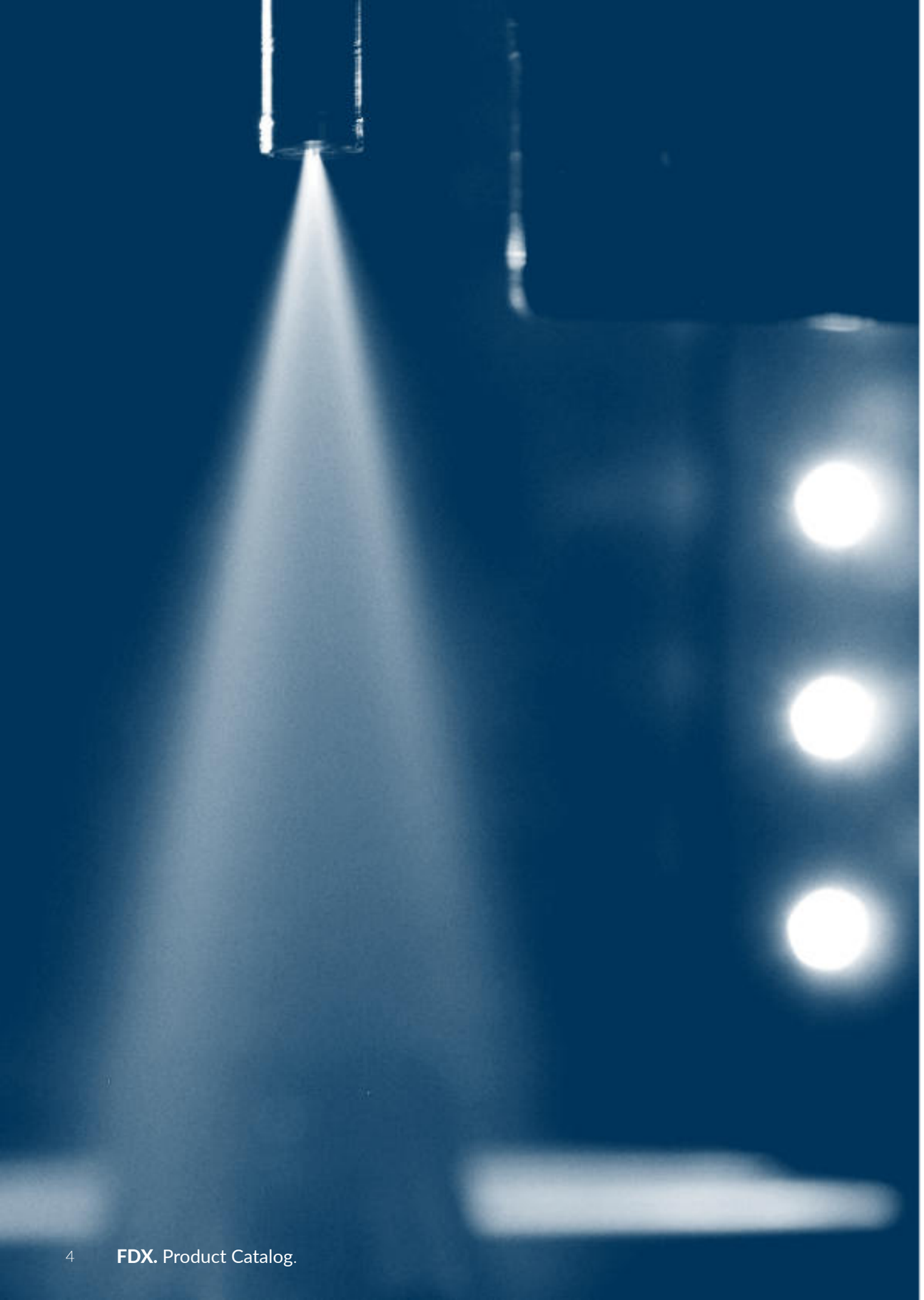
FDX

Product Catalog

Edition 02

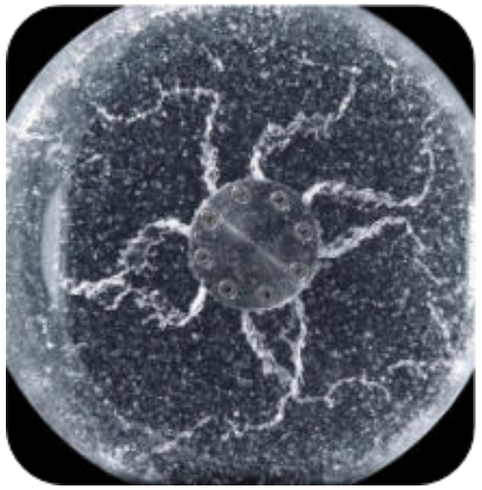


01 OsciJet Technology

OsciJet. **An All-Rounder**

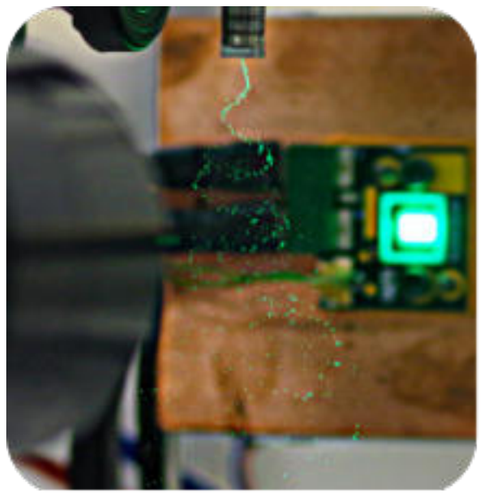
The movement makes the difference

The OsciJet nozzle is the all-rounder for your application. It is based on a smart flow guidance, which creates a flow instability within the nozzle. For all your applications, this unique nozzle is able to generate an oscillating or pulsating fluid jet - without any moving parts!



For the first time, the OsciJet nozzle makes it possible to make use of dynamic jets - even under the most difficult operating conditions - without compromising the durability, reliability and maintenance intensity of the overall system.

With frequencies ranging from a few oscillations per second to the ultrasonic range (approx. 50 kHz), the OsciJet nozzle also provides the frequency range required for your process. For cleaning, a low-frequency version is optimal and results in up to 7 times better cleaning results. Versions with high frequencies, on the other hand, are suitable for mixture improvement (e.g. of fuel and air) or spray generation. Compared to a conventional nozzle, the OsciJet nozzle achieves up to 15 times better mixing and 12 times better cleaning performance.



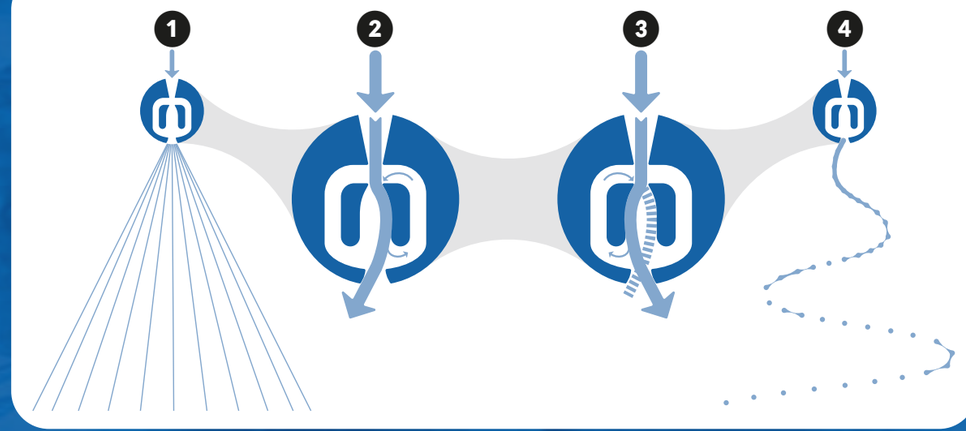
Fluidic Oscillators. **How it Works:**

OsciJet nozzles are based on the principle of fluidic oscillators and are sometimes also referred to as pendulum nozzles. These create a self-excited oscillation inside them without relying on moving components.

The mode of operation is as elegant as it is simple. (1) illustrates within an OsciJet nozzle as we would perceive it with the naked eye. Since the human eye is generally too slow, it appears that the visible spray pattern is apparently no different from that of a flat fan nozzle. If you look at the process in slow motion, you can see that inside the nozzle, a jet attaches itself to one of the sides in the main chamber (2). This is due to the so-called Coandă effect. We know this effect from everyday life, for example: if you hold the back of a spoon under a tap, the flow follows the curved surface of the spoon instead of falling straight down.

If you follow the jet further through the main chamber, you will see that a small part of the jet is diverted into a side channel before leaving the nozzle. At the end of the side channel, this meets the main jet again and pushes it to the other side (3). This causes the main jet to oscillate continuously from one side to the other. This process is now repeated on the opposite side and a periodic oscillation is created - without any moving parts at all! (4) shows how the water jet would look like.

The oscillating characteristic completely depends on the exact design of the components. Even small changes to the geometry can lead to completely different effects. With our technology platform, however, we are able to adapt components precisely to customer requirements, such as frequency, pressure drop and beam pattern. The components can be scaled as required and operate in a frequency range from a few Hz to several kHz. Furthermore, this technology is not only applicable for in-plane oscillating jets, but also for still pulsating designs in the main flow direction.



Video:

OsciJet. **The Water Saving Nozzle.**

Cracked soils, dried-up rivers are no longer just images from the far-flung regions of the world, but have now also arrived in the heart of Europe. The drought in large parts of Europe is becoming more severe from year to year. Spain, France and Italy are suffering particularly from the drought. But northeastern Germany is also affected by the lack of precipitation and dry soils. This has both ecological and serious economic consequences, and efficient management of this valuable resource is the way forward.

The guiding principle of FDX is to improve the efficiency of flow processes in order to save resources, or to put it more simply: to save energy and water by optimizing the use of nozzles. This is especially true of industrial processes where we see an enormous potential and are of the opinion that every drop that is saved leads to further energy savings, as it does not have to be treated. We have taken this catalog as an opportunity to determine the amount of water that has been saved by our nozzles since 2015:

2.1 billion liters of water!

To put that into perspective, that's the equivalent of about 14 million standard bathtubs or 84 Olympic-sized swimming pools. But of course we're not resting on our laurels; by the end of 2024 we plan to increase water savings to a total of 6 billion liters of water.

You can help achieve this by using optimized nozzles. You can help achieve this by using optimized nozzles as choosing the right nozzle is often underestimated. If the selected nozzle is too small then the pump works against the nozzle and increases the pressure in the system unnecessarily. This increases the pump's energy demand and can damage it in the long run. If the nozzle is too large then the liquid is not sufficiently accelerated and the desired effect does not occur. In addition, the cleaning performance can be increased by using an OsciJet nozzle, which means that a smaller nozzle can often be used. As a result, the amount of **water** can be **reduced by up to 50%** and the pump output can be reduced without impacting the cleaning effectiveness.

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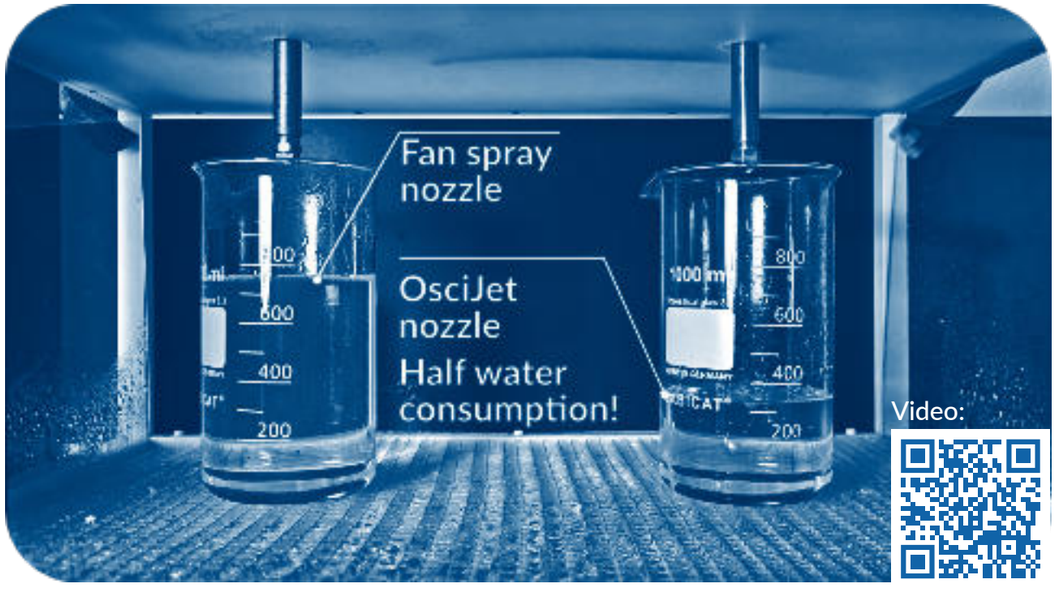
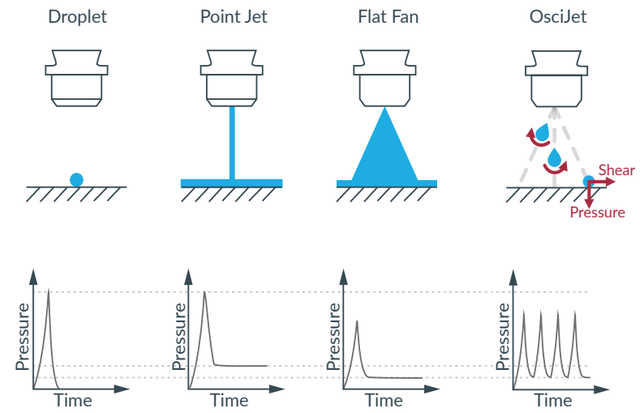
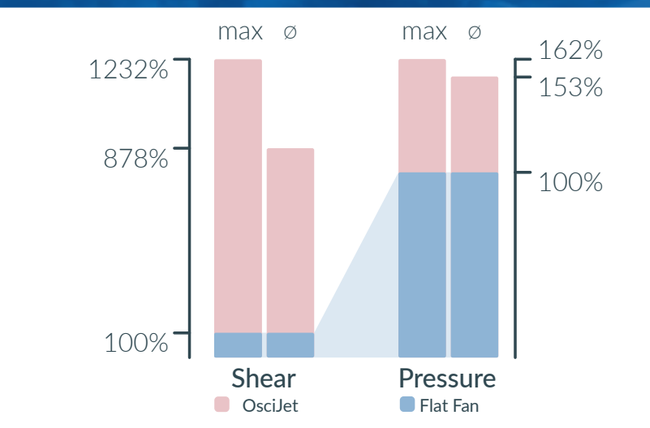


Increased Cleaning Performance. **The Reason.**



In general, surface cleaning involves accelerating water or a cleaning medium with a nozzle and then applying it to a surface. The medium then transfers a force that blasts or softens the dirt. In the figure above, this is shown for different configurations. If we consider a point just below a nozzle, a single droplet will transfer the full momentum in the form of a force pulse. If we now move from a single droplet to a continuous sequence of droplets, we obtain a point jet, similar to a garden hose. Here, the first droplets can transfer their full momentum until a dampening water film is formed. With a flat jet nozzle, this spot jet and thus also the impulse is widened or distributed over the entire jet width. In an OsciJet nozzle, the water jet oscillates inside the nozzle, so that quasi individual drops leave the nozzle with different trajectories. The drops hit the surface one after the other at different points, giving the water time to drain off. In addition, the drops from the OsciJet nozzle rotate as a matter of principle.

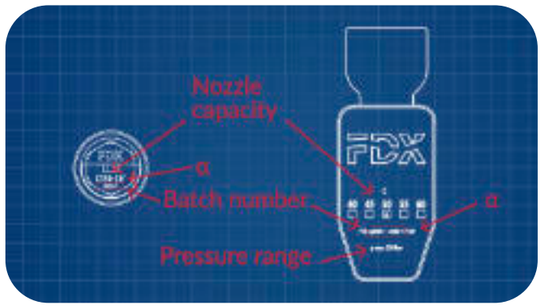
The increased cleaning performance can thus be verified with force measurements. Below are the results of an OsciJet nozzle in direct comparison with a flat fan nozzle of the same size. The values are normalized to the flat fan nozzle and shown for both the maximum and average force. As can be seen, the OsciJet nozzle transmits one and a half times the pressure force and, above all, 12 times the shear force. It is precisely this shear force that removes certain types of soiling particularly well, because a film of water is virtually pressed under the soiling.



Nozzle Technology Terms

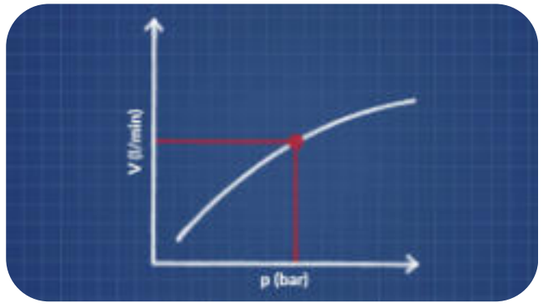
Nozzles are used in numerous applications. Here, the selection of the right parameters is crucial for optimum operation. The choice of nozzle has a decisive influence on the efficiency and effectiveness of the overall process. To help you choose the right nozzle, we have compiled the most important key figures and features of our nozzles for you on this page. If you have any further questions, please do not hesitate to contact us.

Nozzle labeling



All OsciJet series products are labeled with a **batch number**, a permissible **pressure range**, the **nozzle capacity C** and the **spray angle α**. All OsciJet nozzles are individually tested and the nozzle capacity is marked.

Nozzle Capacity



Nozzles come in a wide variety of shapes and sizes. What they all have in common is that they are subject to a pressure-flow relationship. This relationship is largely determined by the narrowest cross-section in the nozzle and the internal flow losses. In order to be able to compare nozzles with one another, the specific **nozzle capacity C** can be derived as a key parameter. This nozzle capacity is specific to each nozzle and thus allows nozzles to be compared with one another using a single parameter. For a given nozzle capacity, the application of a **pressure p** results in a corresponding **volume flow rate V**, or the application of a volume flow yields a resulting pressure. This is shown schematically in the diagram opposite. The nozzle size describes each point on the pressure-flow curve. In principle, we relate the nozzle size to a reference pressure of 20 bar / 290 psi. Thus, the nozzle capacity corresponds to the flow rate at 20 bar / 290 psi. To keep the values as even as possible, we multiply the nozzle capacity by a factor of 10:

Nozzle Capacity = Volume Flow Rate in (l/min) · 10 at 20 bar = Volume Flow Rate in (gpm) · 37.8 at 290 psi

Otherwise, this reference pressure is arbitrary and independent of the operating pressure. Please note that other nozzle manufacturers use different reference pressures and sometimes different denominations. To remain consistent, we always specify the nozzle capacities for all our nozzles. In formula notation, the following relationship results for the nozzle size C (unitless) or the flow rate V (l/min or gpm) as a function of the pressure p (bar or psi):

$$C = \frac{10 \cdot V\,(l/min)}{\sqrt{\frac{p(20\ bar)}{20}}} = \frac{37.8 \cdot V(gpm)}{\sqrt{\frac{p(290\ psi)}{290}}} \qquad V\,(l/min) = \frac{C}{10}\sqrt{\frac{p(20\ bar)}{20}} \qquad V\,(gpm) = \frac{C}{37.8}\sqrt{\frac{p(290\ psi)}{290}}$$

In the following, you will find tables with the pressure-flow relationships for all our products as well as corresponding diagrams to enable you to select the appropriate nozzle. We would like to demonstrate how to use these with the following example.

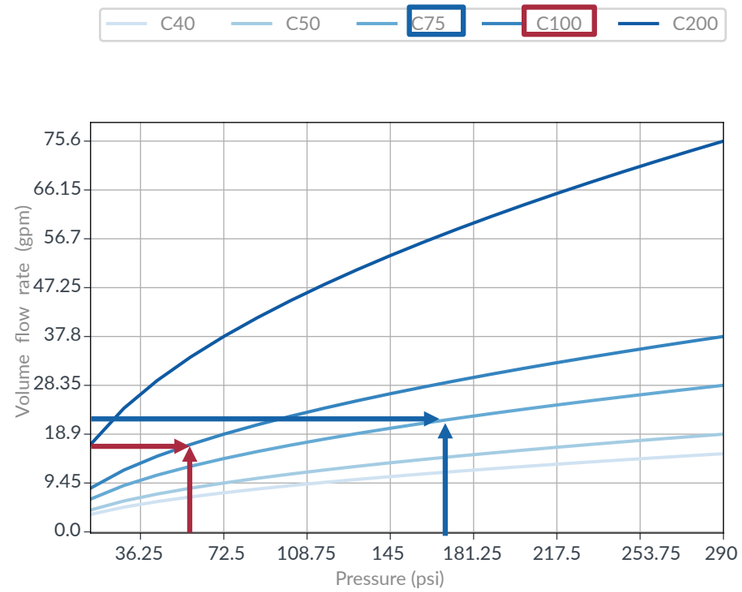
Example 1:

Let's assume you are looking for a nozzle for a low pressure application with line pressure, i.e. at about 58 psi (4 bar). If you select a nozzle with nozzle capacity 100, this results in a flow rate of 1.19 gpm (4.5 l/min), the example is marked in **red** in the table and in the diagram.

	Pressure (psi)														
Capacity (-)	14.5	43.5	58	87	101.5	116	145	159.5	174	203	217.5	232	261	275.5	290
40	0.24	0.40	0.48	0.58	0.63	0.66	0.74	0.79	0.82	0.87	0.93	0.95	1.01	1.03	1.06
50	0.29	0.50	0.58	0.71	0.79	0.85	0.93	0.98	1.03	1.11	1.14	1.19	1.24	1.30	1.32
75	0.45	0.77	0.90	1.08	1.16	1.24	1.40	1.46	1.53	1.67	1.72	1.77	1.88	1.93	1.98
100	0.58	1.00	1.19	1.46	1.56	1.67	1.88	1.96	2.04	2.22	2.30	2.35	2.51	2.57	2.65
200	1.19	2.04	2.35	2.91	3.12	3.33	3.73	3.92	4.10	4.42	4.58	4.74	5.03	5.16	5.29

Example 2:

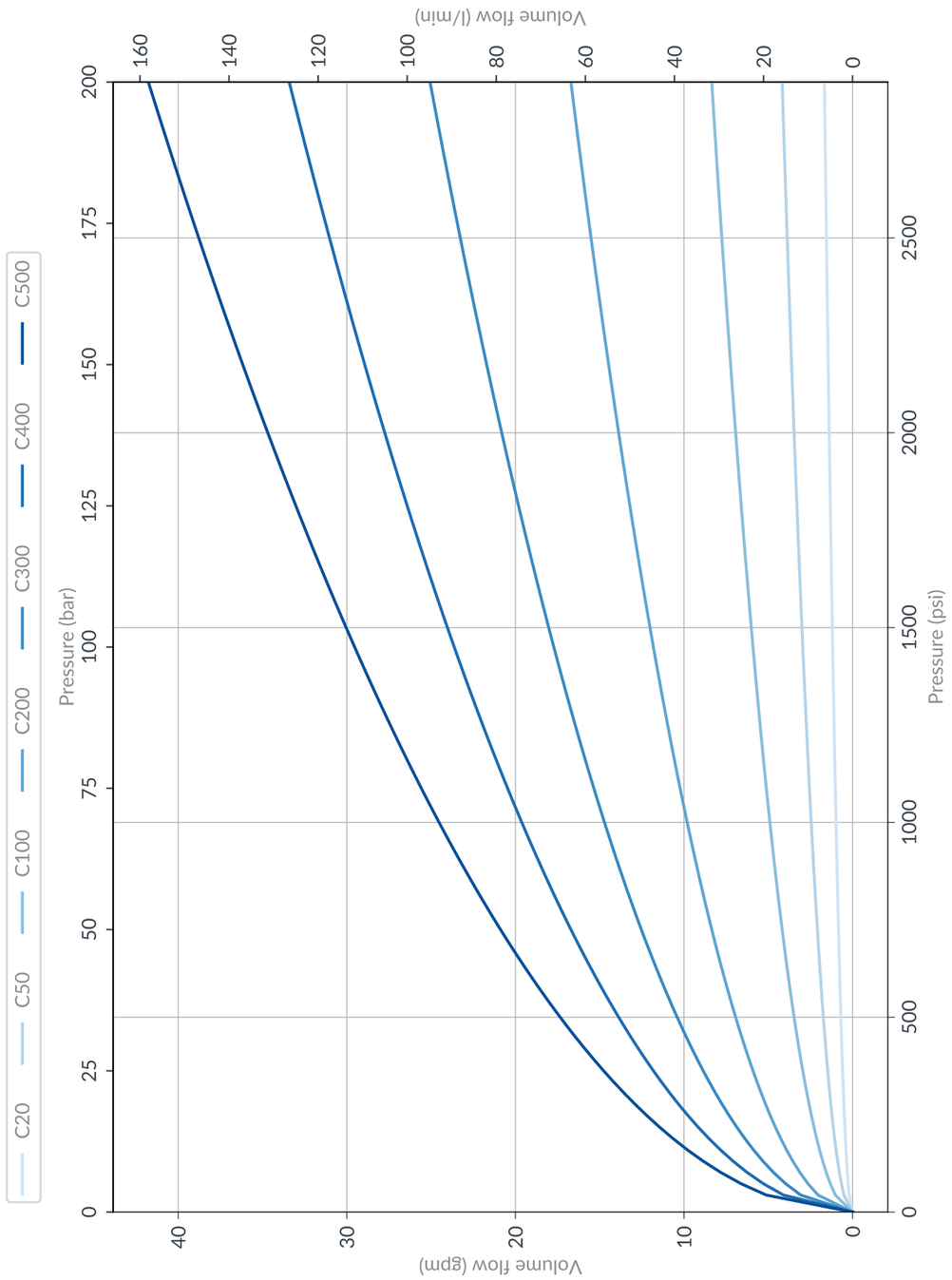
For this example, let's assume that you are using a pump. This provides you with a defined maximum flow rate at a certain pressure. As a rule, this optimum operating pressure is specified by the manufacturer. So let's assume that the pump delivers a flow rate of 1.53 gpm (6 l/min) at a pressure of 174 psi (12 bar). This results in a nozzle capacity of C=75, the example is marked in **blue** in the table and diagram. In practice, one often finds oneself between two sizes and it is necessary to weigh up which achieves the lower losses. Depending on the application, the smaller size can often be selected for our nozzles. But please do not hesitate to contact us, we will be glad to help you.



You will find further help for selecting a nozzle and determining the nozzle size on our homepage. There you also have the option of uploading a pump characteristic curve to determine the optimum operating point. You can access the ProductFinder either via the QR code opposite or via: **https://www.fdx.de/en/productfinder/**

Nozzle Technology Terms

On this double page we have reproduced the general pressure-flow relationship as a diagram and as a table so that you can easily determine the appropriate nozzle capacity.



Technology

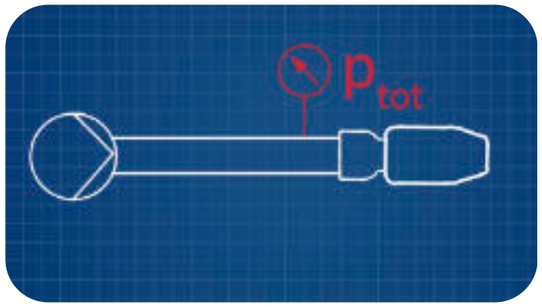
Pressure (psi)

Nozzle Capacity (-)	10	30	50	60	70	120	290	400	600	800	900	1000	1200	1450	1800	2000	2300	2600	2900
1	0.005	0.009	0.011	0.012	0.013	0.017	0.026	0.031	0.038	0.044	0.047	0.049	0.054	0.059	0.066	0.069	0.075	0.079	0.084
3	0.01	0.03	0.03	0.04	0.04	0.05	0.08	0.09	0.11	0.13	0.14	0.15	0.16	0.18	0.20	0.21	0.22	0.24	0.25
5	0.02	0.04	0.05	0.06	0.06	0.09	0.13	0.16	0.19	0.22	0.23	0.25	0.27	0.30	0.33	0.35	0.37	0.40	0.42
10	0.05	0.09	0.11	0.12	0.13	0.17	0.26	0.31	0.38	0.44	0.47	0.49	0.54	0.59	0.66	0.69	0.75	0.79	0.84
15	0.07	0.13	0.16	0.18	0.19	0.26	0.40	0.47	0.57	0.66	0.70	0.74	0.81	0.89	0.99	1.04	1.12	1.19	1.25
20	0.10	0.17	0.22	0.24	0.26	0.34	0.53	0.62	0.76	0.88	0.93	0.98	1.08	1.18	1.32	1.39	1.49	1.58	1.67
25	0.12	0.21	0.27	0.30	0.32	0.43	0.66	0.78	0.95	1.10	1.17	1.23	1.35	1.48	1.65	1.74	1.86	1.98	2.09
30	0.15	0.26	0.33	0.36	0.39	0.51	0.79	0.93	1.14	1.32	1.40	1.47	1.61	1.77	1.98	2.08	2.24	2.38	2.51
35	0.17	0.30	0.38	0.42	0.45	0.60	0.93	1.09	1.33	1.54	1.63	1.72	1.88	2.07	2.31	2.43	2.61	2.77	2.93
40	0.20	0.34	0.44	0.48	0.52	0.68	1.06	1.24	1.52	1.76	1.86	1.97	2.15	2.37	2.64	2.78	2.98	3.17	3.35
45	0.22	0.38	0.49	0.54	0.58	0.77	1.19	1.40	1.71	1.98	2.10	2.21	2.42	2.66	2.97	3.13	3.35	3.56	3.76
50	0.25	0.43	0.55	0.60	0.65	0.85	1.32	1.55	1.90	2.20	2.33	2.46	2.69	2.96	3.30	3.47	3.73	3.96	4.18
55	0.27	0.47	0.60	0.66	0.71	0.94	1.46	1.71	2.09	2.42	2.56	2.70	2.96	3.25	3.63	3.82	4.10	4.36	4.60
60	0.29	0.51	0.66	0.72	0.78	1.02	1.59	1.86	2.28	2.64	2.80	2.95	3.23	3.55	3.95	4.17	4.47	4.75	5.02
65	0.32	0.55	0.71	0.78	0.84	1.11	1.72	2.02	2.47	2.86	3.03	3.19	3.50	3.85	4.28	4.52	4.84	5.15	5.44
70	0.34	0.60	0.77	0.84	0.91	1.19	1.85	2.17	2.66	3.08	3.26	3.44	3.77	4.14	4.61	4.86	5.22	5.54	5.86
75	0.37	0.64	0.82	0.90	0.97	1.28	1.98	2.33	2.85	3.30	3.50	3.68	4.04	4.44	4.94	5.21	5.59	5.94	6.27
80	0.39	0.68	0.88	0.96	1.04	1.36	2.12	2.49	3.04	3.52	3.73	3.93	4.31	4.73	5.27	5.56	5.96	6.34	6.69
85	0.42	0.72	0.93	1.02	1.10	1.45	2.25	2.64	3.23	3.73	3.96	4.18	4.57	5.03	5.60	5.91	6.33	6.73	7.11
90	0.44	0.77	0.99	1.08	1.17	1.53	2.38	2.80	3.42	3.95	4.19	4.42	4.84	5.32	5.93	6.25	6.71	7.13	7.53
95	0.47	0.81	1.04	1.14	1.23	1.62	2.51	2.95	3.62	4.17	4.43	4.67	5.11	5.62	6.26	6.60	7.08	7.53	7.95
100	0.49	0.85	1.10	1.20	1.30	1.70	2.65	3.11	3.81	4.39	4.66	4.91	5.38	5.92	6.59	6.95	7.45	7.92	8.37
110	0.54	0.94	1.21	1.32	1.43	1.87	2.91	3.42	4.19	4.83	5.13	5.40	5.92	6.51	7.25	7.64	8.20	8.71	9.20
120	0.59	1.02	1.32	1.44	1.56	2.04	3.17	3.73	4.57	5.27	5.59	5.90	6.46	7.10	7.91	8.34	8.94	9.51	10.04
130	0.64	1.11	1.43	1.56	1.69	2.21	3.44	4.04	4.95	5.71	6.06	6.39	7.00	7.69	8.57	9.03	9.69	10.30	10.88
140	0.69	1.19	1.54	1.68	1.82	2.38	3.70	4.35	5.33	6.15	6.52	6.88	7.53	8.28	9.23	9.73	10.43	11.09	11.71
150	0.74	1.28	1.65	1.80	1.95	2.55	3.97	4.66	5.71	6.59	6.99	7.37	8.07	8.87	9.89	10.42	11.18	11.88	12.55
160	0.79	1.36	1.76	1.93	2.08	2.72	4.23	4.97	6.09	7.03	7.46	7.86	8.61	9.46	10.55	11.12	11.92	12.67	13.39
170	0.84	1.45	1.87	2.05	2.21	2.89	4.50	5.28	6.47	7.47	7.92	8.35	9.15	10.06	11.20	11.81	12.67	13.47	14.22
180	0.88	1.53	1.98	2.17	2.34	3.06	4.76	5.59	6.85	7.91	8.39	8.84	9.69	10.65	11.86	12.51	13.41	14.26	15.06
190	0.93	1.62	2.09	2.29	2.47	3.23	5.03	5.90	7.23	8.35	8.85	9.33	10.22	11.24	12.52	13.20	14.16	15.05	15.90
200	0.98	1.70	2.20	2.41	2.60	3.40	5.29	6.21	7.61	8.79	9.32	9.83	10.76	11.83	13.18	13.89	14.90	15.84	16.73
220	1.08	1.87	2.42	2.65	2.86	3.74	5.82	6.84	8.37	9.67	10.25	10.81	11.84	13.01	14.50	15.28	16.39	17.43	18.40
240	1.18	2.04	2.64	2.89	3.12	4.08	6.35	7.46	9.13	10.55	11.19	11.79	12.92	14.20	15.82	16.67	17.88	19.01	20.08
260	1.28	2.21	2.86	3.13	3.38	4.42	6.88	8.08	9.89	11.42	12.12	12.77	13.99	15.38	17.14	18.06	19.37	20.60	21.75
280	1.38	2.38	3.08	3.37	3.64	4.76	7.41	8.70	10.65	12.30	13.05	13.76	15.07	16.56	18.45	19.45	20.86	22.18	23.42
300	1.47	2.55	3.30	3.61	3.90	5.11	7.94	9.32	11.42	13.18	13.98	14.74	16.14	17.75	19.77	20.84	22.35	23.76	25.10
325	1.60	2.77	3.57	3.91	4.22	5.53	8.60	10.10	12.37	14.28	15.15	15.97	17.49	19.23	21.42	22.58	24.21	25.74	27.19
350	1.72	2.98	3.84	4.21	4.55	5.96	9.26	10.87	13.32	15.38	16.31	17.19	18.84	20.70	23.07	24.32	26.08	27.72	29.28
375	1.84	3.19	4.12	4.51	4.87	6.38	9.92	11.65	14.27	16.48	17.48	18.42	20.18	22.18	24.72	26.05	27.94	29.70	31.37
400	1.97	3.40	4.39	4.81	5.20	6.81	10.58	12.43	15.22	17.58	18.64	19.65	21.53	23.66	26.36	27.79	29.80	31.69	33.46
425	2.09	3.62	4.67	5.11	5.52	7.23	11.24	13.20	16.17	18.67	19.81	20.88	22.87	25.14	28.01	29.53	31.66	33.67	35.55
450	2.21	3.83	4.94	5.41	5.85	7.66	11.90	13.98	17.12	19.77	20.97	22.11	24.22	26.62	29.66	31.26	33.53	35.65	37.65
475	2.33	4.04	5.22	5.72	6.17	8.08	12.57	14.76	18.08	20.87	22.14	23.33	25.56	28.10	31.31	33.00	35.39	37.63	39.74
500	2.46	4.25	5.49	6.02	6.50	8.51	13.23	15.53	19.03	21.97	23.30	24.56	26.91	29.58	32.95	34.74	37.25	39.61	41.83

Nozzle Technology Terms

Pressure

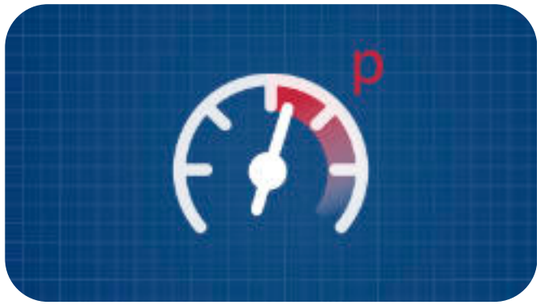
For the determination of the nozzle size and the specification of the permissible pressure range, we measure the total pressure p_{tot} directly at the inlet of the nozzle and not directly at the pump. It had been shown in the past that significant pressure losses from the pump to the nozzle can occur, especially in the high-pressure range. In addition to the precise and fast pressure sensor, we use a calibrated Coriolis mass flow meter with a very high measuring accuracy.



We always use SI units for the design of our components. We use for conversion from bar to psi and for l/min (lpm) to US gpm:

1 bar = 14.504 psi and 1 l/min = 1/3.7854 gpm

Pressure Range



The division into different pressure ranges is not officially defined. To avoid misunderstandings, we define the pressure ranges as follows:

- 0-232 psi / 0 -16 bar:
  Low Pressure → **LPX**
- 232-870 psi / 16-60 bar:
  Middle Pressure → **MPX**
- 870-2900 psi / 60-200 bar:
  High Pressure → **HPX**
- >2900 psi / >200 bar:
  Ultrahigh Pressure → **XPX**

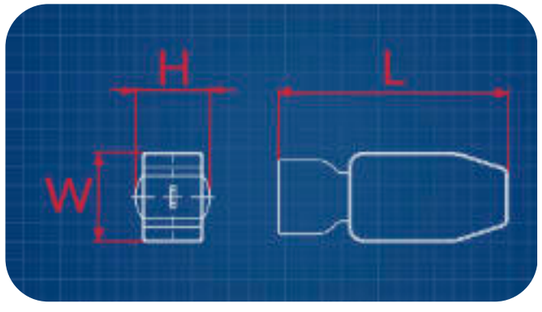
Please note that some of our nozzles can be applied over a pressure range.

Dimensions

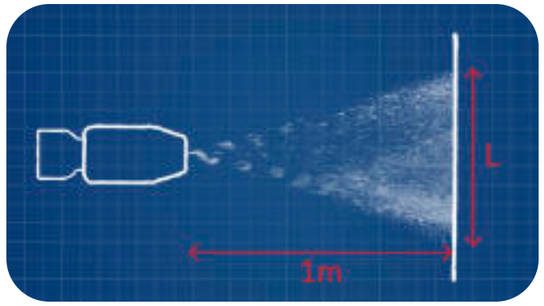
We always specify the maximum external dimensions (rectangular envelope) as dimensions (**length L**, **width B**, **height H**). For more detailed dimensions, we provide CAD models on our homepage.

We always use SI units for the design of our components. For conversion to inch:

1 mm = 1/25.4 inch

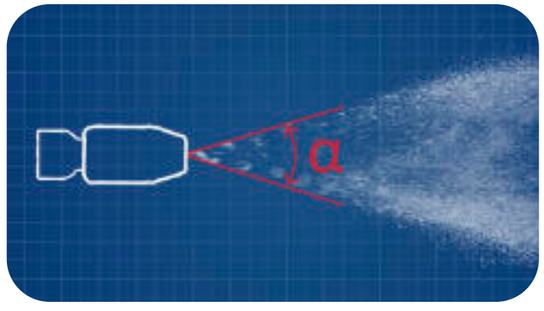


Spray Width



In some applications, the spray width is often used as a key figure. This is defined as the **length L** of the sprayed area at a distance of **one meter / ~ 1 yd / 39.37“**. This is particularly useful when using flat spray or fan nozzles, as the spray fan collapses after a certain run length and therefore cannot necessarily be calculated from the nominal spray angle.

Spray Angle



Besides the nozzle capacity, the jet **spray angle α** is one of the most important parameters of the OsciJet nozzles. We determine this experimentally in our laboratory and it always refers to the full spray range. In contrast to flat spray or fan nozzles, for example, its angle is constant over the entire operating range and is therefore independent of the upstream pressure. In principle, the OsciJet nozzles oscillate only in one plane and thus appear similar to a flat-jet nozzle in terms of the jet pattern. The fanning out of the jet in the plane is the optimum distribution for many applications, for example when used in conveyor lines. However, it is also possible to broaden out the spray area perpendicularly to this.

More Information

You can find more information on our homepage. You can reach this under:

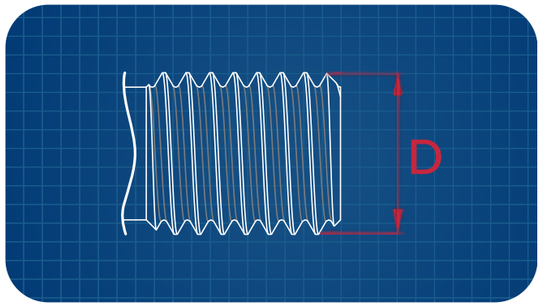
https://www.fdx.de/en/technology/glossary/

or via the QR code on the right.

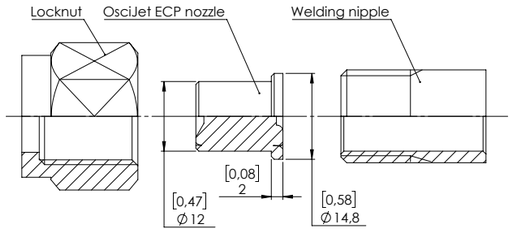
Nozzle Technology Terms

Connections

A wide variety of threads are used in nozzle technology, depending on the application. As standard, we use Whithworth pipe threads, in particular British Standard Pipe (BSP) with tapered (BSPT) and cylindrical (BSPP) threads. Tapered threads according to EN 10226 are designated as usual with a preceding R and the imperial dimension, e.g. R1/8". Cylindrical threads according to EN 10226 are designated with a preceding G, e.g. G1/4". Please note that cylindrical female G threads are screwed onto tapered male R threads to form a seal. Nozzle versions with NPT thread (National Pipe Thread according to ASME/ANSI B1.20.1) are also available.



For versions with the designation ECP, the nozzle is sealed with a cap nut against a weld-on nipple, as shown in the following figure. ECP nozzles are compatible with 3/8" locknuts. The CAD data can be downloaded product-specifically from our homepage.



Materials

Depending on the application, we manufacture our products from different materials. As standard, we use **stainless steel** for nozzles according to the following standards:

- EN 1.4301/1.4305
- DIN X5CrNi18-10/X8CrNiS18-9
- AISI 304/303
- UNS S30400/S30300

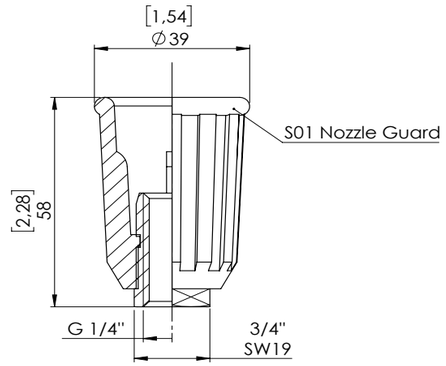
For products made of **brass** we meet the following standards:

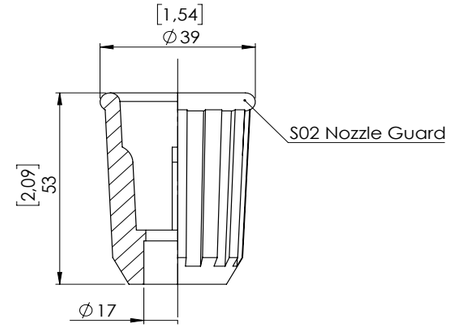
- EN 2.0375
- DIN CuZn36Pb3
- MS58
- EN CW603N
- UNS C36000
- ASTM B16
- AMS Alloy 4610
- SAE J463

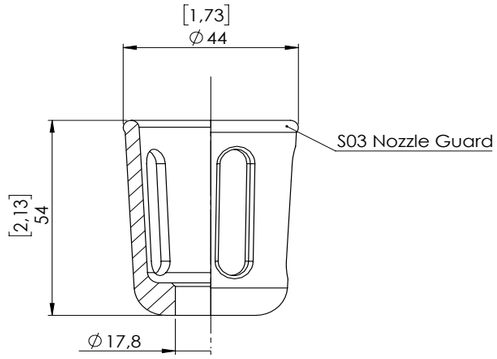
Nozzle guards are made of **PE-UHMW** and **EPDM**. In principle, however, our products can also be made from other materials. Please do not hesitate to contact us.

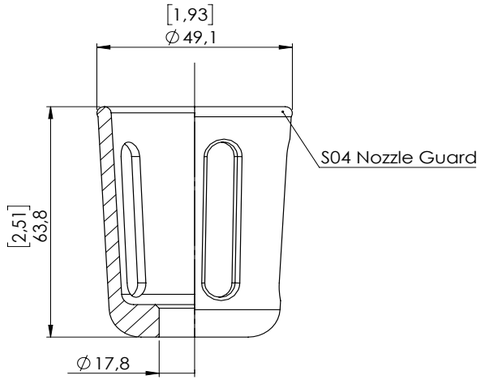
Nozzle Guard

A nozzle guard, or also known as nozzle sleeve, serves on the one hand to protect the nozzle, and thus also to protect the material to be cleaned. We recommend the use of a nozzle guard especially for manual lance cleaning. The nozzle is usually inserted or screwed into the guard. We manufacture the nozzle protectors from **PE-UHMW** or **EPDM** to ensure good stability and elasticity at the same time. Regularly we provide the versions S01-S04. The MPX-CH is by default equipped with the S05, and thus, included in the drawings and CAD files. If you need another version, please contact us.









Data in mm, data in [] in inches

02 Application Areas

Areas of Application

In various industrial processes, a dynamically moving fluid jets brings significant efficiency improvements and thus, among other advantages, an extraordinary savings potential in terms of e.g. material, manufacturing and energy costs, as well as process time. In conventional systems, however, moving fluid jets can currently only be generated by additional moving components. Due to their short service life, high costs and the need for regular maintenance of moving components, such systems are reluctantly used in industrial environments.

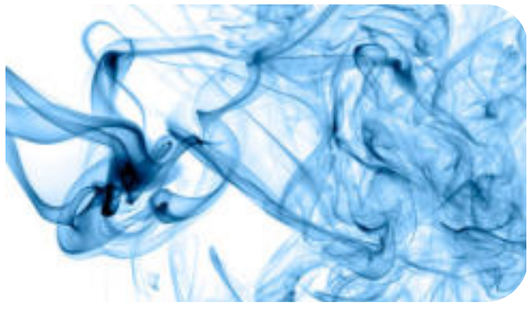
OsciJet nozzles can be used in a variety of ways in these industrial processes and show their advantages wherever dynamic jets can be used. Depending on the oscillation frequency, different jet properties can be achieved. For example, high frequencies are suitable for atomizing liquids very finely and mixing gases, resulting in up to 15 times better mixing than conventional systems in fuel-air treatment in engines, for example.

On the other hand, low frequencies can be used to generate large droplets that transfer a higher momentum, improving surface cleaning by up to 7 times, for example. This predestines the nozzles for use in cleaning processes such as high-pressure cleaners or dishwashers. These and other properties make the nozzles unique worldwide.

Surface Cleaning

In the field of surface cleaning, the OsciJet nozzles can fully demonstrate their superiority over a fan nozzle. Due to the oscillating or pulsating jet, a higher impulse can be applied to the surface without compromising the cleaning area. Thus, the nozzle can be seen as a combination of solid jet nozzle, delivering a high and focused impact and a flat fan nozzle, covering a certain width.

Fluid Distribution



Similar to the application, the OsciJet nozzle can also be used to distribute fluids of any kind. In this case, the nozzle can be designed for a desired jet characteristic, which can also be asymmetrical.

Cooling

A dynamic jet can achieve a significant increase in the effective surface area of the cooling medium, which means an increase in efficiency and thus a lower cooling mass flow can be used. In addition, hard-to-reach areas can be cooled effectively. By using OsciJet nozzles, we were able to achieve an increase in the heat conduction coefficient by a factor of 10 compared to conventional convection cooling.

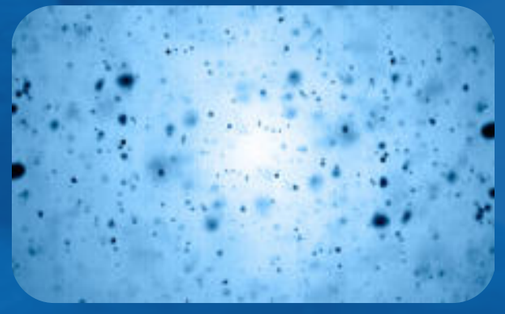
Mixture Improvement

High frequencies are suitable for mixing liquids and/or gases together. This can be used, for example, to create air-fuel mixtures.

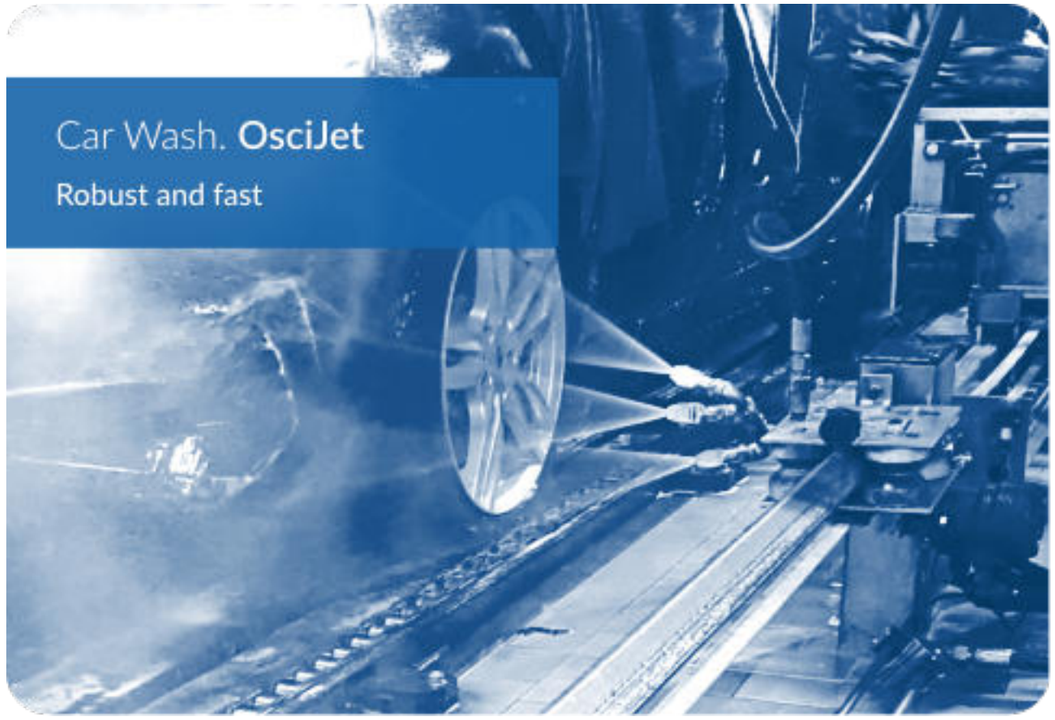
But liquids can also be mixed together excellently. We use the principle, for example, for our **FDmiX** platform, which was created specifically for *nanocapsulation*, *nanoemulsion* and *continuous flow chemistry*. The platform has a high mixing quality and extremely short mixing time, allowing it to be scaled up from the laboratory to industrial series production.

Spray Generation

In the case of the OsciJet nozzles, high frequencies produce smaller droplets and low frequencies produce larger droplets. This allows the droplet size to be selectively adjusted. In addition, all droplets coming from an OsciJet nozzle rotate, which leads to higher flight stability and stronger shear behavior on the surface. This is particularly advantageous in spray cooling, for example to prevent the Leidenfrost effect.



Car Wash



Car Washing Made Easy.

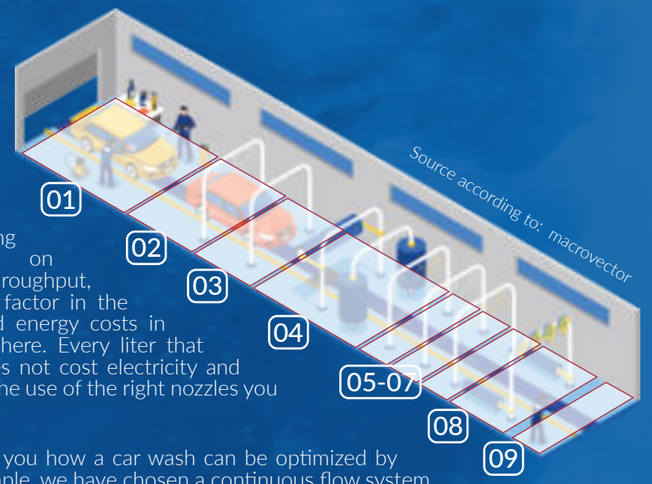
You're probably also familiar with the "wash me" prompts that some prankster whips up with a quick finger on a rear window of a dirty vehicle. What is so easy with a finger is not so easy in automated cleaning. That's why carwashes have a lot more know-how than is generally assumed. Let us give you a brief overview of the background of commercial car washing on these pages.

Car Wash. **An overview:**

Whether portal or continuous systems, they all have in common that the protection of the vehicle and the paint is the first priority. Damage to the vehicle cannot only result in liability claims, but can also quickly put a system out of service. That's why most facilities initially use a prewash to rinse off the coarsest dirt and apply a film of liquid that prevents dirt particles from acting like sandpaper. Of course, the dirt on wheels is particularly stubborn. Tar, road surface and brake dust form a resistant patina, which is usually loosened in seperate steps using high pressure spray washes and mechanically. The prewash is then followed by a shampoo treatment that loosens deeper-lying dirt, which is then removed mechanically with brushes and rags. Since the dirt is electrostatically charged, among other things, nothing works here without mechanical assistance. The main wash cycle is followed by a polish treatment that removes very deep-seated dirt from the paint.

After that, everything is rinsed off again in the final rinse cycle and, last but not least, wax is applied to make the paint resistant to new dirt. In addition, a drying aid is applied to ensure that the surface dries quickly and without stains. In the end, the remaining droplets are blown off and the vehicle is clean again. In addition to the numerous cleaning agents that are matched to each process step, specially adapted nozzles are also used.

After all, to operate a carwash profitably, a high throughput is necessary, and time is a crucial factor here. But choosing the wrong nozzles quickly leads to maintenance work when they become worn or clogged. The conditions placed on the components in a plant are tough. In particular, the humid environment, dirt and cleaning agents place high demands on robustness. In addition to throughput, operating costs are also a major factor in the profitability of a plant. Water and energy costs in particular play an important role here. Every liter that does not have to be pumped does not cost electricity and does not have to be treated. With the use of the right nozzles you can save up to 50% water.



In the following graphic, we show you how a car wash can be optimized by using OsciJet nozzles. For the example, we have chosen a continuous flow system, but the nozzles can be used just as well in a gantry system or a self-service wash box. Finally, it remains to be said that cleaning a vehicle involves more than just an aesthetic aspect. A clean vehicle contributes to driving safety, because a clean and shiny paint is more noticeable and clean windows and lights are probably self-explanatory. In addition, paint and underbody care contributes to the value retention and sustainability of a vehicle.

More information

You can find more information on our homepage. You can reach this under:

https://www.fdx.de/en/applications/carwash/

or via the QR code on the right.

Car Wash

01. Lance Cleaning

Classic high-pressure pre-cleaning with a hand-held lance helps to quickly remove coarse dirt from the vehicle. Rotor nozzles are rather unsuitable for this purpose, as they are not robust enough for professional use and can quickly cause damage to the vehicle if they malfunction. The strong vibrations of the rotor nozzles can also have health effects on the employee. We clearly recommend the use of an OsciJet HPX-CW for this purpose.

Source: freepik

02. Prewash

Source: János Bencs

Whether manual or automatic, whether with lance or nozzle arc, the prewash is a must because it removes coarse dirt and pre-softens the stubborn dirt. This is done with high pressure and we clearly recommend our OsciJet HPX-CW nozzles for this purpose.

03. Surface Cleaning

Rims are often a visual highlight on the vehicle and dirty rims in particular spoil the appearance. Anyone who has ever cleaned rims by hand knows how time-consuming this can be. In car wash stations, rims are usually cleaned with high pressure. The aim is to clean off and dissolve coarse dirt so that it can then be finally cleaned in the main wash. It is precisely here that cleaning efficiency and service life play an essential role, because changing nozzles during operation is extremely annoying. Several of our customers have reported that by replacing rotor nozzles with OsciJet HPX-CW nozzles, up to four sets of nozzles were saved within half a year. But it's best to see for yourself.

Source: freepik

04. Main Wash

In the main wash, stubborn dirt is tackled with foam and brushes. The prewash has previously rinsed off and dissolved coarse dirt. When the foam hits the surface, it swells quickly and creeps under the dirt. This allows it to detach the dirt and at the same time lubricates the surface. This means that the subsequent brushes cannot harm the paint and remove the dirt purely mechanically. We are currently working feverishly on the right nozzles for foam application and brush watering.

Source: Zulfahmi Khani

05. Polish

Source: pisauikan

Many car washes offer paint care with an additional polish sheet. The polish has the task of deep-cleaning the paint, preparing it for drying and enhancing the gloss. Good polishes are followed by an application of wax to provide long-lasting, dirt-repellent paint protection. When applying polishes, waxes and drying aids, it is important to use the right droplet size and to distribute them as homogeneously as possible. The droplet size in particular is crucial to ensure that the droplets are not blown away by the air currents through the drying fans. To ensure this, we have adapted the OsciJet LPX-DS so that the spray has the lowest possible drift.

06. Clear Rinse

At the end of the cleaning process, the last remnants of the vehicle are rinsed off with water. In order to work with as little water as possible in a short time, we also recommend the use of the OsciJet LPX-DS.

Source: Dariusz Sankowski

Car Wash

07. Wax Application

In the last spray arc, a wax for paint care and a drying aid, also called CTH, are applied shortly before the end of the cleaning process. This preservative provides the final stain- and lime-free shine. As with the polish application, the OsciJet LPX-DS has proved particularly suitable for this purpose. This is because the nozzle is designed to produce large drops with a high momentum, which help to better penetrate the existing liquid film. This helps to save time and resources.

Source: Zulfahmi Khani

08. Drying

Source: János Bencs

An impeccable wash result also includes a dry and spotless vehicle. For drying, the last drops are blown off the vehicle by means of a blower. The process is supported by a prior application of a drying aid, also called CTH.

09. Maintenance

Car wash facilities have to withstand a lot. They are damp rooms in continuous operation and therefore place high demands on the materials. This applies not only to the moving parts, but also to the water-bearing components, such as nozzles. In addition, the systems are usually operated with service water, which means that blockages can also occur. For this reason, car washes require frequent maintenance. To extend the maintenance intervals, the OsciNet system can be used. This automatically reports when a nozzle is clogged or worn and can also prevent acute damage. We are working to offer you a suitable solution as soon as possible.

Source: peoplecreations

Water Consumption:

What about water consumption when washing a car and can you clean your car with a clear conscience even in high summer?

There are various reasons for cleaning your vehicle. One important aspect is road safety. A clean vehicle is more visible and a clear view as well as clean lights contribute significantly to traffic safety. Another aspect is paint and underbody care, which contributes to the value retention and sustainability of the vehicle. In addition, car washing binds pollutants, but more on that in a moment.

But what about water consumption? Manual car washing generally consumes up to 37 gal. (140 liters) of water per wash cycle. If you use a high-pressure cleaner, you will quickly use considerably more. A modern car wash uses up to 158 gal. (600 liters) of water per vehicle, depending on the manufacturer and type. Car washes that operate purely with fresh water have become rare, but can still be found. Most facilities have a water treatment system that allows the majority of the water used to be reused. Thus, between 6 and 8 gal. (25 and 30 liters) of fresh water are usually required per vehicle. In addition, the waste water treatment separates pollutants such as oils and other operating materials separately so that they cannot get into the groundwater. Thus, a car wash, like a dishwasher, is more economical than washing by hand. This means that you can also, without having a guilty conscience, have your vehicle washed in scorching heat.

By using OsciJet nozzles, water consumption can be reduced even further. The nozzles are optimized for the different areas of the car wash. The water droplets are larger and have a higher momentum, so that cleaning performance increases, less overspray occurs and the tendency to drift is also reduced. This can **reduce water consumption** by up to **50%** compared to a system without OsciJet nozzles. Lower water consumption also helps water treatment. Lower water volumes mean lower flow rates and therefore more time for treatment.

Reduction in Operating Costs. **A Calculation Example:**

We would like to use two examples to demonstrate that sustainable action is not only good for the environment, but can also have a lasting effect on operating costs.

One of our customers operates a service station with a gantry car wash on a rural road in Lower Saxony. By replacing the original nozzles with OsciJet nozzles, the customer was able to reduce consumption per wash cycle from 64 gal. (243 liters) of water to 42 gal. (161 liters). This represents a saving of 34%, which is also reflected in the costs. Based on german water costs of about 2.92 $ per 264 gal (1000 liters) (fresh and waste water), this alone results in savings of over 460 $ for 2000 vehicle washes.

Another customer of ours operates a car wash and has replaced the rotor nozzles for sill cleaning and rim cleaning with the OsciJet HPX-CW. Due to the use of service water, the customer has normally used up 4 sets of rotor nozzles within half a year, whereas the OsciJet nozzles, which have been in operation for half a year, have not yet shown any signs of wear.

Source: Antonio Alvaro

Food Industry

Little Time. Highest Demands. **Uncompromising Cleaning.**

In the food industry, the hygiene of production facilities and plants is essential. This is not only about ensuring perfect quality, but ultimately also about the well-being of consumers and employees. It therefore stands to reason that uncompromising cleaning is necessary in this area in particular. It is precisely these high demands that pose a challenge in terms of cleaning time, environmental protection and operating costs. The use of dynamic systems (e.g. rotor nozzles) can of course improve cleaning efficiency, but the use of systems with moving components is taboo here. Fortunately, the OsciJet nozzle solves this problem.

More Information

You can find more information on our homepage. You can reach this under:

https://www.fdx.de/en/applications/medium-pressure-cleaning-in-the-food-industry/

or via the QR code on the right.

Cleaning. **The Dynamics Makes the Difference.**

What do you do when you pick up a garden hose to clean something? You probably swing it back and forth from the wrist when it's heavily soiled, right?

This is a movement many people make intuitively, as a moving stream cleans much better due to the interrupted droplet impact. So the motion makes a big difference in cleaning and is therefore used in a variety of ways in food equipment cleaning. Both in hand-held cleaning of the plant, machine or production facility and in stationary cleaning stations (CIP, Cleaning in Place).

The OsciJet nozzle generates a compact and moving jet without complex and thus maintenance-prone mechanics. To this end, the nozzle adopts a flow instability in its interior and thus operates without moving components. This makes the nozzle extremely robust and virtually maintenance-free.

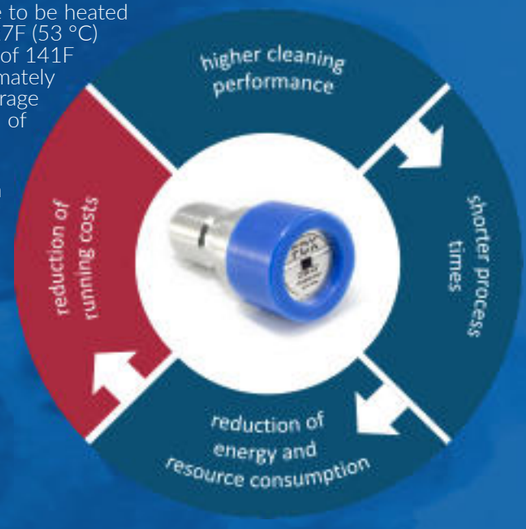
Reduction in Operating Costs. **A Calculation Example:**

It is certainly clear to everyone that saving resources makes a significant contribution to environmental protection. And the fact that this also reduces operating costs, as long as the cleaning performance is right, is certainly not surprising. Can we help here by using an OsciJet nozzle? Let's consider the following example. In a food processing plant, the equipment is cleaned manually after the work is done.

By using an MPX nozzle, the water consumption of 1.84 gpm (7 l/min) can be reduced by 0.26 gpm (1 l/min) without compromising the result. 0.26 gpm at a 4-hour cleaning per day, at 5 days per week, at 52 weeks per year results in an annual consumption of 16,484 gal. (62,400 l).

If hot water is used, these 16,484 gal. still have to be heated accordingly by an 14 degrees (well water) by 127F (53 °C) in order to carry out the cleaning at a minimum of 141F (61 °C). This requires a heat output of approximately 3850 kWh, which corresponds to the average annual electricity consumption of a household of three.

If natural gas is used to heat the water, at an efficiency of 92% and a price of 0.04 USD per kWh, the savings are 180 USD per year and per nozzle. If electricity is used and the average price is USD 0.32/kWh with an efficiency of 98%, the savings are as high as 1269 USD per year.



Food Industry

How We Test

We not only test each and every one of our nozzles for functionality, but also constantly conduct trials to improve our nozzles. Cleaning in the food industry is a particular challenge in this respect, as realistic conditions are often difficult to recreate and standardized cleaning tests do not exist. Below are the results of tests with grease. For this purpose, we melted 0.8 lb. (400 g) of commercially available solid vegetable fat and applied it to a cast-iron pan. We allowed this to cool in the refrigerator for 24 hours so that a homogeneous solid layer of fat could form. Cleaning was then carried out both with a commercially available flat fan nozzle and with our OsciJet MPX-CH at 290 psi (20 bar) at a distance of 7.8" (20 cm). The nozzles were moved automatically with a traverse (9.8 in/s).

As can be seen from the pictures, the use of the flat fan nozzle results in residues in the pan and a smeary film on the cleaned surface. The MPX-CH, on the other hand, reliably cleans off the grease over the complete jet width and can also cover a larger area.

Flat Fan Nozzle

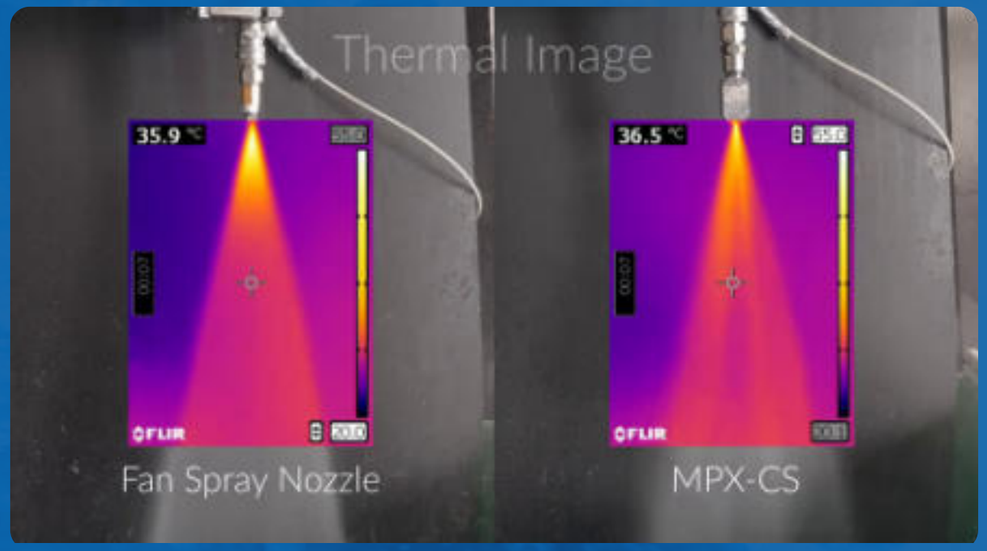
MPX-CH

However, the MPX-CH not only shines with its better cleaning performance, but can also boast better heat transport. To visualize this, we connected the OsciJet MPX-CH and a conventional flat spray nozzle in our hot water test rig and recorded them with a thermal imaging camera. The results can be seen with the video link below. Both nozzles were operated at 290 psi (20 bar) and approx. 140F (60 °C). The dynamics of the oscillating jet from the MPX nozzle can be seen clearly. However, the differences can be seen particularly well at the end in the averaged images. It can be clearly seen that the water jet from the MPX, in contrast to the conventional nozzle, has a higher temperature for longer, which means that the surface is heated more efficiently.

Video:

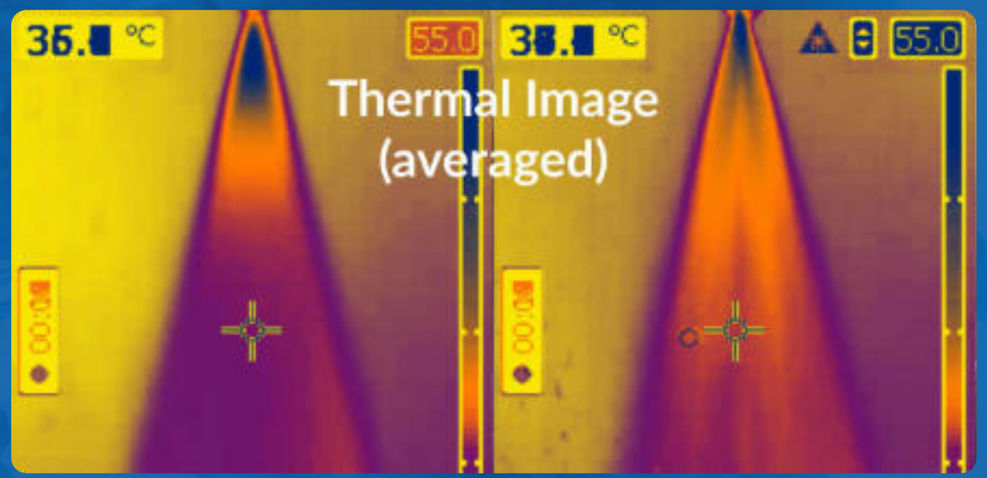
Flat Fan Nozzle

MPX-CH



Flat Fan Nozzle

MPX-CH



Parts Cleaning

Source: onlyyouqj

Parts Cleaning. **The Dynamics Make the Difference.**

Process-related, there is (usually) an undesirable accumulation of particles (such as metal chips) and dirt films (such as cooling lubricants) on the components during the industrial production of components. To ensure the quality of subsequent processes (color coating, hardening, electroplating, etc.) or the purity of the end product, these impurities must be removed. Since the impurities depend on the production process and the product, a variety of cleaning methods are used. In the field of spray cleaning, special nozzles and often even elaborate mechanics are used for additional agitation.

More Information

You can find more information on our homepage. You can reach this under:

https://www.fdx.de/en/applications/industrial-parts-cleaning/

or via the QR code on the right.

Parts Cleaning. **The Dynamic Makes the Difference.**

What do you do when you pick up a garden hose to clean something? You probably swing it back and forth from the wrist when it's heavily soiled, right?

This is a movement many people make intuitively, as a moving stream cleans much better due to the interrupted droplet impact. So the motion makes a big difference in cleaning. This is not different in parts cleaning. Motion improves the cleaning performance. In ultrasonic baths, it is the vibration; in basket or drum washes, it is the (relative) movement between cleaning nozzles and the item being cleaned. Often, even elaborate mechanical solutions are used to generate additional movement.

The OsciJet nozzle, on the other hand, generates a compact and moving jet without complex and thus maintenance-prone mechanics. To this end, the nozzle adopts a flow instability in its interior and thus functions without moving components. This makes the nozzle extremely robust and virtually maintenance-free.

Reduction in Operating Costs. **A Calculation Example:**

Cleaning quality:

- increased cleaning performance
- better cleaning of beads, bores, holes, etc. due to the moving jet
- by the improved washing away and washing off of cleaning residues.

Process time:

- by up to 25% time savings in hand-held and machine washing parts cleaning.
- 7-fold time savings in patio cleaning.
- A higher throughput speed for continuous systems.
- Reduction in process times for turntable and basket washing systems.

Operating costs:

With the innovative OsciJet nozzle you reduce:

- energy costs
- water consumption
- costs for cleaning additives/chemicals
- environmental pollution
- maintenance costs by saving on moving parts subject to wear and tear

Consumption:

- Proven to reduce water and cleaning additive consumption by up to 25% due to faster cleaning.
- a large spray angle even with small flow rates.
- 30% less heat loss in the spray due to larger droplets.
- Reduction in environmental impact.

The OsciJet nozzle thus makes a major contribution to current and future challenges in industrial parts cleaning.

03 Nozzle Finder

Nozzle Finder

The importance of finding the right nozzle is often underestimated. If a nozzle is selected that is too small, it will work against the pump. This means a higher power requirement and a higher mechanical load on the pump and supply line. If, on the other hand, a nozzle is selected that is too large, the power of the pump cannot be fully converted into pulse. This shows how important it is to select the components correctly. But this can quickly become confusing. To help you choose the right nozzle, we have created this page. Here you can find the right nozzle in 4 ways. The easiest way is to use our nozzle wizard. It guides you through the selection process in simple steps. On the next page we will guide you through this process analogously, but of course it is particularly convenient to do this via our homepage:

https://www.fdx.de/en/productfinder/

There you can also use the nozzle calculator to calculate a suitable nozzle and even put together a system from several nozzles. Or you can use the product tables on the following product pages directly if you are looking for a special version.

For clarification of technical terms, we provide a comprehensive glossary starting on page 6.
Probably the most important technical term is nozzle capacity (see page 10). We use this to classify nozzles. The nozzle size describes a pressure-flow ratio and can be expressed by a simple number. The nozzle size thus allows the flow rate to be calculated for any inlet pressure, which has proved very practical in practice.

You are also welcome to simply contact us and we will help you select the right nozzle or put together an entire nozzle system together. Our sales team will be happy to assist you. Below you will find your contact persons and on page 66 we introduce our team in more detail.

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Easy Nozzle Selection. **Our Nozzle Scheme.**

In principle, the selection of the appropriate nozzle can be made using the naming scheme for our nozzles. We have tried to find a consistent naming scheme for our nozzles. We came up with the scheme pPX-aa CXXX-YY°. Here, p stands for the pressure range, aa for the application area, XXX for the nozzle capacity and YY for the spray angle. For example, LPX-PC C050-30° stands for a low-pressure (LPX) parts cleaning nozzle (PC) with a nozzle size of 50 and a spray angle of 30°.

Pressure Key:
LPX - Low Pressure
MPX - Medium Pressure
HPX - High Pressure
XPX - Ultra High Pressure

Nozzle Capacity:
A measure for the pressure/ volume flow rate ratio.

µLPX-DS C050-30°

Special Key:
µ -Micro Nozzles
Δ - Double Nozzles
...

Application Key:
DS -Distributing Sweeping
MS - Mixing Sweeping
CS - Cleaning Sweeping
PC - Parts Cleaning
...

Spray Angle:
Effective spray angle in degrees

Pressure Range

HPX
870 - 2900 psi
60 - 200 bar

MPX
232 - 870 psi
16 - 60 bar

LPX
0 - 290 psi
0 - 20 bar

Nozzle Capacity

Nozzle Capacity
20 - 500

Spray Angle

Angle
15° - 60°

Application Areas

Currently, we generally offer nozzles for three main application areas. This means that for these applications the jet dynamics are specially adapted to achieve an optimum for the application. In the cleaning area, we have optimized the nozzles even further for special cleaning tasks.

CS — **Cleaning Sweeping** high impact force
MS — **Mixing Sweeping** optimized for mixing
DS — **Distributed Sweeping** uniform distribution

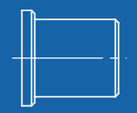
Specialized cleaning nozzles

PC — **Parts Cleaning** especially for ind. parts cleaning
CZ — **Cleaning Zipped** weight reduced for handheld cleaning
CH — **Cleaning High Frequency** frequency optimized for handheld cleaning
CW — **Car Wash** especially for vehicle cleaning

04 OsciJet Products

OsciJet **LPX-DS**

Perfectly wetted.



In many applications, a wide and reliable distribution of liquids is indispensable. Those who use flat fan, hollow, or full-cone nozzles here unnecessarily restrict their operating range, because with these nozzle types the jet angle depends on the upstream pressure. In addition, flat fan nozzles in particular require a sharp edge to produce a defined fan; if this sharp edge is degraded by wear, this also affects the jet quality. This is why we have developed the OsciJet LPX-DS specifically for car wash applications. The nozzle is extremely robust and has no sharp edges in the flow path, so wear and aging processes also have little effect on the jet quality. In addition to the robustness requirements, car wash systems also place high demands on the drift of the spray, because the rotating brushes and drying fans cause strong air currents to occur within the systems. The nozzles were therefore trimmed to a particularly low drift tendency by adjusting the droplet size. The droplets of the OsciJet nozzles rotate, which gives them additional stability. This makes the nozzles ideal for applying foams, chemical drying aids (CTH) and, of course, water. Naturally, the nozzles are also suitable for numerous other applications.

Thus, the OsciJet LPX-DS allows you to achieve a higher throughput speed over a wide operating range with less tendency to clogging or requiring a high upstream pressure.

Pressure Range

15 psi	to	290 psi
1 bar	to	20 bar

Spray Angle in deg

60°	75°

S-XL

Nozzle Capacity

40	50	75	100

The OsciJet LPX-DS at a glance:

- All-round nozzle for the distribution of liquids
- Produces very large drops
- Very low drift tendency
- Operating range 14.5-290 psi (1-20 bar)
- Adapted for the application of liquid media
- Saves energy costs, water consumption, costs for cleaning additives/chemicals, environmental impact

Fields of application:

Cleaning

Cleaning in place

Car cleaning

Fluid distribution

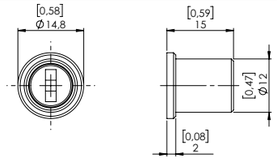
Link

OsciJet **LPX-DS**

Product Overview:

C40/50/75/100	
Spray angle:	60°, 75°
Material:	Brass
Connection:	ECP
Dimensions (LxWxH):	5/8x1/2x1/2 inch*
	15x12x12 mm

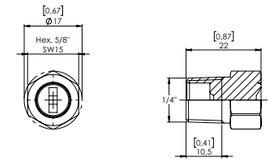
Product may differ from the picture



Dimensions in mm, dimensions in [] in inches

C40/50/75/100	
Spray angle:	60°, 75°
Material:	Brass
Connection:	R1/4“, 1/4“ NPT
Dimensions (LxWxH):	7/8x11/16x11/16 inch*
	22x17x17 mm

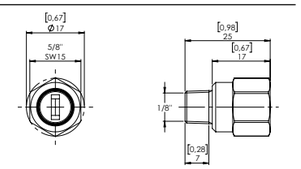
Product may differ from the picture



Dimensions in mm, dimensions in [] in inches

C40/50/75/100	
Spray angle:	60°, 75°
Material:	Brass
Connection:	R1/8”
Dimensions (LxWxH):	1x11/16x11/16 inch*
	25x17x17 mm

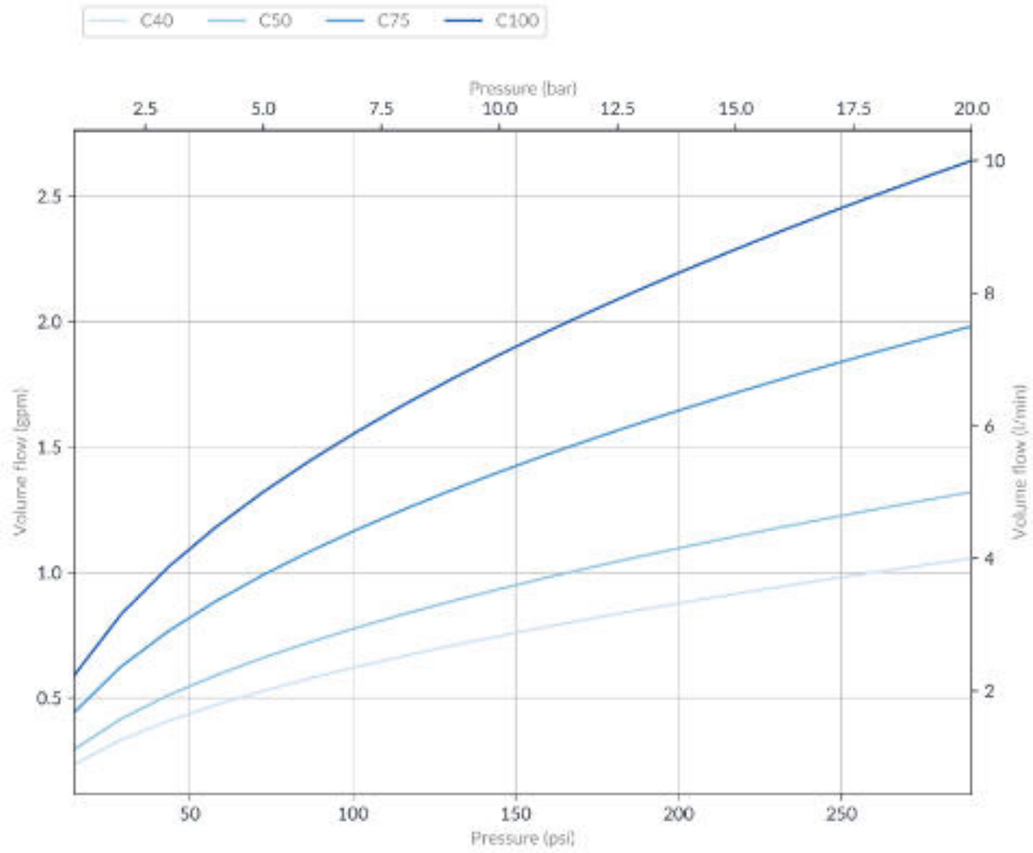
Product may differ from the picture



Dimensions in mm, dimensions in [] in inches

Approximate Size in Inches

Pressure-flow Relationship:



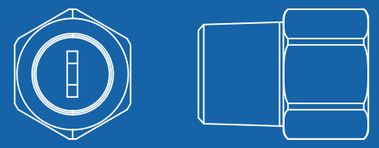
Pressure (psi)

Nozzle Capacity (-)	10	14.5	30	50	70	90	110	130	150	170	190	210	230	250	270	290
40	2.8	3.3	4.9	6.3	7.5	8.5	9.4	10.2	11	11.7	12.3	13	13.6	14.1	14.7	15.2
50	3.5	4.2	6.1	7.9	9.4	10.6	11.7	12.7	13.7	14.6	15.4	16.2	17	17.7	18.4	19
75	5.3	6.3	9.2	11.9	14	15.9	17.6	19.1	20.5	21.9	23.1	24.3	25.4	26.5	27.6	28.6
100	7.1	8.4	12.2	15.8	18.7	21.2	23.5	25.5	27.4	29.2	30.8	32.4	33.9	35.4	36.7	38.1

The table shows the pressure-flow relationship of a nozzle depending on the nozzle size. It gives the volume flow in (gpm) for a given nozzle size and pressure. For example, a nozzle size of 75 results in a volume flow of 6.3 gpm at 14.5 psi. The definition of the nozzle capacity can be found on **page 10**.

OsciJet **LPX-PC**

The new high-impact nozzle.



During the industrial production of components, the process usually results in an undesirable impact of particles (such as metal chips) and dirt films (such as cooling lubricants) on the surfaces. To ensure the quality of subsequent processes (color coating, hardening, electroplating, etc.) or the purity of the end product, these contaminants must be removed. A wide variety of cleaning processes are used for this purpose. Spray cleaning with aqueous cleaning media is a widely used cleaning method.

The LPX-PC parts cleaning nozzle was specially designed for this method. With its adapted dynamics, it provides increased cleaning performance and better cleaning of beads, bores, holes and the like. In addition, the dynamic jet helps to wash away and wash off the cleaning residues.

Thus, the OsciJet LPX-PC enables you to achieve higher throughput speeds in continuous flow systems and shorten process times in turntable and basket washing systems, spray cleaning and pressure flooding.

Pressure Range

14.5 psi	to	290 psi
1 bar	to	20 bar

Spray Angle in deg

15°	30°	45°	60°

S-XL

Nozzle Capacity

30	to	500

The OsciJet LPX-PC at a glance:

- Specially adapted for industrial parts cleaning
- Operating range 14.5-290 psi (1-20 bar)
- Constant spray angle over the entire operating range
- Lower maintenance costs due to the elimination of wear-prone moving parts
- Savings in energy costs, water consumption, costs for cleaning additives/chemicals, environmental pollution

Fields of application:

Cleaning

Parts cleaning

Cleaning in place

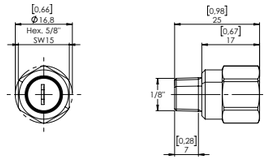
Link

OsciJet **LPX-PC**

Product Overview:

C30/40/50	
Spray angle:	15°, 30°, 45°, 60°
Material:	Stainless Steel, Brass
Connection:	R1/8”
Dimensions (LxWxH):	1x11/16x11/16 inch*
	25x16,8x16,8 mm

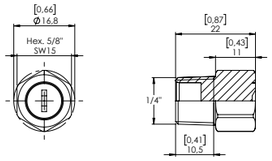
Product may differ from the picture



Dimensions in mm, dimensions in [] in inches

C30/40/50	
Spray angle:	15°, 30°, 45°, 60°
Material:	Stainless Steel, Brass
Connection:	R1/4“, 1/4“ NPT
Dimensions (LxWxH):	7/8x11/16x11/16 inch*
	22x16,8x16,8 mm

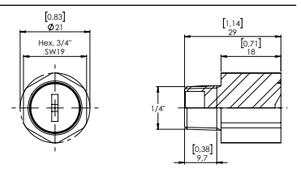
Product may differ from the picture



Dimensions in mm, dimensions in [] in inches

C75/100	
Spray angle:	15°, 30°, 45°, 60°
Material:	Stainless Steel, Brass
Connection:	R1/4“, 1/4“ NPT
Dimensions (LxWxH):	1 1/8x13/16x13/16 inch*
	29x21x21 mm

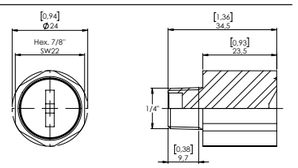
Product may differ from the picture



Dimensions in mm, dimensions in [] in inches

C150/200/300/400	
Spray angle:	15°, 30°, 45°, 60°
Material:	Stainless Steel, Brass
Connection:	R1/4”
Dimensions (LxWxH):	1.35x1x1 inch*
	34,5x24x24 mm

Product may differ from the picture

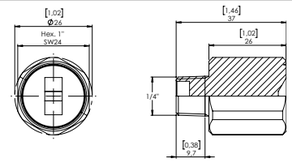


Dimensions in mm, dimensions in [] in inches

Approximate Size in Inches

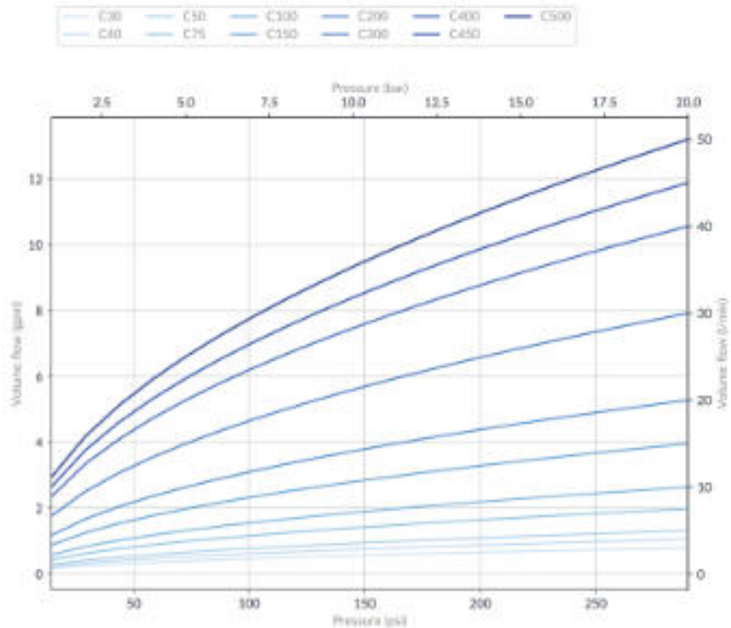
C450/500	
Spray angle: :	15°, 30°, 45°, 60°
Material:	Stainless Steel, Brass
Connection:	R1/4”
Dimensions (LxWxH):	1.45x1x1 inch*
	37x26x26 mm

Product may differ from the picture



Dimensions in mm, dimensions in [] in inches

Pressure-flow Relationship:



Pressure (psi)

Nozzle Capacity (-)	10	14.5	30	50	70	90	110	130	150	170	190	210	230	250	270	290
30	2.1	2.5	3.7	4.7	5.6	6.4	7	7.6	8.2	8.7	9.2	9.7	10.2	10.6	11	11.4
40	2.8	3.3	4.9	6.3	7.5	8.5	9.4	10.2	11	11.7	12.3	13	13.6	14.1	14.7	15.2
50	3.5	4.2	6.1	7.9	9.4	10.6	11.7	12.7	13.7	14.6	15.4	16.2	17	17.7	18.4	19
75	5.3	6.3	9.2	11.9	14	15.9	17.6	19.1	20.5	21.9	23.1	24.3	25.4	26.5	27.6	28.6
100	7.1	8.4	12.2	15.8	18.7	21.2	23.5	25.5	27.4	29.2	30.8	32.4	33.9	35.4	36.7	38.1
150	10.6	12.5	18.4	23.7	28.1	31.8	35.2	38.2	41.1	43.7	46.2	48.6	50.9	53	55.1	57.1
200	14.1	16.7	24.5	31.6	37.4	42.4	46.9	51	54.8	58.3	61.6	64.8	67.8	70.7	73.5	76.2
300	21.2	25.1	36.7	47.4	56.1	63.6	70.4	76.5	82.2	87.5	92.5	97.2	101.7	106.1	110.2	114.2
400	28.3	33.5	49	63.2	74.8	84.9	93.8	102	109.5	116.6	123.3	129.6	135.6	141.4	147	152.3
450	31.8	37.6	55.1	71.1	84.2	95.5	105.5	114.7	123.2	131.2	138.7	145.8	152.6	159.1	165.3	171.3
500	35.4	41.8	61.2	79.1	93.5	106.1	117.3	127.5	136.9	145.8	154.1	162	169.6	176.8	183.7	190.4

The table shows the pressure-flow relationship of a nozzle depending on the nozzle size. It gives the volume flow in (gpm) for a given nozzle size and pressure. For example, a nozzle size of 75 results in a volume flow of 6.3 gpm at 14.5 psi. The definition of the nozzle capacity can be found on **page 10**.

OsciJet **MPX-CH**

The new standard nozzle for food cleaning.

The OsciJet MPX-CH was specially designed for detailed cleaning of hard-to-reach areas during cleaning in the food industry. Due to its intelligent flow guidance, the MPX-CH generates an oscillating jet without moving or rotating parts. Thus, for the first time, the MPX-CH combines the increase of cleaning performance with the robustness of a flat fan nozzle. The dynamics of the nozzle are specially adapted to the cleaning of films containing grease and protein. The MPX-CH is available in two angles, making it suitable for both flat and hard-to-reach areas. In addition, it shines through its particularly high durability, and thus not only saves cleaning time and operating costs, but also pays for itself quickly through its long service life.

Pressure Range

230 psi	to	880 psi
16 bar	to	60 bar

Spray Angle in deg

15°	25°

S-XL

Nozzle Capacity

150	to	300

The OsciJet MPX-CH at a glance:

- Specially adapted for cleaning in the food industry
- Fast and thorough cleaning
- Saves time and operating costs
- Operating range 230-880 psi (16-60 bar)
- Constant spray angle over the entire operating range
- Lower maintenance costs due to elimination of wear-prone moving parts
- Savings in energy costs, water consumption, costs for cleaning additives/chemicals, environmental impact

Fields of application:

- Cleaning
- Cleaning in place
- Medium pressure cleaning food industry
- Nozzle guard available
- Fluid distribution

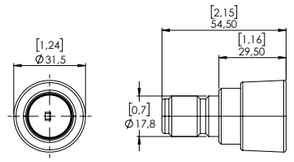
Link

OsciJet **MPX-CH**

Product Overview:

C150/200/250/300	
Spray angle:	15°, 25°
Material:	Stainless Steel
Connection:	Quick Coupler
Dimensions (LxWxH):	2.1x1.2x1.2 inch
	54,5x31,5x31,5 mm
Optionally available without nozzle guard	

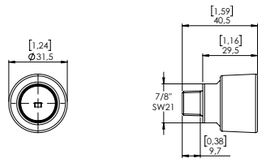
Product may differ from the picture



Dimensions in mm, dimensions in [] in inches

C150/200/250/300	
Spray angle:	15°, 25°
Material:	Stainless Steel
Connection:	R1/4”
Dimensions (LxWxH):	1.6x1.2x1.2 inch
	40,5x31,5x31,5 mm
Optionally available with nozzle guard	

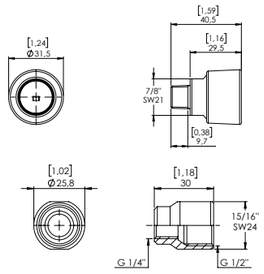
Product may differ from the picture



Dimensions in mm, dimensions in [] in inches

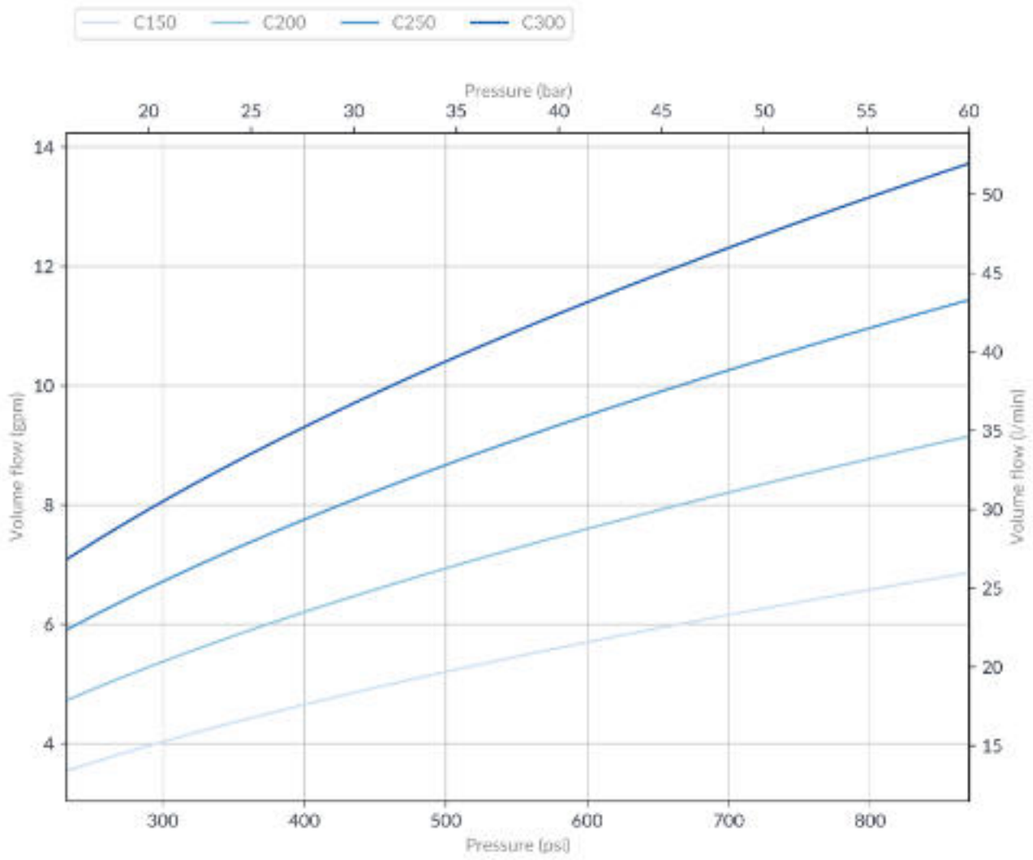
C150/200/250/300	
Spray angle:	15°, 25°
Material:	Stainless Steel
Connection:	R1/2”
Dimensions (LxWxH):	2.3x1.2x1.2 inch
	59,5x31,5x31,5 mm
Optionally available with nozzle guard	
Design identical in construction to the above R1/4" design and supplemented with adapter	

Product may differ from the picture



Dimensions in mm, dimensions in [] in inches

Pressure-flow Relationship:



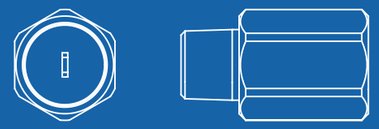
Pressure (psi)

Nozzle Capacity	230	232	280	330	380	430	480	530	580	630	680	730	780	830	880
150	50.9	51.1	56.1	60.9	65.4	69.6	73.5	77.2	80.8	84.2	87.5	90.6	93.7	96.6	99.5
200	67.8	68.1	74.8	81.2	87.2	92.7	98	103	107.7	112.2	116.6	120.8	124.9	128.8	132.7
250	84.8	85.1	93.5	101.5	109	115.9	122.5	128.7	134.6	140.3	145.8	151	156.1	161	165.8
300	101.7	102.2	112.2	121.9	130.8	139.1	147	154.4	161.6	168.4	174.9	181.2	187.3	193.3	199

The table shows the pressure-flow relationship of a nozzle depending on the nozzle size. It gives the volume flow in (gpm) for a given nozzle size and pressure. For example, a nozzle capacity of 250 results in a volume flow of 122.5 gpm at 480 psi. The definition of the nozzle capacity can be found on **page 10**.

OsciJet **HPX-CW**

Taking vehicle washing to a new level.



The OsciJet HPX-CW at a glance:

- Specially adapted for vehicle cleaning
- Robust and low maintenance
- Suitable for process water
- Operating range 580-1900 psi (40-130 bar)
- Constant spray angle over the entire operating range
- Lower maintenance costs due to elimination of wear-prone moving parts
- Available with nozzle protection
- Savings in operating costs (energy costs, water consumption)

The OsciJet HPX-CW is the innovation in the field of high-pressure car wash. The nozzle is specially designed for hand-held lance cleaning in the prewash. It is particularly lightweight without compromising on cleaning performance. To protect the nozzle and the vehicle, the OsciJet HPX-CW can be mounted directly in a nozzle guard. This not only protects the nozzle, but also the vehicle.

With a jet angle of 30 and 45°, it is ideally suited for the rapid cleaning of large areas and develops its full power already at 580 psi (40 bar). This saves time, operating costs and nerves. Due to the special acoustics and a slight vibration of the nozzle, the user experiences the cleaning performance with all his senses, a special cleaning experience!

This nozzle can also be operated with process water without significantly limiting durability.

Pressure Range

580 psi	to	1900 psi
40 bar	to	130 bar

Spray Angle in deg

30°	45°

S-XL

Nozzle Capacity

30	35	40	45	50	55	60	65	70

Fields of application:

- Cleaning
- Car cleaning
- High pressure cleaning
- Nozzle guard available
- Cleaning in place

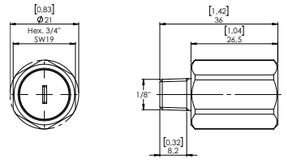
Link

OsciJet **HPX-CW**

Product Overview:

C40/50	
Spray angle:	45
Material:	Stinless Steel
Connection:	R1/8”
Dimensions (LxWxH):	1.4x13/16x13/16 inch*
	36x21x21 mm
Optionally available with nozzle guard S01	

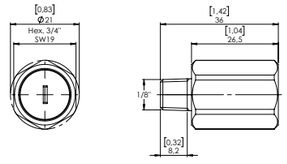
Product may differ from the picture



Dimensions in mm, dimensions in [] in inches

C30/35/40/45/50/55/60/65	
Spray angle:	45
Material:	Stinless Steel
Connection:	R1/4“, 1/4“ NPT
Dimensions (LxWxH):	1.4x13/16x13/16 inch*
	36x21x21 mm
Optionally available with nozzle guard S01	

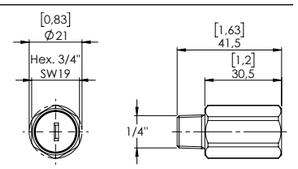
Product may differ from the picture



Dimensions in mm, dimensions in [] in inches

C70	
Spray angle:	45
Material:	Stinless Steel
Connection:	R1/4“, 1/4“ NPT
Dimensions (LxWxH):	1.6x13/16x13/16 inch*
	41,5x21x21 mm
Optionally available with nozzle guard S01	

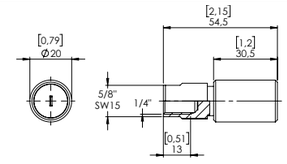
Product may differ from the picture



Dimensions in mm, dimensions in [] in inches

C30/35/40/45/50/55/60/65	
Spray angle:	30
Material:	Stinless Steel
Connection:	G1/4“ (internal), 1/4“ NPT
Dimensions (LxWxH):	2.1x13/16x13/16 inch*
	54,5x20x20 mm
Optionally available with nozzle guard S02	

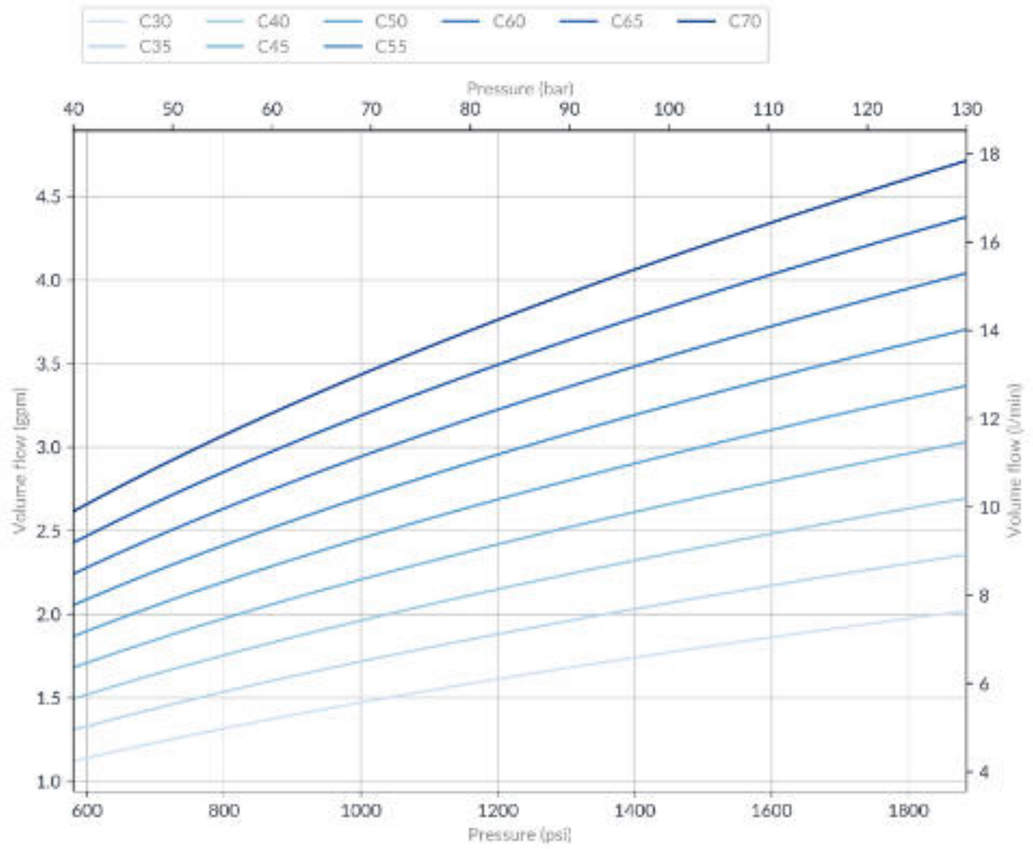
Product may differ from the picture



Dimensions in mm, dimensions in [] in inches

Approximate Size in Inches

Pressure-flow Relationship:

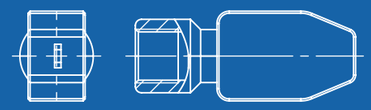


Nozzle Capacity (-) \ Pressure (psi)	580	690	800	910	1,020	1,130	1,240	1,350	1,460	1,570	1,680	1,790	1,900
30	16.2	17.6	19	20.2	21.4	22.5	23.6	24.6	25.6	26.6	27.5	28.4	29.2
35	18.8	20.6	22.1	23.6	25	26.3	27.6	28.8	29.9	31	32.1	33.1	34.1
40	21.5	23.5	25.3	27	28.6	30.1	31.5	32.9	34.2	35.4	36.7	37.8	39
45	24.2	26.4	28.5	30.4	32.1	33.8	35.4	37	38.4	39.9	41.2	42.6	43.9
50	26.9	29.4	31.6	33.7	35.7	37.6	39.4	41.1	42.7	44.3	45.8	47.3	48.7
55	29.6	32.3	34.8	37.1	39.3	41.3	43.3	45.2	47	48.7	50.4	52	53.6
60	32.3	35.2	37.9	40.5	42.8	45.1	47.2	49.3	51.3	53.2	55	56.8	58.5
65	35	38.2	41.1	43.8	46.4	48.9	51.2	53.4	55.5	57.6	59.6	61.5	63.4
70	37.7	41.1	44.3	47.2	50	52.6	55.1	57.5	59.8	62	64.2	66.2	68.2

The table shows the pressure-flow relationship of a nozzle depending on the nozzle size. It gives the volume flow in (gpm) for a given nozzle size and pressure. For example, a nozzle capacity of 45 results in a volume flow of 37 gpm at 1350 psi. The definition of the nozzle capacity can be found on **page 10**.

OsciJet **HPX-CZ**

Clean with ease.



The OsciJet HPX-CZ at a glance:

- Extremely robust
- Operating range 870-2900 psi (60-200 bar)
- Constant spray angle over the entire operating range
- Lower maintenance costs due to elimination of wear-prone moving parts
- Suitable for process water
- Available with nozzle protection

The nozzle is specially designed for cleaning applications and impresses as an all-rounder with its particularly high durability and cleaning performance. It has been optimized in terms of weight so that it can be used for longer periods in hand-held high-pressure cleaning without compromising on performance or robustness. The nozzle's high dynamics are designed to prevent unpleasant (occupational health and safety-relevant) vibrations in the handpiece and thus, unlike a rotor nozzle, also allow for all-day use. In addition, the dynamic jet helps to quickly wash away and wash off cleaning residues, so the nozzle saves valuable cleaning time. To prevent damage during manual guidance, the nozzle can also be integrated into a separately available nozzle guard.

A special feature of the nozzle is that it can also be operated with process water without significantly reducing its durability. The OsciJet HPX-CZ cleans with ease, saving above all time, operating costs and water.

Pressure Range

870 psi	to	2900 psi
60 bar	to	200 bar

Spray Angle in deg

30°

S-XL

Nozzle Capacity

30	to	200

Fields of application:

- Cleaning
- High pressure cleaning
- Cleaning in place
- Car cleaning
- Nozzle guard available

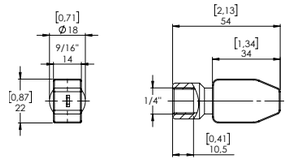
Link

OsciJet **HPX-CZ**

Product Overview:

C30/35/40/45/50/55/60/65	
Spray angle:	30°,
Material:	Stainless Steel
Connection:	G1/4”
Dimensions (LxWxH):	2.1x7/8x3/4 inch*
	54x22x18 mm
Optionally available with nozzle guard S02	

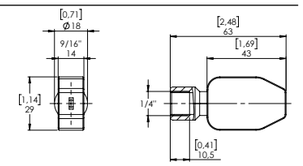
Product may differ from the picture



Dimensions in mm, dimensions in [] in inches

C70/80/85/90/100/110	
Spray angle:	30°
Material:	Stainless Steel
Connection:	G1/4”
Dimensions (LxWxH):	2.4x1.1x3/4 inch*
	63x29x18 mm
Optionally available with nozzle guard S03	

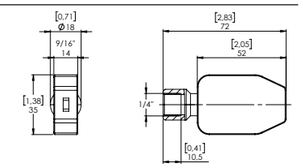
Product may differ from the picture



Dimensions in mm, dimensions in [] in inches

C125/150/175/200	
Spray angle:	30°
Material:	Stainless Steel
Connection:	G1/4”
Dimensions (LxWxH):	2.8x1.3x3/4 inch*
	72x35x18 mm
Optionally available with nozzle guard S04	

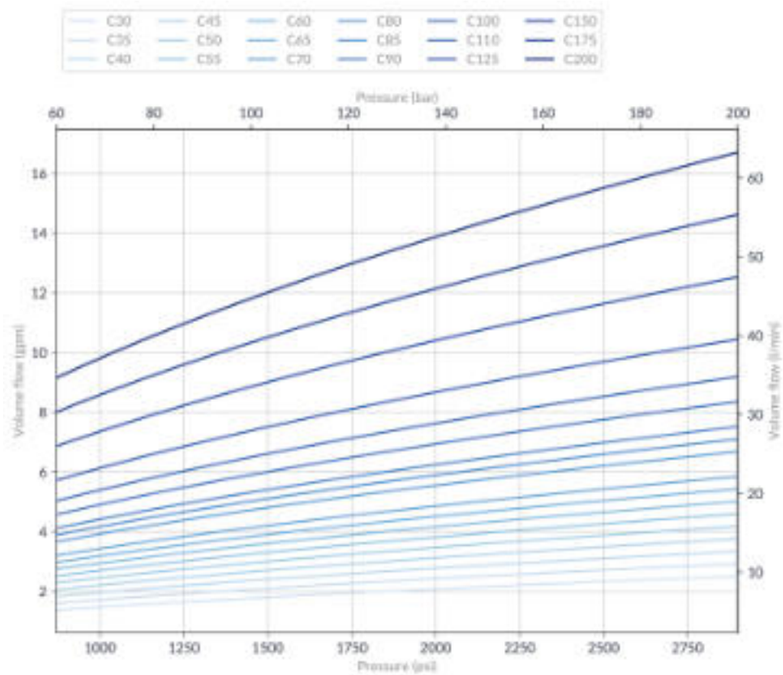
Product may differ from the picture



Dimensions in mm, dimensions in [] in inches

Approximate Size in Inches

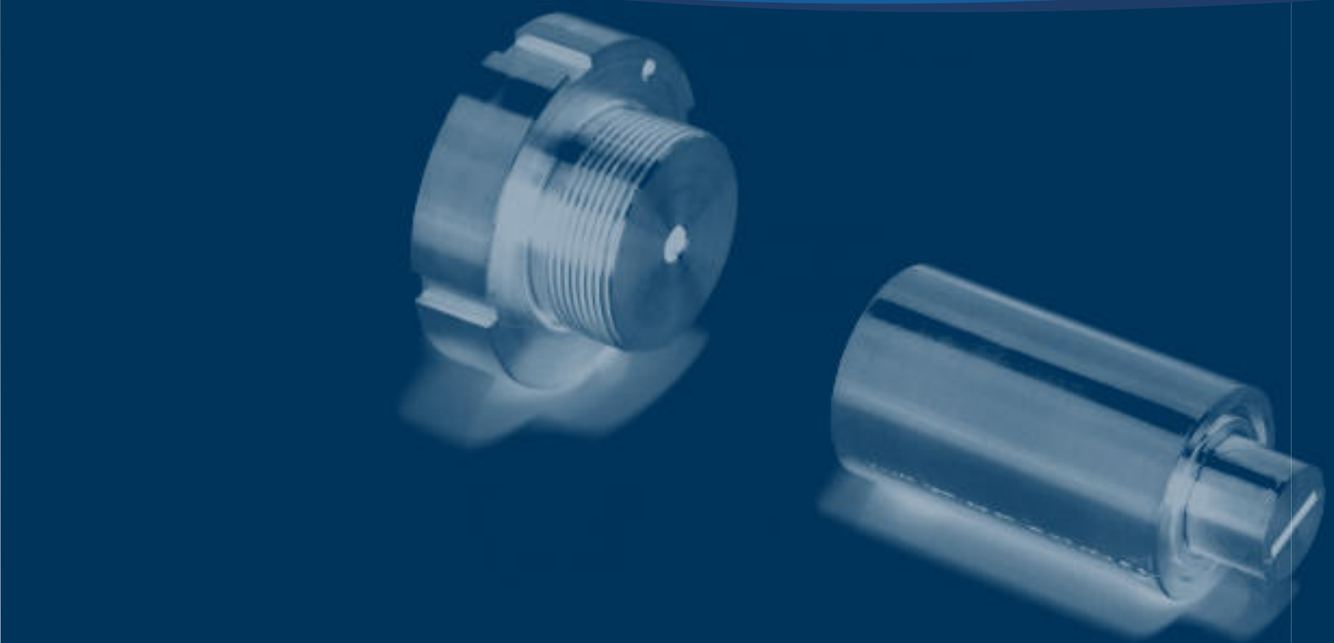
Pressure-flow Relationship:



Nozzle Capacity (-) \ Pressure (psi)	870	1070	1270	1470	1670	1870	2070	2270	2470	2670	2900
30	19.8	21.9	23.9	25.7	27.4	29	30.5	32	33.3	34.7	36.1
35	23.1	25.6	27.9	30	32	33.8	35.6	37.3	38.9	40.4	42.1
40	26.4	29.3	31.9	34.3	36.6	38.7	40.7	42.6	44.5	46.2	48.2
45	29.7	32.9	35.9	38.6	41.1	43.5	45.8	47.9	50	52	54.2
50	33	36.6	39.8	42.9	45.7	48.3	50.9	53.3	55.6	57.8	60.2
55	36.3	40.2	43.8	47.2	50.3	53.2	56	58.6	61.1	63.5	66.2
60	39.6	43.9	47.8	51.4	54.8	58	61	63.9	66.7	69.3	72.2
65	42.9	47.5	51.8	55.7	59.4	62.9	66.1	69.2	72.2	75.1	78.3
70	46.2	51.2	55.8	60	64	67.7	71.2	74.6	77.8	80.9	84.3
80	52.8	58.5	63.7	68.6	73.1	77.4	81.4	85.2	88.9	92.4	96.3
85	56.1	62.2	67.7	72.9	77.7	82.2	86.5	90.6	94.5	98.2	102.4
90	59.4	65.8	71.7	77.2	82.2	87	91.6	95.9	100	104	108.4
100	66	73.1	79.7	85.7	91.4	96.7	101.7	106.5	111.1	115.5	120.4
110	72.5	80.5	87.7	94.3	100.5	106.4	111.9	117.2	122.2	127.1	132.5
125	82.4	91.4	99.6	107.2	114.2	120.9	127.2	133.2	138.9	144.4	150.5
150	98.9	109.7	119.5	128.6	137.1	145	152.6	159.8	166.7	173.3	180.6
175	115.4	128	139.4	150	159.9	169.2	178	186.4	194.5	202.2	210.7
200	131.9	146.3	159.4	171.5	182.8	193.4	203.5	213.1	222.3	231.1	240.8

The table shows the pressure-flow relationship of a nozzle depending on the nozzle size. It gives the volume flow in (gpm) for a given nozzle size and pressure. For example, a nozzle capacity of 90 results in a volume flow of 87 gpm at 1870 psi. The definition of the nozzle capacity can be found on **page 10**.

05 Engineering



Weitere Pr.

Engineering

Small Challenges. **Big Help.**

Whether you want to focus on your core business or improve your products, we are here to help. We are happy to work closely with you to achieve the best possible results. We can adapt our nozzles and other components to your system if necessary, or supply and also assemble the entire pump-nozzle system if required. For this purpose, we maintain a broad network from component manufacturers to installers and can thus supply you with everything from a single source. With our team of flow experts, we have been able to gain a lot of experience, even in the most adverse applications. Whether aerospace applications, cryogenic applications for shock freezing with liquid nitrogen, or strong vibrations scare us just as little as the design of a cleaning nozzle.

Therefore, please do not hesitate to contact us, we are looking forward to your inquiry.

More Information

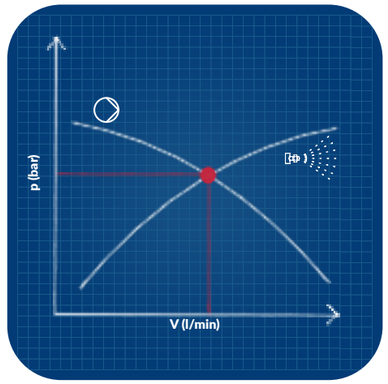
You can find more information on our homepage. You can reach this under:

https://www.fdx.de/en/services/

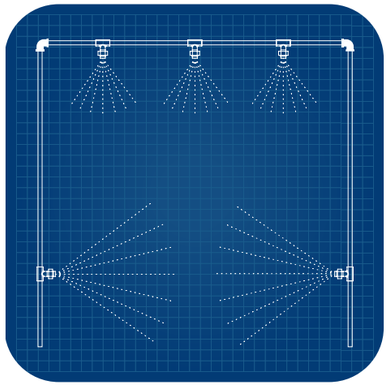
or via the QR code on the right.

01. **Component consulting**

The choice of the right components in a pump-nozzle system plays a decisive role in determining whether a system runs efficiently and effectively, i.e. whether the system is operated at the energy minimum and thus minimizes operating costs, and whether it fulfills its task at all. To ensure optimum operation, the pump, lines and nozzles must be matched to each other. Depending on the application, it may make sense to replace conventional nozzles with smaller OsciJet nozzles and use a less powerful pump without sacrificing quality. This can reduce operating costs and save water. We will be happy to help you with the design of pump-nozzle systems and, if required, we can also supply them completely from a single source. Together with our partners, we can provide you with the right pumps and other necessary components.



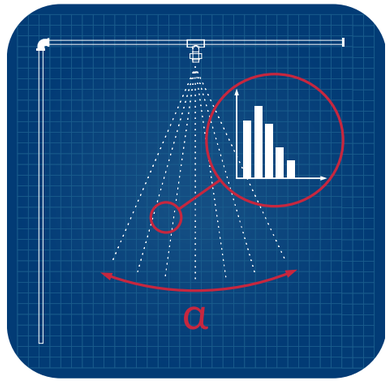
02. Nozzle Arcs/Bars



In many applications, nozzles are arranged along bars or beams to ensure optimum coverage and consistent quality. We are happy to offer you nozzle bars for your applications, and can also drive them mechanically in addition and also install them on site if necessary. Since we know the spraying characteristics of our nozzles very well, we can optimize the bars for your case to minimize operating costs.

03. Spray and Nozzle Characterization

Nozzles are found in numerous applications and usually have a major impact on the effectiveness and efficiency of the application. Therefore, the flow characteristics of a nozzle are of essential interest for many applications. The parameters pressure-volume flow ratio, jet angle and jet force are of central importance. But also the droplet size, respectively the droplet size distribution is important to know in many cases. Regardless of whether nozzles are manufactured in-house or by other nozzle manufacturers, the flow characteristics of a nozzle are subject to manufacturing tolerances, aging and wear. We have the appropriate measurement technology and experience to measure your nozzles quickly and easily. On-site measurements are also possible if necessary.



06 The Company

The Company

FDX Fluid Dynamix GmbH, based in Berlin, was founded in 2015. It emerged from the Chair of Fluid Dynamics at the TU Berlin. The company was founded with the help of the renowned EXIST research transfer program and achieved 1st place in Germany's largest business plan competition in 2015. Subsequently, the company was accepted into the Start-up Accelerator TechFounders, the BMW Start-up Garage and the Start-up Autobahn. FDX develops and sells nozzles for cleaning, cooling and mixing applications based on its unique OsciJet technology. This produces a dynamic jet without the use of moving parts, making them robust and reliable. With 15 employees, most of them highly qualified engineers, FDX has created a proprietary nozzle technology platform. In the meantime, FDX has developed a standard product range, but also can rely on a database with over 6000 desiges. The main fields of activity are high, medium and low pressure cleaning, as well as the targeted distribution of liquids. However, applications in the mixing and cooling sector are also developed at FDX. With OsciNet, the company has developed a way to check function, flow and pressure in real time, so that quality assurance is constantly possible. Since 2016, FDX has been certified according to ISO 9001:2015. Contact us! Get to know us!

Your Point Contact. **Our Specialists.**

Martin Leßmann

Industrial parts cleaning

Sales

m.lessmann@fdx.de

With his broad experience in the field of fluid mechanics, Mr. Leßmann is not only our specialist for industrial parts cleaning, but also an expert for low-pressure cleaning in general. You are always well advised with him.

Thomas Rossegger

Head of Sales

CSO

t.rossegger@fdx.de

With many years of international experience, Mr. Rossegger heads the sales department at FDX and specializes in medium pressure cleaning in the food sector. But also for all other areas he is always at your disposal.

Dr.-Ing. Jens Wintering

Car wash

CPO

j.wintering@fdx.de

Mr. Wintering is our expert for vehicle washing and cleaning in the high-pressure and medium-pressure range. But also in other cases he is actively at your disposal.

Dr.-Ing. Bernhard Bobusch

Special applications

CEO

b.bobusch@fdx.de

As managing director, Mr. Bobusch is our all-rounder. Since the company was founded, he has been involved with a wide variety of applications and can therefore advise you in all areas. If you have any questions, please feel free to contact him.

Your Way to Us. **Our Contact Details.**

Whether you want to order nozzles or have questions about a nozzle or application, feel free to contact us. Our team is at your disposal at any time.

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+49 (0)30 549 08 17-0
info@fdx.de
https://www.fdx.de
@Fluid_Dynamix

References

Clients. **References.**

After more than 12 months of continuous use, we are convinced: The OsciJet HPX-CS Pro from FDX delivers the best cleaning results with outstanding durability.

(Frank Koslitzki, Managing Director Stadiko)

FDX offers true product-ready innovation and world-class collaboration.

(Meike Arndt, Teamleader Product Management – Mobile Watering)

Caramba's wash expertise combined with FDX's high-tech nozzle technology creates sustainable solutions for vehicle washing and offers car wash operators real added value: up to 30 percent lower water consumption and a significantly improved spray pattern.

(Reiner Eckhardt, CEO Caramba Chemistry Group)

As the #1 service portal washer manufacturer in the industry, we trust FDX nozzles - because they're tough, use less water, clog less and clean more efficiently.

(Henning Benkens, Managing Director & Founder, Car-Wash-Service)

With the OsciJet MPX-CH C200 nozzles from FDX Fluid Dynamix, we achieved a clean chain and carriers without residues in our automated CIP solution with a reduced cleaning time. In the poultry processing line, these cleaning nozzles ensure a high level of food safety and hygiene, reduce cleaning time, save water and energy.

(Brian Lund, Solution & Development Manager, System Cleaners)

Impressum

Information according to § 5 TMG

FDX Fluid Dynamix GmbH
Rohrdamm 88
13629 Berlin

Represented by

Herrn Dr.-Ing. Bernhard Bobusch
Herrn Dr.-Ing. Oliver Krüger-Knoll
Herrn Dr.-Ing. Jens Wintering
Herrn Thomas Rossegger

Contact

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E info@fdx.de

Register Entry

Entry in the Commercial Register.
Register court: Local court Berlin Charlottenburg
Registration number: HRB 168427 B

Tax number

27/283/31668

Sales tax ID

Sales tax identification number according to §27 a Umsatzsteuergesetz:
DE301226356

Responsible for the content according to § 55 para. 2 RStV

Dr. Oliver Krüger-Knoll, FDX Fluid Dynamix GmbH, Rohrdamm 88, 13629 Berlin

Design

Dr. Oliver Krüger-Knoll

2023