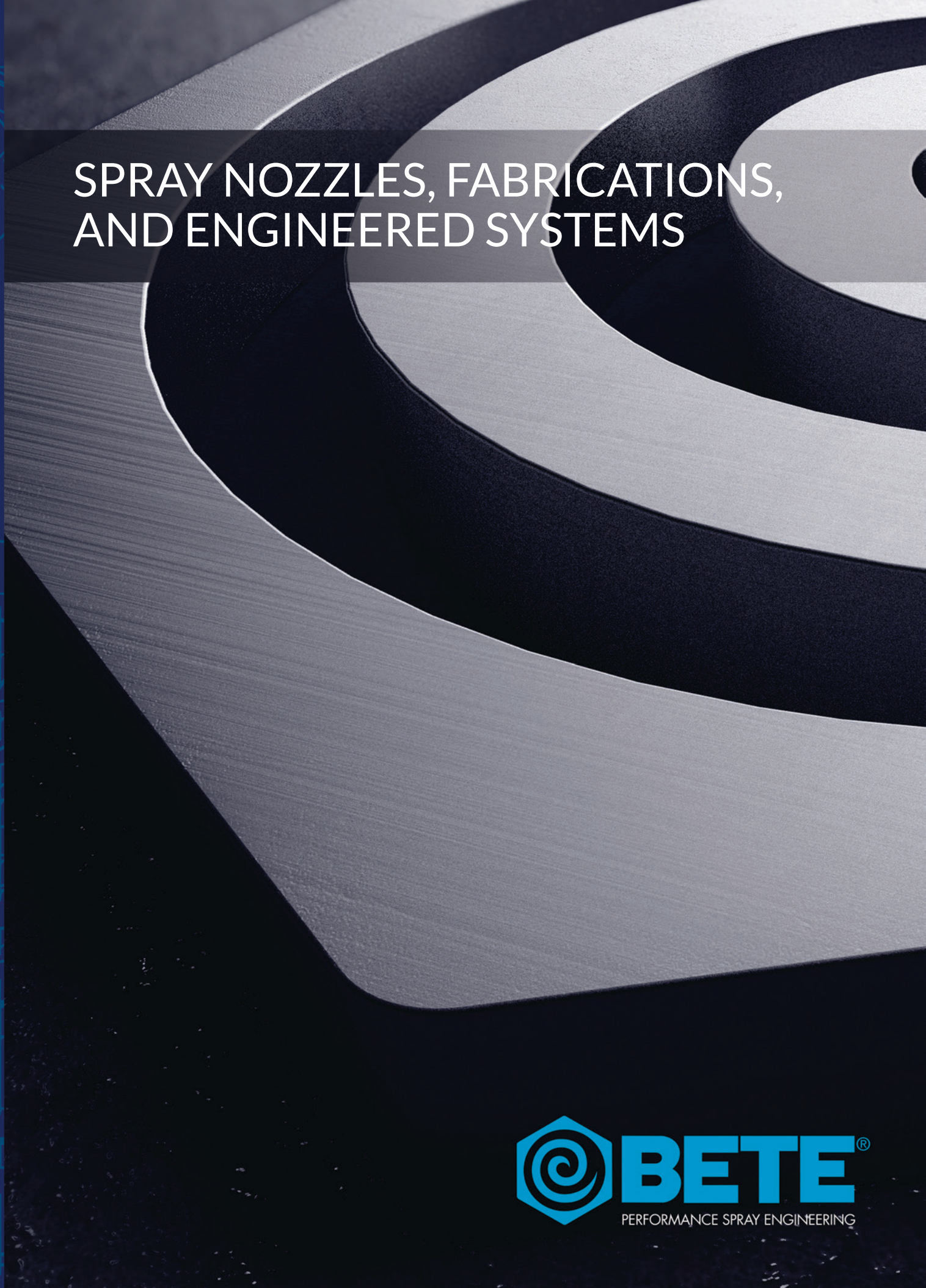
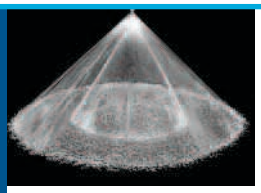
SPRAY NOZZLES, FABRICATIONS, AND ENGINEERED SYSTEMS



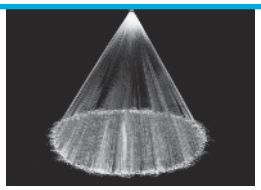
BETE®
PERFORMANCE SPRAY ENGINEERING

Nozzles 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. 28

TFXP

Same as the TF plus maximum free passage. 3/8"- 4"
p. 29

ST

A Cobalt Alloy tip and 316 stainless connection for spraying abrasive liquids. 1/4"- 4"
p. 30

STXP

Same as the ST with extra rugged construction plus maximum free passage. 3/8"- 4"
p. 31

WL

Low flow rate, full cone nozzles. 1/8" - 1"
p. 32

MPL

Low flow, maximum free passage. Unique, S-shaped internal vanes allow free passage of particles. 1/8" and 1/4"
p 33

MaxiPass

Patented MaxiPass "S"-shaped vanes for superior distribution and largest free passage. 3/8" - 4"
pp. 34, 35

CW

Low flow rate full or hollow cone, 3-piece construction with optional strainer and cover. 1/8"- 3/8"
p. 36

WTZ

Tangential full cone nozzle with 3-piece construction. 1/4"- 1/2"
p. 37

EZ

Quick connection system, ramped engagement for automatic alignment. 1/8" - 1/2"
p. 38

SF

Snap release nozzle system features clamp-on adapters for easy installation. 1" - 2"
p. 39

SC

Metal full cone nozzles available in a wide range of alloys. 3/4"- 6"
pp. 40, 41

NC

Complete line of full cone nozzles available in a variety of plastic materials. 3/4"- 6"
pp. 42, 43

NCS

"Stubbies"; short NC-type nozzles for use where space is at a premium. 1"- 4"
p. 44

NCK

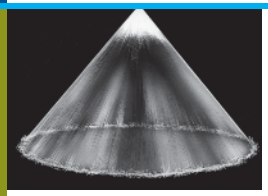
Narrow spray angle injector. 3/4"- 6"
p. 45

NCFL

Large plastic nozzles with high flow rates for applications where flanged connections are required. 4"- 12"
p. 46

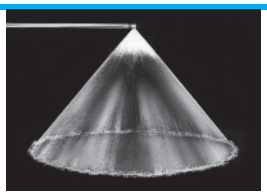
TC

High capacity full cone metal nozzles. 6"- 12"
p. 47



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. 48, 49

WTX

Similar to WT, with design features for extended life. 1/8"- 3/4"
pp. 50, 51

CW

Low flow rate full or hollow cone, 3-piece construction with optional strainer and cover. 1/8"- 3/8"
p. 52

TF

The standard spiral line, available in a wide range of flows, angles, and materials. 1/8"- 4"
p. 53

EZ

Quick connection system, ramped engagement for automatic alignment. 1/8" - 1/2"
pp. 54, 55

SF

Snap release nozzle system features clamp-on adapters for easy installation. 1" - 2"
p. 56

NCJ

Narrow spray angle injector.

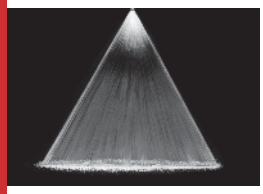
3/4"- 6"
p. 57

TH

Larger one-piece tangential hollow cone nozzle 1"- 3"
pp. 58, 59

THW

Same as TH, with wide spray pattern. 1"- 3"
pp. 60, 61



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 inter-changeable tips; fan spray. 1/8"- 3/8"

pp. 62, 63

BJH

Interchangeable tips, strainer. Male and female tips. Can be used with HydroPulse. 1/8"- 1/2"

pp. 64

NFV

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

p. 66

NF

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

p. 67

NFD

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

p. 68

NFH

Tungsten carbide orifice inserts for maximum wear resistance and service life. 1/4"

p. 65

NFS

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

p. 69

FF

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

pp. 70, 71

EZ

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

pp. 72, 73

SF

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

p. 74

SPN

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

p. 75

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. 76

PJ

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

p. 77

P

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

p. 78

L

A low-flow, spiral nozzle.

1/8" or 1/4"

p. 79

UltiMist

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

p. 80

SS

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

p. 81

Air Atomizing Nozzles

Compressed gas, most often air, is used to increase the atomization efficiency of these nozzles.

XA

Two-fluid nozzles for low flow applications. Automatic options available. 0.006-4.54 L/min

pp. 82-99

SAM

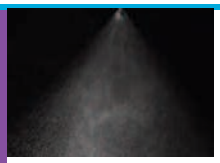
External mix/flat fan or narrow round variable coverage, fine control of dropsize. 0.05-2.96 L/min

pp. 100, 101

SpiralAir

Two-fluid nozzles for high flow applications. 1.24-75 L/min

pp. 102, 103



Automatic Nozzles

Electric-actuated or air-actuated intermittent spraying solutions ensure precision volumes of expensive ingredients and compounds are sprayed directly onto your processing target, with overspray waste virtually eliminated.

HydroPulse EHP

Electric actuated food grade hygenic design with interchangeable tips. 0.084-101 L/min

pp. 24, 25

HydroPulse EHPI

For industrial applications - electric actuated with interchangeable tips. 0.084-101 L/min

pp. 24, 25

HydroPulse PHP

Pneumatically actuacted for crisp on/off spray with interchangabel tips. 0.084-101 L/min

pp. 26, 27

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. 105

HydroWhirl Poseidon

Rotating tank washing nozzle in PTFE. Ideal for harsh chemical environments.
1/2"- 1-1/2"
p. 106

HydroWhirl Orbitor

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

p. 107

HydroWhirl Orbitor 100

High impact rotary tank cleaning machine ideal for small to medium tanks.

p. 108

HydroClaw

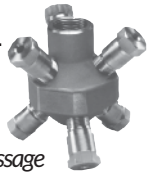
Unique, clog-resistant design with vigorous 360° rinsing action for food-grade applications.
3/4" - 1-1/2"
p. 109

TW

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

p. 110

CLUMP



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

p. 111

LEM

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

p. 112

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

AFF

FM Approved extra-wide flat fan for fire protection water wall.

3/4" & 1/2"

p. 113

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. 114

TF29-180

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

p. 115

SPRAY DRYING NOZZLES

Twist & Dry

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

pp. 116-120

TDL

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

p. 120

TurboMix

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

p. 121

IS

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

p. 122

LP

Self-aligning, interchangeable family of shower nozzles.

p. 123

PSR

Small physical size, hard-driving high velocity, straight jet
9/16" - 24 UNEF
p. 124

FINZ

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

p. 125

SJ

Swivel joints allow custom alignment of nozzles without piping changes.
1/4"- 3/4"
p. 126

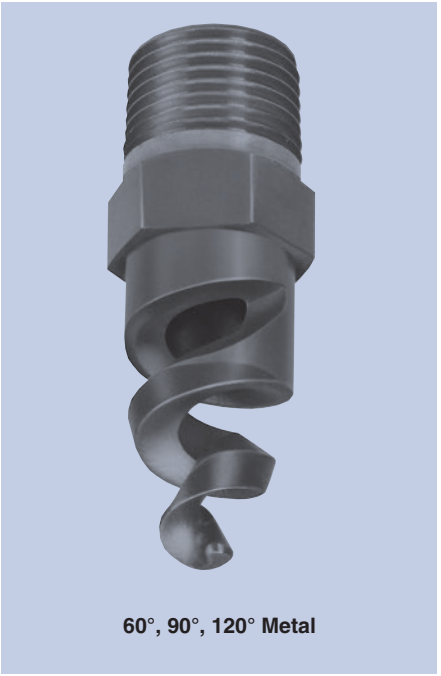
Accessories

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

p. 127

TF

Wide Range of Flows and Angles



60°, 90°, 120° Metal

DESIGN FEATURES

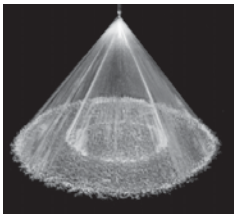
- The original spiral nozzle invented by BETE and continuously improved!
- High energy efficiency
- One-piece/no internal parts
- Clog-resistant performance
- High discharge velocity
- Male connection standard; female connection available by special order

SPRAY CHARACTERISTICS

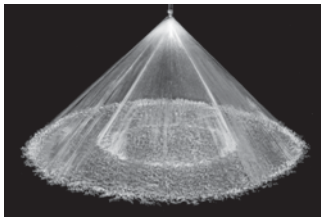
- Wide range of flow rates and spray angles
- Fine atomization

Spray patterns: Full Cone.
For Hollow Cone, see page 53
Spray angles: 50° to 180°
Flow rates: 2.26 to 10700 l/min (Higher flow rates available)

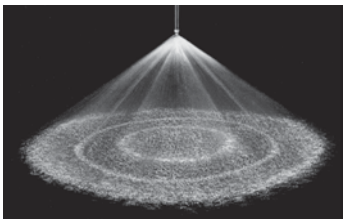
Available with FM approval: N series (page 114), 1/4" TF8 NN, FCN in brass, 1/2" TF24-150 in multiple materials



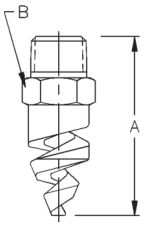
Full Cone 60° (NN)



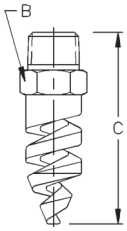
Full Cone 90° (FCN)



Full Cone 150°/170°



90°, 120°



150°, 170°

Dimensions are approximate. Check with BETE for critical dimension applications

TF Full Cone Flow Rates and Dimensions

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

Male Pipe Size	Nozzle Number	Available Spray Angles 60° 90° 120° 150° 170°	K Factor	LITERS PER MINUTE @ BAR 0.5 bar	0.7 bar	1 bar	2 bar	3 bar	PTFE not recommended at pressures above red line: 5 bar	Metal ONLY at pressures above green line: 10 bar	20 bar	Approx. (mm) Orif. Dia.	Free Pass Dia.	Dim. (mm) for Metal Only* A	B	C	Wt. (g) 60° 90° 120° Metal	Plas.
1/8	TF6	60° 90° 120° 150° 170°	3.19	2.26	2.67	3.19	4.5	5.5	7.1	10.1	14.3	2.38	2.38	42.9	14.3	42.9	28	6
	TF8	60° 90° 120° 150° 170°	5.93	4.19	4.96	5.93	8.4	10.3	13.2	18.7	26.5	3.18	3.18	42.9	14.3	55.6		
1/4	TF6	60° 90° 120° 150° 170°	3.19	2.26	2.67	3.19	4.5	5.5	7.1	10.1	14.3	2.38	2.38	47.6	14.3	47.6	35	6
	TF8	60° 90° 120° 150° 170°	5.93	4.19	4.96	5.93	8.4	10.3	13.2	18.7	26.5	3.18	3.18	47.6	14.3	60.3		
	TF10	60° 90° 120° 150° 170°	9.12	6.45	7.63	9.12	12.9	15.8	20.4	28.8	40.8	3.97	3.18	47.6	14.3	60.3		
3/8	TF6	60° 90° 120°	3.19	2.26	2.67	3.19	4.5	5.5	7.1	10.1	14.3	2.38	2.38	47.6	17.5	60.5	46	7
	TF8	60° 90° 120°	5.93	4.19	4.96	5.93	8.4	10.3	13.2	18.7	26.5	3.18	3.18					
	TF10	60° 90° 120°	9.12	6.45	7.63	9.12	12.9	15.8	20.4	28.8	40.8	3.97	3.18					
	TF12	60° 90° 120° 150° 170°	13.7	9.67	11.4	13.7	19.3	23.7	30.6	43.2	61.1	4.76	3.18					
	TF14	60° 90° 120° 150° 170°	18.5	13.1	15.4	18.5	26.1	32.0	41.3	58.4	82.6	5.56	3.18					
	TF16	60° 90° 120° 150° 170°	24.2	17.1	20.2	24.2	34.2	41.8	54.0	76.4	108	6.35	3.18					
	TF20	60° 90° 120° 150° 170°	37.6	26.6	31.5	37.6	53.2	65.1	84.1	119	168	7.94	3.18					
1/2	TF24	60° 90° 120° 150° 170°	54.9	38.8	46.0	54.9	77.7	95.1	123	174	246	9.53	4.76	63.5	22.2	77.7	85	14
	TF28	60° 90° 120° 150° 170°	75.2	53.2	62.9	75.2	106	130	168	238	336	11.1	4.76					
3/4	TF32	60° 90° 120° 150° 170°	95.7	67.7	80.1	95.7	135	166	214	303	428	12.7	4.76	69.9	28.6	88.9	156	25
1	TF40	60° 90° 120° 150° 170°	153	108	128	153	216	264	341	483	683	15.9	6.35	92.1	34.9	111	241	71
	TF48	60° 90° 120° 150° 170°	217	153	181	216	306	375	484	685	968	19.1	6.35					
1 1/2	TF56	60° 90° 120° 150° 170°	294	208	246	294	416	509	657	930	1320	22.2	7.94	111	50.8	137	624	120
	TF64	60° 90° 120° 150° 170°	385	272	322	385	545	667	861	1220	1720	25.4	7.94	111	50.8	137		
	TF72	60° 90° 120° 150° 170°	438	309	366	438	619	758	978	1380	1960	28.6	7.94	111	50.8	143		
2	TF88	60° 90° 120° 150° 170°	638	451	534	638	902	1110	1430	2020	2850	34.9	11.1	143	63.5	175	1300	227
	TF96[1]	60° 90° 120° 150° 170°	806	570	674	806	1140	1400	1800	2550	3600	38.1	11.1	176	63.5	178	1530	255
3	TF112[1]	60° 90° 120° 150° 170°	1170	825	976	1170	1650	2020	2610	3690	5220	44.5	14.3	219	88.9	235	3230	567
	TF128[1]	60° 90° 120° 150° 170°	1550	1090	1290	1550	2190	2680	3460	4891	6920	50.8	14.3					
4	TF160[1]	60° 90° 120°	2390	1690	2000	2390	3380	4140	5350	7570	10700	63.5	15.9	257	114		4790	765

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

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

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

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

WL

Low Flow/Full Cone

DESIGN FEATURES

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

SPRAY CHARACTERISTICS

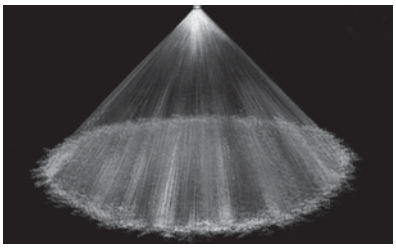
- Medium to coarse atomization

Spray pattern: Full Cone. Square pattern available

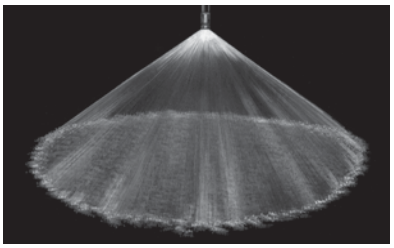
Spray angles: 30°, 60°, 90°, and 120° standard

Flow rates: 0.497 to 192 l/min

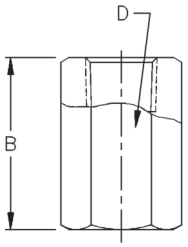
Metal



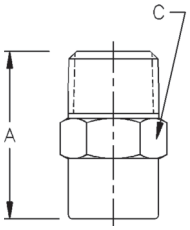
Full Cone 90°



Full Cone 120°



Female Metal



Male Metal

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

WL Flow Rates and Dimensions

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

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

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

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

*1/8" PTFE and Polypropylene not available in 120°.
**1/8 WL-1/4 not available in Polypropylene.

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.*

MaxiPass®

Maximum Free Passage

DESIGN FEATURES

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

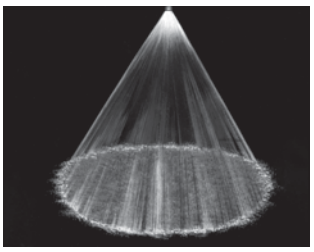
SPRAY CHARACTERISTICS

- High reliability spray performance under the most difficult conditions

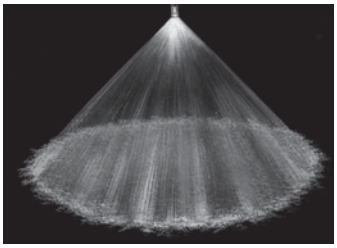
Spray pattern: Full Cone
(Square patterns to special order)
Spray angles: 30°, 60°, 90° and 120°
Flow rates: 2.60 to 3540 L/min
(Flow rates up to 17,000 L/min available; call BETE Applications Engineering for details.)

Wide Angle Metal

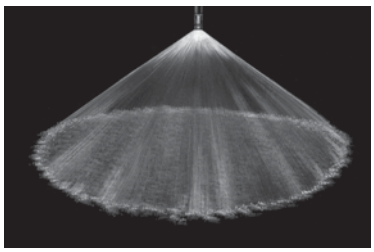
Full Cone 30° (NN)



Full Cone 60° (N)



Full Cone 90° (M)



Full Cone 120° (W)

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

MaxiPass Flow Rates and Dimensions

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

Male or Female Pipe Size	Nozzle Number	K Factor	LITERS PER MINUTE @ BAR 0.2 bar	0.3 bar	0.5 bar	0.7 bar	1 bar	2 bar	3 bar	5 bar	Approx. Free Passage Dia. (mm)	Approx. Dimensions (mm) Overall Length 30° A	60° A	90° A	120° A	B	Wt.** (kg) Metal
3/8*	MP125	5.53	2.60	3.14	3.99	4.68	5.53	7.66	9.27	11.8	3.18	-	38.1	38.1	38.1	22.2	0.09
	MP156	8.79	4.13	4.99	6.35	7.43	8.79	12.2	14.7	18.7	3.97						0.09
	MP187	12.7	5.96	7.21	9.17	10.7	12.7	17.6	21.3	27.1	4.76						0.07
1/2*	MP187	12.7	5.96	7.21	9.17	10.7	12.7	17.6	21.3	27.1	4.76	-	47.6	47.6	47.6	25.4	0.13
	MP218	20.2	9.48	11.5	14.6	17.1	20.2	28.0	33.9	43.0	5.56						0.11
	MP250	22.7	10.7	12.9	16.4	19.2	22.7	31.4	38.0	48.4	6.35						0.11
3/4	MP281	27.9	13.1	15.8	20.1	23.6	27.9	38.6	46.8	59.4	7.14	102	63.5	60.3	63.5	31.8	0.23
	MP312	33.8	15.9	19.2	24.4	28.6	33.8	46.8	56.6	72.0	7.94						0.23
	MP343	41.4	19.4	23.5	29.9	35.0	41.4	57.3	69.4	88.2	8.73						0.20
	MP375	48.8	22.9	27.7	35.2	41.3	48.8	67.6	81.8	104	9.53						0.20
1	MP375	48.8	22.9	27.7	35.2	41.3	48.8	67.6	81.8	104	9.53	111	74.6	74.6	74.6	38.1	0.35
	MP406	58.5	27.5	33.2	42.2	49.2	58.5	81.0	98.0	125	10.3						0.33
	MP437	68.4	32.1	38.8	49.4	57.8	68.4	94.7	115	146	11.1						0.33
1 1/4	MP437	68.4	32.1	38.8	49.4	57.8	68.4	94.7	115	146	11.1	137	85.7	85.7	85.7	50.8	0.61
	MP500	87.9	41.3	49.9	63.5	74.3	87.9	122	148	187	12.7						
	MP531	97.6	45.8	55.4	70.5	82.5	97.6	135	164	208	13.5						
	MP562	107	50.2	60.8	77.3	90.5	107	148	179	228	14.3						
1 1/2	MP562	107	50.2	60.8	77.3	90.5	107	148	179	228	13.97	184	111	111	111	57.2	0.91
	MP593	122	57.3	69.3	88.1	103	122	169	205	260	15.1						
	MP625	130	61.0	73.8	93.9	110	130	180	218	277	15.9						
	MP656	158	74.2	89.7	114	134	158	219	265	337	16.7						
	MP687	166	77.9	94.3	120	140	166	230	278	354	17.5						

Flow Rate ($L/_{min}$) $= K\ (\ bar\ )^{0.47}$ ** Weights given are for 60°, 90°, and 120° (PTFE not available in 3/8" and 1/2" sizes. Cobalt A6 not available in 3/8".)

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

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

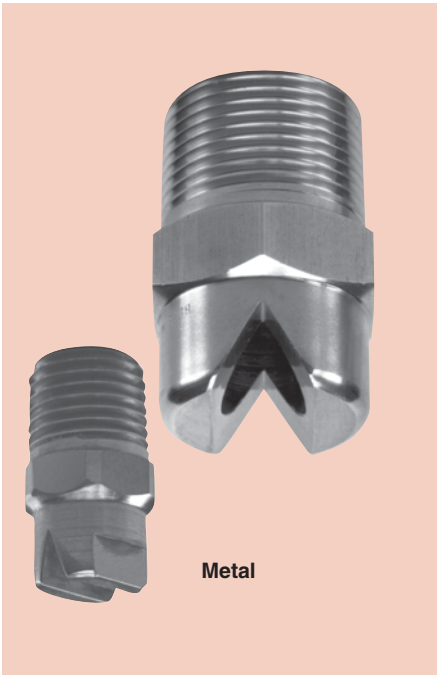
*3/8" and 1/2" sizes: 30° not available, 60° not available in plastic

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

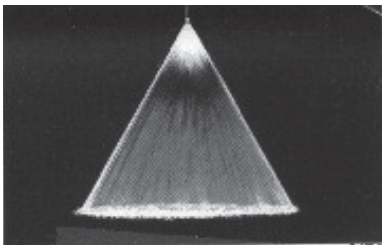
Standard Fan Nozzle



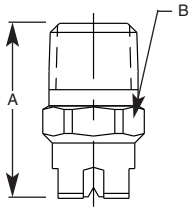
DESIGN FEATURES
- One-piece construction
- No internal parts
- Sizes for all applications
- Male connection

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.

MicroWhirl®

Fine Atomization

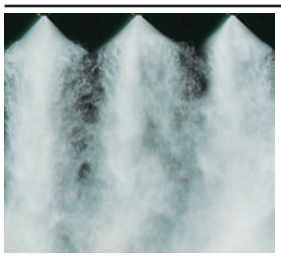
DESIGN FEATURES

- Outstanding atomization
- Rugged pinless design
- Drip-free performance
- Standard: 70 micron polypropylene filter
  - Optional: 200-mesh 316SS screen
- Safety wire hole available
- Patented design
- Minimum operating pressure 7 bar

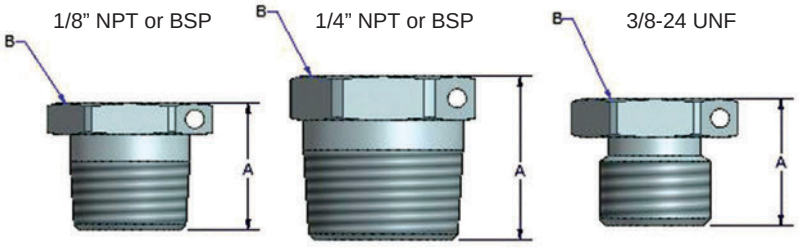
SPRAY CHARACTERISTICS

- 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)

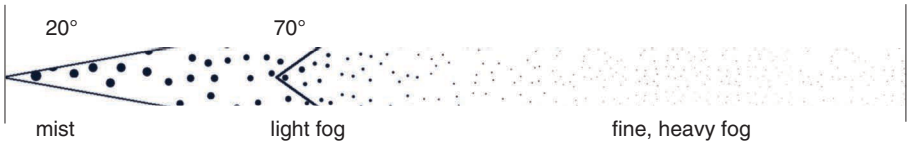
Pipe Size	A	B
1/8"	12.3	11.1
1/4"	17.5	14.3
3/8-24UNF	10.8	12.7

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.*

HydroWhirl® Stinger

(HWS2) Reactionary Force Slotted Spray Nozzle

DESIGN FEATURES

- Patent-pending no-weld design eliminates weak points and uneven surfaces
- Bearing assembly is centered within the spray head for improved balance and spray propagation
- Better spray uniformity can be maintained at lower pressures
- Compact size with industry-leading flow rates fits tri-clamp openings with inside diameters between 23 and 47mm
- Unique patent-pending pipe thread technology flushes to reduce contamination and bacteria growth
- Zirconia ceramic bearings for long service life and extreme chemical resistance
- 32 Ra surface finish ideal for sanitary applications

SPRAY CHARACTERISTICS

- Vigorous spray action
- Optimum cleaning performance @ 3 bar

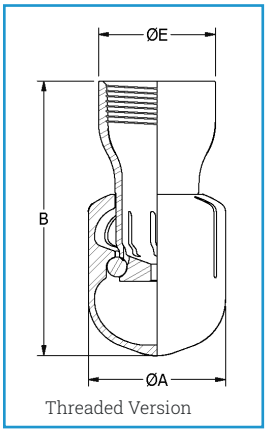
Spray Angles: Complete 360° spray coverage

Flow Rates: 4.15 to 380 l/min

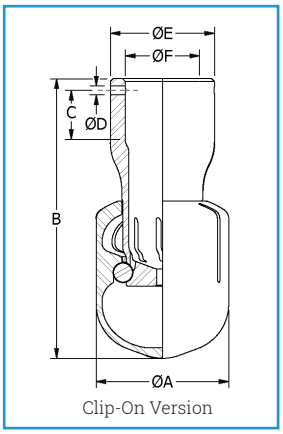
Max Temperature: 200°F/93°C

Filtration:

- Line strainer with a mesh size 0.10 mm/150 mesh for nozzle number HWS2-4 and smaller
- Line strainer with a mesh size 0.07 mm/200 mesh for nozzle number HWS2-7.5 and larger



Threaded Version



Clip-On Version

DIMENSIONS IN MILLIMETERS (CLIP-ON)

Tube Size	A	B	C	D	E	F	Weight (grams)	Min Tank Entry Dia
1"	47.0	86.4	21.3	3.96	33.5	25.4	340	47
3/4"	34.3	72.2	12.7	2.18	26.9	19.0	198	34
1/2"	21.6	48.3	12.4	2.18	21.3	12.7	85	30
3/8"	15.2	34.9	8.61	2.18	14.2	9.52	23	23

DIMENSIONS IN MILLIMETERS (THREADED)

Pipe Size	A	B	E	Weight (grams)	Min Tank Entry Dia
1"	47.0	80.0	36.6	298	47
3/4"	34.3	69.1	29.2	146	34
1/2"	34.3	60.3	24.1	134	34
3/8"	21.6	45.2	19.1	40	23
1/8"	15.2	31.7	12.8	28	16

HYDROWHIRL® STINGER FLOW RATES

Materials: 316L Stainless Steel Body, Ceramic Bearings

Female Connection Type	Nozzle Number	Spray Angles	Flow Rate (LPM) @ Differential Pressure (bar)					Maximum Free Passage	Coverage Dia @ 2 bar
			0.7	1	2	3	4		
			bar	bar	bar	bar	bar	mm	m
1/8" FNPT, BSP 3/8" Tube Clip-On	HWS2-2.1	360°	4.15	4.92	6.83	8.27	9.48	0.64	0.6
	HWS2-4		7.80	9.27	13.0	15.8	18.1	0.99	2
	HWS2-7.5		14.6	17.4	24.3	29.6	34.0	1.60	2
3/8" FNPT, BSP 1/2" Tube Clip-On	HWS2-10	360°	18.8	22.6	32.1	39.5	45.7	0.61	2
	HWS2-12		23.7	28.1	39.0	47.3	54.2	0.99	3
	HWS2-17		32.8	39.1	54.9	67.1	77.3	2.00	3
1/2" FNPT, BSP	HWS2-20	360°	39.0	46.3	64.8	78.9	90.6	0.99	3
	HWS2-26		49.0	58.8	83.6	103	119	1.63	3
3/4" FNPT, BSP 3/4" Tube Clip-On	HWS2-20	360°	39.0	46.3	64.8	78.9	90.6	0.99	3
	HWS2-26		49.0	58.8	83.6	103	119	1.63	3
1" FNPT, BSP 1" Tube Clip-On	HWS2-33	360°	63.5	75.7	107	130	150	0.79	3
	HWS2-55		105	126	177	217	251	1.63	4
	HWS2-66		127	152	213	260	300	2.39	4
	HWS2-84		165	195	272	331	380	3.18	4

Flow rates represent threaded connections with a 360° spray angle.
Flow rates may vary for other connection types and spray angles.

HydroClaw®

Tank Washing - Superior Clog Resistance

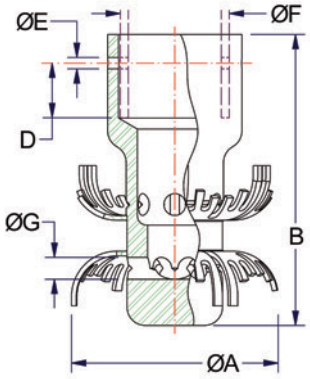
DESIGN FEATURES

- Patent-pending, clog-resistant design with no moving parts
- Allows passage of particles 6.4 mm in diameter, three times the free passage of a comparable spray ball
- Made from FDA compliant 316L stainless steel for use in food-grade and sanitary Clean-In-Place (CIP) applications
- Low pressure/high flow operation quickly cleans tank walls to reduce overall water consumption compared to a static spray ball
- Self-draining and self-flushing
- Laser-welded for durability
- Available in a variety of connection sizes and types, including threaded, clip-on and welded.
- Clip-on nozzles include low-profile retaining pin for secure connection
- Fits through compact openings: either 63.5 mm or 76 mm diameter

SPRAY CHARACTERISTICS

- Vigorous rinsing action quickly flushes solids and contamination from vessels
- Complete 360° omnidirectional coverage
- Optimum cleaning performance at 2 bar
- Recommended installation 0.6 - 1.0 m vertically below top of tank

Flow rates: 119 - 442 L/min



HydroClaw Flow Rates and Dimensions

Connection Types	Nozzle Number	LITERS PER MINUTE @BAR				Dimensions (mm)						Wt (g)	Coverage Diameter (m) @2 BAR
		1.5 BAR	2 BAR	2.5 BAR	3 BAR	A	B	D	E	F	Free Pass. G		
3/4" NPT	HC-42	119	136	152	166	60.5	91.2	_	_	_	6.4	416	2.4
G3/4												413	
1" Tube Weld-On												325	
1-1/2" Tube Clip-On	HC-42	125	145	161	176	60.5	102	19.1	4.1	38.1	6.4	504	2.4
1" Tube Clip-On							91.2			25.4		391	
DN20 Tube Clip-On*										23.1		416	
3/4" Pipe Clip-On										26.7		382	
1" NPT	HC-100	279	322	360	394	73.2	102	_	_	_	7.6	649	3.0
G1												635	
1-1/2" Tube Weld-On												425	
1-1/2" Tube Clip-On	HC-100	312	361	403	442	73.2	102	19.1	4.1	38.1	7.6	527	3.0
DN40 Tube Clip-On*										40.0		437	
1" Pipe Clip-On										33.5		598	

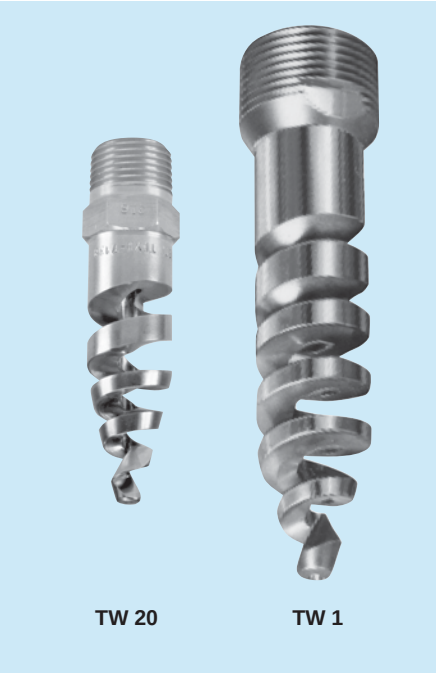
Standard Material: 316L Stainless Steel

Clip-on flow rates may vary depending on actual O.D. of installation tube or pipe

*Per DIN 11866 Part A / DIN 11850 Part B

TW

Tank Washing



TW 20 TW 1

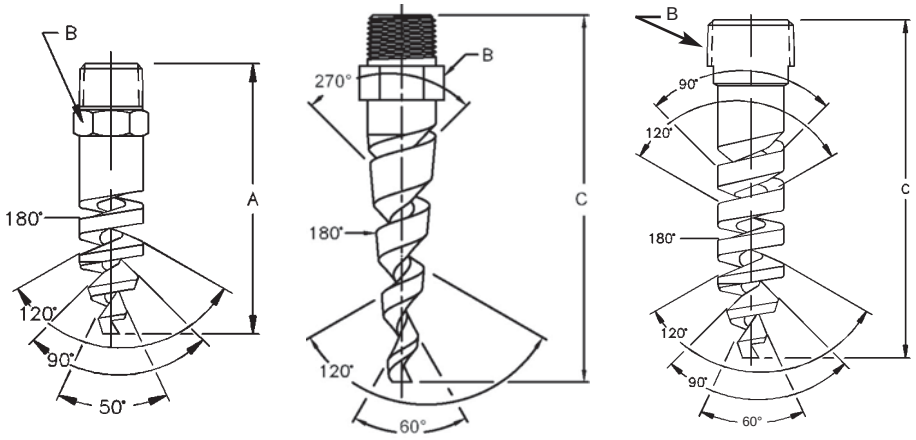
DESIGN FEATURES

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

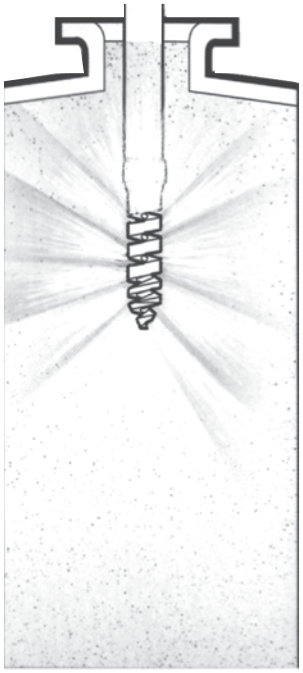
SPRAY CHARACTERISTICS

- 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
1/2	TW24	1200	2700

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

Tank Washing TW Flow Rates and Dimensions

TW 180° and 270°, 3/8", 1/2", and 1" Pipe Sizes

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	92.1	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				
1/2	TW24	270°	54.9	46.0	54.9	77.7	**95.1**	110	123	10.4	4.32		22.2	108.0	181
1	TW1	270°	116	97.2	116	164	**201**	232	260	14.2	5.08		28.7	146.1	298

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

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.*