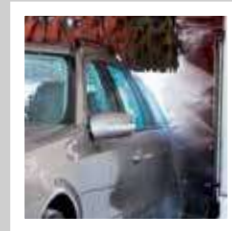
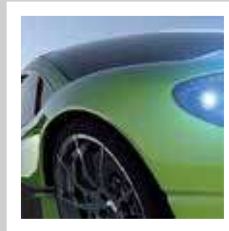


ENGINEERING
YOUR SPRAY SOLUTION



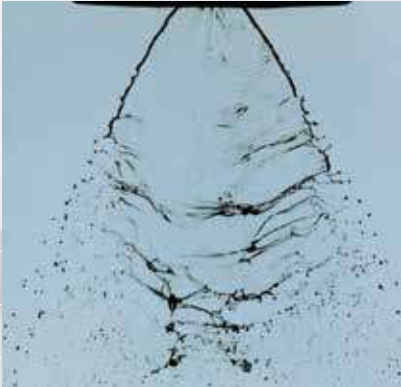
Precision Spray Nozzles for Surface Technology



Surface Technology

INNOVATIVE NOZZLE TECHNOLOGY MAKES INNOVATIVE SURFACE TECHNOLOGY POSSIBLE

B
Being successful means taking advantage of all the opportunities that the market offers.



This also includes flawless production processes. Particular importance is placed on increasing product quality and using more rational production methods.

Nozzle and spraying technology offers many different, often surprisingly effective, possibilities of performing such tasks. Lechler can support you in mastering these tasks with extraordinary potential in terms of experience, ideas and innovative technology.

When it comes to assessing a product, the quality of the surface plays a particularly important role. Experience has shown that optimum results are always achieved when nozzle technology has been perfectly tailored to the production process. This requires a lot of know-how and a wide range of suitable products. Additional knowledge and experience in surface technology applications are especially helpful here to simplify planning and provide decision making confidence.



In addition, the performance data of the individual nozzles is reliably documented by Lechler, which means that all the relevant information is readily available.



Everything but superficial

Diligence and precision are especially important to success in surface treatment processes. That's why our experts will focus intensively on your task and will bring their expertise and specialized knowledge of the industry to find the best possible result in collaboration with you. At the same time you will benefit from 130 years of experience in the specialized field of nozzle and spraying technology.



Nozzles for surface treatment

In this brochure you will find Lechler products that are specially tailored to surface technology techniques and that have already proven themselves time and again. If you can't find what you are searching for, the standard full line catalog offers an extensive range of economical and readily available nozzles. The Lechler standard catalog also offers you an extensive range of economical and readily available standard nozzles.

Please let us know more about what you require so that we can talk to you about the possibility of developing a nozzle that is specially tailored to your needs.

Lechler has become a technology leader in the specialized field of nozzle and spraying technology. This has given rise to advantages that many renowned companies (including some in surface technology) make use of. You too can rely on the practical experience of our application engineers who have proven their experience with nozzles and their knowledge of the trade, along with having developed many solutions for optimizing production processes.

Extensive know-how and excellent technical conditions allow exemplary results to be obtained time after time. Constant research and development work are your guarantee of future-proof solutions.

For detailed and clearly arranged information, visit our website at www.lechlerUSA.com

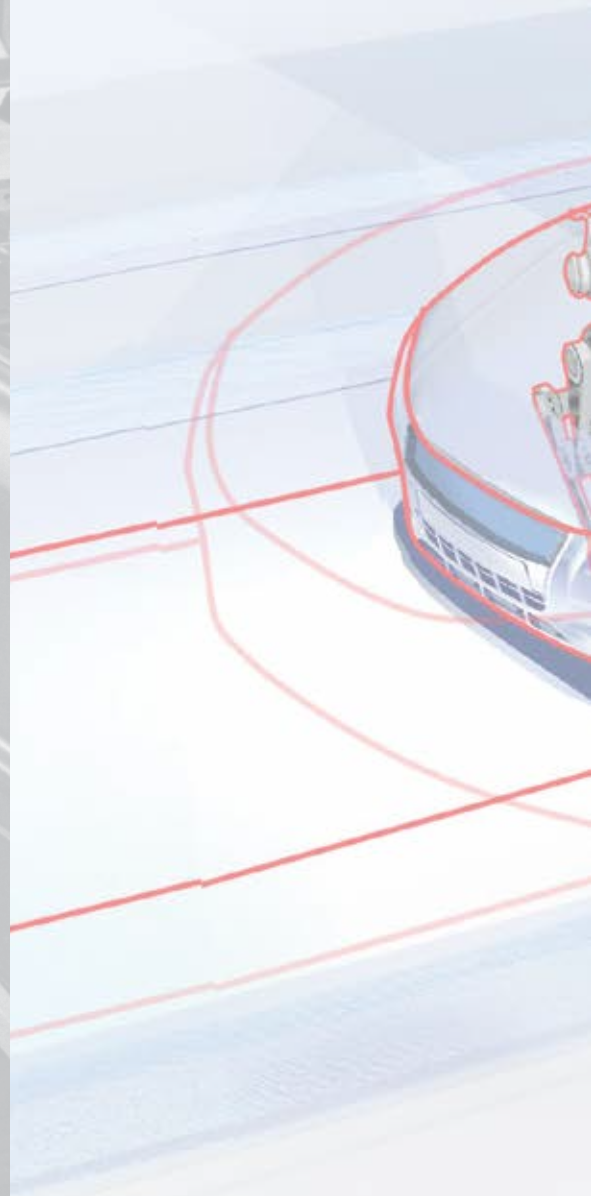


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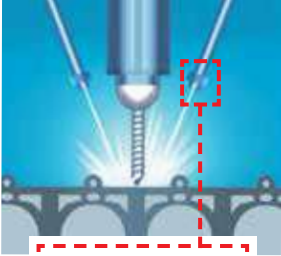
LECHLER NOZZLES ARE USED IN MANY FIELDS IN THE AUTOMOBILE INDUSTRY

Areas of use from A to Z

- A** Aquaplaning test track spraying
- B** Blowing off dust
- C** Cooling of tools, cleaning of components and parts
- D** Degreasing, dust removal
- E** Electrophoresis washing pipes
- F** Filter cleaning, fire protection, fuel injection
- G** Gas treatment
- H** High pressure deburring and cleaning
- I** Impregnation
- J** Jet cutting
- L** Leak tests (car body leak test), lubrication
- M** Machine cleaning
- N** NOx removal
- P** Phosphate treatment
- Q** Quenching
- R** Rain and fog simulation, rain curtains
- S** Salt mist tests (corrosion tests)
- T** Tank cleaning, temperature control
- U** Underbody cleaning
- W** Wet zone with demineralized water, washing between zones
- Z** Zone cleaning (paint spray lines)

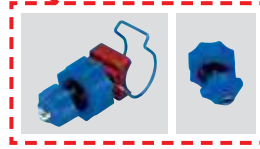


Nozzles for tool cooling, tool lubrication and chip removal



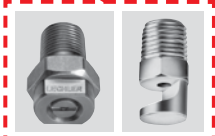
For this task it is crucial that the nozzles spray in the correct location so that the best cooling or lubrication effect is achieved. **Series 676 nozzles** (for example) provide the possibility of adjustment with the aid of a ball joint. In CNC machining centres, **tank cleaning nozzles** that clean the machine's entire interior are also used for chip removal.

Nozzles for surface pretreatment



Flat fan nozzles are typically used in many stages of automobile pre-treatment. The **MEMOSPRAY®** and **Easy-Clip** nozzle systems are particularly common.

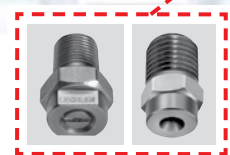
Nozzles for use in washing installations



In this application it is crucial that the nozzles spray in the correct location. Lechler offers a wide range of different **flat fan nozzles**. These also include **high-pressure nozzles** and **tongue-type nozzles**. Selecting the correct nozzle enables the cleaning result and water consumption to be balanced.

Nozzles for leak testing

Before they are delivered, cars must be checked to ensure that they are well sealed against rain and moisture. This involves spraying them from all sides using **full cone** and **flat fan nozzles**. Cars must even pass through the lowest levels of impact in order to be approved.



CLEANING SYSTEMS ARE FITTED WITH LECHLER FLAT FAN AND TONGUE-TYPE NOZZLES

Nozzles for the pre-wash

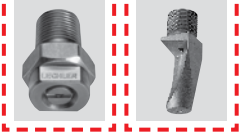
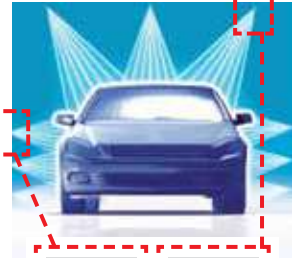
The purpose of the pre-wash is to soften the dirt. **Flat fan nozzles** or **tongue-type nozzles** with a wide spray angle and a low flow rate are preferred.



Nozzles for the main wash

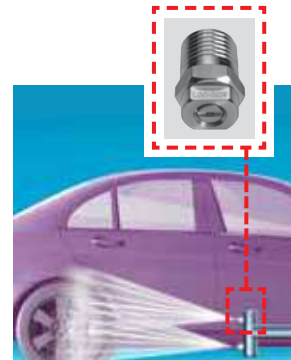
The main wash requires high-impact flat fan nozzles or tongue-type nozzles. The spray angle should be 30 to 45 degrees. Tongue-type nozzles are ideally suited for use at lower pressures because of their intense spray.

High-pressure flat fan nozzles differ from low-pressure nozzles by virtue of their hardened nozzle mouthpiece, which gives these nozzles a longer service life.



Nozzles for sill and wheel washing

The lower portion of the vehicle is where most dirt accumulates (e.g. impacted insects). A high impact is crucial to removing this type of dirt. We recommend **high-pressure nozzles** with a narrow spray angle.



Nozzles for applying wax

Wax should be applied as evenly as possible. This requires a defined nozzle arrangement. For this we recommend our **series 652 in conjunction with a retaining nut and eye-let clamp**. Manifolds fitted with this series distribute the wax very evenly.



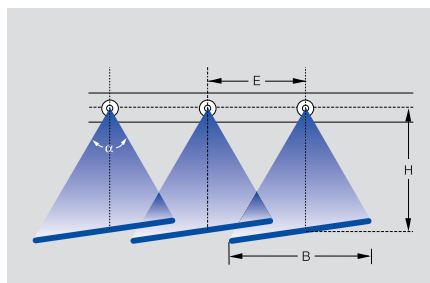
Nozzles for rinsing

Rinsing is the last stage before drying. This requires small droplets that run off the vehicle quickly. **Flat fan nozzles** with a very low flow rate are used in most cases. The nozzles are easy to align in conjunction with a **bayonet cap** and a **ball joint**.



Arrangement of low-pressure flat fan nozzles

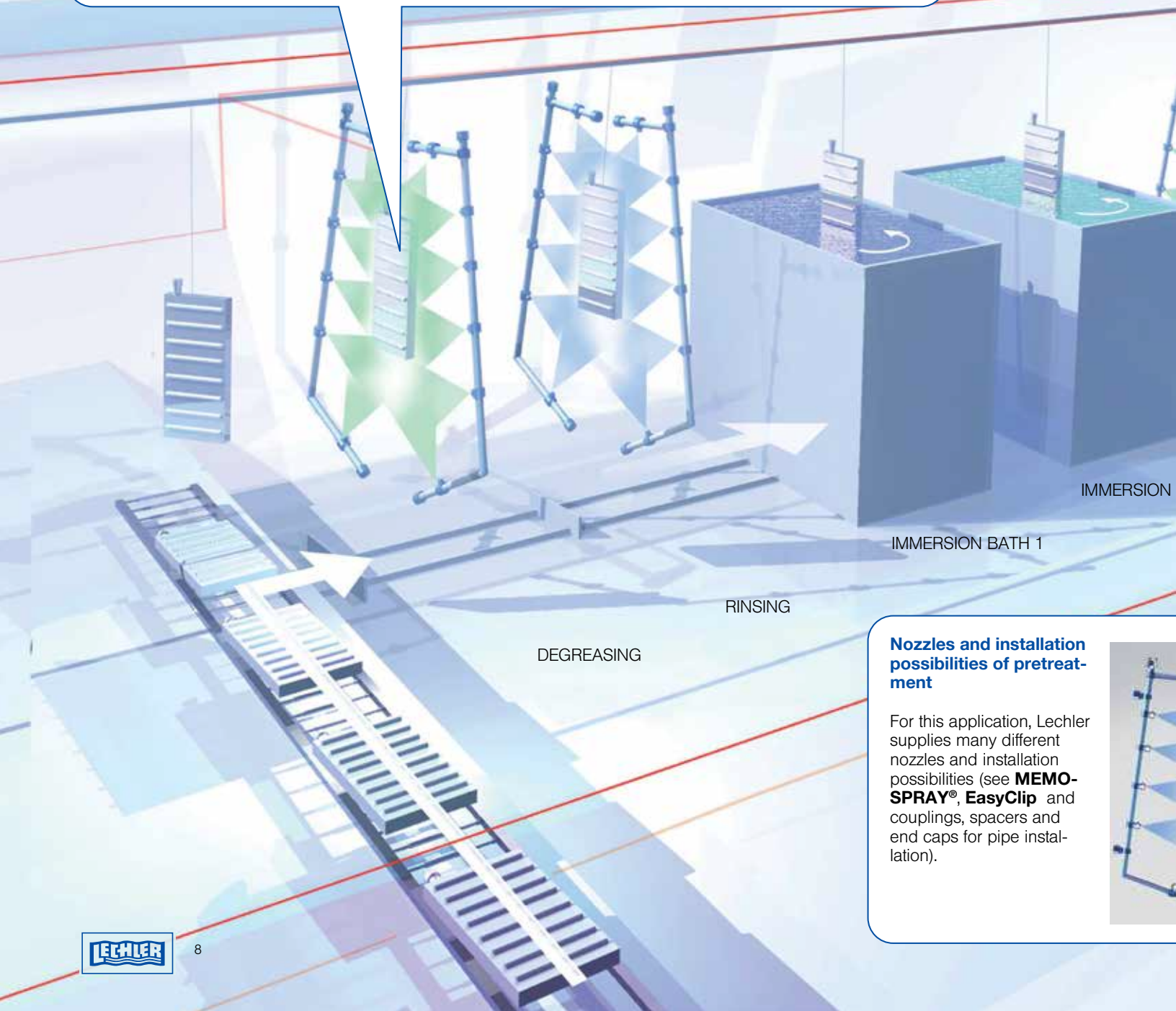
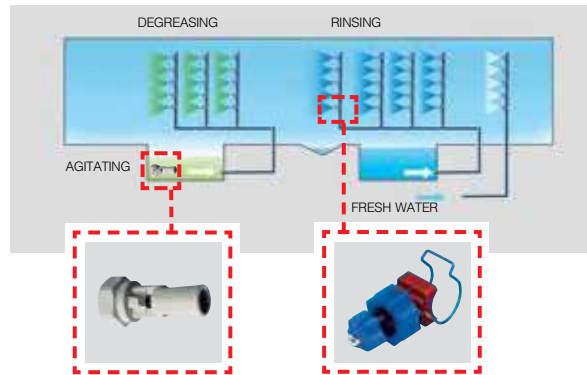
Lechler **flat fan nozzles** provide a consistent, parabolic coverage over the impact area. For this purpose, the spray widths B ought to overlap each other by $1/3$ to $1/4$. To avoid interferences of the sprays, the nozzle orifices must be offset 5° - 15° to the pipe's axis.



LECHLER NOZZLES ARE AN INTEGRAL COMPONENT IN PRETREATMENT AND PAINTING SYSTEMS

Nozzles for water jet cleaning

In pretreatment and painting systems, water jet cleaning is often employed as an automated process. **Flat fan nozzles and tongue-type nozzles with eyelet clamps** are the main variants used for this. The components pass through several process steps in which they are treated with various fluids. These include, for example, aqueous alkaline solutions and deionized water. **Eductor nozzles** are also used underwater, the purpose of which is to prevent sedimentation.



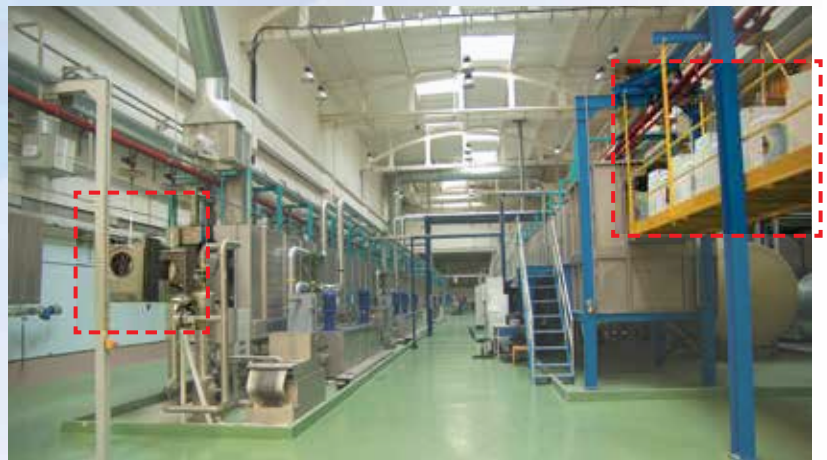
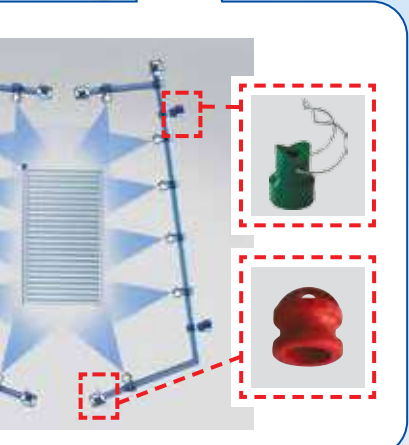
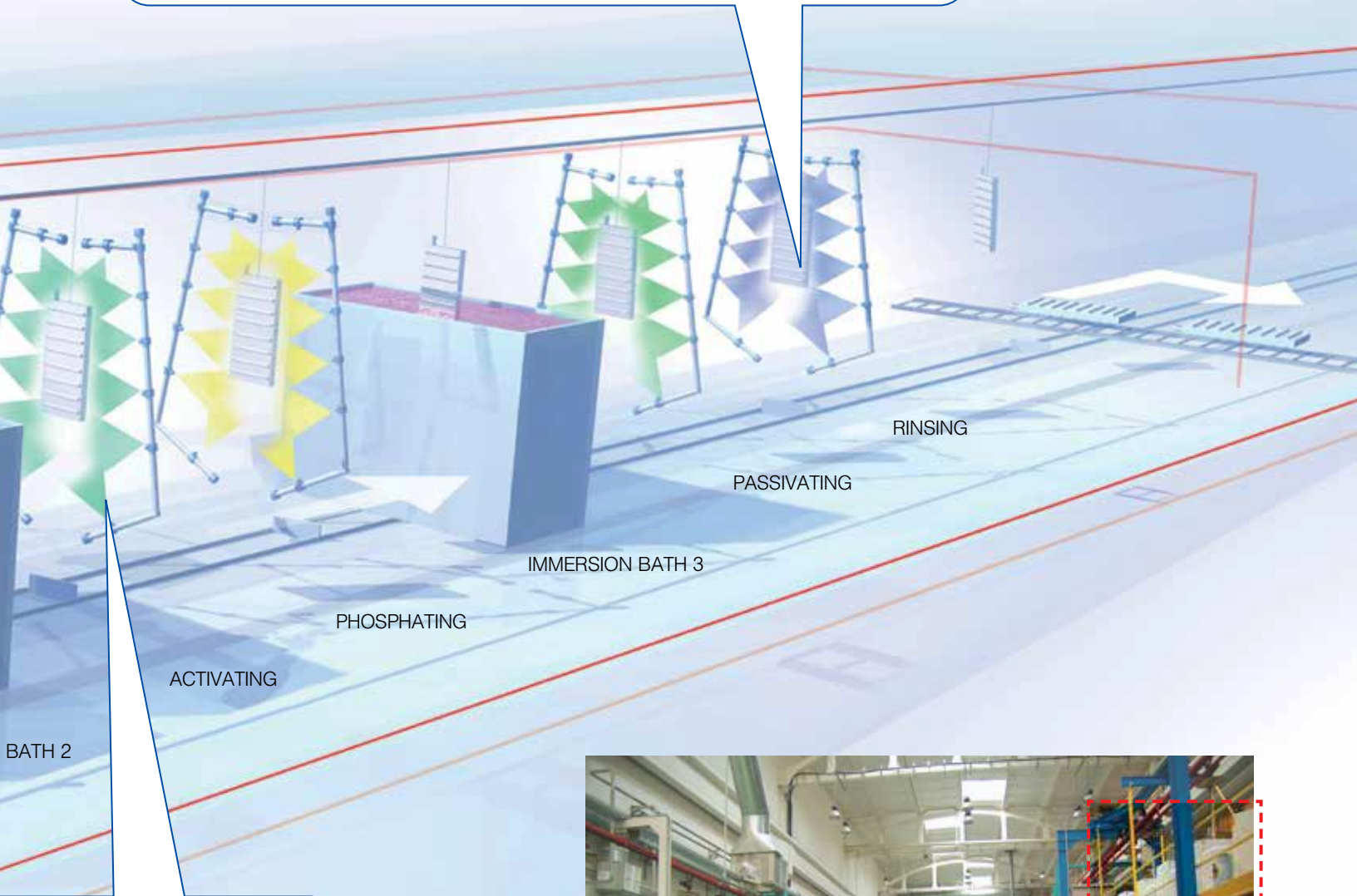
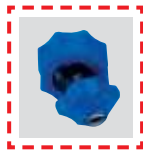
Nozzles and installation possibilities of pretreatment

For this application, Lechler supplies many different nozzles and installation possibilities (see **MEMO-SPRAY®**, **EasyClip** and couplings, spacers and end caps for pipe installation).



Nozzles for the rinsing zone

At the end of a painting line, the components pass through a rinsing zone. There, surplus paint particles that are still mechanically attached are washed off. This is done according to the cascade principle, i.e. in several stages with increasingly clean rinsing agent until deionized water is used.


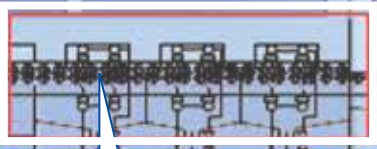
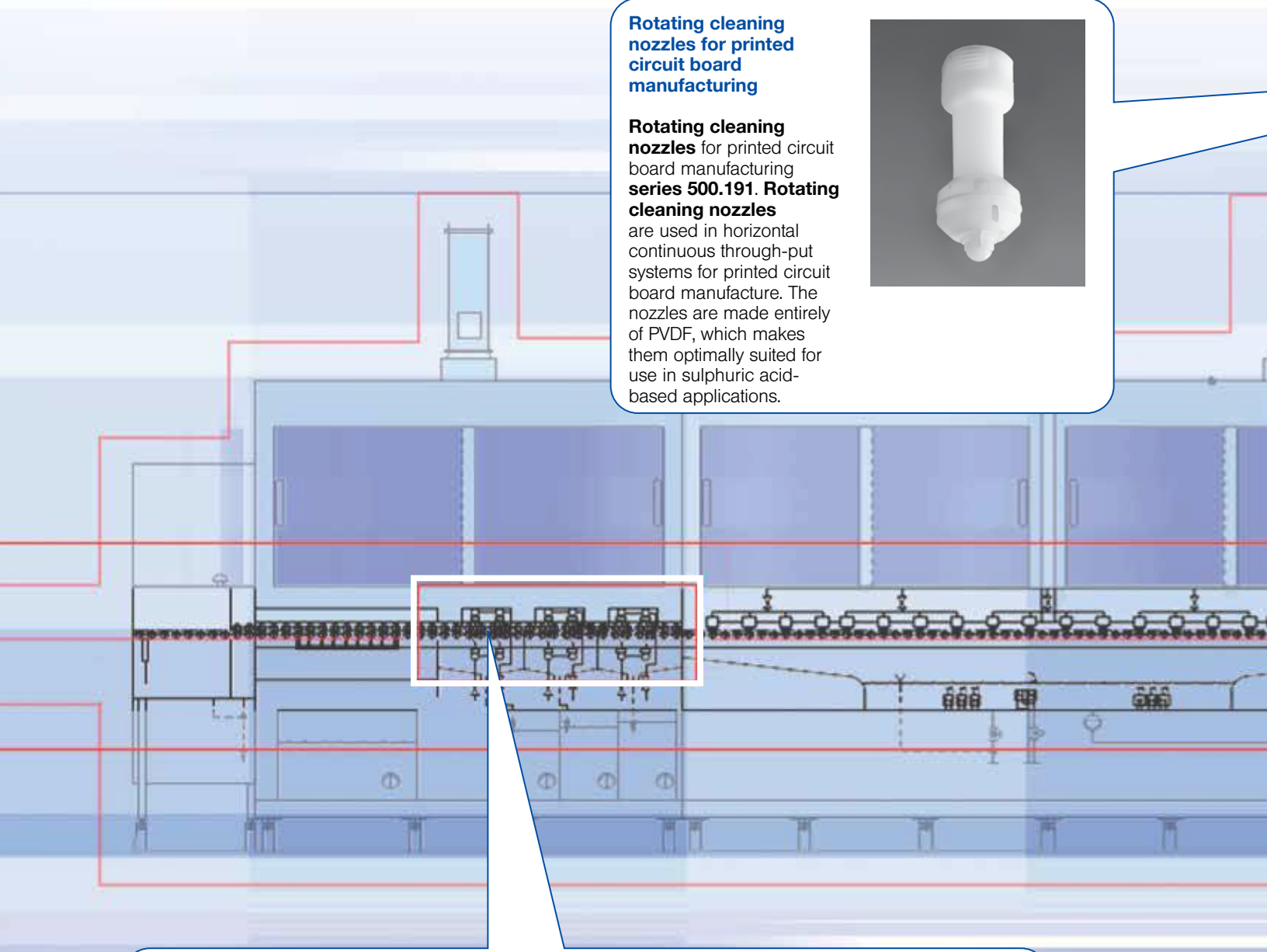


Example of a painting line for washing machine housings. On the left the component before painting, on the right the painting housing exits.

LECHLER NOZZLES ARE USED IN MANY FIELDS IN THE PHOTOVOLTAIC AND PRINTED CIRCUIT BOARDS INDUSTRY

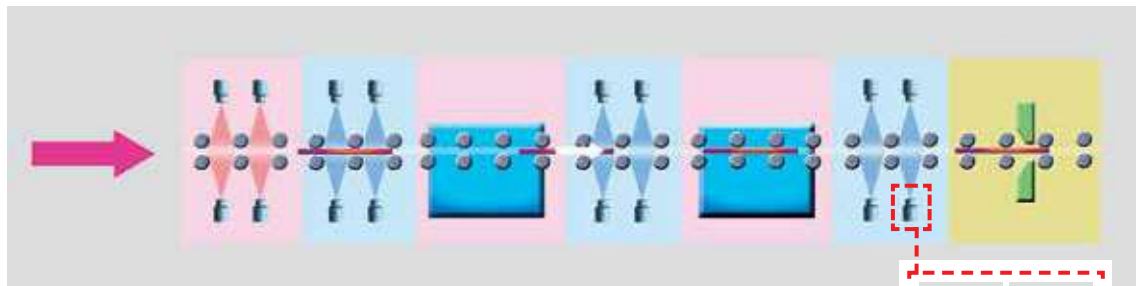

Rotating cleaning nozzles for printed circuit board manufacturing

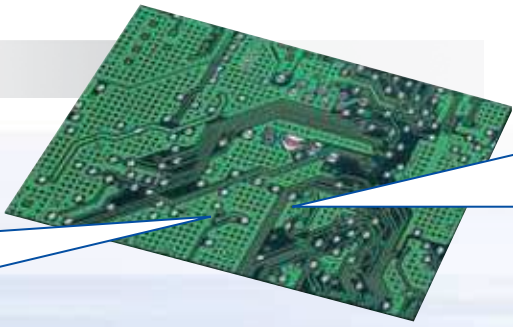
Rotating cleaning nozzles for printed circuit board manufacturing **series 500.191. Rotating cleaning nozzles** are used in horizontal continuous through-put systems for printed circuit board manufacture. The nozzles are made entirely of PVDF, which makes them optimally suited for use in sulphuric acid-based applications.

Nozzles for alkaline texturing

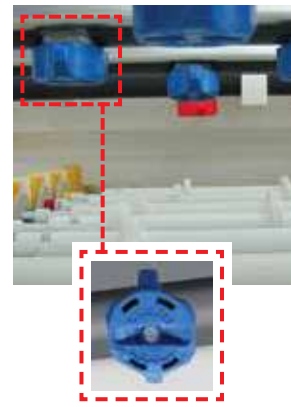
Flat fan nozzles in several series-connected modules are used in this process. Nozzles made of PVDF are preferred, because they are resistant to the chemicals used.



Circuit board manufacturing

Developing, etching, stripping. In a typical inner layer line for manufacturing circuit boards, the resist is developed in the developer, the bare copper is sprayed with an acidic etching solution in the etching module and is removed down to the base material, and the resist is stripped off by using an alkaline solution. This involves the use of many types of nozzles that

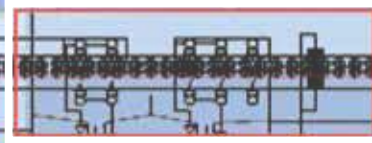
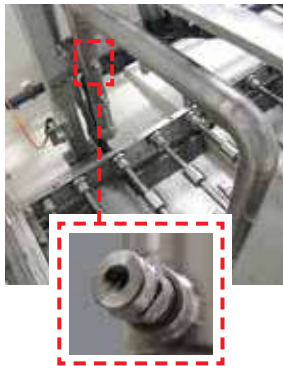


are already familiar, such as **series 646 bayonet quick-locking system**.



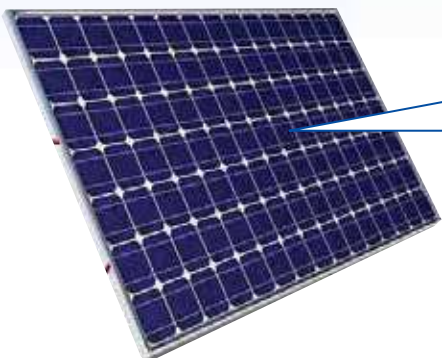
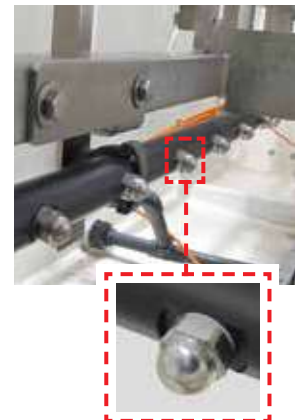
Wafer cleaning

After the sawing process, the wafers are gently cleaned with **full cone nozzles**. The cleaning medium is sprayed onto the individual wafers, thereby achieving a homogeneous cleaning result across the entire surface.



Nozzles for wafer moistening

After the sawing process, the wafers are moistened with hollow cone nozzles. **Hollow cone nozzles** produce a fine spray mist that settles on the wafers. This ensures that no impurities dry onto the wafer, thereby also ensuring an efficient wafer production process.



PART CLEANING WITH LECHLER FLAT FAN NOZZLES AND TONGUE-TYPE NOZZLES

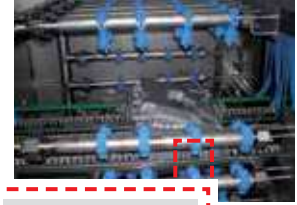
Cleaning engine pistons

Dual-lane continuous cyclic cleaning system for cleaning aluminium engine pistons. Increasing volumes require efficient and reliable nozzles. **Series 612 nozzles** can be used if only a small installation space is available at the same time.



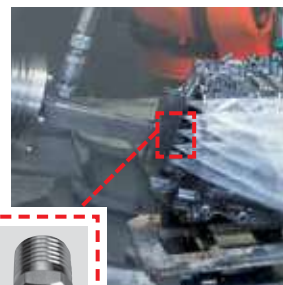
Oil sump cleaning

Continuous cleaning system for aluminium oil sumps, four-sided spraying. **Simple installation and quick replacement of nozzles** enable the system's maintenance costs to be reduced.



Deburring

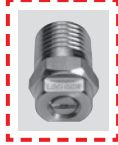
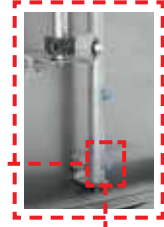
High-pressure water jet-deburring aided by a robot. A notable feature of **flat jet nozzles** is a very shallow jet depth, giving them a particularly powerful cleaning effect.



PROFESSIONAL RINSING TECHNOLOGY WITH LECHLER NOZZLES

Cleaning oven racks

Washing system for cleaning oven racks used in bakeries, for example. **Series 612 PVDF flat fan high pressure nozzles** and **series 650 stainless steel flat fan nozzles with a retaining nut and eyelet clamp** are used to spray the cleaner onto the racks in foam form. The nozzles are used for rinsing objects in a downstream process.



Conveyor belt dishwashers

Lechler series 612 PVDF flat fan high pressure nozzles are used for fresh-water rinsing in conveyor belt dishwashers in order to remove any remaining suds from the objects being washed. This requires homogenous water distribution in order to achieve an optimum and constant cleaning result.



WHAT YOU SHOULD KEEP IN MIND WHEN PLANNING

The most important criteria that must be taken into account when selecting nozzles are listed below.

① Impact

The impact force of a liquid jet on a surface plays an important role in cleaning technology. The ratio of the impact force (F) to the impact surface (A) is referred to as the Impact (I).

$$I = \frac{\text{Impact force}}{\text{Impact surface}} = \frac{F}{A} \left[\frac{\text{LB}}{\text{in}^2} \right]$$

It can be controlled via the following parameters:

Impact surface and spray shape

The impact surface is the area where the droplet hits. The smaller the impact surface, the greater the impact values. Nozzles with high impact are, for example, solid stream nozzles and flat fan nozzles with a narrow spray angle.

Pressure

The impact increases linearly with the connected pressure. If the pressure is doubled while maintaining the same flow rate, the impact is also doubled.

Flow rate

Increasing the flow rate by using a larger nozzle increases the impact, assuming that the other parameters (spray angle, pressure and medium) remain the same.

Nozzle selection criteria:

① Impact

- Impact surface and spray shape
- Pressure
- Flow rate
- Spraying distance
- Spray depth

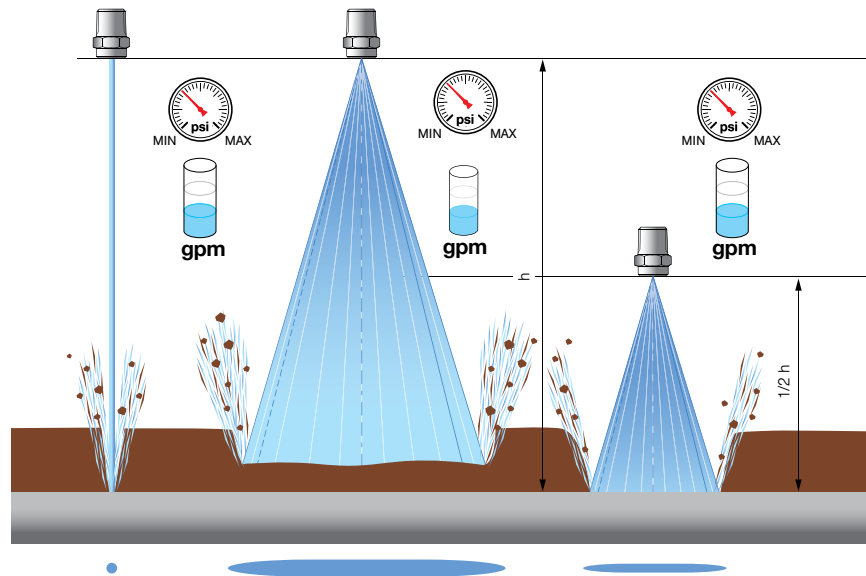
② Spray angle and spraying behavior

③ Liquid distribution

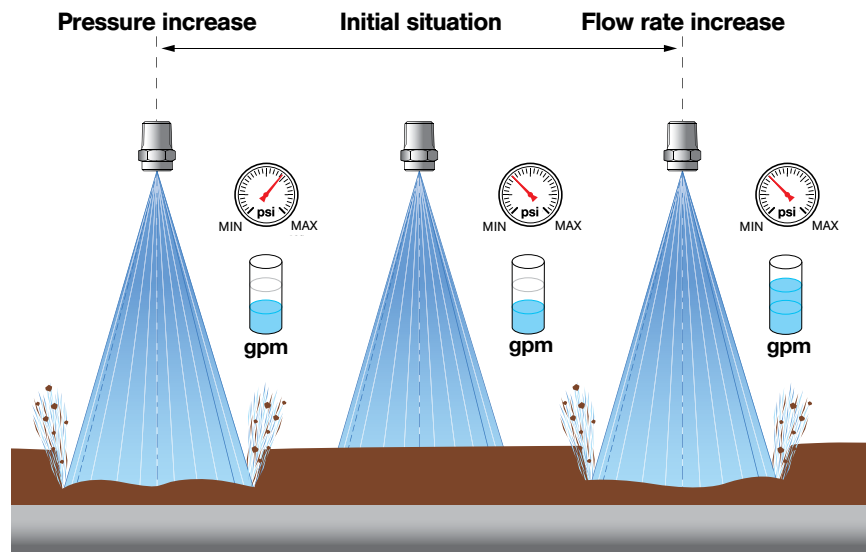
④ Droplet sizes

⑤ Temperature behavior of nozzle materials

⑥ Material and wear

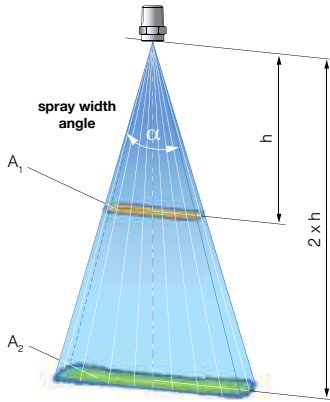


Comparison of the cleaning result of three nozzles with identical pressure and flow rate.



Comparison of the cleaning result of three nozzles with pressure or flow rate increase.

Spraying distance (vertical distance to the nozzle)



With a flat fan nozzle, doubling the distance would ideally result in a quadrupling of the surface area sprayed.

In theory, for atomizing nozzles, as the spray distance from the object being sprayed increases, the sprayed surface area will also increase while the spray impact will decrease.

The spray angle and spray depth ensure that the sprayed surface area becomes larger as the spraying distance increases.

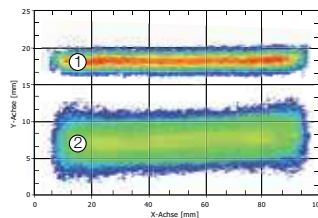
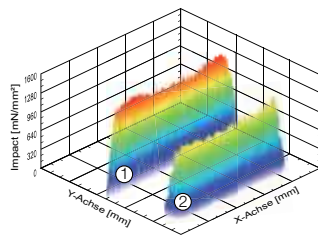
Theoretically, the following applies to flat fan nozzles: If the spraying distance is doubled, the sprayed surface area quadruples. Consequently, the impact decreases four-fold.

Distance	Area	Impact
h	A	I
1.5 x h	2.25 x A	I / 2.25
2 x h	4 x A	I / 4
3 x h	9 x A	I / 9
4 x h	16 x A	I / 16

Spray depth

When flat fan nozzles are used, the impact that can be achieved depends greatly on the quality of the spray. For example, using special spray geometries (Lechler high-pressure flat fan nozzles) or a high flow rate, a shallower spray depth can be obtained.

Assuming that the other parameters (pressure, flow rate, spray angle and medium) remain the same, a shallower spray results in a higher impact.



Comparison of the spray depth of a high-pressure flat fan nozzle ① with a standard flat fan nozzle ②

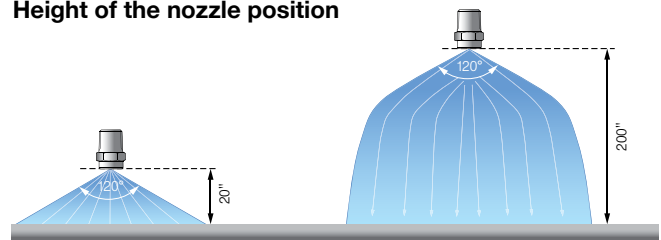
② Spray angle, spraying distance, spraying behavior

Depending on the application, we supply single-fluid nozzles with spray angles from 0° (solid stream nozzles) to 360° (tank-cleaning nozzles). Gravity and air flows influence the spray pattern.

Depending on the version, Lechler single-fluid nozzles can spray the fluid as a hollow cone, solid stream or flat fan. The solid stream nozzle does

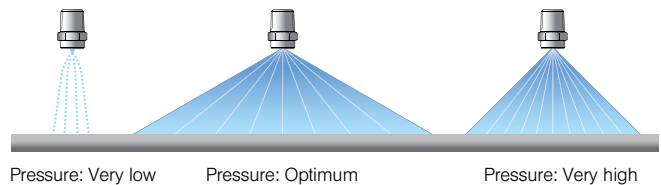
not spray, but rather produces a closed spray pattern that hits at a concentrated point. The droplets only begin to break up after some distance. Twin-fluid nozzles have a narrow spray angle of approximately 20° due to the high speed at which the compressible medium exits. However, as the distance from the nozzle increases, the spray pattern becomes increasingly less sharply delineated. Twin-fluid nozzles normally produce full cone or flat fan spray patterns.

Height of the nozzle position

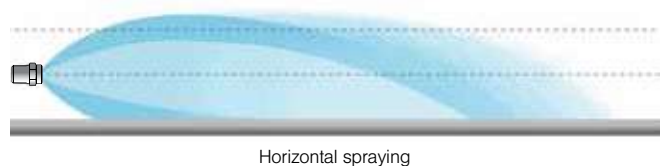
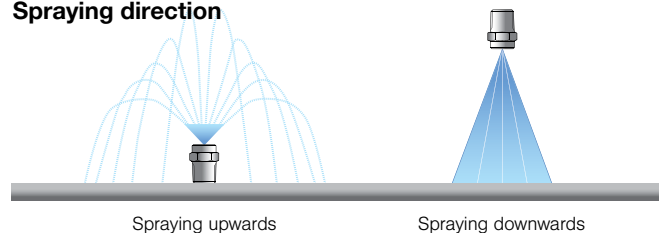


The diagram above illustrates how height influences the spray pattern

Changing the nozzle pressure



Spraying direction

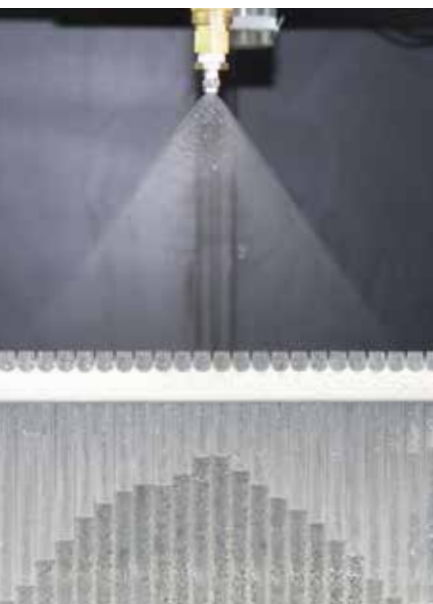


Spray patterns under different working conditions and installations

WHAT YOU SHOULD KEEP IN MIND WHEN PLANNING

③ Liquid distribution

An even liquid distribution is crucial to processes such as coating. This requires several nozzles to be arranged next to each other. This is because a single nozzle produces a parabolic liquid distribution while several nozzles arranged next to each other allow an almost even distribution via overlapping.



Liquid distribution measurement

Measuring the distribution

The liquid distribution in a plane can be determined with the aid of a combination of Plexiglas cylinders. The filling level of the individual cylinders is determined automatically. This measuring process can also record the liquid distribution of a nozzle over a moving measuring plane. This enables conveyor belt spraying to be simulated, for example.

④ Droplet sizes

Lechler twin-fluid nozzles can produce very fine to extremely fine droplets. The size depends mainly on the flow rate ratio of the compressible medium used (m^3/h) to the atomized fluid (l/min): The greater the ratio, the finer the atomization. In the case of single-fluid nozzles however, the decisive factors are pressure, nozzle type and flow rate across the droplet spectrum. Increasing pressure results in finer atomization, but mostly only up to a certain level.



Droplet size measurement

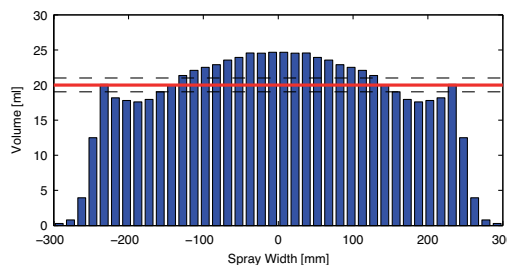
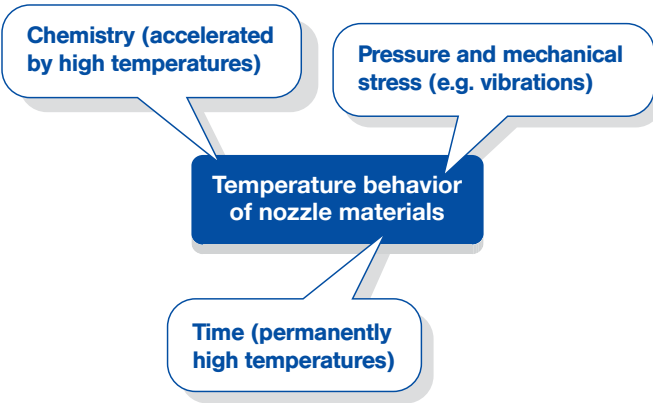
Lechler hollow cone nozzles produce very fine to fine droplets at the same pressure and flow rate. Full cone nozzles produce slightly coarser droplet spectrums, and finally flat fan nozzles have the coarsest droplet spectrum.

The following generally applies: Within a series and at a given pressure, nozzles with a lower flow rate produce finer droplet spectrums than nozzles with a higher flow rate.

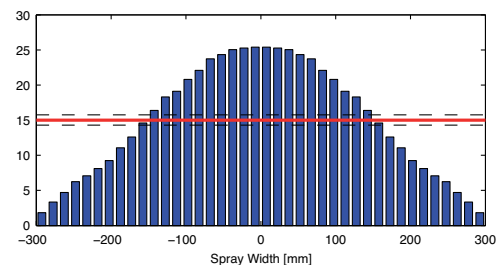
⑤ Temperature behavior of nozzle materials

Applications with temperatures up to 284°F are very common. These include, for example, most cleaning applications and sterilization processes. Applications with higher temperatures are rare, and applications at very low temperatures are even rarer. The general temperature information from material data sheets must always be scrutinized for every single case of nozzle use. Pressure, mechanical stress type, chemistry and time are decisive factors for the suitability of a nozzle material at increased temperatures. Chemical processes can be more aggressive at high temperatures.

A material may be able to withstand them if this temperature occurs for a very short period only. In all materials, high temperatures result in reduced strength values. The mechanical stress type must also be taken into account in high-pressure applications in particular. In addition, vibrations in the system can cause premature failure.



Liquid distribution of a Lechler high-pressure flat fan nozzle



Liquid distribution of a Lechler standard flat fan nozzle

⑥ Material and wear

Nozzle wear depends greatly on the conditions of use and the nozzle material. Normally, the nozzle's fluid discharge opening wears as a result of material abrasion. The following conditions of use can speed up wear:

- Operating the nozzle above the recommended pressure range
- Solids in the fluid and also hard particles
- The use of chemically aggressive substances (see figure)

The nozzle body can also wear from the outside if the nozzle is used in a harmful environment (corrosive gases, radiation, temperature).

The diagram below shows the factors that influence nozzle wear.

Signs of nozzle wear

Nozzle wear becomes apparent from a noticeable increase in flow rate. The cause of this is the enlarged cross section of the fluid opening that results from material abrasion. This means that if a pressure is permanently set, more fluid is discharged than originally intended. The result of this is both increased water consumption and high waste water disposal costs. Fig. 1 shows an example of a heavily corroded spray ball.

Material wear

In most cases, excessive wear can be counteracted by selecting a different material. One of the most common cases is the atomization of a liquid with a solid component. Fluids with a large number of particles can cause significant wear if the particles have a greater hardness than the nozzle material (Fig. 2). The table shows different materials and their average Vickers hardness. The values are based on estimate.

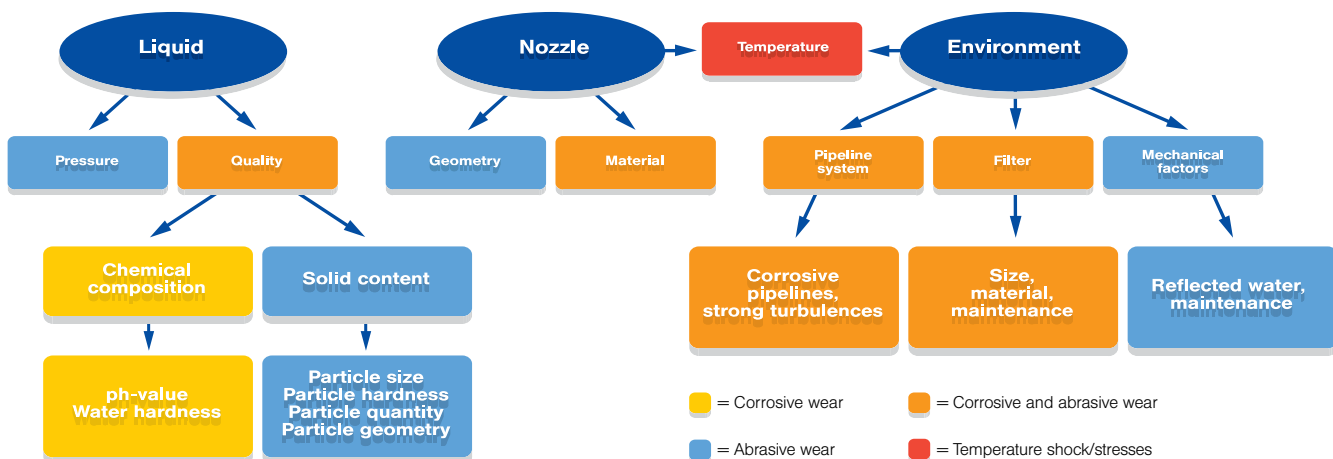


Fig. 1: Chemical corrosion of a spray ball



Fig. 2: Wear of a full cone nozzle

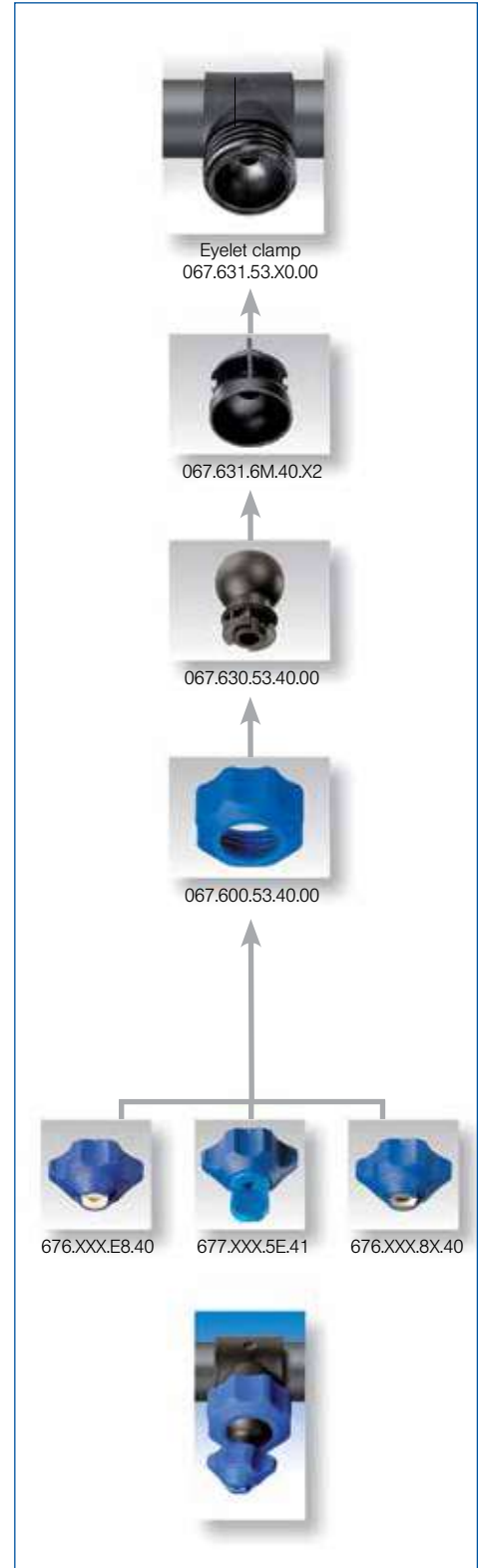
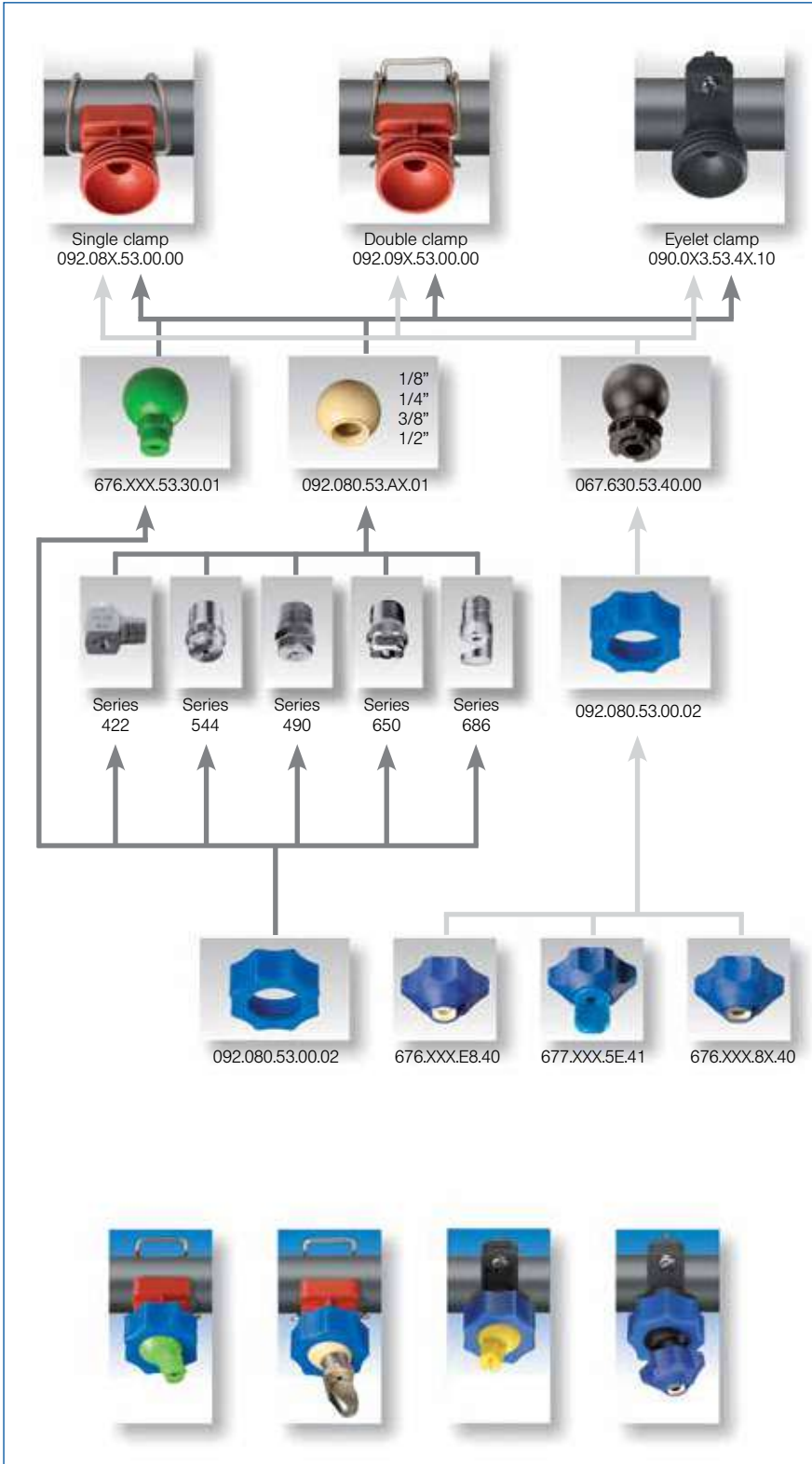
Nozzle material	Vickers hardness (HV)
Aluminium	~ 80
Brass	80 – 150
Titanium (Grade 1 to 4)	125 – 210
Hastelloy®	200 – 250
Stainless steel	220 – 270
Stainless steel (hardened)	390 – 690
Carbide	1000 – 2300
Ceramic	1500 – 2700
Sapphire / ruby	~ 2300



Factors that influence nozzle wear.



MEMO SPRAY® / Easy-Clip combination

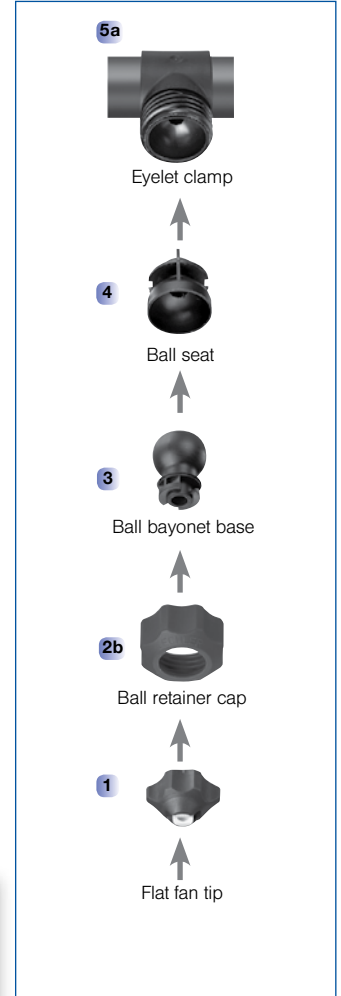
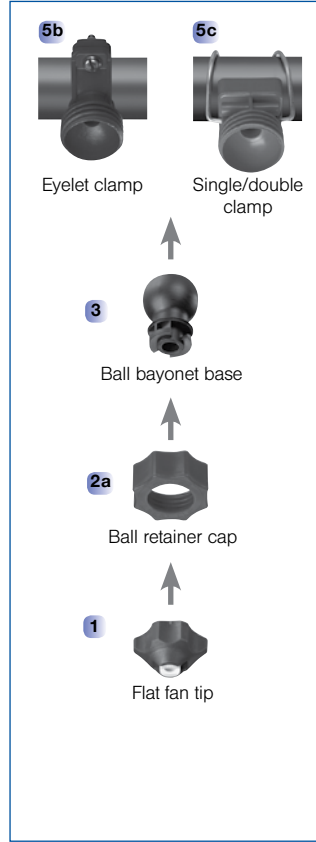
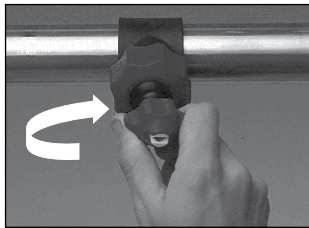
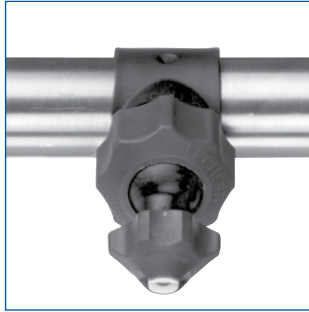




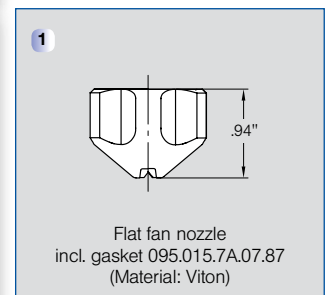
Special pressure-resistant pipe connector, which maintains the adjusted spray direction using the "Memory Method." Easy assembly and maintenance without the need for special tools.

Application:

- Degreasing
- Phosphating in surface treatment
- Cleaning



Description	Spray angle	Ordering no.				Orifice diameter	Flow Rate (Gallons Per Minute)							Weight (lb.)				
		Material no.					15 psi	20 psi	2 bar	30 psi	40 psi	60 psi	70 psi	PP/ 303 SS 8F	PP/ 316 L 8R	PP/Ceramic E8	PP 53	
		Housing: PP Insert: 303 SS 8F	Housing: PP Insert: 316 L 8R	Housing: PP Insert: ceramic E8	Polypropylene (PP) 53													
1 Flat fan tip	30°	676. 642. xx. 40	○	○	-	-	.045	.76	.88	4.0	1.1	1.2	1.5	1.6	.03	.03	-	-
		676. 722. xx. 40	○	○	-	-	.059	1.2	1.4	6.3	1.7	2.0	2.4	2.6	.03	.03	-	-
		676. 762. xx. 40	○	○	-	-	.065	1.5	1.8	8.0	2.2	2.5	3.0	3.3	.03	.03	-	-
		676. 802. xx. 40	○	○	-	-	.073	1.9	2.2	10.0	2.7	3.1	3.8	4.1	.03	.03	-	-
		676. 842. xx. 40	○	○	-	-	.085	2.4	2.7	12.5	3.4	3.9	4.8	5.1	.03	.03	-	-
		676. 882. xx. 40	○	○	-	-	.096	3.0	3.5	16.0	4.3	5.0	6.1	6.6	.03	.03	-	-
		676. 922. xx. 40	○	○	-	-	.116	3.8	4.4	20.0	5.4	6.2	7.6	8.2	.03	.03	-	-
		676. 962. xx. 40	○	○	-	-	.119	4.8	5.5	25.0	6.7	7.8	9.5	10.3	.03	.03	-	-
677. 002. xx. 40	○	-	-	-	.133	6.0	6.9	31.5	8.5	9.8	12.0	12.9	.03	-	-	-		
1 Flat fan tip	60°	676. 644. xx. 40	○	○	-	-	.045	.76	.88	4.0	1.1	1.2	1.5	1.6	.03	.03	-	-
		676. 724. xx. 40	○	○	-	-	.059	1.2	1.4	6.3	1.7	2.0	2.4	2.6	.03	.03	-	-
		676. 764. xx. 40	○	○	-	-	.065	1.5	1.8	8.0	2.2	2.5	3.0	3.3	.03	.03	-	-
		676. 804. xx. 40	○	○	-	-	.073	1.9	2.2	10.0	2.7	3.1	3.8	4.1	.03	.03	-	-
		676. 844. xx. 40	○	○	-	-	.085	2.4	2.7	13.0	3.4	3.9	4.8	5.1	.03	.03	-	-
		676. 884. xx. 40	○	○	-	-	.096	3.0	3.5	16.0	4.3	5.0	6.1	6.6	.03	.03	.02	.02
		676. 924. xx. 40	○	○	-	-	.116	3.8	4.4	20.0	5.4	6.2	7.6	8.2	.03	.03	.02	.02
		676. 964. xx. 40	○	○	-	-	.119	4.8	5.5	25.0	6.7	7.8	9.5	10.3	.03	.03	.02	.02
		677. 004. xx. 40	○	○	-	-	.133	6.0	6.9	31.5	8.5	9.8	12.0	12.9	.03	.03	.02	.02
		677. 044. xx. 40	○	○	-	-	.155	7.6	8.8	40.0	10.8	12.4	15.2	16.4	.03	.03	-	-
		677. 084. xx. 40	○	○	-	-	.175	9.5	11.0	50.0	13.4	15.5	19.0	20.5	.03	.03	-	-



Continued on next page.

Conversion formula for the above series: $V_2 = V_1 \sqrt{\frac{P_2}{P_1}}$

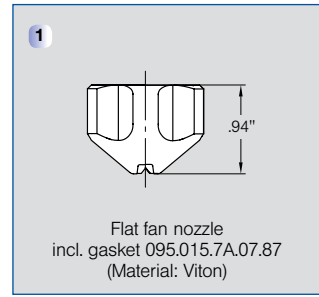


Nozzle systems for surface treatment

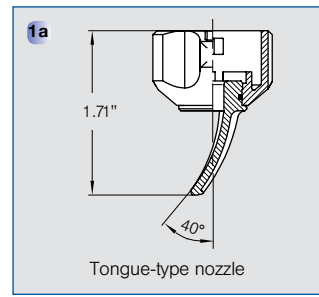
MEMO SPRAY®/Easy-Clip



Description	Spray angle	Ordering no.				Orifice diameter	Flow Rate (Gallons Per Minute)							Weight (lb.)				
		Material no.					15 psi	20 psi	liters per minute	2 bar	30 psi	40 psi	60 psi	70 psi	PP/ 303 SS	PP/ 316 L	PP/Ceramic	PP
		8F	8R	E8	53													
1 Flat fan tip	90°	676. 646. xx. 40	○	○	-	-	.045	.76	.88	4.0	1.1	1.2	1.5	1.6	.03	.03	-	-
		676. 726. xx. 40	○	○	-	-	.059	1.2	1.4	6.3	1.7	2.0	2.4	2.6	.03	.03	-	-
		676. 766. xx. 40	○	○	-	-	.065	1.5	1.8	8.0	2.2	2.5	3.0	3.3	.03	.03	-	-
		676. 806. xx. 40	○	○	-	-	.073	1.9	2.2	10.0	2.7	3.1	3.8	4.1	.03	.03	-	-
		676. 846. xx. 40	○	○	-	-	.085	2.4	2.7	12.5	3.4	3.9	4.8	5.1	.03	.03	-	-
		676. 886. xx. 40	○	○	-	-	.096	3.0	3.5	16.0	4.3	5.0	6.1	6.6	.03	.03	-	-
		676. 926. xx. 40	○	○	-	-	.116	3.8	4.4	20.0	5.4	6.2	7.6	8.2	.03	.03	-	-
676. 966. xx. 40	○	○	-	-	.119	4.8	5.5	25.0	6.7	7.8	9.5	10.3	.03	.03	-	-		
1 Flat fan tip	120°	676. 647. xx. 40	○	○	-	-	.045	.76	.88	4.0	1.1	1.2	1.5	1.6	.03	.03	-	-
		676. 727. xx. 40	○	○	-	-	.059	1.2	1.4	6.3	1.7	2.0	2.4	2.6	.03	.03	-	-
		676. 767. xx. 40	○	○	-	-	.065	1.5	1.8	8.0	2.2	2.5	3.0	3.3	.03	.03	-	-
		676. 807. xx. 40	○	○	-	-	.073	1.9	2.2	10.0	2.7	3.1	3.8	4.1	.03	.03	-	-
		676. 847. xx. 40	○	○	-	-	.085	2.4	2.7	12.5	3.4	3.9	4.8	5.1	.03	.03	-	-
		676. 887. xx. 40	○	○	-	-	.096	3.0	3.5	16.0	4.3	5.0	6.1	6.6	.03	.03	-	-
		676. 927. xx. 40	○	○	-	-	.116	3.8	4.4	20.0	5.4	6.2	7.6	8.2	.03	.03	-	-



Description	Spray angle	Ordering no.				Orifice diameter	Flow Rate (Gallons Per Minute)							Weight (lb.)				
		Material no.					15 psi	20 psi	liters per minute	2 bar	30 psi	40 psi	60 psi	70 psi	PP/ 303 SS	PP/ 316 L	PP/Ceramic	PP
		8F	8R	E8	53													
1a Tongue-type nozzle	70°	677. 005. xx. 41	-	○	○	-	.169	6.0	6.9	32	8.5	9.8	12.0	12.9	-	.05	.02	-



Example **Type** + **Material no.** = **Ordering no.**
for Ordering: 676. 646. xx. 40 + 8F = **676. 646. 8F. 40**



Nozzle systems for surface treatment

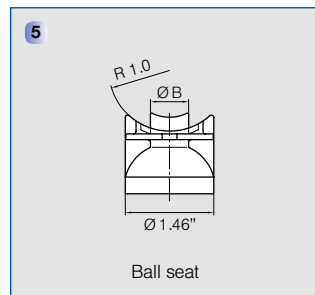
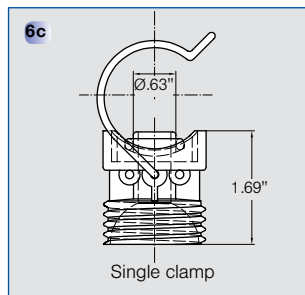
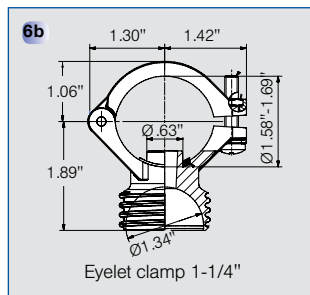
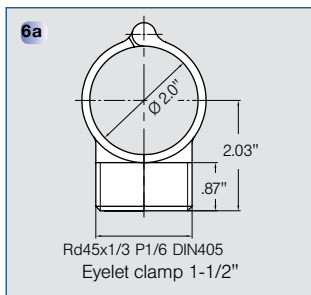
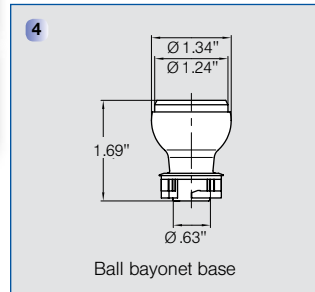
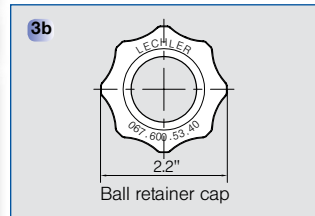
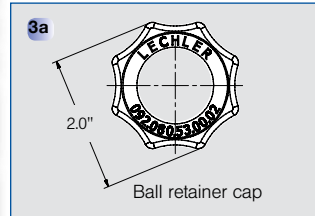
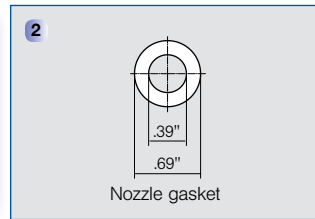
MEMO SPRAY®/Easy-Clip



Description	Ordering no.	Material no.				Drill Size	For pipe-Ø
		Polypropylene (PP)	PP reinforced				
		53	6M				
2 Ball retainer cap	092.080.xx.00.02	○	-				
3a Ball retainer cap	067.600.xx.40	○	-				
3b Ball bayonet base	067.630.xx.40	○	-				
4 Ball seat for ball retainer cap no.	067.631.xx.40.22	-	○		.562"	1-1/4"	
5	067.631.xx.40.02	-	○		.625"	1-1/4"	
	067.631.xx.40.00.0	067.631.xx.40.12	-	○	.781"	1-1/4"	
	067.631.xx.50.22	-	○		.562"	1-1/2"	
	067.631.xx.50.02	-	○		.625"	1-1/2"	
	067.631.xx.50.00.0	067.631.xx.50.12	-	○	.781"	1-1/2"	
6a Eyelet clamp	067.631.xx.40.00	○	-		-	1-1/4"	
	067.631.xx.50.00	○	-		-	1-1/2"	
6b Eyelet clamp	090.023.xx.44.10	○	-		.562"	1"	
	090.023.xx.43.10	○	-		.625"	1"	
	090.033.xx.44.10	○	-		.562"	1-1/4"	
	090.033.xx.43.10	○	-		.625"	1-1/4"	
	090.033.xx.40.10	○	-		.797"	1-1/4"	
	090.043.xx.44.10	○	-		.562"	1-1/2"	
	090.043.xx.43.10	○	-		.625"	1-1/2"	
	090.043.xx.40.10	○	-		.797"	1-1/2"	
6c Single clamp*	092.080.xx.00	○	-		.625"	1"	
	092.081.xx.00	○	-		.625"	1-1/4"	
	092.082.xx.00	○	-		.625"	1-1/2"	
	092.083.xx.00	○	-		.625"	2"	

* Other drill sizes on request

Example **Type** + **Material-no.** = **Ordering no.**
 for ordering: 092.080.xx.00.02 + 53 = 092.080.53.00.02





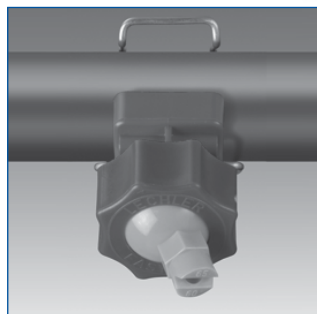
Nozzle systems for surface treatment

Easy-Clip nozzle system



Excellent for quick and economical header construction. Spring mounting bases allow flexible nozzle alignment with a wide range of angles and flow rates. Drill .656" hole in the pipe for mounting. No welding or threading. Maximum pressure 100 psi.

- Applications:
- Parts washing and degreasing
 - Phosphating lines
 - Pre-painting processing



Materials:
 Clamp: Stainless steel 1.4310
 Sealing: EPDM
 Cylinder pin, screw and screw unit: 1.4401.
 Body, ball retainer cap: PP, reinforced.
 Nozzle, ball joint: PP

Sets

existing of

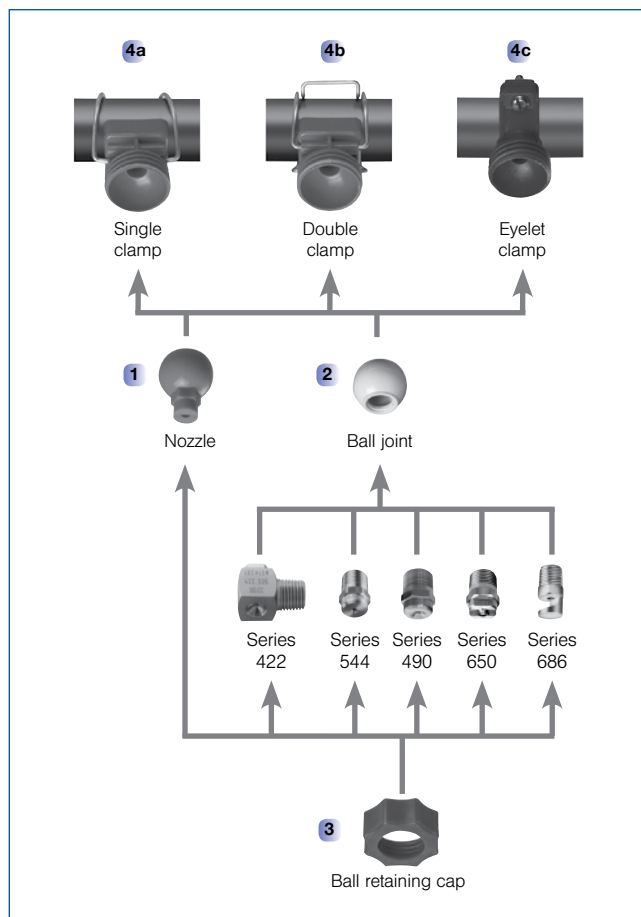
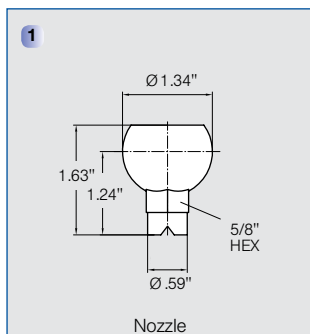
- Nozzle
- Single clamp for 1-1/4" pipe
- Ball retainer cap

Ordering no.	Nozzle color	60°	Flow Rate (Gallons Per Minute)				
			10 psi	15 psi	20 psi	25 psi	30 psi
676. 724. 53. 31	grey	60°	1.0	1.2	1.4	1.6	1.7
676. 804. 53. 31	purple	60°	1.5	1.8	2.1	2.4	2.6
676. 844. 53. 31	yellow	60°	2.0	2.4	2.8	3.2	3.5
676. 884. 53. 31	red	60°	2.5	3.1	3.5	4.0	4.3
676. 924. 53. 31	green	60°	3.0	3.7	4.2	4.7	5.2

Components

1 Nozzle

Ordering no.	Color	60°	Flow Rate (Gallons Per Minute)				
			10 psi	15 psi	20 psi	25 psi	30 psi
676. 724. 53. 30. 01	grey	60°	1.0	1.2	1.4	1.6	1.7
676. 804. 53. 30. 01	purple	60°	1.5	1.8	2.1	2.4	2.6
676. 844. 53. 30. 01	yellow	60°	2.0	2.4	2.8	3.2	3.5
676. 884. 53. 30. 01	red	60°	2.5	3.1	3.5	4.0	4.3
676. 924. 53. 30. 01	blue	60°	3.0	3.7	4.2	4.7	5.2
092. 080. 53. 00. 01	grey		Plug				





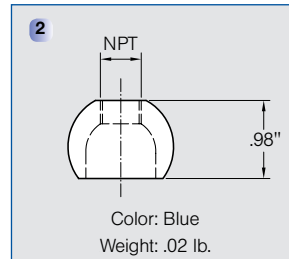
Nozzle systems for surface treatment

Easy-Clip nozzle system



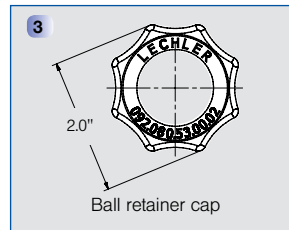
2 Adapter ball joint

Ordering no.	Material	For Nozzle	
		Connection Female NPT	Series
092. 080. 53. BB. 01	PP	1/8"	490, 544, 650, 686
092. 080. 53. BD. 01	PP	1/4"	490, 544, 650, 686
092. 080. 53. BF. 01	PP	3/8"	490, 650, 686
092. 080. 53. BH. 01	PP	1/2"	490, 650, 686



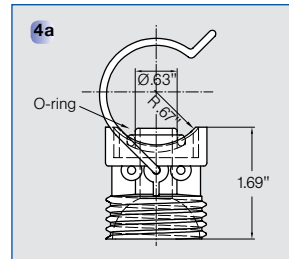
3 Ball retainer cap

Ordering no.
092. 080. 53. 00. 02



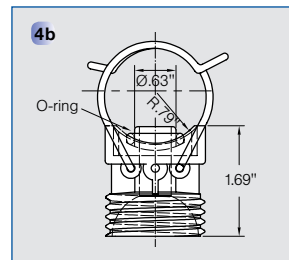
4a Single clip with o-ring

Ordering no.	Material	For Pipe		Weight (lb.)
		Tap Ø	Size	
092. 080. 53. 00	PP	.63"	1"	.08
092. 081. 53. 00	PP	.63"	1-1/4"	.09
092. 082. 53. 00	PP	.63"	1-1/2"	.11
092. 083. 53. 00	PP	.63"	2"	.11



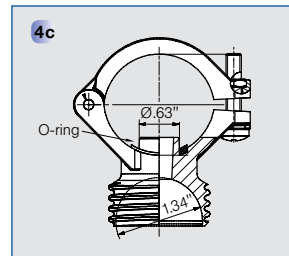
4b Double clip with o-ring

Ordering no.	Material	For Pipe		Weight (lb.)
		Tap Ø	Size	
092. 090. 53. 00	PP	.63"	1"	.08
092. 091. 53. 00	PP	.63"	1-1/4"	.09
092. 092. 53. 00	PP	.63"	1-1/2"	.11
092. 093. 53. 00	PP	.63"	2"	.11



4c Clamp assembly with o-ring

Ordering no.	Material	For Pipe		Weight (lb.)
		Tap Ø	Size	
090. 023. 53. 43. 10	PP	.63"	1"	.08
090. 033. 53. 43. 10	PP	.63"	1-1/4"	.09
090. 043. 53. 43. 10	PP	.63"	1-1/2"	.11





Flat fan nozzles

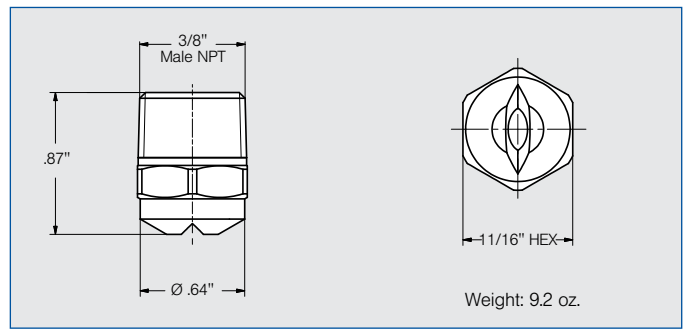
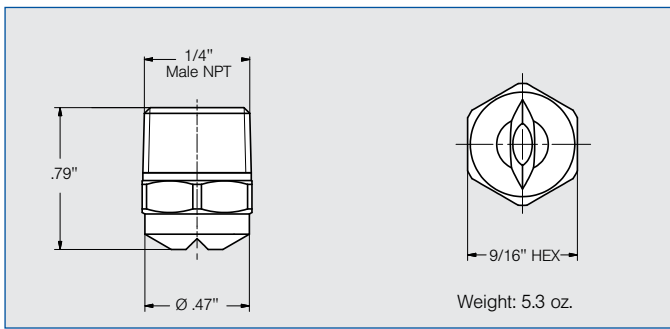
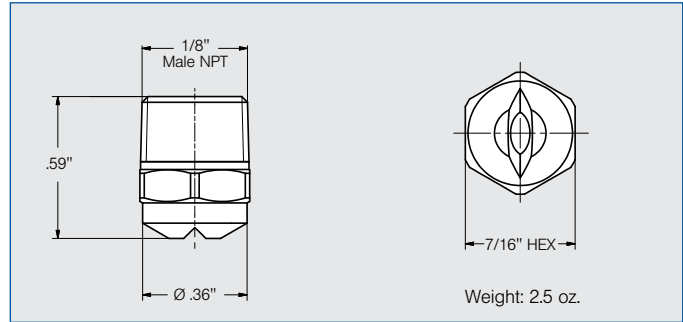
Series 650 / 651



Standard threaded axial flat fan nozzle with stable spray angles and a wide range of pressures. Please note there is a minimum quantity of 250 nozzles when placing orders.

Applications:

- Spray cleaning
- Lubricating
- Parts washing



Spray angle	Ordering no.				Equivalent Orifice diam. (in.)	Free passage (in.)	Flow Rate (Gallons Per Minute)							Spray Coverage (in.) @ 30 psi		
	Type	Mat. no. (1C)	Connection				10 psi	20 psi	liters per minute	40 psi	60 psi	80 psi	100 psi	H=10"	H=20"	
			1/8"	1/4"												3/8"
45°	650.483	○	BA BC	-	.042	.043	.25	.35	1.6	.50	.61	.70	.78	7	13	
	650.563	○	BA BC	-	.056	.055	.39	.55	2.5	.78	.95	1.1	1.2	7	14	
	650.603	○	BA BC	-	.062	.063	.49	.69	3.2	.98	1.2	1.4	1.6	8	15	
	650.643	○	BA BC	-	.071	.071	.62	.88	4.0	1.2	1.5	1.8	2.0	8	15	
	650.723	○	BA BC	-	.085	.094	.98	1.4	6.3	2.0	2.4	2.8	3.1	8	15	
	650.763	○	-	BC	-	.099	.102	1.2	1.8	8.0	2.5	3.0	3.5	3.9	8	15
	650.803	○	-	BC	-	.113	.118	1.6	2.2	10.0	3.1	3.8	4.4	4.9	8	15
	650.843	○	-	BC BE	-	.127	.134	1.9	2.7	12.5	3.9	4.8	5.5	6.1	8	15
	650.883	○	-	BC BE	-	.141	.150	2.5	3.5	16.0	5.0	6.1	7.0	7.9	9	17
	650.923	○	-	BC BE	-	.155	.165	3.1	4.4	20.0	6.2	7.6	8.8	9.8	9	17
	650.963	○	-	-	BE	.169	.173	3.9	5.5	25.0	7.8	9.5	11.0	12.3	9	17
	650.993	○	-	-	BE	.184	.189	4.7	6.6	30.0	9.3	11.4	13.2	14.7	9	17
	651.003	○	-	-	BE	.198	.205	4.9	6.9	31.5	9.8	12.0	13.8	15.5	9	17
651.043	○	-	-	BE	.226	.232	6.2	8.8	40.0	12.4	15.2	17.6	19.6	9	17	
60°	650.484	○	BA BC	-	.042	.039	.25	.35	1.6	.50	.61	.70	.78	10	20	
	650.564	○	BA BC	-	.056	.051	.39	.55	2.5	.78	.95	1.1	1.2	11	21	
	650.604	○	BA BC	-	.062	.059	.49	.69	3.2	.98	1.2	1.4	1.6	11	22	
	650.644	○	BA BC	-	.071	.063	.62	.88	4.0	1.2	1.5	1.8	2.0	12	22	
	650.724	○	BA BC	-	.085	.083	.98	1.4	6.3	2.0	2.4	2.8	3.1	12	23	
	650.764	○	-	BC	-	.099	.091	1.2	1.8	8.0	2.5	3.0	3.5	3.9	12	23
	650.804	○	-	BC	-	.113	.102	1.6	2.2	10.0	3.1	3.8	4.4	4.9	12	23
	650.844	○	-	BC BE	-	.127	.118	1.9	2.7	12.5	3.9	4.8	5.5	6.1	12	23
	650.884	○	-	BC BE	-	.141	.134	2.5	3.5	16.0	5.0	6.1	7.0	7.9	12	22
	650.924	○	-	BC BE	-	.155	.161	3.1	4.4	20.0	6.2	7.6	8.8	9.8	13	25
	650.964	○	-	-	BE	.169	.165	3.9	5.5	25.0	7.8	9.5	11.0	12.3	13	25
	650.994	○	-	-	BE	.184	.173	4.7	6.6	30.0	9.3	11.4	13.2	14.7	13	25
	650.004	○	-	-	BE	.198	.189	4.9	6.9	31.5	9.8	12.0	13.8	15.5	13	25
650.044	○	-	-	BE	.226	.217	6.2	8.8	40.0	12.4	15.2	17.6	19.6	13	25	

Continued on next page.

Example Type + Material no. + Conn. = Ordering no.
for ordering: 650.483 + 1C + BA = 650.483.1C.BA



Conversion formula for the above series: $V_2 = V_1 \sqrt{\frac{P_2}{P_1}}$



Flat fan nozzles

Series 650 / 651



Spray angle	Ordering no.				Equivalent Orifice diam. (in.)	Free passage (in.)	Flow Rate (Gallons Per Minute)						Spray Coverage (in.) @ 30 psi			
	Type	Mat. no.	Connection				10 psi	20 psi	liters per minute	40 psi	60 psi	80 psi	100 psi	H=10"	H=20"	
			1/8"	1/4"												3/8"
90°	650.486	○	BA	BC	-	.042	.031	.25	.35	1.6	.50	.61	.70	.78	17	33
	650.566	○	BA	BC	-	.056	.043	.39	.55	2.5	.78	.95	1.1	1.2	18	33
	650.606	○	BA	BC	-	.062	.047	.49	.69	3.2	.98	1.2	1.4	1.6	18	33
	650.646	○	BA	BC	-	.071	.051	.62	.88	4.0	1.2	1.5	1.8	2.0	18	34
	650.726	○	BA	BC	-	.085	.067	.98	1.4	6.3	2.0	2.4	2.8	3.1	19	35
	650.766	○	-	BC	-	.099	.075	1.2	1.8	8.0	2.5	3.0	3.5	3.9	19	35
	650.806	○	-	BC	-	.113	.094	1.6	2.2	10.0	3.1	3.8	4.4	4.9	19	35
	650.846	○	-	BC	BE	.127	.094	1.9	2.7	12.5	3.9	4.8	5.5	6.1	19	35
	650.886	○	-	BC	BE	.141	.122	2.5	3.5	16.0	5.0	6.1	7.0	7.9	19	36
	650.926	○	-	BC	BE	.155	.142	3.1	4.4	20.0	6.2	7.6	8.8	9.8	21	40
	650.966	○	-	-	BE	.169	.154	3.9	5.5	25.0	7.8	9.5	11.0	12.3	21	40
	650.996	○	-	-	BE	.184	.146	4.7	6.6	30.0	9.3	11.4	13.2	14.7	21	40
	651.006	○	-	-	BE	.198	.165	4.9	6.9	31.5	9.8	12.0	13.8	15.5	21	40
651.046	○	-	-	BE	.226	.193	6.2	8.8	40.0	12.4	15.2	17.6	19.6	21	40	
120°	650.487	○	BA	BC	-	.042	.024	.25	.35	1.6	.50	.61	.70	.78	27	50
	650.567	○	BA	BC	-	.056	.035	.39	.55	2.5	.78	.95	1.1	1.2	27	51
	650.607	○	BA	BC	-	.062	.043	.49	.69	3.2	.98	1.2	1.4	1.6	28	51
	650.647	○	BA	BC	-	.071	.051	.62	.88	4.0	1.2	1.5	1.8	2.0	28	51
	650.727	○	BA	BC	-	.085	.063	.98	1.4	6.3	2.0	2.4	2.8	3.1	29	54
	650.767	○	-	BC	-	.099	.067	1.2	1.8	8.0	2.5	3.0	3.5	3.9	30	55
	650.807	○	-	BC	-	.113	.079	1.6	2.2	10.0	3.1	3.8	4.4	4.9	31	57
	650.847	○	-	BC	BE	.127	.091	1.9	2.7	12.5	3.9	4.8	5.5	6.1	31	57
	650.887	○	-	BC	BE	.141	.102	2.5	3.5	16.0	5.0	6.1	7.0	7.9	31	57
	650.927	○	-	BC	BE	.155	.114	3.1	4.4	20.0	6.2	7.6	8.8	9.8	31	57
	650.967	○	-	-	BE	.169	.126	3.9	5.5	25.0	7.8	9.5	11.0	12.3	31	57
	650.997	○	-	-	BE	.184	.134	4.7	6.6	30.0	9.3	11.4	13.2	14.7	31	57
	650.007	○	-	-	BE	.198	.146	4.9	6.9	31.5	9.8	12.0	13.8	15.5	31	57
650.047	○	-	-	BE	.226	.173	6.2	8.8	40.0	12.4	15.2	17.6	19.6	31	57	

Example Type + Material no. + Conn. = Ordering no.
 for ordering: 650.486 + 1C + BA = 650.486.1C.BA

Conversion formula for the above series: $V_2 = V_1 \sqrt{\frac{P_2}{P_1}}$





Flat fan nozzle tips

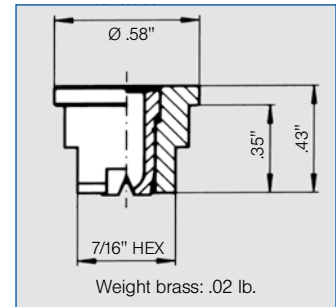
Series 652



Precision standard design axial flat fan nozzle tips. Stable spray angles at a wide range of pressures. Uniform parabolic distribution. Most capacities use Lechler's insert design. For use with nozzle base and cap.

Applications:

- Spray cleaning
- Lubricating
- Board and web rinsing
- Parts washing



Spray angle	Ordering no.					Equivalent Orifice diam. (in.)	Free passage (in.)	Flow Rate (Gallons Per Minute)						Spray Coverage (in.) @ 30 psi		
	Type	Material no.						10 psi	20 psi	liters per minute 2 bar	40 psi	60 psi	80 psi	100 psi	H=10" H=20"	
		303 SS 16	316 SS 17 ¹⁾	Brass 30	PVDF 5E										coverage	
20°	652.301	○	○	○	○	.028	.024	.05	.07	.32	.10	.12	.14	.16	3	5
	652.361	○	○	○	○	.039	.032	.10	.14	.63	.20	.24	.28	.31	3	5
	652.441	○	○	○	○	.053	.043	.19	.27	1.3	.39	.48	.55	.61	3	5
	652.481	○	○	○	○	.059	.047	.25	.35	1.6	.50	.61	.70	.78	3	5
	652.511	-	-	-	○	.065	.055	.29	.42	1.9	.59	.72	.83	.93	3	5
30°	652.302	○	○	○	○	.024	.020	.05	.07	.32	.10	.12	.14	.16	5	9
	652.362	○	○	○	○	.039	.028	.10	.14	.63	.20	.24	.28	.31	5	9
	652.402	○	○	○	○	.047	.035	.16	.22	1.0	.31	.38	.44	.49	5	9
	652.442	○	○	○	○	.053	.039	.19	.27	1.3	.39	.48	.55	.61	5	9
	652.482	○	○	○	○	.059	.043	.25	.35	1.6	.50	.61	.70	.78	5	9
	652.562	○	○	○	○	.079	.059	.39	.55	2.5	.78	.95	1.1	1.2	5	9
	652.602	○	○	○	-	.087	.067	.49	.69	3.2	.98	1.2	1.4	1.5	5	9
	652.642	○	○	○	-	.099	.071	.62	.88	4.0	1.2	1.5	1.8	2.0	5	9
	652.722	○	○	○	-	.118	.095	.98	1.4	6.3	2.0	2.4	2.8	3.1	5	9
	652.762	○	○	○	-	.138	.106	1.2	1.8	8.0	2.5	3.0	3.5	3.9	5	9
652.802	○	○	○	-	.158	.122	1.6	2.2	10.0	3.1	3.8	4.4	4.9	5	9	
45°	652.303	○	○	○	-	.028	.020	.05	.07	.32	.10	.12	.14	.16	7	13
	652.363	○	○	○	○	.039	.024	.10	.14	.63	.20	.24	.28	.31	7	13
	652.403	○	○	○	-	.047	.035	.16	.22	1.0	.31	.38	.44	.49	7	13
	652.443	○	○	○	-	.053	.039	.19	.27	1.3	.39	.48	.55	.61	7	13
	652.483	○	○	○	○	.059	.043	.25	.35	1.6	.50	.61	.70	.78	7	13
	652.513	○	○	○	-	.065	.047	.29	.42	1.9	.59	.72	.83	.93	7	13
	652.563	○	○	○	○	.079	.055	.39	.55	2.5	.78	.95	1.1	1.2	7	13
	652.603	○	○	○	-	.087	.067	.49	.69	3.2	.98	1.2	1.4	1.5	7	13
	652.643	○	○	○	○	.099	.071	.62	.88	4.0	1.2	1.5	1.8	2.0	7	14
	652.723	○	○	○	-	.118	.095	.98	1.4	6.3	2.0	2.4	2.8	3.1	7	14
652.763	○	○	○	-	.138	.102	1.2	1.8	8.0	2.5	3.0	3.5	3.9	7	14	
652.803	○	○	○	-	.158	.118	1.6	2.2	10.0	3.1	3.8	4.4	4.9	8	14	
60°	652.304	○	○	○	○	.028	.016	.05	.07	.32	.10	.12	.14	.16	11	21
	652.334	○	○	○	○	.035	.020	.07	.10	.45	.14	.17	.20	.22	11	21
	652.364	○	○	○	○	.039	.024	.10	.14	.63	.20	.24	.28	.31	11	21
	652.404	○	○	○	○	.047	.032	.16	.22	1.0	.31	.38	.44	.49	11	21
	652.444	○	○	○	○	.053	.035	.19	.27	1.3	.39	.48	.55	.61	11	21
	652.484	○	○	○	○	.059	.039	.25	.35	1.6	.50	.61	.70	.78	11	21
	652.514	○	○	○	○	.065	.043	.29	.42	1.9	.59	.72	.83	.93	11	21
	652.564	○	○	○	○	.079	.051	.39	.55	2.5	.78	.95	1.1	1.2	11	21
	652.604	○	○	○	○	.087	.059	.49	.69	3.2	.98	1.2	1.4	1.5	11	20
	652.644	○	○	○	○	.099	.063	.62	.88	4.0	1.2	1.5	1.8	2.0	11	20
	652.674	○	○	○	○	.106	.071	.74	1.0	4.8	1.5	1.8	2.1	2.3	11	20
	652.724	○	○	○	○	.118	.083	.98	1.4	6.3	2.0	2.4	2.8	3.1	11	20
	652.764	○	○	○	-	.138	.091	1.2	1.8	8.0	2.5	3.0	3.5	3.9	11	20
	652.804	○	○	○	○	.158	.102	1.6	2.2	10.0	3.1	3.8	4.4	4.9	11	20
	652.844	○	-	○	○	.177	.118	1.9	2.7	12.5	3.9	4.8	5.5	6.1	11	20
652.884	○	-	○	-	.197	.134	2.5	3.5	16.0	5.0	6.1	7.0	7.8	11	20	
652.944	○	○	○	-	.225	.173	3.5	4.9	22	7.0	8.5	9.8	11.0	11	20	

Continued on next page.

Example Type + Material no. = Ordering no.
for ordering: 652.403 + 30 = 652.403.30

1) We reserve the right to deliver material 316 SS or 316L SS, if we show the material code 17.



Conversion formula for the above series: $V_2 = V_1 \sqrt{\frac{P_2}{P_1}}$



Flat fan nozzles

Series 652



Spray angle A	Ordering no.					Equivalent Orifice diam. (in.)	Free passage (in.)	Flow Rate (Gallons Per Minute)							Spray Coverage (in.) @ 30 psi	
	Type	Material no.						10 psi	20 psi	liters per minute 2 bar	40 psi	60 psi	80 psi	100 psi	H=10"	H=20"
		303 SS 16	316 SS 17 ¹⁾	Brass 30	P.VDF 5E											
75°	652. 145	○	-	○	-	.008	.005	.008	.011	.05	.016	.019	.022	.025	11	22
	652. 165	○	-	○	-	.008	.003	.011	.015	.07	.022	.027	.031	.034	11	22
	652. 185	○	-	○	-	.008	.006	.012	.018	.08	.025	.030	.035	.039	11	22
	652. 215	○	-	○	-	.016	.008	.017	.024	.11	.034	.042	.048	.054	11	22
	652. 245	○	-	○	-	.020	.012	.025	.035	.16	.05	.06	.07	.08	11	22
	652. 275	○	-	○	-	.024	.012	.034	.05	.22	.07	.08	.10	.11	11	22
90°	652. 216	○	-	○	-	.016	.008	.017	.024	.11	.034	.042	.048	.054	15	30
	652. 276	○	-	○	-	.024	.012	.034	.05	.22	.07	.08	.10	.11	18	31
	652. 306	○	○	○	○	.028	.016	.05	.07	.32	.10	.12	.14	.16	18	31
	652. 336	○	○	○	○	.035	.020	.07	.10	.45	.14	.17	.20	.22	18	31
	652. 366	○	○	○	○	.039	.020	.10	.14	.63	.20	.24	.28	.31	18	31
	652. 406	○	○	○	○	.047	.028	.16	.22	1.0	.31	.38	.44	.49	18	31
	652. 446	○	○	○	○	.053	.032	.19	.27	1.3	.39	.48	.55	.61	18	31
	652. 486	○	○	○	○	.059	.032	.25	.35	1.6	.50	.61	.70	.78	18	31
	652. 516	○	○	○	○	.065	.035	.29	.42	1.9	.59	.72	.83	.93	18	31
	652. 566	○	○	○	○	.079	.043	.39	.55	2.5	.78	.95	1.1	1.2	18	32
	652. 606	○	○	○	○	.087	.047	.49	.69	3.2	.98	1.2	1.4	1.5	18	32
	652. 646	○	○	○	○	.099	.051	.62	.88	4.0	1.2	1.5	1.8	2.0	18	32
	652. 676	○	○	○	○	.106	.055	.74	1.0	4.8	1.5	1.8	2.1	2.3	18	32
	652. 726	○	○	○	○	.118	.067	.98	1.4	6.3	2.0	2.4	2.8	3.1	18	32
	652. 766	○	○	○	-	.138	.075	1.2	1.8	8.0	2.5	3.0	3.5	3.9	18	32
	652. 806	○	○	○	○	.158	.095	1.6	2.2	10.0	3.1	3.8	4.4	4.9	18	32
652. 846	-	-	○	○	.177	.095	1.9	2.7	12.5	3.9	4.8	5.5	6.1	18	32	
652. 886	○	-	○	○	.197	.122	2.5	3.5	16.0	5.0	6.1	7.0	7.8	18	33	
120°	652. 187	○	-	○	-	.014	.008	.012	.018	.08	.025	.030	.035	.039	25	48
	652. 217	○	-	○	-	.016	.008	.017	.024	.11	.034	.042	.048	.054	26	48
	652. 247	○	-	○	-	.020	.008	.025	.035	.16	.05	.06	.07	.08	26	49
	652. 277	○	-	○	-	.024	.012	.034	.05	.22	.07	.08	.10	.11	26	49
	652. 307	○	-	○	○	.028	.012	.05	.07	.32	.10	.12	.14	.16	26	50
	652. 337	○	○	○	○	.035	.016	.07	.10	.45	.14	.17	.20	.22	26	50
	652. 367	○	○	○	○	.039	.020	.10	.14	.63	.20	.24	.28	.31	26	50
	652. 407	○	○	○	○	.047	.024	.16	.22	1.0	.31	.38	.44	.49	26	50
	652. 447	○	○	○	○	.053	.024	.19	.27	1.3	.39	.48	.55	.61	26	50
	652. 487	○	○	○	○	.059	.024	.25	.35	1.6	.50	.61	.70	.78	26	50
	652. 517	○	○	○	○	.065	.035	.29	.42	1.9	.59	.72	.83	.93	26	50
	652. 567	○	○	○	○	.079	.035	.39	.55	2.5	.78	.95	1.1	1.2	26	50
	652. 607	○	○	○	○	.087	.043	.49	.69	3.2	.98	1.2	1.4	1.5	27	51
	652. 647	○	○	○	-	.099	.051	.62	.88	4.0	1.2	1.5	1.8	2.0	27	51
	652. 677	○	○	○	-	.106	.055	.74	1.0	4.8	1.5	1.8	2.1	2.3	27	51
	652. 727	○	○	○	○	.118	.063	.98	1.4	6.3	2.0	2.4	2.8	3.1	27	52
652. 767	○	○	○	-	.138	.067	1.2	1.8	8.0	2.5	3.0	3.5	3.9	28	52	
652. 807	○	○	○	-	.158	.079	1.6	2.2	10.0	3.1	3.8	4.4	4.9	28	52	
652. 847	-	-	-	○	.177	.091	1.9	2.7	12.5	3.9	4.8	5.5	6.1	31	57	
652. 887	-	-	-	○	.197	.102	2.5	3.5	16.0	5.0	6.1	7.0	7.8	31	57	

Example Type + Material no. = Ordering no.
for ordering: 652. 407 + 30 = 652. 407. 30

1) We reserve the right to deliver material 316 SS or 316L SS, if we show the material code 17.

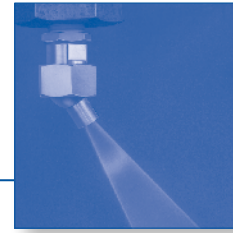
Conversion formula for the above series: $V_2 = V_1 \sqrt{\frac{P_2}{P_1}}$





Flat fan adjustable ball-type nozzles

Series 676



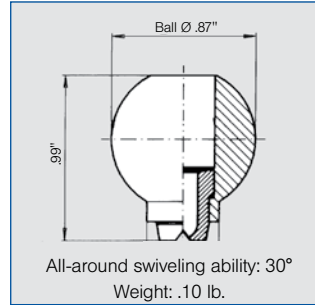
Flat fan nozzle swivels for precise adjusting of spray direction. No gaskets necessary. Designed for long service life.

Applications:

- Cleaning
- Cooling
- Lubricating



Nozzle ball joint with optional retaining nut



All-around swiveling ability: 30°
Weight: .10 lb.

Spray angle	Ordering no.				Equivalent Orifice diam. (in.)	Free passage (in.)	Flow Rate (Gallons Per Minute)										Spray Coverage (in.) @ 30 psi	
	Type	Material no.		10 psi			20 psi	litres per minute 2 bar	30 psi	40 psi	60 psi	80 psi	100 psi	150 psi	H=10" H=20"			
		303 SS 16	Brass 30												coverage	coverage		
20°	676. 301	○	○	.028	.024	.05	.07	.32	.09	.10	.12	.14	.16	.19	3	5		
	676. 361	○	○	.039	.031	.10	.14	.63	.17	.20	.24	.28	.31	.38	3	5		
	676. 441	○	○	.053	.043	.19	.27	1.3	.34	.39	.48	.55	.61	.75	3	6		
	676. 481	○	○	.059	.047	.25	.35	1.6	.43	.50	.61	.70	.78	.96	3	6		
30°	676. 302	○	○	.028	.020	.05	.07	.32	.09	.10	.12	.14	.16	.19	5	9		
	676. 362	○	○	.039	.028	.10	.14	.63	.17	.20	.24	.28	.31	.38	5	9		
	676. 402	○	○	.047	.035	.16	.22	1.0	.27	.31	.38	.44	.49	.60	5	9		
	676. 482	○	○	.059	.043	.25	.35	1.6	.43	.50	.61	.70	.78	.96	5	9		
	676. 562	○	○	.079	.059	.39	.55	2.5	.67	.78	.95	1.1	1.2	1.5	5	9		
	676. 642	○	○	.098	.071	.62	.88	4.0	1.1	1.2	1.5	1.8	2.0	2.4	5	9		
	676. 722	○	○	.118	.094	.98	1.4	6.3	1.7	2.0	2.4	2.8	3.1	3.8	5	9		
	676. 762	○	○	.138	.106	1.2	1.8	8.0	2.1	2.5	3.0	3.5	3.9	4.8	5	10		
676. 802	○	○	.157	.122	1.6	2.2	10.0	2.7	3.1	3.8	4.4	4.9	6.0	5	10			
45°	676. 303	○	○	.028	.020	.05	.07	.32	.09	.10	.12	.14	.16	.19	6	11		
	676. 363	○	○	.039	.024	.10	.14	.63	.17	.20	.24	.28	.31	.38	6	11		
	676. 403	○	○	.047	.035	.16	.22	1.0	.27	.31	.38	.44	.49	.60	7	13		
	676. 483	○	○	.059	.043	.25	.35	1.6	.43	.50	.61	.70	.78	.96	7	13		
	676. 563	○	○	.079	.055	.39	.55	2.5	.67	.78	.95	1.1	1.2	1.5	7	14		
	676. 643	○	○	.098	.071	.62	.88	4.0	1.1	1.2	1.5	1.8	2.0	2.4	8	15		
	676. 723	○	○	.118	.094	.98	1.4	6.3	1.7	2.0	2.4	2.8	3.1	3.8	8	15		
	676. 763	○	○	.138	.102	1.2	1.8	8.0	2.1	2.5	3.0	3.5	3.9	4.8	8	15		
676. 803	○	○	.157	.118	1.6	2.2	10.0	2.7	3.1	3.8	4.4	4.9	6.0	8	15			
60°	676. 304	○	○	.028	.016	.05	.07	.32	.09	.10	.12	.14	.16	.19	8	17		
	676. 334	○	○	.035	.020	.07	.10	.45	.12	.14	.17	.20	.22	.27	9	17		
	676. 364	○	○	.039	.024	.10	.14	.63	.17	.20	.24	.28	.31	.38	9	18		
	676. 404	○	○	.047	.031	.16	.22	1.0	.27	.31	.38	.44	.49	.60	10	19		
	676. 444	○	○	.053	.035	.19	.27	1.3	.34	.39	.48	.55	.61	.75	10	19		
	676. 484	○	○	.059	.039	.25	.35	1.6	.43	.50	.61	.70	.78	.96	10	20		
	676. 514	○	○	.065	.043	.29	.42	1.9	.51	.59	.72	.83	.93	1.1	11	20		
	676. 564	○	○	.079	.051	.39	.55	2.5	.67	.78	.95	1.1	1.2	1.5	11	21		
	676. 604	○	○	.087	.059	.49	.69	3.2	.85	.98	1.2	1.4	1.5	1.9	11	22		
	676. 644	○	○	.098	.063	.62	.88	4.0	1.1	1.2	1.5	1.8	2.0	2.4	12	22		
	676. 674	○	○	.106	.071	.74	1.0	4.8	1.3	1.5	1.8	2.1	2.3	2.9	12	23		
	676. 724	○	○	.118	.083	.98	1.4	6.3	1.7	2.0	2.4	2.8	3.1	3.8	12	23		
676. 764	○	○	.138	.091	1.2	1.8	8.0	2.1	2.5	3.0	3.5	3.9	4.8	12	23			

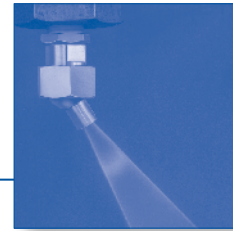
Example Type + Material no. = Ordering no.
for ordering: 676. 301 + 16 = 676. 301. 16

Continued on next page.



Flat fan adjustable ball-type nozzles

Series 676



Spray angle	Ordering no.				Equivalent Orifice diam. (in.)	Free passage (in.)	Flow Rate (Gallons Per Minute)										Spray Coverage (in.) @ 30 psi	
	Type	Material no.		10 psi			20 psi	2 litres per minute	30 psi	40 psi	60 psi	80 psi	100 psi	150 psi	Coverage diagram			
		303 SS 16	Brass 30												H=10"	H=20"		
75°	676. 145	○	○	.006	.012	.008	.011	.05	.013	.016	.019	.022	.025	.030	11	22		
	676. 165	○	○	.008	.013	.011	.015	.07	.019	.022	.027	.031	.034	.04	11	22		
	676. 185	○	○	.014	.008	.012	.018	.08	.021	.025	.030	.04	.04	.05	12	23		
	676. 215	○	○	.016	.008	.017	.024	.11	.030	.034	.04	.05	.05	.07	12	23		
	676. 245	○	○	.020	.012	.025	.035	.16	.043	.05	.06	.07	.08	.10	12	23		
	676. 275	○	○	.024	.012	.034	.05	.22	.06	.07	.08	.10	.11	.13	12	23		
90°	676. 216	○	○	.016	.008	.017	.024	.11	.030	.034	.04	.05	.05	.07	15	28		
	676. 276	○	○	.024	.012	.034	.05	.22	.06	.07	.08	.10	.11	.13	15	28		
	676. 306	○	○	.028	.016	.05	.07	.32	.09	.10	.12	.14	.16	.19	15	29		
	676. 336	○	○	.035	.020	.07	.10	.45	.12	.14	.17	.20	.22	.27	16	31		
	676. 366	○	○	.039	.020	.10	.14	.63	.17	.20	.24	.28	.31	.38	17	32		
	676. 406	○	○	.047	.028	.16	.22	1.0	.27	.31	.38	.44	.49	.60	17	32		
	676. 446	○	○	.053	.031	.19	.27	1.3	.34	.39	.48	.55	.61	.75	17	33		
	676. 486	○	○	.059	.031	.25	.35	1.6	.43	.50	.61	.70	.78	.96	17	33		
	676. 516	○	○	.065	.035	.29	.42	1.9	.51	.59	.72	.83	.93	1.1	17	33		
	676. 566	○	○	.079	.043	.39	.55	2.5	.67	.78	.95	1.1	1.2	1.5	18	33		
	676. 606	○	○	.087	.047	.49	.69	3.2	.85	.98	1.2	1.4	1.5	1.9	18	34		
	676. 646	○	○	.098	.051	.62	.88	4.0	1.1	1.2	1.5	1.8	2.0	2.4	18	34		
	676. 676	○	○	.106	.055	.74	1.0	4.8	1.3	1.5	1.8	2.1	2.3	2.9	18	34		
	676. 726	○	○	.118	.067	.98	1.4	6.3	1.7	2.0	2.4	2.8	3.1	3.8	19	35		
120°	676. 187	○	○	.014	.008	.012	.018	.08	.021	.025	.030	.035	.039	.05	25	47		
	676. 217	○	○	.016	.008	.017	.024	.11	.030	.034	.042	.048	.054	.07	25	48		
	676. 247	○	○	.020	.008	.025	.035	.16	.04	.05	.06	.07	.08	.10	26	48		
	676. 277	○	○	.024	.012	.034	.05	.22	.06	.07	.08	.10	.11	.13	26	49		
	676. 307	○	○	.028	.012	.05	.07	.32	.09	.10	.12	.14	.16	.19	26	49		
	676. 337	○	○	.035	.016	.07	.10	.45	.12	.14	.17	.20	.22	.27	26	50		
	676. 367	○	○	.039	.020	.10	.14	.63	.17	.20	.24	.28	.31	.38	26	50		
	676. 407	○	○	.047	.024	.16	.22	1.0	.27	.31	.38	.44	.49	.60	26	50		
	676. 447	○	○	.053	.024	.19	.27	1.3	.34	.39	.48	.55	.61	.75	27	50		
	676. 487	○	○	.059	.024	.25	.35	1.6	.43	.50	.61	.70	.78	.96	27	50		
	676. 517	○	○	.065	.035	.29	.42	1.9	.51	.59	.72	.83	.93	1.1	27	50		
	676. 567	○	○	.079	.035	.39	.55	2.5	.67	.78	.95	1.1	1.2	1.5	27	51		
	676. 607	○	○	.087	.043	.49	.69	3.2	.85	.98	1.2	1.4	1.5	1.9	28	51		
	676. 647	○	○	.098	.051	.62	.88	4.0	1.1	1.2	1.5	1.8	2.0	2.4	28	51		
	676. 677	○	○	.106	.055	.74	1.0	4.8	1.3	1.5	1.8	2.1	2.3	2.9	28	52		
	676. 727	○	○	.118	.063	.98	1.4	6.3	1.7	2.0	2.4	2.8	3.1	3.8	29	54		
676. 767	○	○	.138	.067	1.2	1.8	8.0	2.1	2.5	3.0	3.5	3.9	4.8	30	55			

Example Type + Material no. = Ordering no.
 for ordering: 676. 301 + 16 = 676. 301. 16

For accessories, see next page.

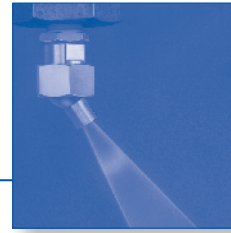
Conversion formula for the above series: $V_2 = V_1 \sqrt{\frac{P_2}{P_1}}$





Flat fan adjustable ball-type nozzles

Series 676



Accessories

<p>Socket 092. 020. 16. BF. 03 Material: 303 SS 092. 020. 30. BF. 03 Material: Brass</p>	<p>Welding nipple 092. 020. 17. 00. 04 Material: 316 SS</p>
<p>Retaining nut 092. 020. 16. 00. 02 Material: 303 SS 092. 020. 30. 00. 02 Material: Brass</p>	
Socket / Retaining nut Assembly	Welding nipple / Retaining nut Assembly

Notes: Above accessories sold separately from Series 676 adjustable ball-type nozzle.
 Retaining nut mates with either the Socket or the Welding nipple (see drawings above).
 Series 676 adjustable ball-type nozzle fits inside Retaining nut.



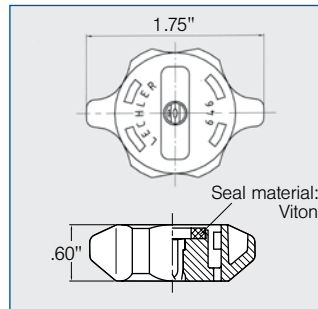
Flat fan nozzles with bayonet quick-release cap Series 646



**Quick and easy assembly
with bayonet quick-release
cap. Adjustable spray
direction. Even liquid
distribution.**

Applications:

- Printed circuit board etching
- Belt cleaning
- Surface treatment
- Spray cleaning
- Coating processes
- Parts washing



Spray angle	Ordering no.		Equivalent Orifice diam. (in.)	Free passage (in.)	Flow Rate (Gallons Per Minute)						Spray Coverage (in.) @ 30 psi		
	Type	Material no.			10 psi	20 psi	litres per minute 2 bar	40 psi	60 psi	80 psi	100 psi	H=10" H=24"	
												5E	
20°	646. 301	○	.028	.024	.05	.07	.32	.10	.12	.14	.16	3	6
	646. 361	○	.039	.032	.10	.14	.63	.20	.24	.28	.31	3	6
	646. 441	○	.053	.043	.19	.27	1.3	.39	.48	.55	.61	3	6
	646. 481	○	.059	.047	.25	.35	1.6	.50	.61	.70	.78	3	6
30°	646. 302	○	.028	.020	.05	.07	.32	.10	.12	.14	.16	4	11
	646. 362	○	.039	.028	.10	.14	.63	.20	.24	.28	.31	4	11
	646. 402	○	.047	.035	.16	.22	1.0	.31	.38	.44	.49	4	11
	646. 482	○	.059	.043	.25	.35	1.6	.50	.61	.70	.78	4	11
60°	646. 562	○	.079	.059	.39	.55	2.5	.78	.95	1.1	1.2	4	11
	646. 304	○	.028	.016	.05	.07	.32	.10	.12	.14	.16	9	22
	646. 334	○	.035	.020	.07	.10	.45	.14	.17	.20	.22	9	22
	646. 364	○	.039	.024	.10	.14	.63	.20	.24	.28	.31	9	22
90°	646. 404	○	.047	.032	.16	.22	1.0	.31	.38	.44	.49	9	22
	646. 444	○	.053	.035	.19	.27	1.3	.39	.48	.55	.61	9	22
	646. 484	○	.059	.039	.25	.35	1.6	.50	.61	.70	.78	9	22
	646. 514	○	.065	.043	.29	.42	1.9	.59	.72	.83	.93	9	22
	646. 564	○	.079	.051	.39	.55	2.5	.78	.95	1.1	1.2	9	22
	646. 604	○	.087	.059	.49	.69	3.2	.98	1.2	1.4	1.5	9	22
	646. 306	○	.028	.016	.05	.07	.32	.10	.12	.14	.16	17	40
	646. 336	○	.035	.020	.07	.10	.45	.14	.17	.20	.22	17	40
120°	646. 366	○	.039	.020	.10	.14	.63	.20	.24	.28	.31	17	40
	646. 406	○	.047	.028	.16	.22	1.0	.31	.38	.44	.49	17	40
	646. 446	○	.053	.032	.19	.27	1.3	.39	.48	.55	.61	17	40
	646. 486	○	.059	.032	.25	.35	1.6	.50	.61	.70	.78	17	40
	646. 516	○	.065	.035	.29	.42	1.9	.59	.72	.83	.93	17	40
	646. 566	○	.079	.043	.39	.55	2.5	.78	.95	1.1	1.2	17	40
	646. 606	○	.087	.047	.49	.69	3.2	.98	1.2	1.4	1.5	17	40
	646. 307	○	.028	.012	.05	.07	.32	.10	.12	.14	.16	29	69
646. 337	○	.035	.016	.07	.10	.45	.14	.17	.20	.22	29	69	
646. 367	○	.039	.020	.10	.14	.63	.20	.24	.28	.31	29	69	
646. 407	○	.047	.024	.16	.22	1.0	.31	.38	.44	.49	29	69	
646. 447	○	.053	.024	.19	.27	1.3	.39	.48	.55	.61	29	69	
646. 487	○	.059	.024	.25	.35	1.6	.50	.61	.70	.78	29	69	
646. 517	○	.065	.035	.29	.42	1.9	.59	.72	.83	.93	29	69	
646. 567	○	.079	.035	.39	.55	2.5	.78	.95	1.1	1.2	29	69	
646. 607	○	.087	.043	.49	.69	3.2	.98	1.2	1.4	1.5	29	69	

Example Type + Material no. = Ordering no.
for ordering: 646. 406 + 5E = 646. 406. 5E



Bayonet quick-release base options for use with Series 646 nozzle

Conversion formula for the above series: $V_2 = V_1 \sqrt{\frac{P_2}{P_1}}$





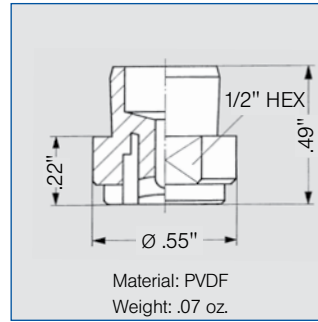
Flat fan nozzles for pressing into pipes

Series 612 in PVDF



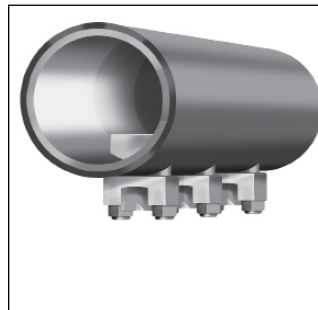
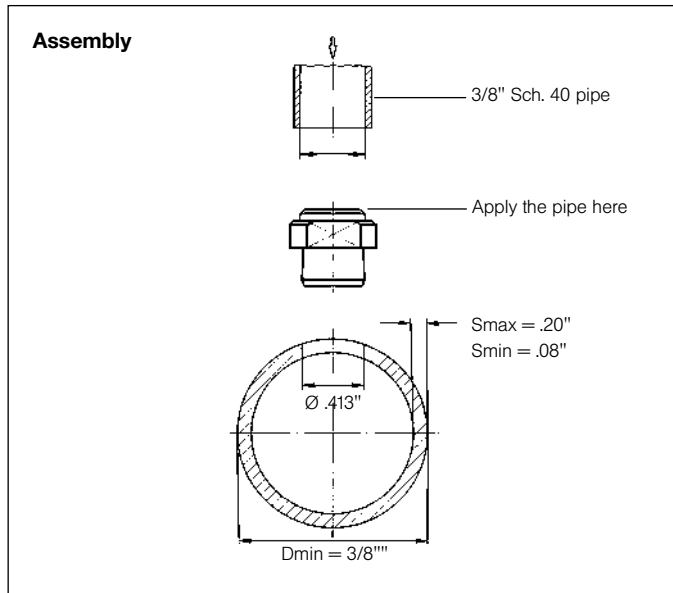
**For pressing into pipes.
Stable spray pattern.
Uniform liquid distribution.**

- Applications:
- Cleaning and rinsing
 - Parts washing



Material: PVDF
Weight: .07 oz.

Spray angle	Ordering no.	Material	Equiv. Orifice diam. (in.)	Free passage (in.)	Flow Rate (Gallons Per Minute)								Spray Coverage (in.) @ 40 psi	
					5 psi	10 psi	15 psi	20 psi	litres per minute 2 bar	30 psi	40 psi	50 psi	H=10"	H=20"
90°	612. 366. 5E. 03	PVDF	.039	.020	.07	.10	.12	.14	.63	.17	.20	.22	20	39
	612. 486. 5E. 03	PVDF	.059	.024	.18	.25	.30	.35	1.6	.43	.50	.56	21	40
120°	612. 487. 5E. 03	PVDF	.059	.024	.18	.25	.30	.35	1.6	.43	.50	.56	32	58
	612. 647. 5E. 03	PVDF	.099	.047	.44	.62	.76	.88	4.0	1.1	1.2	1.4	32	58



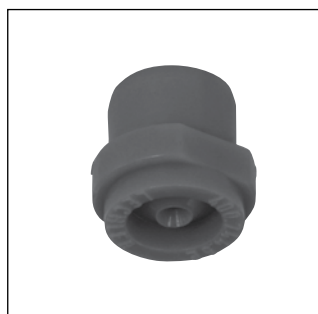
Assembly:
Drill pipe to \varnothing .413" and press nozzle into pipe using a 3/8" Sch. 40 pipe as shown in diagram. Drive in with a rubber mallet. Use of pipe as tool protects against damage during insertion. Flow velocity in pipe max. 6-10 ft/s.

Example **Type** + **Material no.** = **Ordering no.**
for ordering: 612. 366 + 5E. 03 = 612. 366. 5E. 03



Flat fan nozzle for pressing into pipes with stainless steel insert

Flow rate range
.013-1.07 gpm at 30 psi.
Available on request.



Full cone nozzle for pressing into pipes

Flow rate range
.43 gpm at 30 psi.
Spray angle 60°
Available on request.



Flat fan nozzles

High pressure

Series 602 / 608 / 652



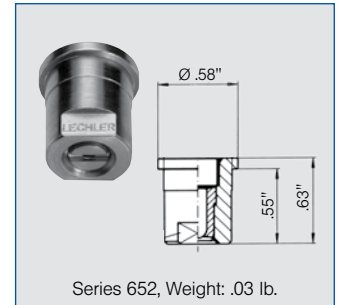
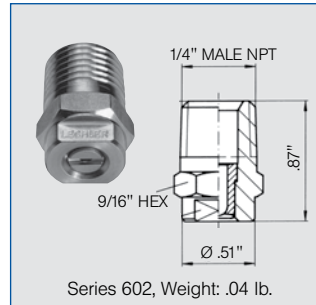
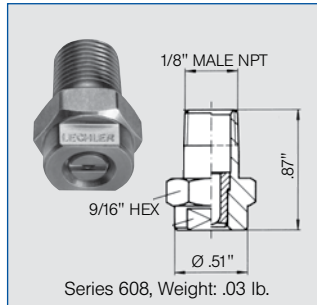
Sharp uniform flat fan for high pressure usage.

Applications:

- High pressure cleaners
- Steam jet cleaners

Materials:

Nozzle body: 303 SS
 Insert: Hardened stainless steel



Nozzle Code			Flow Rate Code				Equivalent Orifice diam. (in.)	Flow Rate (Gallons Per Minute)							
1/8"	1/4"	nut	Spray Angle					40 psi	600 psi	1000 psi	1500 psi	liters per minute			
			20°	30°	45°	60°						100 bar	2000 psi	3000 psi	4500 psi
608	602	652	361	362	363	364	.039	.20	.77	.99	1.2	4.5	1.4	1.7	2.1
608	602	652	381	382	383	384	.043	.25	.95	1.2	1.5	5.6	1.7	2.1	2.6
608	602	652	401	402	403	404	.046	.30	1.2	1.5	1.8	6.8	2.1	2.6	3.2
608	602	652	411	412	413	414	.051	.34	1.3	1.7	2.1	7.8	2.4	3.0	3.6
608	602	652	451	452	453	454	.053	.40	1.6	2.0	2.5	9.2	2.8	3.5	4.3
608	602	652	471	472	473	474	.055	.45	1.7	2.3	2.8	10.3	3.2	3.9	4.8
608	602	652	481	482	483	484	.061	.51	2.0	2.5	3.1	11.5	3.6	4.4	5.4
608	602	652	501	502	503	504	.063	.55	2.1	2.8	3.4	12.6	3.9	4.8	5.9
608	602	652	521	522	523	524	.067	.60	2.3	3.0	3.7	13.8	4.3	5.2	6.4
608	602	652	531	532	533	534	.070	.65	2.5	3.3	4.0	14.8	4.6	5.6	6.9
608	602	652	541	542	543	544	.070	.70	2.7	3.5	4.3	15.9	4.9	6.0	7.4
608	602	652	551	552	553	554	.074	.75	2.9	3.7	4.6	17.0	5.3	6.5	7.9
608	602	652	571	572	573	574	.080	.80	3.1	4.0	4.9	18.2	5.6	6.9	8.4
608	602	652	591	592	593	594	.082	.90	3.5	4.5	5.5	21	6.4	7.8	9.6
608	602	652	601	602	603	604	.090	1.0	3.9	5.0	6.1	23	7.1	8.7	10.6
-	602	652	641	642	643	644	.098	1.2	4.8	6.2	7.6	28	8.7	10.7	13.1
-	602	652	671	672	673	674	.106	1.5	5.7	7.4	9.1	34	10.5	12.8	15.7
-	602	652	701	702	703	704	.118	1.7	6.7	8.7	10.6	40	12.3	15.0	18.4
-	602	652	-	-	723	724	.120	2.0	7.8	10.0	12.3	46	14.2	17.3	21
-	602	652	-	-	793	-	.154	2.9	11.4	14.7	18.0	67	21	25	31

Connection Code	Connection	Maximum pressure
A3. 00	Male BSPT	Approx. 5000 psi
A3. 07	Male NPT	Approx. 5000 psi
A3. 29	Retainer cap	Approx. 3000 psi

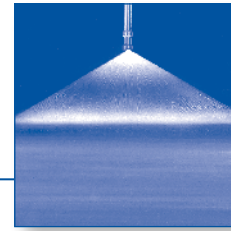
Example Nozzle code + Flow rate code + Connection code = Ordering no.
 for ordering: **602.** + **361** + **A3. 07** = **602. 361. A3. 07**
 (see bolded column headings above) (.99 gpm & 20° spray angle @ 1000 psi; 1/4" Male NPT)

Conversion formula for the above series: $V_2 = V_1 \sqrt{\frac{P_2}{P_1}}$





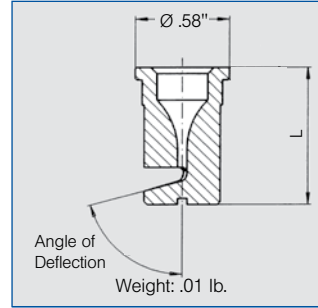
Flat fan nozzle tips
Tongue-type deflector wide angle
Series 684



Deflector produces moderate impact with a very wide spray angle. Clog resistant. Even distribution. Assembles with 3/8" retaining nut.

Applications:

- Foam control for storage tanks, wastewater treatment plants
- Dust suppression
- Light washing
- Spray cooling
- Degreasing and phosphating

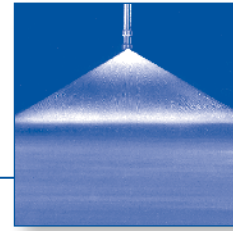


Spray angle	Deflector angle	Ordering no.		Color for version 56 POM *version 5E PVDF is blue	Orifice diam. (in.)	Flow Rate (Gallons Per Minute)								Length (L) (in.)	Spray Coverage (in.) @ 30 psi 	
		Type	Material no.			10 psi	20 psi	liters per minute 2 bar	30 psi	40 psi	60 psi	80 psi	100 psi			
			56													5E
140°	75°	684. 348	○	-	Green	.028	.08	.11	.50	.13	.16	.19	.22	.25	.8	54
		684. 368	○	○	Yellow	.032	.10	.14	.63	.17	.20	.24	.28	.31	.8	54
		684. 408	○	-	Blue	.039	.16	.22	1.0	.27	.31	.38	.44	.49	.8	54
		684. 448	○	-	Red	.047	.19	.27	1.3	.35	.39	.48	.55	.61	.8	54
		684. 488	○	○	Brown	.051	.25	.35	1.6	.43	.50	.61	.70	.78	.8	54
		684. 528	○	-	Grey	.059	.31	.44	2.0	.54	.62	.76	.88	.98	.8	54
		684. 568	○	○	White	.067	.39	.55	2.5	.67	.78	.95	1.1	1.2	.7	54
		684. 608	○	-	Light blue	.075	.49	.69	3.2	.86	.98	1.2	1.4	1.5	.7	54
		684. 688	○	-	Green	.095	.78	1.1	5.0	1.3	1.6	1.9	2.2	2.5	.7	54
		684. 728	○	○	Black*	.106	.98	1.4	6.3	1.7	2.0	2.4	2.8	3.1	.7	54
		684. 808	○	-	Purple	.134	1.6	2.2	10.0	2.7	3.1	3.8	4.4	4.9	.6	54

Example Type + Material no. = Ordering no.
 for ordering: 684. 608 + 56 = 684. 608. 56



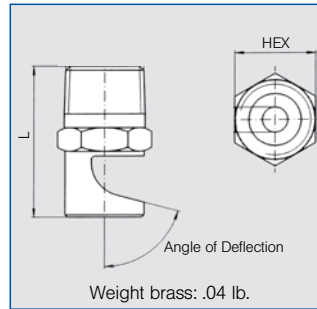
Flat fan nozzles Tongue-type deflector wide angle Series 686




Deflector produces moderate impact with a very wide spray angle. Clog resistant. Even distribution.

Applications:

- Foam control for storage tanks, wastewater treatment plants
- Dust suppression
- Light washing
- Spray cooling
- Degreasing and phosphating



Dimensions (in.)			
Inlet (NPT)	L	HEX	Wt. (lb.)
1/8	.91	7/16	.03
1/4	1.10	9/16	.06
3/8	1.26	11/16	.09
1/2	1.58	7/8	.20

Spray angle	Deflector angle	Ordering no.				Orifice diam. (in.)	Flow Rate (Gallons Per Minute)							Spray Coverage (in.) @ 30 psi 					
		Type	Material no.				Male NPT				10 psi	20 psi	liters per minute 2 bar		30 psi	40 psi	60 psi	80 psi	100 psi
			316 SS 17	Brass 30	PVDF 5E		1/8"	1/4"	3/8"	1/2"									
90°	53°	686. 366	-	○	-	BA	-	-	-	.031	.10	.14	.63	.17	.20	.24	.28	.31	20
	75°	686. 406	-	○	-	BA	-	-	-	.039	.16	.22	1.0	.27	.31	.38	.44	.49	21
	40°	686. 686	-	○	-	-	BC	-	-	.094	.78	1.1	5.0	1.3	1.6	1.9	2.2	2.5	21
	40°	686. 726	-	○	-	BA	-	-	-	.106	.98	1.4	6.3	1.7	2.0	2.4	2.8	3.1	21
	40°	686. 806	-	○	-	-	BC	-	-	.133	1.6	2.2	10.0	2.7	3.1	3.8	4.4	4.9	21
	40°	686. 886	○	-	-	-	BC	-	-	.165	2.5	3.5	16.0	4.3	5.0	6.1	7.0	7.8	21
	40°	686. 926	○	-	-	-	BE	-	.185	3.1	4.4	20	5.4	6.2	7.6	8.8	9.8	21	
140°	75°	686. 368	○	○	-	BA	-	-	-	.032	.10	.14	.63	.17	.20	.24	.28	.31	54
		686. 408	○	○	-	BA	-	-	-	.039	.16	.22	1.0	.27	.31	.38	.44	.49	54
		686. 448	○	○	-	BA	BC	-	-	.047	.19	.27	1.3	.35	.39	.48	.55	.61	54
		686. 488	○	○	-	BA	BC	-	-	.051	.25	.35	1.6	.43	.50	.61	.70	.78	54
		686. 528	○	○	-	BA	BC	-	-	.059	.31	.44	2.0	.54	.62	.76	.88	.98	54
		686. 568	○	○	○	BA	BC*	-	-	.067	.39	.55	2.5	.67	.78	.95	1.1	1.2	54
		686. 608	○	○	-	BA	BC	-	-	.075	.49	.69	3.2	.86	.98	1.2	1.4	1.5	54
		686. 648	○	○	-	-	BC	-	-	.087	.62	.88	4.0	1.1	1.2	1.5	1.8	2.0	54
		686. 688	○	○	-	BA	BC	-	-	.095	.78	1.1	5.0	1.4	1.6	1.9	2.2	2.5	54
		686. 728	-	○	-	BA	BC	-	-	.106	.98	1.4	6.3	1.7	2.0	2.4	2.8	3.1	54
		686. 768	○	○	-	BA*	BC	-	-	.118	1.2	1.8	8.0	2.2	2.5	3.0	3.5	3.9	54
		686. 808	○	○	-	BA	BC	-	-	.134	1.6	2.2	10.0	2.7	3.1	3.8	4.4	4.9	54
		686. 828	○	○	-	BA	BC	-	-	.142	1.7	2.5	11.2	3.0	3.5	4.3	4.9	5.5	54
		686. 848	○	○	-	BA*	BC	-	-	.150	1.9	2.7	12.5	3.4	3.9	4.8	5.5	6.1	54
		686. 868	○	○	-	-	BC	-	-	.158	2.2	3.1	14.0	3.8	4.3	5.3	6.1	6.9	54
		686. 888	○	○	-	-	BC	-	-	.165	2.5	3.5	16.0	4.3	5.0	6.1	7.0	7.8	54
		686. 908	○	○	-	-	BC	-	-	.177	2.8	3.9	18.0	4.8	5.6	6.8	7.9	8.8	54
		686. 928	○	-	-	-	BE	-	-	.185	3.1	4.4	20	5.4	6.2	7.6	8.8	9.8	54
686. 968	○	○	-	-	BE	BG	-	.209	3.9	5.5	25	6.7	7.8	9.5	11.0	12.3	54		
686. 988	○	○	-	-	BE	BG	-	.221	4.3	6.1	28	7.5	8.7	10.6	12.3	13.7	54		

* Only available in 316 SS (material no. 17)

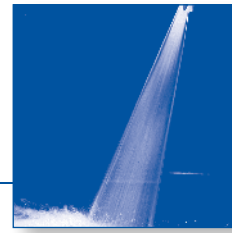
Example Type + Material no. + Conn. = Ordering no.
for ordering: 686. 908 + 17 + BC = 686. 908. 17. BC

Conversion formula for the above series: $V_2 = V_1 \sqrt{\frac{P_2}{P_1}}$





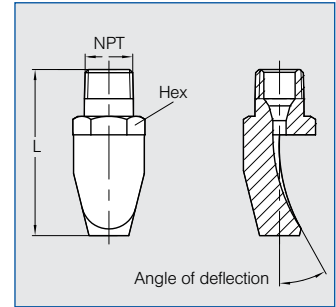
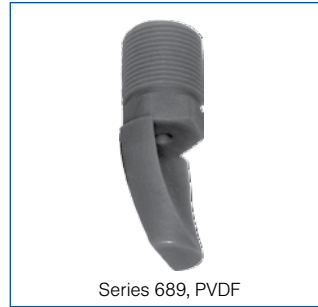
Flat fan nozzles Tongue-type impactor deflector Series 688 / 689



Deflector design provides clog resistance and high impact at low pressures. Even distribution.

Applications:

- Heavy impact washing
- Drum filter cleaning
- Knock-off showers
- Phosphating lines



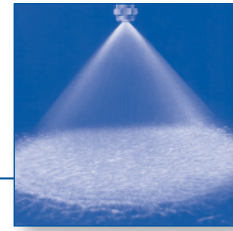
Spray angle	Deflector angle	Ordering no.				Orifice diam. (in.)	Flow Rate (Gallons Per Minute)								Dimensions (in.)		Weight 303 SS (lb.)	Spray Coverage (in.) @ 30 psi		
		Type	Material no.		Connection		Gallons Per Minute					L	Hex	H						
			303 SS 16	PVDF 5E	Male NPT 3/8" 3/4"		10 psi	20 psi	2 bar liters per minute	30 psi	40 psi			60 psi	80 psi	100 psi		H=10"	H=20"	
45°	35°	688. 763	○	-	BE	-	.118	1.2	1.8	8.0	2.1	2.5	3.0	3.5	3.9	1.7	3/4	.25	9	17
	30°	688. 843	○	-	BE	-	.150	1.9	2.7	12.5	3.4	3.9	4.8	5.5	6.1	2.0	3/4	.29	9	17
	29°	688. 923	○	-	BE	-	.189	3.1	4.4	20	5.4	6.2	7.6	8.8	9.8	2.3	7/8	.54	9	17
	35°	689. 003	○	○	-	BK	.236	4.9	6.9	32	8.6	9.8	12.0	13.8	15.5	3.1	1-1/4	.67	10	19
																3.1*	15/16*	.07*		

* Measurement for PVDF model

Example Type + Material no. + Conn. = Ordering no.
for ordering: 688. 923 + 16 + BE = 688. 923. 16. BE



Full cone nozzles
Axial-flow
Series 460 / 461



Uniform spray pattern.
Offered in a wide range of spray angles and flow rates.

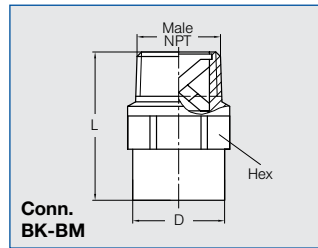
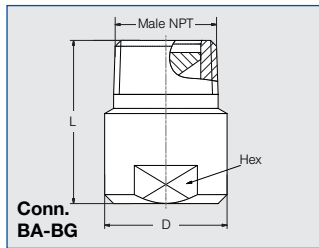
Applications:

- Washing and cleaning
- Dust suppression
- Mist eliminator washing
- Chemical reactors
- Surface spraying
- Chemical injection



Connection Code	Dimensions (in.)				Weight Brass (lb.)
	Inlet (Male NPT)	L	D	Hex	
BA	1/8	.71	.51	9/16	.03
BC	1/4	.87	.51	9/16	.04
BE	3/8	1.18	.63	11/16	.07
BG	1/2	1.65	.83	7/8	.15
BK	3/4	1.97	1.09	1-1/8	.38
BM	1	2.20	1.32	1-3/8	.79

Subject to technical modification.



Spray angle	Ordering no.							Orifice diam. (in.)	Free passage (in.)	Flow Rate (Gallons Per Minute)										Spray Coverage (in.) @ 30 psi H=8" H=20"	
	Type	Mat. no.	Connection				litters per minute														
	SE	PDF	1/8"	1/4"	3/8"	1/2"	3/4"			1"	10 psi	20 psi	2 bar	30 psi	40 psi	60 psi	80 psi	100 psi	150 psi		
60°	460.644	○	-	BC	BE	-	-	-	.095	.075	.69	.91	4.0	1.1	1.2	1.4	1.6	1.7	2.0	9	22
	460.964	○	-	-	-	-	BK	-	.229	.193	4.3	5.7	25	6.7	7.5	8.8	9.9	10.8	12.7	9	22
90°	460.326	○	BA	-	-	-	-	-	.032	.022	.07	.09	0.4	.11	.12	.14	.16	.17	.20	15	34
	460.406	○	BA	-	-	-	-	-	.047	.033	.17	.23	1.0	.27	.30	.35	.40	.43	.51	15	34
	460.486	○	BA	-	-	-	-	-	.057	.047	.28	.36	1.6	.43	.48	.57	.63	.69	.82	15	34
	460.526	○	BA	-	-	-	-	-	.065	.051	.35	.46	2.0	.54	.60	.71	.79	.87	1.0	15	34
	460.606	○	BA	-	BE	-	-	-	.081	.057	.54	.72	3.2	.84	.95	1.1	1.2	1.4	1.6	1.5	34
	460.646	○	-	BC	BE	-	-	-	.091	.071	.69	.91	4.0	1.1	1.2	1.4	1.6	1.7	2.0	15	38
	460.726	○	-	-	BE	-	-	-	.116	.079	1.1	1.4	6.3	1.7	1.9	2.2	2.5	2.7	3.2	15	38
	460.746	○	-	-	BE	-	-	-	.130	.075	1.2	1.6	7.1	1.9	2.1	2.5	2.8	3.1	3.6	15	38
	460.766	○	-	-	BE	-	-	-	.130	.095	1.4	1.8	8.0	2.1	2.4	2.8	3.2	3.5	4.1	15	38
	460.806	○	-	-	BE	-	-	-	.146	.106	1.7	2.3	10.0	2.7	3.0	3.5	4.0	4.3	5.1	15	38
	460.846	○	-	-	BE	-	-	-	.160	.126	2.2	2.8	12.5	3.3	3.8	4.4	5.0	5.4	6.4	15	38
	460.886	○	-	-	BE	BG	-	-	.185	.122	2.8	3.6	16.0	4.3	4.8	5.7	6.3	6.9	8.2	15	38
	460.926	○	-	-	-	BG	-	-	.205	.150	3.5	4.6	20	5.4	6.0	7.1	7.9	8.7	10.2	15	38
	460.966	○	-	-	-	BG	BK	-	.229	.150	4.3	5.7	25	6.7	7.5	8.8	9.9	10.8	12.7	15	38
461.006	○	-	-	-	BG	-	-	.252	.150	5.4	7.2	32	8.4	9.5	11.1	12.5	13.7	16.1	15	38	
461.046	○	-	-	-	-	BK	-	.284	.209	6.9	9.1	40	10.7	12.0	14.1	15.9	17.3	20	15	38	
461.086	○	-	-	-	-	BK	-	.323	.209	8.6	11.4	50	13.4	15.0	17.7	19.8	22	25	15	38	
461.126	○	-	-	-	-	-	BM	.366	.256	10.9	14.3	63	16.9	18.9	22	25	27	32	15	38	
461.146	○	-	-	-	-	-	BM	.390	.264	12.3	16.2	71	19.0	21	25	28	31	36	15	38	
120°	460.408	○	BA	-	-	-	-	-	.047	.033	.17	.23	1.0	.27	.30	.35	.40	.43	.51	27	48
	460.488	○	BA	-	-	-	-	-	.059	.039	.28	.36	1.6	.43	.48	.57	.63	.69	.82	27	48
	460.528	○	BA	-	-	-	-	-	.065	.047	.35	.46	2.0	.54	.60	.71	.79	.87	1.0	27	48
	460.608	○	BA	-	-	-	-	-	.083	.055	.54	.72	3.2	.84	.95	1.1	1.2	1.4	1.6	27	48
	460.648	○	-	BC	BE	-	-	-	.097	.063	.69	.91	4.0	1.1	1.2	1.4	1.6	1.7	2.0	27	52
	460.728	○	-	-	BE	-	-	-	.122	.075	1.1	1.4	6.3	1.7	1.9	2.2	2.5	2.7	3.2	27	52
	460.748	○	-	-	BE	-	-	-	.130	.075	1.2	1.6	7.1	1.9	2.1	2.5	2.8	3.1	3.6	27	52
	460.768	○	-	-	BE	-	-	-	.138	.075	1.4	1.8	8.0	2.1	2.4	2.8	3.2	3.5	4.1	27	52
	460.808	○	-	-	BE	-	-	-	.150	.095	1.7	2.3	10.0	2.7	3.0	3.5	4.0	4.3	5.1	27	52
	460.848	○	-	-	BE	-	-	-	.165	.106	2.2	2.8	12.5	3.3	3.8	4.4	5.0	5.4	6.4	27	52
	460.888	○	-	-	BE	BG	-	-	.181	.122	2.8	3.6	16.0	4.3	4.8	5.7	6.3	6.9	8.2	27	52
	460.968	○	-	-	-	BG	-	-	.232	.162	4.3	5.7	25	6.7	7.5	8.8	9.9	10.8	12.7	27	52
	461.048	○	-	-	-	-	BK	-	.299	.193	6.9	9.1	40	10.7	12.0	14.1	15.9	17.3	20	27	52

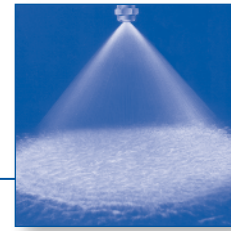
Example Type + Material no. + Conn. = Ordering no.
for ordering: 460.728 + 5E + BE = 460.728.5E.BE





Full cone nozzles
Axial-flow
Series 490 / 491

NEW Patent pending



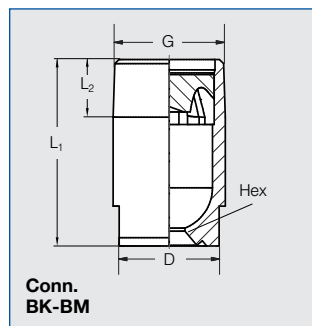
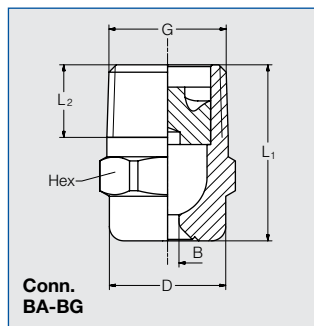
Excellent uniform full cone distribution and thorough atomization. Non-clogging nozzle design. Stable spray angle and particularly even liquid distribution.

Applications:

Cleaning and washing processes, surface spraying, container cleaning, foam precipitation, degassing of liquids.



Series 490/491 represents a new generation within the axial-flow full cone nozzles product group. These nozzles were developed using state-of-the-art design and simulation methods (CFD).



Conn.	G	Dimensions (in.)			Hex	Weight Brass
		L ₁	L ₂	D		
BA	1/8 NPT	0.71	0.26	0.39	7/16	.03
BC	1/4 NPT	0.87	0.39	0.51	9/16	.04
BE	3/8 NPT	0.96	0.39	0.63	11/16	.07
BE	3/8 NPT	1.18	0.39	0.63	11/16	.11
BG	1/2 NPT	1.28	0.51	0.83	14/16	.13
BG	1/2 NPT	1.71	0.51	0.83	14/16	.19
BK	3/4 NPT	1.65	0.59	1.26	1-1/16	.42
BK	3/4 NPT	1.97	0.59	1.26	1-1/16	.44
BM	1 NPT	2.20	0.67	1.57	1-7/16	.77

Subject to technical modification.

In a critical installation situation, please ask for the exact dimensions.

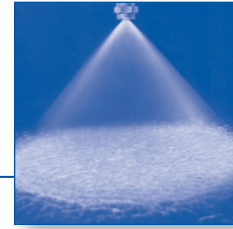
Spray angle	Ordering no.										Orifice diam. (in.)	Free Passage (in.)	Flow Rate (Gallons Per Minute)								Spray Coverage (in.) @ 30 psi		
	Type	Mat. no.		Connection									10 psi	20 psi	liters per minute 2 bar	30 psi	40 psi	60 psi	80 psi	100 psi	150 psi	H=8"	H=20"
		316 L	Brass	Male NPT																			
	1Y	30	1/8"	1/4"	3/8"	1/2"	3/4"	1"															
45°	490. 403	○	○	BA	-	-	-	-	-	-	.049	.049	.17	.23	1.00	0.27	.30	.35	.40	.43	.51	6	16
	490. 523	○	○	BA	-	-	-	-	-	-	.067	.067	.35	.46	2.00	0.54	.60	.71	.79	.87	1.02	6	16
	490. 603	○	○	BA	-	-	BC	BE*	-	-	.079	.079	.54	.72	3.15	0.84	.95	1.11	1.25	1.37	1.61	6	16
	490. 643	-	○	-	-	-	BE	-	-	-	.096	.098	.69	.91	4.00	1.07	1.20	1.41	1.59	1.73	2.04	6	16
	490. 683	-	○	-	-	-	BE	-	-	-	.100	.100	.86	1.14	5.00	1.34	1.50	1.77	1.98	2.17	2.55	6	16
	490. 703	-	○	-	-	-	BE	-	-	-	.104	.104	.97	1.27	5.60	1.50	1.68	1.98	2.22	2.43	2.85	6	16
	490. 723	○	○	-	-	-	BE	-	-	-	.112	.112	1.09	1.43	6.30	1.69	1.89	2.23	2.50	2.73	3.21	6	16
	490. 783	-	○	-	-	-	-	BG	-	-	.136	.136	1.55	2.05	9.00	2.41	2.70	3.18	3.57	3.90	4.58	6	16
	490. 843	-	○	-	-	-	-	BG	-	-	.150	.150	2.16	2.85	12.50	3.35	3.76	4.42	4.96	5.42	6.37	6	16
60°	490. 404	○	○	BA	-	-	-	-	-	-	.045	.045	.17	0.23	1.00	.27	.30	.35	.40	.43	0.51	9	22
	490. 444	○	-	BA	-	-	-	-	-	-	.049	.049	.22	0.29	1.25	.33	.38	.44	.49	.54	0.64	9	22
	490. 484	○	○	BA	-	-	-	-	-	-	.057	.057	.28	0.36	1.60	.43	.48	.57	.63	.69	0.82	9	22
	490. 524	○	○	BA	-	-	-	-	-	-	.063	.063	.35	0.46	2.00	.54	.60	.71	.79	.87	1.02	9	22
	490. 564	○	○	BA	-	-	-	-	-	-	.071	.071	.43	0.57	2.50	.67	.75	.88	.99	1.08	1.27	9	22
	490. 604	○	○	BA	BC	BE	-	-	-	-	.081	.081	.54	0.72	3.15	.84	.95	1.11	1.25	1.37	1.61	9	22
	490. 644	○	○	-	BC	BE	-	-	-	-	.091	.091	.69	0.91	4.00	1.07	1.20	1.41	1.59	1.73	2.04	9	22
	490. 684	○	○	-	BC	BE	-	-	-	-	.102	.102	.86	1.14	5.00	1.34	1.50	1.77	1.98	2.17	2.55	9	22
	490. 724	○	○	-	BC	BE	-	-	-	-	.112	.110	1.09	1.43	6.30	1.69	1.89	2.23	2.50	2.73	3.21	9	22
	490. 764	○	○	-	-	BE	-	-	-	-	.128	.128	1.38	1.82	8.00	2.14	2.40	2.83	3.17	3.47	4.08	9	22
	490. 804	○	○	-	-	BE	-	-	-	-	.146	.146	1.72	2.28	10.00	2.68	3.00	3.53	3.97	4.34	5.10	9	22
	490. 844	○	○	-	-	-	BG	-	-	-	.159	.159	2.16	2.85	12.50	3.35	3.76	4.42	4.96	5.42	6.37	9	22
	490. 884	○	○	-	-	-	BG	-	-	-	.183	.183	2.76	3.64	16.00	4.28	4.81	5.65	6.34	6.94	8.16	9	22
	490. 924	○	○	-	-	-	-	BK	-	-	.205	.205	3.45	4.56	20.00	5.36	6.01	7.07	7.93	8.67	10.20	9	22
	490. 964	○	○	-	-	-	-	BK	-	-	.228	.228	4.31	5.69	25.00	6.70	7.51	8.83	9.91	10.84	12.74	9	22
	491. 044	○	○	-	-	-	-	-	BM	-	.285	.285	6.90	9.11	40.00	10.71	12.02	14.14	15.86	17.34	20.39	9	22
491. 084	○	○	-	-	-	-	-	BM	-	.321	.321	8.63	11.38	50.00	13.39	15.02	17.67	19.82	21.67	25.49	9	22	

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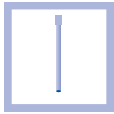
Full cone nozzles
Axial-flow
Series 490 / 491



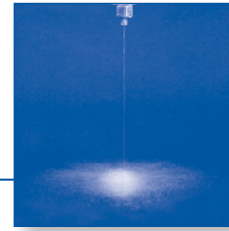
Spray angle	Ordering no.										Orifice diam. (in.)	Free Passage (in.)	Flow Rate (Gallons Per Minute)										Spray Coverage (in.) @ 30 psi	
	Type	Mat. no.		Connection									10 psi	20 psi	2 bar	30 psi	40 psi	60 psi	80 psi	100 psi	150 psi	H=8"	H=20"	
		1Y	30	Male NPT																				
				1/8"	1/4"	3/8"	1/2"	3/4"	1"															
90°	490.406	○	○	BA	-	-	-	-	-	.047	.047	.17	.23	1.00	.27	.30	.35	.40	.43	.51	15	34		
	490.446	-	○	BA	-	-	-	-	-	.051	.051	.22	.29	1.25	.33	.38	.44	.49	.54	.64	15	34		
	490.486	○	○	BA	-	-	-	-	-	.057	.057	0.28	.36	1.60	.43	.48	.57	.63	.69	.82	15	34		
	490.526	○	○	BA	-	-	-	-	-	.067	.067	.35	.46	2.00	.54	.60	.71	.79	.87	1.02	15	34		
	490.566	○	○	BA	-	-	-	-	-	.075	.075	.43	.57	2.50	.67	.75	.88	.99	1.08	1.27	15	34		
	490.606	○	○	BA	-	BE	-	-	-	.081	.081	.54	.72	3.15	.84	.95	1.11	1.25	1.37	1.61	15	34		
	490.646	○	○	-	BC	BE	-	-	-	.094	.094	.69	.91	4.00	1.07	1.20	1.41	1.59	1.73	2.04	15	38		
	490.686	○	○	-	BC	BE	-	-	-	.106	.106	.86	1.14	5.00	1.34	1.50	1.77	1.98	2.17	2.55	15	38		
	490.726	○	○	-	BC	BE	-	-	-	.126	.110	1.09	1.43	6.30	1.69	1.89	2.23	2.50	2.73	3.21	15	38		
	490.746	○	○	-	-	BE	-	-	-	.124	.124	1.23	1.62	7.10	1.90	2.13	2.51	2.82	3.08	3.62	15	38		
	490.766	○	○	-	-	BE	-	-	-	.134	.134	1.38	1.82	8.00	2.14	2.40	2.83	3.17	3.47	4.08	15	38		
	490.806	○	○	-	-	BE	-	-	-	.154	.154	1.72	2.28	10.00	2.68	3.00	3.53	3.97	4.34	5.10	15	38		
	490.846	○	○	-	-	BE	-	-	-	.183	.157	2.16	2.85	12.50	3.35	3.76	4.42	4.96	5.42	6.37	15	38		
	490.886	○	○	-	-	-	BG	-	-	.215	.177	2.76	3.64	16.00	4.28	4.81	5.65	6.34	6.94	8.16	15	38		
	490.926	○	○	-	-	-	BG	-	-	.232	.177	3.45	4.56	20.00	5.36	6.01	7.07	7.93	8.67	10.20	15	38		
	490.966	○	○	-	-	-	BG	BK	-	.258	.191	4.31	5.69	25.00	6.70	7.51	8.83	9.91	10.84	12.74	15	38		
	491.006	○	○	-	-	-	BG	BK	-	.297	.285	5.44	7.17	31.50	8.44	9.47	11.13	12.49	13.66	16.06	15	38		
	491.046	○	○	-	-	-	-	BK	-	.339	.315	6.90	9.11	40.00	10.71	12.02	14.14	15.86	17.34	20.39	15	38		
	491.086	○	○	-	-	-	-	BK	BM	.372	.285	8.63	11.38	50.00	13.39	15.02	17.67	19.82	21.67	25.49	15	38		
	491.126	○	○	-	-	-	-	-	BM	.409	.315	10.87	14.35	63.00	16.87	18.93	22.26	24.98	27.31	32.12	15	38		
491.146	○	○	-	-	-	-	-	BM	.433	.295	12.25	16.17	71.00	19.01	21.33	25.09	28.15	30.78	36.20	15	38			
120°	490.368	○	○	BA	-	-	-	-	-	.033	.026	.11	.14	.63	.17	.19	.22	.25	.27	.32	27	48		
	490.408	○	○	BA	-	-	-	-	-	.047	.047	.17	.23	1.00	.27	.30	.35	.40	.43	.51	27	48		
	490.448	○	○	BA	-	-	-	-	-	.051	.051	.22	.29	1.25	.33	.38	.44	.49	.54	.64	27	48		
	490.488	○	○	BA	-	-	-	-	-	.057	.057	.28	0.36	1.60	.43	.48	.57	.63	.69	.82	27	48		
	490.528	○	○	BA	-	-	-	-	-	.067	.067	.35	.46	2.00	.54	.60	.71	.79	.87	1.02	27	48		
	490.568	○	○	BA	-	-	-	-	-	.075	.075	.43	.57	2.50	.67	.75	.88	.99	1.08	1.27	27	48		
	490.608	○	○	-	BC	-	-	-	-	.083	.081	.54	.72	3.15	.84	.95	1.11	1.25	1.37	1.61	27	48		
	490.648	○	○	-	BC	BE	-	-	-	.094	.094	.69	.91	4.00	1.07	1.20	1.41	1.59	1.73	2.04	27	52		
	490.688	○	○	-	BC	BE	-	-	-	.108	.108	.86	1.14	5.00	1.34	1.50	1.77	1.98	2.17	2.55	27	52		
	490.728	○	○	-	BC	BE	-	-	-	.126	.110	1.09	1.43	6.30	1.69	1.89	2.23	2.50	2.73	3.21	27	52		
	490.748	○	○	-	-	BE	-	-	-	.126	.126	1.23	1.62	7.10	1.90	2.13	2.51	2.82	3.08	3.62	27	52		
	490.768	○	○	-	-	BE	-	-	-	.136	.136	1.38	1.94	8.00	2.14	2.40	2.83	3.17	3.47	4.08	27	52		
	490.808	○	○	-	-	BE	-	-	-	.154	.154	1.72	2.28	10.00	2.68	3.00	3.53	3.97	4.34	5.10	27	52		
	490.848	○	○	-	-	BE	-	-	-	.185	.157	2.16	2.85	12.50	3.35	3.76	4.42	4.96	5.42	6.37	27	52		
	490.888	○	○	-	-	-	BG	-	-	.201	.177	2.76	3.64	16.00	4.28	4.81	5.65	6.34	6.94	8.16	27	52		
	490.928	○	○	-	-	-	BG	-	-	.228	.228	3.45	4.56	20.00	5.36	6.01	7.07	7.93	8.67	10.20	27	52		
	490.968	○	○	-	-	-	BG	BK	-	.262	.191	4.31	5.69	25.00	6.70	7.51	8.83	9.91	10.84	12.74	27	52		
	491.048	○	○	-	-	-	-	BK	-	.362	.230	6.90	9.11	40.00	10.71	12.02	14.14	15.86	17.34	20.39	27	52		
	491.128	○	○	-	-	-	-	-	BM	.425	.305	10.87	14.35	63.00	16.87	18.93	22.26	24.98	27.31	32.12	27	52		
	491.148	○	○	-	-	-	-	-	BM	.449	.301	12.25	16.17	71.00	19.01	21.33	25.09	28.15	30.78	36.20	27	52		

Example Type + Material no. + Conn. = Ordering no.
for ordering: 490.368 + 1Y + BA = 490.368.1Y.BA





Solid stream nozzles
High pressure
Series 546 / 548 / 550



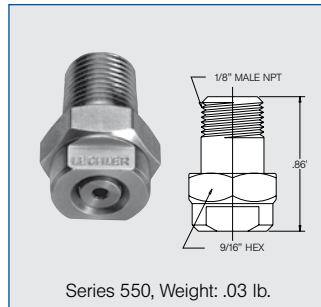
Exceptionally tight solid stream nozzles for pressures up to 4500 psi. Available in 1/8" NPT or BSPT, 1/4" NPT or BSPT, or tip version.

Applications:

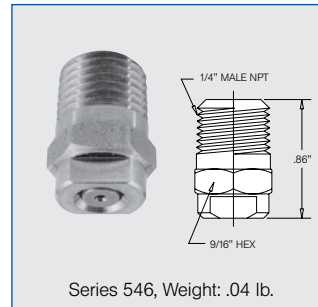
- High pressure cleaning
- Trimming
- Jet cutting

Materials:

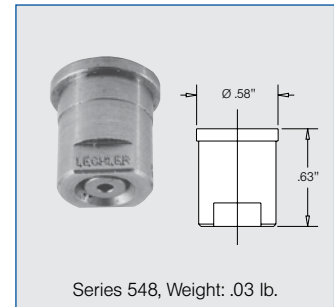
Nozzle body: 303 SS
 Insert: Hardened stainless steel



Series 550, Weight: .03 lb.



Series 546, Weight: .04 lb.



Series 548, Weight: .03 lb.

Nozzle Code			Flow Rate Code	Orifice diam. (in.)	Flow Rate (Gallons Per Minute)								
1/8" Male NPT or BSPT	1/4" Male NPT or BSPT	Tip			300 psi	450 psi	725 psi	1000 psi	liters per minute 100 bar	1500 psi	2000 psi	3000 psi	4500 psi
550	546	548	360	.033	.54	.67	.84	.99	4.5	1.2	1.4	1.7	2.1
550	546	548	400	.041	.82	1.0	1.3	1.5	6.8	1.8	2.1	2.6	3.2
550	546	548	410	.042	.90	1.1	1.4	1.6	7.5	2.0	2.3	2.8	3.5
550	546	548	420	.044	.96	1.2	1.5	1.8	8.0	2.1	2.5	3.0	3.7
550	546	548	450	.047	1.1	1.3	1.7	2.0	9.2	2.5	2.8	3.5	4.3
550	546	548	470	.050	1.2	1.5	1.9	2.3	10.3	2.8	3.2	3.9	4.8
550	546	548	480	.052	1.4	1.7	2.2	2.5	11.5	3.1	3.6	4.4	5.4
550	546	548	500	.055	1.5	1.9	2.4	2.8	12.6	3.4	3.9	4.8	5.9
550	546	548	520	.058	1.7	2.0	2.6	3.0	13.8	3.7	4.3	5.2	6.4
550	546	548	570	.067	2.2	2.7	3.4	4.0	18.2	4.9	5.6	6.9	8.4
550	546	548	600	.074	2.7	3.3	4.2	5.0	23	6.1	7.0	8.6	10.5
550	546	548	670	.091	4.1	5.0	6.4	7.5	34	9.2	10.6	13.0	15.9
550	546	548	720	.105	5.5	6.7	8.5	10.0	46	12.3	14.2	17.3	21

Connection Code	Connection	Maximum pressure
A3. 00	Male BSPT	Approx. 5000 psi
A3. 07	Male NPT	Approx. 5000 psi
A3. 29	Retainer cap	Approx. 3000 psi

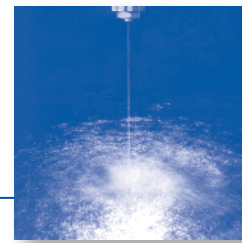
Example **Nozzle code** + **Flow rate code** + **Connection code** = **Ordering no.**
 for ordering: **550.** + **360.** + **A3. 07** = **550. 360. A3. 07**
 (see bolded column headings above) **(.99 gpm & 0° spray angle at 1000 psi; 1/8" Male NPT)**





Eductor nozzles

Series 500.262 / 500.428



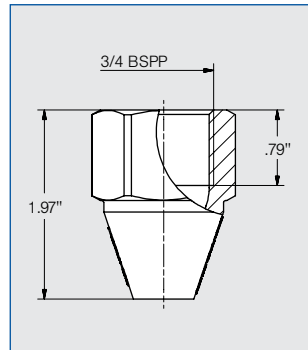
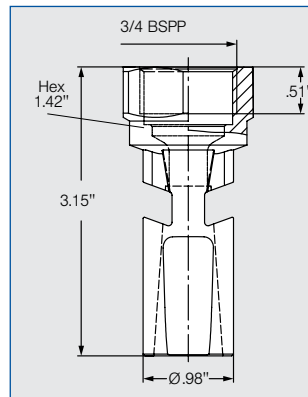
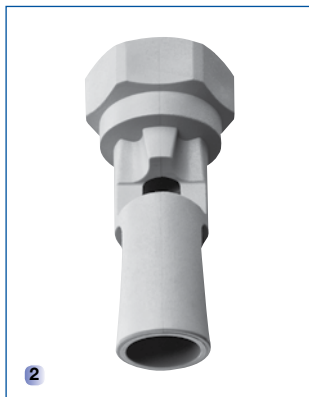
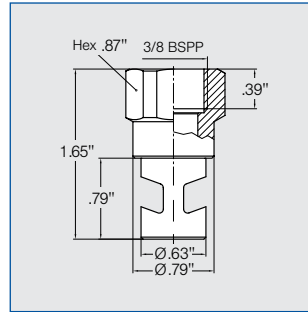
No risk of blockage thanks to the large cross sections from 29 to 145 psi.

Applications:

- Tank mixing
- Liquid circulation
- Preventing sedimentation

Material:

- 1 Polypropylene
- 2 + 3 Polypropylene
Fiberglass reinforced



Ordering no.	Orifice diam. (in.)	Flow Rate (Gallons Per Minute)					
		30 psi	40 psi	60 psi	liters per minute 6 bar	80 psi	100 psi
1 500. 262. 53. 02	.06	1.2	1.4	1.7	7.7	2.0	2.2
500. 262. 53. 04	.10	3.0	3.4	4.2	19.2	4.9	5.4
500. 262. 53. 06	.13	4.9	5.7	7.0	31.8	8.1	9.0
500. 262. 53. 08	.17	8.5	9.8	12.0	54.8	13.9	15.5
2 500. 262. 53. 20	.30	25.8	29.8	36.5	166.5	42.2	47.0
3 500.4 28. 53. 00	.27	23.3	26.9	32.9	150.1	38.0	42.5

Other sizes on request.

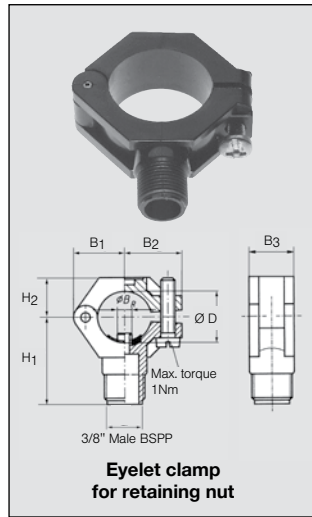


Accessories

Eyelet clamps / Retaining nuts

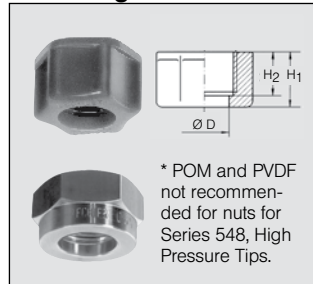
Eyelet clamps with bayonet quick-release system

Split eyelet



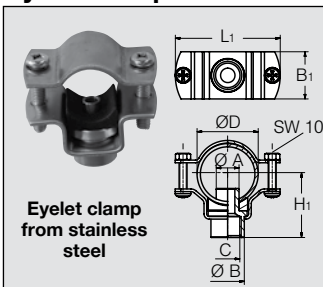
For series	Ordering no.				Screw (Material)	Dimensions (in.)							Weight (Nylon)	
	Type	Material no.				Pipe Ø	Drill hole diameter	B _R Ø	B ₁	B ₂	B ₃	H ₁		H ₂
		51	53	5E										
2TR 302 468 652 679 684	090.053	○	○	○	303 SS	3/8"	1/4"	.25	.75	.87	.73	1.36	.57	.05
	090.003	○	○	○		1/2"	1/4"	.25	.84	.94	.73	1.44	.65	.05
	090.013	○	○	○		3/4"	5/16"	.31	.96	1.05	.87	1.56	.69	.06
	090.023	○	○	○		1"	7/16"	.43	1.18	1.22	.87	1.73	.83	.07
	090.033	○	○	○		1 1/4"	1/2"	.51	1.34	1.40	.99	1.89	.99	.09

Retaining nuts

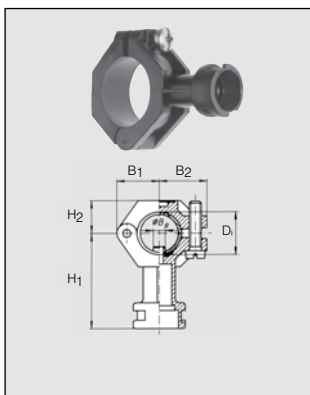


For series	Ordering no.						Dimensions (in.)					Weight (Brass) lb.
	Type	Material no.					For thread	H ₁	H ₂	D	Hex	
		303 SS	316SS	316LSS	Brass	POM						
2TR 468 548*	065.200	○	○	-	○	○	3/8" BSPP	.57	.40	.50	.87	.06
	069.000	○	-	○	○	-	1 1/16"-16	.57	.40	.50	.87	.06
656/664	065.600	○	○	-	○	○	3/4" BSPP	.63	.51	.79	1.26	.13

Eyelet clamps



For series	Ordering no.				Pipe Ø	Dimensions (in.)					
	Type	Female thread (C)				D	L ₁	B ₁	H ₁	A Ø	B Ø
		1/8"	1/4"	3/8"							
All nozzles with 1/8", 1/4" or 3/8" male thread	090.000.16	AB	AD	-	1/2"	.79-.87	2.04	1.18	1.26	.28	.71
	090.101.16	AB	AD	-	3/4"	.98-1.08	2.20	.98	1.36	.28	.71
	090.020.16	-	AD	AF	1"	1.26-1.36	2.29	1.18	1.54	.28	.71
	090.030.16	-	AD	AF	1 1/4"	1.58-1.70	2.76	2.76	1.83	.69	1



For series	Ordering no.					Screw (Material)	Pipe Ø	Drill hole diameter	Opening pressure (psi)	Closing pressure (psi)	Dimensions (in.)					Weight (lb.)		
	Type	Material no.									Conn.	H ₁	H ₂	ØB _R	B ₁		B ₂	B ₃
		51	53	5E	56													
302 bay. 422 bay. 2TR 468 652 679 684	090.003	○	○	○	-	KA	1/2"	9/32"	-	-	1.95	.65	.25	.84	.94	.73	.05	
	090.013	○	○	○	-	KA	3/4"	5/16"	-	-	2.07	.69	.31	.97	1.04	.87	.06	
	090.023	○	○	○	-	KA	1"	7/16"	-	-	2.25	.83	.43	1.18	1.22	.87	.07	



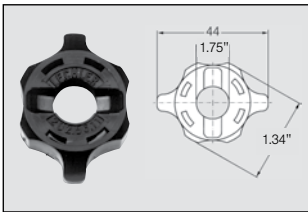
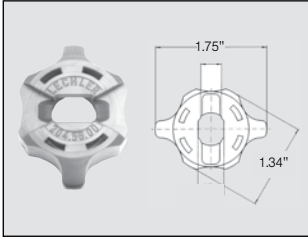
Accessories

Bayonet quick-release system

Bayonet nipple

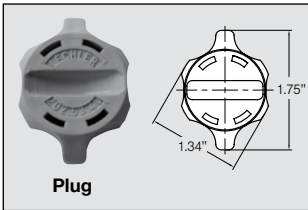
Bayonet quick-release retainer caps

incl. gasket 065.242.73 (rubber)



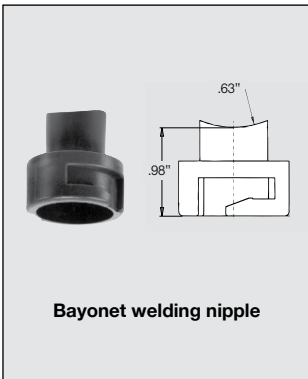
For series	Ordering no.	Material	Color	Weight (oz.)
652	065. 202. 56. 00	POM	Red	.016
	065. 202. 53. 00	PP	Gray	.016
	065. 202. 5E. 00*	PVDF	Blue	.016
2TR 468 679 684	065. 202. 56. 11	POM	Black	.016
	065. 202. 53. 11	PP	Gray	.016

* does not work with 090.075.53.00.0 base, incl. gasket 065.242.7A (viton)



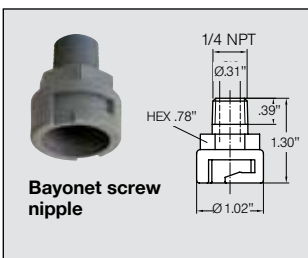
Plug

Ordering no.	Material	Color
065. 202. 56. 40	POM	beige
065. 202. 53. 40	Polypropylene	grey



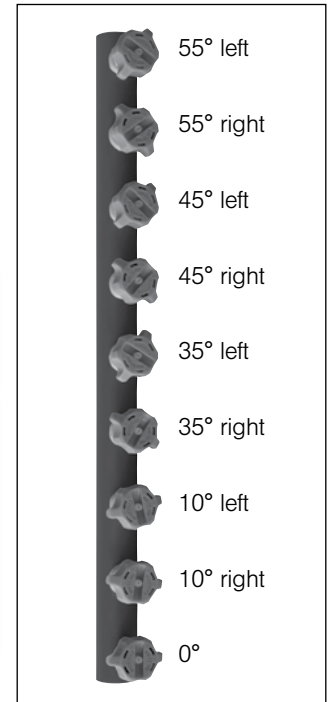
Bayonet welding nipple

For series	Ordering no.	Material	Twist angle to the pipe axis	
			Angle	Direction
302 bay, 422 bay, 2TR 468 652 679 684	095. 016. 50. 10. 85	PVC	0°	
	095. 016. 53. 08. 05	PP	10°	right
	095. 016. 53. 09. 29	PP	10°	left
	095. 016. 53. 09. 99	PP	35°	right
	095. 016. 53. 09. 98	PP	35°	left
	095. 016. 53. 07. 36	PP	45°	right
	095. 016. 53. 09. 30	PP	45°	left
	095. 016. 53. 10. 87	PP	55°	right
	095. 016. 53. 10. 88	PP	55°	left



Bayonet screw nipple

For series	Ordering no.	Material	Dimensions (in.)
652 684	090. 075. 53. 00	PP	1/4" Male NPT



Nozzle mounting with different twist angles

For standard offset, 10° can be used.



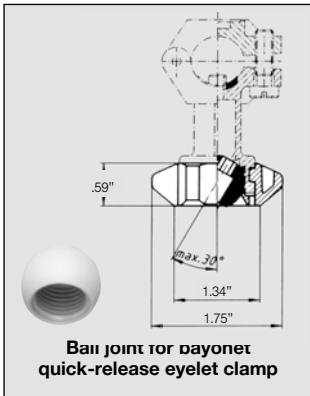
Accessories

Ball joint for bayonet quick-release system

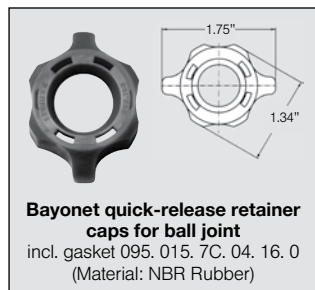
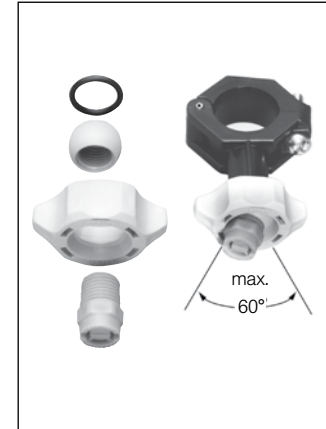
Compact ball joints for narrow installation conditions

Ball joint for bayonet quick-release system

Ball joint system for nozzles with 1/8" or 1/4" male thread.



For series	Ordering no.			Color
	Type	Mat. no.	Connection	
		PVDF 5E	Female NPT 1/8" 1/4"	
For all nozzles with 1/8" or 1/4" male thread	092. 150	○	BB BD	blue

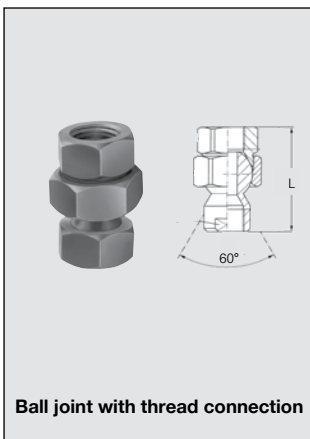


For series	Ordering no.	Material	Color
For ball joint	092. 150. 5E. 00	PVDF	blue

Pressure/Temperature Rating of Complete Bayonet Assembly

T	P _{max}
149° F	145 psi
176° F	116 psi
212° F	58 psi

Maximum pressure at various operating temperatures



For series	Ordering no.				Dimensions (in.)							Weight (Brass) lb.
	Type	Material no.			Inlet	Outlet	D ₁	D ₂	Largest HEX	L		
		303 SS/316 SS	303 SS	Brass								
422	092. 010. xx. BB. BB	-	○	○	1/8" Female NPT	1/8" Female NPT	-	-	7/8	1.70	.09	
490	092. 020. xx. BD. BD	-	○	○	1/4" Female NPT	1/4" Female NPT	-	-	1-1/16	2.37	.13	
544	092. 021. xx. BF. BD	-	○	○	3/8" Female NPT	1/4" Female NPT	-	-	1-1/16	2.30	.18	
612	092. 030. xx. BF. BF	-	○	○	3/8" Female NPT	3/8" Female NPT	-	-	1-1/8	2.23	.18	
650												
686												
688												

Example Type + Material no. + Code = Ordering no.
for ordering: 092. 020 + 16 + AD = 092. 020. 16. AD



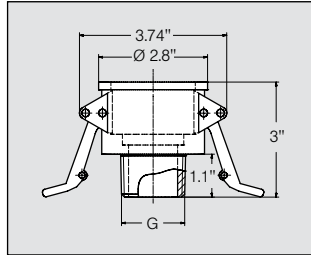
Accessories

Quick-release couplings

Pipe spacer



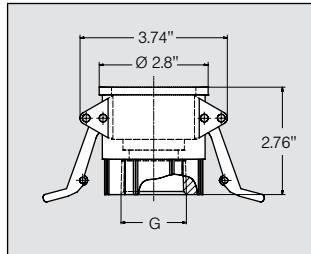
Quick-fit pipe connection (male thread)



Ordering no.	Material	G	Color
092. 300. 53. 40. B0	PP	1-1/2" NPT	purple



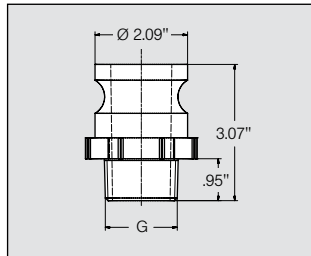
Quick-fit pipe connection (female thread)



Ordering no.	Material	G	Color
092. 300. 53. 40. D0	PP	1-1/2" NPT	purple



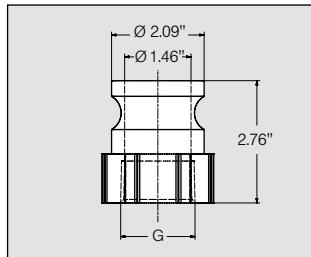
Adapter (male thread)



Ordering no.	Material	G	Color
092. 300. 53. 40. F0	PP	1-1/2" NPT	purple



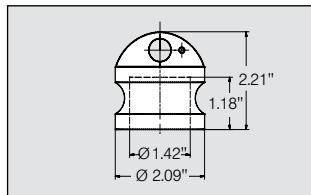
Adapter (female thread)



Ordering no.	Material	G	Color
092. 300. 53. 40. A0	PP	1-1/2" NPT	purple

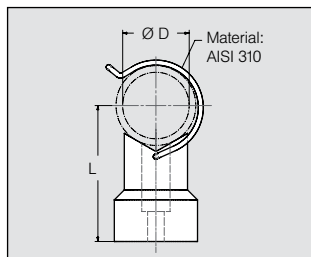


Plug



Ordering no.	Material	Color
092. 301. 53. 40. DP	PP	red

Pipe spacer



Ordering no.	Material	For pipe Ø	Dimensions (in.)	
			L	Ø D
092. 400. 53. 25. 00	PP/ 310 SS	1"	3	.98
092. 400. 53. 32. 00	PP/ 310 SS	1-1/4"	3.11	1.26
092. 400. 53. 40. 00	PP/ 310 SS	1-1/2"	3.27	1.57
092. 400. 53. 50. 00	PP/ 310 SS	2"	3.5	1.97

(incl. attachment material: screw, hexagon nut, washer, details on request)

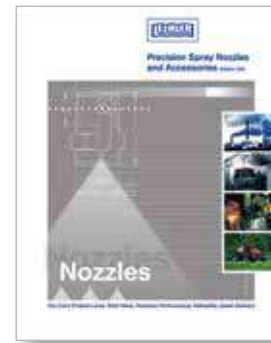
Version with two clips available on request









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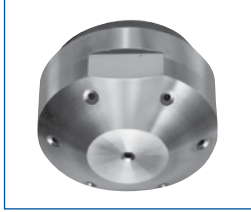
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handbook. It contains valuable tools and comprehensive technical information on Lechler products.

Many of them have for a long time also been used to satisfy a very wide range of surface treatment applications.



Pneumatic atomizing nozzles		Series	Spray pattern	Mode of liquid supply	Mixing of fluids		Flow range-Water (gal/hr)	Application/Design
		136	Full cone or flat fan	Pressure principle or suction principle	Internal or external	20° 45° 60° 80°	.03 – 35.11	Humidification of air, cooling.
Axial-flow hollow cone nozzles		Series		Flow range (gpm @ 45 psi)	Connection	Application/Design		
		220	60° 80°	.004 – .021	1/4" NPT	Disinfection, humidification of air, spraying over germinating boxes, product dampening, humidification of textiles, oil spraying, absorption.		
Eccentric hollow cone nozzles		Series		Flow range (gpm @ 40 psi)	Connection	Application/Design		
		302	60° 80° 90° 130°	.12 – 7.8	3/8" BSPP	Humidification of air in air washers, dust control, spraying onto filters, foam control, cooling. Non-clogging nozzle design, without swirl insert.		
Full cone nozzles		Series		Flow range (gpm @ 40 psi)	Connection	Application/Design		
		422 423	60° 90° 120°	.31 – 31	1/4" NPT 3/8" NPT 1/2" NPT 3/4" NPT 1" NPT	Cleaning and washing process, cooling of gaseous fluids and solids, surface spraying, spraying onto mats in air washers, improving on chemical reactions, continuous casting. Without swirl inserts, non-clogging.		

Full cone nozzles		Series		Flow range (gpm @ 40 psi)	Connection	Application/ Design
	502	70°		.39 – 18.7	1/2" NPT 3/4" NPT	Cooling of gaseous and solid material, desuperheating, chlorine precipitation, absorption as well as for improvement of chemical reaction by enlarging the contact area. Fine full cone atomization with the aid of several hollow cones spraying into one another.
	503	130°				

Flat fan nozzles		Series		Flow range (gpm @ 40 psi)	Connection	Application/ Design
	660	20°		.016 – 3.1	Assembly with 3/8" lock nut and dove-tail guide	Cleaning installations, cooling headers, spray pipes. Automatic jet alignment, due to dove-tail guide.
		30°				
45°						
60°						
75°						
90°						
120°						
						

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