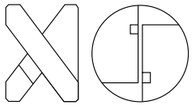
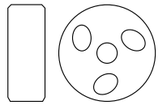
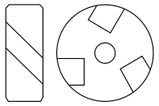
For Effective Use of Full Cone Spray Nozzles

Clogging & Free Passage Diameter

In order to form uniform distribution, full cone spray nozzles are usually fitted with whirlers and this part is the bottleneck of the liquid passage, where clogging problems often occur. Whirlers have several shapes such as X-shaped, disc-shaped and spiral-shaped ones, and the diameter of a sphere that can pass through the whirler is defined as free passage diameter.
As compared with other whirlers, the **X-shaped whirler** has a larger free passage diameter, which minimizes clogging. Some full cone nozzles without whirlers have been developed to eliminate clogging problems, such as the **AJP-series** which features minimal clogging.


X-shaped whirler


Disc whirler


Spiral-shaped whirler

Wear and Corrosion Resistance

If the liquid contains slurry, the inside of the nozzle exposed to the flow of liquid at high speed will wear out relatively quickly. For these applications, the **JUP-series** is ideal, as the orifice and whirler are made of ceramics. **JUXP, AJP-AL92 and TJJX-SiC series** are more effective as all parts are made of ceramics. For corrosive applications, nozzles made of special materials such as plastics and titanium alloy are available.

Weight Savings

For arrangements of many large size nozzles, weight savings of the nozzles affects the total production cost for the systems. The **TJJX-series** with a newly developed X-shaped whirler has a 20% shorter overall length and 20% less weight than conventional nozzles. In addition, the weight of TJJX-SiC is less than half of metal nozzles.

Rotation Reaction Force

In full cone spray nozzles with whirlers, rotation torque is generated as a reaction force by the vortex current produced by the whirler, which is determined by the following equation.

$$T \fallingdotseq C \cdot Q \cdot D \cdot \sqrt{P}$$

T : Torque (N-cm)
C : Constant
Q : Spray capacity (ℓ/min)
D : External dimension of whirler (mm)
P : Spray pressure (MPa)

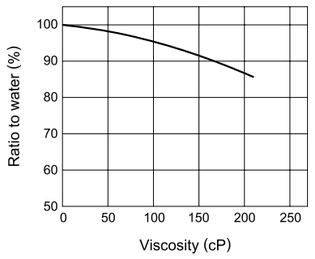
[Example]

Nozzle No.	Torque at pressure of 0.2MPa
¾FJJXP23	2.5N-cm
8TJJX8000	8,000N-cm

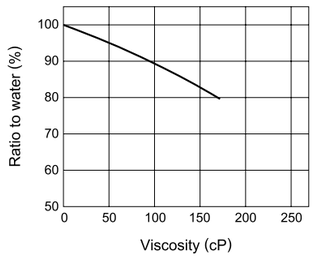
Viscosity

As the viscosity of the liquid increases, generally spray capacity and angle decreases, spray distribution deteriorates and spray droplet size becomes larger.
(Spray capacity of hollow cone spray nozzles increases as the viscosity of liquid increases. See p.55 for details.)

[Relation between viscosity and spray capacity]



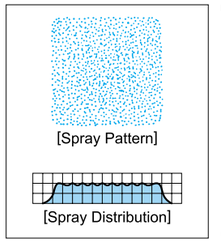
[Relation between viscosity and spray angle]



Nozzle tested : JJXP90
Pressure : 0.02-0.03MPa

Square Spray Nozzles

SSXP / SSXP-HTPVC



[Features]
- Square full cone spray pattern with uniform distribution.
- Wide spray angle of 90-100° provides large spray coverage.
- Square full cone spray pattern leaves no gaps in multiple-nozzle arrangements.
- X-shaped whirler provides large free passage diameter for minimal clogging.

[Standard Pressure]
0.2MPa

[Applications]
Cleaning : Gases, incinerator fumes, machinery, eliminators, screen, tanks, gravel, stones, sand, etc.
Cooling : Gases, machinery, tanks, steels, etc.
Spraying : Waste water treatment, foam breaking, fire extinguishing, dust suppression, etc.

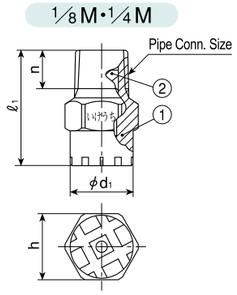
SSXP-series

	SSXP-series
Structure	• One-piece structure with press-fit X-shaped whirler.
Material	• Sizes 1F or smaller : B (brass) or S303 (stainless steel 303) • Sizes 1½F or larger : S316 (stainless steel 316) (SCS14) • Optional material : S316L (SCS16)

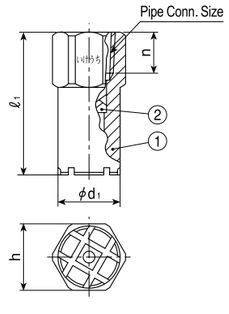
Series	Pipe Conn. Size	Dimensions(mm) ℓ1	ℓ2	h	w	φd1	φd2	n	Mass(g) B	S303 (S316)
SSXP	⅛M	21	—	12	—	11.5	—	7	12	11.5
	¼M	29	—	14	—	13.5	—	10.5	21.5	20
	⅛F	27	—	12	—	11.5	—	7	19	18
	¼F	36.5	—	17	—	16	—	10.5	46	45
	⅜F	45.5	6	—	17	—	20	11	74	70
	½F	56	8	—	22	—	25	14	160	150
	¾F	73	10	—	27	—	32	15	320	300
	1F	94	14	—	34	—	40	17	620	575
	1½F	131	20	—	50	—	58	19	—	1690
	2F	168	24	—	60	—	70	23	—	2910
	2½F	199	27	—	80	—	90	27	—	5860
	3F	220	30	—	90	—	105	30	—	9420

[Note] Appearance and dimensions may differ slightly depending on materials and nozzle codes.

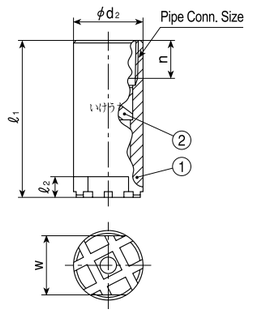
⅛M•¼M



⅛F•¼F



⅜F and over



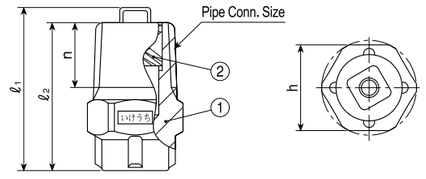
①Body ②Whirler

SSXP-HTPVC series

	SSXP-HTPVC series
Structure	• One-piece structure with removable X-shaped whirler.
Material	• HTPVC (heat-treated polyvinyl chloride)

Series	Pipe Conn. Size	Dimensions(mm) ℓ1	ℓ2	h	n	Mass(g)
SSXP-HTPVC	¼M	26.5	24	14	10.5	3.1

[Note] Appearance and dimensions may differ slightly depending on materials and nozzle codes.



①Body ②Whirler

Square Spray Nozzles
SSXP / SSXP-HTPVC series

■ SSXP-series

Spray Capacity Code	Pipe Conn. Size				Spray Angle			Spray Capacity (ℓ/min)									Mean Drop. Dia. (μm)	Free Pass. Dia. (mm)
	1/8M	1/4M	1/8F	1/4F	0.05 MPa	0.2 MPa	0.5 MPa	0.03 MPa	0.05 MPa	0.1 MPa	0.15 MPa	0.2 MPa	0.3 MPa	0.5 MPa	0.7 MPa	1 MPa		
020	○		○		86°	90°	81°	—	1.06	1.46	1.75	2.00	2.36	2.91	3.34	3.86	330	1.3
030	○		○		86°	90°	81°	—	1.59	2.18	2.63	3.00	3.54	4.36	5.00	5.79	380	1.5
040		○		○	90°	95°	85°	—	2.12	2.91	3.51	4.00	4.72	5.81	6.67	7.72	360	1.5
050		○		○	91°	95°	86°	—	2.65	3.64	4.38	5.00	5.90	7.27	8.34	9.64	≀	1.8
060		○		○	91°	95°	86°	2.51	3.18	4.37	5.26	6.00	7.08	8.72	10.0	11.6	490	1.8

Spray Capacity Code	Pipe Conn. Size								Spray Angle			Spray Capacity (ℓ/min)									Mean Drop. Dia. (μm)	Free Pass. Dia. (mm)
	3/8F	1/2F	3/4F	1 F	1 1/2F	2 F	2 1/2F	3 F	0.05 MPa	0.2 MPa	0.5 MPa	0.03 MPa	0.05 MPa	0.1 MPa	0.15 MPa	0.2 MPa	0.3 MPa	0.5 MPa	0.7 MPa	1 MPa		
070	○								94°	100°	89°	2.93	3.71	5.09	6.14	7.00	8.26	10.2	11.7	13.5	440	2.0
080	○								95°	100°	90°	3.35	4.24	5.82	7.01	8.00	9.44	11.6	13.3	15.4	≀	2.0
10	○								96°	100°	91°	4.19	5.29	7.28	8.77	10.0	11.8	14.5	16.7	19.3		2.6
12	○								97°	100°	92°	5.03	6.35	8.73	10.5	12.0	14.2	17.4	20.0	23.1	630	2.6
16		○							95°	100°	90°	6.70	8.47	11.6	14.0	16.0	18.9	23.3	26.7	30.9	≀	2.8
20		○							96°	100°	91°	8.36	10.6	14.6	17.5	20.0	23.6	29.1	33.4	38.6	710	3.5
30			○						96°	100°	91°	12.6	15.9	21.8	26.3	30.0	35.4	43.6	50.0	57.9	≀	4.1
40			○						97°	100°	92°	16.8	21.2	29.1	35.1	40.0	47.2	58.1	66.7	77.2		4.4
50				○					95°	100°	90°	20.9	26.5	36.4	43.8	50.0	59.0	72.7	83.4	96.4	750	5.3
60				○					96°	100°	91°	25.1	31.8	43.7	52.6	60.0	70.8	87.2	100	115	≀	5.7
80				○					97°	100°	92°	33.5	42.4	58.2	70.1	80.0	94.4	115	135	155	1000	6.7
100					○				96°	100°	91°	41.9	52.9	72.8	87.7	100	120	145	170	195	≀	7.5
150					○				97°	100°	92°	62.8	79.4	110	130	150	180	220	250	290		10.3
300						○			97°	100°	92°	125	160	220	265	300	355	435	500	580	1350	12.7
500							○		97°	100°	92°	210	265	365	440	500	590	730	835	965	1500	17.5
700								○	97°	100°	92°	290	370	510	615	700	826	1020	1170	1350	1700	19.0

■ SSXP-HTPVC series

Spray Capacity Code	Pipe Conn. Size	Spray Angle			Spray Capacity (ℓ/min)								Mean Drop. Dia. (μm)	Free Pass. Dia. (mm)
		0.05 MPa	0.2 MPa	0.5 MPa	0.05 MPa	0.1 MPa	0.15 MPa	0.2 MPa	0.3 MPa	0.5 MPa	0.7 MPa	1 MPa		
1.5 65/4.5	1/4M	56°	65°	65°	2.72	3.74	4.50	5.14	6.06	7.46	8.56	9.90	450	2.2

How to order

Please inquire or order for a specific nozzle using this coding system.

① SSXP (Metal)

〈Example〉···1/8MSSXP020B

1/8M SSXP 020 B

- 1/8M (Pipe Conn. Size)
- ≀
- 3F
- 020 (Spray Capacity Code)
- ≀
- 700
- B (Material)
- S303
- S316

② SSXP-HTPVC (Plastic)

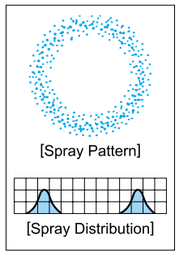
1/4MSSXP 1.5 65/4.5 HTPVC

SPILLBACK Nozzles for gas cooling

SPB

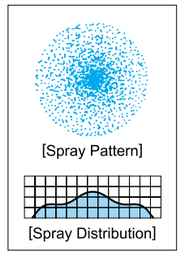
Single-head SPB-R series





4-orifice SPB-series Patented





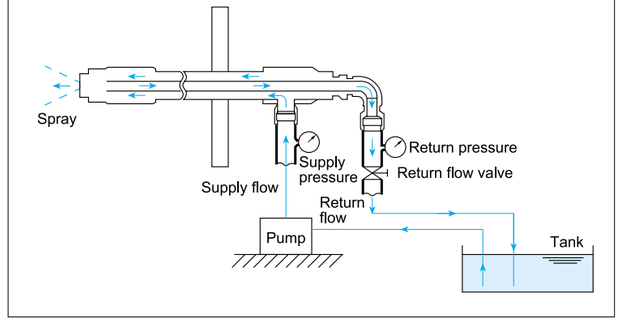
[Features]

- Variable capacity hollow cone spray nozzle generating fine atomization with uniform spray distribution (single-head).
- Spray capacity can be controlled by only adjusting return pressure while supply pressure is kept constant. Spray capacity is maximized by fully closing the return valve and minimized by fully opening the return valve. The turn-down ratio of spray capacity is 1:10.
- Part of the supplied liquid flows back when the return valve is opened, causing supply flow to increase. The increase of supply flow is within 40% of the maximum spray capacity.
- The variation in spray droplet sizes is minimized despite the modulation of spray flow, SPILLBACK is suitable for evaporative cooling in cooling towers where the inlet gas temperature varies.
- Multiple-head SPILLBACK is suitable for applications which require larger spray capacity and minimal increase in spray droplet size.

[Standard Pressure]

Supply pressure 2MPa (Return flow valve: totally closed)

System Diagram (Example)

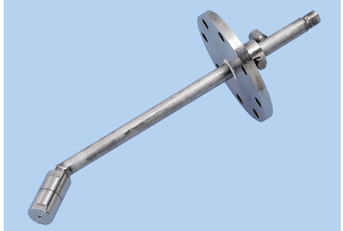


[Applications]

Cooling : Incinerators, cement factories, glass factories, blast furnaces, iron works, etc.
Moisture control : Blast furnaces, etc.

The following are also available to suit various installations.

L-type (45°) SPILLBACK Nozzles



Flange-mounted Protective Cylinder

Pressure-resistant Flexible Hose

For further information, please contact us or our local sales office.