BETE®

ENGINEERED
SPRAYING SOLUTIONS

NOZZLES FOR INDUSTRY, POLLUTION CONTROL, AND FIRE PROTECTION

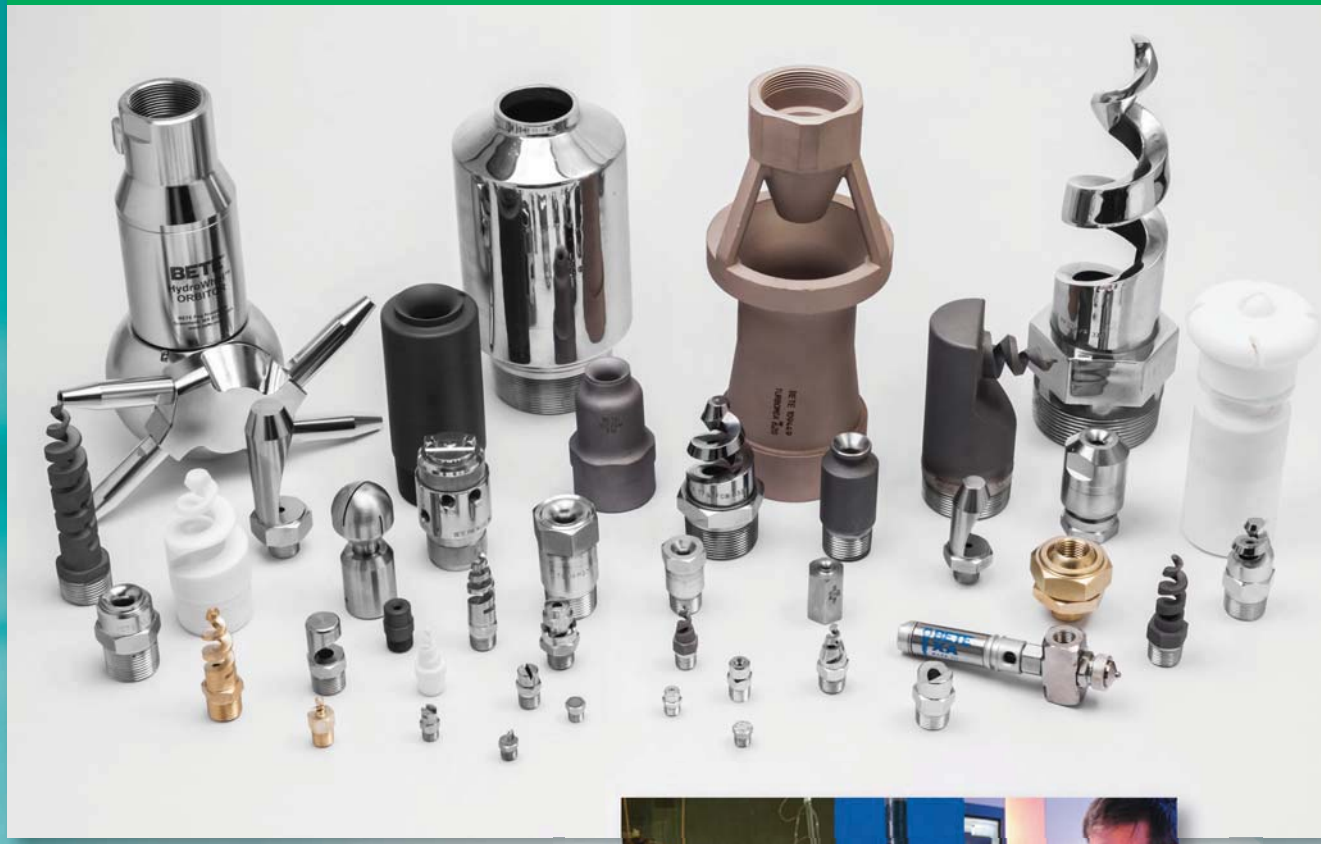

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Table of Contents

BETE ISO 9001: 2008 QUALITY SYSTEMS

With thousands of different spray nozzles available in hundreds of different materials, it's often hard to know where to start. 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. 2-4

Do you know the spray pattern, but not the type of nozzle?.....see pages 2-4

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

→ BY APPLICATION....PP. 5-11

Want to see what nozzles excel at your specific application?.....see pages 5-11

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 Customer Service Representatives and Applications 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.

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0813Metric

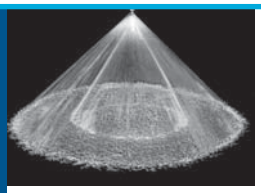
Alphabetical Nozzle Index

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.

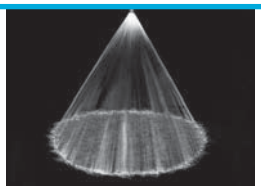
Special flow rates and angles are available for most nozzle series.

...by SPRAY PATTERN



Full Cone Nozzles

The most frequently used nozzle type in industry is the full cone nozzle. The spray emits from the nozzle in a conical shape with the liquid dispersed over the interior of the cone. When the spray intersects with a surface, a circle of spray is formed with liquid present throughout. The full cone pattern from a spiral nozzle consists of several concentric hollow cones that combine to produce a full cone effect with a smaller droplet size.



TF

The standard spiral line, available in a wide range of flows, angles, and materials. 1/8"- 4"
p. 20

TFXP

Same as the TF plus maximum free passage. 3/8"- 4"
p. 21

ST

A Cobalt Alloy tip and 316 stainless connection for spraying abrasive liquids. 1/4"- 4"
p. 22

STXP

Same as the ST with extra rugged construction plus maximum free passage. 3/8"- 4"
p. 23

WL

Low flow rate, full cone nozzles. 1/8" - 1"
p. 24

MPL

Low flow, maximum free passage. Unique, S-shaped internal vanes allow free passage of particles. 1/8" and 1/4"
p 25

MaxiPass

Patented MaxiPass "S"-shaped vanes for superior distribution and largest free passage. 3/8" - 4"
pp. 26, 27

CW

Low flow rate full or hollow cone, 3-piece construction with optional strainer and cover. 1/8"- 3/8"
p. 28

WTZ

Tangential full cone nozzle with 3-piece construction. 1/4"- 1/2"
p. 29

EZ

Quick connection system, ramped engagement for automatic alignment. 1/8" - 1/2"
p. 30

SF

Snap release nozzle system features clamp-on adapters for easy installation. 1" - 2"
p. 31

SC

Metal full cone nozzles available in a wide range of alloys. 3/4"- 6"
pp. 32, 33

NC

Complete line of full cone nozzles available in a variety of plastic materials. 3/4"- 6"
pp. 34, 35

NCS

"Stubbies"; short NC-type nozzles for use where space is at a premium. 1"- 4"
p. 36

NCK

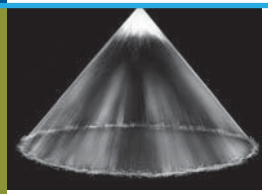
Narrow spray angle injector. 3/4"- 6"
p. 37

NCFL

Large plastic nozzles with high flow rates for applications where flanged connections are required. 4"- 12"
p. 38

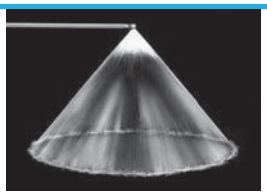
TC

High capacity full cone metal nozzles. 6"- 12"
p. 39



Hollow Cone Nozzles

Used less frequently than full cone nozzles, hollow cone nozzles produce a thin ring of liquid. The spray emits from the nozzle in a conical shape with the liquid only at the periphery of the cone. When the spray intersects with a surface, a ring of spray is formed with a hollow center.



WT

Tangential hollow cone nozzle with 2-piece construction. 1/8"- 3/4"
pp. 40, 41

WTX

Similar to WT, with design features for extended life. 1/8"- 3/4"
pp. 42, 43

CW

Low flow rate full or hollow cone, 3-piece construction with optional strainer and cover. 1/8"- 3/8"
p. 44

TF

The standard spiral line, available in a wide range of flows, angles, and materials. 1/8"- 4"
p. 45

EZ

Quick connection system, ramped engagement for automatic alignment. 1/8" - 1/2"
pp. 46,47

SF

Snap release nozzle system features clamp-on adapters for easy installation. 1" - 2"
p. 48

NCJ

Narrow spray angle injector.

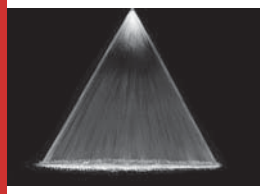
3/4"- 6"
p. 49

TH

Larger one-piece tangential hollow cone nozzle 1"- 3"
pp. 50, 51

THW

Same as TH, with wide spray pattern. 1"- 3"
pp. 52, 53



Fan Nozzles

These nozzles produce a thin, flat sheet of liquid that expands outward from the nozzle. A thin line of liquid is produced when the spray intersects a surface. As the liquid is concentrated into a smaller net area, the impact force from fan nozzles is greater than from full or hollow cone nozzles.

BJ

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

pp. 54, 55

HydroPulse

Pneumatically actuated low flow flat fan nozzle with interchangeable tips. 1/8"- 3/8"

pp. 56-59

NFV

Fan nozzle with integral strainer option. 1/8" or 1/4"

p. 60

NF

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

p. 61

NFD

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

p. 62

NFS

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

p. 63

FF

Deflector-style; extra-wide angle flat fan spray. 1/8"- 1"

pp. 64, 65

EZ

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

pp. 66, 67

SF

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

p. 68

SPN

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

p. 69

Misting Nozzles

Misting nozzles are characterized by their very small droplet size and relatively small flow rate. The pressure of the incoming fluid is used to drive the atomization process. Higher liquid pressures produce increasingly finer droplets.

MicroWhirl

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

p. 70

PJ

Combines small size and super-fine atomization. 1/8" or 1/4"

p. 71

P

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

p. 72

L

A low-flow, spiral nozzle.

1/8" or 1/4"

p. 73

UltiMist

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

p. 74

SS

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

p. 75

Air Atomizing Nozzles

Compressed gas, most often air, is used to increase the atomization efficiency of these nozzles. A smaller droplet size for a given liquid flow rate can be achieved with the use of compressed air than can be achieved with nozzles that only use the pressure of the fluid.

XA

Two-fluid nozzles for low flow applications.

pp. 76-93

SAM

External mix/flat fan or narrow round variable coverage, fine control of dropsize.

pp. 94, 95

SpiralAir

Two-fluid nozzles for high flow applications.

pp. 96, 97

Tank Washing Nozzles

These specialized products are customized to the task of cleaning the interior surfaces of tanks. The typical 360° spray pattern covers all internal surfaces while specialized 270° and 180° patterns focus the cleaning fluid on specific surfaces. Models range from basic fixed nozzles to advanced fluid-driven tank cleaning machines.

HydroWhirl S

Slotted, rotating tank washing spray nozzle. Available with ATEX approval for Zone 0.
1/8" - 1-1/2"
p. 99

HydroWhirl Poseidon

Rotating tank washing nozzle in PTFE. Ideal for harsh chemical environments.
1/2"- 1-1/2"
p. 100

HydroWhirl Orbitor

High impact rotary tank cleaning machine. 360° and 180° wash patterns. 2 or 4 nozzle configurations
p. 101

TW

Compact design; fits small openings. Unique patterns that spray in opposing directions.
3/8" & 1"
p. 102

CLUMP

A tank washing manifold with 6 large free passage MaxiPass nozzles.
3/4" - 1"
p. 103

LEM

A special tank washing assembly with omni-directional spray.
3/4"& 1"
p. 104

RTW

Self propelled rotating tank and drum washing nozzle with hard driving fan tips.
3/4"
p. 105

Special Purpose Nozzles and Accessories

Applications with very specific requirements require specialized nozzles. Nozzles for fire control, spray drying, submerged tank mixing, the paper industry, and air blowoff are some that require application-specific designs.

Fire Protection Nozzles

N

Specially designed for fire protection. Factory Mutual, UL, U.S. Coast Guard, and Lloyd's Register approved models.
1/2"-1 1/2"
p. 106

TF29-180

Ultra-wide fire protection nozzle has full cone spray coverage close to the nozzle
1/2"
p. 107

Spray Drying Nozzles

Twist & Dry

Stainless steel, FDA- compliant nozzles for food processing and spray drying applications.
1/4" - 3/4"
pp. 108-111

TDL

Stainless steel, FDA-compliant nozzles with low flow rates for food processing and spray drying applications.
1/8"- 3/8"
p. 112

TurboMix

Tank-mixing eductor nozzle. Inherently clog resistant.
3/8" - 8"
p. 113

IS

Mounted in pairs for rectangular coverage.
1/16"- 1 1/2"
p. 114

LP

Self-aligning, interchangeable family of shower nozzles.
p. 115

PSR

Small physical size, hard-driving high velocity, straight jet
9/16" - 24 UNEF
p. 116

FINZ

High-impact air fan nozzle, versatile cleaning nozzle.
1/4"
p. 117

SJ

Swivel joints allow custom alignment of nozzles without piping changes.
1/4"- 3/4"
p. 118

Accessories

Strainers, bushings, adapters, couplings, manifolds, and flanges to complete your installation.
p. 119

...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	TFXP	TH	MaxiPass	NC	SC
3.5-7 bar 2-10 l/min 90°-120° p. 20	3.5-7 bar 2-10 l/min 90°-120° p. 21	0.5-1 bar 371-2230 l/min 54°-95° SNBSC avail. pp. 50, 51	0.5-1 bar 371-2230 l/min 90°-120° lumpy liquids pp. 26, 27	0.5-1 bar 371-2230 l/min 90°-120° pp. 34, 35	0.5-1 bar 371-2230 l/min 90°-120° metal nozzle pp. 32, 33

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

XA	NF	BJ	SAM
1.5-4 bar 0.4-7 l/h 20°-60° 2.4-14 Nm³/h pp. 76-93	4-7 bar 0.1-0.4 l/min 65°-120° p. 61	4-7 bar 0.03-0.4 l/min 50°-80° pp. 54, 55	0.7-1 bar 20°-70° 0.8-7.2 Nm³/h pp. 90, 91

Aeration
Aerate waste water treatment, fish ponds, and impoundment ponds

TF	TFXP	MaxiPass
1.5-3.5 bar 10-40 l/min 90°-120° p. 20	1.5-3.5 bar 10-40 l/min 90°-120° lumpy liquids p. 21	0.7-3 bar 5-40 l/h 90°-120° lumpy liquids pp. 26, 27

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

NF (D,S)	FF	SPN
3-5 bar 4.0-102 l/min 0.6-90 Nm³/h pp. 62, 63	3-5 bar 4.0-102 l/min 0.3-90 Nm³/h pp. 64, 65	3-5 bar 4.0-102 l/min 0.6-90 Nm³/h p. 69

Air Conditioning
Cooling air at gas turbine inlets

PJ	XA	MicroWhirl
4-70 bar 0.05-5.34 l/h 90° p. 71	1.5-4 bar 0.4-7 l/h 20°-60° 2.4-14 Nm³/h pp. 76-93	70-200 bar 0.04-0.60 l/min 20°-70° p. 70

Air Nozzle
Blowoff nozzle uses compressed air only

FINZ
0.7-6 bar 7-65 Nm³/h p. 117

Blowoff Nozzles
Remove water or dust from strips and conveyors

NF	FF	SPN	FINZ
3-5 bar 4.0-102 l/min 0.6-90 Nm³/h p. 61	3-5 bar 4.0-102 l/min 0.3-90 Nm³/h pp. 64, 65	2-30 bar 3.2-100 l/min 0.6-90 Nm³/h p. 69	0.7-6 bar 7-65 Nm³/h p. 117

Color Code:
- Full Cone
- Hollow Cone
- Fan
- Misting
- Air Atomizing
- Tank Washing
- Special Purpose

Car Wash Nozzles
High pressure wash nozzles used in automated car wash units.

NF
3-5 bar
4.0-102 l/min
120°
p. 61

FF
3-5 bar
4.0-102 l/min
105°-145°
pp. 64, 65

SPN
2-30 bar
3.2-100 l/min
35°-50°
p. 69

Clean in Place Nozzles
Rotating and stationary bottle, drum, and tank washing nozzles

HydroWhirl S
0.5-4 bar
4.39-338 l/min
360°
p. 99

HydroWhirl Poseidon
0.7-4 bar
58.3-333 l/min
360°
p. 100

HydroWhirl Orbitor
3-10 bar
80-600 l/min
180°, 360°
p. 101

CLUMP
3-4 bar
54.3-254 l/min
360°
lumpy liquids
p. 103

LEM
3-4 bar
33.2-451 l/min
360°
even rinsing
p. 104

TW
2-4 bar
19.3-232l/min
180°- 270°
very compact
p. 102

Clog-resistant Nozzles
Wide free passage to spray lumpy, viscous liquids with less clogging

MaxiPass
0.2-5 bar
2.8-3400 l/min
30°-120°
lumpy liquids
pp. 26, 27

TFXP
0.5-20 bar
9.7-10700 l/min
90°-120°
lumpy liquids
p. 21

TH
0.2-3 bar
15.3-2230 l/min
54°-95°
SNBSC avail.
pp. 50, 51

WTZ
0.5-10 bar
0.8-70.4 l/min
90°-110°
p. 41

SPN
0.7-15 bar
1.9-177 l/min
15°-50°
p. 69

FF
0.2-10 bar
0.05-757 l/min
145°
pp. 64, 651

Coating
Apply thin coatings (wet or dry) on product moving past nozzles

XA
1.5-4 bar
11-265 l/h
20°
0.6-16 Nm³/h
pp. 76-93

NF (D,S)
2-5.5 bar
0.8-64 l/min
50°-120°
pp. 62, 63

BJ
2-5.5 bar
0.3-40 l/min
25°-80°
pp. 54, 55

PJ
4-7 bar
0.05-1.7 l/min
90°
p. 71

L
3-7 bar
1-4 l/min
90°
p. 73

SAM
0.7-1 bar
20°-70°
0.8-7.2 Nm³/h
pp. 94, 95

Concrete Curing
Humidify concrete to control curing process

XA
2-4 bar
3.2-93 l/hr
20°- 70°
0.9-24 Nm³/h
pp. 76-93

PJ
5-70 bar
0.058-5.34 l/min
90°
p. 71

MicroWhirl
70-200 bar
0.04-0.60 l/min
20°-70°
p. 70

Cooling: Deluge
Process cooling for food, chemical, and industrial processes

TF
0.7-1.5 bar
45-945 l/min
90°-120°
p. 20

MaxiPass
0.2-1.5 bar
23-940 l/min
90°-120°
lumpy liquids
pp. 26, 27

WL
0.3-1.5 bar
2-53 l/min
80°-120°
p. 25

NC
0.2-1.5 bar
23-940 l/min
90°-120°
pp. 34, 35

TC
0.1-0.7 bar
820-13250 l/min
60°-120°
p. 39

Cooling: Evaporative
Cool hot (+ 300°F) flue gases prior to entering a baghouse or temperature-sensitive equipment

SpiralAir
3-7 bar
1.2-68 l/min
20°-60°
40-220 Nm³/h
pp. 96, 97

TF - full
4-10 bar
6-68 l/min
90°-120°
p. 20

TF - hollow
4-10 bar
6-68 l/min
90°-120°
p. 45

TFXP
4-10 bar
6-68 l/min
90°-120°
lumpy liquids
p. 21

L
4-14 bar
1.2-21 l/min
90°
p. 73

P
4-14 bar
1.2-21 l/min
90°
p. 72

XA
1.5-4 bar
11-100 l/h
20°-60°
1.2-19 Nm³/h
pp. 76-93

MicroWhirl
70-200 bar
0.04-0.60 l/min
20°-70°
p. 70

Cooling: Parts
Cool hot parts on conveyors from pre-treatment ovens

MaxiPass
0.7-4 bar
4.77-888 l/min
90°-120°
lumpy liquids
pp. 26, 27

WL
0.7-4 bar
0.5-94 l/min
90°-120°
p. 24

SC
0.7-4 bar
11.3-640 l/min
90°-120°
metal nozzle
pp. 32, 33

TFXP
0.7-4 bar
2.7-588 l/min
90°-120°
p. 21

TF
0.7-4 bar
2.7-588 l/min
90°-120°
p. 20

MPL
0.7-6 bar
0.44-7.97 l/min
90°-120°
p. 25

Cooling: Pond
Cool pond water; heat recovery

TFXP
0.5-1 bar
75-454 l/min
90°-120°
lumpy liquids
p. 21

TF - full
0.5-1 bar
75-454 l/min
90°-120°
p. 20

TF - hollow
0.5-1 bar
75-454 l/min
90°-120°
p. 45

TH
0.2-1 bar
61-341 l/min
80°-100°
pp. 50, 51

MaxiPass
0.7-1.5 bar
23-341 l/min
90°
pp. 26, 27

Debarking
Remove bark from logs prior to pulping

NF
3-70 bar
4-5250 l/min
30°-90°
p. 61

SPN
3-4 bar
7.9-91.2 l/min
35°-50°
p. 69

Disposal:
Evaporative
Evaporate tailing ponds or volatile waste

TFXP
3-8 bar
10-265 l/min
90°-120°
lumpy liquids
p. 21

TF - full
3-8 bar
10-265 l/min
90°-120°
p. 20

TF - hollow
4-10 bar
6-68 l/min
90°-120°
p. 45

MaxiPass
3-8 bar
21-246 l/min
90°-120°
lumpy liquids
pp. 26, 27

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

NC
0.2-1.5 bar
11-13250 l/min
90°-120°
plastic nozzle
pp. 34, 34

SC
0.2-1.5 bar
7.6-1597 l/min
90°-120°
metal nozzle
pp. 32, 33

MaxiPass
0.2-1.5 bar
4-1930 l/min
90°-120°
lumpy liquids
pp. 26, 27

TC
0.1-0.7 bar
820-13250 l/min
60°-120°
p. 39

IS
0.05-0.7 bar
2-435 l/min
used in pairs
lumpy liquids
p. 114

WL
0.3-1.5 bar
4-57 l/min
90°-120°
p. 24

Drying
Remove excess water after washing or rinsing

NF
3-5 bar
0.6-90 Nm³/h
p. 61

FF
3-5 bar
0.3-90 Nm³/h
pp. 64, 65

SPN
3-5 bar
0.6-90 Nm³/h
p. 69

FINZ
0.7-6 bar
7-65 Nm³/h
p. 117

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

TF
2-5.5 bar
4.5-43 l/min
90°-120°
p. 20

TFXP
2-5.5 bar
19.5-43 l/min
90°-120°
lumpy liquids
p. 21

MaxiPass
3-5.5 bar
9-47 l/min
90°-120°
lumpy liquids
pp. 26, 27

SpiralAir
3-7 bar
1.2-68 l/min
20°-60°
40-220 Nm³/h
pp. 96, 97

L
3-5.5 bar
1-13 l/min
90°
very fine dust
p. 73

P
3-5.5 bar
0.25-14.5 l/min
90°
very fine dust
p. 72

MicroWhirl
70-200 bar
0.09-0.28 l/min
90°
p. 70

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

TF
2-5.5 bar
4.6-43 l/min
90°-120°
p. 20

TF150
2-5.5 bar
20-57 l/min
150°
wide coverage
p. 20

MaxiPass
3-5.5 bar
9-47 l/min
90°-120°
lumpy liquids
pp. 26, 27

TFXP
2-5.5 bar
20-57 l/min
90°-120°
lumpy liquids
p. 21

TF170
2-5.5 bar
20-57 l/min
170°
wide coverage
p. 20

L
3-5.5 bar
1-14.5 l/min
90°
transfer point
p. 73

Etching:
Electronics
Wash and rinse circuit boards and wafers

WL
0.7-3 bar
0.5-15.1 l/min
60°-120°
p. 24

NF (D,S)
0.7-3 bar
0.5-26.5 l/min
50°-120°
pp. 62, 63

SPN
0.7-3 bar
1.8-15 l/min
35°-50°
p. 69

FF
0.2-1.5 bar
0.05-14 l/min
145°
pp. 64, 65

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

EZ FF, NF, SPN
0.2-35 bar
0.05-162 l/min
0°-145°
pp. 66, 67

EZ WL, TF
0.2-35 bar
0.13-206 l/min
30°-120°
p. 30

EZ WL, TF, WT
0.2-35 bar
0.13-206 l/min
30°-120°
p. 46

Color Code:
- Full Cone
- Hollow Cone
- Fan
- Misting
- Air Atomizing
- Tank Washing
- Special Purpose

Fire Protection: Deluge
Protect offshore platforms, storage tanks, hazardous loading areas, and equipment bays

N	TFXP	MaxiPass	TF150
4-10 bar 200-1300 l/min 90°-120° FM approved p. 106	4-10 bar 200-1140 l/min 90°-120° lumpy liquids p. 21	4-8 bar 178-674 l/min 90°-120° lumpy liquids pp. 26, 27	4-10 bar 200-1140 l/min 150° wide coverage p. 20

Fire Protection: Special
Protect coal conveyors; fueling and vulcanizing cabinets; warehouses and munitions storage

N	TF29-180	SpiralAir	CW
4-10 bar 200-1300 l/min 90°-120° FM approved p. 106	4-10 bar 35-246 l/min 180° wide coverage p. 107	3-7 bar 1-72 l/min 20°-40° 37-185 Nm³/h pp. 96, 97	3-14 bar 1-8.3 l/min 80°-120° p. 28

Fire Protection: Water Wall
Protect personnel, evacuation muster areas, equipment, and structures from heat radiation

TF	TF150	TF170	NF (D,S)	FF	TFXP
4-10 bar 200-1140 l/min 90°-120° p. 20	4-10 bar 200-1140 l/min 150° wide coverage p. 20	4-12 bar 200-1140 l/min 170° horiz. spray p. 20	4-8 bar 76-738 l/min 90°-120° pp. 62, 63	4-8 bar 64-570 l/min 145° wall wetting pp. 64, 65	4-10 bar 200-1140 l/min 90°-120° lumpy liquids p. 21

Foam Control
Control build-up of foam in aeration and settling basins; mixing vessels and below weirs; and spillways

MaxiPass	WL	SC	TFXP
0.2-1 bar 6-435 l/min 90°-120° lumpy liquids pp. 26, 27	0.4-1.5 bar 11-53 l/min 90°-120° p. 24	0.2-1 bar 6.3-320 l/min 90°-120° pp. 32, 33	4-10 bar 200-1140 l/min 90°-120° lumpy liquids p. 21

Fog Nozzles
Fine atomization misting; movie special effects

PJ	TF - full	TF - hollow	XA	UltiMist	MicroWhirl
5-15 bar 0.06-2.5 l/min 90° p. 71	3-70 bar 5.5-76 l/min 90°-120° p. 20	4-10 bar 6-68 l/min 90°-120° p. 45	0.7-4 bar 1.1-110 l/h 20°-40° pp. 76-93	40-150 bar 5.3-84 l/hr 50°- 110° p. 74	70-200 bar 0.04-0.60 l/min 20°-70° p. 70

Food Processing
Applying flavorants or colorants

XA	FF
0.7-7 bar 16-227 l/h 20°-120° pp. 76-93	0.7-5 bar 0.1-18.3 l/min 145° pp. 64, 65

Gas Scrubbing
Spray reagent into gas

STXP	ST	MaxiPass	TH	NC	SC
0.4-1 bar 227-2460 l/min 90°-120° recycle slurry p. 23	0.4-1 bar 227-2460 l/min 90°-120° resist erosion p. 22	0.2-1.5 bar 200-1930 l/min 90°-120° recycle slurry pp. 26, 27	0.2-1.5 bar 170-2300 l/min 90°-120° SNBSC avail. pp. 50, 51	0.2-1.5 bar 42-1597 l/min 90°-120° plastic nozzle pp. 34, 35	0.2-1.5 bar 91-1300 l/min 90°-120° metal nozzle pp. 32, 33

Humidification
Humidify air in ducts, drying kilns, curing rooms, greenhouses, and other open areas; area misting

XA	PJ	TF	L	SpiralAir	MicroWhirl
2-4 bar 1.5-113 l/h 20°-40° 1-27 Nm³/h pp. 76-93	4-14 bar 0.5-2.4 l/min 90° p. 71	5.5-14 bar 7-23 l/min 120° hollow cone p. 20	5.5-14 bar 1.5-13 l/min 90° p. 73	4-7 bar 1.1-57 l/min 20°-60° 59-225 Nm³/h pp. 96, 97	70-200 bar 0.04-0.60 l/min 20°-70° p. 70

Large Free Passage Nozzle
Clog resistant; allow lumpy viscous liquids to pass easily

MaxiPass	TFXP	TH
0.2-5 bar 2.8-3400 l/min 30°-120° pp. 26, 27	0.5-20 bar 9.7-10700 l/min 90°- 120° p. 21	0.2-3 bar 15.3-2230 l/min 90°-120° SNBSC avail. pp. 50, 51

Color Code:
- Full Cone
- Hollow Cone
- Fan
- Misting
- Air Atomizing
- Tank Washing
- Special Purpose

Lubrication
Lubricate dies and moulds; roll bite in strip mills

XA
1.5-4 bar
0.4-7 l/h
20°-60°
3-40 Nm³/h
pp. 76-93

NF (D,S)
4-7 bar
0.1-0.4 l/min
65°- 120°
pp. 62,63

BJ
4-7 bar
0.03-0.4 l/min
50°- 80°
pp. 54, 55

Mist Eliminator Wash
Clean mist eliminators in packed or open tower scrubbers

NC
1-3 bar
15.8-114 l/min
90°
pp. 34, 35

MaxiPass
1.5-4 bar
6.4-60 l/min
90°
pp. 26, 27

WL
1.5-5.5 bar
0.7-106 l/min
90°-120°
p. 24

Misting
Moisten paper; mist produce; compost piles of crushed products

UltiMist
15-150 bar
1.8-17 l/hr
60°- 110°
p. 74

PJ
7-150 bar
0.1-50 l/min
90°
p. 71

XA
3-7 bar
0-330 l/h
60°-120°
pp. 76-93

TF - full
3-30 bar
5.5-75 l/min
90°- 120°
p. 20

TF - hollow
4-10 bar
6-68 l/min
90°-120°
p. 45

MicroWhirl
70-200 bar
0.04-0.60 l/min
20°-70°
p. 70

Mixing Eductors
Keep solids suspended by eduction

TurboMix
0.7-7 bar
40-1000 l/min
p. 113

Moistening
Wetting, humidifying products on conveyor

XA
3-7 bar
3.4-320 l/h
60°-120°
pp. 76-93

PJ
7-140 bar
0.1-0.2 l/min
90°
p. 71

LP
4-35 bar
1.9-167 l/min
0°-60°
p. 115

MicroWhirl
70-200 bar
0.04-0.60 l/min
20°-70°
p. 70

Odor Control
Spray odor neutralizing agents

XA
3-7 bar
0-16 l/h
60°-120°
pp. 76-93

PJ
7-150 bar
0.14-5 l/min
90°
p. 71

MicroWhirl
70-200 bar
0.09-0.28 l/min
90°
p. 70

SpiralAir
3-7 bar
1.2-68 l/min
20°-60°
40-220 Nm³/h
pp. 92, 93

Packing
Distribute scrubbing liquor in scrubbers or water in humidifiers

NC
0.2-1.5 bar
11-13250 l/min
120°
plastic nozzle
pp. 34, 35

SC
0.2-1.5 bar
7.6-1597 l/min
90°-120°
metal nozzle
pp. 32, 33

MaxiPass
0.2-1.5 bar
4-1930 l/min
90°- 120°
lumpy liquids
pp. 26, 27

TC
0.1-0.7 bar
820-13250 l/min
60°-120°
metal nozzle
p. 39

IS
0.05-0.7 bar
2-435 l/min
used in pairs
lumpy liquids
p. 114

WL
0.3-1.5 bar
4-57 l/min
90°-120°
p. 24

Pollution Control
Distribute slurry in open towers

STXP
0.4-1 bar
227-2460 l/min
90°-120°
RBSC avail
p. 23

ST
0.4-1 bar
227-2460 l/min
90°-120°
RBSC avail
p. 22

MaxiPass
0.2-1.5 bar
200-1930 l/min
90°-120°
recycle slurry
pp. 26, 27

TH
0.2-1.5 bar
170-2300 l/min
90°-120°
SNBSC avail.
pp. 50, 51

NC
0.2-1.5 bar
42-1597 l/min
90°-120°
plastic nozzle
pp. 34, 35

SC
0.2-1.5 bar
91-1300 l/min
90°-120°
metal nozzle
pp. 32, 33

Pulp Bleaching
Wall wash bleaching tanks

FF
1.5-4 bar
0-196 l/min
105°-145°
pp. 64, 65

NF
3-7 bar
4-36 l/min
20°-60°
p. 61

Quench
Evaporatively quench hot gases

SpiralAir
2-7 bar
2-80 l/min
25-135 Nm³/h
20°-90°
pp. 96, 97

L
5.5-14 bar
1.5-6.8 l/min
90°
p. 73

TF - full
3-8 bar
5.5-84.1 l/min
90°-120°
p. 20

TF - hollow
4-10 bar
6-68 l/min
90°-120°
p. 45

XA
3-4 bar
2.6-167 l/h
20°-40°
1.8-27 Nm³/h
pp. 76-93

PJ
4-70 bar
0.03-5.3 l/min
90°
p. 71

MicroWhirl
70-200 bar
0.04-0.60 l/min
20°-70°
p. 70

Roll Cooling
Cool rolls in steel strip mills

NF (D,S)
0.7-3 bar
0.5-26.5 l/min
60°-120°
pp. 62, 63

Scrubbing: Conditioning
Inject ammonia or water upstream of electrostatic precipitators; inject odor control additives

XA
2-4 bar
1.5-113 l/h
20°-40°
1-27 Nm³/h
pp. 76-93

PJ
4-14 bar
0.05-2.4 l/min
90°
p. 71

L
5.5-14 bar
1.5-6.8 l/min
90°
p. 73

SpiralAir
4-7 bar
1.1-57 l/min
59-150 Nm³/h
20°-60°
pp. 96, 97

MicroWhirl
70-200 bar
0.04-0.60 l/min
20°-70°
p. 70

Scrubbing: Direct Contact
Spray water or reagent slurry into open tower; flue gas desulphurization

STXP
0.4-1 bar
227-2460 l/min
90°-120°
recycle slurry
p. 23

ST
0.4-1 bar
227-2460 l/min
90°-120°
resist erosion
p. 22

MaxiPass
0.2-1.5 bar
200-1930 l/min
90°-120°
recycle slurry
pp. 26, 27

TH
0.2-1.5 bar
170-2300 l/min
90°-120°
SNBSC avail.
pp. 50, 51

NC
0.2-1.5 bar
42-1597 l/min
90°-120°
plastic nozzle
pp. 34, 35

SC
0.2-1.5 bar
91-1300 l/min
90°-120°
metal nozzle
pp. 32, 33

TF
3-8 bar
5.5-84.1 l/min
90°-120°
p. 20

Scrubbing: Dry
Inject lime slurry; inject food and chemical product into spray dryer

SpiralAir
3.5-7 bar
5.3-57 l/min
20°-60°
45-225 Nm³/h
pp. 96, 97

XA
3-4 bar
2.6-167 l/h
20°-40°
1.8-27 Nm³/h
pp. 76-93

WT
4-10 bar
0.45-57 l/min
80°-130°
pp. 40, 41

WTX
4-10 bar
0.45-57 l/min
80°-130°
pp. 42, 43

Self Cleaning Nozzles/ Showers
Clean webs in paper mills, wash or rinse steel strip or conveyor belts

LP
4-35 bar
1.9-167 l/min
30°- 60°
p. 102

Spray Drying
Processing of milk, other foods and chemical products

Twist & Dry
15-350 bar
35.3-5970 l/h
50°- 80°
pp. 108-111

TDL
15-350 bar
11.3-469 l/h
70°-75°
p. 112

TD-K
15-350 bar
11.3-469 l/h
70°-75°
pp. 110, 111

SpiralAir
2-7 bar
2-80 l/min
45-139 Nm³/h
20°-90°
pp. 96, 97

Street Flushing & Cleaning
High impact wash down, clear loose debris from streets; walkways

FF
1.7-7 bar
8.3-74 l/min
145°
wide coverage
pp. 64, 65

SPN
1.7-7 bar
8.3-74 l/min
15°-50°
high impact
p. 69

NF
1.7-7 bar
85-763 l/min
50°-90°
p. 61

Washing: Conveyor

Wash coal, sand, gravel, and crushed rock; pre-wet to reduce dust at hoppers and transfer points

NF (D,S)
0.4-4 bar
5.3-1700 l/min
65°-120°
pp. 62, 63

SPN
0.7-5.5 bar
7.6-106 l/min
15°-50°
high impact
p. 69

FF
0.2-4 bar
1.5-110 l/min
145°
wide coverage
pp. 64, 65

MaxiPass
0.2-3 bar
2.6-144 l/min
60°-120°
lumpy liquids
pp. 26, 27

TFXP
0.5-3 bar
10-159 l/min
90°-120°
lumpy liquids
p. 21

L
3-4 bar
1-11 l/min
90°
transfer point
p. 73

Washing: Intermittent

Periodic wash down of mist eliminator, filter pads, sieve screens, and distribution plates

NC
1-3 bar
15.8-114 l/min
60°-120°
plastic nozzle
pp. 34, 35

MaxiPass
1.5-4 bar
6.4-60 l/min
60°-120°
lumpy liquids
pp. 26, 27

WL
1.5-5.5 bar
0.7-106 l/min
80°-120°
p. 24

SC
1-3 bar
17-121 l/min
60°-120°
metal nozzle
pp. 32, 33

Washing: Parts

High impact parts washing and surface preparation

NF (D,S)
1.5-5.5 bar
0.7-106 l/min
65°-120°
pp. 62, 63

SPN
0.7-5.5 bar
7.6-106 l/min
15°-50°
high impact
p. 69

WL
0.7-4 bar
1.4-98 l/min
90°-120°
p. 24

NC
0.7-3 bar
14-144 l/min
60°-120°
plastic nozzle
pp. 34, 35

SC
0.7-3 bar
11-167 l/min
60°-120°
metal nozzle
pp. 32, 33

SF
1-5.5 bar
2.3-56 l/min
35°-95°
p. 68

Washing: Tank

Rinsing and solvent cleaning of tanks, drums, and process equipment

HydroWhirl S
0.5-4 bar
4.39-338 l/min
360°
p. 99

HydroWhirl Poseidon
0.7-4 bar
58.3-333 l/min
360°
p. 100

HydroWhirl Orbitor
3-10 bar
80-600 l/min
180°, 360°
p. 101

CLUMP
0.7-3 bar
29-224 l/min
360°
lumpy liquids
p. 103

LEM
0.7-5.5 bar
30-530 l/min
360°
even rinsing
p. 104

TW
0.7-5.5 bar
11-273 l/min
210°
very compact
p. 102

Venturi Scrubbing

Keep solids suspended by injection

NCK
0.5-7 bar
23.1-4660 l/min
30°
p. 37

NCJ
0.5-7 bar
23.1-4660 l/min
30°
p. 49

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*
Brass	4	Messing	230°	
Naval Brass	64		400°	
Bronze		Bronze	400°	
L.C. Steel	72	C-Stahl	210°	
303	5	1.4305	430°	
304	6	1.4301	430°	
304L		1.4306	430°	
316	7	1.4401	430°	
Tungsten Carbide	7H			
Alumina	26			
316L	20	1.4404	430°	
317	21	1.4440	430°	
317L	22	1.4438	430°	
416	24	1.4005	430°	
904L	74	1.4539	430°	
Alloy 20	70	2.4660	490°	Carpenter® 20
Nickel Alloy M30C	37	2.4360/2.4366	540°	Monel®
Nickel Alloy 600	35	2.4816	1100°	Inconel® 600
Nickel Alloy 625	3B	2.4856	1100°	Inconel® 625
Nickel Alloy 800	33	1.4876	1010°	Incoloy® 800
Nickel Alloy 825	34	2.4858	1010°	Incoloy® 825
Nickel Alloy B	31	2.4800/2.4810	760°	Hastelloy® B w/2.5 Max. Co
Nickel Alloy G	32	2.4619	1100°	Hastelloy® G
Nickel Alloy G30	49	2.4603	1100°	Hastelloy® G30
Nickel Alloy C276	81	2.4819	1100°	Hastelloy® C276
Nickel Alloy C22	2A	2.4602	1100°	Hastelloy® C22
Nickel	38	Nickel	350°	
Titanium	11	Titan	540°	
Tantalum	40	Tantal	1500°	
Zirconium	61	Zirkonium	540°	
Cobalt Alloy 6	9		1050°	Stellite® 6
SNBSC ceramic	62		1660°	Refrax®
RBSC ceramic	59		1380°	
PTFE	3	PTFE	150°	Teflon®
PVDF	36	PVDF	120°	Kynar®
PVC	1	PVC	60°	
CPVC	16	CPVC	100°	
Polypropylene	2	Polypropylen	70°	
UHMW	17		80°	
Polyurethane	69		80°	
ABS	15		70°	

*** BETE does not represent that it manufactures its products with materials sold under any of these brand names.** Customers sometimes ask for BETE products without using a USA standard specification for the material they require. When materials are described incompletely, with DIN specifications or with a commonly used brand name, BETE will usually supply materials according to the USA specifications listed above. Specifications for forms other than cast or bar may differ from the above.

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

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_2 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 formed to produce John Bete's unique spiral (corkscrew) nozzle which can deliver a fine, high velocity spray at the lowest possible pressure.

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

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.

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

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

It takes eight minutes to heat 27kg of stainless steel to the 1500°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 craftmanship in a state-of-the-art manufacturing facility.

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 nozzle out of the even 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.

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.

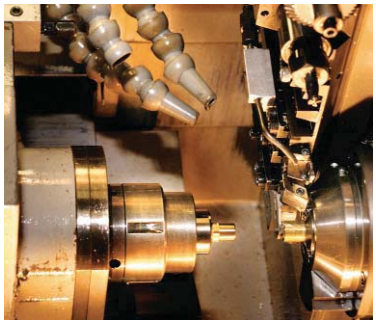
In addition, BETE offers many specialized processes. The welding department, which is fully qualified to ASME B & PV Code Section IX, has made a specialty of

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 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.

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.

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 recommendations 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.

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

BETE Applications 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.

You see, BETE's mission goes far beyond just selling nozzles: it is to provide spraying solutions that meet or exceed customer expectations 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 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 effectiveness. BETE's high-speed "Patternator" provides detailed information on spray density and coverage at various locations in the spray 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.

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

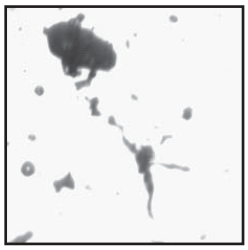
Spray Analysis

The most important function of any nozzle is making your process work correctly. BETE employs multiple methods to analyze nozzle spray characteristics and how they affect your process.

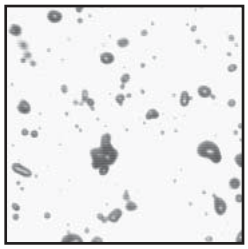
Physical Spray Laboratory Testing

There is no better way to determine nozzle performance than to spray it and measure how it performs. BETE's laboratory is capable of fully characterizing single and two-fluid sprays, including flow rate, spray angle, spray coverage, pattern distribution, and droplet size. Droplet size measurement is performed using a video analyzer, providing robust measurement of spherical and non-spherical droplets alike while allowing a straightforward understanding of this complex topic.

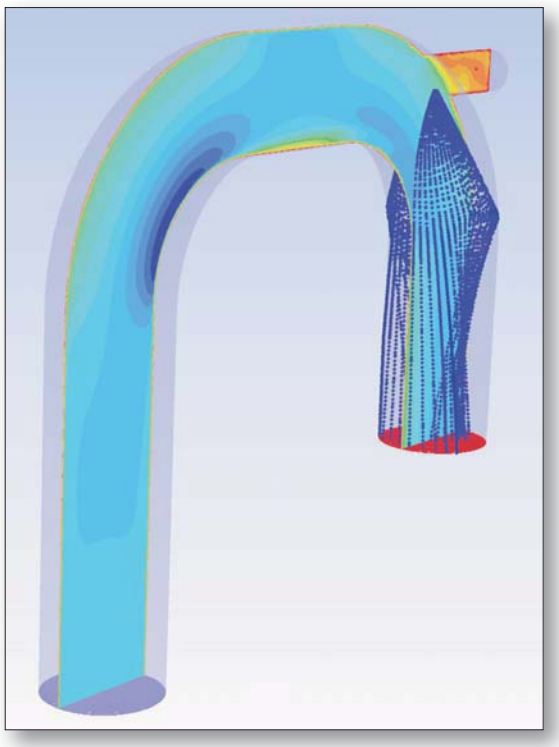
BETE's lab capabilities extend beyond just the nozzle to how the nozzle functions in your process. Gas velocity effects on the spray, elevated temperature tests, lifetime determination tests, and material erosions tests are just a few of the ways that BETE Labs is putting its expertise to work for you.



The BETE Droplet Analyzer is capable of characterizing non-spherical droplets like those seen in this actual image.



Actual droplet images captured using the BETE Model 700 Spray Analysis System.



Computational Fluid Dynamics

When duplicating an industrial process for physical testing is not feasible, computational modeling is an effective alternative. Computational fluid dynamics (CFD) software, coupled with actual spray performance data captured in our laboratory, can model a wide variety of systems to predict distribution, velocity, temperature, flow paths, droplet evaporation, wall hit, and almost any physical quantity. CFD lets you know that your process is going to work before you build it.

Spray Lances

Injectors Quills Spools Fabrications

Visit www.spraylances.com for more information.

BETE takes its ability to provide robust spray nozzles one step further to construct spray assembly fabrications that you can install for immediate use.

Refineries and chemical plants have counted on BETE for decades to supply complete fabricated assemblies, custom designed from the nozzle up. Starting with the process conditions, we recommend the most appropriate nozzle and then incorporate it into an assembly that meets all mechanical design criteria.

BETE works to your requirements, from the most simple to the most complex. Incorporation of client specifications is routine for us as is design, fabrication, and inspection to Code requirements. All design and fabrication work is performed at the same facility, ensuring close coordination through all phases of the process to ensure all mechanical and performance requirements are met.

Design Requirements
- ASME B31.3 and B31.1 NBEP
- Welding qualification to ASME B&PVC, Section IX
- Canadian Registration (CRN)
- NACE compliance

Mechanical Inspections
- RT – Radiographic
- UT – Ultrasonic
- PT – Visible Dye Penetrant
- Hydrostatic
- Hardness
- PMI – Positive Material Identification

Performance Inspections
- Flow
- Spray Angle
- Droplet Size
- Special Customer Requirements

LANCES

Drop-in solutions

Whether you call them lances, quills, or injectors, BETE is your source.

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 in an ISO 9001-controlled shop environment.

Fabrications are BETE's specialty, from complex Code compliant fabrications to simple pipe and flange assemblies. By using BETE as a single source supplier, you can concentrate on your larger process details, knowing that our experience is working for you.

Steam-jacketed fabrication with three spray nozzles installed through the jacket.

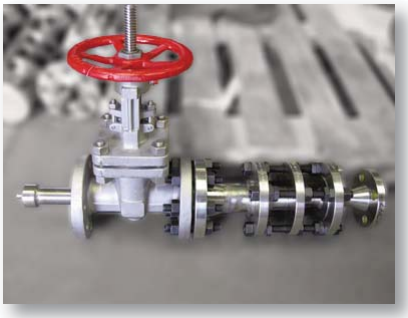
TO ORDER: *specify pipe size, connection type, nozzle number, spray angle, and material.*

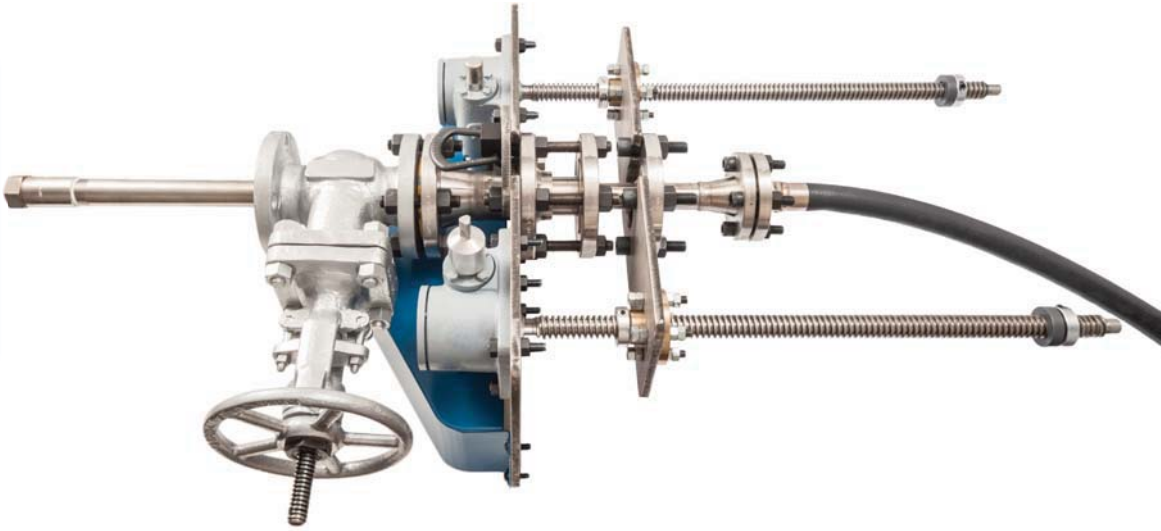
Retractable Lances

Maintenance without downtime

Retractable lances allow you to remove a nozzle for inspection or service without taking your process offline. A retractable lance allows you to withdraw your nozzle, isolate it from the process, and then remove it completely for servicing all while maintaining the integrity of the process boundary. Once the nozzle is serviced or inspected, simply reattach it to the system, open the isolation valve, and insert it back into the process.

For smaller pipe sizes, retractable lances can be inserted and withdrawn manually. For larger sizes, or any size where automation or ease of use is required, BETE offers a robust retraction mechanism that effortlessly moves the lance. A simple cordless drill is all that is required to power the unit, making this design a favorite with maintenance crews. The mechanism is flexible in its configuration, allowing alternate electric, pneumatic, or hydraulic power sources to drive the unit.





Complete retractable system including lance, isolation valve, and retraction mechanism

Spool Sections

Complete spray solutions

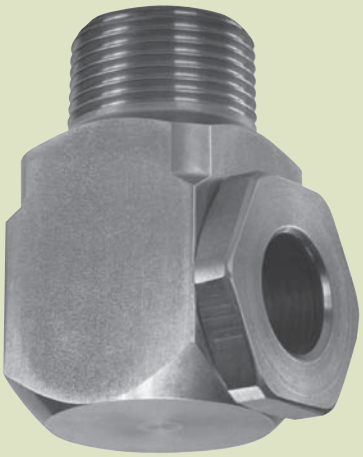
Just as BETE can provide the lance on which the spray nozzle is installed, BETE can also provide the piping section into which the lance is installed. There are many benefits to single-sourcing all components related to the spray nozzle.

When all the work is done by one facility, there are no miscommunications between contractors about size, orientation, or location of the spray ports. The nozzles can be trial fit into the spool piece as part of the manufacturing process before leaving the factory. This translates to no last minute on-site surprises.

BETE provides everything you need from the concept design stage to on-site delivery, right down to the gaskets, studs, and nuts.

WT

Right Angle/Hollow Cone



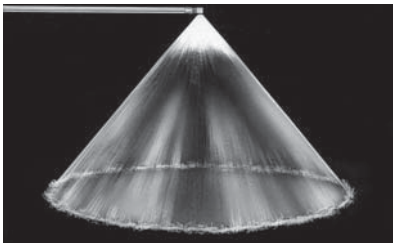
Male Metal

DESIGN FEATURES

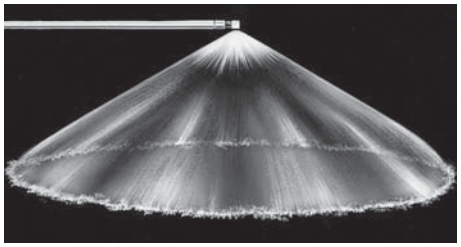
- Conventional design using tangential whirl method of atomization
- Durable
- Use where a circular pattern is required or in large area multiple installations where there is considerable overlapping of sprays
- Male and female connections
- Large free passage

SPRAY CHARACTERISTICS

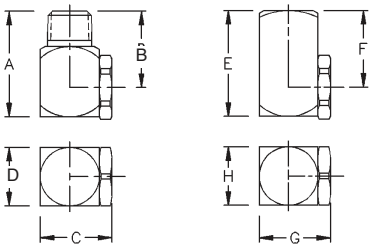
Spray pattern: Hollow Cone
Spray angles: 70° to 120°
Flow rates: 0.125 to 145 l/min



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 0.3 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	7 bar	Approx. (mm) Inlet Dia.	Orifice Dia.	Dimensions for Metal Only (mm) A	B	C	D	E	F	G	H	Wt. (g) 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										

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.

***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 0.3 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	7 bar	Approx. (mm) Inlet Dia.	Orifice Dia.	Dimensions for Metal Only (mm) A	B	C	D	E	F	G	H	Wt. (g) Metal	Plas.
	WT53	80°	1.21	0.662	0.854	1.01	1.21	1.71	2.09	2.70	3.20	2.29	2.79										
	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										
1/4	WT220	120°	5.01	2.75	3.55	4.19	5.01	7.09	8.68	11.2	13.3	4.57	5.59	33.3	25.4	20.1	16.0	28.4	20.6	20.1	16.0	85	21
	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										
	WT100	70°	2.28	1.25	1.61	1.91	2.28	3.22	3.95	5.10	6.03	3.56	3.81										
	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										
3/8	WT260	120°	5.93	3.25	4.19	4.96	5.93	8.38	10.3	13.2	15.7	4.83	5.84	38.1	28.4	24.6	19.1	34.0	24.6	24.6	19.1	85	21
	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										
	WT500	70°	11.4	6.24	8.06	9.53	11.4	16.1	19.7	25.5	30.1	7.62	7.62										
	WT600	70°	13.7	7.49	9.67	11.4	13.7	19.3	23.7	30.6	36.2	8.38	7.87										
1/2	WT800	70°	18.2	9.99	12.9	15.3	18.2	25.8	31.6	40.8	48.2	9.14	9.14	47.5	34.8	31.8	25.4	46.0	33.3	31.8	25.4	276	113
	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										
	WT800	70°	18.2	9.99	12.9	15.3	18.2	25.8	31.6	40.8	48.2	9.14	9.65										
	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										
3/4	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	57.2	41.1	38.1	31.8	55.6	39.6	38.1	31.8	397	227
	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.

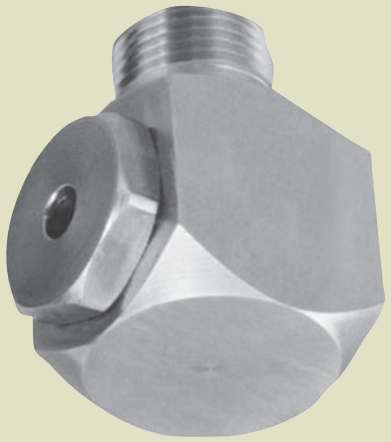
Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

WTX

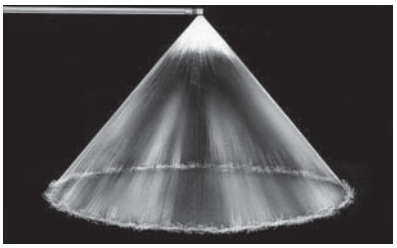
Extended Life/Hollow Cone

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

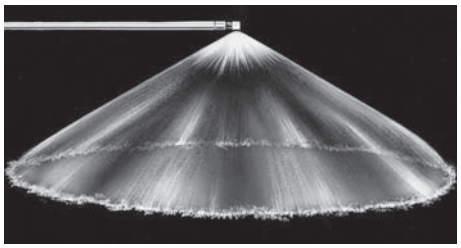
SPRAY CHARACTERISTICS
Spray pattern: Hollow Cone
Spray angles: 70° to 120°
Flow rates: 0.13 to 145 l/min



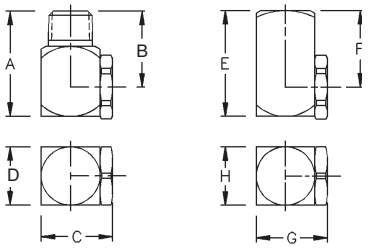
Metal



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 0.3 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	7 bar	Approx. (mm) Inlet Dia.	Orifice Dia.	Dimensions for Metal Only (mm) A	B	C	D	E	F	G	H	Wt. (g) Metal
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									

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.

***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 0.3 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	7 bar	Approx. (mm) Inlet Dia.	Orifice Dia.	Dimensions for Metal Only (mm) A	B	C	D	E	F	G	H	Wt. (g) Metal
	WTX53	80°	1.21	0.662	0.854	1.01	1.21	1.71	2.09	2.70	3.20	2.29	2.79									
	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									
1/4	WTX220	120°	5.01	2.75	3.55	4.19	5.01	7.09	8.68	11.2	13.3	4.57	5.59	33.3	25.4	22.2	19.1	33.3	25.4	25.4	19.1	74
	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									
	WTX100	70°	2.28	1.25	1.61	1.91	2.28	3.22	3.95	5.10	6.03	3.56	3.81									
	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									
3/8	WTX260	120°	5.93	3.25	4.19	4.96	5.93	8.38	10.3	13.2	15.7	4.83	5.84	38.1	28.4	26.9	22.2	34.0	25.4	24.6	22.2	99
	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									
	WTX500	70°	11.4	6.24	8.06	9.53	11.4	16.1	19.7	25.5	30.1	7.62	7.62									
	WTX600	70°	13.7	7.49	9.67	11.4	13.7	19.3	23.7	30.6	36.2	8.38	7.87									
1/2	WTX800	70°	18.2	9.99	12.9	15.3	18.2	25.8	31.6	40.8	48.2	9.14	9.14	47.5	34.8	38.1	31.8	47.8	35.1	38.1	31.8	320
	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									
	WTX800	70°	18.2	9.99	12.9	15.3	18.2	25.8	31.6	40.8	48.2	9.14	9.50									
	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									
3/4	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	57.2	41.1	44.5	38.1	55.6	39.6	44.5	38.1	460
	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.

CW

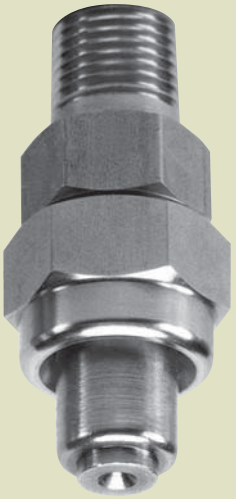
Low Flow

DESIGN FEATURES

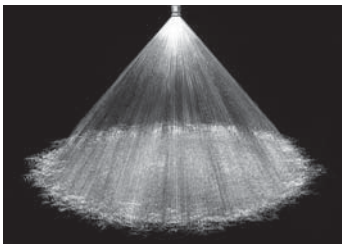
- Standard 3-piece construction
- Optional 50- or 100-mesh strainer (refer to page 119 for additional information)
- Protective cover available
- Male and female connections
- Interchangeable spray tips

SPRAY CHARACTERISTICS

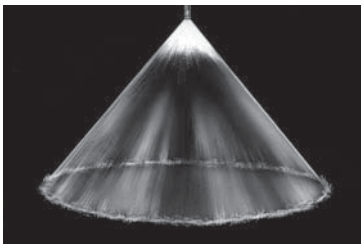
Spray patterns: Hollow Cone (H)
For Full Cone, see page 28
Spray angles: 80° and 120°
Flow rates: 0.424 to 8.39 l/min



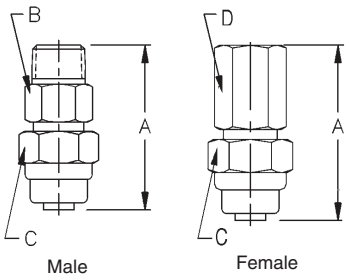
Male Metal



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

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 0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	10 bar	15 bar	Approx. Orifice Dia.(mm)	Male or Female Pipe Size	Dimensions (mm) A	B	C	D	Wt. (g) Metal
1/8 or	CW25-H	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
1/4	CW50-H	1.17	0.848	0.993	1.17	1.63	1.97	2.50	3.47	4.19	1.37						
or	CW75-H	1.76	1.27	1.49	1.76	2.44	2.95	3.75	5.20	6.29	1.60	3/8	52.3	17.5	20.6	20.6	
3/8	CW100-H	2.35	1.70	1.99	2.35	3.25	3.94	5.01	6.93	8.39	2.18						

Flow Rate ($^{l}/_{min}$) $= K$ (*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.

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

TF

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

SPRAY CHARACTERISTICS

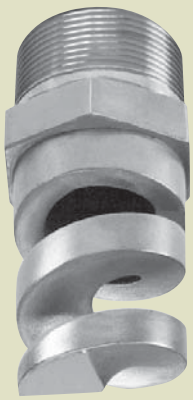
- Wide range of flow rates and spray angles
- Fine atomization

Spray patterns: Hollow Cone

For Full Cone, see page 20

Spray angles: 50° to 180°

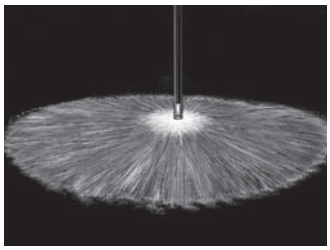
Flow rates: 2.26 to 10700 l/min (Higher flow rates available)



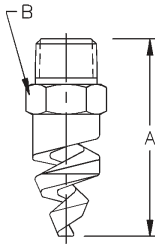
180° Metal

Hollow Cone 50° (N)

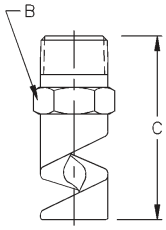
Hollow Cone 120° (W)



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 50°	60°	90°	120°	180°	K Factor	LITERS PER MINUTE @ BAR 0.5 bar	0.7 bar	1 bar	2 bar	3 bar	PTFE not recommended above red line 5 bar	Metal Only above green line 10 bar	20 bar	Approx. (mm) Orif. Dia.	Free Pass. Dia.	Dim. (mm) for Metal Only* A	B	C	Wt. (g) 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			
	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	35	21
	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[1]	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					
	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					
1/2	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	758	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 ($^{l}/_{min}$) $= K\sqrt{bar}$ *Dimensions are for bar stock, cast sizes may vary. [1] 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 - TF10)**

TF8 and TF 24 150° are Factory Mutual approved. Contact BETE for more information.

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

EZ TF WT

EZ Change Quick Connection System

EZTF

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

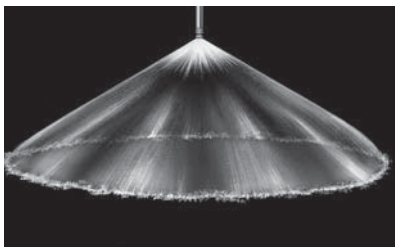
More EZ tips:

Full Cone: page 30
Flat Fan: pages 66 and 67

Flow rates: 0.13 to 206 l/min

Spray Angles:

EZTF: 60°, 90°, 120°, and 180°
EZWT: 70° and 110°



120° Hollow Cone

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

EZTF Flow Rates and Dimensions

Hollow *Cone Spiral 60° (*V*), 90° (*M*), 120° (*W*), 150°, 170° or* 180° (XW*) Spray Angle 1/8" to 1/2" BSP or NPT*

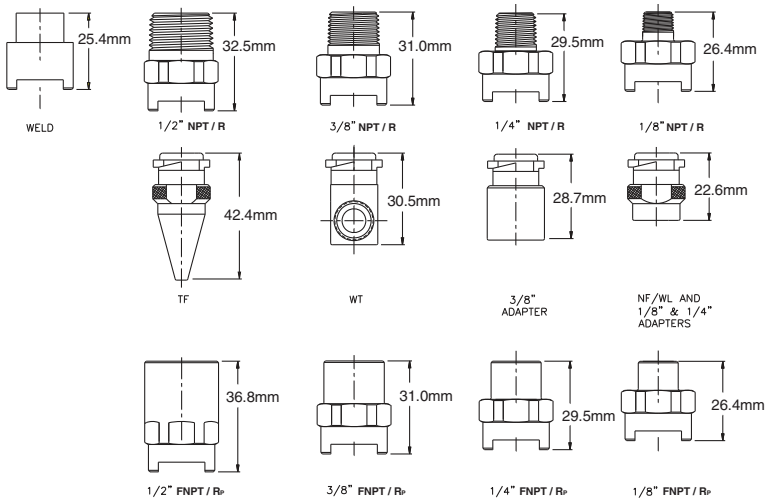
Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR 0.3 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	7 bar	10 bar	15 bar	20 bar	30 bar	Approx. Orifice Dia. (mm)		Approx. Assembly Dim. (mm) Hex	Length	Wt. (g)
1/8"	EZTF6	3.19	1.75	2.26	2.67	3.19	4.51	5.53	7.13	8.44	10.1	12.4	14.3	17.5	2.38	1/8"	22.4	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
	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

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

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



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

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 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	Orifice Dia. (mm)		Approx. Assembly Dim. (mm) Hex	Length	Wt. (g)
	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				
	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	0.794				
	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	1/8"	22.4	41.4	62
	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				
1/8"	**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				
	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				
TO	**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	3/8"	22.4	46.0	74
	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				
	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	1/2"	22.4	47.5	82
	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 $\sqrt{bar}$

Standard Materials: 303 Stainless Steel, 316 Stainless Steel, Brass, Viton gaskets standard.

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 alkalies
- 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

More SF Nozzle Systems:

Full Cone: page 31

Flat Fan: page 68

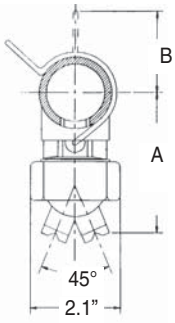
Flow rates: 2.42 - 72.1 l/min

Spray angles:

Fan: 40°, 50°, 65°, 80°, 95°

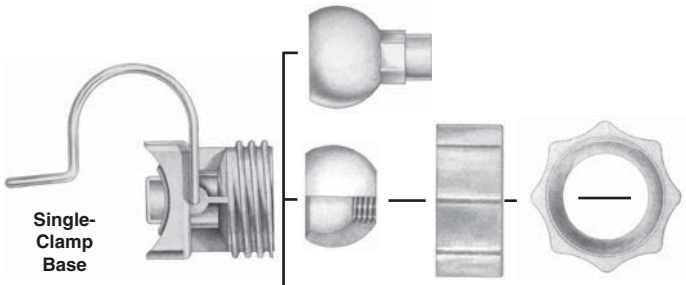
Hollow Cone: 50°, 65°, 90°

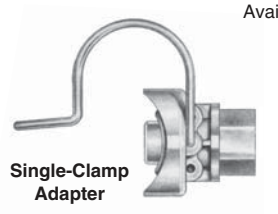
Full Cone: 35°, 65°, 80°



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 female threads; or 1/8" BSP female threads
- 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 0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	7 bar	10 bar	Pipe Size	Body Color	Approx. Dim. (mm) A	B	Wt. (g)
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.

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.

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

NCJ

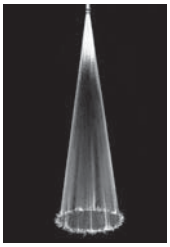
Hollow Cone/Narrow Angle Injector

Metal

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

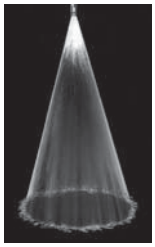
SPRAY CHARACTERISTICS
- Spray is coarse and extremely hard-driving

Spray pattern: Hollow Cone
Spray angles: 15°, 20° and 30°
Flow rates: 23.1 to 4660 l/min
(Special flow rates available)

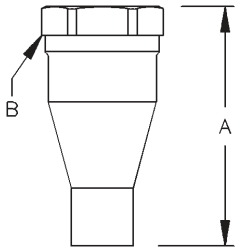


Hollow Cone 15°

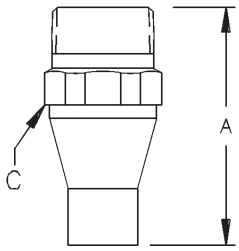
Hollow Cone 20°



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 0.5 bar	0.7 bar	1 bar	1.5 bar	2 bar	3 bar	5 bar	7 bar	Approx. Orifice Dia. (mm)	Dimensions for Metal Only (mm) A	B	C	Wt. (kg) 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

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

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.

TH

Tangential Inlet/Right Angle

Metal

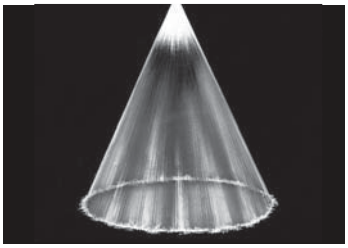
DESIGN FEATURES

- Large free passage
- Clog-resistant; nozzles have no internal parts
- One-piece construction
- Female connection
- Flanged connection available
- Silicon carbide available upon request
- Inlet and outlet are in-line

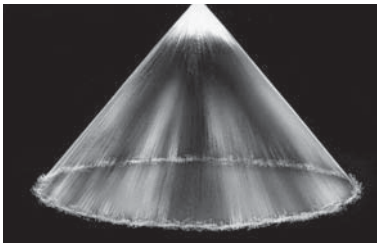
SPRAY CHARACTERISTICS

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

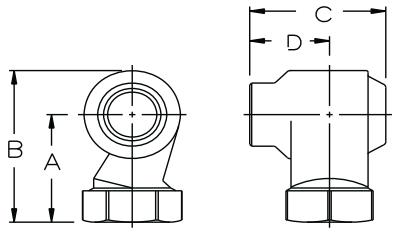
Spray pattern: Hollow Cone
Spray angles: Narrow to Medium
Flow rates: 15.3 to 2230 l/min



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. 0.3 bar	Spray Ang. 1 bar	Spray Ang. 3 bar	K Factor	LITERS PER MINUTE @ BAR 0.2 bar	0.3 bar	0.5 bar	0.7 bar	1 bar	1.5 bar	2 bar	3 bar	Approx. Orifice Dia. (mm)	Free Pass. Dia. (mm)	Dimensions (mm) (MAX) A	B	C	D	Wt. (kg)
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	79.5	63.3	39.4	0.47
	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	74.2	99.3	75.4	46.7	0.75
	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	75.7	105	92.0	57.9	0.85
	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					

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.

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

Silicon Carbide, Flanged

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. 0.3 bar	Spray Ang. 1 bar	Spray Ang. 3 bar	K Factor	LITERS PER MINUTE @ BAR 0.2 bar	0.3 bar	0.5 bar	0.7 bar	1 bar	1.5 bar	2 bar	3 bar	Approx. Orifice Dia. (mm)	Free Pass. Dia. (mm)	Dimensions (mm) A	B	C (MAX)	D (MAX)	Wt. (kg)
2	THF8516	63°	65°	65°	194	86.6	106	137	162	194	237	274	336	21.8	21.8	93.2	132	109	64.5	1.43
	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	126	173	143	88.1	2.94
	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	146	201	162	99.0	4.03
	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

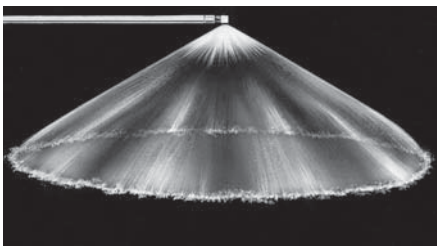
Metal

DESIGN FEATURES

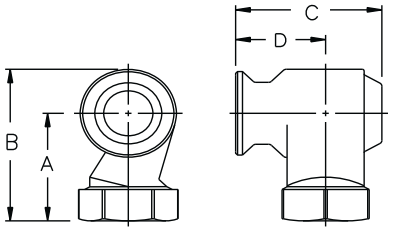
- Large free passage
- Clog-resistant; nozzles have no internal parts
- Wide spray band
- Female connection
- Flanged connection available
- Silicon carbide available upon request
- Inlet and outlet are in-line

SPRAY CHARACTERISTICS

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



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

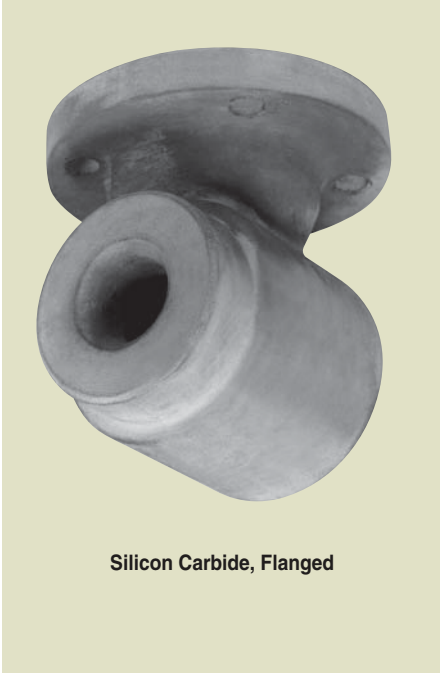
Female Pipe Size	Nozzle Number	Spray Angles 0.3 bar	1 bar	3 bar	K Factor	LITERS PER MINUTE @ BAR 0.2 bar	0.3 bar	0.5 bar	0.7 bar	1 bar	1.5 bar	2 bar	3 bar	Approx. Orifice Dia. (mm)	Free Pass. Dia. (mm)	Dimensions (mm) (MAX) A	B	C	D	Wt. (kg)
1	THFW1508	100°	100°	100°	34.2	15.3	18.7	24.2	28.6	34.2	41.9	48.3	59.2	8.73	8.73	58.7	79.5	63.3	39.4	0.47
	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	120°	120°	120°	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	74.2	99.3	75.4	46.7	0.75
	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	75.7	105	94.0	59.9	0.88
	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					

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

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

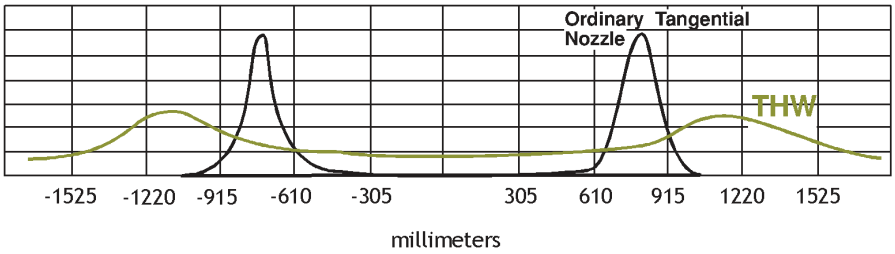
Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

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



Silicon Carbide, Flanged

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 0.3 bar	1 bar	3 bar	K Factor	LITERS PER MINUTE @ BAR 0.2 bar	0.3 bar	0.5 bar	0.7 bar	1 bar	1.5 bar	2 bar	3 bar	Approx. Orifice Dia. (mm)	Free Pass. Dia. (mm)	Dimensions (mm) (MAX) A	B	C	D	Wt. (kg)
2	THFW8516	112°	115°	115°	194	86.6	106	137	162	194	237	274	336	21.8	21.8	92.2	131	117	72.6	1.47
	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	180	156	104	3.20
	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	149	209	182	117	4.29
	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 ($^{l}/_{min}$) $= K\sqrt{bar}$

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

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

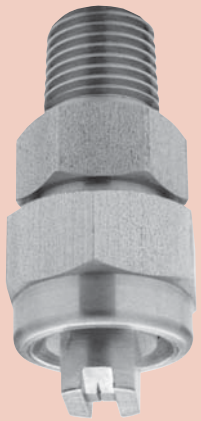
BJ

Low Flow

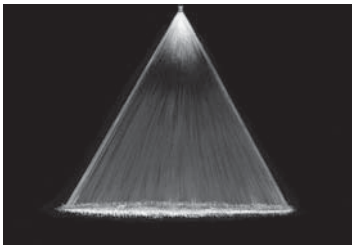
DESIGN FEATURES
- Three-piece construction
- Interchangeable spray tips
- Integral strainer available (refer to page 119 for more information)
- Male and female connections

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

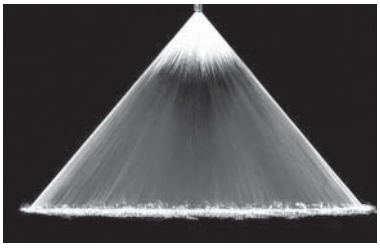
Spray pattern: Flat Fan
Spray angles: 0° to 110°
Flow rate: 0.011 to 101 l/min



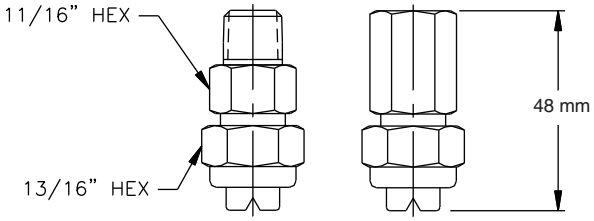
Metal



Fan 50°



Fan 80°



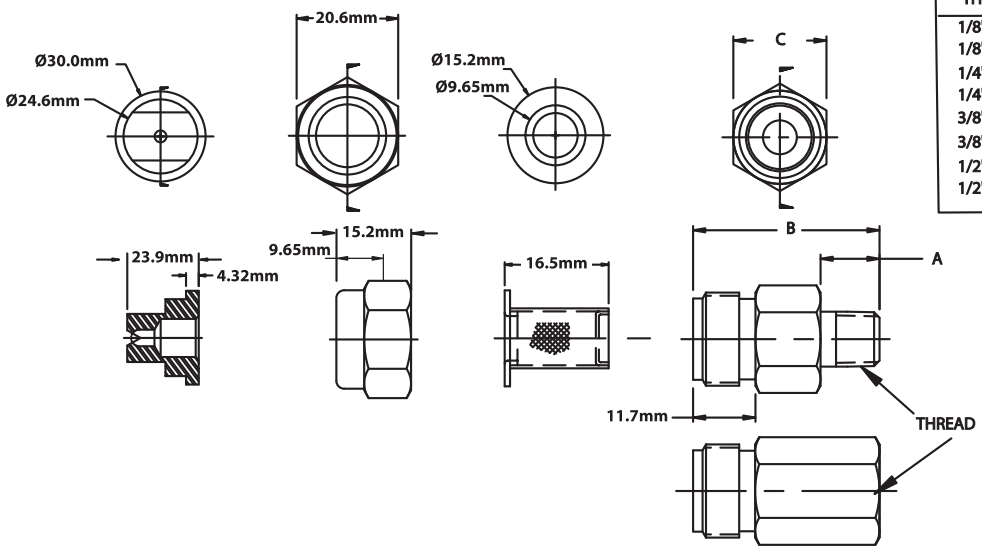
Dimensions are approximate. Check with BETE for critical dimension applications.

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°		
	BJ 0009	0.04	0°											
	BJ 0012	0.05	0°											
1/8"	BJ 0017	0.07		15°	25°	40°	50°	65°						
	BJ 0019	0.07	0°										200	28
	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°					
	BJ 005	0.2	0°	15°	25°	40°	50°	65°		80°				
	BJ 0067	0.26	0°	15°	25°	40°	50°	65°						
1/4"	BJ 0077	0.3							73°				100	28
	BJ 01	0.39	0°	15°	25°	40°	50°	65°		80°	95°	110°		
	BJ 0116	0.46							73°					
	BJ 015	0.59	0°	15°	25°	40°	50°	65°		80°	95°	110°		
OR	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°		
3/8"	BJ 0308	1.22							73°					
	BJ 0385	1.52							73°					
	BJ 04	1.58	0°	15°	25°	40°	50°	65°		80°	95°	110°	50	28
	BJ 0462	1.82							73°					
OR	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°					
	BJ 077	3.04							73°					
	BJ 08	3.16	0°	15°	25°	40°	50°	65°		80°	95°	110°		
1/2"	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°		
	BJ 30	11.8	0°	15°	25°	40°	50°	65°		80°	95°	110°		
OR	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°	50	28
1/2"	BJ 60	23.7		15°	25°	40°	50°	65°		80°	95°	110°		
	BJ 70	27.6		15°	25°	40°	50°	65°		80°	95°	110°		

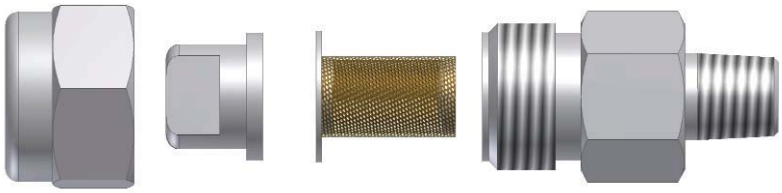
Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

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



THREAD	A	B	C
1/8" MALE	11.2	35.1	11/16"
1/8" FEM	N/A	35.1	11/16"
1/4" MALE	14.2	35.1	11/16"
1/4" FEM	N/A	35.1	11/16"
3/8" MALE	14.2	35.1	11/16"
3/8" FEM	N/A	35.1	13/16"
1/2" MALE	15.7	35.1	7/8"
1/2" FEM	N/A	35.1	1 1/8"

Dimensions in mm,
C-Hex sizes in inches



Cap Nut | Tip | Optional Integral Strainer | Body

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
	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
1/8"	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
	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
1/4"	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	0.91	0.264	0.14	0.19	0.22	0.37	0.53	0.59	0.84	1.18	1.45	1.67
	BJ 015	0.97	0.342	0.19	0.24	0.29	0.48	0.68	0.76	1.08	1.53	1.87	2.16
OR	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
	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
3/8"	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
	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
1/2"	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" OR 1/2"	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
	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

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

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.

HydroPulse

Pneumatically Actuated - Flat Fan

DESIGN FEATURES

- Interchangeable flat fan spray tips
- Pneumatically actuated for crisp on/off spray
- Straight through porting for fluid recirculation
- 303 SS assembly contains all food-grade materials
- Variety of mounting brackets available

SPRAY CHARACTERISTICS

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

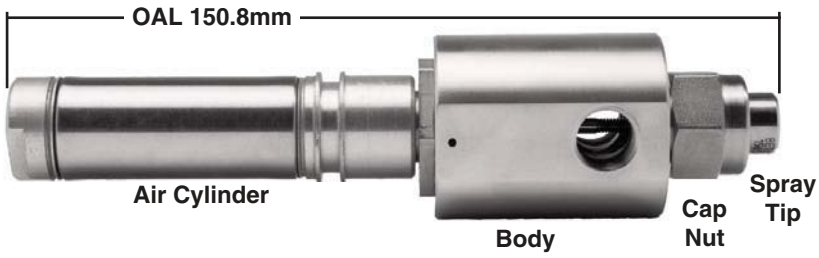
Spray pattern: Flat Fan
Spray angles: 0° to 110°
Flow rate: 0.011 to 101 l/min

HP01 Assembly

HP02 Assembly

- **Fluid Connection Size:** 1/8, 1/4, Female, NPT/BSP
  Two fluid ports are standard; a plug to seal the recirculation port is included.
- **Maximum Fluid Pressure:** 41.3 bar
- **Air Connection Size:** 1/8 Female NPT; 1/8 Female BSP Adapter automatically included when fluid connection is BSP
- **Air Cylinder Pressure:** Minimum: 2 bar; Maximum: 17.2 bar. For larger BJ tips, more pressure may be required to break seal.
- **Operating Temperature Range:** -26° to 204°C. Nylon Mounting Hardware: 121°C MAX
- **Standard Materials:**
  Body: Nickel-plated Brass or 303 Stainless Steel
  Internals: PTFE, Viton, 303SS
  Air Cylinder: Stainless Steel, Anodized Aluminum, PTFE, and Viton®
- **Fluid Seals:** FDA-compliant Viton®
- **Air Cylinder:** Single-acting spring extend type. Air pressure retracts the rod and allows flow through the nozzle. Removing air pressure extends the rod and seals the nozzle. Double-acting cylinder available upon request.
- **Frequency Rating:** Up to 180 cycles/minute, with an appropriate solenoid valve (Cv=0.08 minimum).

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



HP01 Assembly

HP02 Assembly

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

Flat Fan (BJ) - Fan Tip Dimensions

Nozzle Tip Number	Equiv. Orifice Diameter (mm)	K Factor	LITERS PER MINUTE @ BAR							Standard Available Spray Angles*
			0.3 bar	1 bar	2 bar	5 bar	10 bar	20 bar	40 bar	
BJ 0009	0.200	0.021	0.011	0.021	0.029	0.046	0.065	0.092	0.130	0
BJ 0012	0.250	0.027	0.015	0.027	0.039	0.061	0.086	0.120	0.170	0
BJ 0017	0.280	0.039	0.021	0.039	0.055	0.087	0.120	0.170	0.250	15, 25, 40, 50, 65
BJ 0019	0.300	0.043	0.024	0.043	0.061	0.097	0.140	0.190	0.270	0
BJ 0021	0.330	0.048	0.026	0.048	0.068	0.110	0.150	0.210	0.300	0
BJ0023	0.330	0.052	0.029	0.052	0.074	0.120	0.170	0.230	0.330	73
BJ 0025	0.330	0.057	0.031	0.057	0.081	0.130	0.180	0.250	0.360	15, 25, 40, 50, 65
BJ 0033	0.380	0.075	0.041	0.075	0.110	0.170	0.240	0.340	0.480	15, 25, 40, 50, 65
BJ 0039	0.410	0.089	0.049	0.089	0.130	0.200	0.280	0.400	0.560	73
BJ 005	0.500	0.114	0.062	0.114	0.160	0.250	0.360	0.510	0.720	0, 15, 25, 40, 50, 65, 80
BJ 0067	0.580	0.153	0.084	0.153	0.220	0.340	0.480	0.680	0.970	0, 15, 25, 40, 50, 65, 80
BJ 0077	0.580	0.175	0.096	0.175	0.250	0.390	0.550	0.780	1.11	73
BJ 01	0.710	0.228	0.120	0.228	0.320	0.510	0.720	1.02	1.44	0, 15, 25, 40, 50, 65, 80, 95, 110
BJ 0116	0.910	0.264	0.140	0.264	0.370	0.590	0.840	1.18	1.67	73
BJ 015	0.970	0.342	0.190	0.342	0.480	0.760	1.08	1.53	2.16	0, 15, 25, 40, 50, 65, 80, 95, 110
BJ 02	0.990	0.456	0.250	0.456	0.640	1.02	1.44	2.04	2.88	0, 15, 25, 40, 50, 65, 80, 95, 110
BJ 03	1.19	0.684	0.370	0.684	0.970	1.53	2.16	3.06	4.32	0, 15, 25, 40, 50, 65, 80, 95, 110
BJ 04	1.40	0.912	0.500	0.912	1.29	2.04	2.88	4.08	5.77	0, 15, 25, 40, 50, 65, 80, 95, 110
BJ 05	1.55	1.14	0.620	1.14	1.61	2.55	3.60	5.10	7.21	0, 15, 25, 40, 50, 65, 80, 95, 110
BJ 06	1.70	1.37	0.750	1.37	1.93	3.06	4.32	6.11	8.65	0, 15, 25, 40, 50, 65, 80, 95, 110
BJ 08	1.88	1.82	1.00	1.82	2.58	4.08	5.77	8.15	11.5	0, 15, 25, 40, 50, 65, 80, 95, 110
BJ 10	2.18	2.28	1.25	2.28	3.22	5.10	7.21	10.2	14.4	0, 15, 25, 40, 50, 65, 80, 95, 110
BJ 15	2.72	3.42	1.87	3.42	4.83	7.64	10.8	15.3	21.6	0, 15, 25, 40, 50, 65, 80, 95, 110
BJ 20	3.18	4.56	2.5	4.56	6.45	10.2	14.4	20.4	28.8	0, 15, 25, 40, 50, 65, 80, 95, 110
BJ 30	3.67	6.84	3.74	6.84	9.67	15.3	21.6	30.6	43.2	0, 15, 25, 40, 50, 65, 80, 95, 110
BJ 40	3.97	9.12	4.99	9.12	12.9	20.4	28.8	40.8	57.7	0, 15, 25, 40, 50, 65, 80, 95, 110
BJ 50	4.37	11.4	6.24	11.4	16.1	25.5	36	51	72.1	15, 25, 40, 50, 65, 80, 95, 110
BJ 60	4.76	13.7	7.49	13.7	19.3	30.6	43.2	61.1	86.5	15, 25, 40, 50, 65, 80, 95, 110
BJ 70	5.16	16.0	8.74	16.0	22.6	35.7	50.4	71.3	101	15, 25, 40, 50, 65, 80, 95, 110

***HP 02 ONLY**

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

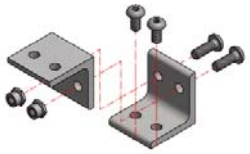
BJ tip materials: Brass, 303SS, and 316SS

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

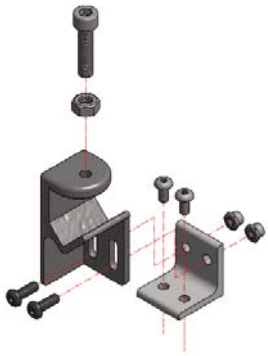
HydroPulse

Optional Mounting Bracket Kits

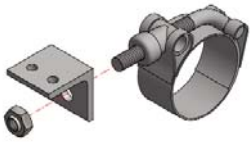
Kit 01
Angle Bracket



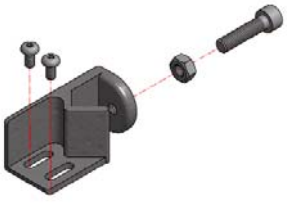
Kit 02
V-Block Bracket



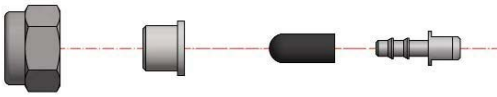
Kit 03
Clamp Bracket

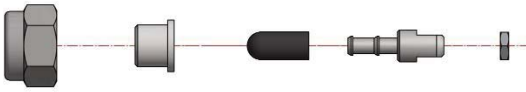


Kit 04
Direct Mount
V-Block Bracket

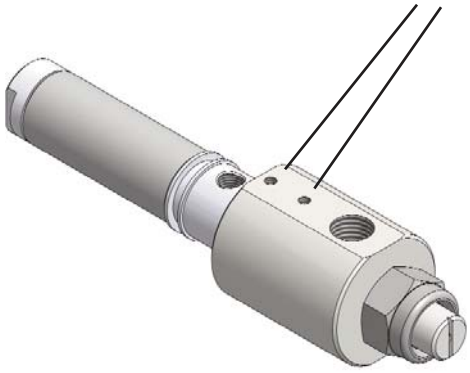


Brackets: 316 Stainless Steel; Hardware: 18-8SS



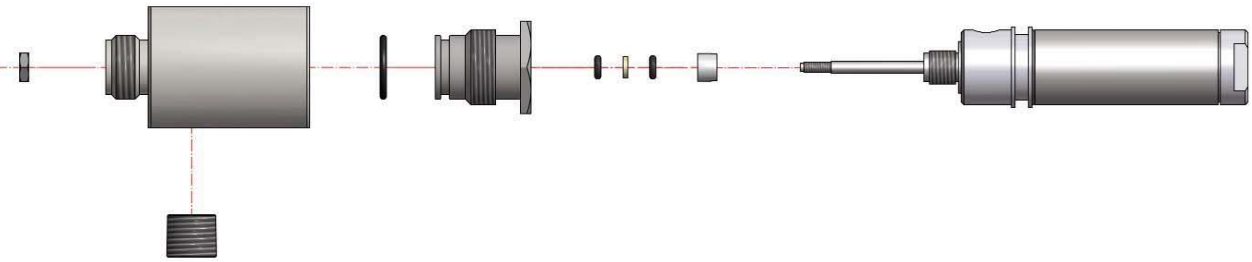


Mounting Bracket Attachment Threads

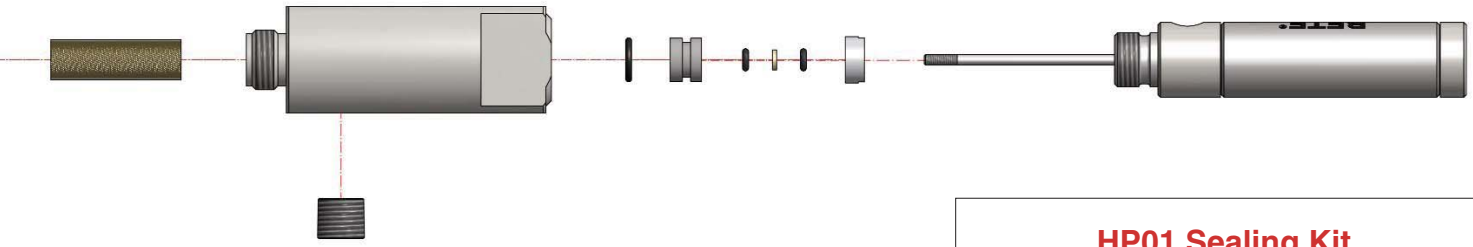


TO ORDER: *specify pipe size, connection type, nozzle number, spray angle, and material.*

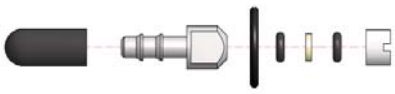
HydroPulse 01



HydroPulse 02



HP01 Sealing Kit



HP02 Sealing Kit

TO ORDER

Spray Set-up Number

1/4	HP01	BJ01	80	A	01	B

- **Size:** 1/8" 1/4"
- **Series Style:** 01 02
- **Tip Series and Number:** BJ (BJ20-70 only available for Body Style 02)
- **Spray Angle**
- **Actuation:** A – HP 01 Pneumatic Cylinder; B – HP 02 Pneumatic Cylinder; C – HP 01 Double-acting Pneumatic Cylinder
- **Mounting Hardware:** 00 (no kit) 01 02 03 04
- **Threads:** B = BSP; omit for NPT

NFV

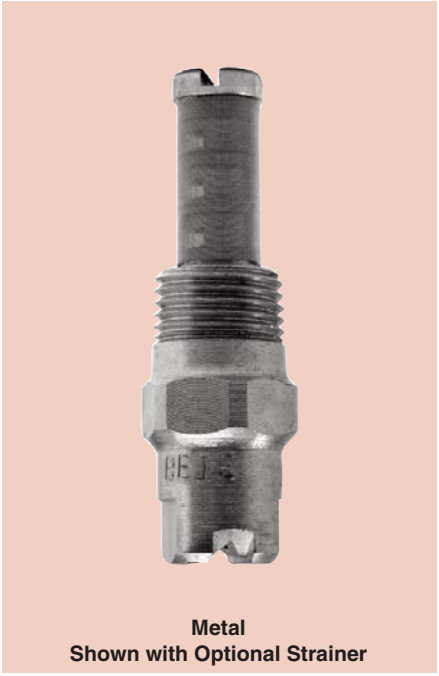
Fan Nozzle with Integral Strainer Option

DESIGN FEATURES
- One-piece construction
- No internal parts
- Male connection
- Low nozzle maintenance
- Optional removable strainer for easy cleaning

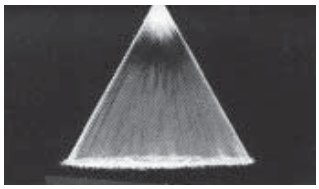
Connections: Male NPT and BSP
Optional Strainer: 50, 100, 200 mesh

SPRAY CHARACTERISTICS
- High impact
- Uniform distribution

Spray pattern: Flat Fan and Straight Jet
Spray angles: 0°, 15°, 25°, 40°, 50°, 65°, 80°, 95° and 110°
Flow rates: 0.039 to 49.85 l/min



Metal
Shown with Optional Strainer



Fan 50°

Call BETE to verify spray angle performance at operating pressures above 30 bar.

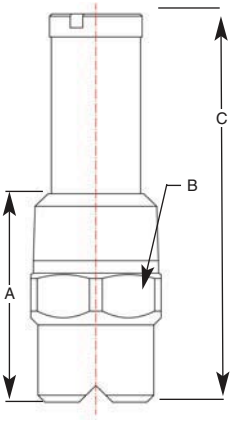
To Order: Spray Set-up Number

1/4 NFV 0067 95 -L -B 303

- 1/4 — pipe size
- NFV — series
- 0067 — nozzle number
- 95 — spray angle
- -L — optional strainer, also specify mesh size
- -B — BSP thread
- 303 — specify material

NFV Dimensions

Pipe Size	Dimensions (mm) A	B	C	Wt. (g)
1/8	22.4	11.2	37.9	28.4
1/4	26.9	14.2	42.9	42.5



1/8" - 1/4" Metal

NFV Flow Rates

Fan and Straight Jet, 0°, 15°, 25°, 40°, 50°, 65°, 80°, 95°, and 110°, 1/8" and 1/4" Pipe Sizes

Male Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR 1 bar	2 bar	3 bar	5 bar	10 bar	30 bar	Equiv. Orifice Dia. (mm)	Screen Mesh Selection Guide
1/8" or 1/4"	NFV0017	0.039	0.039	0.055	0.067	0.087	0.12	0.21	0.28	200
	NFV0025	0.057	0.057	0.081	0.099	0.13	0.18	0.31	0.36	200
	NFV0033	0.075	0.075	0.11	0.13	0.17	0.24	0.41	0.38	200
	NFV005	0.114	0.11	0.16	0.20	0.25	0.36	0.62	0.51	100
	NFV0067	0.153	0.15	0.22	0.26	0.34	0.48	0.84	0.58	100
	NFV01	0.228	0.23	0.32	0.39	0.51	0.72	1.25	0.66	100
	NFV015	0.342	0.34	0.48	0.59	0.76	1.08	1.87	0.79	100
	NFV02	0.456	0.46	0.64	0.79	1.02	1.44	2.50	0.91	100
	NFV025	0.569	0.57	0.80	0.99	1.27	1.80	3.12	1.02	50
	NFV03	0.684	0.68	0.97	1.18	1.53	2.16	3.75	1.09	50
	NFV04	0.912	0.91	1.29	1.58	2.04	2.88	5.00	1.32	50
	NFV05	1.139	1.14	1.61	1.97	2.55	3.60	6.24	1.45	50
	NFV06	1.367	1.37	1.93	2.37	3.06	4.32	7.48	1.57	50
	NFV07	1.598	1.60	2.26	2.77	3.57	5.05	8.75	2.08	50
	NFV08	1.823	1.82	2.58	3.16	4.08	5.76	9.98	1.83	50
	NFV10	2.279	2.28	3.22	3.95	5.10	7.21	12.48	2.03	50
	NFV15	3.418	3.42	4.83	5.92	7.64	10.81	18.72	2.39	50
	NFV20	4.550	4.55	6.44	7.88	10.18	14.39	24.92	2.77	50
	NFV30	6.826	6.83	9.65	11.82	15.26	21.58	37.39	3.58	50
	NFV40	9.101	9.10	12.87	15.76	20.35	28.78	49.85	3.96	50

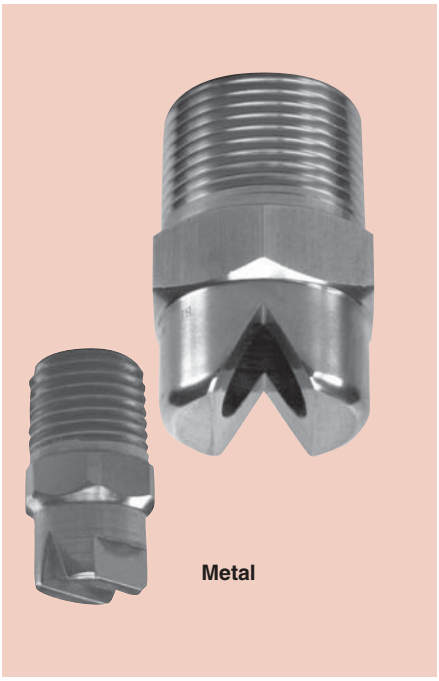
Flow Rate (L/min) = $K\sqrt{bar}$ **Standard Materials: Brass and 303 Stainless Steel. Highlighted NFVs available in 316 Stainless Steel.**

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.*

NF

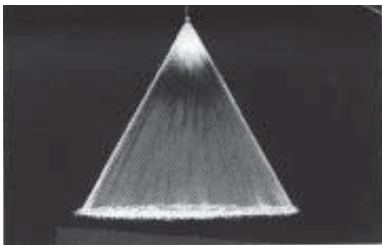
Standard Fan Nozzle



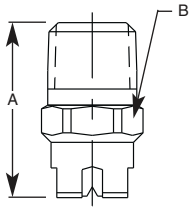
DESIGN FEATURES
- One-piece construction
- No internal parts
- Sizes for all applications
- Male connection

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



Fan 50°



3/8" - 2" Metal

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

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

Male Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR 0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	10 bar	30 bar	Equivalent Orifice Dia. (mm)
	NF01	0.228	0.16	0.19	0.23	0.32	0.39	0.51	0.72	1.25	0.66
1/8	NF015	0.342	0.24	0.29	0.34	0.48	0.59	0.76	1.08	1.87	0.79
	NF02	0.455	0.32	0.38	0.46	0.64	0.79	1.02	1.44	2.49	0.91
or	NF025	0.569	0.40	0.48	0.57	0.81	0.99	1.27	1.80	3.12	1.02
	NF03	0.683	0.48	0.57	0.68	0.97	1.18	1.53	2.16	3.74	1.09
1/4	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
	NF08	1.82	1.28	1.52	1.82	2.57	3.15	4.06	5.74	9.95	1.83
1/8	NF10	2.28	1.61	1.91	2.28	3.22	3.95	5.10	7.21	12.5	2.03
or	NF15	3.42	2.42	2.86	3.42	4.83	5.92	7.64	10.8	18.7	2.38
1/4	NF20	4.56	3.22	3.81	4.56	6.45	7.89	10.2	14.4	25.0	2.78
or	NF30	6.84	4.83	5.72	6.84	9.67	11.8	15.3	21.6	37.4	3.57
3/8	NF40	9.12	6.45	7.63	9.12	12.9	15.8	20.4	28.8	49.9	3.97
1/4	NF50	11.4	8.06	9.53	11.4	16.1	19.7	25.5	36.0	62.4	4.37
or	NF60	13.7	9.67	11.4	13.7	19.3	23.7	30.6	43.2	74.9	4.76
3/8	NF70	16.0	11.3	13.3	16.0	22.6	27.6	35.7	50.4	87.4	5.16
	NF60	13.7	9.67	11.4	13.7	19.3	23.7	30.6	43.2	74.9	4.76
3/8	NF70	16.0	11.3	13.3	16.0	22.6	27.6	35.7	50.4	87.4	5.16
or	NF80	18.2	12.9	15.3	18.2	25.8	31.6	40.8	57.7	99.9	5.56
1/2	NF90	20.5	14.5	17.2	20.5	29.0	35.5	45.9	64.9	112	5.95
	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
1/2	NF150	34.2	24.2	28.6	34.2	48.3	59.2	76.4	108	187	7.54
	NF200	45.6	32.2	38.1	45.6	64.5	78.9	102	144	250	8.73
3/4	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
1	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 1/4	NF800	182	129	153	182	258	316	408	577	999	18.3
	NF1150	262	185	219	262	371	454	586	829	1440	21.8
1 1/2	NF1500	342	242	286	342	483	592	764	1080	1870	24.6
2	NF2250	513	362	429	513	725	890	1150	1620	2810	30.2

NF Dimensions

BSP or NPT

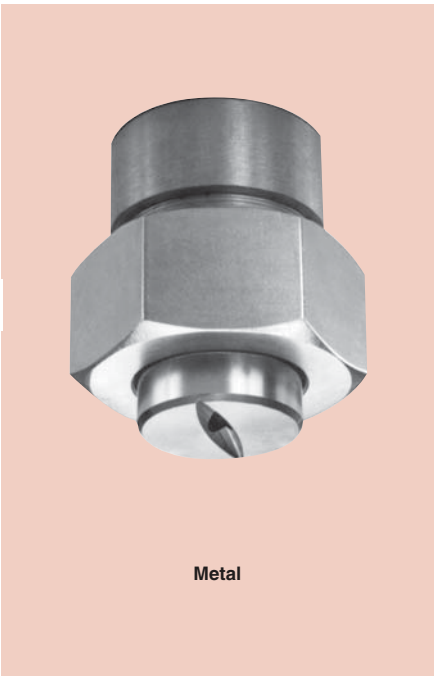
Pipe Size	Dim. for Metal Only (mm) A	B	Wt. (g) Metal	Plas.
1/8	22.2	11.1	28.4	7.09
1/4	27.0	14.3	42.5	10.6
3/8	31.8	17.5	56.7	14.2
1/2	38.1	22.2	85.1	28.4
3/4	44.5	28.6	170	42.5
1	55.6	34.9	227	56.7
1 1/4	63.5	44.5	340	85.1
1 1/2	76.2	50.8	567	142
2	88.9	63.5	1588	284

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

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

NFD

Dovetail Flat Fan



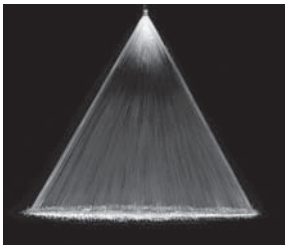
Metal

DESIGN FEATURES

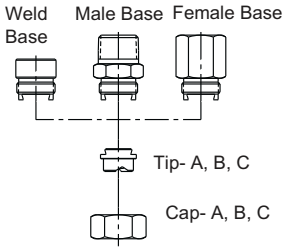
- Dovetail joint guarantees alignment of interchangeable tips
- Dimensionally compatible with other dovetail systems
- Tips offset 5° or 15° for overlapping spray patterns
- Tapered overlapping spray provides uniform coverage
- Male, female and welded connections
- Other sizes available upon request

SPRAY CHARACTERISTICS

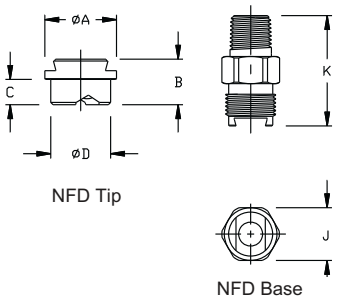
- **Spray pattern:** Flat Fan
- **Spray angles:** 20°, 30°, 45°, 60°, 90°, and 120°. Special angles are available on request
- **Flow rates:** 0.159 to 358 l/min



Fan 45°

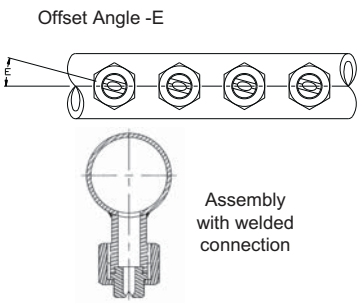


NFD Components



NFD Tip

NFD Base



Assembly with welded connection

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 0.5 bar	1 bar	2 bar	3 bar	5 bar	7 bar	10 bar	Equiv. Orifice Dia. (mm)	Approximate Tip Dimensions (mm) A	B	C	D	E	Wt. (g)	BSP NPT Pipe	Approx. Base Dim. (mm) 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									
	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	14.8						1/4"	17.5	36.5
	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		12			5°	42			
	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			7						
	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				12			3/8"	17.5	36.5
	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									
	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	24						1/2"	22	44.5
	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		15			15°	168			
	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			9				3/4"	28.5	51
	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				20					
	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									
	NFD 195	1-1/4	44.5	31.4	44.5	62.9	77.0	99.4	118	141	10.0	38.5	22	13.5	32	15°	224	1-1/4"	44.5	63.5
	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 $\sqrt{bar}$ ** 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

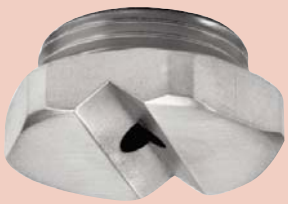
Stubby Flat Fan

DESIGN FEATURES

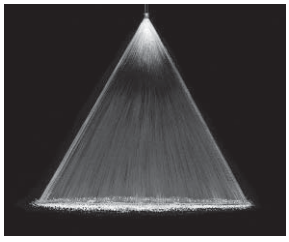
- Extremely short length for minimum projection and maximum clearance
- Produces a flat fan spray pattern available in a variety of spray angles
- Available in straight (parallel) threads only, NPS and G
- Requires gasket to seal connection

SPRAY CHARACTERISTICS

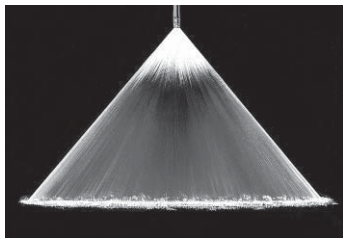
Spray pattern: Fan
Spray angles: 20°, 30°, 45°, 60°, 90° and 120° standard
Flow rates: 0.20 to 951 l/min



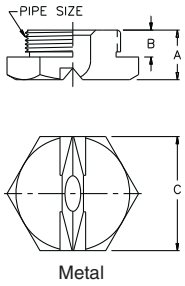
Metal



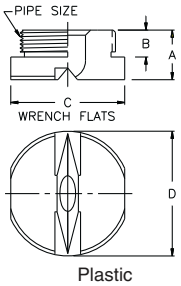
Fan 45°



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 0.5 bar	1 bar	2 bar	3 bar	5 bar	7 bar	10 bar	Equiv. Orifice Dia. (mm)
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
	NFS 77	17.7	12.5	17.7	25.0	30.6	39.5	46.7	55.9	6.00
3/4"	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	7.11		
	NFS 50	20° 30° 45° 60° 90°			17.5	
	NFS 62	45° 60° 90°				
	NFS 77	45°				19.1
3/4	NFS 25 To NFS 77	20° 30° 45° 60° 90° 120°	15.0			
	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°				
	NFS 195	20° 30° 45° 60° 90° 120°				35.1
	NFS 309	20° 30° 45° 60° 90° 120°				
1¼	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 $\sqrt{bar}$

**Available in straight (parallel) threads only, NPS and G

Standard Materials: Brass, 316 Stainless Steel, 303 Stainless Stee,l and PVC

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

FF

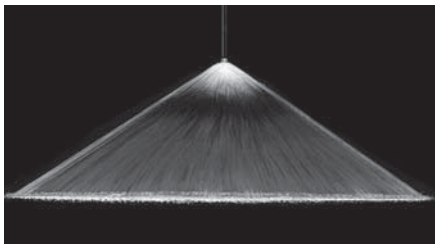
Extra-Wide Angle

DESIGN FEATURES
- One-piece construction
- Clog resistant
- Durable
- All 3/8" FFs in Brass are available with UL approval
- Male connection

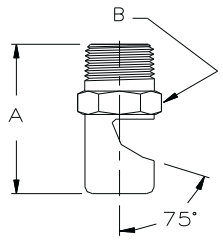
SPRAY CHARACTERISTICS
- Extra-wide 145° spray angle
- Medium-impact spray
- Spray discharge deflected 75° from inlet axis
- Coarse atomization

Spray pattern: Flat Fan
Spray angle: 105° and 145°
Flow rates: 0.510 to 757 l/min

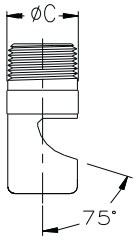
Plastic



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 0.2 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	10 bar	Approx. Orifice Dia. (mm)
	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
1/8	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
	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
1/8	FF104	145°	4.56	2.04	3.22	3.81	4.56	6.45	7.89	10.2	14.4	2.64
or	FF116	145°	5.47	2.45	3.87	4.58	5.47	7.73	9.47	12.2	17.3	2.95
1/4	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
	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
1/4	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

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

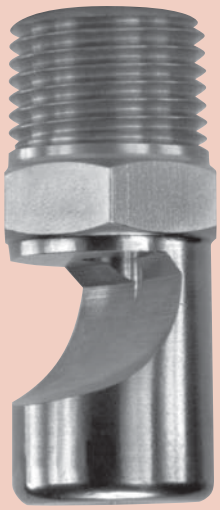
FF Dimensions

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

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).

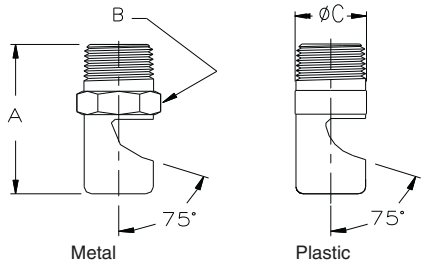
Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

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



Metal

All 3/8" FFs in Brass have UL approval



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 0.2 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	10 bar	Approx. Orifice Dia (mm)
3/8	FF187	145°	13.7	6.11	9.67	11.4	13.7	19.3	23.7	30.6	43.2	4.75
	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
	FF218	145°	18.2	8.2	12.9	15.3	18.2	25.8	31.6	40.8	57.7	5.54
	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
	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
	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
	FF375	145°	54.7	24.5	38.7	45.8	54.7	77.3	94.7	122	173	9.53
	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
	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

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

FF Dimensions

Pipe Size	Dim. (mm) A	B	C	Wt. (g) M	P
3/8	44.5	17.5	19.1	72	15
1/2	50.8	22.4	22.4	117	25
3/4	66.8	38.1	38.1	345	73
1	85.9	50.8	50.8	908	192

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.

EZ FF NF SPN

EZ Change Quick Connection System

EZNF

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.
- Sanitary EZs are available with weld connection and no knurling

SPRAY CHARACTERISTICS

- Available in six standard tips: EZFF; EZNF; EZSPN; EZWL; EZTF, and EZWT

More EZ tips:

Full Cone: page 28

Hollow Cone: page 46

Flow rates: 0.051 to 125 l/min

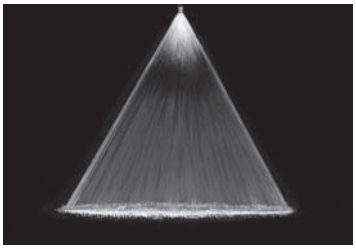
Spray Angle:

EZFF: 105° and 145°

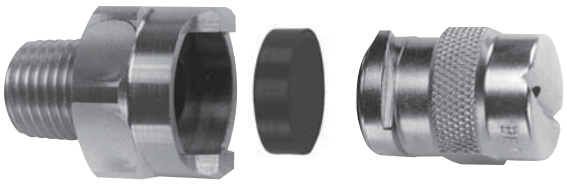
EZNF: 0°, 15°, 30°, 50°, 65°, 80°, 90°, 110°, 120°

EZSPN: 15°, 25°, 35°, 40° and 50°

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 0.2 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	Approx. Orifice Dia. (mm)	Pipe Size	Approx. Assembly Dim. (mm) Hex	Length	Wt. (g)
	EZFF016*	0.114	0.051	0.081	0.095	0.114	0.161	0.197	0.255	0.406				
	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	1/8	22.4	41.4	62
1/8"	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	1/4"	22.4	44.5	62
TO	EZFF093	3.42	1.53	2.42	2.86	3.42	4.83	5.92	7.64	2.36				
	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	3/8"	22.4	46.0	74
	EZFF148	9.12	4.08	6.45	7.63	9.12	12.9	15.8	20.4	3.76				
1/2"	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	1/2"	22.4	47.5	82
1/4"	EZFF218	18.2	8.15	12.9	15.3	18.2	25.8	31.6	40.8	5.31				
TO	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				
	EZFF256	27.3	12.2	19.3	22.9	27.3	38.7	47.4	61.1	6.55				

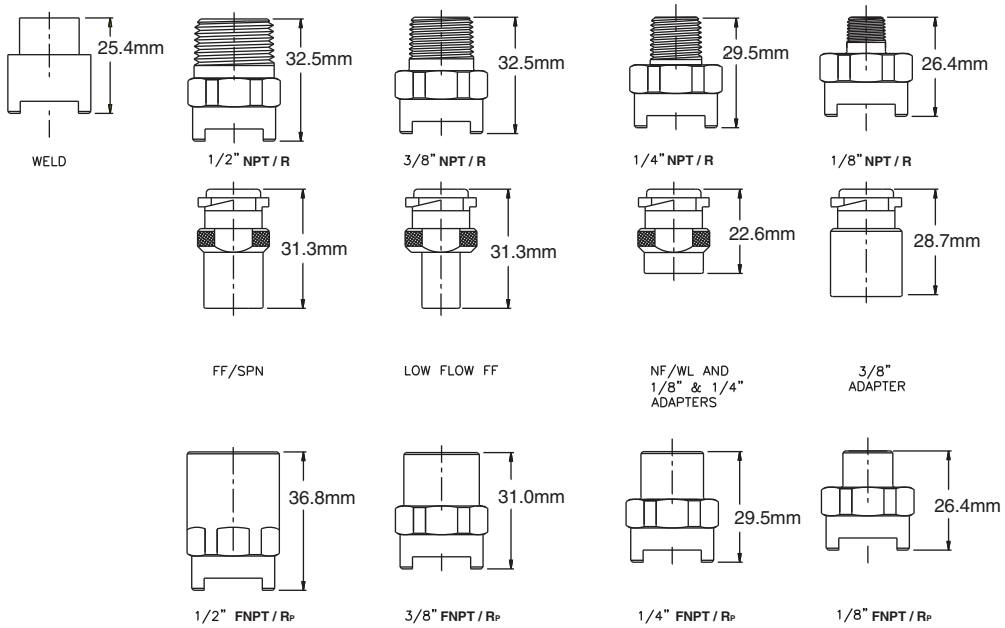
Flow Rate (l/min) = K $\sqrt{bar}$

*Available in 105° only; all others 145°

Standard Materials: 303 Stainless Steel, 316 Stainless Steel, and Brass; Viton gaskets standard.

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.

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 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	Equivalent Orifice Dia. (mm)	Approx. Assembly Dim. (mm)	Hex	Length	Wt. (g)
	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				
	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	1/8"	22.4	41.4	62
	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				
	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				
1/8"	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				
	EZNF05	1.14		0.806	0.953	1.14	1.61	1.97	2.55	3.60	4.41	5.10	6.24	6.74	1.45	1/4"	22.4	44.5	62
TO	EZNF06	1.37	0.612	0.967	1.14	1.37	1.93	2.37	3.06	4.33	5.30	6.12	7.49	8.09	1.57				
	EZNF08	1.82	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				
1/2"	EZNF10	2.28	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				
	EZNF15	3.42	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	3/8"	22.4	46.0	74
	EZNF20	4.56	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				
	EZNF30	6.84	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				
	EZNF40	9.12	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				
	EZNF50	11.4	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	1/2"	22.4	47.5	82
	EZNF60	13.7	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				
	EZNF70	16.0	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				
1/4"	EZNF80	18.2	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				
-1/2"	EZNF90	20.5	9.17	14.5	17.2	20.5	29.0	35.5	45.9	64.9	79.4	91.7	112	121	5.95				

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

Standard Materials: 303 Stainless Steel, 316 Stainless Steel, and Brass; Viton 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 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	Equiv. Orifice Dia (mm)	Deflection Angle @ Spray Angle 15°	25°	35°	40°	50°	Approx. Assembly Dim. (mm)	Hex	Length	Wt. (g)
	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
1/8"	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°				
TO	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° 40° 50°	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°				
1/2"	EZSPN50	35° 40°	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°						
	EZSPN60	15° 35° 40° 50°	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°							
1/4"	EZSPN80	15° 35° 40° 50°	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°					
TO	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
1/2"	EZSPN100	15° 35° 40° 50°	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°					

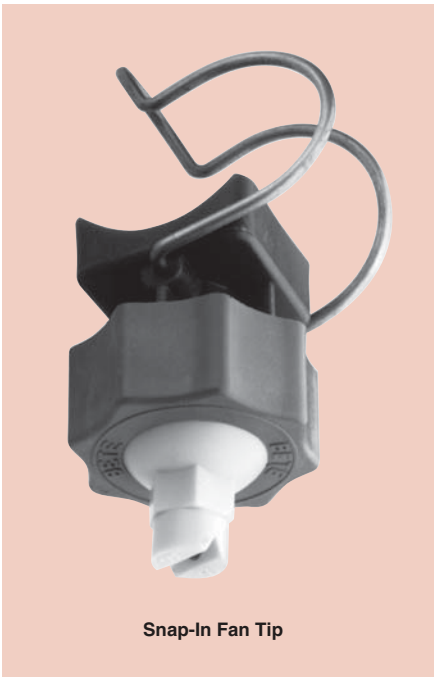
Flow Rate (l/min) = K $\sqrt{bar}$

Standard Materials: 303 Stainless Steel, 316 Stainless Steel, and Brass; Viton gaskets standard.

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

SF

Snap Release Nozzle System



Snap-In Fan Tip

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 alkalies
- Double clamp base or adapter available for higher pressure operation

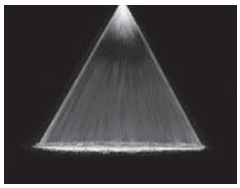
SPRAY CHARACTERISTICS

- Quick Set-up System can be provided with fan, hollow or full cone spray tips
- Full 45° alignment of spray without tools

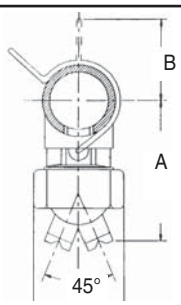
More SF Nozzle Systems:
Full Cone: page 31
Hollow Cone: page 48

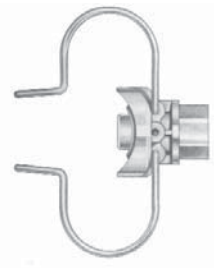
Flow rates: 1.61 to 75.6 l/min

Spray angles:
Fan: 40°, 50°, 65°, 80°, 95°
Hollow Cone: 50°, 65°, 90°
Full Cone: 35°, 65°, 80°

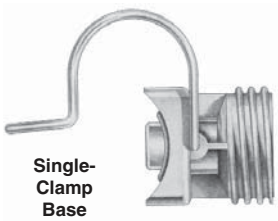


50° Fan

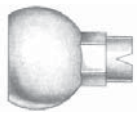




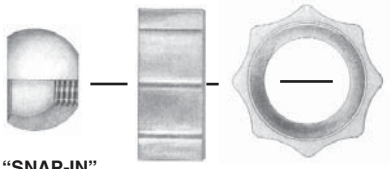
Double-Clamp Adapter



Single-Clamp Base



"SNAP-IN" Flat-Fan Nozzle Tip



"SNAP-IN" Threaded Swivel Ball
Available with 1/8", 1/4", 3/8", 1/2" NPT or BSP Female threads

Retainer Cap

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 female or 1/8" BSP female threads
- Available with single or double clamp.
- **TO ORDER ADAPTER**
  Specify: Pipe Size, thread size, thread type, number of clamps, materials.

Single-Clamp Adapter

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 0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	7 bar	10 bar	Approx. Orifice Dia. (mm)	Pipe Size	Body Color	Pipe O.D. (mm)	Approx. Dim. (mm) A	B	Wt. (g)
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						

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

Standard Materials: Polypropylene, 302 Stainless Steel clamp, EPDM seal.
Optional Materials: 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.

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

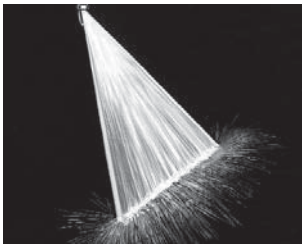
SPRAY CHARACTERISTICS

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

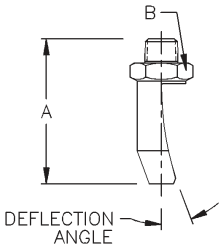
Spray pattern: Fan
Spray angles: 15°, 25°, 35°, 40°, 50°
Flow rates: 0.76 to 177 l/min

Metal

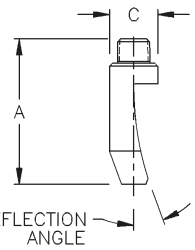
Plastic



Fan 50°



Metal



Plastic

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 0.7 bar	1 bar	2 bar	3 bar	4 bar	5 bar	10 bar	15 bar	Approx. Orifice Dia. (mm)	Deflection Angle @ Spray Angle 15°	25°	35°	40°	50°	Dimensions (mm) Metals Only A	B	C
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° 50°	2.28	1.91	2.28	3.22	3.95	4.56	5.10	7.21	8.83	1.98	5°		35°		55°	50.8	22.4	19.1
	SPN 20	15° 35° 50°	4.56	3.81	4.56	6.45	7.89	9.12	10.2	14.4	17.7	2.77	5°		35°		45°			
	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° 50°	27.3	22.9	27.3	38.7	47.4	54.7	61.1	86.5	106	7.14	5°		25°		40°			
	SPN 125	50°	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° 50°	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° 50°	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° 50°	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°					

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

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.

MicroWhirl®

Fine Atomization

DESIGN FEATURES

- Outstanding atomization
- Rugged pinless design
- Drip-free performance
- 70 micron polypropylene filter
- Safety wire hole available
- Patented design
- Minimum operating pressure 7 bar

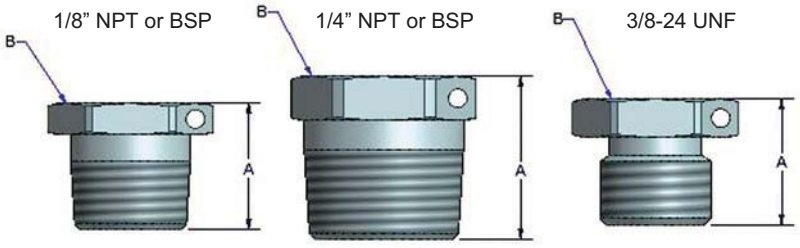
SPRAY CHARACTERISTICS

- 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	
	MW085	0.0122	0.032	0.055	0.077	0.102	0.122	0.145	0.160	0.173	
1/8"	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	7.09
or	MW195	0.0281	0.074	0.126	0.178	0.235	0.281	0.332	0.366	0.397	
3/8"-24UNF	MW275	0.0396	0.105	0.177	0.251	0.332	0.396	0.469	0.517	0.560	
	MW695	0.09988	0.264	0.447	0.632	0.836	0.999	1.182	1.302	1.413	

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

Standard Materials: 303 and 316 Stainless Steel, Polypropylene filter and 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.

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

PJ

Smallest Physical Size

DESIGN FEATURES

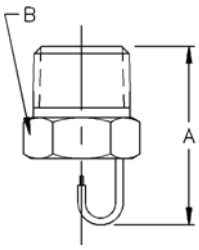
- High energy efficiency
- One-piece, compact construction
- No whirl vanes or internal parts
- 1/8" or 1/4" male connection
- 100-mesh screen, 20 micron paper filter or 70 micron polypropylene filter optional
- Optional welded pin and optional safety wire hole

SPRAY CHARACTERISTICS

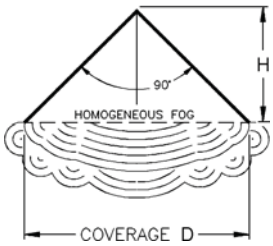
- Finest fog of any direct pressure nozzle

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

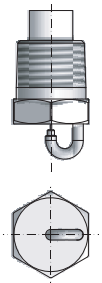
Fog



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 2 bar	3 bar	5 bar	10 bar	20 bar	30 bar	50 bar	70 bar	Approx. Orifice Dia. (mm)	Approx. Cov. D (mm)	Approx. Spray Height H (mm)	Pipe Size	Dim. (mm) A	Dim. (mm) B	Wt. (g) Metal
	PJ6	0.0137			0.031	0.043	0.061	0.075	0.097	0.114	0.152	203	103				
	PJ8	0.0259			0.058	0.082	0.116	0.142	0.183	0.217	0.203	254	127				
1/8	PJ10	0.0387		0.067	0.087	0.123	0.173	0.212	0.274	0.324	0.254	254	127	1/8	19.1	11.1	
	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				7
OR	PJ20	0.153	0.216	0.264	0.341	0.483	0.683	0.836	1.08	1.28	0.508	310	155				
	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	24.6	14.2	
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				
	PJ40	0.638	0.902	1.11	1.43	2.02	2.85	3.49	4.51	5.34	1.02	610	305				

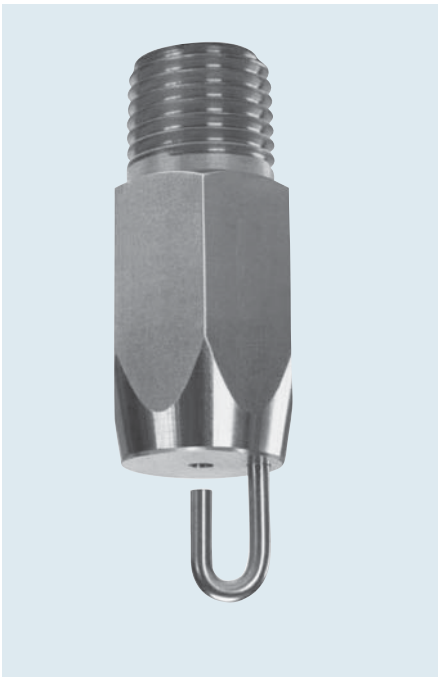
Flow Rate ($^{l}/_{min}$) $= K\sqrt{bar}$

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

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

P

Fine Atomization



DESIGN FEATURES

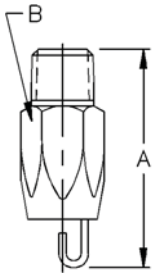
- High energy efficiency
- No whirl vanes or internal parts
- Highly efficient laminar jet impinges on target pin generating fine fog
- Male connection

SPRAY CHARACTERISTICS

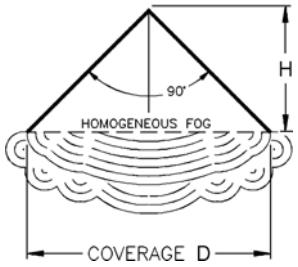
- Finest fog of any direct pressure nozzle

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

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 1 bar	2 bar	3 bar	5 bar	7 bar	10 bar	20 bar	30 bar	Approx. Orifice Dia. (mm)	Approx. Coverage (mm) D	Approx. Spray Height H (mm)	Approx. Dim. (mm) A	B	Wt. (g) Metal
	P20	0.153	0.153	0.216	0.264	0.341	0.404	0.483	0.683	0.836	0.508	300	150			
	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			
1/4	P40	0.638	0.638	0.902	1.11	1.43	1.69	2.02	2.85	3.49	1.02	610	305	46.5	16.0	57
	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			

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.

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

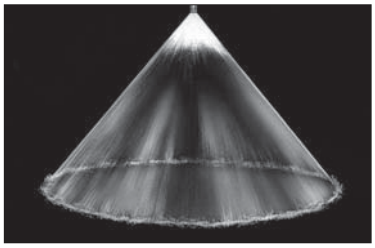
L

Low Flow

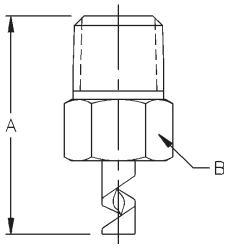
DESIGN FEATURES
- A series of small spiral nozzles with orifice diameters of 1.02mm to 3.05mm
- Male connection

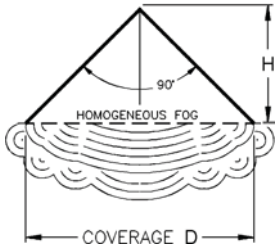
SPRAY CHARACTERISTICS
Spray pattern: Hollow Cone Fog, nearly as fine as P Series
Spray angles: 90° standard (120° available by special order)
Flow rates: 0.534 to14.7 l/min

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

Male Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR 0.7 bar	1 bar	1.5 bar	2 bar	3 bar	4 bar	High Pressure Operation recom. for **Metal Only** 5 bar	7 bar	Approx. Orifice Dia. (mm)	Spray Dimensions (mm) D	H
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
	L48	0.912	0.76	0.91	1.12	1.29	1.58	1.82	2.04	2.41	1.22	690	345
or	L54	1.21	1.01	1.21	1.48	1.71	2.09	2.42	2.70	3.20	1.37	760	380
	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	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

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

L Dimensions
BSP or NPT

Male Pipe Size	Dimensions (mm) A	B	Wt. (g) Metal
1/8"	28.4	14.3	17
1/4"	33.3	14.3	21

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.

UltiMist®

Misting Nozzles

Plastic Nozzle

Metal

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

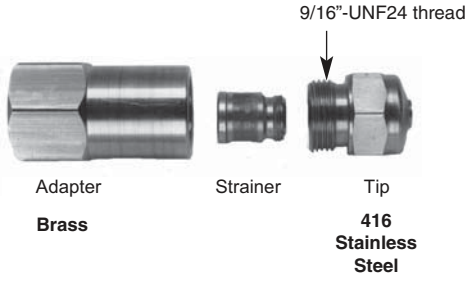
SPRAY CHARACTERISTICS

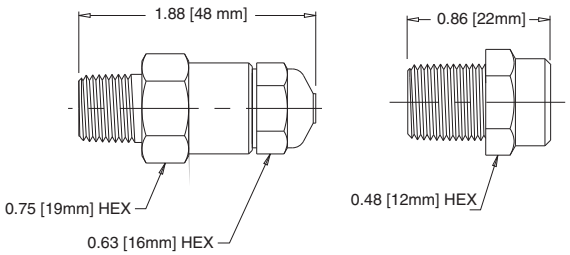
- Very fine, fog-like mist
- Produces high number of droplets under 60 microns

Spray pattern: Hollow Cone
Medium angle

Flow rates: Metal - (1.5 - 61.1 l/hr)
Plastic - (2.5 - 32.6 l/hr)

Mist





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
	UM37M	0.84	1.5	2.7	5.3	7.1	7.5
1/8	**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	**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
1/4	**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

NPT Male Pipe Size	Nozzle Number	K Factor	LITERS PER HOUR @ BAR 3 bar	5 bar	10 bar	20 bar	70 bar
	UML63M	1.44	2.5	3.2	4.6	6.4	12.1
1/8	**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.

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

SS

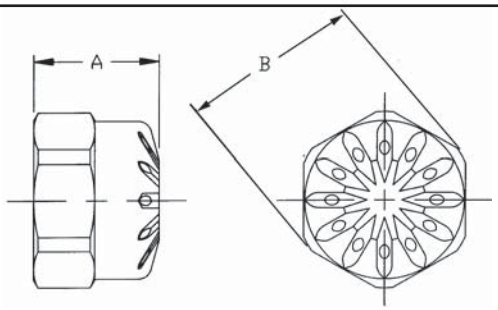
Small Droplet Size Dense Fog

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 0.7 bar	1 bar	2 bar	3 bar	5 bar	10 bar	15 bar	Dimensions (mm) A	B	Wt. (g)
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			

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

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

XA

Low Flow Air Atomizing

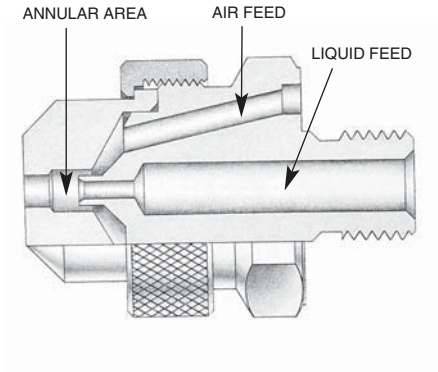
The XA nozzle system uses the energy in compressed air to produce highly atomized sprays at low flow rates. There are many interchangeable components that can be assembled to achieve a variety of spraying objectives.

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.

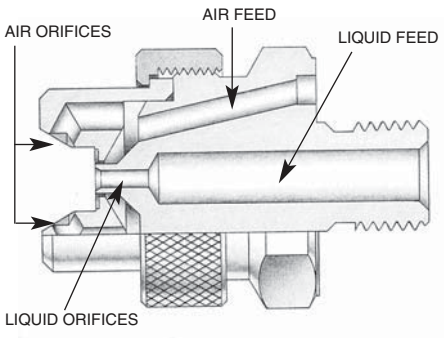


Cutaway View: Internal Mix Set-up

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.



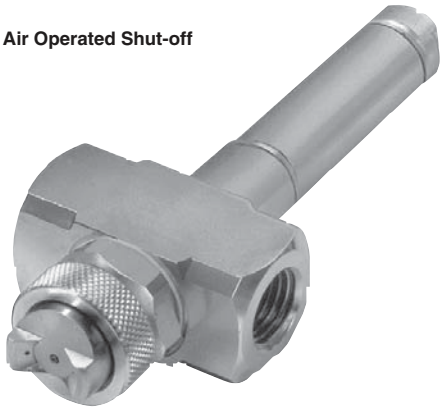
Cutaway View: External Mix Set-up

Siphon Set-ups

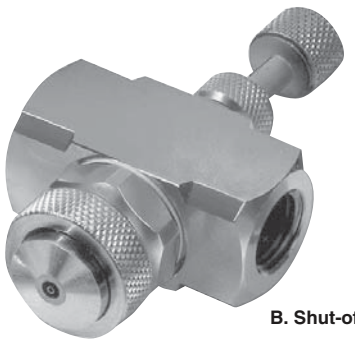
Internal and External Mix Set-ups require the liquid to be supplied to the nozzle under pressure from a municipal water supply, pump, or pressure pot. Siphon Set-ups use the flow of compressed air within the nozzle to siphon liquid from a container. Siphon Set-ups are frequently used for spraying additives from a container without the use of a pump. They provide the

A. End Plug

E. Air Operated Shut-off



D. Clean-out/Shut-off



B. Shut-off

Bold letters (A, B, C, D, E, F) refer to hardware assemblies shown on p. 78.

TO ORDER: *specify pipe size, body style, spray set-up #, hardware and mounting assemblies, and material. See page 78.*

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 dia-meter 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.


PR Air Cap


Fluid Cap


SR Air Cap


FF Air Cap


ER Air Cap


EF Air Cap

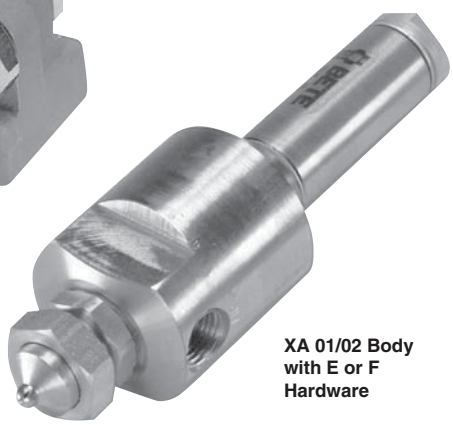

XW Air Cap


PF Air Cap


XA03 Body


XA00 Body
with C Hardware


XA05 Body


XA 01/02 Body
with E or F
Hardware

XA Components & Options

Spray Set-up

Air Caps

ER
SF
SR
PR
PF
AD
EF
FF
XW

Fluid Cap

Front Gasket

Body Styles and Seals

XA 05 Spray parallel to parallel inlets

XA 00 - standard

Rear Gasket

Replaceable E or F Tip assembly

Adapter

XA 03 spray perpendicular to parallel inlets

XA 01

Replaceable E or F Tip assembly

XA 02

Rear Gasket

Mounting Bracket

Thick & Thin Wall Mounting Adapter

Thin Wall Mount Lock Nut

Thin Wall Mounting Gasket

XA 07 Diminutive body spray perpendicular to 1/8" parallel inlets

XA 06 (4-5 spray setups) Parallel inlets

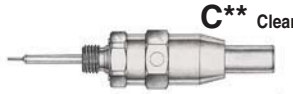
XA 08 Directional spray, 2 nozzle spray setups

XA 12 Spray parallel to parallel inlets. With mounting holes

Hardware Assemblies

A End Plug

B Shut-off



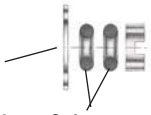
C** Clean-out

D** Clean-out/Shut-off

E Air-operated Shut-off

F** Air-operated Clean-out/Shut-off

Seal Kit: 39572



Rear Gasket
Bushing
Large O-rings

Replaceable Components and Gaskets

Seal Kit	Thick & Thin Wall Mount Adapter
Front Gasket	Thin Wall Lock Nut
Rear Gasket	Thin Wall Mounting Gasket
Body Seal	Mounting Bracket
Cap Nut	
Adapter	**E** - Replacement Tip
	F - Replacement Tip**

**Specify fluid cap

TO ORDER

Spray Set-up Number

1/4 XA 01 PR 250 E 01 12

- Sizes and Series: 1/8"B, 1/4"B, 1/2"B - BSP; 1/8", 1/4", 1/2" - NPT
- Body Styles: 00 01 02 03 05 06 07 08 12
- Air Cap Style: PR FF AD XW PF EF SR SF ER
- Combination Number
- Hardware Assemblies: A B C D E F
- Mounting Hardware: 01 02 03
- Extension Size*: 12"

*For extensions, A hardware is standard; E and F hardware may be provided on an application-specific basis.

TO ORDER: *specify pipe size, body style, spray set-up #, hardware and mounting assemblies, and material.* *See page 78.*

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.

Corrosion-resistant XA in PVC

SPRAY EXTENSIONS

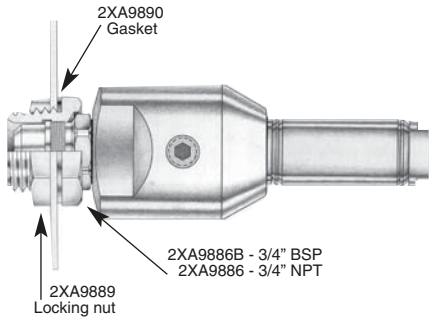
The spray set-up can be moved away from the nozzle body by using optional 152mm or 305mm extensions. These allow the spray to be moved closer to the target while keeping the nozzle body and associated piping at a distance.

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

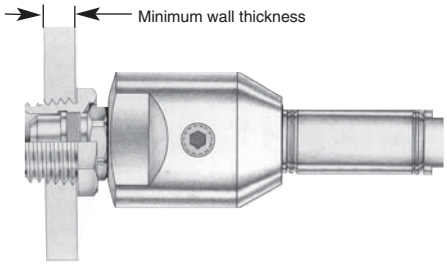
Three-piece adapter used to support an XA nozzle with the body located outside a tank or duct having a relatively thin (less than 10mm) wall and the spray directed into the interior. To use this adapter, a 27mm diameter hole must be drilled through the wall. This adapter both secures the air cap and 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 12 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.

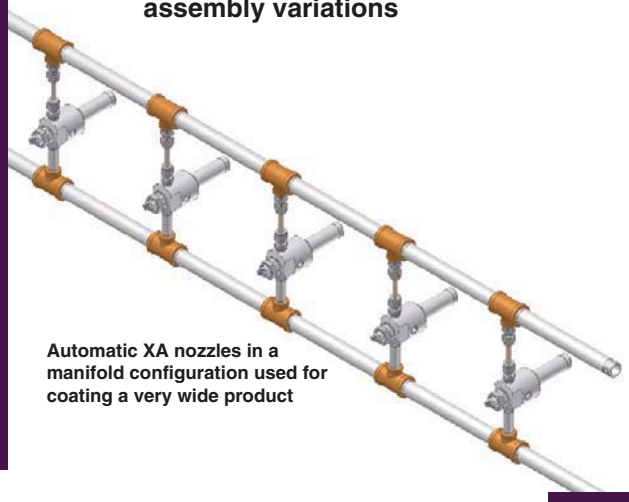
Seals

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.

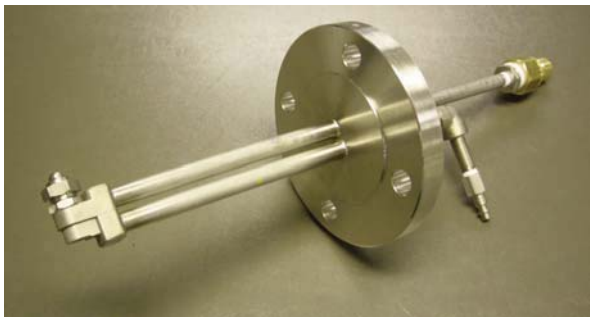
The standard material for O-rings in XA automatics is Viton®. Other materials available on request.

XA03 Mounting Bracket

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



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



Spray lance (see pages 18, 19) with a right angle XA and quick-connect fittings

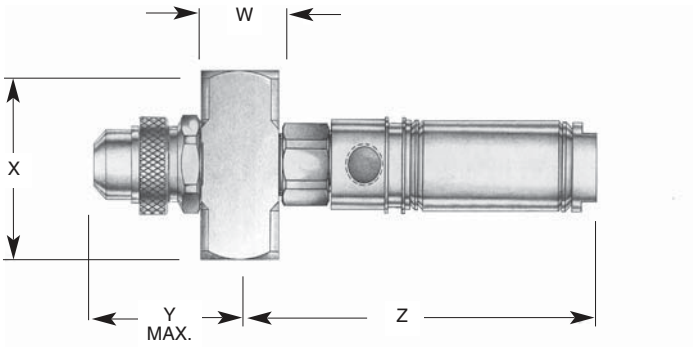
TO ORDER: *specify pipe size, body style, spray set-up #, hardware and mounting assemblies, and material. See page 78.*

Spray Set-up Numbers

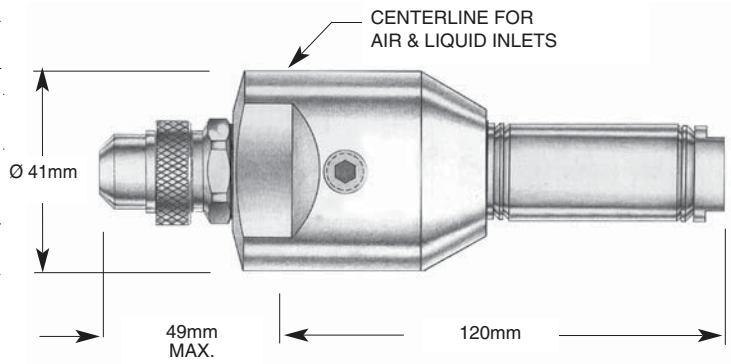
SPRAY SET-UP		PIPE SIZE BSP or NPT	SET-UP NO.	FLUID CAP	AIR CAP
EF	FLAT FAN (EXTERNAL MIX)	1/8 OR 1/4	EF 050	FC7	AC1001
			EF 100		AC1003
			EF 150	FC4	AC1001
			EF 200		AC1003
			EF 250	FC3	AC1001
			EF 300		AC1003
			EF 350	FC6	AC1002
			EF 400		AC1004
			EF 450	FC2	AC1002
			EF 500		AC1004
			EF 550	FC1	AC1002
			EF 600		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 OR 1/4	SF 050	FC3	AC1101
			SF 100	FC6	AC1102
			SF 150	FC2	AC1103
			SF 200	FC2	AC1104
SR	SIPHON ROUND	1/8 OR 1/4	SR 050	FC7	AC1201
			SR 150	FC4	AC1201
			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 OR 1/4	PF 050	FC4	AC1301
			PF 100	FC3	AC1303
			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 OR 1/4	PR 050	FC4	AC1501
			PR 100	FC4	AC1502
			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 OR 1/4	AD 050	FC4	AC1601
			AD 100	FC2	AC1603
			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
ER	NARROW ANGLE ROUND	1/8 OR 1/4	ER 050	FC7	AC1801
			ER 150	FC4	
			ER 250	FC3	
			ER 350	FC6	AC1802
			ER 450	FC2	
			ER 550	FC1	
			ER 650	FC3	AC1803
			ER 750	FC9	
			ER 850	FC5	

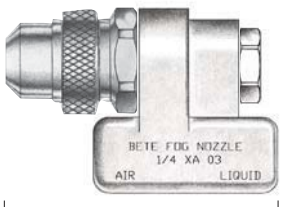
Dimensions with Hardware Options for XA00 Body, BSP or NPT

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

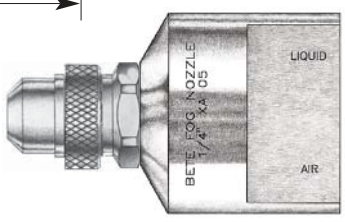




41.3mm

Overall Dimensions for Assemblies with XA03 Bodies

54mm
MAX.



Ø
41.3mm

Overall Dimensions for Assemblies with XA05 Bodies

66.7mm
MAX.

AIR ATOMIZING

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

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.

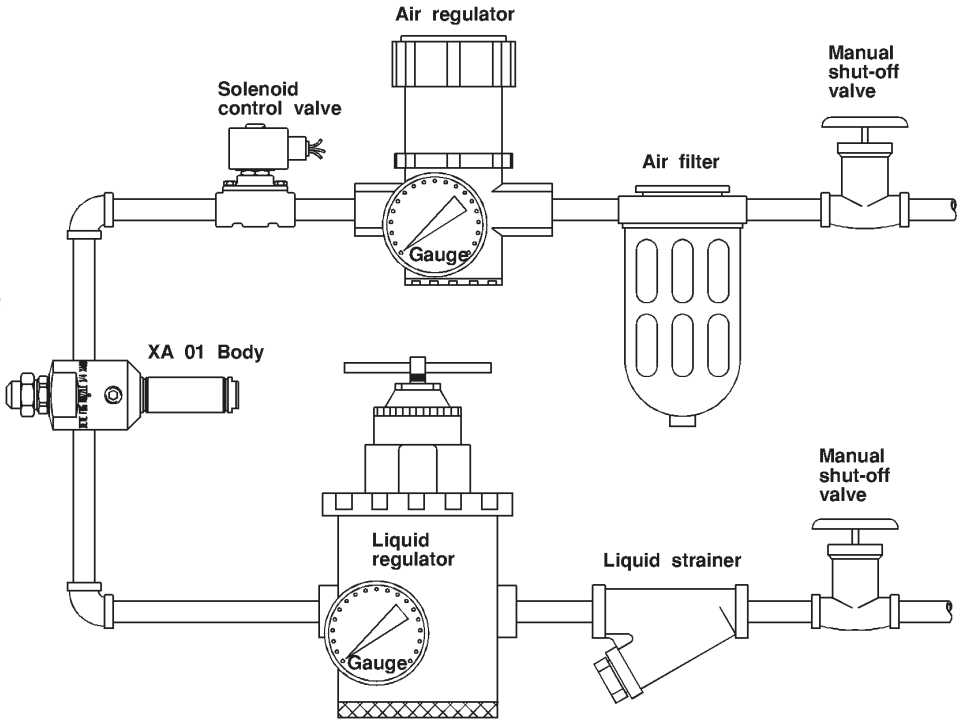
Contact your BETE representative for details.

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 pres-sure, 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.



PRESSURE SYSTEM

Siphon System Set-up

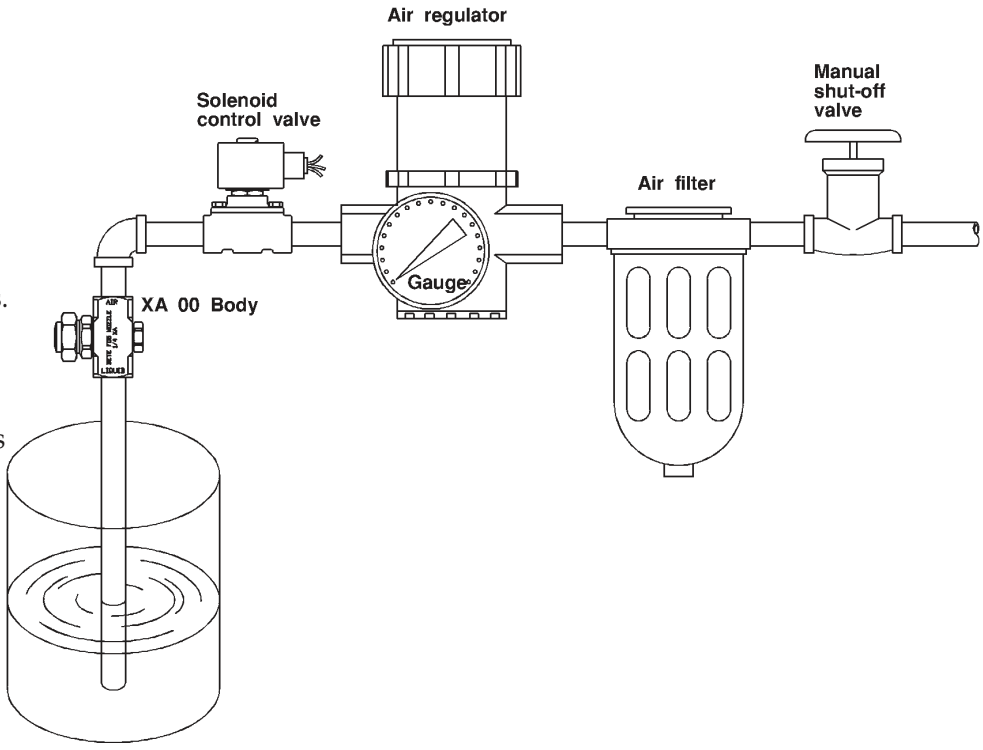
In a siphon-fed system, the liquid is supplied by either a siphon or gravity feed.

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.



SIPHON SYSTEM

TO ORDER: *specify pipe size, body style, spray set-up #, hardware and mounting assemblies, and material. See page 78.*

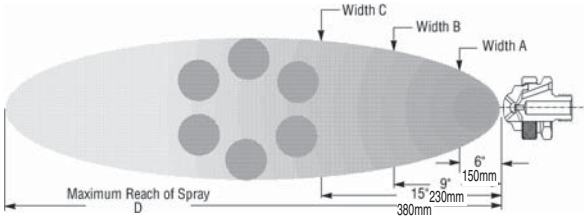
XA AD

Pressure-fed/Int. Mix/Wide Angle Round

1/4" XA AD100 C
XA 00 Body; C Hardware

DESIGN/SPRAY CHARACTERISTICS

- Internal mix
- Very fine atomization
- 70° Hollow Cone spray pattern
- Moderate forward spray projection



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^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	Bar air	Bar liquid	A (mm)	B (mm)	C (mm)	D (m)
1/8 OR 1/4	AD 050	Fluid Cap FC4 & Air Cap AC1601	0.6 0.7 0.9 1.0	**5.3** **4.3** **3.0** **1.7**	0.60 0.72 0.84 1.02	1.1 1.3 1.4 1.5 1.7 1.8	**8.1** **7.0** **6.4** **5.5** **4.5** **3.5**	0.79 0.88 0.94 1.01 1.16 1.30	1.5 1.8 2.1 2.4	**8.1** **6.6** **4.9** **3.2**	0.92 1.09 1.32 1.68	2.4 2.7 3.0 3.2 3.4 3.5	**8.9** **8.1** **6.4** **4.9** **4.2** **3.4**	1.24 1.40 1.66 1.92 2.13 2.33	3.1 3.4 3.9 4.2 4.6 4.9	**10.5** **9.7** **7.8** **6.1** **4.4** **2.8**	1.44 1.68 2.16 2.52 2.82 3.24	0.7 1.4 1.8 3.0 3.9	0.7 1.5 2.0 3.0 4.0	140 150 160 160 190	180 190 200 200 230	230 240 250 260 300	1.5 1.8 2.1 2.7 4.0
	AD 100	Fluid Cap FC2 & Air Cap AC1603	0.9 1.0	**7.0** **2.1**	3.00 3.72	1.7 1.8	**13.2** **9.8**	4.08 4.74	2.0 2.1 2.2	**18.5** **15.1** **11.7**	4.08 4.56 5.10	2.8 3.0 3.1 3.2 3.4 3.5 3.7	**25.0** **22.0** **18.5** **15.1** **12.1** **9.1** **6.1**	5.04 5.52 6.06 6.54 7.14 7.80 8.52	3.7 3.8 3.9 4.1 4.2 4.6 4.9	**31.0** **28.0** **26.0** **23.0** **20.0** **13.6** **6.8**	5.76 6.30 6.78 7.32 7.80 9.18 11.0	0.9 1.7 2.1 3.2 4.1	0.7 1.5 2.0 3.0 4.0	180 190 190 200 210	240 250 250 260 280	310 330 330 340 370	1.8 2.4 3.2 4.1 5.9
	AD 150	Fluid Cap FC2 & Air Cap AC1602	1.1 1.3 1.4 1.5 1.7 1.8 2.0	**12.3** **9.9** **7.9** **6.1** **4.9** **3.9** **3.1**	2.40 2.70 3.00 3.24 3.48 3.72 4.02	2.2 2.5 2.8 3.0 3.1 3.2 3.4	**16.3** **12.1** **8.9** **7.6** **6.4** **5.5** **4.7**	3.72 4.26 4.74 4.98 5.22 5.46 5.70	2.7 3.0 3.2 3.4 3.5 3.9 4.2	**21.0** **16.3** **12.3** **10.7** **9.3** **6.4** **4.7**	4.14 4.68 5.16 5.46 5.64 6.30 6.90	4.2 4.6 4.9 5.3 5.6 6.0 6.3	**19.3** **14.6** **10.8** **8.1** **6.2** **4.9** **4.0**	6.00 6.78 7.44 8.10 8.76 9.42 10.0	5.6 6.0 6.3 6.7 7.0	**22.0** **17.6** **14.0** **11.4** **9.1**	7.80 8.52 9.12 9.78 10.4	1.5 3.0 3.4 5.3 6.3	0.7 1.5 2.0 3.0 4.0	150 160 160 180 190	190 200 200 220 240	230 240 240 250 280	2.7 4.6 5.5 7.3 9.4
	AD 200	Fluid Cap FC1 & Air Cap AC1603	0.7 0.9 1.0	**23.1** **8.30** **3.40**	1.70 2.89 3.40	1.4 1.5 1.7 1.8	**37.1** **30.3** **18.2** **11.7**	2.38 2.89 3.74 4.42	2.1 2.2 2.4 2.5	**26.9** **22.3** **11.4** **7.20**	3.91 4.42 5.44 5.95	2.8 3.0 3.1 3.2 3.4 3.5 3.7	**49.2** **40.1** **32.9** **28.8** **20.1** **15.5** **7.60**	3.91 4.59 5.10 5.44 6.63 7.14 8.33	3.7 3.8 4.0 4.2 4.6 4.9	**57.2** **53.0** **44.7** **34.4** **18.9** **7.90**	4.59 5.10 5.95 6.80 8.83 10.7	0.9 1.5 2.4 3.2 3.9	0.7 1.5 2.0 3.0 4.0	190 200 200 200 200	250 270 270 280 280	360 370 370 380 390	2.1 3.2 4.1 5.0 6.8
	AD 250	Fluid Cap FC1 & Air Cap AC1604	1.3 1.5 1.8 2.0 2.1 2.3 2.4	**26.1** **21.2** **13.6** **9.50** **7.60** **4.20** **2.60**	5.27 5.95 7.14 7.82 8.16 8.83 9.17	2.1 2.4 2.7 3.0 3.2 3.5 4.2	**45.0** **38.6** **30.7** **23.8** **19.3** **12.9** **1.50**	7.14 8.16 9.17 10.2 10.9 11.9 14.1	3.1 3.2 3.4 3.5 3.9 4.6 4.9	**42.4** **40.1** **35.6** **33.3** **24.6** **11.0** **6.40**	10.0 10.7 11.0 11.2 12.6 15.0 16.0	4.2 4.9 5.6 6.0 6.3 6.7 7.0	**55.6** **42.0** **28.4** **20.6** **14.8** **7.00** **1.20**	11.8 13.8 15.9 17.1 18.0 19.2 20.1	5.6 6.0 6.3 6.7 7.0	**59.8** **52.4** **46.8** **39.4** **33.9**	14.7 15.6 16.8 17.7 18.9	2.0 3.0 3.9 6.0 6.3	0.7 1.5 2.0 3.0 4.0	200 200 220 230 240	250 270 280 290 320	330 340 370 380 400	5.5 6.4 8.2 9.1 10.4
	AD 300	Fluid Cap FC5 & Air Cap AC1605	1.7 1.8 2.0 2.1 2.3	**25.0** **19.7** **15.1** **11.4** **7.6**	9.36 10.0 10.7 11.6 12.3	3.0 3.1 3.2 3.4 3.5 3.7	**39.0** **33.0** **27.0** **23.0** **18.5** **14.8**	13.8 14.4 15.3 15.9 16.8 17.4	3.4 3.5 3.7 3.9 4.1 4.2 4.4	**50.0** **43.0** **41.0** **27.0** **23.0** **18.9** **15.9**	15.0 15.6 16.5 18.0 18.6 19.2 20.1	4.6 4.9 5.3 5.6 6.0 6.3	**62.0** **47.0** **36.0** **26.0** **18.9** **13.6**	19.2 20.7 22.5 24.3 26.1 27.6	6.0 6.3 6.7 7.0	**93.0** **77.0** **62.0** **52.0**	23.7 25.5 27.6 29.7	2.0 3.2 3.9 5.3 6.3	0.7 1.5 2.0 3.0 4.0	240 250 280 290 330	330 340 370 380 420	460 470 510 530 580	5.5 6.4 7.3 7.9 9.8

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

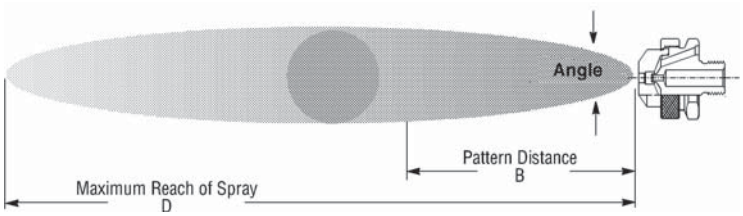
XA PR

Pressure-fed/Int. Mix/Narrow Angle Round

1/4" XA 02 PR050 E
XA 02 Body; E Hardware

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^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	Bar air	Bar liquid	Spray Angle (deg.)	B (mm)	D (m)
1/8 OR 1/4	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	**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	0.9	0.7	13	300	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	1.7	1.5	13	330	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	2.5	2.0	13	360	3
						2.0	**3.0**	1.38	2.4	**3.0**	1.56	3.2	**4.3**	1.86	4.5	**4.5**	2.58	3.1	3.0	14	390	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	4.5	4.0	15	440	4
						2.2	**2.0**	1.62	2.7	**2.3**	1.86	3.7	**3.0**	2.28	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	**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	0.9	0.7	12	430	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	1.5	1.5	13	460	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	2.4	2.0	13	480	4
						2.0	**3.9**	2.22	2.2	**4.8**	2.40	3.1	**6.3**	2.94	3.9	**8.4**	3.48	3.0	3.0	13	510	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	3.9	4.0	15	560	5
									2.7	**3.6**	2.88	3.4	**5.5**	3.30	4.5	**6.8**	4.08					
	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					
			1.1	**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	1.5	0.7	12	480	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	2.5	1.5	13	510	4
			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	2.0	13	530	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
			2.0	**2.8**	2.64	3.1	**3.6**	3.54	3.5	**4.1**	3.90	4.2	**7.9**	3.90	4.9	**11.8**	4.08					
	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					
			1.4	**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	1.7	0.7	18	660	5
			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	2.8	1.5	20	760	6
			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	3.9	2.0	20	810	7
			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
			2.1	**2.7**	7.62							6.3	**3.6**	17.4	7.0	**11.0**	18.3					
	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	**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	1.0	0.7	17	610	5
			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	1.8	1.5	18	690	6
			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	2.8	2.0	20	760	7
						2.0	**35.0**	6.12	3.0	**22.0**	8.64	3.7	**44.0**	9.24	5.3	**39.0**	12.9	3.5	3.0	20	790	7
						2.1	**30.0**	6.60				3.8	**37.0**	9.66	5.6	**31.0**	14.4	4.9	4.0	21	910	9
						2.2	**25.0**	7.14				3.9	**35.0**	10.2	6.0	**23.0**	15.6					
	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					
			1.1	**32.0**	6.12	1.5	**106**	5.46	2.1	**108**	7.14	2.5	**174**	6.60	3.2	**225**	7.20	1.0	0.7	19	890	6
						1.7	**87.0**	6.30	2.2	**95.0**	7.80	2.8	**146**	7.98	3.5	**205**	8.46	1.7	1.5	20	990	7
						1.8	**70.0**	7.08	2.4	**79.0**	8.58	3.1	**121**	9.24	3.8	**182**	9.78	2.4	2.0	21	1040	8
						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	**95.0**	10.6	4.6	**121**	13.5	3.8	4.0	22	1170	9
									2.8	**42.0**	10.7	3.5	**84.0**	11.2	4.9	**93.0**	15.3					

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

TO ORDER: *specify pipe size, body style, spray set-up #, hardware and mounting assemblies, and material. See page 78.*

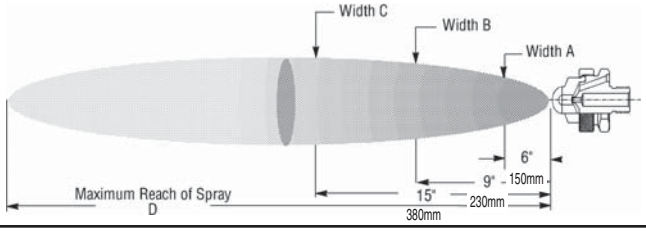
XA PF

Pressure-fed/Internal Mix/Flat Fan

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

DESIGN/SPRAY CHARACTERISTICS

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



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

XA PF Set-up Flow Rates and Dimensions

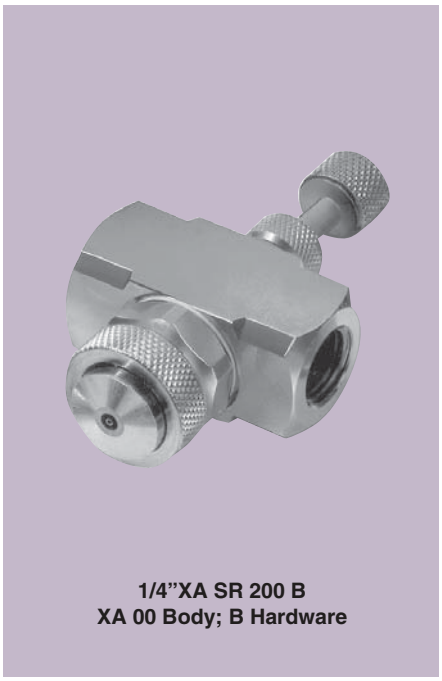
Pressure-fed, Internal Mix, Flat Spray Pattern, 1/8" and 1/4" Pipe Sizes, BSP or NPT

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^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	Bar air	Bar liquid	A (mm)	B (mm)	C (mm)	D (m)
1/8 OR 1/4	PF 050	Fluid Cap FC4 & Air Cap AC1301	0.7 0.9 1.0 1.1 1.3 1.4 1.5	**5.5** **4.7** **4.1** **3.5** **3.0** **2.5** **2.0**	1.44 1.62 1.86 2.04 2.22 2.40 2.64	1.3 1.5 1.8 2.1 2.4 2.7 2.8	**9.1** **7.7** **6.5** **5.4** **4.3** **3.3** **2.8**	1.86 2.16 2.52 2.82 3.12 3.42 3.60	2.0 2.2 2.5 2.8 3.1 3.2 3.4	**8.6** **7.5** **6.2** **5.2** **4.2** **3.7** **3.2**	2.52 2.82 3.12 3.42 3.78 3.90 4.08	2.7 3.0 3.2 3.5 4.2 4.6 4.9	**11.2** **10.1** **9.1** **8.1** **5.4** **4.2** **3.1**	3.12 3.36 3.72 3.96 4.74 5.10 5.46	3.9 4.6 5.3 6.0 6.3 6.7 7.0	**12.0** **9.7** **7.5** **5.3** **4.3** **3.3** **2.4**	4.14 4.86 5.58 6.24 6.60 6.96 7.32	1.1 2.1 2.8 3.5 6.0	0.7 1.5 2.0 3.0 4.0	250 360 380 470 560	360 480 530 610 740	460 660 760 860 940	2.6 3.0 3.2 3.4 4.0
	PF 100	Fluid Cap FC3 & Air Cap AC1303	1.3 1.4 1.5 1.7 1.8 2.0	**3.9** **3.0** **2.3** **1.8** **1.3** **1.0**	1.80 1.98 2.10 2.28 2.46 2.64	2.1 2.4 2.5 2.7 2.8 3.0 3.1	**7.4** **5.3** **4.4** **3.7** **3.1** **2.6** **2.1**	2.40 2.70 2.82 3.00 3.12 3.30 3.42	3.0 3.1 3.2 3.4 3.5 3.9	**6.1** **5.3** **4.5** **3.8** **3.2** **1.8**	3.12 3.24 3.42 3.54 3.72 4.08	3.9 4.2 4.6 4.9	**9.4** **7.2** **5.3** **3.8**	3.60 4.02 4.38 4.80	5.3 5.6 6.0 6.3	**10.2** **8.3** **6.6** **5.1**	4.68 5.04 5.34 5.88	1.5 2.7 3.2 4.2 5.6	0.7 1.5 2.0 3.0 4.0	250 360 480 610 640	330 510 580 740 760	460 690 740 940 970	1.8 2.0 2.0 2.1 2.3
	PF 150	Fluid Cap FC3 & Air Cap AC1301	0.9 1.0 1.1 1.3 1.4	**8.2** **6.8** **5.5** **4.1** **2.9**	1.20 1.38 1.62 1.80 2.04	1.4 1.7 2.0 2.1 2.2 2.4 2.5	**14.4** **11.9** **9.5** **8.3** **7.1** **6.1** **5.1**	1.62 1.92 2.22 2.40 2.58 2.76 2.94	2.1 2.4 2.7 3.0 3.2 3.4 3.5	**13.5** **11.4** **9.2** **7.1** **5.0** **4.0** **3.3**	2.16 2.52 2.82 3.18 3.54 3.78 3.96	2.7 3.0 3.2 3.5 4.2 4.6 4.9	**19.1** **17.1** **15.1** **13.1** **8.1** **5.9** **4.0**	2.52 2.76 3.12 3.42 4.32 4.74 5.16	4.6 4.9 5.3 5.6 6.0 6.3 6.7	**16.1** **13.8** **11.5** **9.3** **7.3** **5.6** **4.3**	4.14 4.56 4.98 5.40 5.82 6.24 6.72	1.1 2.1 3.0 3.5 5.6	0.7 1.5 2.0 3.0 4.0	360 430 510 580 580	460 610 660 760 760	710 810 890 970 970	2.1 2.4 2.6 2.7 3.2
	PF 200	Fluid Cap FC3 & Air Cap AC1302	1.0 1.1 1.3 1.4 1.7 2.0 2.2	**9.0** **7.8** **6.6** **5.2** **3.1** **2.0** **1.1**	1.50 1.80 1.92 2.16 2.64 3.00 3.36	2.0 2.1 2.2 2.5 2.8 3.1 3.4	**10.4** **9.3** **8.2** **6.1** **4.3** **3.0** **2.0**	2.46 2.70 2.88 3.30 3.72 4.14 4.50	2.4 2.5 2.7 3.0 3.2 3.5 3.8	**11.6** **10.4** **9.4** **7.3** **5.5** **4.1** **2.9**	2.88 3.06 3.24 3.66 4.08 4.50 4.86	3.1 3.2 3.4 3.8 4.2 4.9 6.0	**15.6** **14.6** **13.7** **10.8** **8.5** **5.2** **2.3**	3.36 3.54 3.72 4.26 4.92 5.88 7.20	4.2 4.6 4.9 5.3 5.6 6.3 7.0	**17.1** **15.0** **12.8** **11.0** **9.4** **7.2** **6.1**	4.38 4.80 5.22 5.64 6.18 7.14 8.04	1.4 2.5 3.2 3.8 5.3	0.7 1.5 2.0 3.0 4.0	100 130 130 150 200	130 150 170 220 250	170 200 220 280 330	3.0 3.7 4.0 4.2 4.8
	PF 250	Fluid Cap FC2 & Air Cap AC1304	1.1 1.3 1.4 1.5 1.7	**11.2** **8.5** **6.5** **5.0** **3.8**	3.24 3.60 3.90 4.26 4.62	2.1 2.2 2.4 2.5	**18.0** **15.8** **13.6** **11.6**	4.74 5.04 5.34 5.70	2.7 2.8 3.0 3.1 3.2	**19.6** **17.3** **15.2** **13.2** **11.4**	5.58 5.88 6.18 6.54 6.84	3.5 3.7 3.8 3.9 4.1 4.2	**27.0** **25.0** **23.0** **21.0** **18.9** **17.0**	6.72 6.96 7.26 7.56 7.92 8.22	4.6 4.9 5.3 5.6 6.0 6.3	**33.0** **28.0** **24.0** **19.7** **15.7** **12.4**	8.22 8.94 9.66 10.4 11.2 12.0	1.4 2.4 3.0 3.7 5.3	0.7 1.5 2.0 3.0 4.0	150 230 250 300 330	180 280 330 380 410	200 330 400 460 480	3.0 3.2 3.4 3.5 4.0
	PF 300	Fluid Cap FC1 & Air Cap AC1304	0.9 1.0 1.1 1.3 1.4 1.5	**27.0** **20.0** **15.9** **12.5** **10.2** **7.6**	1.98 2.28 2.70 2.88 3.36 3.72	1.8 2.1 2.2 2.4 2.5 2.7	**38.0** **28.0** **24.0** **21.0** **17.8** **15.1**	3.30 3.96 4.26 4.56 4.92 5.22	2.4 2.7 3.0 3.2 3.4 3.5 3.7	**39.0** **30.0** **24.0** **17.8** **15.1** **12.9** **10.6**	4.02 4.62 5.22 5.88 6.18 6.54 6.84	3.2 3.5 3.8 3.9 4.2 4.6 4.9	**58.0** **47.0** **38.0** **34.0** **27.0** **20.0** **14.8**	4.56 5.22 5.82 6.18 6.78 7.56 8.40	4.6 5.3 5.6 6.0 6.3 6.7 7.0	**59.0** **40.0** **32.0** **26.0** **20.0** **15.9** **12.7**	6.36 7.92 8.70 9.48 10.3 11.1 11.9	1.1 2.4 3.2 3.9 6.0	0.7 1.5 2.0 3.0 4.0	180 230 250 300 330	230 300 330 380 410	300 410 430 480 510	3.4 3.5 3.7 3.8 4.4
	PF 350	Fluid Cap FC1 & Air Cap AC1305	1.0 1.1 1.3 1.4	**17.0** **11.0** **7.6** **3.2**	1.38 1.62 1.98 2.40	2.0 2.1 2.2 2.4 2.5	**24.0** **18.9** **14.4** **10.6** **7.2**	2.64 3.00 3.36 3.78 4.26	2.4 2.5 2.7 2.8 3.0	**28.0** **23.0** **18.9** **15.1** **11.7**	3.06 3.54 3.96 4.44 4.74	3.4 3.5 3.7 3.8 3.9 4.2 4.6	**38.0** **33.0** **28.0** **23.0** **19.7** **13.1** **7.2**	4.32 4.80 5.34 5.82 6.30 7.20 8.28	3.9 4.2 4.6 4.9 5.3 5.6 6.3	**65.0** **53.0** **40.0** **30.0** **21.0** **13.8** **3.2**	4.50 5.34 6.48 7.62 8.94 10.4 13.5	1.1 2.1 2.8 3.7 4.9	0.7 1.5 2.0 3.0 4.0	100 100 130 150 200	130 130 170 200 250	150 170 220 280 350	2.4 3.0 3.4 3.6 4.0
	PF 400	Fluid Cap FC5 & Air Cap AC1306	1.0 1.1	**29.0** **18.9**	5.40 6.48	1.8 2.0	**56.0** **40.0**	7.02 7.98	2.1 2.2 2.4 2.5 2.7	**100** **79.0** **62.0** **48.0** **36.0**	7.14 7.98 8.82 9.72 10.6	3.0 3.1 3.2 3.4 3.5 3.7 3.8	126 **110** **95.0** **78.0** **62.0** **48.0** **37.0**	8.40 9.06 9.78 11.0 11.6 12.6 13.5	4.1 4.2 4.6 4.9 5.3 5.6	**140** **125** **89.0** **58.0** **34.0** **16.7**	10.9 11.6 13.5 15.9 18.3 20.4	1.0 1.8 2.4 3.4 4.9	0.7 1.5 2.0 3.0 4.0	180 250 250 330 360	200 300 300 410 430	250 430 460 530 580	3.4 3.8 4.3 4.6 5.2

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

XA SR

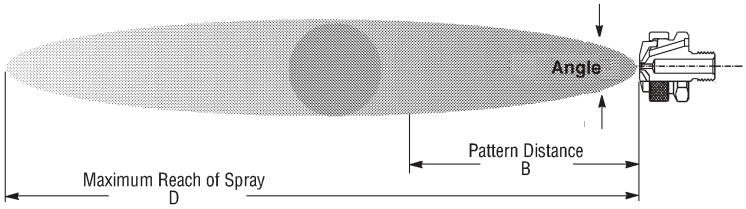
Siphon-fed Round



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

DESIGN FEATURES

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



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			
					Gravity Head			Siphon Height								
			Air (bar)	Air Capacity (Nm^3/h)	450 mm	**300 mm**	150 mm	100 mm	200 mm	**300 mm**	600 mm	900 mm	Air (bar)	Spray Angle (deg.)	B (mm)	D (m)
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	21	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**			3.0	20	530	7.0
			4.0	14.4		**43**	40	31	28	**23**	11.0		4.0	21	580	7.6
			5.6	18.9	44	**42**	39	31	28	**24**	16.7	8.3	5.6	22	630	8.2

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

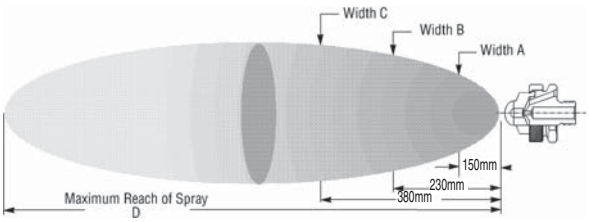
TO ORDER: *specify pipe size, body style, spray set-up #, hardware and mounting assemblies, and material. See page 78.*

XA SF

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



1/4"XA02 SF 050 F
XA 02 Body; F Hardware

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 Air (bar)	ATOMIZING AIR Air Capacity (Nm^3/h)	Liquid Capacity in l/h (Liters Per Hour) Gravity Head 450 mm	Gravity Head **300 mm**	Gravity Head 150 mm	Siphon Height 100 mm	Siphon Height 200 mm	Siphon Height **300 mm**	Siphon Height 600 mm	Siphon Height 900 mm	Spray Dimensions at 200 mm Siphon Height Air (bar)	A (mm)	B (mm)	C (mm)	D (m)
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	**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	1.8
	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
			4.0	6.60	1.9	**1.8**	1.6	1.5	1.3	**1.2**			4.0	280	390	480	2.7
	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
			3.5	7.02	2.2	**2.0**	1.7										
	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

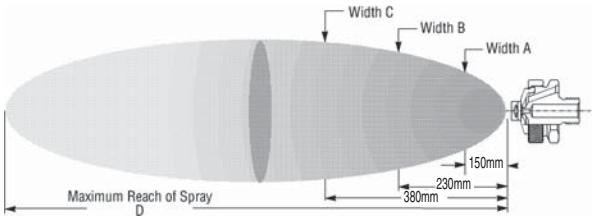
XAEF

Pressure-fed/External Mix/Flat Fan

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

DESIGN FEATURES

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



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

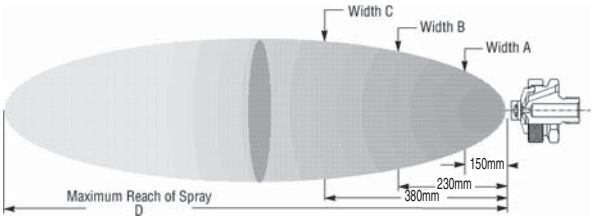
XA EF Set-up Flow Rates and Dimensions

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^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	Bar air	Bar liquid	A (mm)	B (mm)	C (mm)	D (m)
1/8 or 1/4	EF 050	Fluid Cap FC7 & & Air Cap AC1001	0.4 0.4 0.5 0.6	3	1.32 1.50 1.62 1.68	0.4 0.4 0.6 0.7	4	1.32 1.50 1.68 2.04	0.4 0.6 0.7 0.9	5	1.50 1.68 2.04 2.40	0.6 0.7 1.1 1.4	8	1.68 2.04 2.70 3.24	0.7 1.1 1.8 2.5	11	2.04 2.70 3.72 4.74	0.4 0.6 0.6 1.1 1.4 1.1 1.4	0.3 0.7 1.5 1.5 1.5 2.0 3.0	200 230 280 280 250 280 300	280 300 350 330 300 350 380	330 400 460 430 410 480 510	1.2 1.8 1.8 2.4 2.7 2.6 2.7
	EF 100	Fluid Cap FC7 & & Air Cap AC1003	0.2 0.4 0.7 1.1 1.4 1.8 2.1	3	1.51 1.58 1.87 2.38 2.72 3.23 3.56	0.4 0.7 1.1 1.4 1.8 2.1 2.8	4	1.58 1.87 2.38 2.72 3.23 3.56 4.42	0.7 1.1 1.4 1.8 2.1 2.8 3.5	5	1.87 2.38 2.72 3.23 3.56 4.42 5.10	1.4 1.8 2.1 2.8 3.5 4.2 5.6	8	2.72 3.23 3.57 4.42 5.10 6.12 8.34	2.8 3.5 4.2 4.9 5.3 5.6 6.3	11	4.38 5.10 6.12 7.14 7.65 8.34 9.54	0.2 1.1 1.4 1.4 1.8 2.8 4.9	0.2 0.2 0.4 1.4 0.7 1.4 2.8	90 90 100 120 120 130 150	150 150 150 180 150 180 180	230 230 230 250 240 280 240	0.9 1.2 1.2 1.5 1.5 1.8 2.4
	EF 150	Fluid Cap FC4 & & Air Cap AC1001	0.4 0.6 0.7 1.1	5	1.32 1.68 2.04 2.70	0.4 0.7 1.1 1.4	6	1.32 2.04 2.70 3.24	0.6 0.7 1.4 2.1	8	1.68 2.04 3.24 4.26	0.7 1.4 2.1 2.5	12	2.04 3.24 4.26 4.74	1.1 1.4 2.1 2.5	17	2.70 3.24 4.26 4.74	0.7 1.1 0.7 1.4 2.5 1.8 1.8	0.3 0.7 1.5 1.5 1.5 2.0 3.0	280 300 380 350 330 380 410	330 380 460 430 400 460 480	400 480 580 560 510 580 660	1.5 2.1 1.8 2.4 3.0 2.7 2.9
	EF 200	Fluid Cap FC4 & & Air Cap AC1003	0.4 0.7 1.1 1.4 1.8 2.1 2.8	5	1.58 1.87 2.38 2.72 3.23 3.56 4.42	0.7 1.1 1.4 1.8 2.1 2.8 3.5	6	1.87 2.38 2.72 3.23 3.56 4.42 5.10	1.1 1.4 1.8 2.1 2.8 3.5 4.2	8	2.38 2.72 3.23 3.56 4.42 5.10 6.12	1.8 2.1 2.8 3.5 4.2 4.9 6.3	12	3.23 3.56 4.42 5.10 6.12 7.14 9.54	3.2 3.5 4.2 4.9 5.3 6.3 6.7	17	4.92 5.10 6.12 7.14 7.62 9.54 9.84	0.4 1.4 1.8 1.8 2.1 3.5 5.3	0.2 0.2 0.4 1.4 0.7 1.4 2.8	80 90 100 130 130 130 150	140 150 170 190 180 220 190	220 220 230 290 250 300 250	1.0 1.7 1.8 2.1 1.8 2.4 3.0
	EF 250	Fluid Cap FC3 & & Air Cap AC1001	0.4 0.5 0.6 0.7	9	1.50 1.65 1.68 2.04	0.4 0.6 0.7 0.7	10	1.50 1.68 1.86 2.04	0.4 0.6 0.7 0.9	16	1.50 1.68 2.04 2.40	0.7 0.9 1.1 1.4	23	2.04 2.40 2.70 3.24	1.4 1.8 2.1 2.5	33	3.24 3.72 4.26 4.74	0.6 0.6 0.7 1.1 1.4 1.8 2.1	0.3 0.7 1.5 1.5 1.5 2.0 3.0	350 350 380 410 430 410 410	480 480 480 510 530 510 510	610 630 630 660 660 690 690	1.8 1.5 1.8 2.1 2.4 2.7 2.9
	EF 300	Fluid Cap FC3 & & Air Cap AC1003	0.7 1.1 1.4 1.8 2.1 2.8 3.5	9	1.87 2.38 2.72 3.23 3.56 4.42 5.10	1.1 1.4 1.8 2.1 2.8 3.5 4.2	10	2.38 2.72 3.23 3.56 4.42 5.10 6.12	1.4 1.8 2.1 2.8 3.5 4.2 4.9	16	2.72 3.23 3.56 4.42 5.10 6.12 7.14	2.5 2.8 3.5 4.2 4.9 5.6 6.3	23	4.08 4.42 5.10 6.12 7.14 8.34 9.54	3.5 4.2 4.9 5.3 5.6 6.3 7.0	33	5.10 6.12 7.14 7.62 8.34 9.54 10.56	0.7 1.8 2.1 2.5 2.8 4.2 5.3	0.2 0.2 0.4 1.4 0.7 1.4 2.8	130 130 130 140 140 140 170	170 170 180 200 190 200 200	250 250 240 320 300 360 300	1.2 1.8 1.8 1.8 2.3 3.0 4.0

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

TO ORDER: *specify pipe size, body style, spray set-up #, hardware and mounting assemblies, and material. See page 78.*



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^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	Bar 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 0.7 1.1 1.4	13	5.46 6.12 7.80 9.36	0.7 1.1 1.8 2.1	16	6.12 7.80 11.0 12.6	1.4 2.1 2.5 2.8	25	9.36 12.6 14.1 15.6	2.1 2.8 3.5 4.2	37	12.6 15.6 18.6 21.6	3.2 4.2 5.3 5.6	52	17.1 21.6 25.8 27.3	1.4 2.1 2.1 3.2 4.2 3.9	0.3 0.7 1.5 1.5 1.5 2.0	330 330 350 380 380 410	380 400 460 480 480 510	480 560 580 660 640 690	3.8 4.3 4.0 4.6 5.2 4.6
	EF 400	Fluid Cap FC6 & Air Cap AC1004	0.7 1.0 1.4 1.8 2.1 2.8 3.5	13	5.10 6.12 6.96 8.34 9.36 11.7 13.6	1.0 1.4 1.8 2.1 2.8 3.5 4.2	16	6.12 6.96 8.34 9.36 11.7 13.6 16.0	1.4 1.8 2.1 2.5 2.8 3.5 4.2	25	6.96 8.34 9.36 10.7 11.7 13.6 16.0	2.5 2.8 3.5 4.2 4.9 5.6 6.3	37	10.7 11.7 13.6 16.0 18.7 21.6 24.7	3.2 3.5 3.9 4.2 4.9 5.6 6.3	52	12.7 13.9 15.3 16.5 18.8 21.6 24.7	0.7 1.8 2.1 2.5 2.5 4.2 4.9	0.2 0.2 0.4 0.7 1.4 1.4 2.8	130 130 150 150 170 170 170	190 190 190 220 230 230 220	250 250 280 280 360 370 320	1.7 2.7 3.0 3.5 3.7 4.3 4.9
	EF 450	Fluid Cap FC2 & Air Cap AC1002	0.6 1.1 1.4 1.8	18	5.46 7.80 9.36 11.0	0.7 1.4 1.8 2.1	22	6.12 9.36 11.0 12.6	1.1 1.8 2.5 2.8	33	7.80 11.0 14.1 15.6	2.5 3.2 3.9 4.2	48	14.1 17.1 19.8 21.6	3.5 4.6 6.0 6.7	68	18.6 22.8 28.5 31.5	1.1 1.8 2.5 3.2 4.2 4.2 4.9	0.2 0.7 1.5 1.5 1.5 2.0 3.0	330 350 380 330 300 330 330	380 480 460 430 430 430 430	510 640 640 610 580 610 600	3.5 3.0 3.8 4.3 4.9 5.2 4.0
	EF 500	Fluid Cap FC2 & Air Cap AC1004	0.7 1.0 1.4 1.8 2.1 2.8 3.5	18	5.10 6.12 6.96 8.34 9.36 11.7 13.6	1.4 1.8 2.1 2.5 2.8 3.5 4.2	22	6.96 8.34 9.36 10.7 11.7 13.6 16.0	1.8 2.1 2.5 2.8 3.5 4.2 4.9	33	8.34 9.36 10.7 11.7 13.6 16.0 18.7	2.8 3.2 3.5 4.2 4.9 5.6 6.3	48	11.7 12.7 13.6 16.0 18.7 21.6 24.7	3.5 4.2 4.9 5.3 5.6 6.3 6.6	68	13.9 16.5 18.8 20.4 21.6 24.7 25.7	0.7 1.8 2.5 2.8 2.8 4.2 5.3	0.4 0.7 1.4 1.4 1.4 2.1 2.8	150 150 150 150 170 170 180	190 190 220 220 250 250 230	270 270 330 360 370 370 360	2.1 3.0 3.4 3.8 4.0 4.9 5.8
	EF 550	Fluid Cap FC1 & Air Cap AC1002	0.7 1.1 1.4 1.8	36	6.12 7.80 9.36 11.0	1.1 1.4 2.1 2.5	45	7.80 9.36 12.6 14.1	1.8 2.1 2.8 3.2	68	11.0 12.6 15.6 17.1	3.2 3.5 4.9 5.9	100	17.1 18.6 24.3 27.3	5.3 6.0 6.7 7.0	141	25.8 28.5 31.5 33.0	2.1 2.8 3.2 4.6 5.6 3.9 6.3	0.3 0.7 1.5 1.5 1.5 2.0 3.0	400 460 480 430 380 480 410	560 580 580 530 510 640 560	760 810 790 760 660 840 790	3.0 4.0 4.3 4.9 5.8 4.3 5.8
	EF 600	Fluid Cap FC1 & Air Cap AC1004	1.0 1.4 1.8 2.1 2.5 2.8 3.5	36	6.12 6.96 8.34 9.36 10.7 11.7 13.6	1.8 2.1 2.5 2.8 3.2 3.5 4.2	45	8.34 9.36 10.7 11.7 12.7 13.6 16.0	2.5 2.8 3.2 3.5 4.2 4.9 5.6	68	10.7 11.7 12.7 13.6 16.0 18.7 21.6	3.2 3.5 3.9 4.2 4.9 5.6 6.3	100	12.7 13.6 14.8 16.0 18.7 21.6 24.7	3.9 4.2 4.6 4.9 5.6 6.3 7.0	141	15.3 16.5 17.8 18.8 21.6 24.7 27.2	1.0 2.1 2.8 3.2 3.5 4.2 5.6	0.2 0.2 0.4 1.4 0.7 1.4 2.8	150 150 180 200 190 200 180	200 220 240 280 270 280 240	250 290 360 390 380 390 380	2.7 3.0 3.5 3.7 4.0 4.3 5.9
	EF 650	Fluid Cap FC8 & Air Cap AC1005	1.8 2.1 2.5 2.8 3.2 3.5 4.2	36	14.1 15.6 18.0 19.8 21.3 22.8 26.7	1.8 2.1 2.5 2.8 3.2 3.5 4.2	45	14.1 15.6 18.0 19.8 21.3 22.8 26.7	2.5 2.8 3.2 3.5 3.9 4.2 4.9	68	18.0 19.8 21.3 22.8 24.6 26.7 31.2	3.9 4.2 4.6 4.9 5.3 5.6 6.3	100	24.6 26.7 28.8 31.2 33.9 36.0 41.1				1.8 2.8 2.8 3.5 3.9 4.2 4.9	0.2 0.2 0.3 0.7 1.5 1.0 1.5	150 150 150 170 170 170 170	200 200 200 220 220 230 230	290 300 300 320 340 330 340	3.0 3.4 4.0 4.3 4.6 4.7 5.5
	EF 700	Fluid Cap FC9 & Air Cap AC1005	2.1 2.5 2.8 3.2 3.5 4.2 4.9	64	15.6 18.0 19.8 21.3 22.8 26.7 31.2	2.8 3.2 3.5 3.9 4.2 4.9 5.6	78	19.8 21.3 22.8 24.6 26.7 31.2 36.0	3.9 4.2 4.6 4.9 5.3 5.6 6.3	119	24.6 26.7 28.8 31.2 33.9 36.0 41.1	4.9 5.3 5.6 6.0 6.3	175	31.2 33.9 36.0 38.4 41.1				2.1 3.2 3.9 4.9 4.9 5.3 5.6	0.2 0.2 0.3 0.7 1.5 1.0 1.5	170 180 180 180 200 180 200	240 240 250 250 250 250 250	340 360 360 360 380 380 380	3.5 4.3 4.9 5.5 5.5 5.8 6.1
	EF 750	Fluid Cap FC5 & Air Cap AC1005	2.8 3.2 3.5 3.9 4.2 4.6 4.9	102	19.8 21.3 22.8 24.6 26.7 28.8 31.2	3.5 3.9 4.2 4.6 4.9 5.3 5.6	125	22.8 24.6 26.7 28.8 31.2 33.9 36.0	4.6 4.9 5.3 5.6 6.0 6.3	192	28.8 31.2 33.9 36.0 38.4 41.1	5.6 6.0 6.3	280	36.0 38.4 41.1				2.8 3.9 4.6 5.3 5.6 5.6 6.0	0.2 0.2 0.3 0.7 1.0 1.5 1.5	190 200 200 220 220 220 220	250 250 250 270 270 270 270	360 370 370 380 410 410 410	4.6 4.9 5.2 5.5 5.5 5.8 6.1

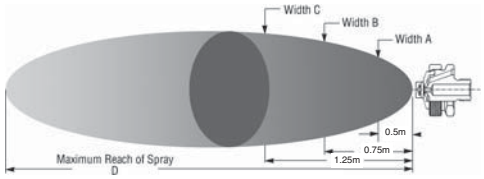
Standard Materials: Nickel-plated Brass, 303 Stainless Steel, and 316 Stainless Steel

XAER

Pressure-fed/Ext. Mix/Narrow Angle Round

DESIGN/SPRAY CHARACTERISTICS

- External mix: allows spraying of viscous liquids
- Variable atomization
- Narrow spray angle (10°- 30°)
- Precise metering of liquid flow rate



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

1/4" XAER850A
XA 00 Body; A Hardware

XA ER Set-up Flow Rates and Spray Dimensions

Pressure-fed, External Mix, Narrow Round Spray Pattern, 1/8" and 1/4" Pipe Sizes

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 BAR Liquid			Spray Dimensions					
			BAR air	L/h	Nm^3/h	BAR air	L/h	Nm^3/h	BAR air	L/h	Nm^3/h	BAR air	L/h	Nm^3/h	BAR air	L/h	Nm^3/h	BAR Liquid	BAR Air	A mm	B mm	C mm	D m
1/8" or 1/4"	ER 050	Fluid Cap FC7 & Air Cap AC1801	0.3 0.7 1.4 2.1	2.7	1.3 1.9 2.9 3.7	0.3 0.7 1.4 2.1 2.8	3	1.3 1.9 2.9 3.7 4.6	0.3 0.7 1.4 2.1 2.8 3.4	4.4	1.3 1.9 2.9 3.7 4.6 5.6	0.7 1.4 2.1 2.8 3.4 4.1 5.5	6.6	1.9 2.9 3.7 4.6 5.6 6.5 8.5	1.4 2.1 2.8 3.4 4.1 4.8 6.2	9.5	2.9 3.7 4.6 5.6 6.5 7.6 9.4	0.2 0.3 0.3 0.7 1.5 1.5 3.0	0.7 1.4 2.8 2.8 1.4 2.8 4.1	50 60 40 60 60 60 70	90 90 90 80 60 60 70	130 110 130 130 80 90 100	2.3 3 3.7 4.9 4.3 5.5 6.1
	ER 150	Fluid Cap FC4 & Air Cap AC1801	0.3 0.7 1.4 2.1 2.8	3.7	1.3 1.9 2.9 3.7 4.6	0.3 0.7 1.4 2.1 2.8 3.4	4.5	1.3 1.9 2.9 3.7 4.6 5.6	0.7 1.4 2.1 2.8 3.4 4.1	7.4	1.9 2.9 3.7 4.6 5.6 6.5	1.4 2.1 2.8 3.4 4.1 4.8 6.2	11	2.9 3.7 4.6 5.6 6.5 7.6 9.4	1.4 2.1 2.8 3.4 4.1 4.8 6.2	15	2.9 3.7 4.6 5.6 6.5 7.6 9.4	0.2 0.3 0.3 0.7 1.5 1.5 3.0	0.7 1.4 2.8 2.8 1.4 2.8 4.1	50 60 60 60 80 70 80	60 80 60 80 80 90 100	80 80 110 100 130 100 140	3 4.3 4.9 5.5 4 5.5 6.1
	ER 250	Fluid Cap FC3 & Air Cap AC1801	0.4 0.7 1.4 2.1 2.8 3.4	7.7	1.4 1.9 2.9 3.7 4.6 5.6	0.7 1.4 2.1 2.8 3.4 4.1	9.5	1.9 2.9 3.7 4.6 5.6 6.5	0.7 1.4 2.1 2.8 3.4 4.1	15	1.9 2.9 3.7 4.6 5.6 6.5	1.4 2.1 2.8 3.4 4.1 4.8 6.2	18	2.9 3.7 4.6 5.6 6.5 7.6 9.4	2.8 3.4 4.1 4.8 5.5 6.2	23	4.6 5.6 6.5 7.6 8.5 9.4	0.2 0.3 0.3 0.7 1.5 1.5 3.0	0.7 1.4 2.8 2.8 1.4 2.8 4.1	80 80 70 80 80 80 90	90 80 80 90 110 100 100	100 130 120 130 110 130 130	3 4.3 4.3 5.2 5.5 4.9 5.2
	ER 350	Fluid Cap FC6 & Air Cap AC1802	0.7 1.0 1.4 2.1 2.8 3.4	12	5.5 7.2 8.8 11.6 14.3 17	0.7 1.4 2.1 2.8 3.4 4.1	15	5.5 8.8 11.6 14.3 17.0 19.6	1.4 2.1 2.8 3.4 4.1	22	8.8 11.6 14.3 17 19.6	2.1 2.8 3.4 4.1 4.8 5.5 6.2	32	11.6 14.3 17 19.6 22.3 25.1 26.9	2.8 3.4 4.1 4.8 5.5 6.2	47	14.3 17 19.6 22.3 25.1 26.9	0.2 0.3 0.3 0.7 1.5 1.5 3.0	0.7 1.4 2.8 2.8 2.1 4.1 4.1	80 80 80 80 80 80 80	130 100 150 100 100 130 130	150 150 150 150 150 180 150	2.7 3.4 4.9 4.9 4.6 5.2 5.5
	ER 450	Fluid Cap FC2 & Air Cap AC1802	0.7 1 1.4 2.1 2.8 3.4	19	5.5 7.2 8.8 11.6 14.3 17	0.7 1 1.4 2.1 2.8 3.4 4.1	23	5.5 7.2 8.8 11.6 14.3 17 19.6	1 1.4 2.1 2.8 3.4 4.1 4.8	33	7.2 8.8 11.6 14.3 17 19.6 22.2	2.1 2.8 3.4 4.1 4.8 5.5	49	11.6 14.3 17 19.6 22.3 25.1	2.8 3.4 4.1 4.8 5.5	72	14.3 17 19.6 22.3 25.1	0.2 0.3 0.3 0.7 1.5 1.5 3.0	0.7 1.4 2.8 2.8 2.1 4.1 4.1	100 110 100 130 120 100 110	140 130 110 120 110 130 100	210 150 140 180 160 180 180	4.3 5.5 6.4 6.7 6.1 6.7 6.7
	ER 550	Fluid Cap FC1 & Air Cap AC1802	1 1.4 2.1 2.8 3.4	39	7.2 8.8 11.6 14.3 17	1.4 2.1 2.8 3.4 4.1	46	8.8 11.6 14.3 17 19.6	2.1 2.8 3.4 4.1 4.8 5.5	68	11.6 14.3 17 19.6 22.3 25.1	2.8 3.4 4.1 4.8 5.5	97	14.3 17 19.6 22.3 25.1	3.4 4.1 4.8 5.5	119	17 19.6 22.3 25.1	0.2 0.3 0.3 0.7 1.5 1.5 3.0	1.4 1.4 2.8 4.1 2.8 4.1 5.5	140 130 130 140 110 110 100	150 150 170 150 150 130 130	220 230 180 240 180 180 140	4.9 4.6 6.4 6.7 6.7 6.7 6.7
	ER650	Fluid Cap FC8 & Air Cap AC1803	1.0 1.4 1.7 2.1 2.8 3.4 4.1	39	11.6 14.1 16.6 18.8 23.2 27.7 31.9	1.4 1.7 2.1 2.8 3.4 3.8 4.1	46	14.1 16.6 18.8 23.2 27.7 29.8 31.9	2.1 2.8 3.4 3.8 4.1 4.5 4.8	68	18.8 23.2 27.7 29.8 31.9 34.0 36.1	3.4 3.8 4.1 4.5 4.8 5.5 6.2	97	27.7 29.8 31.9 34 36.1 40.5 44.8				0.2 0.3 0.3 0.7 1.5 1.5 1.5	1.4 2.1 3.4 4.1 3.4 4.8 6.2	130 150 120 130 130 100 100	150 140 130 140 150 130 130	200 150 160 170 150 180 180	5.2 6.7 6.7 6.7 6.7 5.5 5.5
	ER750	Fluid Cap FC9 & Air Cap AC1803	1.4 2.1 2.8 3.4 3.8 4.1 4.8	65	14.1 18.8 23.2 27.7 29.8 31.9 36.1	2.1 2.8 3.4 4.1 4.5 4.8 5.5	76	18.8 23.2 27.7 31.9 34 36.1 40.5	2.8 3.4 4.1 4.5 4.8 5.5 6.2	110	23.2 27.7 31.9 34 36.1 40.5 44.8	3.4 3.8 4.1 4.5 4.8 5.5 6.2	165	27.7 29.8 31.9 34 36.1 40.5 44.8				0.2 0.3 0.3 0.7 1.5 1.5 1.5	1.4 2.1 4.1 4.1 3.4 4.8 6.2	150 140 150 130 130 100 100	150 160 170 130 150 130 150	220 200 180 180 200 200 200	5.8 6.4 6.7 6.7 6.1 5.8 5.8
	ER850	Fluid Cap FC5 & Air Cap AC1803	2.8 3.4 3.8 4.1 4.5	95	23.2 27.7 29.8 31.9 34	3.8 4.1 4.5 4.8 5.5	109	29.8 31.9 34 36.1 40.5	4.5 4.8 5.5 6.2	158	34 36.1 40.5 44.8	5.5 6.2	234	40.5 44.8				0.2 0.3 0.7 0.7 1.5 1.5	2.8 4.8 4.8 6.2 5.5 6.2	150 90 90 80 90 80	160 110 110 100 100 100	180 180 150 150 150 140	6.7 6.1 5.8 5.5 5.5 5.8

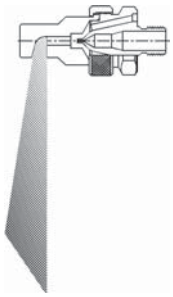
Standard Materials: Nickel Plated Brass, 303 Stainless Steel, and 316 Stainless Steel.

TO ORDER: *specify pipe size, body style, spray set-up #, hardware and mounting assemblies, and material. See page 78.*

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

XA FF Set-up Flow Rates

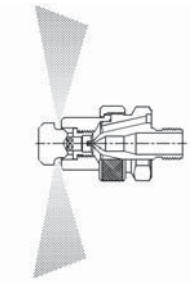
Pressure-fed, Internal Mix, Deflected Flat Fan Spray Pattern, 1/8" and 1/4" Pipe Sizes, BSP or NPT

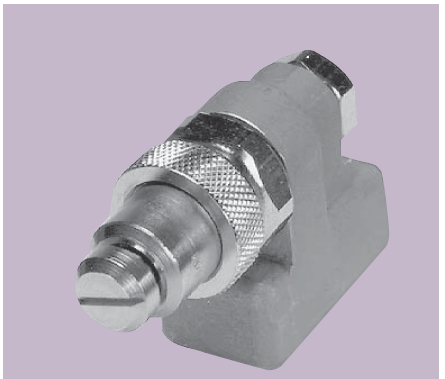
Pipe Size	Spray Set-up Number	Fluid and Air Cap Numbers	0.7 Bar Liquid			1.5 Bar Liquid			2.0 Bar Liquid			3.0 Bar Liquid			4.0 Bar Liquid		
			Air (bar)	l/hr	$\frac{Nm^3}{hr}$	Air (bar)	l/hr	$\frac{Nm^3}{hr}$	Air (bar)	l/hr	$\frac{Nm^3}{hr}$	Air (bar)	l/hr	$\frac{Nm^3}{hr}$	Air (bar)	l/hr	$\frac{Nm^3}{hr}$
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

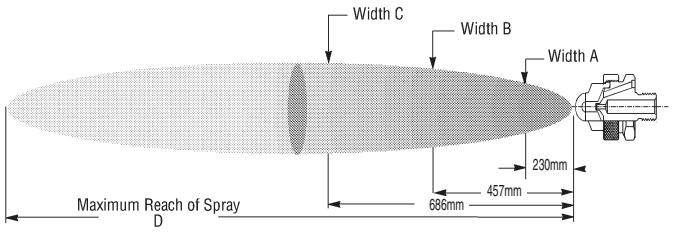
XA XW Set-up Flow Rates

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	$\frac{Nm^3}{h}$	Air (bar)	l/h	$\frac{Nm^3}{h}$	Air (bar)	l/h	$\frac{Nm^3}{h}$	Air (bar)	l/h	$\frac{Nm^3}{h}$	Air (bar)	l/h	$\frac{Nm^3}{h}$
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	**28.0**	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

1/2XA



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^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	bar air	bar 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						

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^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	bar air	bar liquid	A (mm)	B (mm)	C (mm)	D (m)
	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	90	160	250	6.7
			1.4	25	23.4	1.8	121	23.7	3.1	200	33.0							2.0	1.0				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												
1/2	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						

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

TO ORDER: *specify pipe size, body style, spray set-up #, hardware and mounting assemblies, and material. See page 78.*

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^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/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 2.5 2.8 3.2	**522**	52.6 57.7 64.5 70.4	2.8 3.2 3.5 3.9 4.2	**681**	64.5 70.4 76.4 81.5 87.4	3.2 3.5 3.9 4.2 4.6 4.9	**795**	70.4 76.4 81.5 87.4 93.3 98.4	3.9 4.2 4.9 5.3 5.6 6.0	**953**	81.5 87.4 98.4 105 110 117	5.6 6.0 6.3 6.6 7.0	**1158**	110 117 122 127 132	2.5 3.5 3.9 4.9 6.3	0.2 0.4 0.5 0.7 1.0	216 229 241 241 254	368 420 445 460 480	520 550 580 610 660	5.80 6.71 7.02 7.63 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^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	bar air	bar liquid	A (mm)	B (mm)	C (mm)	D (m)
	PF 5050	Fluid Cap FC501 & Air Cap AC5301				1.8 2.0 2.1	**154** **119** **93**	35.4 38.4 41.4	3.4 3.5 3.7 3.8	**184** **157** **133** **112**	57.0 60.6 63.6 66.6							2.0 3.5	1.0 2.0	460 510	740 790	910 970	5.8 7.0
1/2	PF 5100	Fluid Cap FC502 & Air Cap AC5302	0.7 0.85	**134** **100**	18.9 22.8	1.3 1.4 1.5 1.7	**320** **255** **200** **154**	26.4 31.2 35.4 40.2	2.1 2.2 2.4 2.5 2.7 2.8 3.0 3.1	**575** **505** **440** **380** **330** **275** **235** **195**	34.2 38.4 43.2 47.4 51.6 55.8 60.6 64.8	3.0 3.1 3.2 3.4 3.5 3.7 3.8 3.9 4.1	**740** **690** **630** **570** **520** **470** **420** **345** **325**	40.8 43.2 46.1 50.8 54.1 59.3 63.3 69.2 74.1	3.9 4.1 4.2 4.4 4.5 4.6 4.8 4.9 5.1 5.2 5.3 5.5	**840** **790** **740** **690** **650** **600** **550** **510** **465** **425** **390** **350**	51.6 55.8 59.4 64.2 68.4 72.6 76.8 81.0 85.8 89.4 93.6 98.4	0.7 1.4 2.5 3.4 4.5	0.35 1.0 2.0 3.0 4.0	510 860 860 910 910	860 1570 1570 1680 1700	1190 2110 2080 2160 2260	4.0 4.6 5.2 5.8 6.4

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.		
					Gravity Head			Siphon Height						
			Air (bar)	Air Capacity (Nm^3/h)	450 mm	**300 mm**	150 mm	100 mm	200 mm	**300 mm**	600 mm	Air (bar)	B (mm)	D (m)
1/2	SR 5050	Fluid Cap FC501 & Air Cap AC5201	0.7 1.5 2.0 3.0 3.5 4.0 5.0 5.6	21.6 34.2 39.6 52.2 59.4 66.0 78.0 87.0	 300 305 315 320	 **260** **265** **270** **280** **290**	 225 235 240 250 255	40 97 117 150 163 170 183 188	 64 90 123 133 143 157 164	 **90** **104** **115** **129** **136**	 53 62	1.5 2.0 3.0 3.5 4.0 5.0 5.6	 150	6.1 6.7 7.3 7.9 8.8 9.8 10.7

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^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h	Air (bar)	l/h	Nm^3/h
1/2	XW 5050	Fluid Cap FC502 & Air Cap AC5401	1.0 1.1 1.3 1.4	**213** **145** **98** **59**	20.7 25.1 34.5 32.3	1.7 1.8 2.0 2.1 2.3 2.4 2.5 2.7	**394** **324** **275** **207** **159** **116** **93** **27**	27.2 31.6 34.4 38.5 42.1 45.5 49.7 54.0	2.5 2.7 2.8 3.0 3.1 3.2 3.4 3.5	**439** **372** **322** **277** **272** **188** **145** **114**	38.0 42.1 45.0 49.1 52.4 55.8 59.4 63.0	3.4 3.5 3.7 3.8 3.9 4.1 4.2 4.4 4.5 4.6	**462** **416** **372** **325** **282** **250** **209** **168** **141** **77**	47.2 50.6 53.4 57.3 61.1 65.0 68.1 71.3 75.5 77.7	5.0 5.2 5.3 5.5 5.6 5.8 5.9 6.0 6.3	**484** **439** **409** **366** **325** **297** **257** **232** **182**	68.3 71.8 75.2 78.6 82.0 85.7 89.1 93.0 100

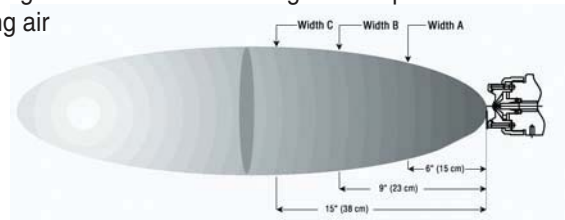
Standard Materials: Nickel-plated Brass, 303 Stainless Steel, and 316 Stainless Steel

SAM

External Mix/Flat Fan or Narrow Round

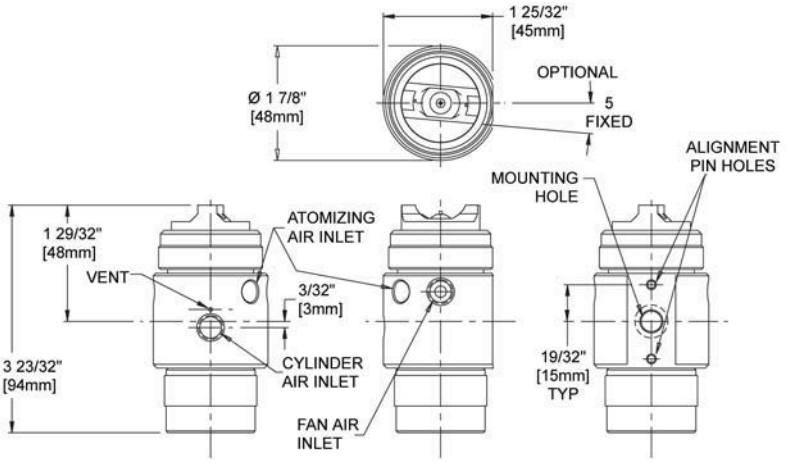
DESIGN FEATURES

- 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
- Pneumatically controlled shut-off and clean-out built in
- 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 & ACT 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

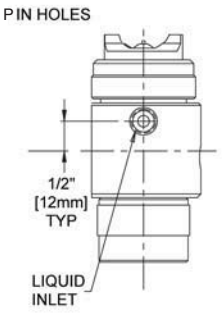


SAM *Air Flow Rates*

Pipe Size	Spray Set-Up No.	Fluid Cap and Air Cap No.	Atomizing Air Capacity Nm³/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	0.8	1.0	1.3	1.6	1.9	2.2	2.8	3.3	3.9
	SAM-02-02	FCS 02 & ACS 02									
	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 Nm³/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	2.7	3.2	4.1	4.9	5.8	6.6	8.3	10.0	11.8
	SAM-02-02	FCS 02 & ACS 02									
	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.

Air-Operated Clean-out/Shut-off. Removal of air pressure to the cylinder causes a spring-loaded poppet valve actuator to shut off liquid flow and includes a clean-out needle.

Replacement air caps include replacement Blue-Gard® gaskets.

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

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

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.	bar air	bar liquid	Spray Dimensions with Varied Fan Air Pressure											
					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	60	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	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						
				1.5				230	330	480	460	610	740			
			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			
				0.7				150	180	250	330	430	560	430	630	690
				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	360	380	310	410	610

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

SpiralAir®

High-flow Air Atomizing

DESIGN FEATURES

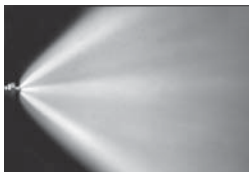
- A two-fluid nozzle using any gas as the atomizing fluid
- Three-stage atomization for highest performance
- Designed for high reliability in extremely hostile environments
- Efficient design reduces compressed air consumption

SPRAY CHARACTERISTICS

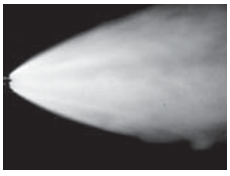
Spray patterns: Full Cone and Flat Fan
Spray angles: 20° to 90°
(Other angles available by special order)
Flow rates: 2.0 to 80 l/min

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

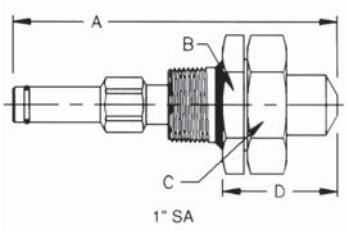
Narrow Round 20°



Wide Round 90°

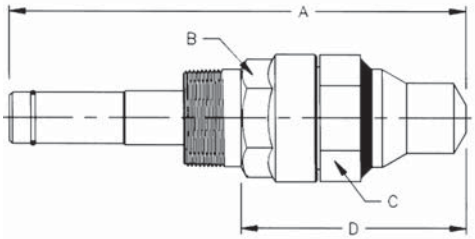


Flat Fan 60°



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

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

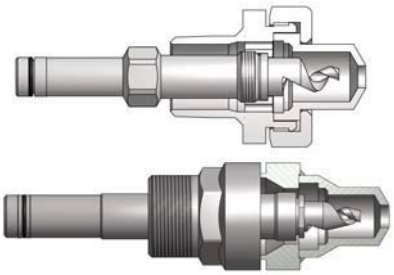


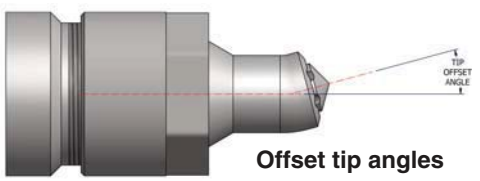
1 1/2" SA (Set-up #) - A -00

SpiralAir Spray Set-up, Spiral Tip and Dimensions

Pipe Size	Spray Set-up No.	Spiral Tip No.	Spray Angle	Approx. Spray Type	Free Pass. Dia. (mm)	Pipe Size	Dimensions (mmu) A	B	C	D	Wt. (Kg)
1"	SA 101	14	20°	Narrow Round	4.83	1	148	50.8	50.8	50.8	0.64
	SA 308		90°	Wide	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	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	5.41						
	SA 2301		60°	Round	5.41						

Larger sizes and flow rates available upon request.





Offset tip angles available upon request

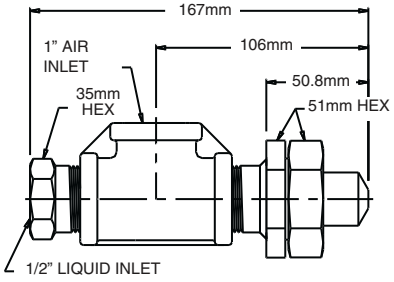
Standard Materials: 316 Stainless Steel with optional Cobalt Alloy 6 wear components.

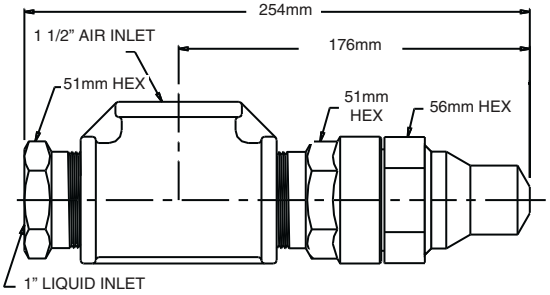
Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

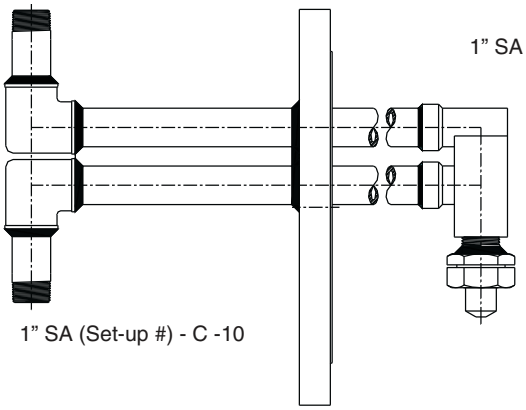
***TO ORDER:** specify pipe size, spray set-up #, hardware and material.*

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.

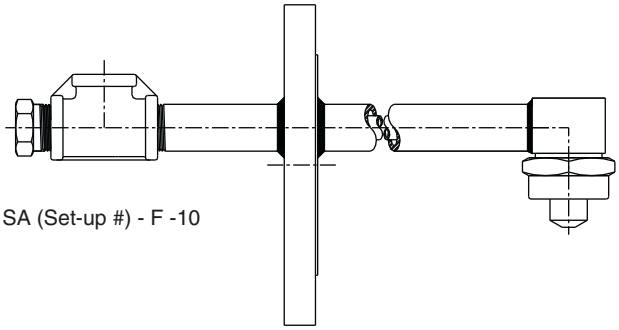






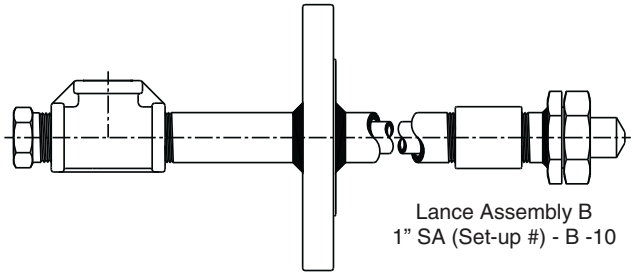
1" SA (Set-up #) - C -10

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	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 ($\frac{Nm^3}{h}$)	liquid (l/min)	liquid (bar)	air ($\frac{Nm^3}{h}$)	liquid (l/min)	liquid (bar)	air ($\frac{Nm^3}{h}$)	liquid (l/min)	liquid (bar)	air ($\frac{Nm^3}{h}$)	liquid (l/min)	liquid (bar)	air ($\frac{Nm^3}{h}$)	liquid (l/min)	liquid (bar)	air ($\frac{Nm^3}{h}$)
1"	14	2	1.8	47.1	2	2.7	77.9	2	3.7	110.3	2	4.7	144.0	2	5.9	179.2	2	7.1	215.8
		3	1.9	36.1	3	2.8	59.8	3	3.8	84.6	3	4.8	110.5	3	6.0	137.5	3	7.2	165.7
		4	2.0	29.9	4	2.9	49.6	4	3.9	70.1	4	4.9	91.6	4	6.1	114.0	4	7.3	137.3
		5	2.1	25.8	5	3.0	42.8	5	4.0	60.6	5	5.0	79.2	5	6.2	98.6	5	7.4	118.7
		6	2.1	22.9	6	3.1	38.0	6	4.1	53.8	6	5.1	70.3	6	6.3	87.5	6	7.5	105.4
		7	2.2	20.7	7	3.1	34.4	7	4.1	48.7	7	5.2	63.6	7	6.4	79.1	7	7.6	95.3
		8	2.3	19.0	8	3.2	31.5	8	4.2	44.6	8	5.3	58.3	8	6.5	72.5	8	7.7	87.4
		9	2.3	17.6	9	3.3	29.2	9	4.3	41.3	9	5.4	54.0	9	6.5	67.2	9	7.8	80.9
		10	2.4	16.4	10	3.3	27.2	10	4.3	38.5	10	5.4	50.4	10	6.6	62.7	10	7.9	75.5
		11	2.4	15.4	11	3.4	25.6	11	4.4	36.2	11	5.5	47.3	11	6.7	58.9	11	7.9	71.0
		12	2.4	14.6	12	3.4	24.2	12	4.4	34.2	12	5.6	44.7	12	6.8	55.7	12	8.0	67.1
	20	4	1.8	61.9	4	2.6	94.4	4	3.4	127.2	4	4.3	160.3	4	5.2	193.7	4	6.2	227.4
		8	2.0	43.0	8	2.7	65.4	8	3.6	88.1	8	4.5	111.0	8	5.4	134.1	8	6.4	157.5
		11	2.1	36.4	11	2.9	55.3	11	3.7	74.4	11	4.6	93.8	11	5.6	113.3	11	6.6	133.0
		15	2.2	30.9	15	3.0	46.9	15	3.8	63.2	15	4.8	79.5	15	5.7	96.1	15	6.7	112.8
		19	2.3	27.3	19	3.1	41.4	19	4.0	55.7	19	4.9	70.2	19	5.9	84.8	19	6.9	99.5
		23	2.4	24.7	23	3.2	37.5	23	4.1	50.4	23	5.0	63.4	23	6.0	76.6	23	7.0	89.9
		26	2.5	23.1	26	3.3	35.1	26	4.2	47.2	26	5.1	59.4	26	6.1	71.8	26	7.1	84.2
		30	2.5	21.5	30	3.4	32.6	30	4.2	43.8	30	5.2	55.1	30	6.1	66.5	30	7.2	78.1
		34	2.6	20.1	34	3.4	30.5	34	4.3	41.0	34	5.2	51.5	34	6.2	62.2	34	7.2	73.1
		38	2.6	19.0	38	3.5	28.7	38	4.4	38.6	38	5.3	48.6	38	6.3	58.7	38	7.3	68.9
1 1/2"	28				40	3.4	67.2	40	4.3	104.7	40	5.3	147.2	40	6.3	194.6	40	7.4	247.0
					45	3.5	61.3	45	4.4	95.6	45	5.4	134.4	45	6.4	177.7	45	7.5	225.5
					50	3.5	56.5	50	4.4	88.2	50	5.4	123.9	50	6.5	163.8	50	7.6	207.9
					55	3.6	52.5	55	4.5	81.9	55	5.5	115.2	55	6.5	152.2	55	7.6	193.1
					60	3.6	49.0	60	4.6	76.6	60	5.6	107.7	60	6.6	142.3	60	7.7	180.5
					65	3.7	46.1	65	4.6	72.0	65	5.6	101.3	65	6.7	133.8	65	7.8	169.7
					70	3.7	43.5	70	4.7	68.0	70	5.7	95.6	70	6.7	126.4	70	7.8	160.2
					75	3.8	41.2	75	4.7	64.5	75	5.7	90.7	75	6.8	119.8	75	7.9	151.9
					80	3.8	39.2	80	4.7	61.4	80	5.7	86.3	80	6.8	114.0	80	8.0	144.5

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

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

CHOOSING A TANK WASHING NOZZLE

Adequate coverage and effective scrubbing are of prime importance in bottle, drum, and tank washing. Choosing from the variety of tank washing nozzles can be confusing. In selecting BETE nozzles you should consider the following vessel characteristics and nozzle design criteria: size and shape of vessel to be cleaned, vessel opening, type of material to be removed, and spray coverage.

Size and Shape of Vessel to be Cleaned

BETE's tank washing nozzles can be used to clean, wash, and rinse every size vessel from small bottles, moderately sized tanks, to railroad tankers.

The TW series is the best choice for cleaning small bottles, kegs, and barrels due to its compact design. Medium-sized tanks up to 7.9m are best cleaned using the HydroWhirl® S, HydroWhirl Poseidon®, or the CLUMP series because of their omni-directional spray.

Where higher impact and larger coverage is needed, BETE's tank washing machine, the HydroWhirl Orbitor, is the perfect choice.

Tank Washing Nozzle	up to	coverage distance in meters (diameter)											
		2	3	4	5	7	9	12	16	18	20	25+	
TW 12 - 20	1.8m												
TW 1	3.6m												
RTW	4.3m												
CLUMP	4.9m												
LEM	4.9m												
HydroWhirl S	6.0m												
HydroWhirl Poseidon	7.6m												
HydroWhirl Orbitor	40m												up to 40 m

What is ATEX (Ex)?
ATEX is an acronym that stands for 'ATmosphere EXplosible'.
At the same time, ATEX is an abbreviation for European Directive 94/9/EC concerning the placement on the market of explosion-protected electrical and mechanical equipment.

All 360° HydroWhirl S nozzles are available with ATEX approval for Zone 0.

Visit www.hydrowhirl.com for more information on our tank washing nozzles.

HydroWhirl® S

Tank Washing - Slotted Spray Nozzle

DESIGN FEATURES

- Cleans more quickly, and uses less water and lower pressure than static tank washers
- Surface finish of 0.8 microns R_a or better: ideal for sanitary applications
- Laser-welded design for durability
- Stainless steel construction - corrosion-resistant material
- Three connections: threaded, clip-on, and welded
- Made from FDA approved materials for use in Clean-In-Place (CIP) applications.

SPRAY CHARACTERISTICS

- Self-cleaning bearings
- Vigorous moving spray action
- Spray Angles: 360°, 90° Up, 90° Down, 180° Up, 180° Down, 270° Up, 270° Down

Flow rates: 4.39 – 338 l/min

All 360° HydroWhirl S nozzles are available with ATEX approval for Zone 0.

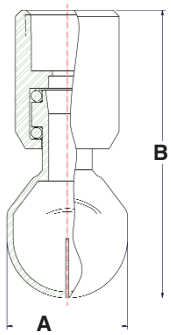
STANDARD CONNECTION SIZES

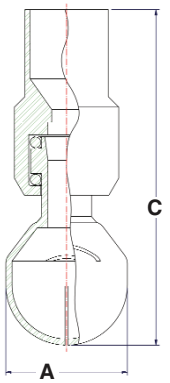
Additional connnection sizes available on request

Connection Type	Nozzle Number													
	HWS 20-3	HWS 20-4	HWS 20	HWS 30-5	HWS 30-6	HWS 30	HWS 40-7.5	HWS 40-8	HWS 40-9	HWS 40	HWS 40HF-11	HWS 40HF	HWS 50-16	HWS 50
Pipe Clip On	--	--	--	--	--	3/8"	--	--	--	3/4"	--	3/4"	--	1-1/2"
Tube Clip On	--	--	--	--	--	3/4"	--	--	--	1"	--	1"	--	2"
Pipe Weld On	--	--	1/4"	--	--	3/8", 1/2"	--	--	--	3/4", 1	--	3/4", 1	--	1-1/2", 2"
Tube Weld On	--	--	1/2"	--	--	3/4"	--	--	--	1"	--	1"	--	2"
FNPT/FBSP	1/8"	1/8"	1/8"	3/8"	3/8"	1/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	1-1/2"	1-1/2"
DIN Clip On (mm)	--	--	8	--	--	15	--	--	--	20, 25	--	20, 25	--	40, 50
DIN Weld On (mm)	--	--	8, 10	--	--	15	--	--	--	15, 20, 25	--	15, 20, 25	--	40, 50

HydroWhirl® S Flow Rates and Dimensions

Female Pipe Size	Nozzle Number	LITERS PER MINUTE @BAR						Dimensions (mm)			Mass (g)	Coverage Diameter (m) @2.75 bar
		0.5 bar	0.7 bar	1 bar	2 bar	3 bar	4 bar	A	B	C		
1/8"	HWS-20-3	4.39	4.79	5.40	7.05	8.19	9.11	16.6	42.7	69.1	24.9	1.5
	HWS-20-4	7.41	8.10	9.20	12.2	14.2	15.9					1.8
	HWS-20	10.8	12.0	13.9	20.2	25.3	29.1					
3/8"	HWS-30-5	7.71	8.80	10.4	15.3	18.9	21.9	27.9	59.4	83.3	93.0	2.4
	HWS-30-6	19.5	21.0	23.4	29.8	34.2	37.6					
1/4"	HWS-30	19.1	21.7	25.7	37.0	45.4	53.1					
3/4"	HWS-40-7.5	18.8	21.3	25.1	35.7	43.8	50.7	38.9	92.7	108	306	3.4
	HWS-40-8	21.5	24.3	28.6	40.6	49.6	57.2					
	HWS-40-9	26.6	30.2	35.7	51.5	63.0	72.7					
	HWS-40	30.2	34.6	41.2	59.9	71.8	82.5					
	HWS-40HF-11	40.9	46.4	54.5	77.3	95.0	109	38.9	92.7	108	302	4.0
	HWS-40HF	50.4	57.3	67.5	97.0	116	132					
1 1/2"	HWS-50-16	81.6	92.0	108	154	188	218	69.1	154.9	180	1524	5.5
	HWS-50	125	142	167	238	293	338					





Standard Materials: nozzle: 316L; ball bearings: 316 stainless steel
Flowrates higher with clip-on connection.

HydroWhirl® Poseidon®

Tank Washing - PTFE Spray Nozzle

DESIGN FEATURES

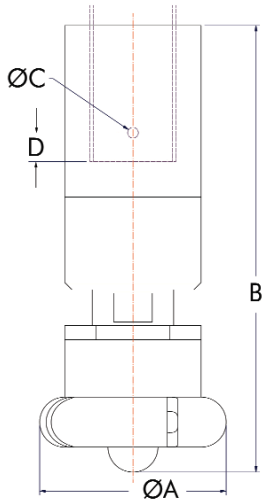
- Cleans more quickly, and uses less water and lower pressure than static tank washers
- PTFE construction:
  - Ideal for harsh chemical environments
  - Corrosion resistant
- Three connections: pipe, tube, or DIN clip-on. Threaded connections available upon request.
- Made from FDA-approved materials for use in Clean-In-Place (CIP) applications.

SPRAY CHARACTERISTICS

- Slow spinning, longer spray dwell time on the target surface increases impact over conventional rotating designs
- Complete 360° omnidirectional spray pattern

Flow rates: 58.3 to 333 l/min

Minimum Tank Opening:
Small: 75mm, Large: 83mm



HydroWhirl Poseidon® Nozzle Coverage Chart
When spraying at 2.8 bar

Nozzle Number	Washing Diameter (m)
HWP-32	4.5
HWP-37	3.5
HWP-48	5.5
HWP-55	6.5
HWP-65	6.0
HWP-73	5.0

CONNECTION SIZES

Connection Type	Body Size					
	SMALL			LARGE		
Threaded	1/2”	3/4”	1”	1”	1-1/4”	1-1/2”
Pipe Clip On	3/4”	1”		1”	1-1/4”	1-1/2”
Tube Clip On	1”	1-1/4”		1-1/2”		1-3/4”
DIN Clip On	20mm	25mm		40mm		

Dimensions are approximate. Check with BETE for critical dimension applications.
Not recommended for applications over 4 bar.

HydroWhirl Poseidon® Nozzle Flow Rates* and Dimensions

Body Size	Nozzle Number	Spray Angle	LITERS PER MINUTE @BAR						Dimensions (mm)				Mass (g)
			0.7 bar	1 bar	1.5 bar	2 bar	3 bar	4 bar	A	B	C	D MAX	
SMALL	HWP-32	360°	58.3	70.6	87.8	102	127	149	74.7	163	4.8	12.7	595
	HWP-37		67.9	81.9	101	118	146	170					
LARGE	HWP-48		85.6	104	129	151	189	221	82.6	185	4.8	12.7	822
	HWP-55		100	121	150	175	217	253					
	HWP-65		120	145	179	207	256	297					
	HWP-73		135	163	201	233	287	333					

Standard Materials: Nozzle: PTFE; Retaining Clip: 316 stainless steel
***Flowrates lower with threaded connection. Contact BETE for more information.**

HydroWhirl® Orbitor

High Impact Rotary Tank Cleaning Machine

DESIGN FEATURES

- Easily field-serviced to reduce maintenance costs
- Minimum moving parts to extend operating life
- Self cleaning; self lubricating
- High-impact jets; orbital wash pattern = high efficiency cleaning process
- Compact design
- 2 or 4 nozzle configurations = wash pattern variable up to super intense
- Male or female connections

SPRAY CHARACTERISTICS

- 360° wash pattern. 180° patterns available on request
- Variable cycle times
- High impact cleaning

Flow rates: 80 - 600 l/min
Working Pressure: 3 - 10 bar

Materials:
Housing: 316L
Nozzle Head: 316L
Gears: PEEK + 316 SS
Bushings/Seals: Carbon Filled PTFE

Max. Working Temp.: 95°C
Max. Ambient Temp.: 140°C
Weight: 6 kg

Minimum opening size is 5" for either 2-nozzle or 4-nozzle standard-capacity model.

Orbitor 2 nozzle spray pattern

Orbitor 4 nozzle spray pattern

Jet lengths are effective cleaning lengths

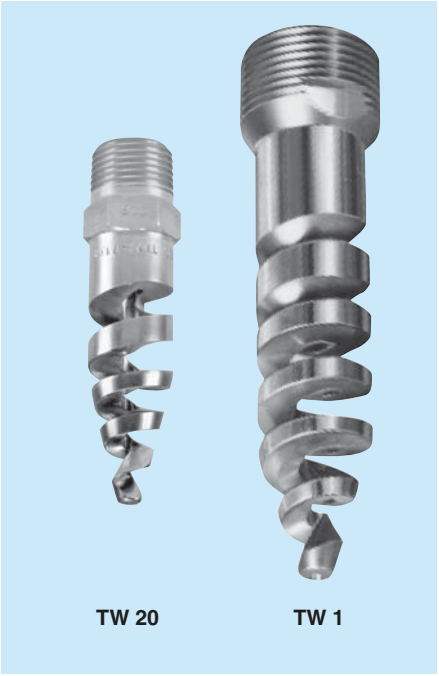
	4 X 4.2mm			4 x 5mm			4 x 6mm			4 x 7mm			4 x 8mm		
Connection Size	1" and 1-1/2"			1" and 1-1/2"			1-1/2"			1-1/2"			1-1/2"		
Pressure (BAR)	Flow (L/min)	Jet Length (m)	Cycle Time (min)	Flow (L/min)	Jet Length (m)	Cycle Time (min)	Flow (L/min)	Jet Length (m)	Cycle Time (min)	Flow (L/min)	Jet Length (m)	Cycle Time (min)	Flow (L/min)	Jet Length (m)	Cycle Time (min)
3	80.0	2.9	11	112	4	13	138	5.3	15.5	217	6.5	20.1	250	7.2	15.5
4	100	3	9.3	137	4.2	10.8	170	5.7	12.9	252	7.1	15.2	293	8	12.9
5	115	3.5	7.9	155	4.7	9.4	200	6.2	11	283	7.7	14.9	333	9	11
6	127	4	6.9	173	5.2	8	220	7	9.5	310	8.5	13	367	9.9	9.5
7	138	5	6.3	185	6.3	7.3	240	8	8.4	333	9.4	11.7	395	10.6	8.5
8	147	6.2	5.8	195	7.5	6.8	257	9.4	7.6	350	10.3	10.4	418	11.2	7.8
9	153	7.1	5.6	202	8.5	6.5	270	10.3	7	367	11.2	9.3	438	12.2	7
10	157	7.8	5.5	207	9	6.4	282	11.2	6.9	380	12	8.9	458	13	6.9

	2 x 6mm			2 x 7mm			2 x 8mm			*2 x 10mm			*2 x 12.5mm		
Connection Size	1-1/2"			1-1/2"			1-1/2"			1-1/2"			1-1/2"		
Pressure (BAR)	Flow (L/min)	Jet Length (m)	Cycle Time (min)	Flow (L/min)	Jet Length (m)	Cycle Time (min)	Flow (L/min)	Jet Length (m)	Cycle Time (min)	Flow (L/min)	Jet Length (m)	Cycle Time (min)	Flow (L/min)	Jet Length (m)	Cycle Time (min)
3	80.0	5.5	33	93.3	6.5	37.5	117	7.2	25.7	217	9.8	41	330	10.1	26.8
4	91.7	6	27.2	117	7.2	31.6	150	8	22.9	255	10.5	34.2	383	11.2	24
5	108	6.3	24.7	137	7.9	28.2	172	8.7	20.5	290	11.5	30.5	433	12.1	21.7
6	122	7	22.6	153	8.5	25.8	190	9.4	18.9	320	12.7	28	473	13.4	19.8
7	130	8	21	168	9.2	24	203	10.3	17.5	347	13.9	26	512	14.8	18.4
8	140	9	19.5	182	10.4	22.3	213	11.3	16.4	368	15.2	24.5	547	16.4	17.2
9	148	10.2	18.4	192	11.3	21	223	12.4	15.6	390	17	23.2	572	18.3	16.3
10	157	11.5	17.4	200	12.3	20	232	13.5	14.9	405	18.8	22	600	20.1	15.5

***High Capacity Jet Machine**

TW

Tank Washing



TW 20 TW 1

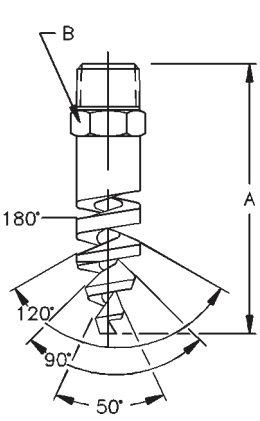
DESIGN FEATURES

- Clog-resistant spiral design
- Energy efficient
- Compact design; fits small openings

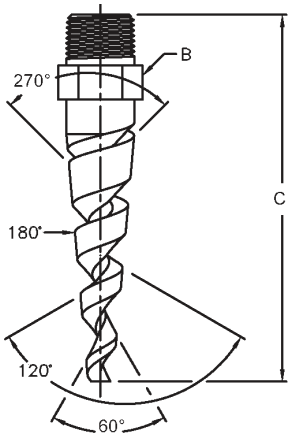
SPRAY CHARACTERISTICS

- Easy to maintain
- Unique patterns that spray in opposing directions

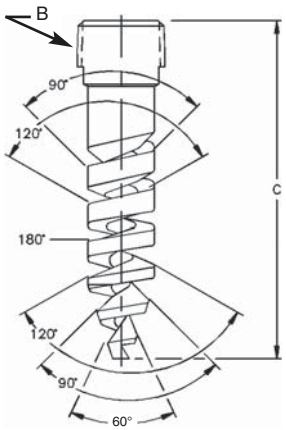
Flow rates: 11.4 to 260 l/min



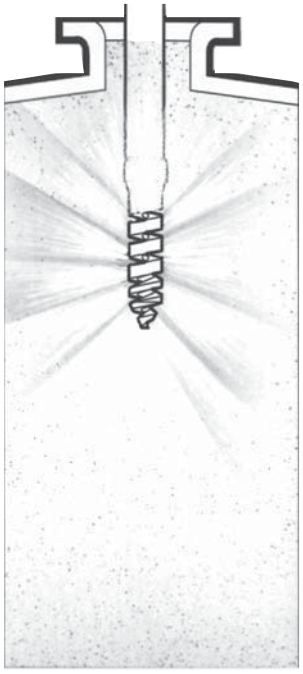
TW 12-TW 20 (180°)



TW 12-TW 20 (270°)



TW 1



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

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 0.7 bar	1 bar	2 bar	3 bar	4 bar	5 bar	Approx. (mm) Orifice Dia	Free Pass. Dia.	Metal Only Dim. (mm) A	B	C	Weight (g) Metal
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		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			146.1	298

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

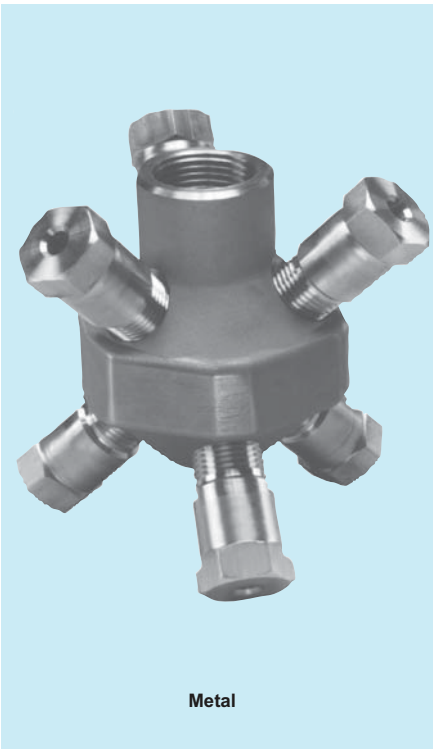
Standard Materials: Brass, 316 Stainless Steel.

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.*

CLUMP

Tank Washing Nozzles



Metal

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

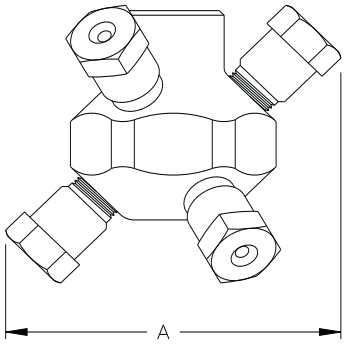
- Spherical omnidirectional coverage
- Six nozzles arranged in cluster to project spray in all directions

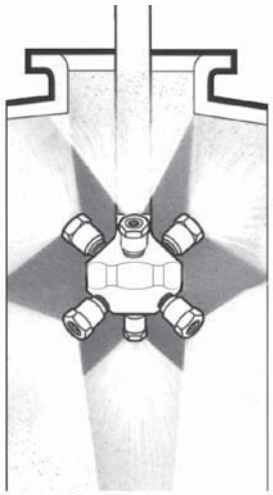
Flow rates: 28.1 to 290 l/min (Special flow rates available)

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

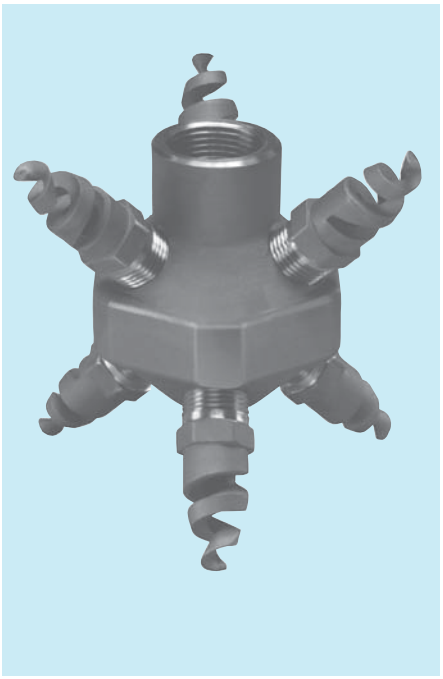
Flow Rate (l/min) = K (bar)$^{0.47}$

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.

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

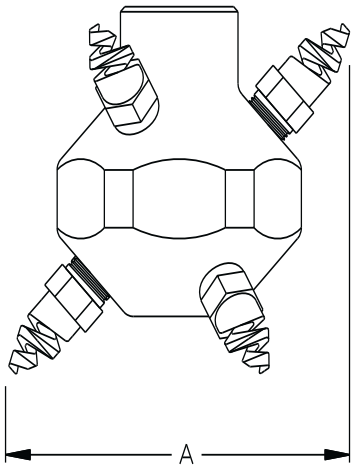
- Spherical omnidirectional coverage
- Six nozzles arranged in cluster to project spray in all directions

Flow rates: 16.0 to 597 l/min (special flow rates available, special tips upon request)

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 0.7 bar	1 bar	1.5 bar	2 bar	3 bar	4 bar	5 bar	7 bar	Minimum Entrance Open. (mm) A	Weight (kg) Metal	Weight (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			

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

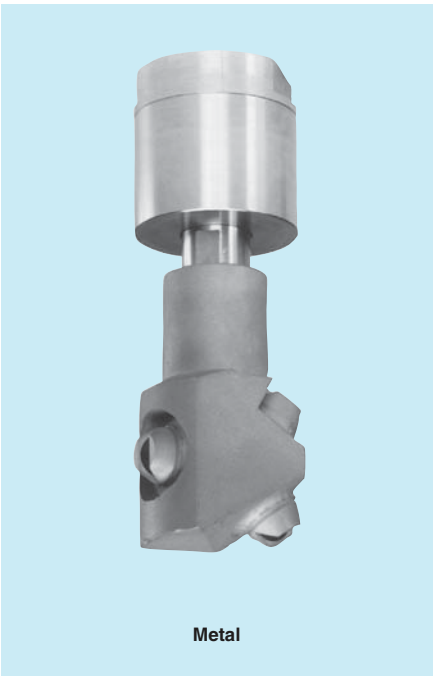
Standard Materials: Brass, 316 Stainless Steel, PVC, and PTFE

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.*

RTW

Rotating Tank and Drum Washing Nozzles



Metal

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

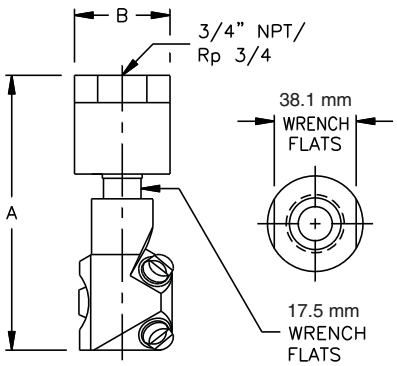
- Slow rotation speed provides better cleaning
- Wide coverage

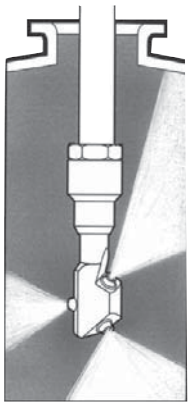
Flow rates: 19.1 to 229 l/min

RTW Coverage Chart

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





Typical RTW installation

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 0.7 bar	1 bar	2 bar	3 bar	4 bar	5 bar	Equivalent Orifice Dia. (mm)	Approx. Dim. (mm) A	B	Wt. (Kg)
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			

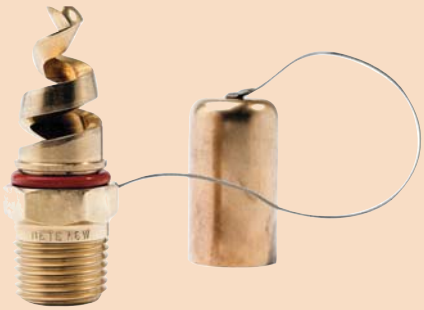
Flow Rate (l/min) = $K\sqrt{bar}$

Standard Materials: 316 Stainless Steel.

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

N

Fire Protection



Nozzle with optional protective cover

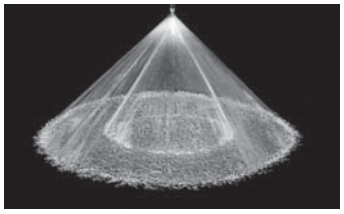
DESIGN FEATURES

- 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

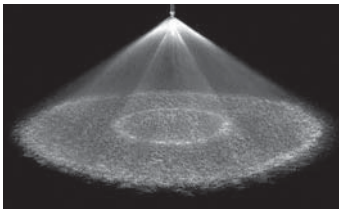
SPRAY CHARACTERISTICS

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

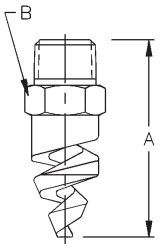
Spray pattern: Full Cone
Spray angles: 90° and 120° standard
Flow rates: 9.67 to 1720 l/min



Full Cone 90°



Full Cone 120° (W)



N3-N5W: U.S. Coast Guard approved

TF24-150° also available in Factory Mutual approved model (see page 20)

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

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 0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	10 bar	20 bar	Approx. (mm) Orifice Dia.	Free Pass. Dia.	Approximate Dimensions (mm) A	B	Wt. (g) Metal
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			

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

Standard Materials: Brass and 316 Stainless Steel. **All 316SS N series covers are 304 Stainless Steel.**

Also available in nickel aluminum bronze and titanium, plus other materials on request.

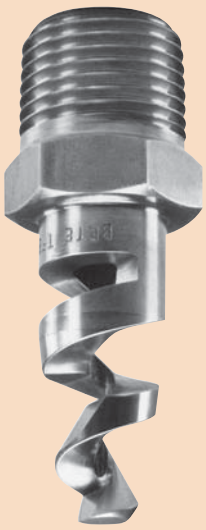
Spray angle performance varies with pressure. Contact BETE for specific data on critical applications.

SPECIAL PURPOSE

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

TF29-180

FireBēter: Ultra-Wide Full Cone Coverage



Metal

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

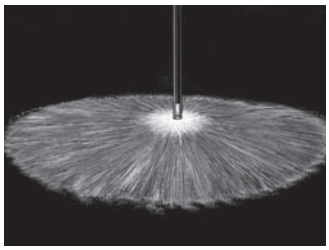
SPRAY CHARACTERISTICS

- Wide spray coverage
- Fine atomization

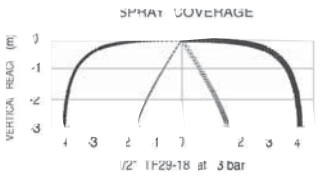
Spray patterns: circular sheet with maximum coverage and excellent atomization

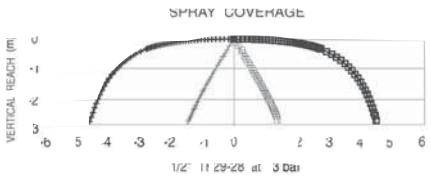
Spray angle: 180° extra-wide angle

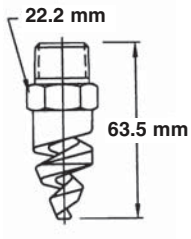
Flow rates: 12.3 to 355 l/min



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 0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	10 bar	20 bar	Approx. Free Pass. & Orifice Dia. (mm)
	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
1/2	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

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

Standard Materials: Brass and 316 Stainless Steel.

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

Twist & Dry®

Twist & Dry® Component System

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

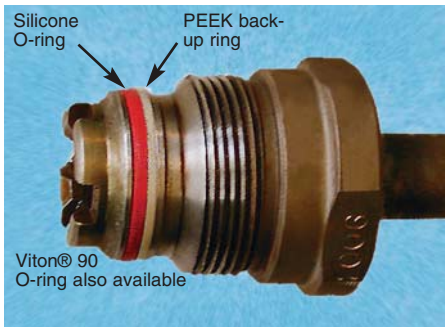
Twist & Dry nozzles have almost 1,000 different combinations of swirl and orifice discs to provide exactly the right flow rate and angle for your needs. The spray angle and flow rate are determined by the "swirl/orifice set-up"—a specific combination of one swirl disc and one orifice. To locate the right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

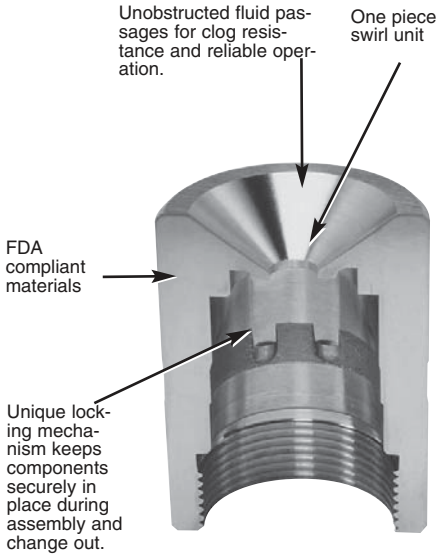
Often higher pressures can increase yield and save money. **Please visit www.bete.com/td-k.html.**

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.

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

TD swirl disc

TD orifice disc

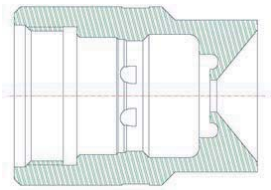
BETE Twister tool is specially designed for the Twist & Dry nozzle series.

SPECIAL PURPOSE

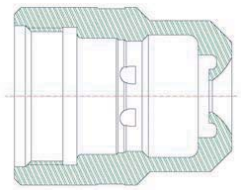
TO ORDER: *specify pipe size, connection type, nozzle number, and material.*

Twist & Dry® Components & Options

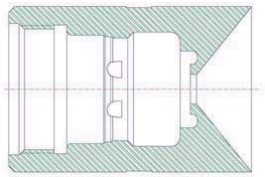
Twist & Dry Material Selection Guide				
Pressure		Temperature		
bar	psi	up to 250°F (121°C)	up to 400°F (204°C)	up to 450°F (232°C)
689	10,000	TD 10K Viton 90 O-ring w/ PEEK Backup Ring Carrier in Duplex 2205 TD 10K only available in Carriers 5 and 11	TD 10K Viton 90 O-ring w/ PEEK Backup Ring Carrier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



Carrier 1 (CI1) (shown)
Carrier 11 (CI11) - without lugs



Standard TD Carrier
Carrier 2 (CI12) (shown)
Carrier 5 (CI15) - without lugs



Carrier 10 (CI10) (shown)
Carrier 12 (CI12) - without lugs

To Order: Spray Set-up Number

¼ TD 2 - 034 - CI1 - 7K – 45 – B @7N

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

PEEK™ is a registered trademark of Victrex.

SPECIAL PURPOSE

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

TD/TD-K

Twist & Dry® Hollow Cone

Female

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** for more information on the TD-K nozzle

SPRAY CHARACTERISTICS

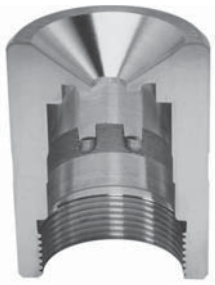
- Hollow Cone

Flow rates: 35.3 to 5,970 l/hr

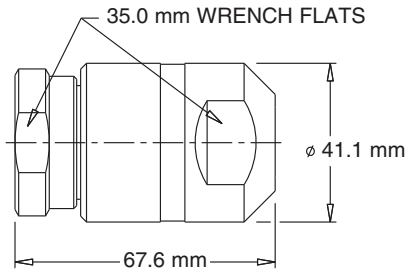
Spray angle: 50°, 55°, 60°, 65°, 70°, 75°, 80°

Check valve available upon request

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/TD-K 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	Swirl	Orifice (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
	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**													
	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**													
	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**													
	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**													
	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**													
	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**													
	TD4-46	**70°**	**SW4**	**1.17**													
	TD3-55	**75°**	**SW3**	**1.40**													
	TD6-40	**50°**	**SW6**	**1.02**	22.8	88.3	135	161	**191**	216	228	250	279	301	322	378	426
	TD5-43	**60°**	**SW5**	**1.09**													
	TD4-52	**70°**	**SW4**	**1.32**													
	TD5-49	**60°**	**SW5**	**1.24**	25.1	97.1	148	177	**210**	238	251	275	307	332	355	416	469
	TD4-58	**70°**	**SW4**	**1.47**													
	TD3-67	**80°**	**SW3**	**1.70**													

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

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

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

SPECIAL PURPOSE

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	Swirl Dia (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

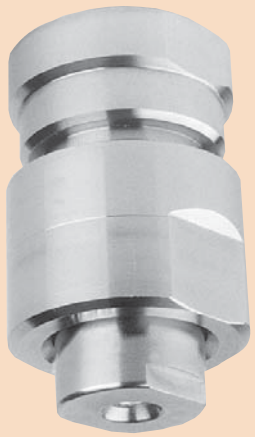
Flow Rate (l/hr) = K $\sqrt{\text{bar}}$

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

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

TDL

Twist & Dry® Low Flow Hollow Cone



Female

DESIGN FEATURES

- Patented locking mechanism for quick and easy change-out and maintenance
- 2-piece body for easy maintenance
- Lower flow rates than theTwist & 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

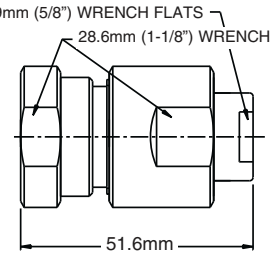
SPRAY CHARACTERISTICS

- Hollow Cone

Flow rates: 11.3 to 469 l/hr

Spray angle: 70° - 75°

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	Swirl	Dia. [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
	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
3/8"	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

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

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

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, and material.*

TurboMix®

TurboMix® Eductor Mixing Nozzle

DESIGN FEATURES

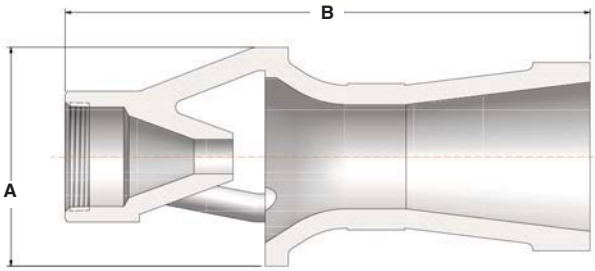
- Effective, economical way to circulate liquids in closed or open tanks
- No moving parts
- Inherently clog resistant
- Requires minimal maintenance
- Nozzle operation creates multiplying effect on fluid flow
- The volume of discharge liquid will be 3-5 times greater than the motive liquid pumped

SPRAY CHARACTERISTICS

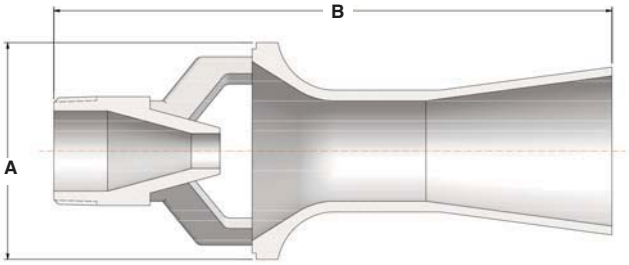
- Cone-shaped plume

Flow rates: 26.7 to 12000 l/min (motive)

Metal



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*

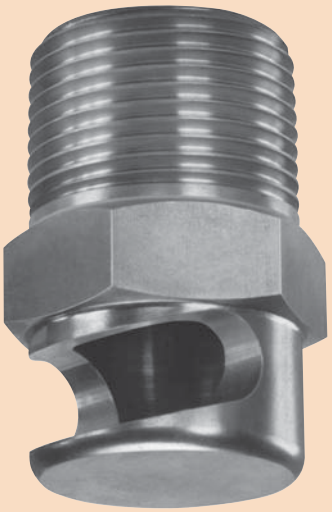
NPT or BSP Connection Size		TurboMix Number	K Factor	Motive Flow Rate LITERS PER MINUTE @ BAR*							Dimensions (mm)	
				0.7 bar	1 bar	1.5 bar	2 bar	3 bar	5 bar	7 bar	A	B
Male	3/8	TM70	31.9	**26.7**	31.9	39.1	45.1	55.3	71.4	84.4	43	108
	1/2	TM110	50.1	**41.9**	50.1	61.3	70.8	87.0	112	132	55	133
	3/4	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

IS

Rectangular Coverage/Mounted in Pairs



Metal

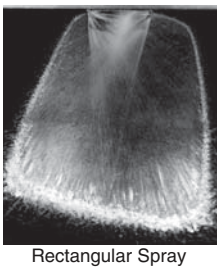
DESIGN FEATURES

- 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

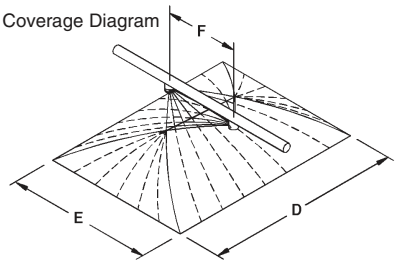
SPRAY CHARACTERISTICS

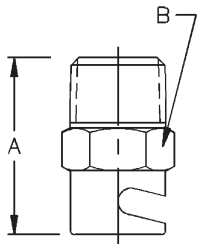
- Pattern widths of 18" to 120" can be achieved
- Good distribution with pressures as low as 0.035 bar
- Thick bands of droplets from opposing pairs intersect and fall uniformly

Spray pattern: Rectangular
Spray angle: See Pattern Width and Coverage Chart
Flow rates: 1.77 to 649 l/min per pair

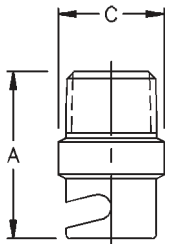


Rectangular Spray





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

Male Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE PER PAIR @ BAR 0.03 bar	0.07 bar	0.1 bar	0.2 bar	0.5 bar	0.7 bar	1 bar	1.5 bar	Nozzle Dim. (mm) A	B	C	Wt. (g) Metal	Plas.
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
	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
	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
	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
	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
	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
	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
	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
	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
	IS96	489	84.7	129	155	219	346	409	489	599					
	IS104	530	91.8	140	168	237	375	443	530	649					

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

Coverage

300mm Mounting Height

Spacing (mm) F	Approx. Cover. (mm) @ bar 0.07 bar D	E	0.1 bar D	E	0.25 bar D	E	0.5 bar D	E
70	600	450	850	650	1500	750	1800	750
100	500	350	800	450	1050	750	1150	900
125	750	450	1000	550	1500	900	1950	1050
150	650	300	900	500	1350	600	1000	600
200	900	300	1500	700	2100	900	2200	1050
250	1050	300	1500	500	1650	600	2250	650
300	750	450	1200	500	1550	600	2250	950
350	1200	350	1500	450	2200	500	2700	600
400	900	350	1200	450	1800	600	3000	950

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.

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

LP

Low Profile

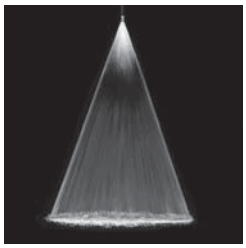
DESIGN FEATURES

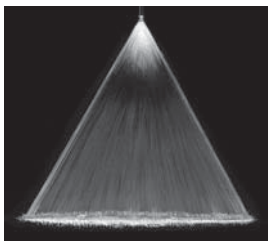
- Provides effective cleaning with low water consumption
- Interchangeable family of shower nozzles
- Self-aligning
- Orifice designed for efficient cleaning

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 3 bar	4 bar	5 bar	10 bar	30 bar	Equivalent Orifice Dia. (mm)
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

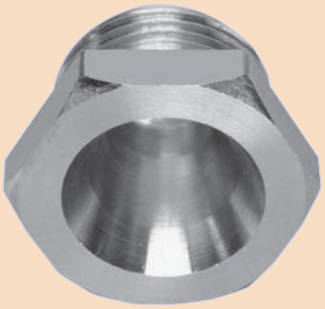
Flow Rate (l/min) = K $\sqrt{bar}$

Standard Materials: 316 Stainless Steel

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

PSR

Small Physical Size Straight Jet



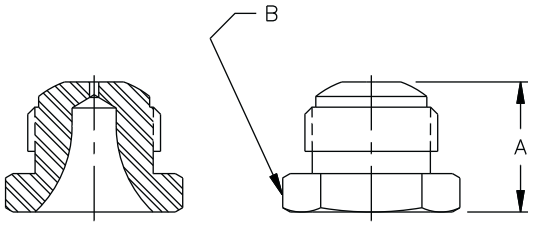
DESIGN FEATURES
- High velocity jet
- Small physical size
- Small orifice size: 0.035mm through 3.18mm
- **Interchangeable with most other needle-type showers**

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 1 bar	3 bar	5 bar	7 bar	10 bar	15 bar	30 bar	60 bar	Equivalent Orifice Dia. (mm)	Approx. Dim. (mm) A	B	Wt. (g)
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			

Flow Rate (l/min) = K (bar) $^{0.48}$

Standard Materials: 316 Stainless Steel.

SPECIAL PURPOSE

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

FINZ™

High Impact Fan Air Nozzle

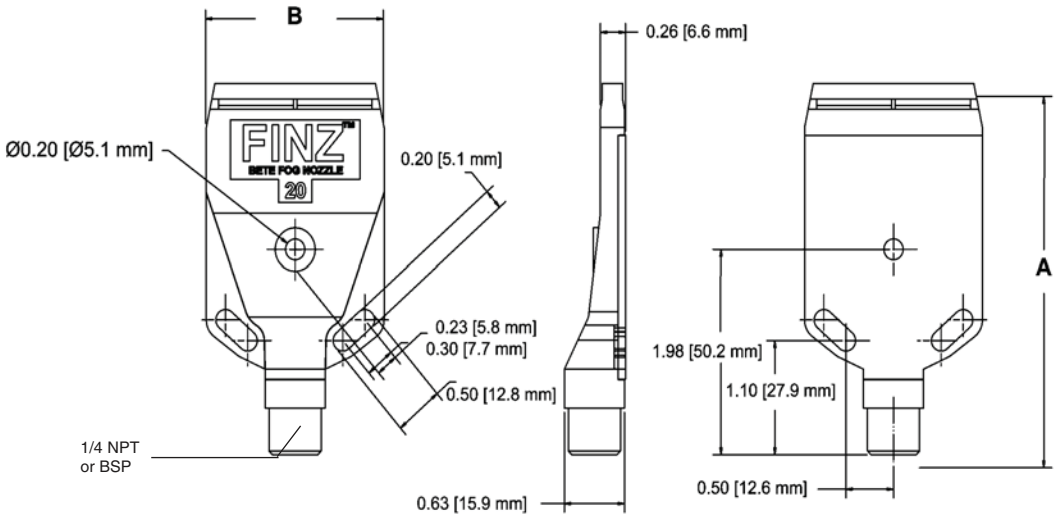
DESIGN FEATURES

- 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 Nm³/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 Nm³/h 0.7 bar	2 bar	**4 bar**	6 bar	Approx. Dim. (mm) A	B	Wt. (g)
	FZ20	7	12	**19**	26			
1/4"	FZ29	11	21	**32**	43	91	47	28.3
	FZ41	15	28	**47**	65			

Standard Materials: Ryton® and ABS plastic.

Ryton is a trademark of Phillips Petroleum company

SJ

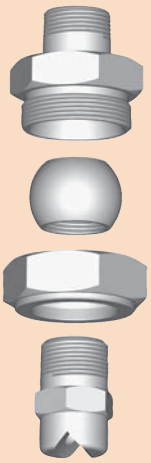
Swivel Joints

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

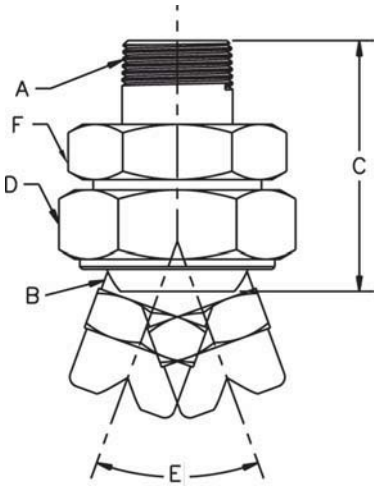
SPRAY CHARACTERISTICS

- **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		20.7	56.7
1/4 X 1/4 SJ	1/4 M	1/4 F	38.1	28.7		25.4	111
3/8 X 1/4 SJ	3/8 M	1/4 F	44.5	38.1	45°	35.1	244
3/8 X 3/8 SJ	3/8 M	3/8 F	45.5	38.1		35.1	244
1/2 X 3/8 SJ	1/2 M	3/8 F	50.8	44.5		41.4	366
1/2 X 1/2 SJ	1/2 M	1/2 F	50.8	44.5	45°	41.4	346
3/4 X 1/2 SJ	3/4 M	1/2 F	54.1	50.8	45°	47.8	505
3/4 X 3/4 SJ	3/4 M	3/4 F	54.1	50.8	45°	47.8	465
1 X 1 SJ	1 M	1 F	76.2	62.0	45°	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

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

Accessories

Components & Sizes

	Components	Materials	Sizes
Nozzle Strainers 	Optional strainer to fit BJ and CW nozzles. All strainers equipped with 316 stainless steel screens of various mesh sizes.	316 stainless steel	Mesh Sizes: 50 0.25mm (US Standard) (S201) 100 0.13mm (US Standard) (S202) 200 0.06mm (US Standard) (S203)
Reducing Bushings 	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	Bushing Sizes: 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
Y-Type Line Strainers 	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.	Strainer Sizes: 1/4, 3/8, 1/2, 3/4, 1, 1-1/2, 2 **Mesh Sizes** / **Screen Opening** 0.25mm / 0.13mm 0.20mm / 0.18mm 0.13mm / 0.28mm 0.06mm / 0.71mm 0.05mm / 0.86mm
Adapters and Couplings 	Reducing couplings, socket adapters, elbows, and various other fittings are available to meet specific applications.	Wide range of materials available.	Sizes available as required
Flanges 	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	Flange Sizes: 2" - 12" DN 50 - DN 300
Manifolds 	Used to cluster many nozzles into a small physical space	Wide range of materials available	Standard Sizes **Inlet** / **Outlets** 1/2" x (7) 3/8"-24 UNF 3/4" x (6) 1/4" or 3/8" 1" x (6) 3/8" or 1/2"

SPECIAL PURPOSE

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

SPECIFYING SPRAY NOZZLES

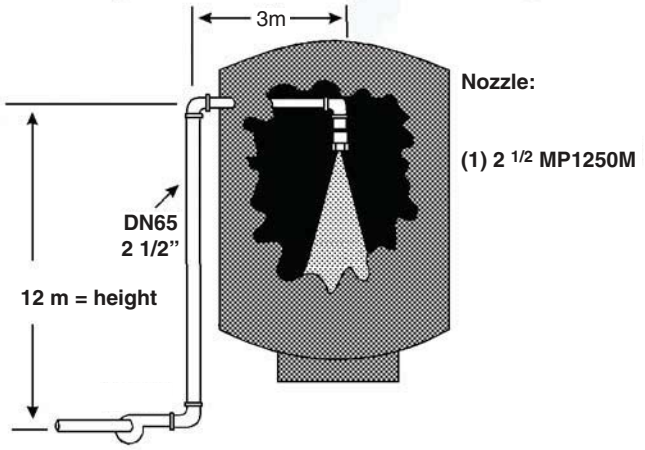
Spray nozzles have three basic functions:

- meter flow
- distribute liquid
- break up a liquid stream into droplets

The process of choosing a nozzle includes specifying:

a.) its flow-rate-versus-pressure characteristics (see catalog flow rate tables)
b.) how the droplets will be distributed after leaving the nozzle (see spray pattern, pp. 2, 3)
c.) the size of the droplets that will be produced (contact BETE Applications Engineering if droplet size is critical)
d.) the nozzle connection to the feed pipe (see dimension tables)
e.) the material of construction (see page 12 for complete list)

System Design Example



Calculate Total Water Flow and Pressure at Pump for Nozzles Operating at 0.5 bar

Total Flow *(p. 26, 27)* = (1 nozzles)(381 l/min/nozzle) = **381 l/min**

Pump Pressure Formula:

$$P_{pump} = P_{nozzle} + P_{pipe\ losses} + \rho gh/100000$$

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_{pump} = 0.5 bar + 0.14 bar + 1.17 bar = 1.81 bar

Pump must be sized to provide 381 l/min at 1.81 bar

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^x.

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 vessel from the gauge pressure at the nozzle inlet as shown:

$$l/min = K\,(Bar_{Inlet} - Bar_{Vessel})^{x}$$

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 (Q)of fluids with different specific gravities:

$$\frac{Q_2}{Q_1} = \sqrt{\frac{SG_1}{SG_2}}$$

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

Viscosity also affects nozzle performance. High viscosities inhibit 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

$$P_{Pump} = P_{Nozzle} + P_{Pipe\ Losses} + \frac{\rho g h}{100000}$$

is useful in estimating the pressure a pump will have to supply to a nozzle system:

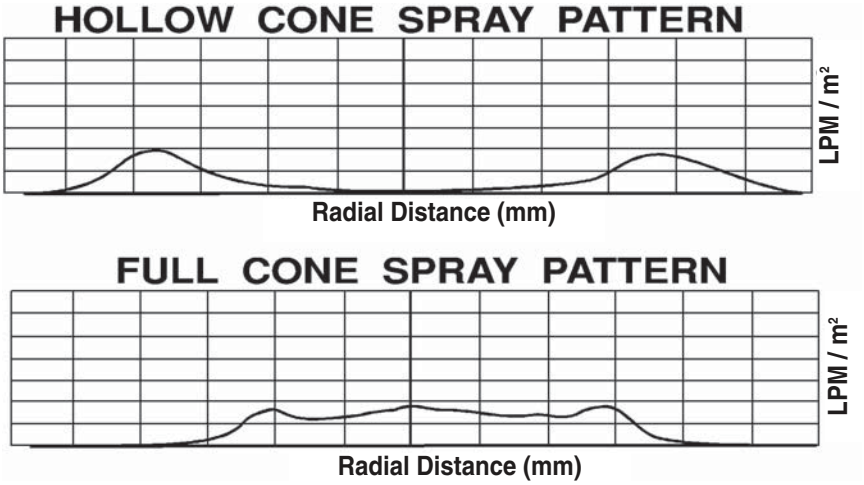
where:
ρ = density of fluid (kg/m^3)
[water = 1000 kg/m^3]
g = 9.81 m/s^2
h = height of nozzle above pump (m) - negative if the nozzle is below the pump
p = pressure (bar)

A chart of pipe friction losses is presented on page 125. 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. 125) 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 increased. For additional information see page 124.



NOZZLE SPRAY PATTERN

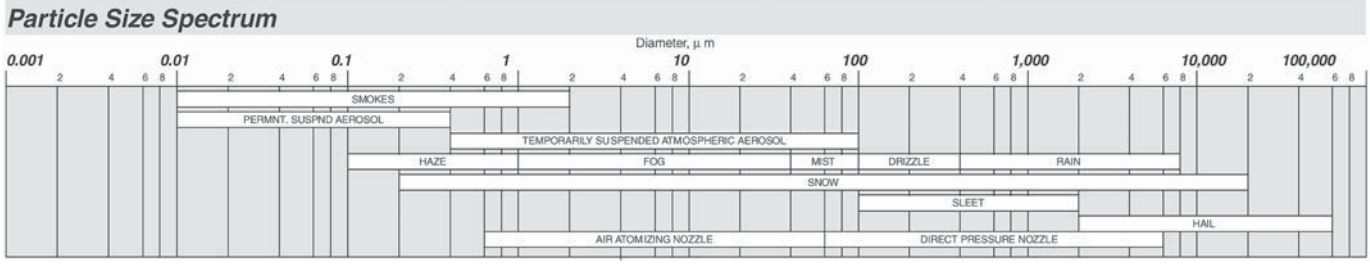
The term "Spray Pattern" describes the location and spray density of the liquid emitted from a nozzle. Two examples of pattern measurement are shown above. The height of the curve at any point is the spray density in units of LPM/m^2.

DROPLET SIZE

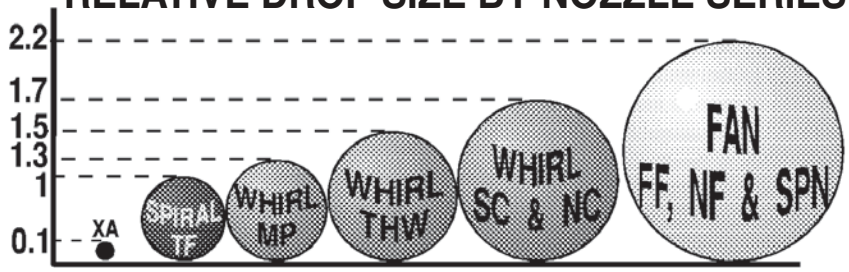
Droplet size is often critical. Many processes such as gas scrubbing depend on exposing the maximum possible amount of liquid surface to a gas stream. Other applications require that the droplets be as large as possible, such as when the spray must project into a fast moving gas stream.

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^3. This cube has a surface area of 6 m^2. If we now split it in two, we expose some of the inner surface and increase the total surface area to 8 m^2. 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^2.

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.



RELATIVE DROP SIZE BY NOZZLE SERIES



The following definitions are given for the most frequently used mean and median diameters:

Arithmetic Mean Diameter (D_{10})
- The average of the diameters of all the droplets in the spray sample.

Volume Mean Diameter (D_{30})
- 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_{32}):
- 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_{05}):
- 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,

$$\frac{D_2}{D_1} = \left(\frac{P_2}{P_1}\right)^{-0.3}$$

and air-atomizing nozzles such as the XA or SpiralAir Series typically produce the smallest droplets of all.

It is 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

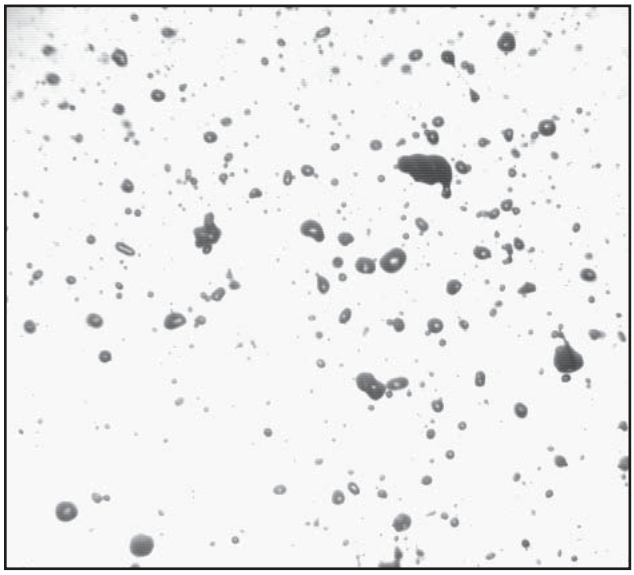
Nozzle Clogging
- low flow rates
- poor spray pattern

Inadequate Pipe Size
- excessive pipe pressure losses leading to low nozzle pressures
- high velocities in headers that disrupt fluid entering the nozzle

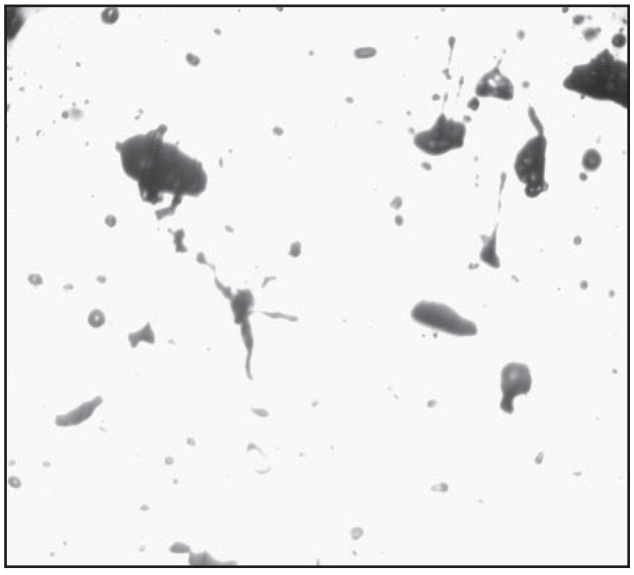
Incorrect Nozzle Location
- poor gas/liquid contact in scrubbers and quenchers
- poor area coverage

Incorrect Nozzle for Application
- drop size too small or too large
- incorrect pattern type

Careful system design and selection of the proper BETE nozzle will minimize spray problems.



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

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^3/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^3/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 analyses 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 today.

INDUSTRY COOPERATIVE DEVELOPMENT PROGRAMS

BETE has worked closely with major industries in research and development programs addressing personnel safety and environmental protection issues.

BETE has provided technical expertise, computer simulation, testing, and nozzle prototypes in a variety of projects, including:

- fire control aboard offshore drilling platforms
- toxic gas control
- oil spill cleanup
- reducing CFC use in the semiconductor industry

Spray Coverage

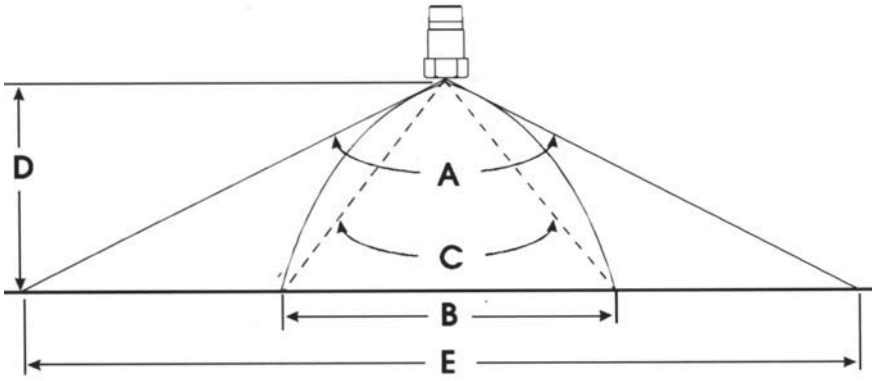
SPRAY ANGLE TERMS
Four terms are commonly used to describe spray coverage:

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.

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 128.



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							

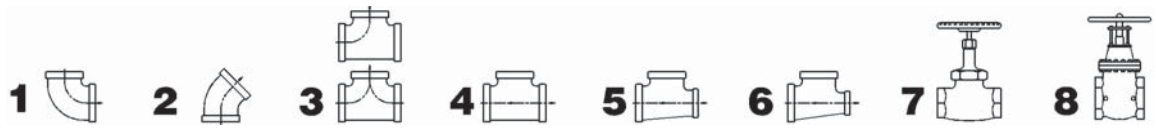
NOTE: Data shown is theoretical and does not take into consideration the effects of gravity, gas flow, or high pressure operation.

Water Flow Data

Flow of Water Through Schedule 40 Steel Pipe

Pressure Drop per 100 meters and Velocity in Schedule 40 Pipe for Water at 15° C

Discharge	1/8"		1/4"		3/8"		1/2"		3/4"		1"		1 1/4"		1 1/2"	
	Velocity	Press. Drop	Velocity	Press. Drop	Velocity	Press. Drop	Velocity	Press. Drop	Velocity	Press. Drop	Velocity	Press. Drop	Velocity	Press. Drop	Velocity	Press. Drop
l/min	m/sec	bar	m/sec	bar	m/sec	bar	m/sec	bar	m/sec	bar	m/sec	bar	m/sec	bar	m/sec	bar
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				
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
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
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			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
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		
800			4.32	2.95	2.80	0.977	2.09	0.473	1.62	0.246	1.03	0.081	0.715	0.032		
850			4.59	3.31	2.97	1.09	2.22	0.528	1.72	0.277	1.10	0.091	0.760	0.036	0.439	0.009
900					3.15	1.22	2.35	0.585	1.82	0.308	1.16	0.010	0.804	0.041	0.465	0.010
950					3.32	1.35	2.48	0.649	1.93	0.342	1.23	0.111	0.849	0.045	0.491	0.012
1000					3.50	1.50	2.61	0.714	2.03	0.377	1.29	0.122	0.894	0.049	0.516	0.013
1100					3.85	1.75	2.87	0.860	2.23	0.452	1.42	0.147	0.983	0.059	0.568	0.015
1200					4.20	2.14	3.14	1.02	2.43	0.534	1.55	0.172	1.07	0.069	0.620	0.018
1300							3.40	1.19	2.64	0.627	1.68	0.200	1.16	0.080	0.671	0.021
1400							3.66	1.37	2.84	0.722	1.81	0.232	1.25	0.091	0.723	0.024



Valve & Fitting Losses Expressed in Equivalent Meters of Pipe

	Pipe Fitting or Valve	Nominal Pipe or Tube Size (mm) 10	15	20	25	32	40	50	65	80	90	100	125	150
1	90˚ Standard Elbow	0.43	0.49	0.61	0.79	1.01	1.22	1.52	1.83	2.29	2.74	3.05	3.96	4.88
2	45˚ Standard Elbow	0.21	0.24	0.27	0.40	0.52	0.64	0.79	0.98	1.22	1.43	1.58	1.98	2.41
3	Flow-Through Branch Tee	0.82	0.91	1.22	1.52	2.13	2.44	3.05	3.66	4.57	5.49	6.40	7.62	9.14
4	Straight Through Flow Tee - No Reduction	0.27	0.30	0.43	0.52	0.70	0.79	1.01	1.25	1.52	1.80	2.04	2.50	3.05
5	Straight Through Flow Tee- Reduced 1/4	0.37	0.43	0.58	0.70	0.94	1.13	1.43	1.71	2.13	2.44	2.74	3.66	4.27
6	Straight Through Flow Tee - Reduced 1/8	0.43	0.49	0.61	0.79	1.01	1.22	1.52	1.83	2.29	2.74	3.05	3.96	4.88
7	Globe Valve - Fully opened	5.18	5.49	6.71	8.84	11.6	13.1	16.8	21.0	25.6	3.05	36.6	42.7	51.8
8	Gate Valve - Fully opened	0.18	0.21	0.27	0.30	0.46	0.55	0.70	0.85	0.98	1.22	1.37	1.83	2.13

Notes!

FLOW OF AIR THROUGH SCHEDULE 40 STEEL PIPE

Free Air m^3/min at 15°C & 1.013 bar abs	Compressed Air m^3/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								
		1/8"	1/4"	3/8"	1/2"					
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	3/4"				
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	1"			
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	1 1/4"		
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	1 1/2"	
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	2"
1.25	0.158			4.99	1.55	0.353	0.102	0.026	0.012	
1.5	0.190			7.20	2.19	0.499	0.147	0.036	0.017	0.0048
1.75	0.221	2 1/2"		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

Pipe Dimensions & Weights

Nominal Pipe Size NPS [DN]	OD in [mm]	Schedule			Wall Thickness mm	ID mm	Weight kg/m
1/8	**0.405**		10	10S	1.24	7.8	0.28
[6]	[10.3]	STD	40	40S	1.73	6.8	0.36
		XS	80	80S	2.41	5.5	0.47
1/4	**0.540**		10	10S	1.65	10.4	0.49
[8]	[13.7]	STD	40	40S	2.24	9.3	0.63
		XS	80	80S	3.02	7.7	0.80
3/8	**0.675**		10	10S	1.65	13.8	0.63
[10]	[17.1]	STD	40	40S	2.31	12.5	0.85
		XS	80	80S	3.20	10.7	1.10
1/2	**0.840**		5	5S	1.65	18.0	0.80
			10	10S	2.11	17.1	1.00
		STD	40	40S	2.77	15.8	1.27
[15]	[21.3]	XS	80	80S	3.73	13.9	1.62
			160		4.78	11.8	1.95
		XX			7.47	6.4	2.55
3/4	**1.050**		5	5S	1.65	23.4	1.02
			10	10S	2.11	22.5	1.28
		STD	40	40S	2.87	20.9	1.68
[20]	[26.7]	XS	80	80S	3.91	18.9	2.19
			160		5.56	15.5	2.89
		XX			7.82	11.0	3.63
1	**1.315**		5	5S	1.65	30.1	1.29
			10	10S	2.77	27.9	2.09
		STD	40	40S	3.38	26.6	2.50
[25]	[33.4]	XS	80	80S	4.55	24.3	3.23
			160		6.35	20.7	4.23
		XX			9.09	15.2	5.45
1-1/4	**1.660**		5	5S	1.65	38.9	1.65
			10	10S	2.77	36.6	2.69
		STD	40	40S	3.56	35.1	3.38
[32]	[42.2]	XS	80	80S	4.85	32.5	4.46
			160		6.35	29.5	5.60
		XX			9.70	22.8	7.76
1-1/2	**1.900**		5	5S	1.65	45.0	1.90
			10	10S	2.77	42.7	3.10
		STD	40	40S	3.68	40.9	4.04
[40]	[48.3]	XS	80	80S	5.08	38.1	5.40
			160		7.14	34.0	7.23
		XX			10.16	27.9	9.54
2	**2.375**		5	5S	1.65	57.0	2.39
			10	10S	2.77	54.8	3.93
		STD	40	40S	3.91	52.5	5.44
[50]	[60.3]	XS	80	80S	5.54	49.3	7.47
			160		8.74	42.9	11.10
		XX			11.07	38.2	13.44
3	**3.500**		5	5S	2.11	84.7	4.51
			10	10S	3.05	82.8	6.45
		STD	40	40S	5.49	77.9	11.27
[80]	[88.9]	XS	80	80S	7.62	73.7	15.26
			160		11.13	66.7	21.32
		XX			15.24	58.4	27.65
3-1/2	**4.000**		5	5S	2.11	97.4	5.17
			10	10S	3.05	95.5	7.40
		STD	40	40S	5.74	90.1	13.56
[90]	[101.6]	XS	80	80S	8.08	85.5	18.61
		XX			16.15	69.3	34.00

Nominal Pipe Size NPS [DN]	OD in [mm]	Schedule			Wall Thickness in	ID in	Weight lb/ft
4	**4.500**		5	5S	2.11	110.1	5.83
			10	10S	3.05	108.2	8.35
		STD	40	40S	6.02	102.3	16.06
[100]	[114.3]	XS	80	80S	8.56	97.2	22.30
			120		11.13	92.1	28.28
			160		13.49	87.3	33.50
		XX			17.12	80.1	40.99
6	**6.625**		5	5S	2.77	162.7	11.29
			10	10S	3.40	161.5	13.83
		STD	40	40S	7.11	154.1	28.24
[150]	[168.3]	XS	80	80S	10.97	146.3	42.52
			120		14.27	139.7	54.16
			160		18.26	131.8	67.49
		XX			21.95	124.4	79.11
8	**8.625**			5S	2.77	213.5	14.75
			10	10S	3.76	211.6	19.94
			20		6.35	206.4	33.28
			30		7.04	205.0	36.75
		STD	40	40S	8.18	202.7	42.49
[200]	[219.1]		60		10.31	198.5	53.04
		XS	80	80S	12.70	193.7	64.57
			100		15.09	188.9	75.82
			120		18.26	182.6	90.35
			140		20.62	177.8	100.83
		XX			22.23	174.6	107.78
			160		23.01	173.1	111.15
10	**10.750**			5S	3.40	266.2	22.61
				10S	4.19	264.7	27.76
			20		6.35	260.4	41.72
			30		7.80	257.5	50.96
		STD	40	40S	9.27	254.5	60.25
[250]	[273.1]	XS	60	80S	12.70	247.7	81.46
			80		15.09	242.9	95.88
			100		18.26	236.5	114.63
			120		21.44	230.2	132.88
			140		25.40	222.3	154.97
			160		28.58	215.9	172.10
12	**12.750**			5S	3.96	315.9	31.23
				10S	4.57	314.7	35.96
			20		6.35	311.2	49.67
			30		8.38	307.1	65.14
		STD		40S	9.53	304.8	73.76
[300]	[323.9]		40		10.31	303.2	79.65
		XS		80S	12.70	298.5	97.35
			60		14.27	295.3	108.87
			80		17.48	288.9	131.90
			100		21.44	281.0	159.71
			120		25.40	273.1	186.75
			140		28.58	266.7	207.86
			160		33.32	257.2	238.51

BETE Fog Nozzle, Inc.
Application Information Sheet

FAX: 413 772-6729
email: appeng@bete.com

Name: _____ **Company:** _____

Telephone: _____ **Company Address:** _____

FAX: _____ **email:** _____ **BETE Cust. #** _____

Sketch a simple representation of the application below:

- What are you trying to accomplish with the spray?

- What is the available pressure?
- What is the desired material of construction?
- What is the flow rate?
- What is the piping material?
- What is the desired flow rate?
- What are the size and connection types desired?
- What liquid is being sprayed?
- What is the distance from the nozzle to the target?
- What is the desired spray angle or coverage?
- What are the environmental conditions surrounding the nozzle?

Conversions & Equations

Q = Flow rate **P = Pressure** **SG= Specific Gravity**

$$Q = K(P)^x$$

$$P = \left(\frac{Q}{K}\right)^{1/X}$$

$$\left(\frac{Q_2}{Q_1}\right) = \left(\frac{P_2}{P_1}\right)^x$$

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

Vessel with internal pressure:

$$l/min = K\left(P_{inlet} - P_{Vessel}\right)^x$$

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
LP	0.50	STXP	0.50
MaxiPass	0.47	TC	0.46
MPL	0.43	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

Dropsize

$$\left(\frac{D_2}{D_1}\right) = \left(\frac{P_2}{P_1}\right)^{-0.3}$$

System Design

$$P_{Pump} = P_{Nozzle} + P_{Pipe\ Losses} + \rho h / 100000$$

Conversion Data

MULTIPLY	BY	TO OBTAIN
atmospheres	1.013	bar
atmospheres	33.931	feet of water
atmospheres	1.0332	kg/cm²
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
cm³	0.061	in³
cm³	0.000264	gallons
cm³	0.001	liters
ft³	1728	inches
ft³	0.02832	m³
ft³	7.48	gallons
ft³	28.32	liters
ft³ (water)	62.43	pounds (water)
in³	16.39	cm³
in³	0.00433	gallons
in³	0.164	liters
m³	35.31	ft³
m³	61.024	in³
m³	264.2	gallons
m³	1000	liters
degree (angle)	60	minutes
degree (Celsius)	(°C x 1.8) +32	degree (Fahrenheit)
degree (Fahrenheit)	(°F-32) x 5/9	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	cm³
gallons	0.1337	ft³
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/cm²	14.22	psi
kiloWatts	1.340	horsepower
liters	1000	cm³
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/cm²
psi	6.895	kPa

Terms and Conditions.

Prices quoted are FOB, Greenfield, MA. Terms are Net 30 days for approved accounts. Minimum order is $50.00 net. A restocking charge of 30% 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.

BETE FOG NOZZLE reserves the right to make changes in specifications or design at any time without notice. Illustrations shown in this catalog are for information only.

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Limitation of Liability—BETE's liability shall be limited to the value of the product billed arising from a purchase order.

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