installation requirement. The examples shown are just a few of the custom assemblies available. For more information, contact BETE Applications Engineering.

A guide with additional engineering data about the SpiralAir series is available on request.

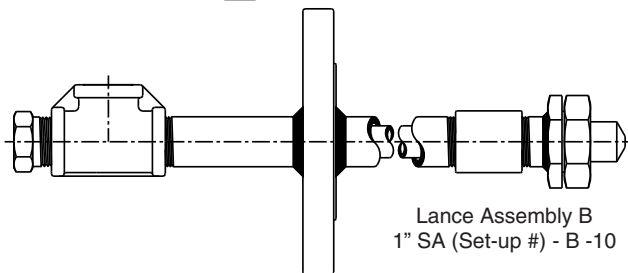


1" SA (Set-up #) - B - 00



1 1/2" SA (Set-up #) - B - 00

1" SA (Set-up #) - F - 10



Lance Assembly B  
1" SA (Set-up #) - B - 10

Since very small variations in liquid pressure produce large variations in liquid flow, BETE recommends using a metering pump or other flow metering device to control the liquid flow.

### SpiralAir Set-Up Flow Rates

Narrow, Wide and Flat Fan Patterns 1" and 1 1/2" BSP or NPT

BSP NPT	Spiral Tip Rating	1.0 Bar Air			2.0 Bar Air			3.0 Bar Air			4.0 Bar Air			5.0 Bar Air			6.0 Bar Air			7.0 Bar Air		
		liquid (l/min)	liquid (bar)	air (Nm <sup>3</sup> /h)	liquid (l/min)	liquid (bar)	air (Nm <sup>3</sup> /h)	liquid (l/min)	liquid (bar)	air (Nm <sup>3</sup> /h)	liquid (l/min)	liquid (bar)	air (Nm <sup>3</sup> /h)	liquid (l/min)	liquid (bar)	air (Nm <sup>3</sup> /h)	liquid (l/min)	liquid (bar)	air (Nm <sup>3</sup> /h)	liquid (l/min)	liquid (bar)	air (Nm <sup>3</sup> /h)
1"	14	2	0.9	25.0	2	1.9	45.0	2	2.8	60.2	2	3.7	86.3	2	4.6	105	2	5.7	137	2	6.4	149
		3	0.9	20.2	3	1.9	39.0	3	2.8	56.8	3	3.8	79.8	3	4.7	97.9	3	5.7	135	3	6.5	146
		4	1.0	17.3	4	2.0	29.1	4	2.9	50.8	4	3.8	73.0	4	4.8	88.9	4	5.9	123	4	6.5	134
		5	2.0	26.8	5	2.0	26.8	5	3.0	43.8	5	3.9	64.8	5	4.8	82.6	5	5.9	110	5	6.6	117
		6	2.1	24.4	6	2.1	24.4	6	3.0	41.2	6	3.9	57.9	6	4.9	78.3	6	6.1	100	6	6.7	112
		7	2.1	21.9	7	2.1	21.9	7	3.0	38.5	7	4.0	53.2	7	5.0	69.9	7	6.2	94.9	7	6.8	107
		8			8	3.1	35.4	8	4.1	49.9	8	5.0	66.7	8	6.0	82.6	8	7.0	99.9	8	7.9	107
	20	4	0.2	34.9	4	1.5	64.4	4	2.4	91.7	4	3.2	117	4	4.0	140	4	4.8	161	4	5.6	180
		8	0.8	24.3	8	1.7	45.9	8	2.6	68.1	8	3.5	91.0	8	4.4	114	8	5.2	139	8	6.0	163
		11	1.9	35.8	11	1.9	35.8	11	2.9	56.3	11	3.8	78.0	11	4.6	101	11	5.3	125	11	6.0	151
		15	2.1	26.8	15	2.1	26.8	15	3.0	45.8	15	3.9	65.2	15	4.8	85.2	15	5.6	105	15	6.4	126
		19	2.2	23.6	19	2.2	23.6	19	3.1	39.0	19	4.1	55.9	19	5.0	74.4	19	5.8	94.3	19	6.7	116
23		2.4	21.8	23	2.4	21.8	23	3.3	36.7	23	4.2	51.6	23	5.1	67.2	23	5.9	82.8	23	6.8	98.7	
26				26	3.5	31.8	26	4.4	46.9	26	5.2	61.6	26	6.1	76.1	26	6.9	90.2				
1 1/2"	28							40	3.1	76.3	40	4.0	107	40	5.0	142	40	6.0	183	40	7.0	229
								45	3.2	69.0	45	4.2	97.4	45	5.2	130	45	6.2	167	45	7.3	208
								50	3.3	61.8	50	4.2	88.4	50	5.2	118	50	6.3	152	50	7.3	189
								55	3.4	55.5	55	4.3	80.7	55	5.3	109	55	6.3	141	55	7.4	175
								60	3.5	49.1	60	4.4	73.2	60	5.4	100	60	6.4	130	60	7.5	162
								65	3.6	43.1	65	4.6	66.3	65	5.6	92.3	65	6.6	121	65	7.6	152
								70	3.8	37.5	70	4.8	60.2	70	5.8	85.8	70	6.8	114	70	7.9	145
								75	4.0	32.1	75	5.0	54.6	75	6.1	80.2	75	7.1	109	75	8.2	141
								80	4.2	27.1	80	5.2	49.8	80	6.2	76.0	80	7.2	106	80	8.2	139

Standard Materials: 316 Stainless Steel with Cobalt Alloy 6 wear components.

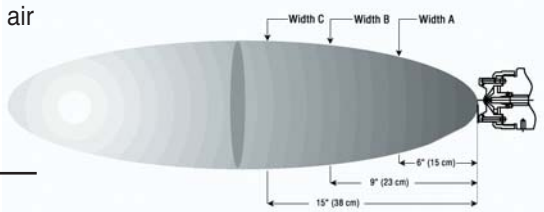
Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

# SAM™

## External Mix/Flat Fan or Narrow Round

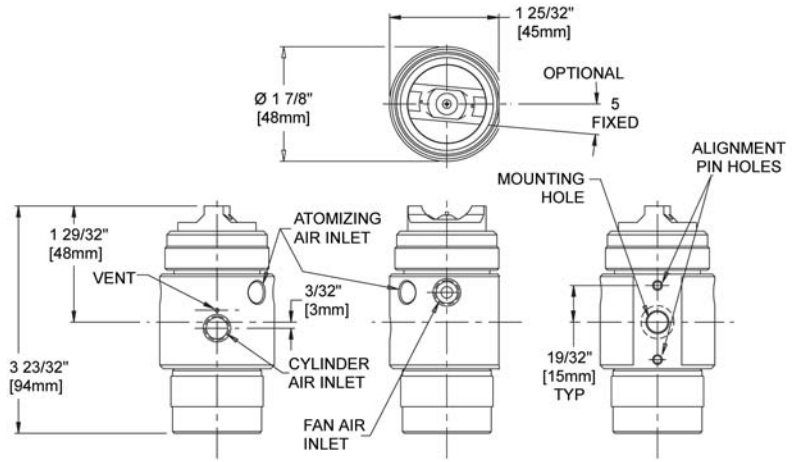
### DESIGN FEATURES

- Separate atomizing and fan air lines provide variable coverage and fine control of drop size without affecting liquid flow rates. Higher atomizing air pressure yields finer drop size; higher fan air pressure yields broader patterns
- Anti-bearding caps optional
- External mix; allows spraying of viscous materials
- Liquid flow rates are independent of air
- Precise metering of the liquid flow rate



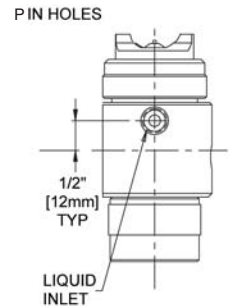
### SAM Liquid Flow Rates

Pipe Size	Spray Set-Up No.	Fluid Cap and Air Cap No.	Liquid Capacity l/h @ bar						
			0.2 bar	0.3 bar	0.5 bar	0.7 bar	1 bar	1.5 bar	
1/8"	SAM-01-02	FCS 01 & ACS 02	2.7	3.3	4.3	5.1	6.2	7.6	
	SAM-02-02	FCS 02 & ACS 02	4.5	5.5	7.2	8.5	10.2	12.5	
	SAM-03-02	FCS 03 & ACS 02	8.8	10.8	14.0	16.6	19.9	24	
	SAM-04-03	FCS 04 & ACS 03	13.5	16.5	21	25	30	37	
	SAM-05-03	FCS 05 & ACS 03	17.2	21	27	32	38	46	
	SAM-06-04	FCS 06 & ACS 04	37	46	60	72	86	107	
	SAM-07-05	FCS 07 & ACS 05	59	74	97	116	140	174	



### SAM Air Flow Rates

Pipe Size	Spray Set-Up No.	Fluid Cap and Air Cap No.	Atomizing Air Capacity Nm <sup>3</sup> /h @ bar								
			0.7 bar	1 bar	1.5 bar	2 bar	2.5 bar	3 bar	4 bar	5 bar	6 bar
1/8"	SAM-01-02	FCS 01 & ACS 02									
	SAM-02-02	FCS 02 & ACS 02	0.8	1.0	1.3	1.6	1.9	2.2	2.8	3.3	3.9
	SAM-03-02	FCS 03 & ACS 02									
	SAM-04-03	FCS 04 & ACS 03	2.8	3.3	4.1	5.0	5.8	6.7	8.3	10.0	11.7
	SAM-05-03	FCS 05 & ACS 03									
	SAM-06-04	FCS 06 & ACS 04	3.5	4.1	5.1	6.2	7.2	8.2	10.2	12.3	14.3
	SAM-07-05	FCS 07 & ACS 05	4.5	5.3	6.7	8.0	9.3	10.6	13.3	15.9	18.5



Pipe Size	Spray Set-Up No.	Fluid Cap and Air Cap No.	Fan Air Capacity Nm <sup>3</sup> /h @ bar								
			0.7 bar	1 bar	1.5 bar	2 bar	2.5 bar	3 bar	4 bar	5 bar	6 bar
1/8"	SAM-01-02	FCS 01 & ACS 02									
	SAM-02-02	FCS 02 & ACS 02	2.7	3.2	4.1	4.9	5.8	6.6	8.3	10.0	11.8
	SAM-03-02	FCS 03 & ACS 02									
	SAM-04-03	FCS 04 & ACS 03	5.0	6.1	7.8	9.6	11.3	13.1	16.6	20	24
	SAM-05-03	FCS 05 & ACS 03									
	SAM-06-04	FCS 06 & ACS 04	5.7	6.9	9.0	11.2	13.3	15.4	19.6	24	28
	SAM-07-05	FCS 07 & ACS 05	5.9	7.2	9.3	11.4	13.6	15.7	20.0	24	29

Standard Materials: 303 Stainless Steel, Blue-gard® gasket, Viton® o-rings

**Note:** Spray set-ups consist of fluid and air caps. Set-ups are interchangeable but each uses a different needle size.

Replacement air caps include replacement Blue-Gard® gaskets.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

Dimensions are approximate. Check with BETE for critical dimension applications.

**SAM Coverage Chart**

Variable Spray, Pressure Fed, Flat Fan or \*Narrow Round Spray Pattern

Pipe Size	Spray Set-up No.	Fluid Cap and Air Cap No.	Spray Dimensions with Varied Fan Air Pressure														
			bar air	bar liquid	0* bar			0.7 bar			2.5 bar			4 bar			
					A (mm)	B (mm)	C (mm)	A (mm)	B (mm)	C (mm)	A (mm)	B (mm)	C (mm)	A (mm)	B (mm)	C (mm)	
1/8	SAM-01-02	FCS 01 & ACS 02	0.7	0.2	50	80	100	180	230	250	150	200	280	150	200	280	
				0.7	60	90	110	180	250	300	180	200	280	180	200	300	
				1.5	50	80	100	200	300	360	230	280	360	200	250	330	
			2	0.2	50	80	110	130	150	180	200	250	360	200	280	360	
				0.7	50	80	130	150	180	250	200	250	330	200	250	300	
				1.5	50	80	100	180	230	330	250	300	380	240	290	370	
		2.5	0.2	60	90	150	130	150	200	200	250	360	230	280	360		
			0.7	50	80	130	150	180	250	230	280	360	230	280	330		
			1.5	50	80	110	180	200	300	250	300	360	250	300	380		
		4	0.2	60	90	150	100	130	150	200	280	330	230	280	360		
			0.7	50	80	130	110	130	180	200	250	360	230	300	380		
			1.5	50	80	110	130	180	230	230	300	410	250	330	430		
	SAM-02-02	FCS 02 & ACS 02	0.7	0.2	50	80	100	200	250	300	160	220	280	150	230	300	
				0.7	60	90	110	200	300	380	230	360	460	180	250	330	
				1.5	50	80	100	200	300	380	200	250	360	200	250	330	
			2	0.2	50	80	110	140	180	200	200	250	360	200	280	360	
				0.7	50	80	130	180	230	300	250	300	360	230	250	330	
				1.5	50	80	100	180	250	300	330	410	460	240	290	370	
		2.5	0.2	60	90	150	130	180	230	200	250	360	230	280	360		
			0.7	50	80	130	180	200	160	240	300	360	230	300	380		
			1.5	50	80	110	160	230	320	290	380	430	280	360	460		
		4	0.2	60	90	150	110	140	180	200	270	330	230	280	360		
			0.7	60	100	140	130	150	220	230	280	360	250	300	380		
			1.5	50	80	110	140	190	240	250	360	460	280	360	460		
	SAM-03-02	FCS 03 & ACS 02	0.7	0.2	50	80	130	230	300	380	180	230	280	180	230	300	
				0.7	50	60	100	300	380	530	300	510	580				
				1.5				250	300	410							
			2	0.2	60	80	110	150	200	230	200	250	330	200	250	330	
				0.7	50	80	130	200	280	380	280	330	330	250	280	330	
				1.5	50	60	100	200	300	360	410	510	560				
		2.5	0.2	60	90	130	130	180	250	200	250	330	200	280	330		
			0.7	50	80	130	180	200	280	280	330	380	250	300	330		
			1.5	50	80	130	180	230	370	330	460	530	300	430	530		
		4	0.2	60	90	140	130	150	200	200	250	330	200	250	330		
			0.7	60	90	140	150	180	240	250	330	410	280	330	380		
			1.5	50	80	110	150	200	250	300	460	560	330	460	530		
	SAM-04-03	FCS 04 & ACS 03	0.7	0.2	60	90	130	230	330	480							
				0.7	50	80	110	150	360	410	460	610	740				
				1.5				230	330	480							
			2	0.2	60	80	130	100	130	180	280	380	460	300	380	460	
				0.7	60	90	130	130	180	230	330	430	560	200	530	660	
				1.5	60	90	140	130	150	230	330	510	610	180	560	690	
		2.5	0.2	60	80	130	90	110	160	230	300	360	280	330	460		
			0.7	60	90	130	100	130	180	250	360	460	130	460	560		
			1.5	60	90	130	100	140	200	280	380	530	150	510	630		
		4	0.2	60	90	130	80	100	150	200	250	330	250	300	430		
			0.7	60	90	110	80	100	150	200	280	360	280	380	460		
			1.5	60	90	110	80	110	180	250	300	410	300	430	560		
SAM-05-03	FCS 05 & ACS 03	0.7	0.2	80	100	150	230	300	460								
			0.7				200	280	380	610	740	890					
			1.5				230	300	380	530	710						
		2	0.2	60	90	150	100	150	200	300	380	480	300	380	480		
			0.7	60	90	130	110	150	200	360	460	580	430	560	630		
			1.5	50	80	130	110	150	230	380	480	690	460	580	690		
	2.5	0.2	60	90	150	90	130	180	250	330	430	300	360	460			
		0.7	60	90	140	100	150	200	300	410	510	380	460	560			
		1.5	60	90	140	90	130	230	330	430	560	410	510	610			
	4	0.2	60	90	150	60	100	180	230	280	360	250	300	430			
		0.7	60	90	140	80	100	150	250	330	410	330	410	510			
		1.5	60	90	140	80	100	150	230	330	430	300	430	580			
SAM-06-04	FCS 06 & ACS 04	0.7	0.2	80	100	130	180	250	330								
			0.7							530	660	840					
			1.5							430	560	760	560	690	860		
		2	0.2	80	100	130	100	150	200	300	360	530	380	480	560		
			0.7	60	90	130	100	150	220	330	410	560	410	530	580		
			1.5							280	410	530	460	460	610		
	2.5	0.2	80	100	140	40	130	180	250	300	430	300	430	530			
		0.7	60	90	130	100	130	180	280	360	510	360	460	640			
		1.5	60	90	130	80	130	200	230	330	430	330	460	660			
	4	0.2	80	100	150	80	100	150	200	250	330	250	330	460			
		0.7	80	100	130	90	110	180	230	300	410	300	410	530			
		1.5	80	90	130	80	100	140	200	250	380	300	410	530			
SAM-07-05	FCS 07 & ACS 05	0.7	0.2	80	100	130	200	280	380								
			0.7							530	690	890					
			1.5							480	610	840					
		2	0.2	80	100	130	130	160	230	330	460	580	430	630	690		
			0.7				150	180	250	330	430	560	460	560	740		
			1.5							360	430	610	460	560	740		
	2.5	0.2	80	100	140	140	150	230	280	380	480	430	610	760			
		0.7	80	90	130	110	180	190	300	380	510	410	510	740			
		1.5							300	360	530	360	480	690			
	4	0.2	80	100	150	100	150	200	230	300	410	360	430	530			
		0.7	80	100	160	130	160	190	250	330	430	330	430	580			
		1.5	60	80	130	90	110	150	180	250	360	310	410	610			

AIR ATOMIZING

CALL 413-772-0846  
Call for the name of your nearest BETE representative.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

# XA

## Low Flow Air Atomizing

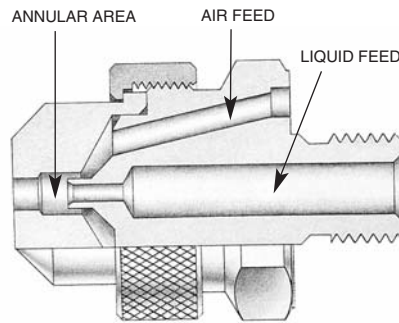
The XA nozzle system uses the energy in compressed air to produce highly atomized sprays at low flow rates. There are many interchangeable components that can be assembled to achieve a variety of spraying objectives.

### SPRAY SET-UPS

XA nozzles produce eight distinctly different types of sprays, depending on which interchangeable air and fluid caps are selected. The spray type and flow rate are determined by the "set-up" — a specific combination of one air cap and one fluid cap.

#### Internal Mix Set-ups

Liquid and air streams meet within the nozzle and are mixed together and expelled through the same orifice(s). This internal mixing means the streams are not independent; a change in air flow will affect the liquid flow. This makes precise metering of the liquid more difficult than with an External Mix Set-up. Internal Mix Set-ups are able to produce the finest atomization of any of the XA set-ups, but they are generally not suitable for use with liquids which have a viscosity that is above 200 centipoise.



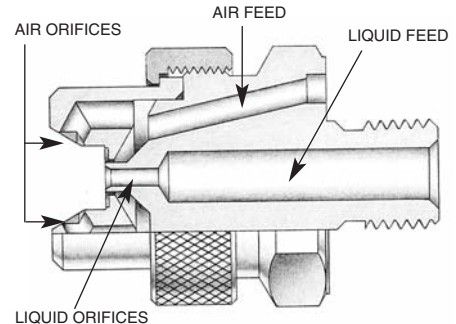
**Cutaway View: Internal Mix Set-up**

#### External Mix Set-ups

The air and liquid streams exit the nozzle independently and are combined and mixed outside of the nozzle. Because there is no connection between the air and liquid lines within the nozzle, the air and liquid flow rates can be controlled independently, allowing precise metering of the liquid. The atomization can be controlled by adjusting the air flow rate—more air

produces finer atomization. In most cases these set-ups do not atomize as finely as Internal Mix Set-ups.

External Mix Set-ups may be used with liquids having a viscosity above 200 centipoise and for abrasive suspensions. BETE Applications Engineers can provide guidance for spraying high viscosity liquids.



**Cutaway View: External Mix Set-up**

#### Siphon Set-ups

Internal and External Mix Set-ups require the liquid to be supplied to the nozzle under pressure from a municipal water supply, pump, or pressure pot. Siphon Set-ups use the flow of compressed air within the nozzle to siphon liquid from a container. Siphon Set-ups are frequently used for spraying

**E. Air Operated Shut-off**



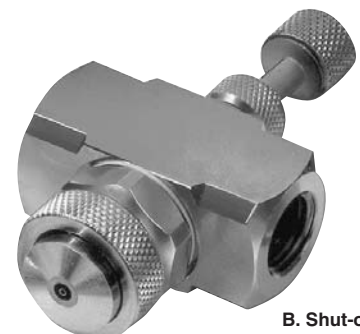
**A. End Plug**



**D. Clean-out/Shut-off**



**B. Shut-off**



Bold letters (A, B, C, D, E, F) refer to hardware assemblies shown on p. 76.

## XA Components & Options

additives from a container without the use of a pump. They provide the lowest flow rates available in the XA series (as low as 0.38 l/hr). They are generally not suitable for use with liquids having a viscosity above 200 centipoise.

By supplying the liquid under pressure, SR Set-ups may be used with liquids having a viscosity above 200 centipoise. In this case, the liquid flow rate is regulated by the fluid cap, and can be determined by using the EF chart for the specific fluid cap.

### BASIC OPERATION

The basic XA nozzle assembly consists of a body, a spray set-up, and a "hardware assembly" that can provide shut-off and clean-out capabilities.

### Non-Automatic Operation

The XA00 Square Body is the basic component of a non-automatic XA nozzle. Air and liquid feeds are located at opposite ends, perpendicular to the spray.

The XA03 Body has air and liquid feeds on one side, perpendicular to the spray axis.

The XA05 Body has air and liquid inlets located in-line with the spray.

*Hardware assemblies cannot be used with the XA05 body.*

### Hardware Assemblies for Non-Automatic Operation

**A. Plug.** The minimum option hardware assembly required for XA operation. Provides neither clean-out nor shut-off.

**B. Shut-off.** Turning the knurled knob will stop the flow of liquid to the nozzle. Should not be used to meter the flow of liquid.

**C. Clean-out.** Pressing the spring-loaded plunger will force a small diameter rod through the liquid

orifice, cleaning any obstruction. Useful for intermittent spraying of a liquid that may dry in the orifice when not in use.

**D. Clean-out/Shut-off.** Combines functions of hardware assemblies B and C in one unit.

XA00 Body  
with C Hardware



XA05 Body



FF Air Cap



SR Air Cap



PR Air Cap



Fluid Cap



PF Air Cap



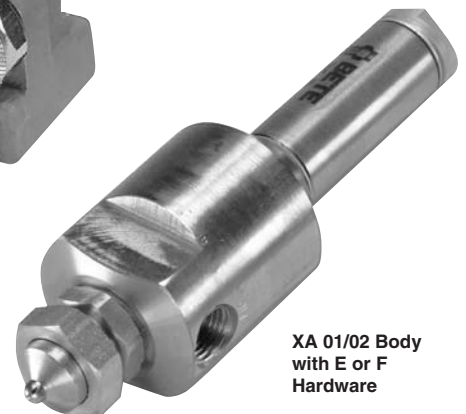
EF Air Cap



XW Air Cap



XA03 Body



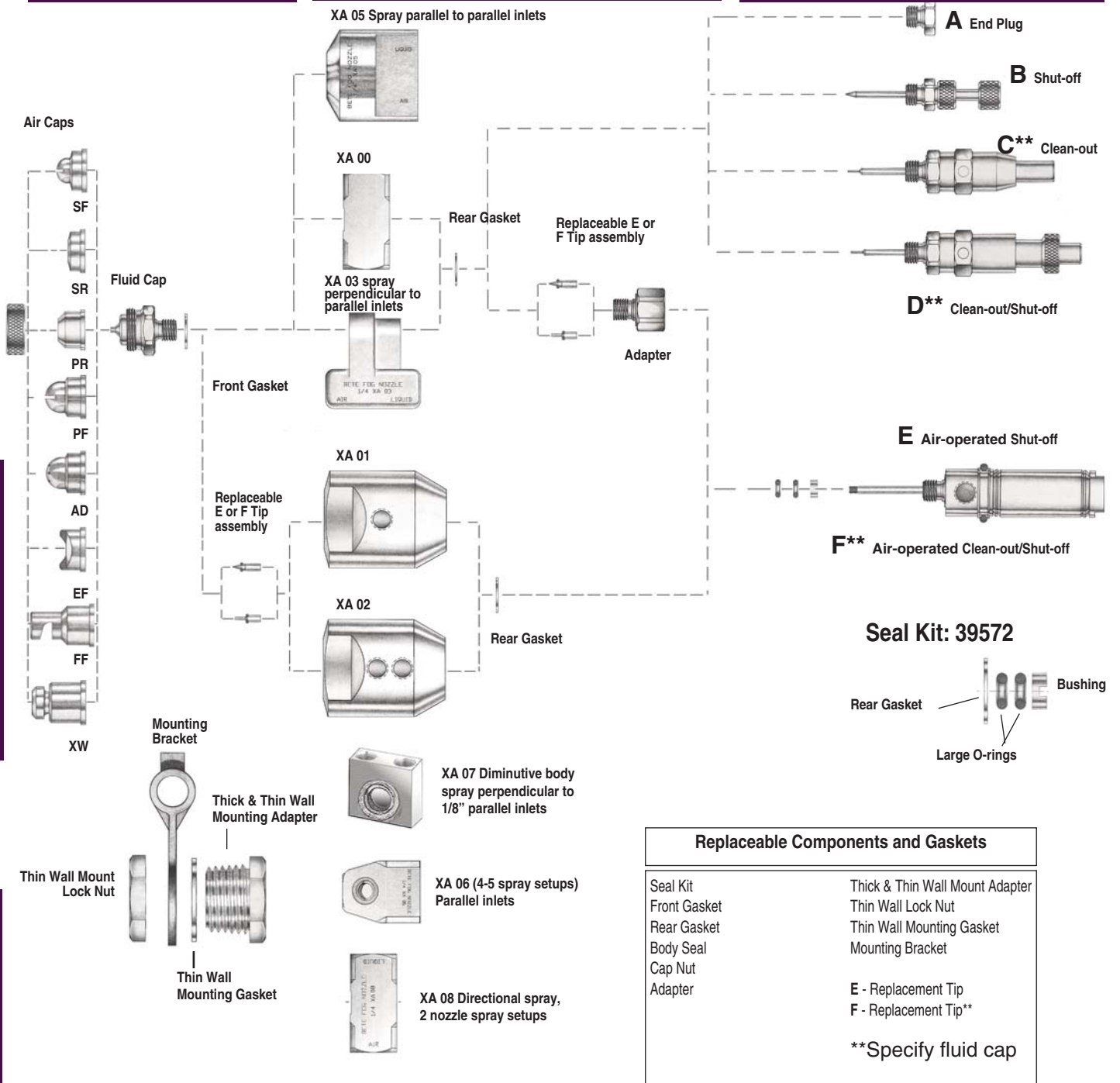
XA 01/02 Body  
with E or F  
Hardware

# XA Components & Options

## Spray Set-up

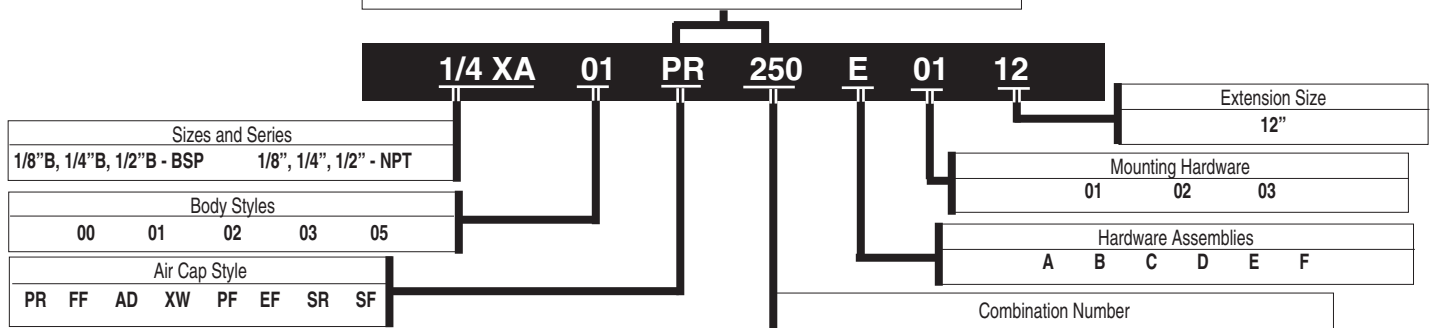
## Body Styles and Seals

## Hardware Assemblies



## TO ORDER

## Spray Set-up Number



# XA Components & Options

## AUTOMATIC OPERATION

For critical applications which require automatic, no-drip, or high-speed spray shut-off, the XA can be supplied with an air-cylinder-operated shut-off or clean-out/shut-off. These air cylinders provide virtually instantaneous liquid shut-off at rates of up to 180 cycles per minute. *The air cylinders require a minimum of 2 bar.*

### Bodies for Automatic Operation

The XA01 and XA02 Round Bodies are rugged, highly reliable, and well suited to the rigors of high-cycle automatic operation. They have been designed to simplify the feed piping required for installing automatic nozzles by providing a constant location for the air inlet piping. With their neat, professional appearance, they are particularly recommended for OEM applications.

The XA01 Round Body has one inlet for air and one for liquid. Because the air inlet supplies air for both cylinder movement and liquid atomization, spraying during start-up and shut-off is not as crisp and precise as with the XA02. *The XA01 body cannot be used with atomizing air pressure under 2 bar.*

The XA02 Round Body has two inlets for air and one inlet for liquid. One of the air inlets supplies the cylinder and the other supplies atomizing air. The XA02 body

must be used when the air cylinder operates at a different pressure from the atomizing air or where the atomizing air is supplied below 2 bar.

*NOTE: The XA00 Square and XA03 Bodies used for non-automatic operation can also be used, with hardware assemblies E or F, for automatic operation. Special design features allow field upgrading to automatic operation.*

### Hardware Assemblies for Automatic Operation

**E. Air-Operated Shut-off.** Removal of air pressure to the cylinder causes a spring-loaded poppet valve actuator to shut off liquid flow.

**F. Air-Operated Clean-out/Shut-off.** Operation similar to E, but includes a clean-out needle.

### SOLENOID VALVES

Electrically operated solenoid valves can be used to control the operation of any XA nozzle. BETE can supply solenoid valves matched to your specific application.

### Solenoids for Automatic XA Nozzles.

A 3-way, quick-exhaust solenoid valve is required to operate the E or F hardware assembly. The valve is located in the line that supplies air to

the cylinder, as close to the nozzle as possible. Independent control of the atomizing air of an XA02 or square body requires an additional 2-way solenoid valve.

### Solenoids for Non-Automatic XA Nozzles.

Two-way solenoid valves can be used to stop and start the flow of air and liquid to any non-automatic XA nozzle.

### FILTERS, REGULATORS AND STRAINERS

For optimum reliability, every XA nozzle should have a strainer and regulator in the liquid feed line and a filter and regulator in the air feed line. Every XA nozzle with a Siphon Feed Set-up should have a filter and regulator in the air line. The size and type of each of these components depends on the application, and can be determined by your BETE sales representative. BETE maintains an inventory of filters, strainers, and regulators that can be supplied with your XA nozzle to ensure reliable operation. These components can be purchased individually or in kit form.

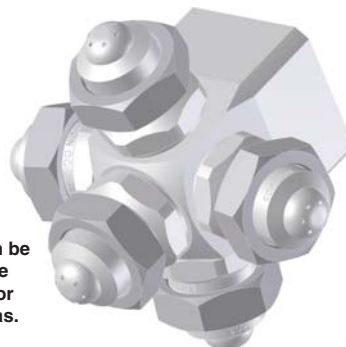


Simple piping and robust design describe this multiple nozzle XA lance.

The XA06 manifold body can be fitted with up to five nozzle setups and is often used for humidification of large areas.



External mix cone cap



Corrosion-resistant XA in PVC

# XA Components & Options

## SPRAY EXTENSIONS

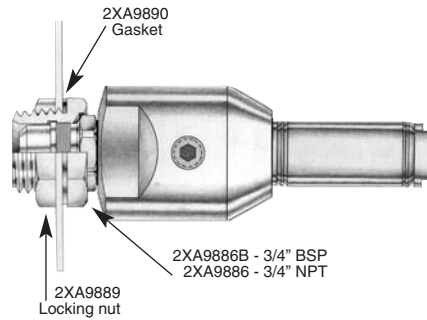
The spray set-up can be moved away from the nozzle body by using optional 152mm or 305mm extensions. These allow the spray to be moved closer to the target while keeping the nozzle body and associated piping at a distance.

## MOUNTING HARDWARE

In many XA installations the nozzle is supported by the rigid metal pipe that supplies air or liquid. There are several components which can provide support for the XA Bodies when it isn't appropriate to suspend the nozzle from piping; for example, when the nozzle will spray through the wall of a tank or duct, or when the air and liquid will be supplied through flexible tubing. All XA bodies except the XA03 can be used with any of the mounting hardware described here.

### Thin Wall 02 Adapter

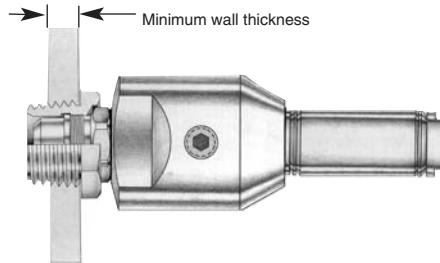
Three-piece adapter used to support an XA nozzle with the body located outside a tank or duct having a relatively thin (less than 10mm) wall and the spray directed into the interior. To use this adapter, a 27mm diameter hole must be drilled through the wall. This adapter both secures the air cap and attaches the nozzle body to the tank wall.



XA02 with Thin Wall 02 Adapter

### Thick Wall 01 Adapter

Similar in design and function to the Thin Wall Adapter, but intended for use with tanks or ducts with walls that are thick enough (10mm or over) to be drilled and tapped for a 3/4" NPT thread.



XA02 with Thick Wall 01 Adapter

### Mounting Bracket 03 Adapter

This bracket is used in combination with a Thin Wall Adapter to support an XA nozzle from a 13mm-diameter metal rod. The bracket allows flexibility in aiming the spray.

## MATERIALS

### Bodies, Fluid Caps, Air Caps, Hardware Assemblies, Mounting Hardware

The standard materials for the XA series are nickel-plated brass and 303 and 316 stainless steels. Other metals and plastics can be supplied on request. See page 13 for a complete material list.

### Air Cylinders

The air cylinders used for XA hardware assemblies E and F have rods and cylinders made of stainless steel and end caps made of anodized aluminum. All metal parts in contact with the spray liquid are 316 stainless steel.

### Seals

The standard material for XA gaskets is compressed fiber with a neoprene binder. For installations requiring FDA approval, SBR gaskets are available. Other elastomeric and metallic gasket materials can be supplied on request.

The standard material for O-rings in XA automatics is Viton®. Other materials available on request.

**BETE can fabricate XA nozzles into any number of lance assembly variations**

Extensions separate the spray tip from the body



XA03 Mounting Bracket

Automatic XA nozzles in a manifold configuration used for coating a very wide product



Spray lance (see page 107) with a right angle XA and quick-connect fittings

AIR ATOMIZING

TO ORDER: specify pipe size, body style, spray set-up #, hardware and mounting assemblies, and material. See page 76.



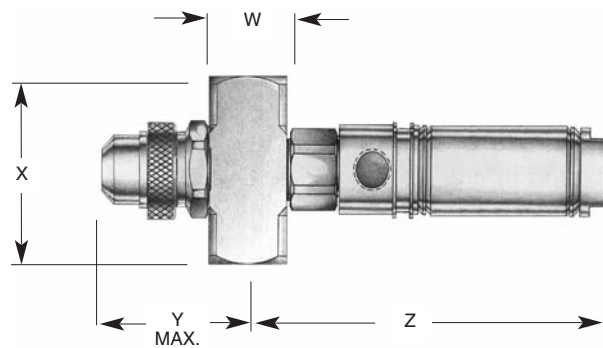
# XA Components & Options

## Spray Set-up Numbers

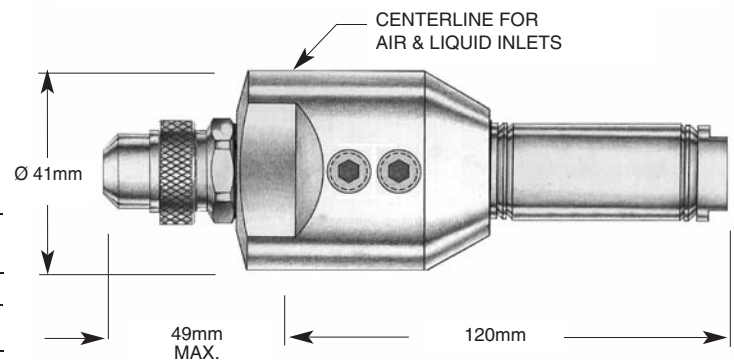
SPRAY SET-UP	PIPE SIZE BSP or NPT	SET-UP NO.	FLUID CAP	AIR CAP		
EF	FLAT FAN (EXTERNAL MIX)	EF 050	FC7	AC1001		
		EF 100	FC7	AC1003		
		EF 150	FC4	AC1001		
		EF 200	FC4	AC1003		
		EF 250	FC3	AC1001		
		OR	EF 300	FC3	AC1003	
		EF 350	FC6	AC1002		
		EF 400	FC6	AC1004		
		EF 450	FC2	AC1002		
		EF 500	FC2	AC1004		
		EF 550	FC1	AC1002		
		EF 600	FC1	AC1004		
		EF 650	FC8	AC1005		
		EF 700	FC9	AC1005		
		EF 800	FC5	AC1005		
			1/2	EF 5050	FC501	AC5001
SF	SIPHON FLAT FAN	1/8	SF 050	FC3	AC1101	
		OR	SF 100	FC6	AC1102	
		1/4	SF 150	FC2	AC1103	
		SF 200	FC2	AC1104		
SR	SIPHON ROUND	1/8	SR 050	FC7	AC1201	
		OR	SR 150	FC4	AC1201	
		1/4	SR 200	FC4	AC1202	
		SR 250	FC3	AC1202		
		SR 400	FC1	AC1204		
		SR 450	FC5	AC1205		
	1/2	SR 5050	FC501	AC5201		
PF	PRESSURE FLAT FAN	1/8	PF 050	FC4	AC1301	
		OR	PF 100	FC3	AC1303	
		1/4	PF 150	FC3	AC1301	
		PF 200	FC3	AC1302		
		PF 250	FC2	AC1304		
		PF 300	FC1	AC1304		
		PF 350	FC1	AC1305		
		PF 400	FC5	AC1306		
			1/2	PF 5050	FC501	AC5301
		PF 5100	FC502	AC5302		
XW	EXTRA WIDE-ANGLE ROUND	1/8 OR 1/4	XW 050	FC8	AC1401	
		1/2	XW 5050	FC502	AC5401	
PR	PRESSURE ROUND	1/8	PR 050	FC4	AC1501	
		OR	PR 100	FC4	AC1502	
		1/4	PR 150	FC3	AC1502	
		PR 200	FC2	AC1503		
		PR 250	FC1	AC1503		
		PR 300	FC5	AC1504		
			1/2	PR 5050	FC501	AC5501
		PR 5100	FC502	AC5502		
AD	WIDE ANGLE ROUND	1/8	AD 050	FC4	AC1601	
		OR	AD 100	FC2	AC1603	
		1/4	AD 150	FC2	AC1602	
		AD 200	FC1	AC1603		
		AD 250	FC1	AC1604		
		AD 300	FC5	AC1605		
			1/2	AD 5050	FC501	AC5601
		AD 5100	FC501	AC5602		
		AD 5150	FC501	AC5603		
		AD 5200	FC502	AC5604		
FF	DEFLECTED FLAT FAN	1/8 OR 1/4	FF 050	FC10	AC1701	

## Dimensions with Hardware Options for XA00 Body, BSP or NPT

Pipe Size	Hardware Option	Dimensions in (mm)			
		W	X	Y	Max. "Z"
1/8 OR 1/4	A				14.3
	B				42.3
	C	22.2	42.9	49.2	63.5
	D				77.0
1/2	E				103
	F				103
1/2	A	31.8	63.5	68.3	25.4



Overall Dimensions of XA Assemblies with XA00 Body (Shown with E or F Hardware)



Overall Dimensions for Assemblies with XA01 or XA02 Bodies

AIR ATOMIZING

CALL 413-772-0846  
Call for the name of your nearest BETE representative.

# XA Components & Options

## SYSTEM SET-UPS AND ACCESSORIES

BETE carries a complete line of controls and accessories required for setting up a system using the XA Series nozzles.

Contact your BETE representative for details.

### Pressure System Set-up

In a pressure-fed system, the liquid is supplied under pressure to either internal or external mix BETE XA Series nozzles.

Air and liquid regulators control the fluid delivery pressure, while the air filter and liquid strainer ensure that the supplied fluids are of high quality.

Operational control is maintained by manual or solenoid valves used in conjunction with the various hardware assemblies.

### Siphon System Set-up

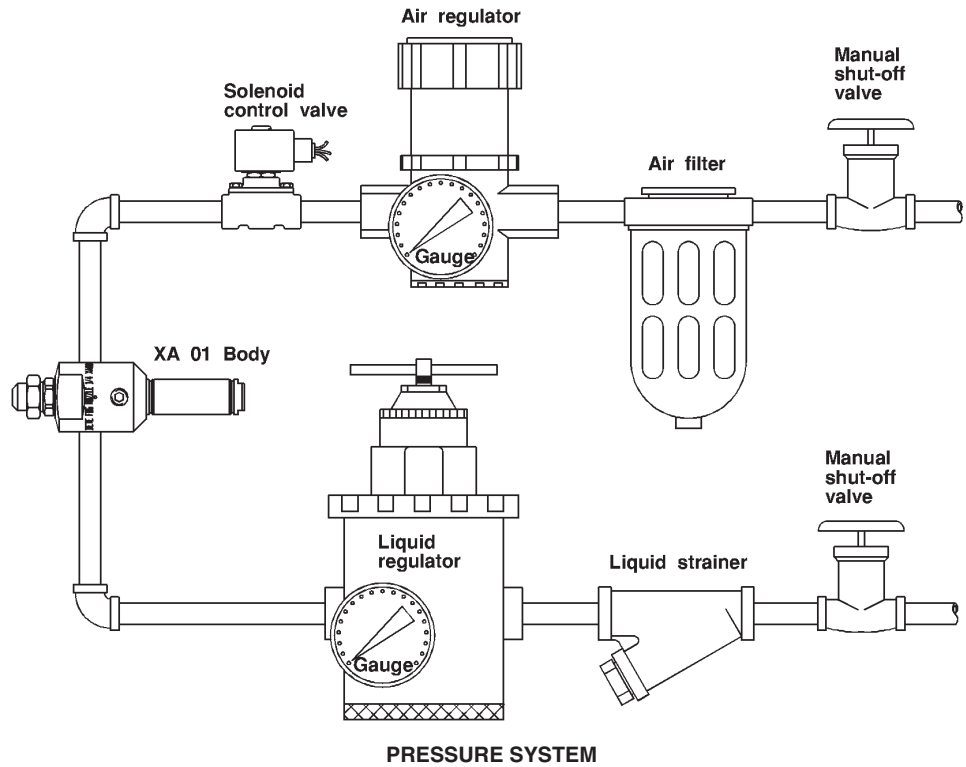
In a siphon-fed system, the liquid is supplied by either a siphon or gravity feed.

An air regulator controls the air delivery pressure, while the air filter ensures that the compressed air is of high quality.

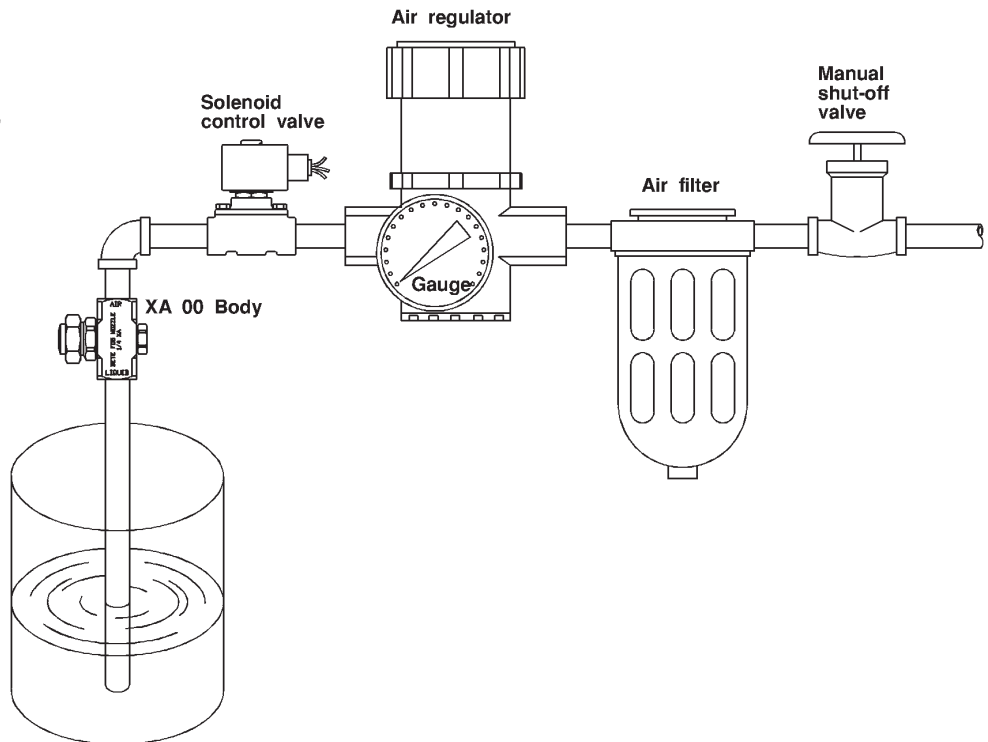
Operational control is maintained by manual or solenoid valves used in conjunction with the various hardware assemblies.

When used as a gravity feed set-up, a positive liquid shutoff capability should be provided.

Filters, regulators, and strainers matched to your XA application are available from stock.



PRESSURE SYSTEM



SIPHON SYSTEM

AIR ATOMIZING

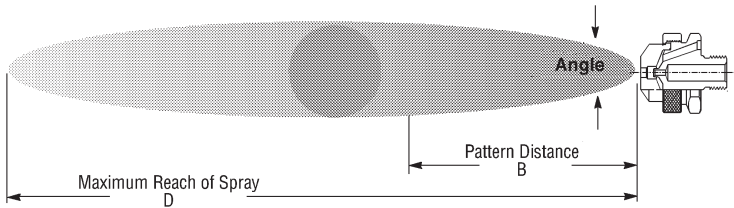
TO ORDER: specify pipe size, body style, spray set-up #, hardware and mounting assemblies, and material. See page 76.

# XAPR

## Pressure-fed/Int. Mix/Narrow Angle Round

### DESIGN/SPRAY CHARACTERISTICS

- Internal mix
- Very fine atomization
- Narrow spray angle (12°- 22°)
- Full cone pattern
- Large forward projection (up to 8.5 m)



Dimensions are approximate. Check with BETE for critical dimension applications.

### XA PR Set-up Flow Rates and Dimensions

Pressure-fed, Internal Mix, Round Spray Pattern, 1/8" and 1/4" Pipe Sizes, BSP or NPT

Pipe Size	Spray Set-up Number	Fluid and Air Cap Numbers	0.7 Bar Liquid			1.5 Bar Liquid			2.0 Bar Liquid			3.0 Bar Liquid			4.0 Bar Liquid			Spray Dimensions				
			Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	air	liquid	Spray Angle (deg.)	B (mm)	D (m)
1/8 OR	PR 050	Fluid Cap FC4 & Air Cap AC1501	0.7	2.5	0.960	1.1	6.4	0.720	1.4	6.4	0.840	2.7	6.2	1.38	3.5	7.8	1.68	0.9	0.7	13	300	3
			0.9	1.8	1.14	1.4	5.0	0.900	1.7	5.5	1.02	2.8	5.7	1.50	3.7	7.3	1.74	1.7	1.5	13	330	3
			1.0	1.4	1.32	1.7	4.1	1.14	2.0	4.5	1.20	3.0	5.2	1.62	3.9	6.4	1.98	2.5	2.0	13	360	3
			1.8	3.4	1.20	2.2	3.4	1.44	3.1	4.7	1.74	4.2	5.5	2.28	4.2	5.5	2.28	3.1	3.0	14	390	4
			2.0	3.0	1.38	2.4	3.0	1.56	3.2	4.3	1.86	4.5	4.5	2.58	4.6	4.1	2.70	4.5	4.0	15	440	4
			2.1	2.6	1.50	2.5	2.5	1.68	3.4	3.9	1.98	4.6	4.1	2.70	4.8	3.7	2.82	4.8	3.7	2.82		
	PR 100	Fluid Cap FC4 & Air Cap AC1502	0.7	2.5	1.14	1.4	5.7	1.62	1.7	6.7	1.74	2.2	9.2	2.04	2.8	11.9	2.34	0.9	0.7	12	430	4
			0.9	2.0	1.32	1.5	5.2	1.74	1.8	6.4	1.86	2.5	8.2	2.34	3.1	11.0	2.58	1.5	1.5	13	460	4
			1.0	1.6	1.56	1.7	4.8	1.92	2.0	5.9	2.04	2.8	7.2	2.64	3.4	10.1	2.82	2.4	2.0	13	480	4
			1.8	4.3	2.10	2.1	5.2	2.22	3.0	6.7	2.82	3.7	9.2	3.12	4.2	9.2	3.12	3.0	3.0	13	510	5
			2.0	3.9	2.22	2.2	4.8	2.40	3.1	6.3	2.94	3.9	8.4	3.48	4.2	7.6	3.72	3.9	4.0	15	560	5
			2.1	3.4	2.40	2.4	4.3	2.58	3.2	5.9	3.12	4.2	7.6	3.72	4.5	6.8	4.08	4.5	6.8	4.08		
1/4	PR 150	Fluid Cap FC3 & Air Cap AC1502	0.9	4.8	1.26	1.7	8.4	1.86	2.0	10.7	1.98	2.7	16.5	2.22	3.4	20.0	2.58	1.5	0.7	12	480	4
			1.1	4.1	1.62	1.8	7.5	2.10	2.1	9.8	2.22	2.8	15.4	2.28	3.7	18.4	2.82	2.5	1.5	13	510	4
			1.4	3.4	1.98	2.0	7.0	2.22	2.4	8.2	2.52	3.1	13.6	2.58	3.9	16.8	3.00	3.0	2.0	13	530	5
			1.5	3.1	2.10	2.2	5.7	2.64	2.7	6.8	2.88	3.4	11.8	2.94	4.2	15.2	3.30	3.0	3.0	14	560	5
			1.7	3.0	2.34	2.5	4.8	2.94	3.0	5.9	3.30	3.7	10.4	3.30	4.5	13.8	3.60	3.4	3.0	14	560	5
			1.8	2.9	2.46	2.8	4.1	3.24	3.2	5.0	3.54	3.9	9.1	3.66	4.8	12.4	3.90	4.2	4.0	15	600	5
	PR 200	Fluid Cap FC2 & Air Cap AC1503	1.1	13.0	4.56	2.2	17.8	6.96	2.8	20.0	8.16	3.4	32.0	8.94	4.6	37.0	11.6	1.7	0.7	18	660	5
			1.4	8.9	5.46	2.5	13.1	7.80	3.1	16.3	8.94	3.9	25.0	10.2	5.3	29.0	13.2	2.8	1.5	20	760	6
			1.5	7.2	5.88	2.8	9.5	8.58	3.4	11.9	9.78	4.6	15.9	12.3	5.6	25.0	14.1	3.9	2.0	20	810	7
			1.7	5.8	6.30	3.1	7.0	9.42	3.9	7.0	11.2	5.3	9.1	14.4	6.0	21.0	15.0	4.0	3.0	21	910	8
			1.8	4.7	6.72	3.4	4.9	10.3	4.2	4.7	12.3	5.6	6.8	15.3	6.3	17.4	16.2	5.3	3.0	21	910	8
			2.0	3.6	7.14	3.5	4.2	10.7	4.6	3.0	13.2	6.0	5.0	16.5	6.7	14.0	17.4	6.0	4.0	21	970	9
PR 250	Fluid Cap FC1 & Air Cap AC1503	0.9	31.0	3.42	1.4	61.0	4.14	2.1	53.0	5.76	2.7	80.0	6.18	3.8	88.0	8.10	1.0	0.7	17	610	5	
		1.0	25.0	3.96	1.5	54.0	4.56	2.4	41.0	6.72	3.0	69.0	7.02	4.2	73.0	9.36	1.8	1.5	18	690	6	
		1.1	18.5	4.50	1.7	48.0	5.10	2.7	31.0	7.62	3.2	59.0	7.80	4.6	61.0	10.6	2.8	2.0	20	760	7	
		1.3	12.9	5.10	1.8	41.0	5.58	2.8	26.0	8.16	3.5	49.0	8.76	4.9	48.0	11.8	3.5	3.0	20	790	7	
		2.0	3.6	7.14	3.5	4.2	10.7	4.6	3.0	13.2	6.0	5.0	16.5	6.7	14.0	17.4	6.0	4.0	21	910	9	
		2.1	2.7	7.62	3.1	3.6	3.54	3.5	2.1	3.90	4.2	7.9	3.90	4.8	11.8	4.08	4.8	11.8	4.08			
PR 300	Fluid Cap FC5 & Air Cap AC1504	1.0	44.0	5.16	1.4	125	4.74	2.0	123	6.48	2.2	199	5.28	3.0	250	5.94	1.0	0.7	19	890	6	
		1.1	32.0	6.12	1.5	106	5.46	2.1	108	7.14	2.5	174	6.60	3.2	225	7.20	1.7	1.5	20	990	7	
		1.7	87.0	6.30	1.7	87.0	6.30	2.2	95.0	7.80	2.8	146	7.98	3.5	205	8.46	2.4	2.0	21	1040	8	
		1.8	70.0	7.08	1.8	70.0	7.08	2.4	79.0	8.58	3.1	121	9.24	3.8	182	9.78	3.1	3.0	21	1070	8	
		2.0	55.0	7.80	2.0	55.0	7.80	2.5	64.0	9.30	3.2	108	9.96	4.1	159	11.0	3.1	3.0	21	1070	8	
		2.7	52.0	9.96	3.4	52.0	9.96	3.4	95.0	10.6	4.6	121	13.5	4.6	121	13.5	3.8	4.0	22	1170	9	
2.8	42.0	10.7	3.5	42.0	10.7	3.5	84.0	11.2	4.9	93.0	15.3	4.9	93.0	15.3	4.9	93.0	15.3					

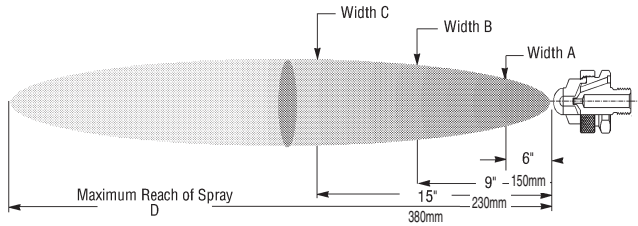
Standard Materials: Nickel-plated Brass, 303 Stainless Steel and 316 Stainless Steel.

# XAPF

## Pressure-fed/Internal Mix/Flat Fan

### DESIGN/SPRAY CHARACTERISTICS

- Internal mix
- Flat fan, wide angle spray patterns (between 80° and 90°)
- Very fine atomization



Dimensions are approximate. Check with BETE for critical dimension applications.



1/4" XA PF300 A  
XA 00 Body; A Hardware

### XA PF Set-up Flow Rates and Dimensions

Pressure-fed, Internal Mix, Round Spray Pattern, 1/8" and 1/4" Pipe Sizes, BSP or NPT

Pipe Size	Spray Set-up Number	Fluid and Air Cap Numbers	0.7 Bar Liquid			1.5 Bar Liquid			2.0 Bar Liquid			3.0 Bar Liquid			4.0 Bar Liquid			Spray Dimensions							
			Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	air	liquid	A (mm)	B (mm)	C (mm)	D (m)		
1/8 OR 1/4	PF 050	Fluid Cap FC4 & Air Cap AC1301	0.7	5.5	1.44	1.3	9.1	1.86	2.0	8.6	2.52	2.7	11.2	3.12	3.9	12.0	4.14								
			0.9	4.7	1.62	1.5	7.7	2.16	2.2	7.5	2.82	3.0	10.1	3.36	4.6	9.7	4.86	1.1	0.7	250	360	460	2.6		
			1.0	4.1	1.86	1.8	6.5	2.52	2.5	6.2	3.12	3.2	9.1	3.72	5.3	7.5	5.58	2.1	1.5	360	480	660	3.0		
			1.1	3.5	2.04	2.1	5.4	2.82	2.8	5.2	3.42	3.5	8.1	3.96	6.0	5.3	6.24	2.8	2.0	380	530	760	3.2		
			1.3	3.0	2.22	2.4	4.3	3.12	3.1	4.2	3.78	4.2	5.4	4.74	6.3	4.3	6.60	3.5	3.0	470	610	860	3.4		
	1.4	2.5	2.40	2.7	3.3	3.42	3.2	3.7	3.90	4.6	4.2	5.10	6.7	3.3	6.96	6.0	4.0	560	740	940	4.0				
	1.5	2.0	2.64	2.8	2.8	3.60	3.4	3.2	4.08	4.9	3.1	5.46	7.0	2.4	7.32										
	1.4	3.0	1.98	2.4	5.3	2.70	3.1	5.3	3.24	4.2	7.2	4.02	5.6	8.3	5.04	1.5	0.7	250	330	460	1.8				
	1.5	2.3	2.10	2.5	4.4	2.82	3.2	4.5	3.42	4.6	5.3	4.38	6.0	6.6	5.34	2.7	1.5	360	510	690	2.0				
	1.7	1.8	2.28	2.7	3.7	3.00	3.4	3.8	3.54	4.9	3.8	4.80	6.3	5.1	5.88	3.2	2.0	480	580	740	2.0				
	1.8	1.3	2.46	2.8	3.1	3.12	3.5	3.2	3.72	3.9	1.8	4.08				4.2	3.0	610	740	940	2.1				
	2.0	1.0	2.64	3.0	2.6	3.30	3.1	2.1	3.42	3.9	1.8	4.08				5.6	4.0	640	760	970	2.3				
PF 150	Fluid Cap FC3 & Air Cap AC1301	0.9	8.2	1.20	1.4	14.4	1.62	2.1	13.5	2.16	2.7	19.1	2.52	4.6	16.1	4.14									
		1.0	6.8	1.38	1.7	11.9	1.92	2.4	11.4	2.52	3.0	17.1	2.76	4.9	13.8	4.56	1.1	0.7	360	460	710	2.1			
		1.1	5.5	1.62	2.0	9.5	2.22	2.7	9.2	2.82	3.2	15.1	3.12	5.3	11.5	4.98	2.1	1.5	430	610	810	2.4			
		1.3	4.1	1.80	2.1	8.3	2.40	3.0	7.1	3.18	3.5	13.1	3.42	5.6	9.3	5.40	3.0	2.0	510	660	890	2.6			
		1.4	2.9	2.04	2.2	7.1	2.58	3.2	5.0	3.54	4.2	8.1	4.32	6.0	7.3	5.82	3.5	3.0	580	760	970	2.7			
1.4	6.1	2.76	3.4	4.0	3.78	3.4	4.0	3.78	4.6	5.9	4.74	6.3	5.6	6.24	5.6	4.0	580	760	970	3.2					
2.5	5.1	2.94	3.5	3.3	3.96	3.5	3.3	3.96	4.9	4.0	5.16	6.7	4.3	6.72											
PF 200	Fluid Cap FC3 & Air Cap AC1302	1.0	9.0	1.50	2.0	10.4	2.46	2.4	11.6	2.88	3.1	15.6	3.36	4.2	17.1	4.38									
		1.1	7.8	1.80	2.1	9.3	2.70	2.5	10.4	3.06	3.2	14.6	3.54	4.6	15.0	4.80	1.4	0.7	100	130	170	3.0			
		1.3	6.6	1.92	2.2	8.2	2.88	2.7	9.4	3.24	3.4	13.7	3.72	4.9	12.8	5.22	2.5	1.5	130	150	200	3.7			
		1.4	5.2	2.16	2.5	6.1	3.30	3.0	7.3	3.66	3.8	10.8	4.26	5.3	11.0	5.64	3.2	2.0	130	170	220	4.0			
		1.7	3.1	2.64	2.8	4.3	3.72	3.2	5.5	4.08	4.2	8.5	4.92	5.6	9.4	6.18	3.8	3.0	150	220	280	4.2			
2.0	2.0	3.00	3.1	3.0	4.14	3.5	4.1	4.50	4.9	5.2	5.88	6.3	7.2	7.14	5.3	4.0	200	250	330	4.8					
2.2	1.1	3.36	3.4	2.0	4.50	3.8	2.9	4.86	6.0	2.3	7.20	7.0	6.1	8.04											
PF 250	Fluid Cap FC2 & Air Cap AC1304	1.1	11.2	3.24	2.1	18.0	4.74	2.7	19.6	5.58	3.5	27.0	6.72	4.6	33.0	8.22	1.4	0.7	150	180	200	3.0			
		1.3	8.5	3.60	2.2	15.8	5.04	2.8	17.3	5.88	3.7	25.0	6.96	4.9	28.0	8.94	2.4	1.5	230	280	330	3.2			
		1.4	6.5	3.90	2.4	13.6	5.34	3.0	15.2	6.18	3.8	23.0	7.26	5.3	24.0	9.66	3.0	2.0	250	330	400	3.4			
		1.5	5.0	4.26	2.5	11.6	5.70	3.1	13.2	6.54	3.9	21.0	7.56	5.6	19.7	10.4	3.7	3.0	300	380	460	3.5			
		1.7	3.8	4.62				3.2	11.4	6.84	4.1	18.9	7.92	6.0	15.7	11.2	5.3	4.0	330	410	480	4.0			
4.2	17.0	8.22	6.3	12.4	12.0				4.2	17.0	8.22	6.3	12.4	12.0											
PF 300	Fluid Cap FC1 & Air Cap AC1304	0.9	27.0	1.98	1.8	38.0	3.30	2.4	39.0	4.02	3.2	58.0	4.56	4.6	59.0	6.36									
		1.0	20.0	2.28	2.1	28.0	3.96	2.7	30.0	4.62	3.5	47.0	5.22	5.3	40.0	7.92	1.1	0.7	180	230	300	3.4			
		1.1	15.9	2.70	2.2	24.0	4.26	3.0	24.0	5.22	3.8	38.0	5.82	5.6	32.0	8.70	2.4	1.5	230	300	410	3.5			
		1.3	12.5	2.88	2.4	21.0	4.56	3.2	17.8	5.88	3.9	34.0	6.18	6.0	26.0	9.48	3.2	2.0	250	330	430	3.7			
		1.4	10.2	3.36	2.5	17.8	4.92	3.4	15.1	6.18	4.2	27.0	6.78	6.3	20.0	10.3	3.9	3.0	300	380	480	3.8			
1.5	7.6	3.72	2.7	15.1	5.22	3.5	12.9	6.54	4.6	20.0	7.56	6.7	15.9	11.1	6.0	4.0	330	410	510	4.4					
3.7	10.6	6.84	4.9	14.8	8.40	7.0			4.9	14.8	8.40	7.0													
PF 350	Fluid Cap FC1 & Air Cap AC1305	1.0	17.0	1.38	2.0	24.0	2.64	2.4	28.0	3.06	3.4	38.0	4.32	3.9	65.0	4.50									
		1.1	11.0	1.62	2.1	18.9	3.00	2.5	23.0	3.54	3.5	33.0	4.80	4.2	53.0	5.34	1.1	0.7	100	130	150	2.4			
		1.3	7.6	1.98	2.2	14.4	3.36	2.7	18.9	3.96	3.7	28.0	5.34	4.6	40.0	6.48	2.1	1.5	100	130	170	3.0			
		1.4	3.2	2.40	2.4	10.6	3.78	2.8	15.1	4.44	3.8	23.0	5.82	4.9	30.0	7.62	2.8	2.0	130	170	220	3.4			
					2.5	7.2	4.26	3.0	11.7	4.74	3.9	19.7	6.30	5.3	21.0	8.94	3.7	3.0	150	200	280	3.6			
4.2	13.1	7.20	5.6	13.8	10.4	4.9			4.2	13.1	7.20	5.6	13.8	10.4	4.9	4.0	200	250	350	4.0					
4.6	7.2	8.28	6.3	3.2	13.5				4.6	7.2	8.28	6.3	3.2	13.5											
PF 400	Fluid Cap FC5 & Air Cap AC1306	1.0	29.0	5.40	1.8	56.0	7.02	2.1	100	7.14	3.0	126	8.40	4.1	140	10.9									
		1.1	18.9	6.48	2.0	40.0	7.98	2.2	79.0	7.98	3.1	110	9.06	4.2	125	11.6	1.0	0.7	180	200	250	3.4			
								2.4	62.0	8.82	3.2	95.0	9.78	4.6	89.0	13.5	1.8	1.5	250	300	430	3.8			
								2.5	48.0	9.72	3.4	78.0	11.0	4.9	58.0	15.9	2.4	2.0	250	300	460	4.3			
								2.7	36.0	10.6	3.5	62.0	11.6	5.3	34.0	18.3	3.4	3.0	330	410	530	4.6			
									3.7	48.0	12.6	5.6	16.7	20.4	4.9	4.0	360	430	580	5.2					
									3.8	37.0	13.5														

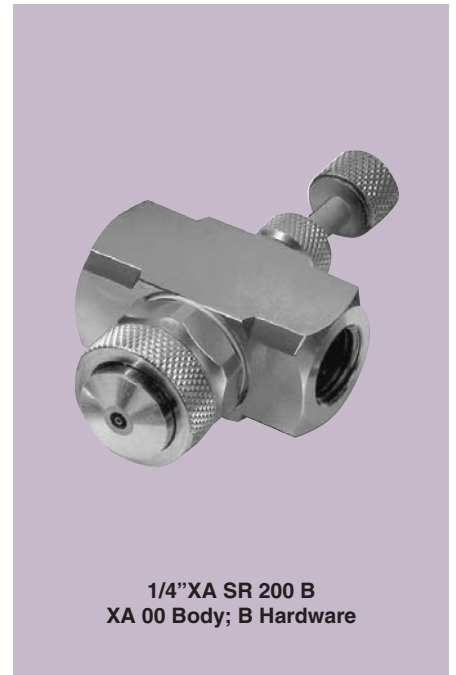
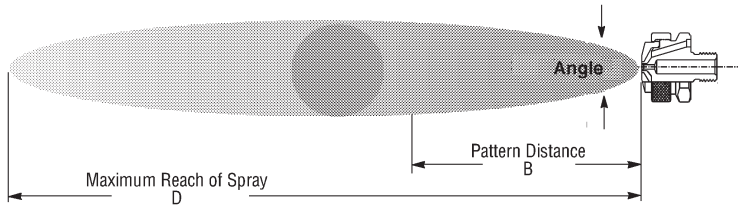
Standard Materials: Nickel-plated Brass, 303 Stainless Steel and 316 Stainless Steel.

# XASR

## Siphon-fed Round

### DESIGN FEATURES

- Lowest flow available
- Very fine atomization
- Narrow spray angle (12°- 22°)
- Full cone pattern
- Short to moderate forward spray projection



1/4"XA SR 200 B  
XA 00 Body; B Hardware

Dimensions are approximate. Check with BETE for critical dimension applications.

### XA SR Set-up Flow Rates and Dimensions

Siphon-fed, External Mix, Round Spray Pattern, 1/8" and 1/4" Pipe Sizes, BSP or NPT

Pipe Size	Spray Set-up Number	Fluid and Air Cap Numbers	ATOMIZING AIR		Liquid Capacity in l/h (Liters Per Hour)								Spray Dimensions at 200 mm. Siphon Height				
			Air (bar)	Air Capacity (Nm <sup>3</sup> /h)	Gravity Head			Siphon Height					Air (bar)	Spray Angle (deg.)	B (mm)	D (m)	
					450 mm	300 mm	150 mm	100 mm	200 mm	300 mm	600 mm	900 mm					
1/8 or 1/4	SR 050	Fluid Cap FC7 & Air Cap AC 1201	0.7	0.66	1.5	1.3	1.1	0.9	0.7	0.5				0.7	18	280	1.8
			1.5	1.02	1.8	1.7	1.5	1.3	1.2	1.1	0.6			1.5	18	280	1.9
			3.0	1.68	2.1	1.9	1.7	1.5	1.4	1.3	1.1	0.8		3.0	18	300	2.3
				4.0	2.16	2.2	2.0	1.8	1.6	1.5	1.4	1.2	0.9	4.0	18	360	2.6
		SR 150	Fluid Cap FC4 & Air Cap AC1201	0.7	0.78	24	2.1	1.7	1.5	1.2	0.8			0.7	18	300	2.1
	1.5			1.20	2.8	2.6	2.4	2.1	1.9	1.6	0.9		1.5	18	330	2.3	
3.0	1.92			3.4	3.1	2.9	2.8	2.6	2.4	1.7	1.1		3.0	18	380	2.6	
			4.0	2.46	3.7	3.4	3.3	3.1	2.9	2.7	2.1	1.5	4.0	19	430	3.0	
	SR 200	Fluid Cap FC4 & Air Cap AC1202	0.7	1.38	2.5	2.3	2.0	1.6	1.4	1.1			0.7	18	300	2.4	
1.5			2.16	2.9	2.8	2.5	2.2	2.0	1.7	0.9		1.5	18	330	2.7		
3.0			3.48	3.4	3.3	3.2	2.9	2.8	2.5	1.9	1.2		3.0	19	380	3.4	
			4.0	4.44	3.7	3.6	3.5	3.4	3.3	3.0	2.5	2.0	4.0	20	430	4.0	
	SR 250	Fluid Cap FC3 & Air Cap AC1202	0.7	1.14	4.5	4.0	3.4	2.1	1.8	1.4			0.7	21	380	3.0	
1.5			1.86	5.3	4.9	4.4	3.5	2.9	2.7	1.8		1.5	21	410	3.4		
3.0			3.00	6.0	5.6	5.0	4.4	4.0	3.4	2.4	1.2		3.0	21	460	4.0	
			4.0	3.90	5.7	5.4	5.0	4.2	3.9	3.5	2.8	1.9	4.0	22	510	4.6	
	SR 400	Fluid Cap FC1 & Air Cap AC 1204	1.5	3.48	22	19.9	16.3	12.3	10.5	8.3	2.8		1.5	17	460	3.7	
3.0			5.28	25	23	19.5	16.7	14.2	11.5	6.4	2.8		3.0	18	510	4.3	
4.0			6.66	26	24	21	18.4	15.7	12.9	7.9	4.5		4.0	18	530	4.9	
			5.6	8.82	26	24	22	19.7	17	14.6	9.8	6.1	5.6	19	580	5.5	
	SR 450	Fluid Cap FC5 & Air Cap AC 1205	2.0	8.64				27	22	16.8			2.0	20	510	6.7	
3.0			11.4				30	26	21	16.8			3.0	20	530	7.0	
4.0			14.4				31	28	23	16.8			4.0	21	580	7.6	
			5.6	18.9	44	43	40	31	28	24	11.0	8.3	5.6	22	630	8.2	

Standard Materials: Nickel-plated Brass, 303 Stainless Steel and 316 Stainless Steel.

AIR ATOMIZING

CALL 413-772-0846  
Call for the name of your nearest BETE representative.

# XAEF

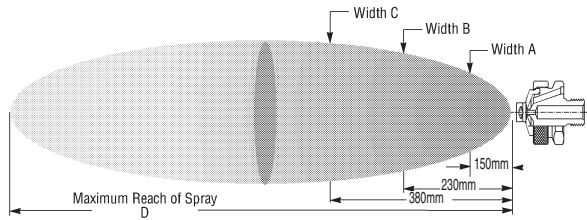
## Pressure-fed/External Mix/Flat Fan

### DESIGN FEATURES

- External mix: allows spraying of viscous materials
- Variable atomization
- Moderate spray angle (60°- 90°)
- Precise metering of the liquid flow rate



1/4"XA EF 150 E  
XA 00 Body; E Hardware



Dimensions are approximate. Check with BETE for critical dimension applications.

### XA EF Set-up Flow Rates and Dimensions

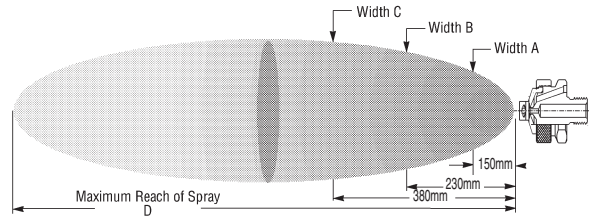
Pressure-fed, External Mix, Flat Fan Spray Pattern, 1/8" and 1/4" Pipe Sizes, BSP or NPT

Pipe Size	Spray Set-up Number	Fluid and Air Cap Numbers	0.2 Bar Liquid			0.3 Bar Liquid			0.7 Bar Liquid			1.5 Bar Liquid			3.0 Bar Liquid			Spray Dimensions						
			Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	air	liquid	A (mm)	B (mm)	C (mm)	D (m)	
1/8	EF 050	Fluid Cap FC7 & Air Cap AC1001	0.4		1.32	0.4		1.32	0.4		1.50	0.6		1.68	0.7		2.04	0.6	0.7	200	280	330	1.2	
			0.4		1.50	0.4		1.50	0.6		1.68	0.7		2.04	1.1		2.70	0.6	1.5	230	300	400	1.8	
			0.5	3	1.62	0.6		1.68	0.7	4		2.04	1.1		2.70	1.8		3.72	1.1	1.5	280	350	460	1.8
			0.6		1.68	0.6		2.04	0.9		2.40	1.4		3.24	2.5		4.74	1.1	1.5	280	330	430	2.4	
																			1.4	1.5	250	300	410	2.7
																			1.1	2.0	280	350	480	2.6
1/4	EF 100	Fluid Cap FC7 & Air Cap AC1003	0.2		1.51	0.4		1.58	0.7		1.87	1.4		2.72	2.8		4.42	0.2	0.2	90	150	230	0.9	
			0.4		1.58	0.7		1.87	1.1		2.38	1.8		3.23	3.5		5.10	1.1	0.2	90	150	230	1.2	
			0.7	3	1.87	1.1		2.38	1.4	4		2.72	1.8		3.23	2.8		4.42	1.4	0.4	100	150	230	1.2
			1.1		2.38	1.4		2.72	1.8		3.23	2.8		4.42	4.9		7.14	1.4	1.4	120	180	250	1.5	
			1.4		2.72	1.8		3.23	2.1		3.56	3.5		5.10	5.3		7.65	1.8	0.7	120	150	240	1.5	
			1.8		3.23	2.1		3.56	2.8		4.42	4.2		6.12	5.6		8.34	2.8	1.4	130	180	280	1.8	
																2.1	2.8	150	180	240	2.4			
1/8	EF 150	Fluid Cap FC4 & Air Cap AC1001	0.4		1.32	0.4		1.32	0.6		1.68	0.7		2.04	1.1		2.70	0.7	0.3	280	330	400	1.5	
			0.6		1.68	0.7		2.04	0.7		2.04	1.4		3.24	1.4		3.24	1.1	0.7	300	380	480	2.1	
			0.7	5	2.04	1.1		2.70	1.4	6		3.24	2.1		4.26	2.1		4.26	1.4	1.5	350	430	560	2.4
			1.1		2.70	1.4		3.24	2.1		4.26	2.5		5.74	2.5		7.74	1.8	2.0	380	460	580	2.7	
																			1.8	3.0	410	480	660	2.9
																			1.8	3.0	410	480	660	2.9
1/4	EF 200	Fluid Cap FC4 & Air Cap AC1003	0.4		1.58	0.7		1.87	1.1		2.38	1.8		3.23	2.8		4.42	0.4	0.2	80	140	220	1.0	
			0.7		1.87	1.1		2.38	1.4		2.72	1.4		3.56	3.5		5.10	1.4	0.2	90	150	220	1.7	
			1.1	5	2.38	1.4		2.72	1.8	6		3.23	2.1		4.42	4.2		6.12	1.8	0.4	100	170	230	1.8
			1.4		2.72	1.8		3.23	2.1		3.56	3.5		5.10	4.9		7.14	1.8	1.4	130	190	290	2.1	
			1.8		3.23	2.1		3.56	2.8		4.42	4.2		6.12	5.3		7.62	2.1	0.7	130	180	250	1.8	
			2.1		3.56	2.8		4.42	3.5		5.10	4.9		7.14	6.3		9.54	3.5	1.4	130	220	300	2.4	
																2.8	2.8	150	190	250	3.0			
1/8	EF 250	Fluid Cap FC3 & Air Cap AC1001	0.4		1.50	0.4		1.50	0.4		1.50	0.7		2.04	1.4		2.70	0.6	0.3	350	480	610	1.8	
			0.5		1.65	0.6		1.68	0.6		1.68	0.9		2.04	1.4		2.40	1.8	0.7	350	480	630	1.5	
			0.6		1.68	0.7		1.86	0.7		2.04	1.1		2.70	2.1		3.24	1.4	1.5	380	480	630	1.8	
			0.7	9	2.04	0.7		2.04	0.9	10		2.40	1.4		3.24	2.5		4.74	1.1	1.5	410	510	660	2.1
																			1.4	1.5	430	530	660	2.4
																			2.1	2.0	410	510	690	2.7
1/4	EF 300	Fluid Cap FC3 & Air Cap AC1003	0.7		1.87	1.1		2.38	1.4		2.72	2.5		4.08	3.5		5.10	0.7	0.2	130	170	250	1.2	
			1.1		2.38	1.4		2.72	1.8		3.23	2.8		4.42	4.2		6.12	1.8	0.2	130	170	250	1.8	
			1.4		2.72	1.8		3.23	2.1		3.56	3.5		5.10	4.9		7.14	2.1	0.4	130	180	240	1.8	
			1.8	9	3.23	2.1		3.56	2.8	10		4.42	4.2		6.12	5.3		7.62	2.5	0.7	140	200	320	1.8
			2.1		3.56	2.8		4.42	3.5		5.10	4.9		7.14	5.6		8.34	2.8	0.7	140	190	300	2.3	
			2.8		4.42	3.5		5.10	4.2		6.12	5.6		8.34	6.3		9.54	4.2	1.4	140	200	360	3.0	
																3.5	2.8	170	200	300	4.0			

Standard Materials: Nickel-plated Brass, 303 Stainless Steel and 316 Stainless Steel.

AIR ATOMIZING

TO ORDER: specify spray set-up #, pipe size, body style, hardware and mounting assemblies, and material. See page 76.



Dimensions are approximate. Check with BETE for critical dimension applications.

**XA EF Set-up Flow Rates and Dimensions**  
 Pressure-fed, External Mix, Flat Fan Spray Pattern, 1/8" and 1/4" Pipe Sizes, BSP or NPT

Pipe Size	Spray Set-up Number	Fluid and Air Cap Numbers	0.2 Bar Liquid			0.3 Bar Liquid			0.7 Bar Liquid			1.5 Bar Liquid			3.0 Bar Liquid			Spray Dimensions					
			Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	air	Bar liquid	A (mm)	B (mm)	C (mm)	D (m)
1/8 OR 1/4	EF 350	Fluid Cap FC6 & Air Cap AC1002	0.6		5.46	0.7		6.12	1.4		9.36	2.1		12.6	3.2		17.1	1.4	0.3	330	380	480	3.8
			0.7	13	6.12	1.1	16	7.80	2.1	25	12.6	2.8	37	15.6	4.2	52	21.6	2.1	0.7	330	400	560	4.3
			1.1		7.80	1.8	11.0	2.5	14.1	3.5	18.6	5.3	25.8	4.2	1.5	380	480	660	4.6				
	EF 400	Fluid Cap FC6 & Air Cap AC1004	0.7		5.10	1.0		6.12	1.4		6.96	1.8		8.34	2.5		10.7	1.1	0.2	130	190	250	1.7
			1.0	13	6.12	1.4	16	6.96	1.8	25	8.34	2.1	37	9.36	3.5	52	15.3	2.1	0.4	150	190	280	3.0
			1.4		6.96	1.8	9.36	2.5	10.7	4.2	16.0	4.2	21.6	5.6	24.7	6.3	32	18.8	2.5	1.4	170	230	360
	EF 450	Fluid Cap FC2 & Air Cap AC1002	0.6		5.46	0.7		6.12	1.1		7.80	2.5		14.1	3.5		18.6	1.1	0.2	330	380	510	3.5
			1.1	18	7.80	1.4	22	9.36	1.8	33	11.0	2.8	48	17.1	4.6	68	22.8	2.5	1.5	380	460	640	3.8
			1.4		9.36	1.8	11.0	2.1	12.6	2.8	15.6	4.2	21.6	6.7	31.5	4.2	2.0	330	430	610	5.2		
	EF 500	Fluid Cap FC2 & Air Cap AC1004	0.6		5.46	0.7		6.12	1.1		7.80	2.5		14.1	3.5		18.6	1.1	0.2	330	380	510	3.5
			1.1	18	7.80	1.4	22	9.36	1.8	33	11.0	2.8	48	17.1	4.6	68	22.8	2.5	1.5	380	460	640	3.8
			1.4		9.36	1.8	11.0	2.1	12.6	2.8	15.6	4.2	21.6	6.7	31.5	4.2	2.0	330	430	610	5.2		
EF 550	Fluid Cap FC1 & Air Cap AC1002	0.7		5.10	1.4		6.96	1.8		8.34	2.8		11.7	3.5		13.9	0.7	0.4	150	190	270	2.1	
		1.0	18	6.12	1.8	22	8.34	2.1	33	9.36	2.5	48	10.7	3.5	68	16.5	1.8	0.7	150	190	270	3.0	
		1.4		6.96	1.8	9.36	2.5	10.7	4.2	16.0	5.6	21.6	6.3	24.7	6.6	25.7	5.3	2.8	180	230	360	5.8	
EF 600	Fluid Cap FC1 & Air Cap AC1004	0.7		5.10	1.4		6.96	1.8		8.34	2.8		11.7	3.5		13.9	0.7	0.4	150	190	270	2.1	
		1.0	18	6.12	1.8	22	8.34	2.1	33	9.36	2.5	48	10.7	3.5	68	16.5	1.8	0.7	150	190	270	3.0	
		1.4		6.96	1.8	9.36	2.5	10.7	4.2	16.0	5.6	21.6	6.3	24.7	6.6	25.7	5.3	2.8	180	230	360	5.8	
EF 650	Fluid Cap FC8 & Air Cap AC1005	0.7		5.10	1.4		6.96	1.8		8.34	2.8		11.7	3.5		13.9	0.7	0.4	150	190	270	2.1	
		1.0	18	6.12	1.8	22	8.34	2.1	33	9.36	2.5	48	10.7	3.5	68	16.5	1.8	0.7	150	190	270	3.0	
		1.4		6.96	1.8	9.36	2.5	10.7	4.2	16.0	5.6	21.6	6.3	24.7	6.6	25.7	5.3	2.8	180	230	360	5.8	
EF 700	Fluid Cap FC9 & Air Cap AC1005	0.7		5.10	1.4		6.96	1.8		8.34	2.8		11.7	3.5		13.9	0.7	0.4	150	190	270	2.1	
		1.0	18	6.12	1.8	22	8.34	2.1	33	9.36	2.5	48	10.7	3.5	68	16.5	1.8	0.7	150	190	270	3.0	
		1.4		6.96	1.8	9.36	2.5	10.7	4.2	16.0	5.6	21.6	6.3	24.7	6.6	25.7	5.3	2.8	180	230	360	5.8	
EF 750	Fluid Cap FC5 & Air Cap AC1005	0.7		5.10	1.4		6.96	1.8		8.34	2.8		11.7	3.5		13.9	0.7	0.4	150	190	270	2.1	
		1.0	18	6.12	1.8	22	8.34	2.1	33	9.36	2.5	48	10.7	3.5	68	16.5	1.8	0.7	150	190	270	3.0	
		1.4		6.96	1.8	9.36	2.5	10.7	4.2	16.0	5.6	21.6	6.3	24.7	6.6	25.7	5.3	2.8	180	230	360	5.8	

AIR ATOMIZING

CALL 413-772-0846  
 Call for the name of your nearest BETE representative.

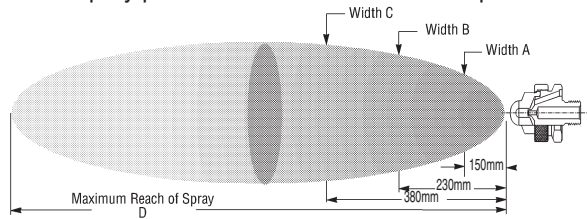
Standard Materials: Nickel-plated Brass, 303 Stainless Steel and 316 Stainless Steel.

# XASF

## Siphon-fed Flat Fan

### DESIGN/SPRAY CHARACTERISTICS

- Lowest flow available
- Very fine atomization
- Flat fan spray pattern
- Moderate spray angle (60° - 85°)
- Small forward projection
- Siphon-fed



Dimensions are approximate. Check with BETE for critical dimension applications.

### XA SF Set-up Flow Rates and Dimensions

Siphon-fed, Internal Mix, Flat Fan Spray Pattern, 1/8" and 1/4" Pipe Sizes, BSP or NPT

Pipe Size	Spray Set-Up Number	Fluid Cap and Air Cap Numbers	ATOMIZING AIR		Liquid Capacity in l/h (Liters Per Hour)								Spray Dimensions at 200 mm Siphon Height					
			Air (bar)	Air Capacity (Nm <sup>3</sup> /h)	Gravity Head				Siphon Height				Air (bar)	A (mm)	B (mm)	C (mm)	D (m)	
					450 mm	300 mm	150 mm	100 mm	200 mm	300 mm	600 mm	900 mm						
1/8 or 1/4	SF 050	Fluid Cap FC3 & Air Cap AC1101	0.7	1.68	1.3	1.2	1.1	1.0	1.0	1.0	0.8	0.6	0.5	0.7	200	260	380	2.1
			1.5	2.58	1.2	1.1	1.0	0.9	0.9	0.8	0.7	0.5	1.5	210	290	380	2.1	
			2.0	3.00	0.8	0.8	0.7	0.6	0.5						2.0	230	300	380
	SF 100	Fluid Cap FC6 & Air Cap AC1102	1.5	3.36	3.7	3.5	3.3	2.9	2.8	2.5	2.3	2.1	1.5	230	320	380	2.7	
			2.0	3.90	3.4	3.3	3.1	2.8	2.7	2.6	2.4	2.2	2.0	240	340	420	2.7	
			3.0	5.22	2.8	2.7	2.5	2.4	2.2	2.1	1.9	1.7	3.0	270	370	460	3.0	
	SF 150	Fluid Cap FC2 & Air Cap AC1103	1.5	4.08	5.1	4.8	4.5	3.8	3.7	3.5	3.0	2.4	1.5	190	230	270	3.4	
			2.0	4.68	4.9	4.7	4.4	3.6	3.4	3.2	2.9	2.3	2.0	200	250	280	3.4	
			3.0	6.18	3.4	3.2	3.0	2.2	2.0	1.7			3.0	220	270	300	3.0	
	SF 200	Fluid Cap FC2 & Air Cap AC1104	1.5	3.78	7.6	7.2	6.6	5.7	5.4	5.1	4.6	3.7	1.5	170	220	270	3.4	
			2.0	4.38	7.6	7.3	6.8	5.9	5.7	5.5	5.0	4.2	2.0	180	230	290	3.4	
			3.0	5.76	6.4	6.1	5.7	5.0	4.5	4.1	3.3		3.0	200	270	330	3.4	
			3.5	6.60	4.2	3.7	3.2	2.6										

Standard Materials: Nickel-plated Brass, 303 Stainless Steel and 316 Stainless Steel.

AIR ATOMIZING

TO ORDER: specify spray set-up #, pipe size, body style, hardware and mounting assemblies, and material. See page 76.

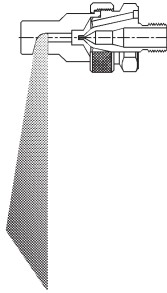


# XAFF

## Pressure-fed/Int. Mix/Deflected Flat Fan

### DESIGN/SPRAY CHARACTERISTICS

- Internal mix
- Very fine atomization
- Deflected flat fan spray pattern



1/4" XA 01 FF050 F  
XA01 Body; F Hardware

AIR ATOMIZING

CALL 413-772-0846  
for the name of your nearest BETE representative.

### XA FF Set-up Flow Rates

Pressure-fed, Internal Mix, Deflected Flat Fan Spray Pattern, 1/8" and 1/4" Pipe Sizes, BSP or NPT

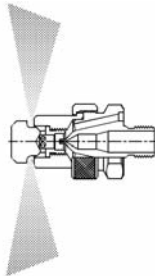
Pipe Size	Spray Set-up Number	Fluid and Air Cap Numbers	0.7 Bar Liquid			1.5 Bar Liquid			2.0 Bar Liquid			3.0 Bar Liquid			4.0 Bar Liquid		
			Air (bar)	l/hr	Nm <sup>3</sup> /hr	Air (bar)	l/hr	Nm <sup>3</sup> /hr	Air (bar)	l/hr	Nm <sup>3</sup> /hr	Air (bar)	l/hr	Nm <sup>3</sup> /hr	Air (bar)	l/hr	Nm <sup>3</sup> /hr
1/8 or 1/4	FF 050	Fluid Cap FC10 & Air Cap AC1701	0.4	11.0	2.70	1.1	14.5	4.74	1.5	15.7	5.76	2.1	20.0	6.84	2.7	26.0	7.98
			0.6	9.5	3.24	1.3	13.2	5.16	1.7	14.3	6.24	2.2	19.2	7.26	3.2	22.0	9.60
			0.7	7.6	3.90	1.4	11.8	5.70	1.8	12.9	6.72	2.7	15.8	8.76	3.8	17.7	11.2
			0.8	5.7	4.62	1.5	10.0	6.18	2.1	9.8	7.80	3.1	11.8	10.4	4.4	13.1	13.8
					1.7	8.7	6.78	2.2	8.3	8.52	3.2	10.3	11.0	4.6	10.2	15.0	

# XAXW

## Pressure-fed/Int. Mix/Extra-wide Angle

### DESIGN/SPRAY CHARACTERISTICS

- Internal mix
- Very fine atomization
- 180° Extra-wide Hollow Cone



1/4" XA 03 XW050 A  
XA 03 Body; A Hardware

### XA XW Set-up Flow Rates

Pressure-fed, Internal Mix, Extra-wide Spray Pattern, 1/8" and 1/4" Pipe Sizes, BSP or NPT

Pipe Size	Spray Set-up Number	Fluid and Air Cap Numbers	0.7 Bar Liquid			1.5 Bar Liquid			2.0 Bar Liquid			3.0 Bar Liquid			4.0 Bar Liquid		
			Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h
1/8 or 1/4	XW 050	Fluid Cap FC8 & Air Cap AC1401	1.4	15.1	4.14	2.8	19.5	8.52	3.5	21.0	11.1	4.2	48.0	12.6	6.0	45.0	20.4
			1.5	10.6	4.62	3.0	16.1	9.18	3.7	17.6	11.8	4.6	37.0	14.4	6.3	37.0	22.5
			1.7	7.6	5.04	3.1	13.2	9.90	3.8	14.8	12.6	4.9	26.0	16.5	6.7	30.0	24.3
			1.8	5.7	5.58	3.2	10.6	10.6	3.9	12.5	13.2	5.6	15.5	20.4	7.0	24.0	26.4
			2.0	4.2	6.18	3.4	8.3	11.3	4.2	8.1	14.7	6.3	7.8	25.5			

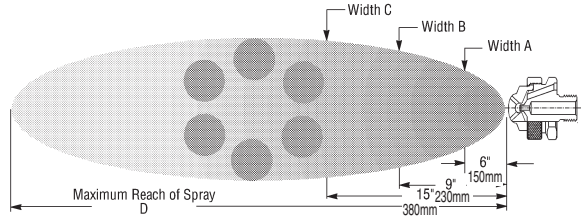
Standard Materials: Nickel-plated Brass, 303 Stainless Steel and 316 Stainless Steel.

# XAAD

## Pressure-fed/Int. Mix/Wide Angle Round

### DESIGN/SPRAY CHARACTERISTICS

- Internal mix
- Very fine atomization
- 70° Hollow Cone spray pattern
- Moderate forward spray projection



1/4" XA AD100 C  
XA 00 Body; C Hardware

Dimensions are approximate. Check with BETE for critical dimension applications.

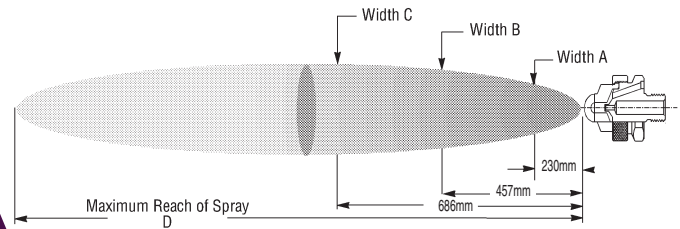
### XA AD Set-up Flow Rates and Dimensions

Pressure-fed, Internal Mix, Wide Angle Round Spray Pattern, 1/8" and 1/4" Pipe Sizes, BSP or NP T

Pipe Size	Spray Set-up Number	Fluid and Air Cap Numbers	0.7 Bar Liquid			1.5 Bar Liquid			2.0 Bar Liquid			3.0 Bar Liquid			4.0 Bar Liquid			Spray Dimensions						
			Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	air	Bar liquid	A (mm)	B (mm)	C (mm)	D (m)	
1/8	AD 050	Fluid Cap FC4 & Air Cap AC1601	0.6	5.3	0.60	1.1	8.1	0.79	1.5	8.1	0.92	2.4	8.9	1.24	3.1	10.5	1.44	0.7	0.7	140	180	230	1.5	
			0.7	4.3	0.72	1.3	7.0	0.88	1.8	6.6	1.09	2.7	8.1	1.40	3.4	9.7	1.68	1.4	1.5	150	190	240	1.8	
			0.9	3.0	0.84	1.4	6.4	0.94	2.1	4.9	1.32	3.0	6.4	1.66	3.9	7.8	2.16	1.8	2.0	160	200	250	2.1	
	AD 100	Fluid Cap FC2 & Air Cap AC1603	1.0	1.7	1.02	1.5	5.5	1.01	2.4	3.2	1.68	3.2	4.9	1.92	4.2	6.1	2.52	3.0	3.0	160	200	260	2.7	
			0.9	7.0	3.00	1.7	13.2	4.08	2.0	18.5	4.08	2.8	25.0	5.04	3.7	31.0	5.76	0.9	0.7	180	240	310	1.8	
			1.0	2.1	3.72	1.8	9.8	4.74	2.1	15.1	4.56	3.0	22.0	5.52	3.8	28.0	6.30	1.7	1.5	190	250	330	2.4	
	AD 150	Fluid Cap FC2 & Air Cap AC1602	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	
			1.1	12.3	2.40	2.2	16.3	3.72	2.7	21.0	4.14	4.2	19.3	6.00	5.6	22.0	7.80	1.5	0.7	150	190	230	2.7	
			1.3	9.9	2.70	2.5	12.1	4.26	3.0	16.3	4.68	4.6	14.6	6.78	6.0	17.6	8.52	3.0	1.5	160	200	240	4.6	
	OR	AD 200	Fluid Cap FC1 & Air Cap AC1603	1.4	7.9	3.00	2.8	8.9	4.74	3.2	12.3	5.16	4.9	10.8	7.44	6.3	14.0	9.12	3.4	2.0	160	200	240	5.5
				1.5	6.1	3.24	3.0	7.6	4.98	3.4	10.7	5.46	5.3	8.1	8.10	6.7	11.4	9.78	3.0	1.5	160	200	240	4.6
				1.7	4.9	3.48	3.1	6.4	5.22	3.5	9.3	5.64	5.6	6.2	8.76	7.0	9.1	10.4	3.4	2.0	160	200	240	5.5
1/4	AD 250	Fluid Cap FC1 & Air Cap AC1604	1.8	3.9	3.72	3.2	5.5	5.46	3.9	6.4	6.30	6.0	4.9	9.42	4.6	6.3	9.18	5.3	3.0	180	220	250	7.3	
			2.0	3.1	4.02	3.4	4.7	5.70	4.2	4.7	6.90	6.3	4.0	10.0	4.9	6.8	11.0	6.3	4.0	190	240	280	9.4	
			0.7	24.0	1.92	1.4	43.0	2.22	2.1	33.0	4.96	2.8	52.0	3.90	3.7	63.0	4.08	0.9	0.7	190	250	360	2.1	
AD 300	Fluid Cap FC5 & Air Cap AC1605	0.9	13.6	2.64	1.5	35.0	2.94	2.2	26.0	4.38	3.0	46.0	4.56	3.8	58.0	4.74	1.5	1.5	200	270	370	3.2		
		1.0	7.6	3.42	1.7	28.0	3.66	2.4	18.9	5.34	3.1	39.0	5.22	4.0	52.0	6.06	3.2	3.0	200	270	370	4.1		
		1.8	3.9	3.72	3.2	5.5	5.46	3.9	6.4	6.30	6.0	4.9	9.42	4.6	6.3	9.18	5.3	3.0	200	280	380	5.0		
AD 250	Fluid Cap FC1 & Air Cap AC1604	2.0	3.1	4.02	3.4	4.7	5.70	4.2	4.7	6.90	6.3	4.0	10.0	4.9	6.8	11.0	6.3	4.0	200	280	390	6.8		
		1.3	36.0	5.10	2.1	57.0	6.96	3.1	53.0	9.36	4.2	64.0	11.8	5.6	74.0	14.7	2.0	0.7	200	250	330	5.5		
		1.5	29.0	6.12	2.4	51.0	7.80	3.2	50.0	9.78	4.9	51.0	13.8	6.0	68.0	15.6	3.0	1.5	200	270	340	6.4		
AD 300	Fluid Cap FC5 & Air Cap AC1605	1.8	23.0	7.02	2.7	45.0	8.58	3.4	47.0	10.2	5.6	40.0	15.9	6.3	62.0	16.8	3.9	2.0	220	280	370	8.2		
		2.0	19.7	7.50	3.0	39.0	9.42	3.5	45.0	10.6	6.0	34.0	17.1	6.7	56.0	17.7	6.0	3.0	230	290	380	9.1		
		2.1	16.7	7.98	3.2	33.0	10.2	3.9	38.0	11.6	6.3	28.0	18.0	7.0	51.0	18.9	6.0	3.0	230	290	380	9.1		
AD 300	Fluid Cap FC5 & Air Cap AC1605	2.3	14.0	8.52	3.5	28.0	11.1	4.6	25.0	13.8	6.7	22.0	19.2	7.0	51.0	18.9	6.3	4.0	240	320	400	10.4		
		2.4	11.4	8.94	4.2	13.6	13.2	4.9	18.5	14.7	7.0	17.8	20.1	6.0	93.0	23.7	2.0	0.7	240	330	460	5.5		
		1.7	25.0	9.36	3.0	39.0	13.8	3.4	50.0	15.0	4.6	62.0	19.2	6.0	93.0	23.7	3.2	1.5	250	340	470	6.4		
AD 300	Fluid Cap FC5 & Air Cap AC1605	1.8	19.7	10.0	3.1	33.0	14.4	3.5	43.0	15.6	4.9	47.0	20.7	6.3	77.0	25.5	3.9	2.0	280	370	510	7.3		
		2.0	15.1	10.7	3.2	27.0	15.3	3.7	41.0	16.5	5.3	36.0	22.5	6.7	62.0	27.6	5.3	3.0	290	380	530	7.9		
		2.1	11.4	11.6	3.4	23.0	15.9	3.9	27.0	18.0	5.6	26.0	24.3	7.0	52.0	29.7	6.3	4.0	330	420	580	9.8		
AD 300	Fluid Cap FC5 & Air Cap AC1605	2.3	7.6	12.3	3.5	18.5	16.8	4.1	23.0	18.6	6.0	18.9	26.1	7.0	52.0	29.7	6.3	4.0	330	420	580	9.8		
		2.0	15.1	10.7	3.2	27.0	15.3	3.7	41.0	16.5	5.3	36.0	22.5	6.7	62.0	27.6	5.3	3.0	290	380	530	7.9		
		2.1	11.4	11.6	3.4	23.0	15.9	3.9	27.0	18.0	5.6	26.0	24.3	7.0	52.0	29.7	6.3	4.0	330	420	580	9.8		

Standard Materials: Nickel-plated Brass, 303 Stainless Steel and 316 Stainless Steel.

# 1/2 XA



## Air Atomizing

Dimensions are approximate. Check with BETE for critical dimension applications.

### AD 1/2" XA AD Set-up Flow Rates and Dimensions Pressure-fed, Internal Mix, Wide Angle Round Spray Pattern, 1/2" Pipe Size, BSP or NPT

Pipe Size	Spray Set-up Number	Fluid and Air Cap Numbers	0.35 Bar Liquid			1.0 Bar Liquid			2.0 Bar Liquid			3.0 Bar Liquid			4.0 Bar Liquid			Spray Dimensions							
			Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	air	liquid	A (mm)	B (mm)	C (mm)	D (m)		
1/2	AD 5050	Fluid Cap FC501 & Air Cap AC5601							2.1	213	10.6	3.1	316	12.8	4.2	238	21.1	2.1	2.0	360	480	690	6.7		
									2.3	127	14.9	3.2	195	17.5	4.3	154	26.3	3.2	3.0	360	480	690	7.3		
												3.4	107	22.3	4.5	100	31.3	4.3	4.0	360	480	690	8.5		
	AD 5100	Fluid Cap FC501 & Air Cap AC5602	0.6	102	11.0	1.1	215	9.18	2.5	185	21.3	3.7	192	33.6	5.0	230	49.8	0.7	0.35	330	470	650	6.1		
			0.7	57	13.8	1.3	124	13.8	2.7	146	24.6	3.9	150	37.2	5.3	158	56.4	1.3	1.0	340	480	670	7.9		
			0.85	32	16.8	1.4	84	16.8	2.8	112	27.9	4.0	119	40.8	5.6	108	64.8	2.8	2.0	330	470	650	6.4		
									3.0	86	31.2	4.2	86	46.2				4.0	3.0	340	480	670	7.3		
									3.1	65	34.8	4.6	51					5.3	4.0	360	480	690	8.2		
	AD 5150	Fluid Cap FC501 & Air Cap AC5603	0.7	129	19.5	1.7	182	32.4	3.1	265	48.6	4.3	350	60.0				0.85	0.35	360	500	690	7.9		
			0.85	82	22.2	1.8	143	35.4	3.2	215	51.6	4.6	260	64.8				1.7	1.0	330	480	660	7.3		
			1.0	45	24.9				3.4	173	54.6	5.0	186	72.0				3.4	2.0	330	470	660	7.0		
									3.5	136	57.0							4.6	3.0	360	500	690	8.5		
									3.6	120	58.8														
	AD 5200	Fluid Cap FC502 & Air Cap AC5604	0.7	134	18.9	1.3	320	26.4	2.1	575	34.2	3.0	740	42.6	3.9	840	51.6	0.7	0.35	330	640	910	3.4		
0.85			100	22.8	1.4	255	31.2	2.2	505	38.4	3.1	690	46.2	4.1	790	55.8	1.4	1.0	330	660	910	4.9			
					1.5	200	35.4	2.4	440	43.2	3.2	630	50.4	4.2	740	59.4	2.5	2.0	280	560	810	6.1			
					1.7	154	40.2	2.5	380	47.4	3.4	570	54.6	4.4	690	64.2	3.4	3.0	280	530	740	6.7			
								2.7	330	51.6	3.5	520	58.8	4.5	650	68.4	4.5	4.0	280	560	790	7.6			
								2.8	275	55.8	3.7	470	63.0	4.6	600	72.6									
								3.0	235	60.6	3.8	420	67.2	4.8	550	76.8									
								3.1	195	64.8	3.9	345	71.4	4.9	510	81.0									
											4.1	325	75.6	5.1	465	85.8									
														5.2	425	89.4									
														5.3	390	93.6									
														5.5	350	98.4									

AIR ATOMIZING

### PR 1/2" XA PR Set-up Flow Rates and Dimensions Pressure-fed, Internal Mix, Round Spray Pattern, 1/2" Pipe Size, BSP or NPT

Pipe Size	Spray Set-up Number	Fluid and Air Cap Numbers	0.35 Bar Liquid			1.0 Bar Liquid			2.0 Bar Liquid			3.0 Bar Liquid			4.0 Bar Liquid			Spray Dimensions							
			Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	air	liquid	A (mm)	B (mm)	C (mm)	D (m)		
1/2	PR 5050	Fluid Cap FC501 & Air Cap AC5501	1.3	34	21.0	1.7	146	21.9	3.0	230	30.6							1.4	0.35				6.7		
			1.4	25	23.4	1.8	121	23.7	3.1	200	33.0							2.0	1.0	90	160	250	7.3		
			1.5	20	24.9	2.0	102	25.8	3.2	176	35.4							3.2	2.0				8.2		
			1.7	15.5	26.7	2.1	86	27.6	3.4	154	37.2														
						2.3	72	29.4	3.5	135	39.6														
						2.4	60	31.2	3.6	118	42.0														
	PR 5100	Fluid Cap FC502 & Air Cap AC5502	0.7	134	18.9	1.3	320	26.4	2.1	575	34.2	3.0	740	42.6	3.9	840	51.6	0.7	0.35	100	180	230	7.0		
			0.85	100	22.8	1.4	255	31.2	2.2	505	38.4	3.1	690	46.2	4.1	790	55.8	1.4	1.0	150	250	330	6.4		
						1.5	200	35.4	2.4	440	43.2	3.2	630	50.4	4.2	740	59.4	2.5	2.0	130	200	250	11.3		
						1.7	154	40.2	2.5	380	47.4	3.4	570	54.6	4.4	690	64.2	3.4	3.0	100	180	250	12.5		
									2.7	330	51.6	3.5	520	58.8	4.5	650	68.4	4.5	4.0	100	180	250	14.3		
									2.8	275	55.8	3.7	470	63.0	4.6	600	72.6								
									3.0	235	60.6	3.8	420	67.2	4.8	550	76.8								
									3.1	195	64.8	3.9	345	71.4	4.9	510	81.0								
												4.1	325	75.6	5.1	465	85.8								
												5.2	425	89.4											
												5.3	390	93.6											
												5.5	350	98.4											

CALL 413-772-0846  
Call for the name of your nearest BETE representative.

Standard Materials: Nickel-plated Brass, 303 Stainless Steel and 316 Stainless Steel.

Dimensions are approximate. Check with BETE for critical dimension applications.

# EF

## 1/2" XA EF Set-up Flow Rates and Dimensions

Pressure-fed, External Mix, Flat Fan Spray Pattern, 1/2" Pipe Size, BSP or NPT

Pipe Size	Spray Set-up Number	Fluid and Air Cap Numbers	0.2 Bar Liquid			0.35 Bar Liquid			0.5 Bar Liquid			0.7 Bar Liquid			1.0 Bar Liquid			Spray Dimensions					
			Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	bar air	bar liquid	A (mm)	B (mm)	C (mm)	D (m)
1/2	EF 5050	Fluid Cap FC501 & Air Cap AC5001	2.1		52.6	2.8		64.5	3.2		70.4	3.9		81.5	5.6		110	2.5	0.2	216	368	520	5.80
			2.5		57.7	3.2		70.4	3.5		76.4	4.2		87.4	6.0		117	3.5	0.4	229	420	550	6.71
			2.8	522	64.5	3.5		76.4	3.9		81.5	4.9		98.4	6.3		122	3.9	0.5	241	445	580	7.02
			3.2		70.4	3.9	681	81.5	4.2	795	87.4	5.3		105	6.6	1158	127	4.9	0.7	241	460	610	7.63
						4.2		87.4	4.6		93.3	5.6		110	7.0		132	6.3	1.0	254	480	660	8.85

# PF

## 1/2" XA PF Set-up Flow Rates and Dimensions

Pressure-fed, Internal Mix, Flat Fan Spray Pattern, 1/2" Pipe Size, BSP or NPT

Pipe Size	Spray Set-up Number	Fluid and Air Cap Numbers	0.35 Bar Liquid			1.0 Bar Liquid			2.0 Bar Liquid			3.0 Bar Liquid			4.0 Bar Liquid			Spray Dimensions							
			Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	bar air	bar liquid	A (mm)	B (mm)	C (mm)	D (m)		
1/2	PF 5050	Fluid Cap FC501 & Air Cap AC5301				1.8	154	35.4	3.4	184	57.0							2.0	1.0	460	740	910	5.8		
						2.0	119	38.4	3.5	157	60.6								3.5	2.0	510	790	970	7.0	
						2.1	93	41.4	3.7	133	63.6	3.8	112	66.6											
	PF 5100	Fluid Cap FC502 & Air Cap AC5302	0.7		18.9	1.3	320	26.4	2.1	575	34.2	3.0	740	40.8	3.9	840	51.6	0.7	0.35	510	860	1190	4.0		
			0.85	134	22.8	1.4	255	31.2	2.2	505	38.4	3.1	690	43.2	4.1	790	55.8	1.4	1.0	860	1570	2110	4.6		
						1.5	200	35.4	2.4	440	43.2	3.2	630	46.1	4.2	740	59.4	2.5	2.0	860	1570	2080	5.2		
						1.7	154	40.2	2.5	380	47.4	3.4	570	50.8	4.4	690	64.2	3.4	3.0	910	1680	2160	5.8		
								2.7	330	51.6	3.5	520	54.1	4.5	650	68.4	4.5	4.0	910	1700	2260	6.4			
								2.8	275	55.8	3.7	470	59.3	4.6	600	72.6									
								3.0	235	60.6	3.8	420	63.3	4.8	550	76.8									
					3.1	195	64.8	3.9	345	69.2	4.9	510	81.0	5.5	350	98.4	5.1	465	85.8						
								4.1	325	74.1	5.1	465	85.8				5.2	425	89.4						
											5.3	390	93.6				5.5	350	98.4						

# SR

## 1/2" XA SR Set-up Flow Rates and Dimensions

Siphon-fed, External Mix, Round Spray Pattern, 1/2" Pipe Size, BSP or NPT

Pipe Size	Set-up Number	Fluid and Air Cap Numbers	ATOMIZING AIR		Liquid Capacity in l/h (Liters Per Hour)						Spray Dimensions at 200 mm Siphon Ht.					
			Air (bar)	Air Capacity (Nm <sup>3</sup> /h)	Gravity Head			Siphon Height			Air (bar)	B (mm)	D (m)			
					450 mm	300 mm	150 mm	100 mm	200 mm	300 mm				600 mm		
1/2	SR 5050	Fluid Cap FC501 & Air Cap AC5201	0.7	21.6						40				1.5		6.1
			1.5	34.2						97	64			2.0		6.7
			2.0	39.6						117	90			3.0		7.3
			3.0	52.2						150	123	90		3.5	150	7.9
			3.5	59.4			300	265	235	163	133	104		4.0		8.8
			4.0	66.0			305	270	240	170	143	115		5.0		9.8
			5.0	78.0			315	280	250	183	157	129	53	5.6		10.7
			5.6	87.0			320	290	255	188	164	136	62			

# XW

## 1/2" XA XW Set-up Flow Rates and Dimensions

Pressure-fed, Internal Mix, Extra-wide Angle, Hollow Cone Spray Pattern, 1/2" Pipe Size, BSP or NPT

Pipe Size	Spray Set-up Number	Fluid and Air Cap Numbers	0.7 Bar Liquid			1.4 Bar Liquid			2.1 Bar Liquid			2.8 Bar Liquid			4.2 Bar Liquid		
			Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h	Air (bar)	l/h	Nm <sup>3</sup> /h
1/2	XW 5050	Fluid Cap FC502 & Air Cap AC5401	1.0	213	20.7	1.7	394	27.2	2.5	439	38.0	3.4	462	47.2	5.0	484	68.3
			1.1	145	25.1	1.8	324	31.6	2.7	372	42.1	3.5	416	50.6	5.2	439	71.8
			1.3	98	34.5	2.0	275	34.4	2.8	322	45.0	3.7	372	53.4	5.3	409	75.2
			1.4	59	32.3	2.1	207	38.5	3.0	277	49.1	3.8	325	57.3	5.5	366	78.6
						2.3	159	42.1	3.1	272	52.4	3.9	282	61.1	5.6	325	82.0
						2.4	116	45.5	3.2	188	55.8	4.1	250	65.0	5.8	297	85.7
						2.5	93	49.7	3.4	145	59.4	4.2	209	68.1	5.9	257	89.1
									3.5	114	63.0	4.4	168	71.3	6.0	232	93.0
												4.5	141	75.5	6.3	182	100
												4.6	77	77.7			

Standard Materials: Nickel-plated Brass, 303 Stainless Steel and 316 Stainless Steel.

AIR ATOMIZING

TO ORDER: specify pipe size, body style, spray set-up #, hardware and mounting assemblies, and material. See page 76.

# SJ

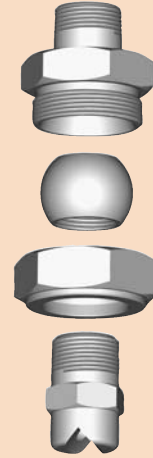
## Swivel Joints

### DESIGN FEATURES

- Adjustable swivel joints allow custom alignment of spray nozzles without expensive piping changes
- Leak-proof design
- Standard materials are brass and stainless steel
- Other materials available upon request

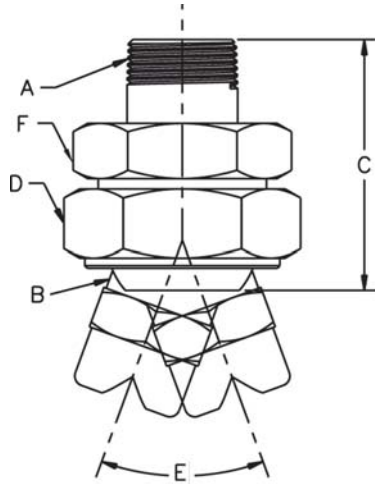
### SPRAY CHARACTERISTICS

- **Adjustment angles:** From 30° to 45°
- Greater control of spray direction for precise coverage



Adjustable Swivel Joints aid in aligning spray nozzles

(Optional NF nozzle shown, choose nozzle when ordering)



Dimensions are approximate. Check with BETE for critical dimension applications.

### Swivel Joint Dimensions

Part Number	A Inlet Pipe Conn. BSP or NPT	B Outlet Pipe Conn. BSP or NPT	C Overall Length (mm)	D Hex Size (mm)	E Angle of Adjustment	F Hex Size (mm)	Net Wt. (g)
1/8 X 1/8 SJ	1/8 M	1/8 F	31.8	20.7	55°	20.7	56.7
1/4 X 1/4 SJ	1/4 M	1/4 F	38.1	28.7	70°	25.4	111
3/8 X 1/4 SJ	3/8 M	1/4 F	44.5	38.1	70°	35.1	244
3/8 X 3/8 SJ	3/8 M	3/8 F	45.5	38.1	55°	35.1	244
1/2 X 3/8 SJ	1/2 M	3/8 F	50.8	44.5	55°	41.4	366
1/2 X 1/2 SJ	1/2 M	1/2 F	50.8	44.5	60°	41.4	346
3/4 X 1/2 SJ	3/4 M	1/2 F	54.1	50.8	40°	47.8	505
3/4 X 3/4 SJ	3/4 M	3/4 F	54.1	50.8	40°	47.8	465
1 X 1 SJ	1 M	1 F	76.2	62.0	40°	57.2	967
1 1/4 X 1 1/4 SJ	1 1/4 M	1 1/4 F	88.9	79.5	30°	73.2	1899
1 1/2 X 1 1/2 SJ	1 1/2 M	1 1/2 F	98.6	85.9	30°	85.9	2679
2 X 2 SJ	2 M	2 F	105	102	40°	88.9	2920

SPECIAL PURPOSE

CALL 413-772-0846  
Call for the name of your nearest BETE representative.

# EZ FF NF SPN

## EZ Change Quick Connection System

### DESIGN FEATURES

- Nozzles can be changed in seconds without tools
- Three part nozzle, base, gasket and interchangeable tip
- Exclusive ramped engagement for efficient automatic alignment
- Threaded adapters will accommodate other standard BETE nozzles. Shut-off plugs are also available.

### SPRAY CHARACTERISTICS

- Available in six standard tips: EZFF; EZNF; EZSPN; EZWL\*; EZTF\* and EZWT\*

**Flow rates:** 0.051 to 125 l/min

#### Spray Angle:

**EZFF:** 105° and 145°

**EZNF:** 0°, 15°, 30°, 50°, 65°, 80°, 90°, 110°, 120°

**EZSPN:** 15°, 25°, 35°, 40° and 50°

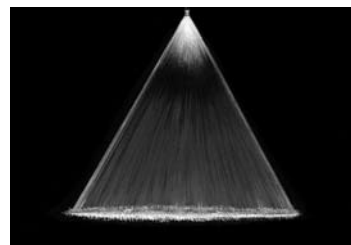
\*See pages 94, 95



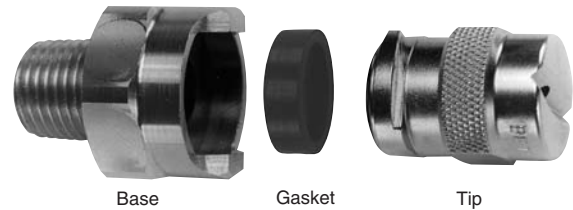
EZNF



145° Fan



50° Fan



Base

Gasket

Tip

EZNF exploded

Dimensions are approximate. Check with BETE for critical dimension applications.

### EZFF Flow Rates and Dimensions

Deflected Flat Fan 105° and 145° Spray Angles 1/8" to 1/2" BSP or NPT

Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR							Approx. Orifice Dia. (mm)	Pipe Size	Approx. Assembly Dim. (mm)		Wt. (g)
			0.2 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar			Hex	Length	
1/8"	EZFF016*	0.114	0.051	0.081	0.095	0.114	0.161	0.197	0.255	0.406	1/8	22.4	41.4	62
	EZFF024*	0.228	0.102	0.161	0.191	0.228	0.322	0.395	0.510	0.610				
	EZFF028*	0.342	0.153	0.242	0.286	0.342	0.483	0.592	0.764	0.711				
	EZFF033*	0.456	0.204	0.322	0.381	0.456	0.645	0.789	1.02	0.838				
	EZFF041	0.684	0.306	0.483	0.572	0.684	0.967	1.18	1.53	1.04				
	EZFF046	0.912	0.408	0.645	0.763	0.912	1.29	1.58	2.04	1.17				
	EZFF052	1.14	0.510	0.806	0.953	1.14	1.61	1.97	2.55	1.32				
	EZFF057	1.37	0.611	0.967	1.14	1.37	1.93	2.37	3.06	1.45				
	EZFF065	1.82	0.815	1.29	1.53	1.82	2.58	3.16	4.08	1.65				
	EZFF073	2.28	1.02	1.61	1.91	2.28	3.22	3.95	5.10	1.85				
TO	EZFF093	3.42	1.53	2.42	2.86	3.42	4.83	5.92	7.64	2.36	1/4"	22.4	44.5	62
	EZFF104	4.56	2.04	3.22	3.81	4.56	6.45	7.89	10.2	2.64				
	EZFF116	5.47	2.45	3.87	4.58	5.47	7.73	9.47	12.2	2.95				
	EZFF125	5.70	2.55	4.03	4.77	5.70	8.06	9.87	12.7	3.18				
	EZFF129	6.84	3.06	4.83	5.72	6.84	9.67	11.8	15.3	3.28				
	EZFF141	8.20	3.67	5.80	6.86	8.20	11.6	14.2	18.3	3.58				
1/2"	EZFF148	9.12	4.08	6.45	7.63	9.12	12.9	15.8	20.4	3.76	3/8"	22.4	46.0	74
	EZFF156	10.0	4.48	7.09	8.39	10.0	14.2	17.4	22.4	3.96				
	EZFF161	10.9	4.89	7.73	9.15	10.9	15.5	18.9	24.5	4.09				
	EZFF173	12.3	5.50	8.70	10.3	12.3	17.4	21.3	27.5	4.39				
	EZFF187	13.7	6.11	9.67	11.4	13.7	19.3	23.7	30.6	4.75				
	EZFF196	16.0	7.13	11.3	13.3	16.0	22.6	27.6	35.7	4.98				
1/4"	EZFF218	18.2	8.15	12.9	15.3	18.2	25.8	31.6	40.8	5.31	1/2"	22.4	47.5	82
	EZFF221	20.5	9.17	14.5	17.2	20.5	29.0	35.5	45.9	5.61				
1/2"	EZFF250	23.9	10.7	16.9	20.0	23.9	33.8	41.4	53.5	6.35	1/2"	22.4	47.5	82
	EZFF256	27.3	12.2	19.3	22.9	27.3	38.7	47.4	61.1	6.55				

Flow Rate (l/min) =  $K \sqrt{\text{bar}}$

\*Available in 105° only all others 145° FF218 - FF256 not available with 1/8" base

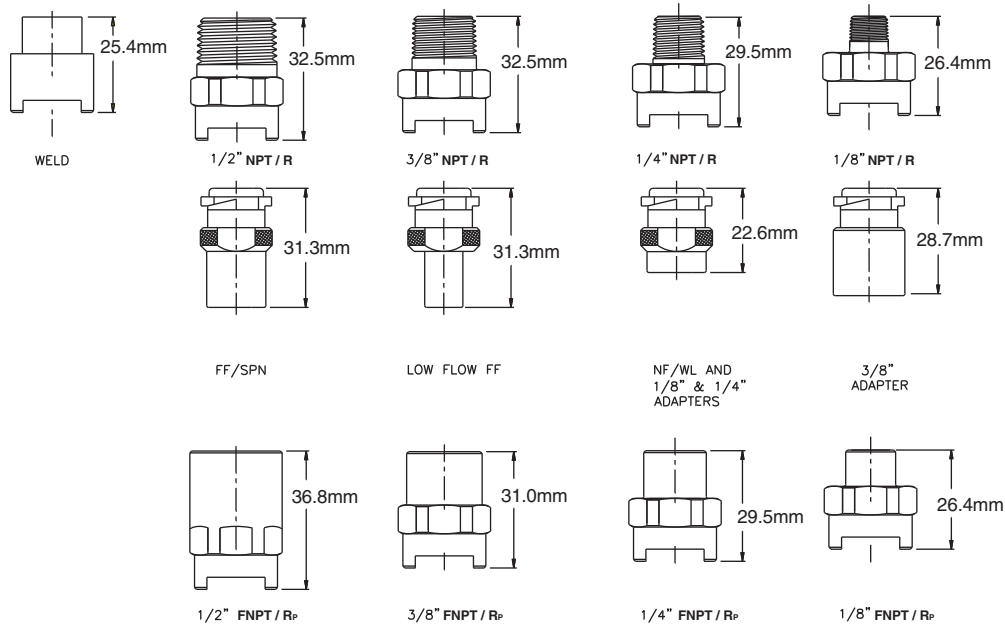
Standard Materials: 303 Stainless Steel, 316 Stainless Steel, Brass, Viton and Buna-N gaskets standard.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

www.BETE.com

SPECIAL PURPOSE

TO ORDER: specify pipe size, connection type, nozzle number, spray angle, and material.



Dimensions are approximate. Check with BETE for critical dimension applications.

### EZNF Flow Rates and Dimensions

Fan and Straight Jet 0°, 15°, 30°, 50°, 65°, 80°, 90°, 110° and 120° Spray Angles 1/8" to 1/2" BSP or NPT

Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR												Equivalent Orifice Dia. (mm)	Approx. Assembly Dim. (mm)		Wt. (g)			
			0.2 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	10 bar	15 bar	20 bar	30 bar	35 bar		Hex	Length				
1/8" TO	EZNF01	0.228		0.161	0.191	0.228	0.322	0.394	0.509	0.720	0.882	1.02	1.25	1.35	0.660	1/8"	22.4	41.4	62		
	EZNF015	0.342		0.242	0.286	0.342	0.483	0.592	0.764	1.08	1.32	1.53	1.87	2.02	0.787						
	EZNF02	0.455		0.322	0.381	0.455	0.644	0.789	1.02	1.44	1.76	2.04	2.49	2.69	0.914						
	1/2"	EZNF025	0.569		0.403	0.476	0.569	0.805	0.986	1.27	1.80	2.20	2.55	3.12	3.37	1.02	1/4"	22.4	44.5	62	
		EZNF03	0.683		0.483	0.572	0.683	0.966	1.18	1.53	2.16	2.65	3.06	3.74	4.04	1.09					
		EZNF04	0.911		0.644	0.762	0.911	1.29	1.58	2.04	2.88	3.53	4.07	4.99	5.39	1.32					
		1/4" TO	EZNF05	1.14	0.612	0.806	0.953	1.14	1.61	1.97	2.55	3.60	4.41	5.10	6.24	6.74	1.45	3/8"	22.4	46.0	74
			EZNF06	1.37	0.812	1.28	1.52	1.82	2.57	3.15	4.06	5.74	7.03	8.12	9.95	10.7	1.83				
			EZNF08	1.82	1.02	1.61	1.91	2.28	3.22	3.95	5.10	7.21	8.83	10.2	12.5	13.5	2.03				
			1/2"	EZNF10	2.28	1.53	2.42	2.86	3.42	4.83	5.92	7.64	10.8	13.2	15.3	18.7	20.2	2.38	1/2"	22.4	47.5
EZNF15				3.42	2.04	3.22	3.81	4.56	6.45	7.89	10.2	14.4	17.7	20.4	25.0	27.0	2.78				
EZNF20				4.56	3.06	4.83	5.72	6.84	9.67	11.8	15.3	21.6	26.5	30.6	37.4	40.4	3.57				
1/4" TO				EZNF30	6.84	4.08	6.45	7.63	9.12	12.9	15.8	20.4	28.8	35.3	40.8	49.9	53.9	3.97	1/2"	22.4	47.5
	EZNF40			9.12	5.10	8.06	9.53	11.4	16.1	19.7	25.5	36.0	44.1	51.0	62.4	67.4	4.37				
	EZNF50			11.4	6.11	9.67	11.4	13.7	19.3	23.7	30.6	43.2	53.0	61.1	74.9	80.9	4.76				
	1/4" TO			EZNF60	13.7	7.13	11.3	13.3	16.0	22.6	27.6	35.7	50.4	61.8	71.3	87.4	94.4	5.16	1/2"	22.4	47.5
		EZNF70		16.0	8.15	12.9	15.3	18.2	25.8	31.6	40.8	57.7	70.6	81.5	99.9	108	5.56				
	1/4" TO	EZNF80		18.2	9.17	14.5	17.2	20.5	29.0	35.5	45.9	64.9	79.4	91.7	112	121	5.95	1/2"	22.4	47.5	82
		EZNF90		20.5	8.15	12.9	15.3	18.2	25.8	31.6	40.8	57.7	70.6	81.5	99.9	108	5.56				

$$\text{Flow Rate (l/min)} = K \sqrt{\text{bar}}$$

Standard Materials: 303 Stainless Steel, 316 Stainless Steel, Brass, Viton and Buna-N gaskets standard.

### EZSPN Flow Rates and Dimensions

Fan 15°, 25°, 35°, 40° and 50° Spray Angles 1/8" to 1/2" BSP or NPT

Pipe Size	Nozzle Number	Available Spray Angle			K Factor	LITERS PER MINUTE @ BAR												Equiv. Orifice Dia (mm)	Deflection Angle @ Spray Angle					Approx. Assembly Dim. (mm)		Wt. (g)
		15°	25°	35°		0.3 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	7 bar	10 bar	15 bar	20 bar	30 bar		15°	25°	35°	40°	50°	Hex	Length	
1/8" TO	EZSPN10	15°	35°	50°	2.28	1.25	1.61	1.91	2.28	3.22	3.95	4.56	5.10	7.21	8.83	10.2	12.5	1.98	5°	35°	55°	1/8"	22.4	41.4	82	
	EZSPN20	15°	35°	50°	4.56	2.50	3.22	3.81	4.56	6.45	7.89	9.12	10.2	14.4	17.7	20.4	25.0	2.77	5°	35°	45°					
	EZSPN25			50°	5.70	3.12	4.03	4.77	5.70	8.06	9.87	11.4	12.7	18.0	22.1	25.5	31.2	3.05			50°					
1/2"	EZSPN30	15°	35°		6.84	3.74	4.83	5.72	6.84	9.67	11.8	13.7	15.3	21.6	26.5	30.6	37.4	3.18	5°	28°		1/4"	22.4	44.5	82	
	EZSPN40	15°	25°	35°	9.12	4.99	6.45	7.63	9.12	12.9	15.8	18.2	20.4	28.8	35.3	40.8	49.9	3.96	5°	20°	35°	35°	55°			
	EZSPN50			35°	11.4	6.24	8.06	9.53	11.4	16.1	19.7	22.8	25.5	36.0	44.1	51.0	62.4	4.34		23°	33°					
1/4" TO	EZSPN60	15°	35°	40°	13.7	7.49	9.67	11.4	13.7	19.3	23.7	27.3	30.6	43.2	53.0	61.1	74.9	4.75	5°	20°	33°	35°	3/8"	22.4	46.0	98
	EZSPN70			40°	16.0	8.74	11.3	13.3	16.0	22.6	27.6	31.9	35.7	50.4	61.8	71.3	87.4	5.05		29°						
	EZSPN80	15°	35°	40°	18.2	9.99	12.9	15.3	18.2	25.8	31.6	36.5	40.8	57.7	70.6	81.5	99.9	5.31	5°	25°	26°	35°				
1/2"	EZSPN90			40°	20.5	11.2	14.5	17.2	20.5	29.0	35.5	41.0	45.9	64.9	79.4	91.7	112	5.54		28°			1/2"	22.4	47.5	109
	EZSPN100	15°	35°	40°	22.8	12.5	16.1	19.1	22.8	32.2	39.5	45.6	51.0	72.1	88.3	102	125	5.94	5°	25°	28°	40°				

$$\text{Flow Rate (l/min)} = K \sqrt{\text{bar}}$$

Standard Materials: 303 Stainless Steel, 316 Stainless Steel, Brass, Viton and Buna-N gaskets standard.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

# EZ TF WL WT

## EZ Change Quick Connection System

### DESIGN FEATURES

- Nozzles can be changed in seconds without tools
- Three part nozzle, base, gasket and interchangeable tip
- Exclusive ramped engagement for efficient automatic alignment
- Threaded adapters will accommodate other standard BETE nozzles. Shut-off plugs are also available

### SPRAY CHARACTERISTICS

- Available in six standard tips: EZTF; EZWL; EZWT; EZFF\*; EZNF\*; EZSPN\*

**Flow rates:** 0.13 to 206 l/min

#### Spray Angle:

**EZTF:** 60°, 90° and 120° (Full or Hollow Cone, please specify when ordering), 150° & 170° (Full cone only), 180° (Hollow cone only)

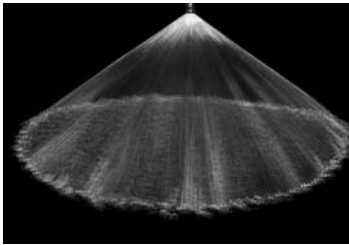
**EZWL:** 30°, 60°, 90°, 120°

**EZWT:** 70° and 110°

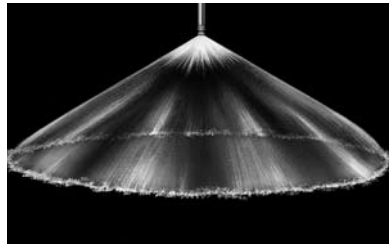
\* See pages 92, 93



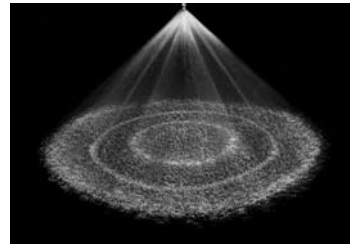
EZTF



120° Full Cone



120° Hollow Cone



90° Full Cone Spiral

Dimensions are approximate. Check with BETE for critical dimension applications.

### EZTF Flow Rates and Dimensions

Full or Hollow Cone Spiral 60° (NN or V), 90° (FCN or M), 120° (FC or W), 150°, 170° or 180° (XW) Spray Angle 1/8" to 1/2" BSP or NPT

Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR												Approx. Orifice Dia. (mm)	Approx. Assembly Dim. (mm)		Wt. (g)	
			0.3 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	7 bar	10 bar	15 bar	20 bar	30 bar		Hex	Length		
1/8"	EZTF6	3.19	1.75	2.26	2.67	3.19	4.51	5.53	7.13	8.44	10.1	12.4	14.3	17.5	2.38	1/8"	22.4	41.4	62
	TO EZTF8	5.93	3.25	4.19	4.96	5.93	8.38	10.3	13.2	15.7	18.7	22.9	26.5	32.5	3.18				
1/2"	EZTF10	9.12	4.99	6.45	7.63	9.12	12.9	15.8	20.4	24.1	28.8	35.3	40.8	49.9	3.97	1/4"	22.4	44.5	62
	TO EZTF12	13.7	7.49	9.7	11.4	13.7	19.3	23.7	30.6	36.2	43.2	53.0	61.1	74.9	4.76				
1/4"	EZTF14	18.5	10.1	13.1	15.4	18.5	26.1	32.0	41.3	48.8	58.4	71.5	82.6	101	5.56	3/8"	22.4	46.0	74
	TO EZTF16	24.2	13.2	17.1	20.2	24.2	34.2	41.8	54.0	63.9	76.4	93.6	108	132	6.35				
1/2"	EZTF20	37.6	20.6	26.6	31.5	37.6	53.2	65.1	84.1	99.5	119	146	168	206	7.94	1/2"	22.4	47.5	82

$$\text{Flow Rate (l/min)} = K \sqrt{\text{bar}}$$

TF20 not available with 1/8" base

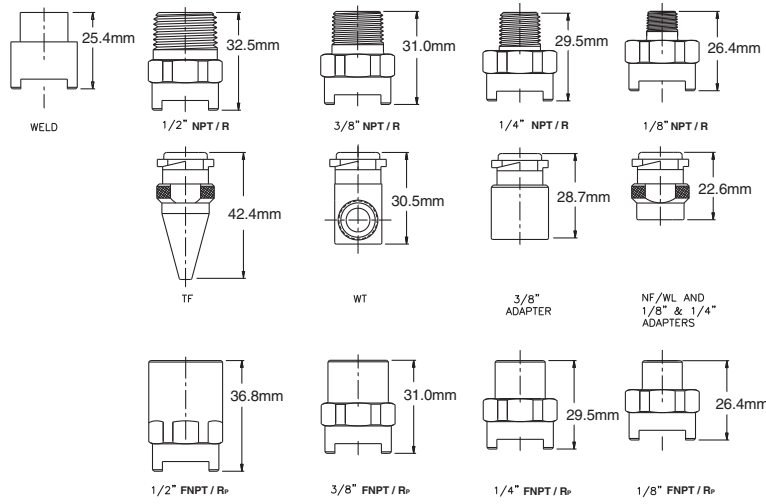
**Standard Materials:** Brass, Viton and Buna-N gaskets standard. 316 Stainless Steel available upon request.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

SPECIAL PURPOSE

TO ORDER: specify pipe size, connection type, nozzle number, spray angle, and material.





Dimensions are approximate. Check with BETE for critical dimension applications.

### EZWL Flow Rates and Dimensions

Full Cone Whirl 30°, 60°, 90°, 120° Spray Angle 1/8" to 1/2" BSP or NPT

Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR							Approx. Orifice Dia (mm)	Pipe Size	Approx. Assembly Dim. (mm)		Wt. (g)
			0.2 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar			Hex	Length	
1/8"	EZWL 1/4	0.587	0.276	0.424	0.497	0.587	0.814	0.984	1.25	1.09	1/8"	22.4	41.4	62
	EZWL 1/2	1.17	0.551	0.848	0.993	1.17	1.63	1.97	2.50	1.40				
	EZWL 3/4	1.76	0.827	1.27	1.49	1.76	2.44	2.95	3.75	1.83				
TO	EZWL1	2.35	1.10	1.70	1.99	2.35	3.25	3.94	5.01	2.08	1/4"	22.4	44.5	62
	EZWL 1 1/2	3.52	1.65	2.54	2.98	3.52	4.88	5.91	7.51	2.77				
1/2"	EZWL2	4.70	2.21	3.39	3.97	4.70	6.51	7.87	10.0	3.18	3/8"	22.4	46.0	74
	EZWL3	7.05	3.31	5.09	5.96	7.05	9.76	11.8	15.0	3.96				
	EZWL4	9.40	4.41	6.78	7.95	9.40	13.0	15.7	20.0	4.78				
	EZWL5	11.7	5.51	8.48	9.93	11.7	16.3	19.7	25.0	5.16				
	EZWL6	14.1	6.62	10.2	11.9	14.1	19.5	23.6	30.0	5.56				

Flow Rate (l/min) = K (bar)<sup>0.47</sup>

Note: Square pattern also available

Standard Materials: 303 Stainless Steel, 316 Stainless Steel, Brass, Viton and Buna-N gaskets standard.

### EZWT Flow Rates and Dimensions

Hollow Cone, Narrow (70°) and Wide (110°) Spray Angles 1/8" to 1/2" BSP or NPT

Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR												Orifice Dia. (mm)	Approx. Assembly Dim. (mm)	Wt. (g)			
			0.3 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	7 bar	10 bar	15 bar	20 bar	30 bar				Hex	Length	
1/8"	EZWT10	0.228	0.13	0.16	0.19	0.23	0.32	0.40	0.51	0.60	0.72	0.88	1.02	1.25	0.794	1/8"	22.4	41.4	62	
	EZWT12	0.273	0.15	0.19	0.23	0.27	0.39	0.47	0.61	0.72	0.87	1.06	1.22	1.50						
	EZWT18	0.410	0.23	0.29	0.34	0.42	0.58	0.71	0.92	1.09	1.30	1.59	1.83	2.25						1.19
	EZWT20	0.456	0.25	0.32	0.38	0.46	0.65	0.79	1.02	1.21	1.44	1.77	2.04	2.50						1.59
	EZWT27	0.615	0.34	0.44	0.52	0.62	0.87	1.07	1.38	1.63	1.95	2.38	2.75	3.37						1.19
	EZWT35	0.798	0.44	0.56	0.67	0.80	1.13	1.38	1.78	2.11	2.52	3.09	3.57	4.37						1.59
	EZWT40	0.912	0.50	0.65	0.76	0.91	1.29	1.58	2.04	2.41	2.88	3.53	4.08	4.99						1.98
	EZWT42	0.957	0.52	0.68	0.80	0.96	1.35	1.66	2.14	2.53	3.03	3.71	4.28	5.24						1.59
	EZWT48	1.09	0.60	0.77	0.92	1.09	1.55	1.89	2.45	2.89	3.46	4.24	4.89	5.99						1.59
	EZWT50	1.14	0.62	0.81	0.95	1.14	1.61	1.97	2.55	3.01	3.60	4.41	5.10	6.24						1.98
TO	EZWT53	1.21	0.66	0.85	1.01	1.21	1.71	2.09	2.70	3.20	3.82	4.68	5.40	6.62	1.98	1/4"	22.4	44.5	62	
	EZWT60	1.37	0.75	0.97	1.14	1.37	1.93	2.37	3.06	3.62	4.32	5.30	6.11	7.49	2.38					
	EZWT68	1.55	0.85	1.10	1.30	1.55	2.19	2.68	3.47	4.10	4.90	6.00	6.93	8.49	1.98					
	EZWT70	1.60	0.87	1.13	1.33	1.60	2.26	2.76	3.57	4.22	5.04	6.18	7.13	8.74	2.38					
	EZWT80	1.82	1.00	1.29	1.53	1.82	2.58	3.16	4.08	4.82	5.77	7.06	8.15	9.99	1.98					
	EZWT100	2.28	1.25	1.61	1.91	2.28	3.22	3.95	5.10	6.03	7.21	8.83	10.2	12.5	3.18					
	EZWT130	2.96	1.62	2.09	2.48	2.96	4.19	5.13	6.62	7.84	9.37	11.5	13.2	16.2	3.18					
	EZWT150	3.42	1.87	2.42	2.86	3.42	4.83	5.92	7.64	9.04	10.8	13.2	15.3	18.7	3.57					
	EZWT160	3.65	2.00	2.58	3.05	3.65	5.16	6.32	8.15	9.65	11.5	14.1	16.3	20.0	3.97					
	EZWT180	4.10	2.25	2.90	3.43	4.10	5.80	7.10	9.17	10.9	13.0	15.9	18.3	22.5	3.97					
1/2"	EZWT200	4.56	2.50	3.22	3.81	4.56	6.45	7.89	10.2	12.1	14.4	17.7	20.4	25.0	4.37	3/8"	22.4	46.0	74	
	EZWT220	5.01	2.75	3.55	4.19	5.01	7.09	8.68	11.2	13.3	15.9	19.4	22.4	27.5	3.97					
	EZWT240	5.47	3.00	3.87	4.58	5.47	7.73	9.47	12.2	14.5	17.3	21.2	24.5	30.0	4.76					
	EZWT260	5.93	3.25	4.19	4.96	5.93	8.38	10.3	13.2	15.7	18.7	22.9	26.5	32.5	5.16					
	EZWT270	6.15	3.37	4.35	5.15	6.15	8.70	10.7	13.8	16.3	19.5	23.8	27.5	33.7	5.16					
	EZWT280	6.38	3.49	4.51	5.34	6.38	9.02	11.1	14.3	16.9	20.2	24.7	28.5	34.9	5.56					
	EZWT300	6.84	3.74	4.83	5.72	6.84	9.67	11.8	15.3	18.1	21.6	26.5	30.6	37.4	5.56					
	EZWT340	7.75	4.24	5.48	6.48	7.75	11.0	13.4	17.3	20.5	24.5	30.0	34.7	42.4	5.56					
	EZWT350	7.98	4.37	5.64	6.67	7.98	11.3	13.8	17.8	21.1	25.2	30.9	35.7	43.7	5.95					
	EZWT400	9.12	4.99	6.45	7.63	9.12	12.9	15.8	20.4	24.1	28.8	35.3	40.8	49.9	7.14					

Flow Rate (l/min) = K √ bar

Standard Materials: 303 Stainless Steel, 316 Stainless Steel, Brass, Viton and Buna-N gaskets standard.

SPECIAL PURPOSE

CALL 413-772-0846  
Call for the name of your nearest BETE representative.

# FINZ™

## High Impact Fan Air Nozzle

### DESIGN FEATURES

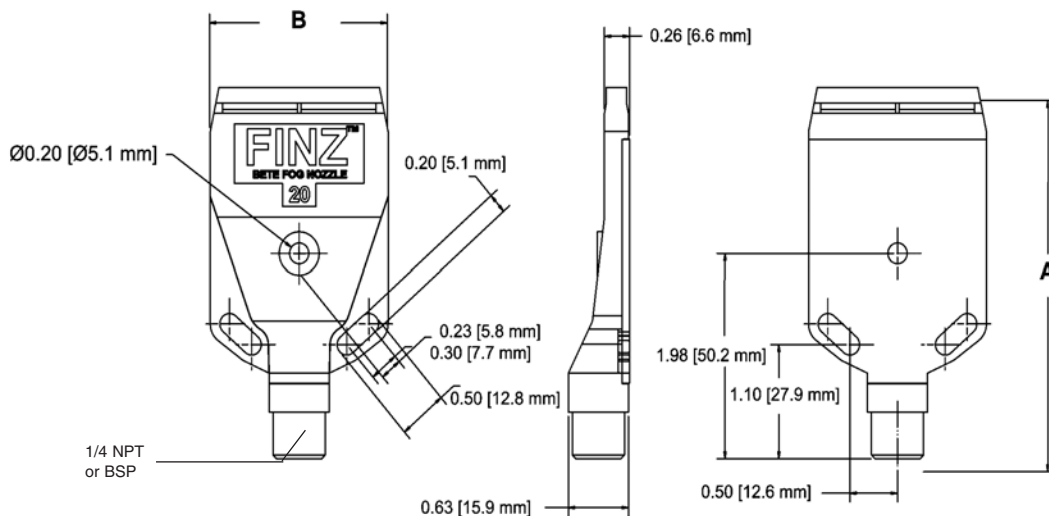
- Controlled wide uniform distribution and high impact coverage of compressed air
- Can be mounted individually or side-by-side for greater coverage
- Efficient air flow rates with unique eductor feature
- Safe operation—meets OSHA specifications for noise and deadhead pressure
- 1/4" male connection is molded to fit either NPT or BSP
- Up to 2dB quieter than competing designs

- Rugged construction of Ryton® or ABS plastic. Ryton® rated to 149°C at 3 bar
- Maximum operating pressure 7 bar

### SPRAY CHARACTERISTICS

**Spray pattern:** Fan

**Air Flow Rates:** 7 to 65 Nm<sup>3</sup>/h at 0.7 to 6 bar



Dimensions are approximate. Check with BETE for critical dimension applications.

### FINZ High Impact Air Nozzle

Male NPT BSP	Nozzle Number	Air Capacity Nm <sup>3</sup> /h				Approx. Dim. (mm)		Wt. (g)
		0.7 bar	2 bar	4 bar	6 bar	A	B	
1/4"	FZ20	7	12	19	26	91	47	28.3
	FZ29	11	21	32	43			
	FZ41	15	28	47	65			

**Standard Materials: Ryton® and ABS plastic.**

*Ryton is a trademark of Phillips Petroleum company*

SPECIAL PURPOSE

TO ORDER: specify pipe size, connection type, nozzle number and material.

# IS

## Rectangular Coverage/Mounted in Pairs

### DESIGN FEATURES

- Effective wherever rectangular pattern is required
- High energy efficiency
- Low coefficient of discharge and large unimpeded openings
- Excellent clog resistance
- Mounted in opposing pairs
- Male connection

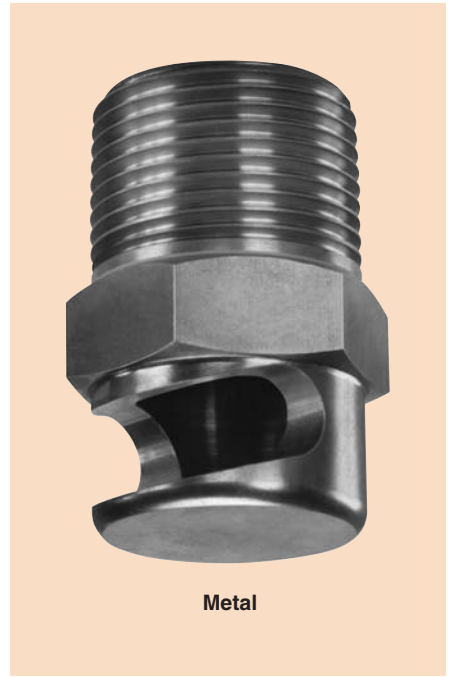
### SPRAY CHARACTERISTICS

- Pattern widths of 18" to 120" can be achieved
- Good distribution with pressures as low as 0.035 bar
- Thick bands of droplets from opposing pairs intersect and fall uniformly

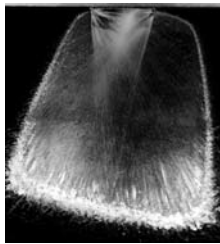
**Spray pattern:** Rectangular

**Spray angle:** See Pattern Width and Coverage Chart

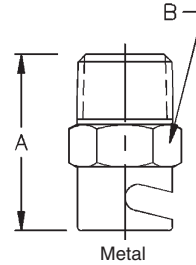
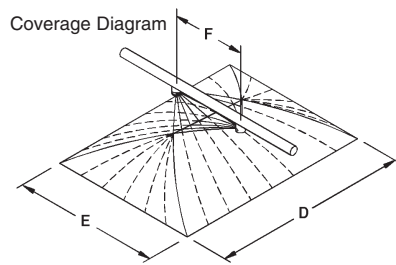
**Flow rates:** 1.77 to 649 l/min per pair



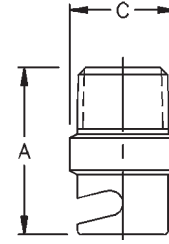
Metal



Rectangular Spray



Metal



Plastic

Dimensions are approximate. Check with BETE for critical dimension applications.

### IS Flow Rates and Dimensions

Rectangular Spray Pattern, 1/16" to 1 1/2" Pipe Sizes, BSP or NPT

### Coverage

300mm Mounting Height

Male Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE PER PAIR @ BAR										Nozzle Dim. (mm)		Wt. (g) Metal Plas.	Spacing (mm) F	Approx. Cover. (mm) @ bar											
			0.03 bar	0.07 bar	0.1 bar	0.2 bar	0.5 bar	0.7 bar	1 bar	1.5 bar	A	B	C	0.07 bar			0.1 bar		0.25 bar		0.5 bar							
			D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E	D	E								
1/16	IS2	10.2	1.77	2.70	3.22	4.56	7.21	8.53	10.2	12.5	19.1	7.87	7.87	4	2	70	600	450	850	650	1500	750	1800	750				
	IS3	15.3	2.65	4.04	4.83	6.84	10.8	12.8	15.3	18.7																		
1/8	IS4	20.4	3.53	5.39	6.45	9.12	14.4	17.1	20.4	25.0	22.2	12.7	11.1	28	7	100	500	350	800	450	1050	750	1150	900				
	IS6	30.6	5.30	8.09	9.67	13.7	21.6	25.6	30.6	37.4																		
1/4	IS8	40.8	7.06	10.8	12.9	18.2	28.8	34.1	40.8	49.9	27.0	15.9	14.3	43	11	125	750	450	1000	550	1500	900	1950	1050				
	IS10	51.0	8.83	13.5	16.1	22.8	36.0	42.6	51.0	62.4																		
3/8	IS12	61.1	10.6	16.2	19.3	27.3	43.2	51.2	61.1	74.9	31.8	19.1	17.5	57	14	150	650	300	900	500	1350	600	1000	600				
	IS14	71.3	12.4	18.9	22.6	31.9	50.4	59.7	71.3	87.4																		
	IS16	81.5	14.1	21.6	25.8	36.5	57.7	68.2	81.5	99.9																		
1/2	IS20	102	17.7	27.0	32.2	45.6	72.1	85.3	102	125	36.5	22.2	22.2	85	28	200	900	300	1500	700	2100	900	2200	1050				
	IS24	122	21.2	32.4	38.7	54.7	86.5	102	122	150																		
	IS28	143	24.7	37.7	45.1	63.8	101	119	143	175																		
3/4	IS32	163	28.2	43.1	51.6	72.9	115	136	163	200	44.5	28.6	28.6	170	43	250	1050	300	1500	500	1650	600	2250	650				
	IS40	204	35.3	53.9	64.5	91.2	144	171	204	250																		
	IS48	245	42.4	64.7	77.3	109	173	205	245	300																		
1	IS56	285	49.5	75.5	90.2	128	202	239	285	349	55.6	34.9	34.9	227	57	300	750	450	1200	500	1550	600	2250	950				
	IS64	326	56.5	86.3	103	146	231	273	326	399																		
1 1/4	IS72	367	63.5	97.1	116	164	259	307	367	449	63.5	44.5	44.5	340	85	350	1200	350	1500	450	2200	500	2700	600				
	IS80	408	70.6	108	129	182	288	341	408	499																		
1 1/2	IS88	448	77.7	119	142	201	317	375	448	549	76.2	50.8	50.8	567	142	400	900	350	1200	450	1800	600	3000	950				
	IS96	489	84.7	129	155	219	346	409	489	599																		
	IS104	530	91.8	140	168	237	375	443	530	649																		

$$\text{Flow Rate (l/min)} = K \sqrt{\text{bar}}$$

Standard Materials: Brass, 303 Stainless Steel, 316 Stainless Steel and PVC.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

# LP

## Low Profile

### DESIGN FEATURES

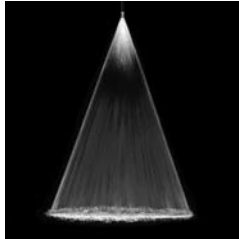
- Provides effective cleaning with low water consumption
- Interchangeable family of shower nozzles
- Self-aligning
- Orifice designed for efficient cleaning

### SPRAY CHARACTERISTICS

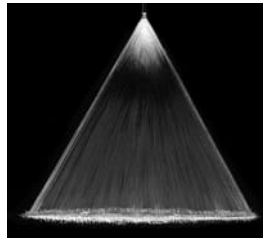
**Spray patterns:** Straight Jet and Flat Fan  
**Spray Angles:** 0°, 30° and 60°  
**Flow rates:** 0.041 to 43.9 gpm  
 0.162 to 155 l/min



0° Fan



30° Fan



60° Fan



Retaining Ring



LP nozzle



Gasket

Dimensions are approximate. Check with BETE for critical dimension applications.

### LP Flow Rates and Dimensions Fan and Straight Jet, 0°, 30° and 60° Spray Angles

Nozzle Number	Available Spray Angle 0° 30° 60°	K Factor	LITERS PER MINUTE @ BAR					Equivalent Orifice Dia. (mm)
			3 bar	4 bar	5 bar	10 bar	30 bar	
LP0041	0°	0.0937	0.162	0.187	0.209	0.296	0.513	0.4
LP0073	0°	0.167	0.290	0.334	0.374	0.529	0.916	0.6
LP0090	0°	0.205	0.354	0.409	0.458	0.647	1.12	0.7
LP013	0°	0.298	0.517	0.597	0.667	0.943	1.63	0.8
LP023	0° 30° 60°	0.520	0.901	1.04	1.16	1.65	2.85	1.0
LP033	0° 30° 60°	0.744	1.29	1.49	1.66	2.35	4.07	1.2
LP043	0° 30° 60°	0.967	1.68	1.93	2.16	3.06	5.30	1.5
LP08	0° 30° 60°	1.83	3.17	3.66	4.09	5.79	10.0	2.0
LP12	0° 30° 60°	2.82	4.89	5.65	6.32	8.93	15.5	2.5
LP20	0° 30° 60°	4.50	7.79	8.99	10.1	14.2	24.6	3.0
LP31	60°	7.16	12.4	14.3	16.0	22.7	39.2	4.0
LP49	60°	11.2	19.3	22.3	25.0	35.3	61.2	5.0
LP78	60°	17.9	31.0	35.7	40.0	56.5	97.9	6.0
LP99	60°	22.5	38.9	45.0	50.3	71.1	123	7.0
LP124	60°	28.2	48.9	56.5	63.2	89.3	155	8.0

$$\text{Flow Rate (l/min)} = K \sqrt{\text{bar}}$$

Standard Materials: 316 Stainless Steel

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

SPECIAL PURPOSE

TO ORDER: specify pipe size, connection type, nozzle number, spray angle, and material.

# TW

## Tank Washing

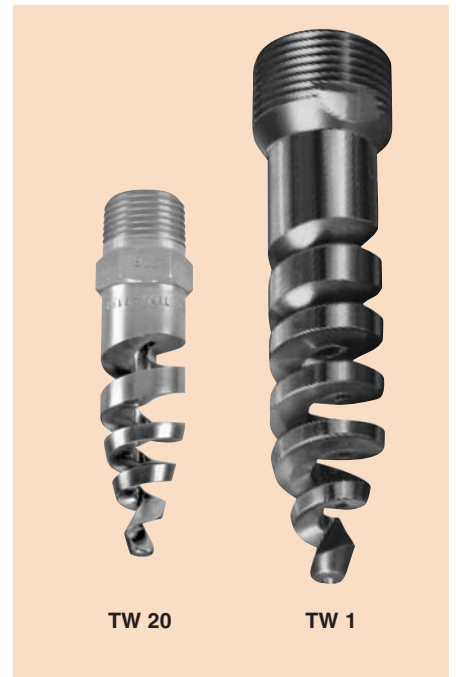
### DESIGN FEATURES

- Clog-resistant spiral design
- Energy efficient
- Compact design; fits small openings

### SPRAY CHARACTERISTICS

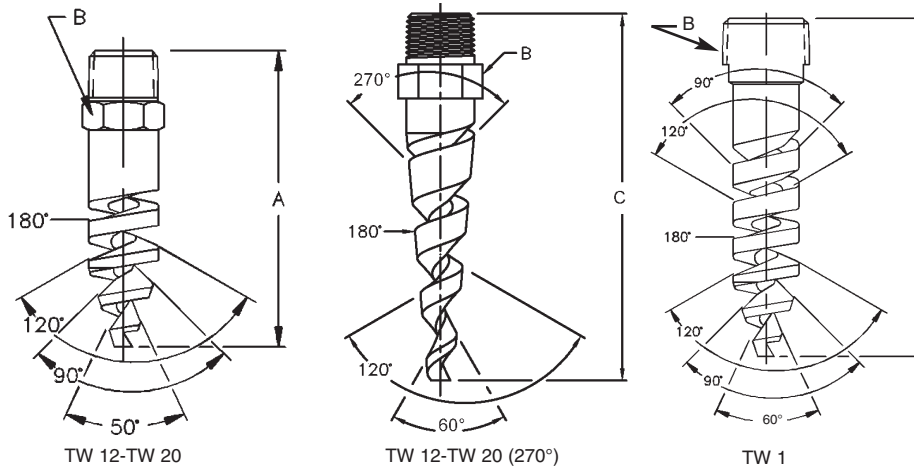
- Easy to maintain
- Unique patterns that spray in opposing directions
- See LEM on page 25 for other tank-washing applications

**Flow rates:** 11.4 to 260 l/min



TW 20

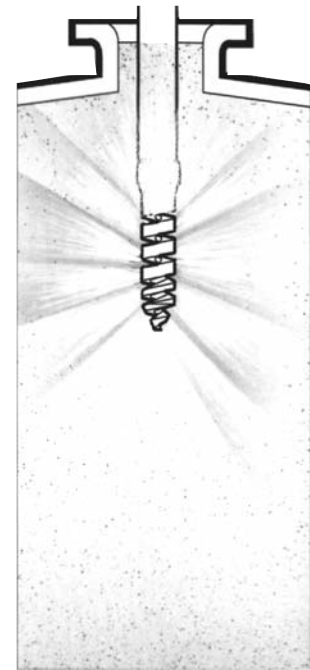
TW 1



TW 12-TW 20

TW 12-TW 20 (270°)

TW 1



### Tank Washing TW Coverage Chart

When Spraying at 2 - 3 bar

Pipe Size	Nozzle Number	Scrubbing Diameter (mm)	Rinsing Diameter (mm)
3/8	TW12	380	760
	TW14	460	1200
	TW16	610	1500
	TW20	910	2100
1	TW1	2400	6100

Dimensions are approximate. Check with BETE for critical dimension applications.

### Tank Washing TW Flow Rates and Dimensions

TW 180° and 270° Spray Angles, 3/8" and 1" Pipe Sizes, BSP or NPT

Male Pipe Size	Nozzle Number	Available Spray Angles	K Factor	LITERS PER MINUTE						Approx. (mm)		Metal Only Dim. (mm)			Weight (g) Metal
				0.7 bar	1 bar	2 bar	3 bar	4 bar	5 bar	Orifice Dia.	Free Pass. Dia.	A	B	C	
3/8	TW12	180°, 270°	13.7	11.4	13.7	19.3	23.7	27.3	30.6	4.83	3.30	73.0	17.5	92.2	49.6
	TW14	180°, 270°	18.5	15.4	18.5	26.1	32.0	36.9	41.3	5.59	3.30				
	TW16	180°, 270°	24.2	20.2	24.2	34.2	41.8	48.3	54.0	6.35	3.30				
	TW20	180°, 270°	37.6	31.5	37.6	53.2	65.1	75.2	84.1	7.87	3.30				
1	TW1	270°	116	97.2	116	164	201	232	260	14.2	5.08	28.6	146.1	298	

$$\text{Flow Rate (l/min)} = K \sqrt{\text{bar}}$$

**Standard Materials: Brass, 316 Stainless Steel.**

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

# PSR

## Small Physical Size Straight Jet

### DESIGN FEATURES

- High velocity jet
- Small physical size
- Small orifice size: 0.035mm through 3.18mm
- **Interchangeable with most other needle-type showers**

### SPRAY CHARACTERISTICS

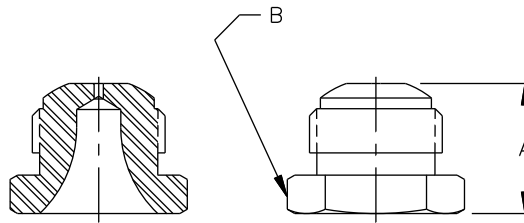
- Hard driving straight jet
- Flow rates:** 0.075 to 34.1 l/min
- Spray angle:** 0°

### TYPICAL APPLICATIONS

Cleaning, Degreasing,  
Cleaning Wires and Felts—Pulp and Paper



0° Straight Jet



Male

Dimensions are approximate. Check with BETE for critical dimension applications.

### PSR Flow Rates and Dimensions Straight Jet, 9/16"-24 UNEF Thread

Nozzle Number	K Factor	LITERS PER MINUTE @ BAR								Equivalent Orifice Dia. (mm)	Approx. Dim. (mm)		Wt. (g)
		1 bar	3 bar	5 bar	7 bar	10 bar	15 bar	30 bar	60 bar		A	B	
PSR03	0.0752	0.075	0.13	0.16	0.19	0.22	0.27	0.37	0.52	0.356			
PSR11	0.258	0.26	0.43	0.55	0.65	0.76	0.92	1.28	1.77	0.711			
PSR16	0.393	0.39	0.67	0.85	1.00	1.19	1.44	2.01	2.80	0.838			
PSR23	0.564	0.56	0.96	1.22	1.44	1.70	2.07	2.89	4.03	1.02			
PSR40	0.981	0.98	1.66	2.12	2.50	2.96	3.60	5.02	7.00	1.40	14.0	17.5	21.3
PSR67	1.644	1.64	2.79	3.56	4.18	4.96	6.03	8.41	11.7	1.78			
PSR120	2.944	2.94	4.99	6.37	7.49	8.89	10.8	15.1	21.0	2.39			
PSR195	4.784	4.78	8.11	10.4	12.2	14.4	17.6	24.5	34.1	3.18			

$$\text{Flow Rate (l/min)} = K (\text{bar})^{0.48}$$

Standard Materials: 316 Stainless Steel.

SPECIAL PURPOSE

TO ORDER: specify pipe size, connection type, nozzle number, spray angle, and material.

# RTW

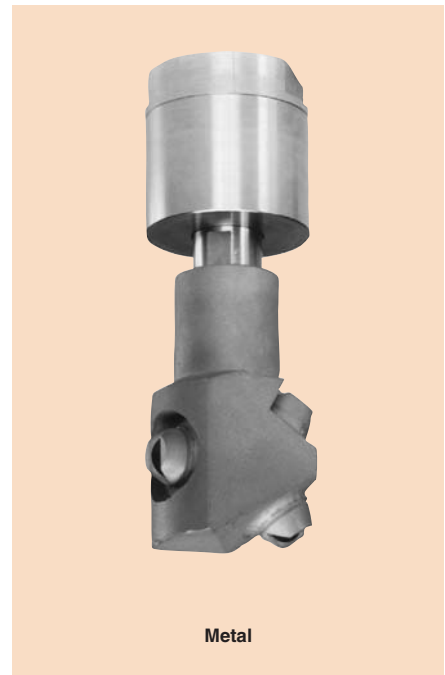
## Rotating Tank and Drum Washing Nozzles

### DESIGN FEATURES

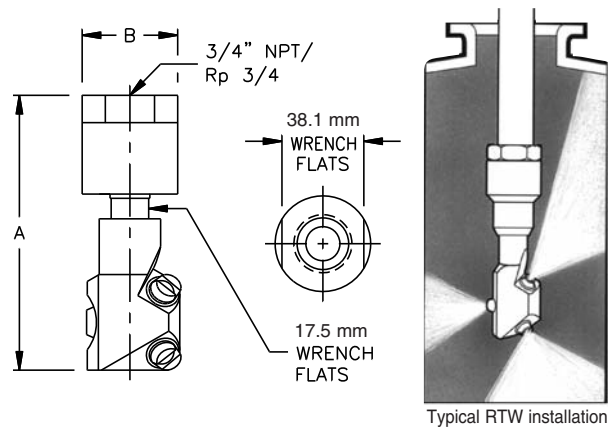
- Fits through a 45mm opening
- Low leakage, resulting in water and chemical savings, as well as a reduction in treatment costs
- Hardened 400 series Stainless Steel bearings.

### SPRAY CHARACTERISTICS

- Slow rotation speed provides better cleaning
  - Wide coverage
- Flow rates:** 19.1 to 229 l/min



<b>RTW Coverage Chart</b> When spraying at 3 bar			
Pipe Size	Nozzle Number	Scrubbing Diameter (mm)	Rinsing Diameter (mm)
3/4"	RTW 10	600	1800
	RTW 18	1200	2400
	RTW 21	1200	3700
	RTW 45	1800	4300



Dimensions are approximate. Check with BETE for critical dimension applications.

### RTW Flow Rates and Dimensions

Wide Spray Angle, 3/4" Pipe Size, BSP or NPT

Female Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR					Equivalent Orifice Dia. (mm)	Approx. Dim. (mm)		Wt. (Kg)	
			0.7 bar	1 bar	2 bar	3 bar	4 bar		5 bar	A		B
3/4"	RTW10	22.8	19.1	22.8	32.2	39.5	45.6	51.0	3.96	171	44.4	0.95
	RTW18	41.0	34.3	41.0	58.0	71.0	82.0	91.7	4.72			
	RTW21	47.9	40.0	47.9	67.7	82.9	95.7	107	5.16			
	RTW45	103	86.0	103	145	178	205	229	7.54			

$$\text{Flow Rate (l/min)} = K\sqrt{\text{bar}}$$

Standard Materials: 316 Stainless Steel.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

SPECIAL PURPOSE

CALL 413-772-0846  
Call for the name of your nearest BETE representative.

# SF

## Snap Release Nozzle System

### DESIGN FEATURES

- Nozzles can be quickly changed and aligned by hand without tools
- Clamp-on adapter fits any style nozzle
- Quick set-up system features special “Snap-in” tips
- Polypropylene, resistant to most acids and alkalis
- Double clamp base or adapter available for higher pressure operation

### SPRAY CHARACTERISTICS

- Quick Set-up System can be provided with fan, hollow or full cone spray tips
- Full 45° alignment of spray without tools

**Flow rates:** 1.61 to 75.6 l/min

#### Spray angles:

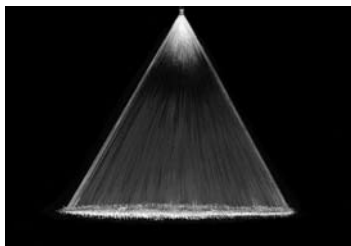
**Fan:** 40°, 50°, 65°, 80°, 95°

**Hollow Cone:** 50°, 65°, 90°

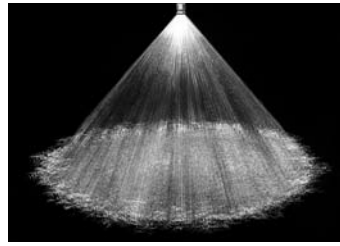
**Full Cone:** 35°, 65°, 80°



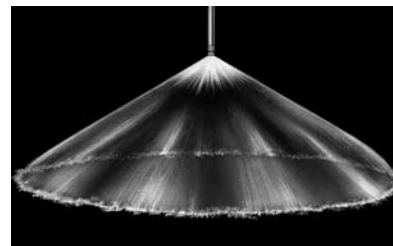
Snap-In Fan Tip



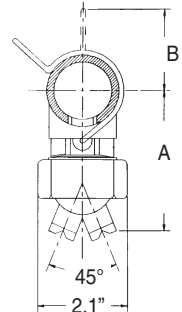
50° Fan



80° Full Cone



90° Hollow Cone



Dimensions are approximate. Check with BETE for critical dimension applications.

### SF Flow Rates and Dimensions

SF Fan 40°, 50°, 65°, 80° and 90° Spray Angles 1", 1-1/4", 1-1/2" and 2"

Nozzle Number	Available Spray Angles	K Factor	LITERS PER MINUTE @ BAR								Approx. Orifice Dia. (mm)	Pipe Size	Body Color	Pipe O.D. (mm)	Approx. Dim. (mm)		Wt. (g)
			0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	7 bar	10 bar					A	B	
SF10	80°	2.277	1.61	1.91	2.28	3.22	3.94	5.09	6.03	7.20	2.0	1"	blue	33.40	83.8	43.2	62.4
SF20	65°	4.556	3.22	3.81	4.55	6.44	7.89	10.2	12.1	14.4	2.8						
SF30	65°	6.832	4.83	5.72	6.83	9.66	11.8	15.3	18.1	21.6	3.6	1-1/4"	red	42.16	86.4	48.3	62.4
SF40	65°	9.109	6.44	7.62	9.11	12.9	15.8	20.4	24.1	28.8	4.0						
SF50	40° 50° 65°	11.40	8.06	9.54	11.4	16.1	19.7	25.5	30.2	36.1	4.4	1-1/2"	purple	48.26	91.4	50.8	62.4
SF60	50° 65° 80° 95°	13.68	9.67	11.4	13.7	19.3	23.7	30.6	36.2	43.3	4.8						
SF70	50° 80°	16.00	11.3	13.4	16.0	22.6	27.7	35.8	42.3	50.6	5.2	2"	green	60.33	94.0	55.9	62.4
SF100	50°	22.7	16.1	19.1	22.8	32.2	39.4	50.9	60.3	72.0	6.4						

$$\text{Flow Rate (l/min)} = K \sqrt{\text{bar}}$$

**Standard Materials:** Polypropylene, 302 Stainless Steel clamp, EPDM seal.

**Optional Materials:** 303 Stainless Steel clamp, Viton seal.

**NOTE:** Drill 16.7mm (21/32") hole in pipe to install SF.

**NOTE:** Maximum recommended pressures for SF assemblies: With single clamp 5 bar for 1" pipe; 3.5 bar for 1-1/4" and 1-1/2" pipe; and 2 bar for 2" pipe; with double clamp up to 10 bar.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

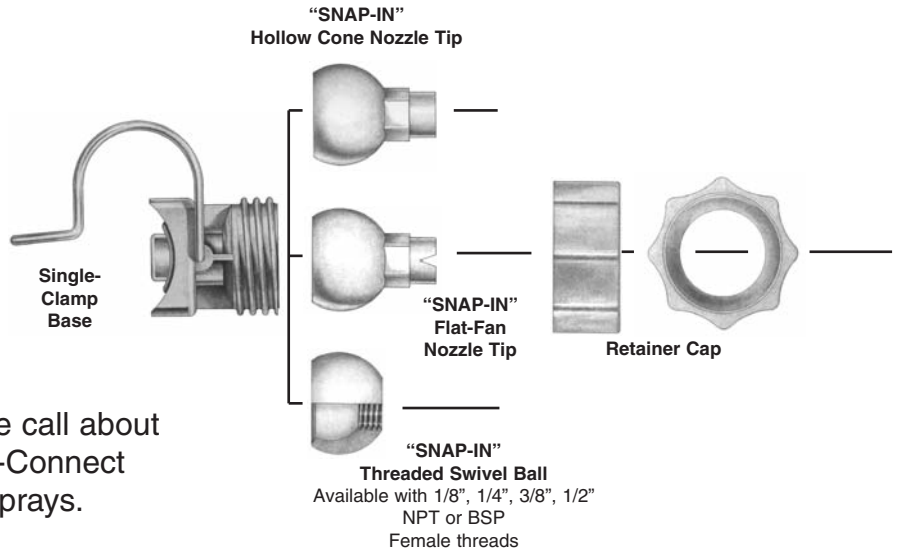
SPECIAL PURPOSE

TO ORDER: specify pipe size, connection type, nozzle number, spray angle, and material.





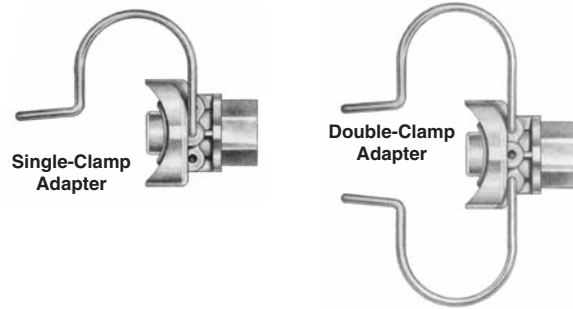
Double Clamp Adapter with Spiral Nozzle



Please call about Quick-Connect Flat Sprays.

**CLAMP-ON ADAPTER**

- Available for 1", 1-1/4", 1-1/2" and 2" pipe.
- Available with 1/8", 1/4", 3/8", 1/2" NPT or BSP female threads (BSP threads available only in 1/8" size)
- Available with single or double clamp.
- **TO ORDER ADAPTER Specify: Pipe Size, thread size, thread type, number of clamps, materials.**



Dimensions are approximate. Check with BETE for critical dimension applications.

**SF Flow Rates and Dimensions**

SF Hollow Cone 50°, 65° and 90° Spray Angles 1", 1-1/4", 1-1/2" and 2"

Nozzle Number	Available Spray Angle	K Factor	LITERS PER MINUTE @ BAR								Pipe Size	Body Color	Approx. Dim. (mm)		Wt. (g)
			0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	7 bar	10 bar			A	B	
SF15HC	90°	3.416	2.42	2.86	3.42	4.83	5.92	7.64	9.04	10.8	1"	blue	83.8	43.2	62.4
SF58HC	50°	13.22	9.35	11.1	13.2	18.7	22.9	29.6	35.0	41.8	1-1/4"	red	86.4	48.3	62.4
SF100HC	65°	22.79	16.1	19.1	22.8	32.2	39.5	51.0	60.3	72.1	1-1/2"	purple	91.4	50.8	62.4
											2"	green	94.0	55.9	62.4

$Flow Rate (l/min) = K \sqrt{bar}$

Standard Materials: Polypropylene, 302 Stainless Steel clamp, EPDM seal.

Optional Materials: 303 Stainless Steel clamp, Viton seal.

**SF Flow Rates and Dimensions**

SF Full Cone 35°, 65° and 80° Spray Angles 1", 1-1/4", 1-1/2" and 2"

Nozzle Number	Available Spray Angle	K Factor	LITERS PER MINUTE @ BAR								Pipe Size	Body Color	Approx Dim. (mm)		Wt. (g)
			0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	7 bar	10 bar			A	B	
SF31FC	35°	7.596	5.45	6.40	7.60	10.6	12.9	16.4	19.3	22.9	1"	blue	83.8	43.2	62.4
SF32FC	80°	7.855	5.63	6.62	7.86	11.0	13.3	17.0	20.0	23.7	1-1/4"	red	86.4	48.3	62.4
SF102FC	65°	25.02	17.9	21.1	25.0	34.9	42.4	54.2	63.7	75.6	1-1/2"	purple	91.4	50.8	62.4
											2"	green	94.0	55.9	62.4

$Flow Rate (l/min) = K (bar)^{0.48}$

Standard Materials: Polypropylene, 302 Stainless Steel clamp, EPDM seal.

Optional Materials: 303 Stainless Steel clamp, Viton seal.

Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

# ScrubMate™



## ScrubMate™ Rotating Washing Nozzles

### DESIGN FEATURES

- Compact design fits through small openings. O.D.: SM50 - 49mm, SM75 - 72mm, SM30 - 35mm
- Superior cleaning at low pressures and low flow rates for greater economy
- Self cleaning
- Patented mist reducing head
- No ball bearings to corrode

### SPRAY CHARACTERISTICS

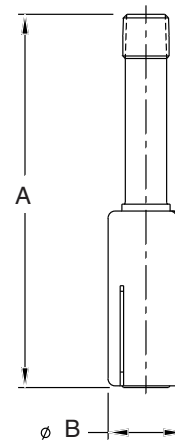
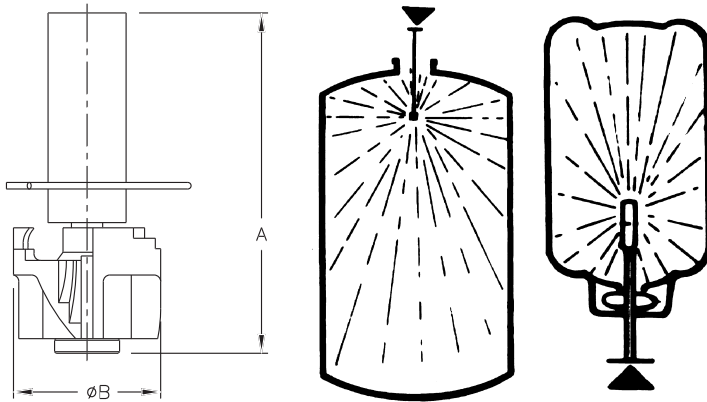
- High impact scrubbing action
- Slow rotation speed provides better cleaning
- Wide coverage

**Flow rates:** 66 to 283 l/min



ScrubMate™ SM50

ScrubMate™ SM30



ScrubMate™ SM30

### ScrubMate™ Coverage Chart

When spraying at 3 bar

	Nozzle Number	Scrubbing Diameter (mm)	Rinsing Diameter (mm)
Pipe Size:			
1/2"	SM30	1500	2000
Tube Size:			
1"	SM50	2100	4200
1 1/2"	SM75	2700	5400

Dimensions are approximate. Check with BETE for critical dimension applications.

### ScrubMate™ Flow Rates and Dimensions

ScrubMate™ 360°, 1" and 1 1/2" Pipe Sizes, Sanitary Connection

	Nozzle No.	K Factor	LITERS PER MINUTE @ BAR					Approximate Free Passage Dia. (mm)	Dim. (mm)		Wt. (kg)
			1 bar	2 bar	3 bar	3.5 bar	4 bar		A	B	
Pipe Size:											
1/2"	SM30	72.95	73	103	126	136	146	1.397	175	34	0.27
Tube Size:											
1"	SM50	66.09	66	93	114	124	132	2.794	124	49	0.19
1 1/2"	SM75	141.3	141	200	245	264	283	4.699	165	72	0.44

$$\text{Flow Rate (l/min)} = K \sqrt{\text{bar}}$$

Standard Materials: Body/Shaft - 316 Stainless Steel, Rotor - Acetal-CoPolymer or PTFE.

SPECIAL PURPOSE

TO ORDER: specify pipe size, connection type, nozzle number, spray angle, and material.

# TurboMix™

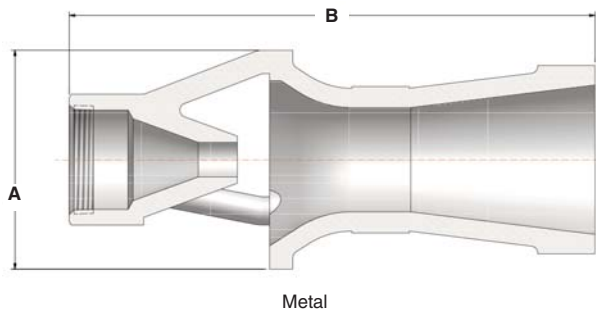
## TurboMix™ Eductor Mixing Nozzle

### DESIGN FEATURES

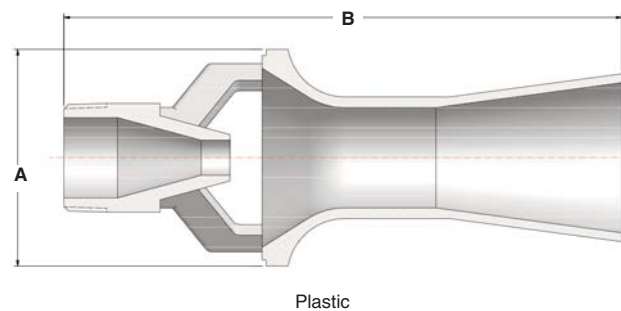
- Effective, economical way to circulate liquids in closed or open tanks
- No moving parts
- Inherently clog resistant
- Requires minimal maintenance
- Nozzle operation creates multiplying effect on fluid flow
- The volume of discharge liquid will be 3-5 times greater than the motive liquid pumped

### SPRAY CHARACTERISTICS

- Cone-shaped plume
- Flow rates:** 26.7 to 12000 l/min (motive)



Metal



Plastic

Dimensions are approximate. Check with BETE for critical dimension applications.

### TurboMix™ in Molded Plastic

NPT or BSP Connection Size	TurboMix Number	K Factor	Motive Flow Rate LITERS PER MINUTE @ BAR*							Dimensions (mm)		
			0.7 bar	1 bar	1.5 bar	2 bar	2.5 bar	3 bar	3.5 bar	A	B	
Male	3/8	TM73	33.2	27.8	33.2	40.7	47	52.5	57.6	62.2	54	114
	1/2	TM120	54.3	45.4	54.3	66.5	76.7	85.8	94	101	64	165
	3/4	TM137	62.4	52.2	62.4	76.4	88.2	98.6	108	117	73	162
	1	TM240	109	90.8	108	133	153	172	188	203	89	241
	1 1/2	TM340	155	130	155	190	219	245	269	290	114	248

Standard Material: Glass-filled Polypropylene. \*BAR = supply pressure at the TurboMix minus the pressure in the tank

### TurboMix™ in Metal

NPT or BSP Connection Size	TurboMix Number	K Factor	Motive Flow Rate LITERS PER MINUTE @ BAR*							Dimensions (mm)		
			0.7 bar	1 bar	1.5 bar	2 bar	3 bar	5 bar	7 bar	A	B	
Male	3/8	TM70	31.9	26.7	31.9	39.1	45.1	55.3	71.4	84.4	43	108
	1/2	TM110	50.1	41.9	50.1	61.3	70.8	87.0	112	132	55	133
	3/4	TM150	68.4	57.2	68.4	83.7	96.7	118	153	181	67	159
	1	TM230	105	87.7	105	128	148	182	234	277	83	200
Female	1 1/2	TM320	146	122	146	179	206	253	326	386	97	233
	2	TM620	282	236	282	345	399	489	631	746	121	286
	3	TM1500	684	572	684	837	967	1180	1530	1810	146	492
Flanged (PN6)	4	TM2510	1130	950	1130	1390	1610	1970	2540	3000	213	864
	6	TM6010	2720	2270	2720	3330	3840	4710	6080	7190	321	1320
	8	TM10050	4550	3800	4550	5570	6430	7870	10200	12000	416	1730

Motive Flow Rate (l/min) =  $K \sqrt{\text{bar}}$

Standard Materials: Brass, Carbon Steel, 316 Stainless Steel. \*BAR = supply pressure at the TurboMix minus the pressure in the tank

SPECIAL PURPOSE

Call for the name of your nearest BETE representative.

CALL 413-772-0846

# SS

## Small Droplet Size Dense Fog

### DESIGN FEATURES

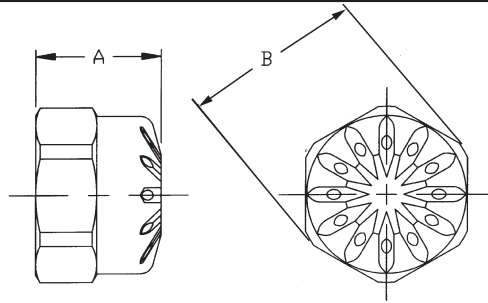
- Multiple flat fan patterns
- Solid one-piece construction
- Female connection

### SPRAY CHARACTERISTICS

- Relatively small droplets
- Spray pattern:** Dense Full Cone  
**Flow rates:** 9.16 to 618 l/min  
**Spray angles:**  
**SS4.8 thru SS25** - 35°  
**SS35 thru SS70** - 45°



Fog



Dimensions are approximate. Check with BETE for critical dimension applications.

### SS Flow Rates and Dimensions

Full Cone, 3/4", 1" and 1-1/4" Pipe Size, BSP or NPT

Female Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR							Dimensions (mm)		Wt. (g)
			0.7 bar	1 bar	2 bar	3 bar	5 bar	10 bar	15 bar	A	B	
3/4	SS4.8	10.9	9.16	10.9	15.5	19.0	24.5	34.6	42.4	25.4	35.1	85.1
	SS9	20.5	17.2	20.5	29.0	35.6	45.9	64.9	79.5			
	SS12	27.4	22.9	27.4	38.7	47.4	61.2	86.5	106			
	SS18	41.1	34.3	41.1	58.1	71.1	91.8	130	159			
1	SS25	57.0	47.7	57.0	80.6	98.8	127	180	221	26.5	42.2	142
	SS35	79.8	66.8	79.8	113	138	178	252	309			
1 1/4	SS50	114	95.4	114	161	198	255	361	442	31.0	53.1	227
	SS70	160	134	160	226	277	357	505	618			

$$\text{Flow Rate (l/min)} = K\sqrt{\text{bar}}$$

Standard Materials: Brass, 303 and 316 Stainless Steel.

SPECIAL PURPOSE

TO ORDER: specify pipe size, connection type, nozzle number, spray angle, and material.

# Spray Lances

BETE provides drop-in solutions in the form of spray lances. Why endure the time and hassle to source pipe, flanges, nozzles, and fittings separately and then coordinate fabrication and testing of the assembly when you can have BETE do it all for you? By using BETE as a single supplier, you can be sure your lance will be correct the first time, every time. Our highly qualified welders are some of the best in the world, with extensive experience in welding dissimilar metals and exotic alloys, including nickel and cobalt alloys. BETE's integrated engineering, quality, and manufacturing departments combine to meet virtually any code, testing, or inspection requirement.



## Need a custom nozzle on a lance in a hurry?

These dual-nozzle lances were custom designed and manufactured with special weld procedures and unusual nozzles, all on an expedited basis to meet the demanding schedule of a petroleum refinery outage.

To request a lance, simply send an inquiry with a sketch to BETE Applications Engineers. Let us turn your hand-drawn sketch into a finished drawing. To ensure the fastest reply, please include in your inquiry all critical dimensions, connection and flange specifications, and any special requirements. If you're not sure what the most appropriate arrangement is for your situation, simply call us and our Application Engineers can make a recommendation based on their extensive experience.



Bolt on the lance, attach your liquid source, and connect the solenoid to your control system. Done.

## Custom Nozzles

BETE offers custom nozzles in cases where a catalog nozzle is not sufficient. Custom nozzles offer the advantage of meeting your specifications precisely. BETE routinely offers custom flow rates, spray angles, connection sizes, and materials. We specialize in those unusual applications where other nozzle companies decline to offer a solution. Installing a custom nozzle in your plant can provide immediate and ongoing process and product improvements.

Call BETE Application Engineers to help optimize your process.









CLUMP, cast and welded in Tantalum

Sometimes process and space constraints require very unique solutions.

# Accessories

## Components & Sizes

	Components	Materials	Sizes															
<b>Nozzle Strainers</b> 	Optional strainer to fit BJ and CW nozzles. All strainers equipped with 316 stainless steel screens of various mesh sizes.	316 stainless steel	<b>Mesh Sizes:</b> 50 0.25mm (US Standard) (S201) 100 0.13mm (US Standard) (S202) 200 0.06mm (US Standard) (S203)															
<b>Reducing Bushings</b> 	BETE nozzles are often installed in pipe sizes larger than their connection. These bushings will adapt BETE nozzles to existing piping.	316 stainless steel nickel alloy C-276 nickel alloy 625 PVC PTFE	<b>Bushing Sizes:</b> 1/4 x 1/8 3/8 x 1/8, 1/4 1/2 x 1/8, 1/4, 3/8 1 x 1/4, 3/8, 1/2, 3/4 1-1/2 x 1/4, 1/2, 1 2 x 1/2, 1															
<b>Y-Type Line Strainers</b> 	BETE recommends the use of strainers to minimize clogging. The 1/4" and 3/8" strainers are equipped with 0.25mm-mesh screens, while 1/2" - 2" strainers come with 0.20mm-mesh screens. Screens with mesh sizes of 0.05, 0.06, 0.13 and 0.15mm available by special order. Screens are easily removed for cleaning. 10 bar rating.	Bronze body with heavy-duty stainless steel wire mesh.	<b>Strainer Sizes:</b> 1/4, 3/8, 1/2, 3/4, 1, 1-1/2, 2  <table border="1"> <thead> <tr> <th>Mesh Sizes</th> <th>Screen Opening</th> </tr> </thead> <tbody> <tr> <td>0.25mm</td> <td>0.13mm</td> </tr> <tr> <td>0.20mm</td> <td>0.18mm</td> </tr> <tr> <td>0.13mm</td> <td>0.28mm</td> </tr> <tr> <td>0.06mm</td> <td>0.71mm</td> </tr> <tr> <td>0.05mm</td> <td>0.86mm</td> </tr> </tbody> </table>	Mesh Sizes	Screen Opening	0.25mm	0.13mm	0.20mm	0.18mm	0.13mm	0.28mm	0.06mm	0.71mm	0.05mm	0.86mm			
Mesh Sizes	Screen Opening																	
0.25mm	0.13mm																	
0.20mm	0.18mm																	
0.13mm	0.28mm																	
0.06mm	0.71mm																	
0.05mm	0.86mm																	
<b>Adapters and Couplings</b> 	Reducing couplings, socket adapters, elbows, and various other fittings are available to meet specific applications.	Wide range of materials available.	Sizes available as required															
<b>Flanges</b> 	Used to attach nozzles too large to be threaded. 150# rating, ANSI standard; 300# and specific ratings also available.	316 stainless steel nickel alloy C-276 nickel alloy 625 PVC PTFE FRP	<b>Flange Sizes:</b> 2" - 12" DN 50 - DN 300															
<b>Junction Box</b> 	Used to facilitate the assembly of spray clusters typically used in spray ponds.	316 stainless steel brass carbon steel	<b>Port Sizes:</b> <table border="1"> <thead> <tr> <th>Inlet</th> <th>Outlet</th> <th># of outlets</th> </tr> </thead> <tbody> <tr> <td>2"</td> <td>1-1/4"</td> <td>4</td> </tr> <tr> <td>3"</td> <td>1-1/2"</td> <td>4</td> </tr> <tr> <td>4"</td> <td>2"</td> <td>4</td> </tr> <tr> <td>6"</td> <td>2-1/2"</td> <td>4</td> </tr> </tbody> </table>	Inlet	Outlet	# of outlets	2"	1-1/4"	4	3"	1-1/2"	4	4"	2"	4	6"	2-1/2"	4
Inlet	Outlet	# of outlets																
2"	1-1/4"	4																
3"	1-1/2"	4																
4"	2"	4																
6"	2-1/2"	4																

SPECIAL PURPOSE

TO ORDER: specify pipe size, connection type, nozzle number, spray angle, and material.



## SPECIFYING SPRAY NOZZLES

Spray nozzles have three basic functions:

- meter flow
- distribute liquid
- break up a liquid stream into droplets

The process of choosing a nozzle includes specifying:

- its flow-rate-versus-pressure characteristics (see catalog flow rate tables)
- how the droplets will be distributed after leaving the nozzle (see spray pattern, pp. 2, 3)
- the size of the droplets that will be produced (contact BETE Applications Engineering if droplet size is critical)
- the nozzle connection to the feed pipe (see dimension tables)
- the material of construction (see page 13 for complete list)

## FLOW RATE

The volume of liquid flowing through a nozzle depends primarily on the difference in fluid pressure upstream of its orifice and the pressure into which the nozzle discharges (normally that of the atmosphere). Pressures that are listed in the flow rate tables of each nozzle series are *gauge pressures*.

Flow rates for pressures not tabulated may be calculated using the equation given at the bottom of each table. The factor "K" is listed for each nozzle and has units of lpm/bar<sup>x</sup>.

A nozzle may discharge into a vessel where the pressure is not atmospheric. Since the nozzle flow rate is determined by the *differential* pressure across it, the flow rate may be calculated by subtracting the gauge pressure inside the

### System Design Example

**Calculate Total Water Flow and Pressure at Pump for Nozzles Operating at 0.5 bar**

Total Flow (p. 38, 39) = (1 nozzles)(381 l/min/nozzle) = **381 l/min**

**Pump Pressure Formula:**

$$P_{\text{pump}} = P_{\text{nozzle}} + P_{\text{pipe losses}} + \rho gh / 100000$$

Calculate Pipe Loss:

Pipe Friction: (15 m)(0.7 bar/100 m) = 0.11 bar

Fitting Loss: (3 elbows)(1.52 m/elbow) = 4.56 m  
(4.56 m)(0.7 bar/100 m) = 0.03 bar

Total Piping Losses: 0.11 bar + 0.03 bar = **0.14 bar**

Elevation Losses: (1000)(9.81)(12 m) / 100000 = **1.17 bar**

$$P_{\text{pump}} = 0.5 \text{ bar} + 0.14 \text{ bar} + 1.17 \text{ bar} = 1.81 \text{ bar}$$

**Pump must be sized to provide 381 l/min at 1.81 bar**

vessel from the gauge pressure at the nozzle inlet as shown:

$$l/min = K (\text{Bar}_{\text{Inlet}} - \text{Bar}_{\text{Vessel}})^x$$

## FLUID PROPERTIES

Specific gravity primarily affects nozzle flow. Flow rates of liquids denser than water are lower than flow rates of water at the same pressure because more energy is required to accelerate denser fluids. The following relationship exists between flow rates of fluids with different specific gravities:

$$\frac{Q_2}{Q_1} = \sqrt{\frac{SG_1}{SG_2}}$$

Viscosity also affects nozzle performance. High viscosities inhibit

## FLUID PROPERTIES (at room temperature)

Fluid	Viscosity	Specific Gravity
Water	1cP	SG=1
10W-30 Oil	110 cP	SG=0.88
Honey	1500 cP	SG=1.05

atomization. In general, fluids with viscosities greater than 100 cP are difficult to atomize except with air-atomizing nozzles.

## SYSTEM DESIGN

The piping system that supplies the nozzles must be designed to deliver the correct pressure at the nozzle inlet. The following formula



$$P_{\text{Pump}} = P_{\text{Nozzle}} + P_{\text{Pipe Losses}} + \frac{\rho g h}{100000}$$

is useful in estimating the pressure a pump will have to supply to a nozzle system:

where:

$\rho$  = density of fluid (kg/m<sup>3</sup>)

[water = 1000 kg/m<sup>3</sup>]

$g = 9.81 \text{ m/s}^2$

$h$  = height of nozzle above pump (m) - negative if the nozzle is below the pump

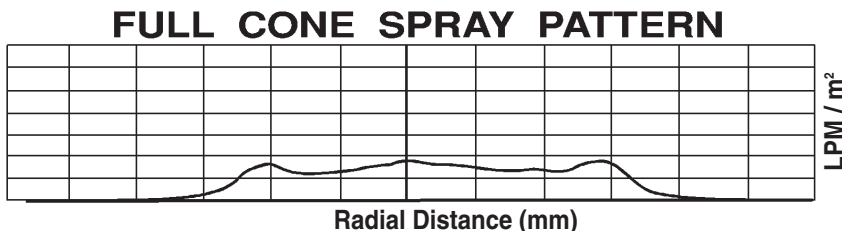
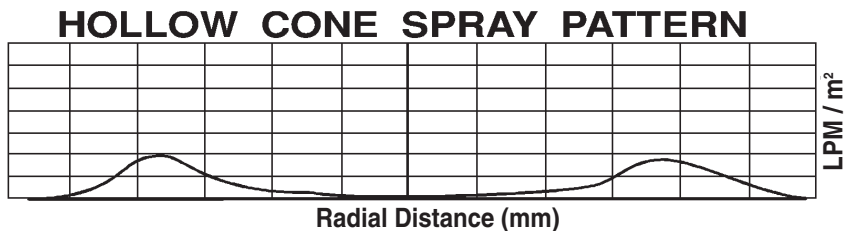
$p$  = pressure (bar)

A chart of pipe friction losses is presented on page 108. In using the chart be sure to look at the *total* system flow if there are multiple nozzles to be supplied by one pipe. Elbows, tees and other pipe fittings (see p. 108) also contribute to pressure loss and can be significant, especially in short, convoluted runs.

### SPRAY ANGLE

The spray angle chosen for a particular application depends on the coverage required.

The spray angle for spiral nozzles is relatively stable over a wide range of pressures, while the spray angle for whirl nozzles tends to decrease as the pressure is increas-



ed. For additional information see page 114.

### NOZZLE SPRAY PATTERN

The term "Spray Pattern" describes the location and spray density of the liquid emitted from a nozzle. Two examples of pattern measurement are shown above. The height of the curve at any point is the spray density in units of LPM/m<sup>2</sup>.

### DROPLET SIZE

Droplet size is often critical. Many processes such as gas scrubbing depend on exposing the maximum possible amount of liquid surface to a gas stream. Other applications require that the droplets be as large as possible, such as when the spray must project into a fast moving gas stream.

Exposing the maximum surface area requires breaking the liquid

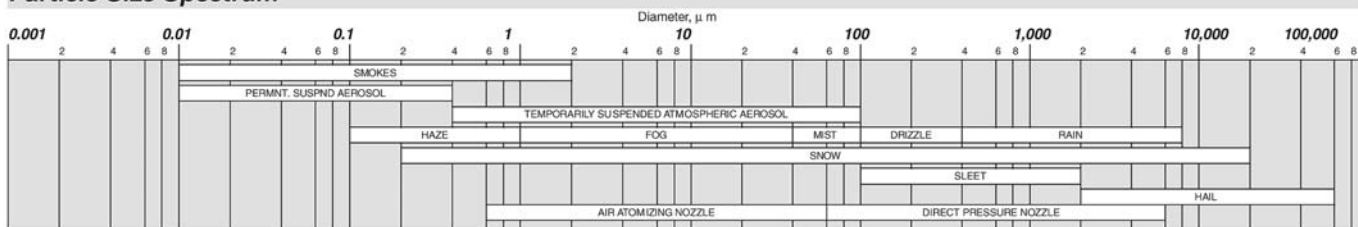
into droplets as small as possible. To get an idea of how this works, imagine a cube of water with a volume of 1 m<sup>3</sup>. This cube has a surface area of 6 m<sup>2</sup>. If we now split it in two, we expose some of the inner surface and increase the total surface area to 8 m<sup>2</sup>. Atomizing the liquid into spheres 1 mm (1,000 microns) in diameter would increase the surface area of this gallon of liquid to 6000 m<sup>2</sup>.

A nozzle actually produces a range of droplet sizes from the solid liquid stream. Since it is inconvenient to list all the sizes produced, droplet size (in microns) is usually expressed by a mean or median diameter. An understanding of diameter terms is essential.

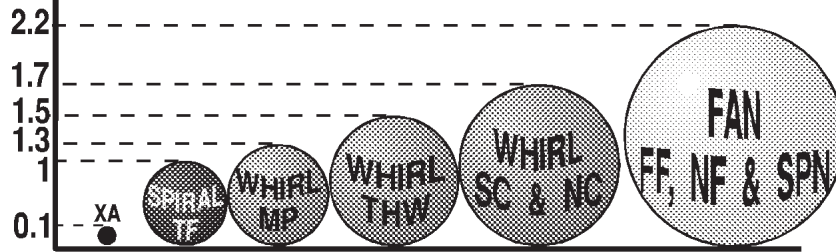
The following definitions are given for the most frequently used mean and median diameters:

### Arithmetic Mean

### Particle Size Spectrum



## RELATIVE DROP SIZE BY NOZZLE SERIES



### Diameter (D<sub>10</sub>)

- The average of the diameters of all the droplets in the spray sample.

### Volume Mean Diameter (D<sub>30</sub>)

- The diameter of a droplet whose volume, if multiplied by the total number of droplets, will equal the total volume of the sample.

### Sauter Mean Diameter (D<sub>32</sub>):

- The diameter of a droplet whose ratio of volume to surface area is equal to that of the complete spray sample.

### Mass (Volume) Median Diameter (DV<sub>05</sub>):

- The diameter which divides the mass (or volume) of the spray into two equal halves. Thus 1/2 of the total mass is made up of droplets with diameters smaller than this number and the other

half with diameters that are larger.

The Sauter Mean Diameter is one of the most useful ways to characterize a spray. The ratio of volume to surface area for the Sauter Mean is the same as that ratio for the entire spray volume. For this reason, the use of the Sauter Mean is preferred for process calculations.

Whirl nozzles generally produce larger droplets than spiral nozzles, and air-atomizing nozzles such as the XA or SpiralAir Series typically produce the smallest droplets of all.

It is

$$\frac{D_2}{D_1} = \left(\frac{P_2}{P_1}\right)^{-0.3}$$

sometimes useful to predict the effect a change in pressure will have on the droplet size produced by the nozzle. For single fluid nozzles the following equation may be used for modest changes in pressure:

### TROUBLESHOOTING BASICS

The following are some of the things to look for when a system is not performing as intended:

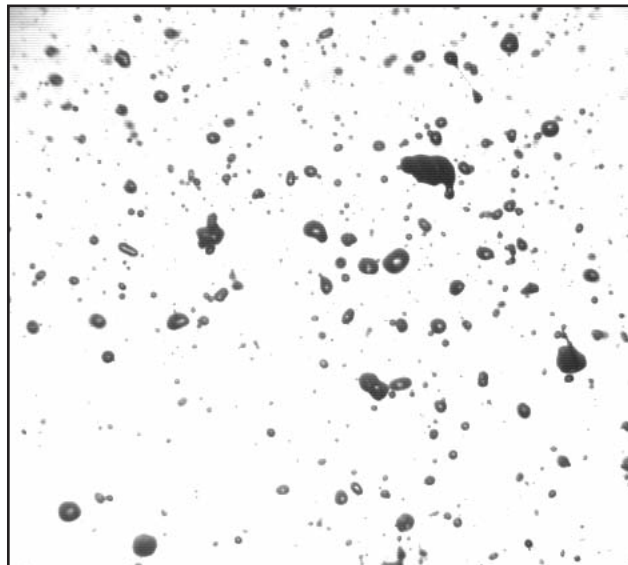
#### Nozzle Wear or Corrosion

- may cause excessive flow rate due to enlarged passages
- may increase droplet size
- degrades spray pattern

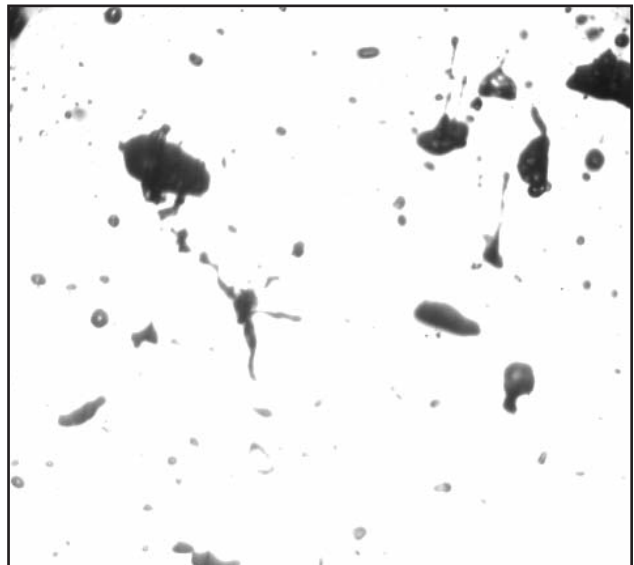
#### Nozzle Clogging

- low flow rates
- poor spray pattern

#### Inadequate Pipe Size



Actual droplet images captured using the BETE Model 700 Spray Analysis System.



The BETE Droplet Analyzer is capable of characterizing non-spherical droplets like those seen in this actual image.

# Research & Development

## RESEARCH & DEVELOPMENT

BETE's state-of-the-art **Spray Laboratory** plays a key role in supporting both product R&D and our customer service network.

Equipped with sophisticated video-image processing and digital analysis technology, the Spray Lab makes possible rapid nozzle development and evaluation.

The Spray Lab is also available on a contract basis to provide confidential, quantitative evaluation of nozzle performance. Industrial applications for contract testing range from comparative nozzle performance testing to development of proprietary designs. These capabilities allow our customers to optimize process performance while minimizing capital and operating costs—a winning combination in today's competitive global marketplace.

### Spray Laboratory Capabilities

- Flow rate (water) measurements from 0.04 to 7500 l/min
- Flow rate (air) measurements from 0.5 to 2550 Nm<sup>3</sup>/h
- Pressure measurements to 210 bar
- Automated drop size distribution measurement from less than 2 to greater than 15,000 microns
- Computerized spray distribution analysis
- Two-fluid capabilities up to 2550 Nm<sup>3</sup>/h air / 3000 l/m water
- 9 m x 15 m x 7 m high test area

## DROPLET ANALYSIS

Frustrated by the limited capabilities of laser-based instruments, BETE developed the Model 700 Video Particle Analyzer. This flexible system allows BETE to characterize the difficult sprays containing significant numbers of large and non-spherical drops often encountered in industrial applications. The Model 700 is a video-imaging system combining a CCD video camera, microscope lens, fast strobed xenon light source, and image processing hardware and software.

## PATTERN DISTRIBUTION ANALYSIS

The BETE Patternator is a unique digital video system for accurately analyzing the volumetric distribution of liquid emitted from a nozzle. The system uses a standard tube patternator combined with BETE's custom shape recognition and timing software. From this digitized information, spray density and effective spray angles are calculated.

Because data collection and analysis are handled by computer, the device is very well-suited for handling the large amount of data required for nozzle development and assessment programs.

Consistently and accurately selecting appropriate sampling positions is extremely important when performing drop size analysis. The challenge lies in sampling the spray in such a way that the

number and locations of the individual tests chosen present a reasonable representation of the entire spray. Recognizing this, BETE has integrated the patternator with the Model 700 analyzer on a calibrated X-Y-Z positioner and developed a number of sampling protocols for droplet size analysis. These protocols ensure that the reported drop size distributions most accurately reflect the overall spray performance, thus allowing a high degree of repeatability and confidence.

## COMPUTER MODELING AND SIMULATION

There are instances when duplicating the operating environment in the spray lab is impossible. When the nozzle is to be used in a high-temperature or pressure environment or sprayed in a high velocity gas stream, BETE Applications Engineers use computer modeling and simulation software developed in-house to assist in specifying the proper nozzle.

Spray-modeling has also been used to predict spray drift from cooling ponds and dust suppression systems and estimating evaporation rates from disposal ponds.

Working with engineering companies and consulting groups, BETE Engineering taps this modeling and simulation technology to offer customized spray nozzle solutions to some of the most vexing problems facing industry

# Spray Coverage

## SPRAY ANGLE TERMS

Four terms are commonly used to describe spray coverage:

### Spray Angle:

**(A)** The included angle of the spray as measured close to the nozzle orifice. Since the droplets are immediately acted upon by external forces (gravity and moving gases, for example), this measurement is useful only for determining spray coverage close to the nozzle. The spray angles listed for nozzles in this catalog are angles at the nozzle, measured at the nozzle's design pressure.

### Actual Spray Coverage:

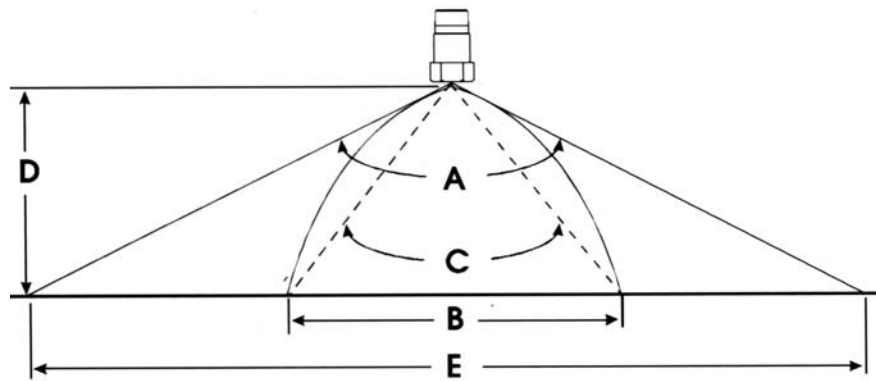
**(B)** The actual coverage at a specified distance **(D)** from the nozzle.

### Effective Spray Angle:

**(C)** The angle calculated from the actual coverage **(B)** at a distance **(D)**.

### Theoretical Spray Coverage:

**(E)** The coverage at distance **(D)** if the spray moved in a straight line.



## THEORETICAL SPRAY COVERAGE (E) IN MILLIMETERS

Included Spray Angle (A)	Distance From Nozzle Orifice (D) (mm)										
	50	75	100	150	200	300	400	600	800	1000	
10°	9	13	17	26	35	52	70	105	140	175	
20°	18	26	35	53	71	106	141	212	282	353	
30°	27	40	54	80	107	161	214	322	429	536	
40°	36	55	73	109	146	218	291	437	582	728	
50°	47	70	93	140	187	280	373	560	746	933	
60°	58	87	115	173	231	346	462	693	924	1155	
70°	70	105	140	210	280	420	560	840	1120	1400	
80°	84	126	168	252	336	503	671	1007	1343	1678	
90°	100	150	200	300	400	600	800	1200	1600	2000	
100°	119	179	238	358	477	715	953	1430	1907	2384	
110°	143	214	286	428	571	857	1143	1714	2285		
120°	173	260	346	520	693	1039	1386	2078			
130°	214	322	429	643	858	1287	1716				
140°	275	412	549	824	1099	1648	2198				
150°	373	560	746	1120	1493	2239					
170°	1143	1715	2286								

**NOTE:** Data shown is theoretical and does not take into consideration the effects of gravity, gas flow, or high pressure operation.

## EXAMPLES:

**Problem:** To achieve a 200mm diameter spray coverage from a nozzle mounted 150mm from the target, what spray angle would be required?

**Solution:** 70° Spray Angle

**Problem:** How far from the target should a nozzle with a 110° spray angle be mounted in order to achieve a 550mm diameter spray?

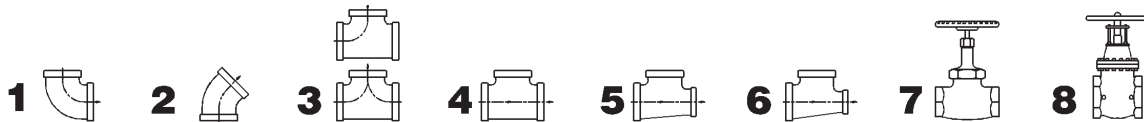
**Solution:** Approximately 200mm. (Actual coverage will be less than theoretical coverage listed in the table.)

**NOTE:** For applications where coverage is critical, contact BETE Applications Engineering using the Applications Intake form on page 109.

# Water Flow Data

## Flow of Water Through Schedule 40 Steel Pipe

Discharge l/min	Pressure Drop per 100 meters and Velocity in Schedule 40 Pipe for Water at 15° C															
	Velocity m/sec	Press. Drop bar	Velocity m/sec	Press. Drop bar	Velocity m/sec	Press. Drop bar	Velocity m/sec	Press. Drop bar	Velocity m/sec	Press. Drop bar	Velocity m/sec	Press. Drop bar	Velocity m/sec	Press. Drop bar	Velocity m/sec	Press. Drop bar
	<b>1/8"</b>		<b>1/4"</b>		<b>3/8"</b>		<b>1/2"</b>		<b>3/4"</b>		<b>1"</b>					
1	0.459	0.726	0.251	0.17												
2	0.918	2.59	0.501	0.60	0.272	0.136	0.170	0.044								
3	1.38	5.59	0.752	1.22	0.407	0.29	0.255	0.091	0.144	0.023						
4	1.84	9.57	1.00	2.09	0.543	0.48	0.340	0.151	0.192	0.038	0.120	0.012				
5	2.29	14.45	1.25	3.18	0.679	0.70	0.425	0.223	0.241	0.057	0.150	0.017				
6	2.75	20.29	1.50	4.46	0.815	0.98	0.510	0.309	0.289	0.077	0.180	0.024	<b>1 1/4"</b>		<b>1 1/2"</b>	
8	3.67	35.16	2.01	7.36	1.09	1.69	0.680	0.524	0.385	0.129	0.240	0.041	0.138	0.011		
10			2.51	11.81	1.36	2.52	0.850	0.798	0.481	0.193	0.300	0.061	0.172	0.015	0.127	0.008
15			3.76	25.67	2.04	5.37	1.28	1.69	0.722	0.403	0.450	0.124	0.258	0.032	0.190	0.015
20					2.72	9.24	1.70	2.84	0.962	0.683	0.600	0.210	0.344	0.054	0.254	0.026
	<b>2"</b>		<b>2 1/2"</b>													
30	0.231	0.016					2.55	6.17	1.44	1.45	0.90	0.442	0.517	0.114	0.380	0.053
40	0.308	0.027	0.216	0.010			3.4	10.72	1.92	2.50	1.20	0.758	0.689	0.193	0.507	0.091
50	0.385	0.039	0.270	0.017					2.41	3.83	1.50	1.14	0.861	0.290	0.634	0.135
60	0.462	0.055	0.324	0.023					2.89	5.41	1.80	1.61	1.03	0.400	0.761	0.187
70	0.539	0.098	0.378	0.031					3.37	7.27	2.10	2.15	1.21	0.541	0.888	0.248
					<b>3"</b>		<b>3 1/2"</b>									
80	0.616	0.092	0.432	0.039	0.280	0.014			3.85	9.27	2.40	2.76	1.38	0.690	1.01	0.315
90	0.693	0.115	0.486	0.048	0.315	0.017	0.235	0.008			2.70	3.47	1.55	0.862	1.14	0.397
100	0.770	0.141	0.540	0.059	0.350	0.020	0.261	0.010	<b>4"</b>		3.00	4.25	1.72	1.05	1.27	0.488
150	1.15	0.295	0.810	0.125	0.524	0.042	0.392	0.021	0.304	0.011	4.50	9.30	2.58	2.26	1.90	1.03
200	1.54	0.512	1.08	0.212	0.699	0.072	0.523	0.036	0.405	0.019			3.44	3.91	2.54	1.81
											<b>5"</b>		<b>6"</b>			
250	1.92	0.773	1.35	0.322	0.874	0.108	0.653	0.053	0.507	0.028					3.17	2.74
300	2.31	1.10	1.62	0.449	1.05	0.152	0.784	0.074	0.608	0.040	0.387	0.014			3.80	3.82
350	2.69	1.47	1.89	0.606	1.22	0.203	0.915	0.099	0.710	0.053	0.452	0.018			4.44	5.18
400	3.08	1.92	2.16	0.780	1.40	0.264	1.05	0.128	0.811	0.068	0.516	0.023	0.357	0.009	5.07	6.69
450	3.46	2.39	2.43	0.979	1.57	0.329	1.18	0.161	0.912	0.084	0.581	0.028	0.402	0.012	5.71	8.45
500	3.85	2.95	2.70	1.20	1.75	0.403	1.31	0.196	1.01	0.101	0.646	0.034	0.447	0.014		
550	4.23	3.55	2.97	1.44	1.92	0.479	1.44	0.232	1.11	0.122	0.710	0.041	0.491	0.016		
600	4.62	4.20	3.24	1.69	2.10	0.566	1.57	0.273	1.22	0.146	0.775	0.047	0.536	0.019		
650	5.00	6.88	3.51	1.97	2.27	0.658	1.70	0.319	1.32	0.169	0.839	0.055	0.581	0.022		
700	5.39	5.63	3.78	2.28	2.45	0.759	1.83	0.368	1.42	0.194	0.904	0.063	0.625	0.025		
750	5.77	6.44	4.05	2.60	2.62	0.863	1.96	0.420	1.52	0.218	0.968	0.072	0.670	0.029		<b>8"</b>



# Notes!

PHONE: 413-772-0846 or Fax to: 413-772-6729

## FLOW OF AIR THROUGH SCHEDULE 40 STEEL PIPE

Free Air $q'$ m <sup>3</sup> /min at 15°C & 1.013 bar abs	Compressed Air m <sup>3</sup> /min at 15°C at 7 bar gauge	Pressure Drop per 100m of Schedule 40 Pipe For Air For 15°C and 7 bar gauge pressure									
		<b>1/8"</b>	<b>1/4"</b>	<b>3/8"</b>	<b>1/2"</b>						
0.03	0.0038	0.093	0.021	0.0045							
0.06	0.0076	0.337	0.072	0.016	0.0051						
0.09	0.0114	0.719	0.154	0.033	0.011	<b>3/4"</b>					
0.12	0.0152	1.278	0.267	0.058	0.018						
0.15	0.0190	1.942	0.405	0.087	0.027	0.0067					
							<b>1"</b>				
0.2	0.0253	3.357	0.698	0.146	0.047	0.011	0.0035				
0.3	0.0379	7.554	1.57	0.319	0.099	0.024	0.0073				
0.4	0.0506		2.71	0.548	0.170	0.041	0.012	<b>1 1/4"</b>			
0.5	0.0632		4.10	0.842	0.257	0.062	0.018				
0.6	0.0759		5.90	1.19	0.370	0.088	0.026	0.0066	<b>1 1/2"</b>		
0.7	0.0885		8.03	1.62	0.494	0.117	0.035	0.0086	0.0041		
0.8	0.101			2.12	0.634	0.150	0.044	0.011	0.0053		
0.9	0.114			2.64	0.803	0.187	0.055	0.014	0.0065		
1.0	0.126			3.26	0.991	0.231	0.067	0.017	0.0079		
1.25	0.158			4.99	1.55	0.353	0.102	0.026	0.012		<b>2"</b>
1.5	0.190			7.20	2.19	0.499	0.147	0.036	0.017	0.0048	
1.75	0.221	<b>2 1/2"</b>		9.79	2.98	0.679	0.196	0.047	0.022	0.0064	
2.0	0.253				3.82	0.871	0.257	0.062	0.029	0.0082	
2.25	0.284	0.0042			4.84	1.10	0.325	0.076	0.036	0.010	
2.5	0.316	0.0051			5.97	1.36	0.393	0.094	0.045	0.012	

# Conversions & Equations

## Flow rate

$$Q = K (P)^x \quad \left(\frac{Q_2}{Q_1}\right) = \sqrt{\frac{SG_1}{SG_2}}$$

$$P = \left(\frac{Q}{K}\right)^{1/x}$$

Vessel with internal pressure:

$$\left(\frac{Q_2}{Q_1}\right) = \left(\frac{P_2}{P_1}\right)^x \quad l/min = K (P_{inlet} - P_{Vessel})^x$$

Nozzle Series	Exponent x	Nozzle Series	Exponent x
BJ	0.50	PJ	0.50
CW	0.47	PSR	0.50
FF	0.50	SC	0.47
IS	0.50	SPN	0.50
L	0.50	ST	0.50
LEM	0.50	STXP	0.50
LP	0.50	TC	0.46
MaxiPass	0.47	TD/TDL	0.50
MicroWhirl	0.50	TF	0.50
N	0.50	TFXP	0.50
NC	0.47	TH, THW	0.50
NCJ	0.47	TW	0.50
NCK	0.47	WL	0.47
NCS	0.47	WT	0.50
NF	0.50	WTX	0.50
P	0.50	WTZ	0.50

## Dropsizes

## System Design

$$\left(\frac{D_2}{D_1}\right) = \left(\frac{P_2}{P_1}\right)^{-0.3} \quad P_{Pump} = P_{Nozzle} + P_{Pipe Losses} + \frac{\rho gh}{100000}$$

Conversion Data		
MULTIPLY	BY	TO OBTAIN
atmospheres	1.013	bar
atmospheres	33.931	feet of water
atmospheres	1.0332	kg/cm <sup>2</sup>
atmospheres	101.3	kiloPascals (kPa)
atmospheres	14.696	psi
bar	100	kPa
bar	14.5	psi
barrels (oil)	42	gallons
centimeters	0.3937	inches
centiStokes	Sp. gravity	centiPoise
cm <sup>3</sup>	0.061	in <sup>3</sup>
cm <sup>3</sup>	0.000264	gallons
cm <sup>3</sup>	0.001	liters
ft <sup>3</sup>	1728	inches
ft <sup>3</sup>	0.02832	m <sup>3</sup>
ft <sup>3</sup>	7.48	gallons
ft <sup>3</sup>	28.32	liters
ft <sup>3</sup> (water)	62.43	pounds (water)
in <sup>3</sup>	16.39	cm <sup>3</sup>
in <sup>3</sup>	0.00433	gallons
in <sup>3</sup>	0.164	liters
m <sup>3</sup>	35.31	ft <sup>3</sup>
m <sup>3</sup>	61.024	in <sup>3</sup>
m <sup>3</sup>	264.2	gallons
m <sup>3</sup>	1000	liters
degree (angle)	60	minutes
degree (Celsius)	(°C x 1.8) +32	degree (Fahrenheit)
degree (Fahrenheit)	(°F-32) x 0.56	degree (Celsius)
feet	0.3048	meters
feet/sec	30.48	centimeters/sec

Conversion Data		
MULTIPLY	BY	TO OBTAIN
feet/sec	18.29	meters/min
feet of water	0.0295	atmospheres
feet of water	0.884	inches of mercury
feet of water	0.433	psi
gallons	3785	cm <sup>3</sup>
gallons	0.1337	ft <sup>3</sup>
gallons	0.83267	imperial gallons
gallons	3.785	liters
gallons/min	0.06309	liters/sec
imperial gallons	1.2	gallons
horsepower	1.014	horsepower (metric)
horsepower	33.000	foot pounds/min
horsepower	746	Watts
inches	2.54	centimeters
kg/cm <sup>2</sup>	14.22	psi
kiloWatts	1.340	horsepower
liters	1000	cm <sup>3</sup>
liters	0.264	gallons
liters	0.22	imperial gallons
liters	33.8	ounces (fluid)
meters	3.281	feet
microns (µm)	0.0394	thousandth of an inch
miles/hr	44.7	centimeters/sec
miles/hr	1.467	feet/sec
millimeters	0.0394	inches
psi	0.068	atmospheres
psi	0.06895	bar
psi	2.307	feet of water
psi	0.0703	kg/cm <sup>2</sup>
psi	6.895	kPa

## Terms and Conditions.

Prices quoted are FOB, Greenfield, MA. Terms are 1%/10 net 30 days for approved accounts. Minimum order is \$50.00 net. A restocking charge of 15% will apply for standard product accepted for return up to one year from the date of purchase. BETE FOG NOZZLE reserves the right to charge interest on past-due accounts. No goods may be returned without prior authorization. Non-Standard items are not subject to return.

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