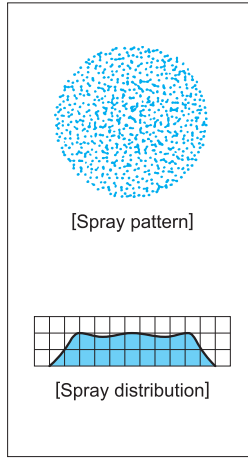


# Flange-type, Large Capacity Full Cone Spray Nozzles

# TJJX



### [Features]

- Full cone spray pattern with a round impact area and uniform distribution.
- Flanged connection.
- X-shaped whirler provides large free passage diameter for minimal clogging.
- Adopting newly developed X-shaped whirler has shortened total length by 20% compared to conventional nozzles.

### [Standard Pressure]

0.2 MPa

### [Applications]

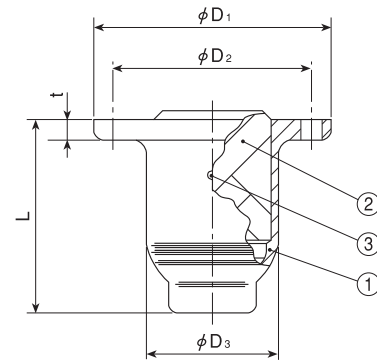
- Cooling: Gas, liquids
- Reacting: Chemical plants
- Spraying: Aeration, sea water desalination

Full Cone

## TJJX series

TJJX series	
Structure	<ul style="list-style-type: none"> <li>• One-piece structure with removable X-shaped whirler fixed to nozzle body by lock bolt.</li> <li>• Flanged connection.</li> </ul>
Material	<ul style="list-style-type: none"> <li>• SCS13 or SCS14 (Lock bolt: S316)</li> <li>• Optional material: SCS16</li> </ul>

Flange size	Dimensions (mm)					Flange (JIS 10K)		Mass (kg)
	L	$\phi D_1$	$\phi D_2$	$\phi D_3$	t	Qty. of bolt holes	$\phi$ (mm)	
4T	171	210	175	117	18	8	19	9.3
5T	211	250	210	143	20	8	23	11.4
6T	253	280	240	169	22	8	23	22.7



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

①Body ②Whirler ③Lock bolt

Spray Capacity Code	Flange size			Spray Angle (°)			Spray Capacity (ℓ/min)						Mean Drop. Dia. (μm)	Free Pass. Dia. (mm)	
	4T	5T	6T	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
1500	○			90	90	75	628	794	1,091	1,315	1,500	1,770	2,180	1,850	29
2000	○			100	100	85	838	1,059	1,455	1,753	2,000	2,360	2,907		
2500		○		90	90	75	1,047	1,324	1,819	2,191	2,500	2,950	3,634	2,500	36
3000		○		100	100	85	1,257	1,588	2,183	2,629	3,000	3,540	4,361		
3500			○	90	90	75	1,466	1,853	2,547	3,067	3,500	4,130	5,087	2,650	44
4000			○	95	95	80	1,675	2,118	2,911	3,505	4,000	4,720	5,814		

[Note] TJJX with larger spray flow and larger flange is available upon request.

## How to order

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


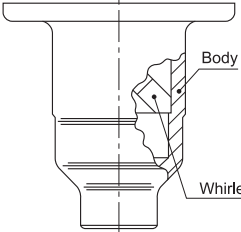
〈Example〉...4TJJX1500S304

Pipe Conn. Size	TJJX	Spray Capacity Code	Material
4	4	1500	S304
6	6	4000	S316

Related Products

For spraying slurry, wear resistance of nozzles must be considered. For such applications, **TJJX-SiC series** nozzles are available. TJJX-SiC series nozzles are made of highly wear-resistant SiC (silicon nitride bonded silicon carbide). Please inquire with us for details.

Full Cone

Series	Appearance	Structure	Features	Applications
TJJX-SiC			<ul style="list-style-type: none"> <li>● Full cone spray pattern with a round impact area and uniform distribution.</li> <li>● X-shaped whirler provides large free passage diameter for minimal clogging.</li> <li>● Whole nozzle fired as one piece.</li> <li>● Highly wear-resistant and lightweight structure made of SiC.</li> </ul> <p>[Note] Since TJJX-SiC series nozzles are die-cast molded, the spray capacity is guaranteed within <math>\pm 10\%</math> and the spray angle within <math>\pm 7^\circ</math> under standard pressure.</p>	<ul style="list-style-type: none"> <li>● Spraying recirculated water for water granulation</li> <li>● Other applications for spraying slurry</li> </ul>

# Effective Use of Full Cone Spray Nozzles

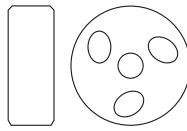
## Clogging and Free Passage Diameter

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.

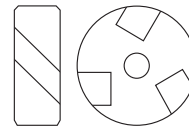
As compared with other whirlers, the **X-shaped whirler** has a larger free passage diameter, which minimizes clogging. Some full cone nozzles without whirlers have been developed to eliminate clogging problems, such as the **AJP series** nozzle which features minimal clogging.



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** nozzle is ideal, as the orifice and whirler are made of ceramics. **JUXP, AJP-AL92 and TJJX-SiC series** nozzles 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.

## Mass Savings

For arrangements of many large size nozzles, mass savings of the nozzles affects the total production cost for the systems. The **TJJX series** nozzle with a newly developed X-shaped whirler has a 20% shorter overall length and 20% less mass than conventional nozzles. In addition, the mass of TJJX-SiC series nozzle (made of silicon nitride bonded silicon carbide) 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.

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

[Example]

Nozzle No.	Torque at pressure of 0.2 MPa
¾FJJXP23	0.025 N-m
6TJJX4000	3,000 N-m

T: Torque (N-m)

C: Constant

Q: Spray capacity (ℓ/min)

D: External dimension of whirler (mm)

P: Spray pressure (MPa)

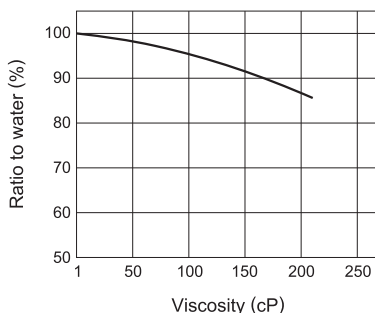
## Viscosity

As the viscosity of the liquid increases, generally spray capacity and angle decreases, spray distribution deteriorates and spray droplet size becomes larger.

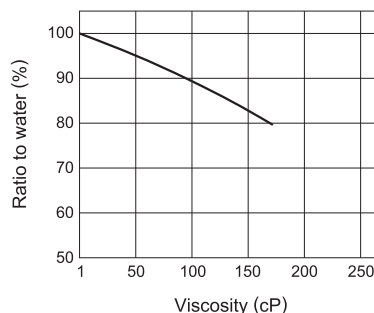
(Spray capacity of hollow cone spray nozzles increases as the viscosity of liquid increases.

See page 55 for details.)

[Relation between viscosity and spray capacity]



[Relation between viscosity and spray angle]



Nozzle tested: JJXP90  
Pressure: 0.02–0.03 MPa