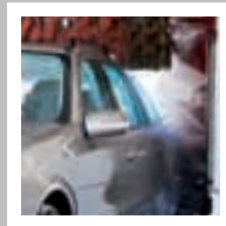
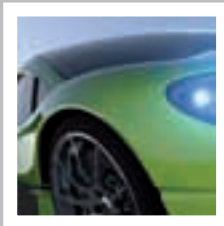
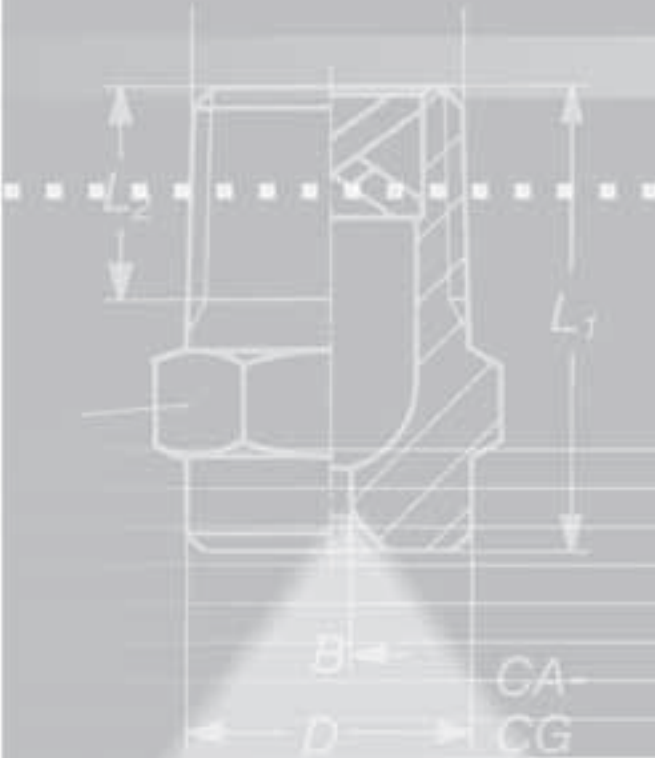




# Precision Spray Nozzles for Surface Technology



# Surface Technology

# INNOVATIVE NOZZLE TECHNOLOGY MAKES INNOVATIVE SURFACE TECHNOLOGY POSSIBLE

# B

**Being successful means making the most of all opportunities that the market offers.**



**This also includes perfect production processes. Particular importance is attached here to 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 an 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 the 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 available to you in advance.



### 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 specialist 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 specialist field of nozzle and spraying technology.



### Nozzles for surface treatment

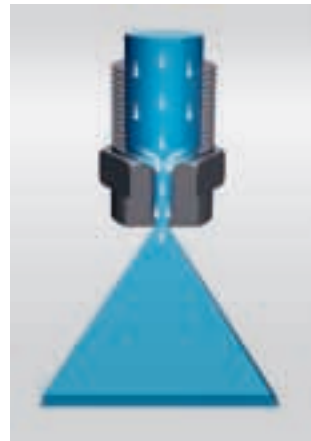
In this brochure you will find Lechler products that are specially tailored to surface technology techniques and that have already proven themselves many times over. Due to their more complex production or smaller production runs, some of these nozzles command higher prices and have longer delivery times. You should bear this in mind in your deliberations and planning. The Lechler standard catalogue also offers you an extensive range of economical and readily available standard nozzles.

Nothing in our range that meets your needs? In that case, 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 specialist 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 proved their expertise in nozzles and their knowledge of the trade, and have developed many solutions for optimising 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.lechler.de](http://www.lechler.de)



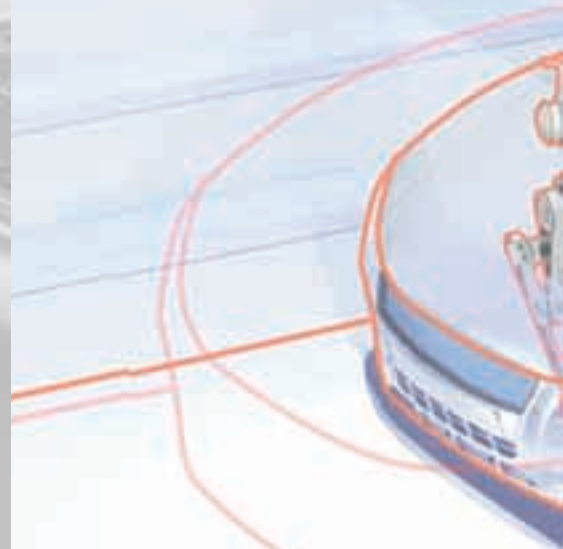
Content	Page
<b>Applications</b>	
Automobile industry	4-5
Cleaning systems	6-7
Pretreatment and painting systems	8-9
Photovoltaic and printed circuit boards industry	10-11
Part cleaning	12
Rinsing technology	13
<b>Planning criteria</b>	
<b>Products</b>	
MEMOSPRAY®/Easy-Clip	18-23
Flat fan nozzles	24-32
High-pressure flat fan nozzles	33
Tongue-type nozzles	34-36
Full cone nozzles	37-38
High-pressure solid stream nozzles	39
Eductor nozzles	40
Accessories	41-44
Other nozzles	45-46
Online services	47



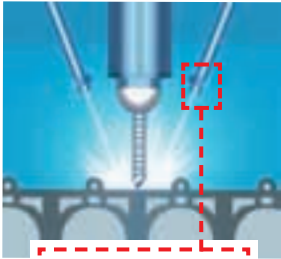
# LECHLER NOZZLES ARE USED IN MANY FIELDS IN THE AUTOMOBILE INDUSTRY

## 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** Machining centre 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
- V** 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**. Here the rain intensity settings range from gentle rain have to pass through a car wash.



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

## Nozzles for the pre-wash

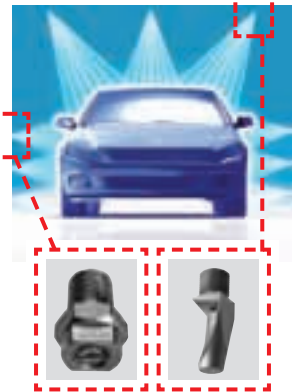
The purpose of the pre-wash is to soften the dirt. **Flat fan nozzles** or **tongue-type nozzles** with a wide spray angle and a low flow rate are preferred.



## Nozzles for the main wash

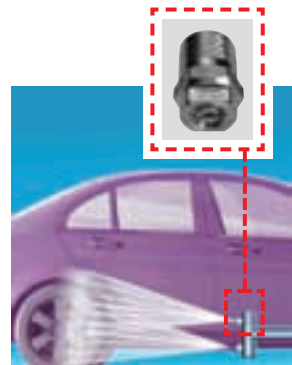
The main wash requires high-impact flat fan nozzles or tongue-type nozzles. The spray angle should be 30 to 45 degrees. Their sharp jet means that tongue-type nozzles are ideally suited to the low pressure.

**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 third of the vehicle is mostly where dirt is found (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 eyelet clamp**.

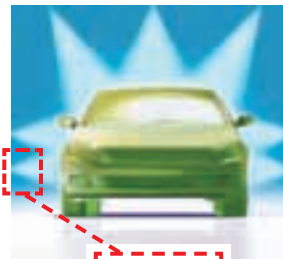
Manifolds fitted with this series distribute the water very evenly.



### Nozzles for rinsing

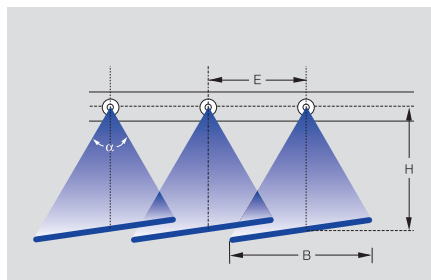
Rinsing is the last stage before drying. This requires small droplets that run off the vehicle quickly. **Flat fan nozzles** with a very low flow rate are used in most cases.

The nozzles are easy to align in conjunction with a **bayonet cap** and a **ball joint**.



### Arrangement of low-pressure flat fan nozzles

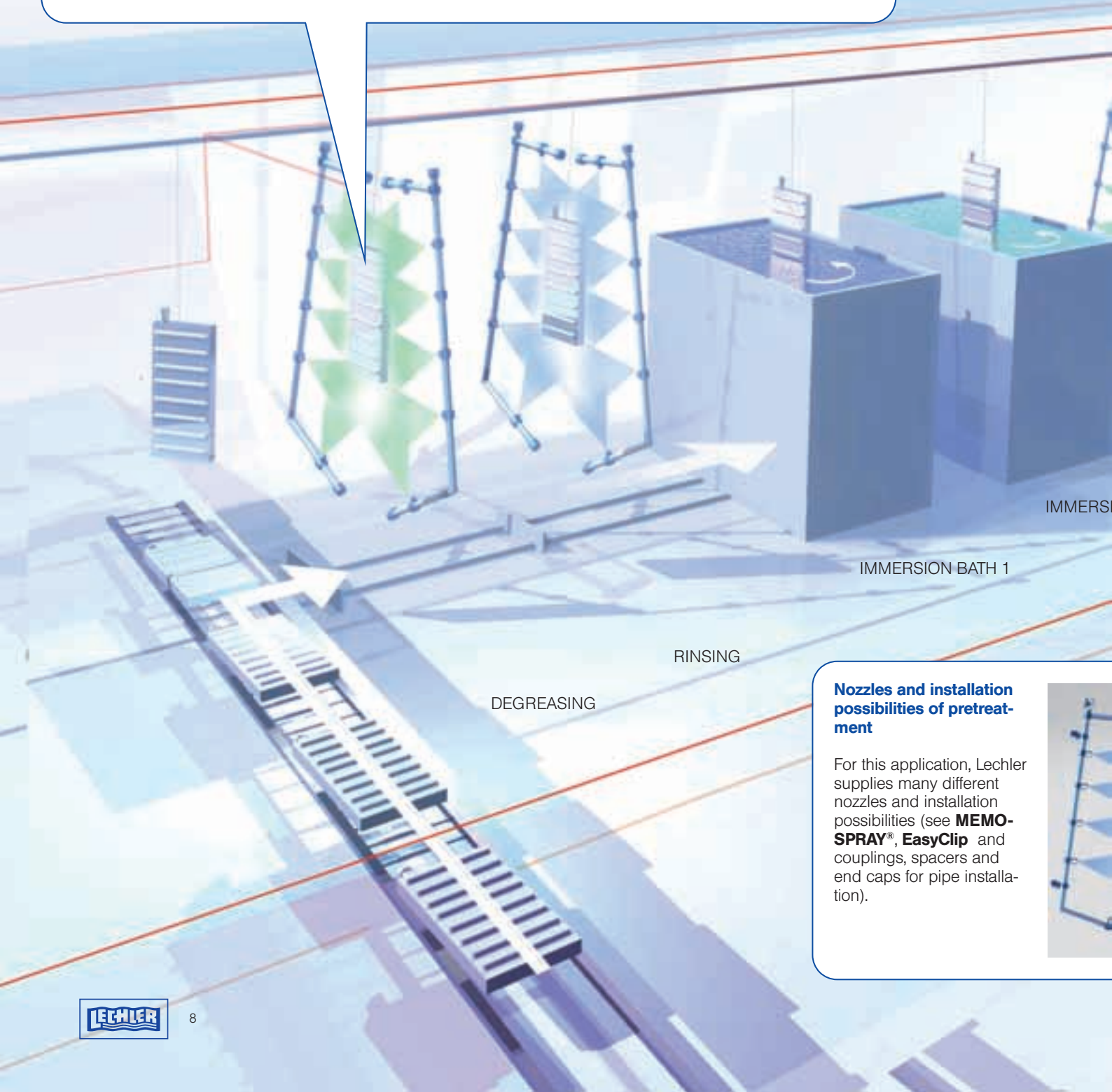
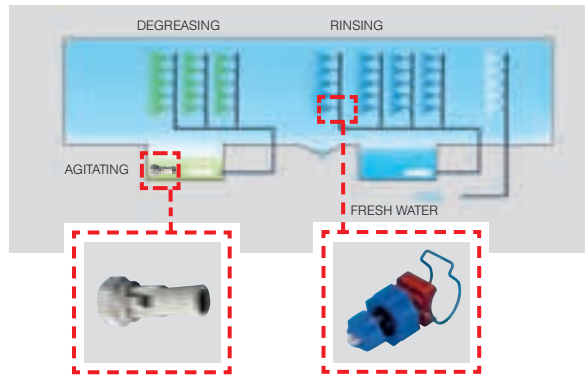
Lechler **flat fan nozzles** give you a linear impact with even droplet application. A prerequisite for this is that the spray widths  $B$  overlap by approximately  $1/3-1/4$ . Here the nozzles should be aligned approximately  $5-15^\circ$  to the pipe's longitudinal axis in order to prevent the sprays from being interrupted.



# 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 deionised water. **Eductor nozzles** are also used under water, the purpose of which is to prevent sedimentation.



## Nozzles and installation possibilities of pretreatment

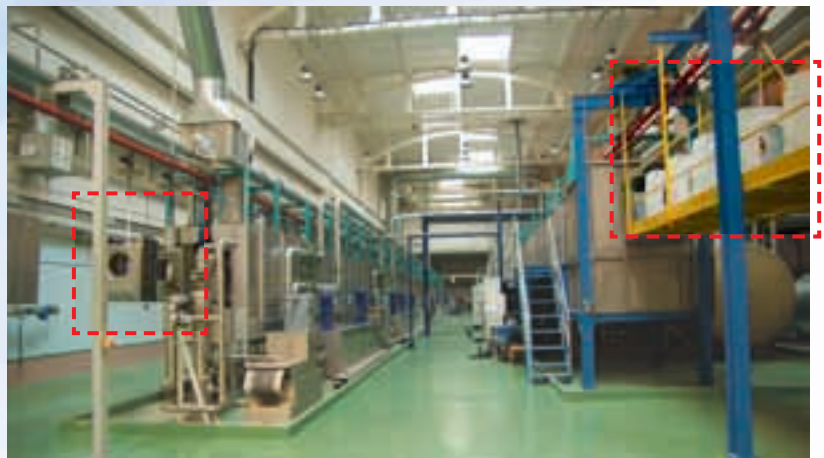
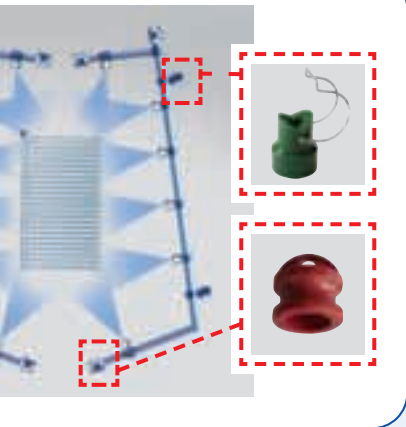
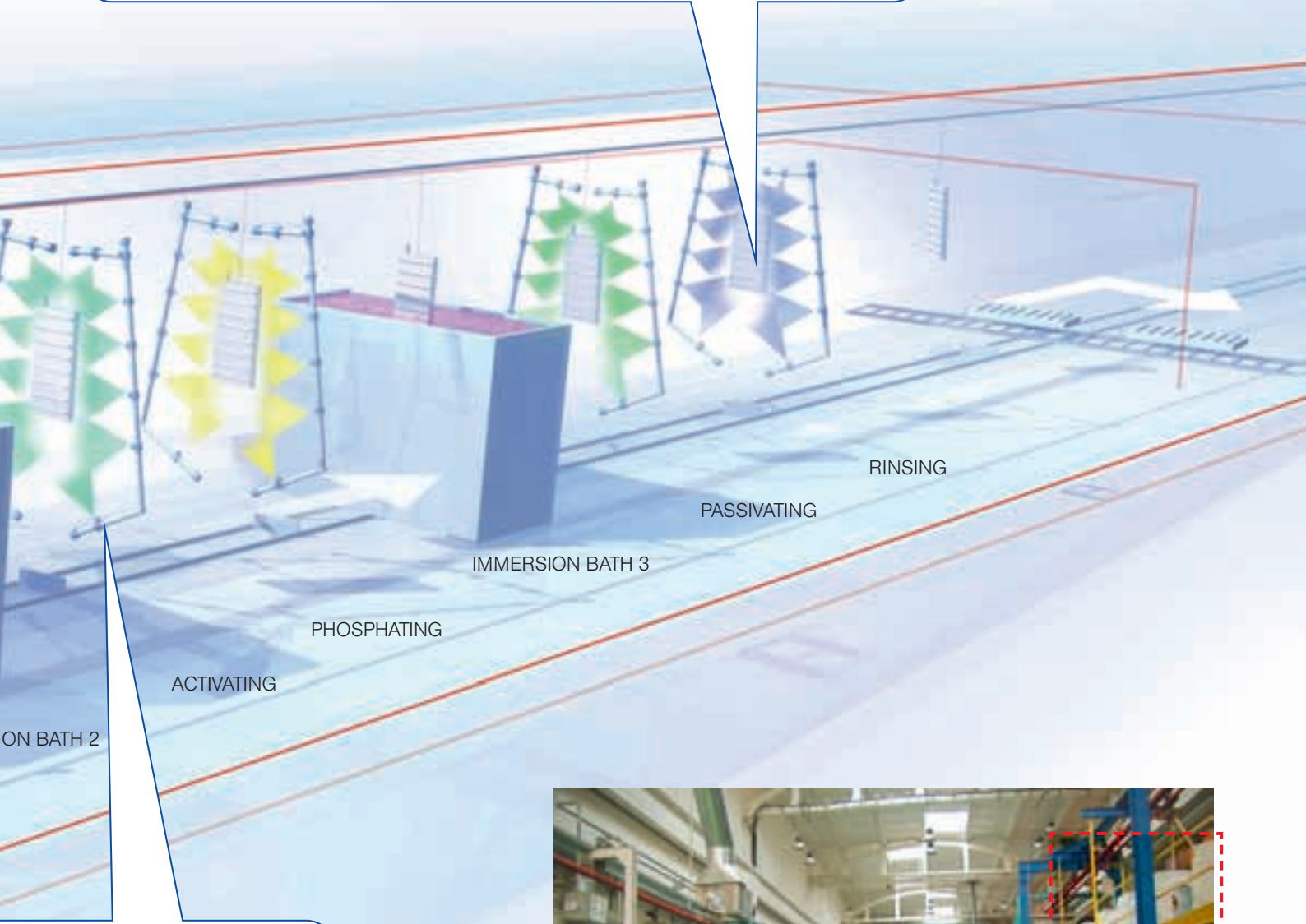
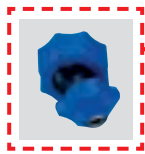
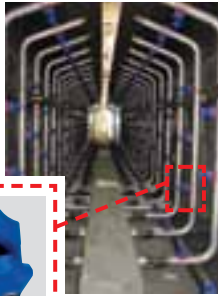
For this application, Lechler supplies many different nozzles and installation possibilities (see **MEMO-SPRAY®**, **EasyClip** and couplings, spacers and end caps for pipe installation).





### 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 deionised water is used.

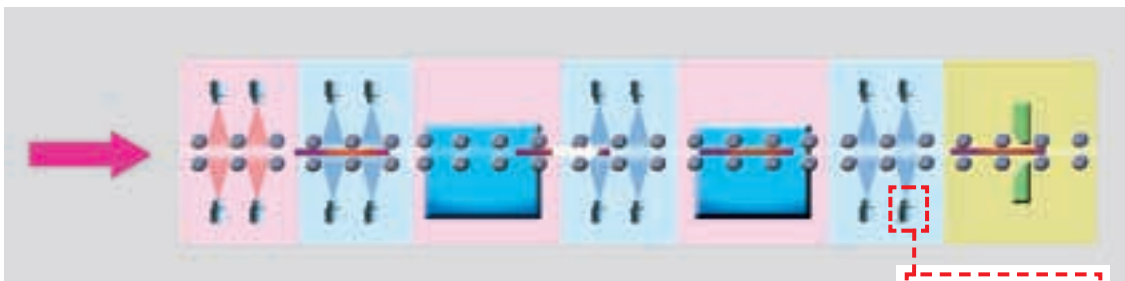


Example of a painting line for washing machine housings. On the left the component before painting, on the right the painting housing exits.

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

## Rotating cleaning nozzles for printed circuit board manufacture

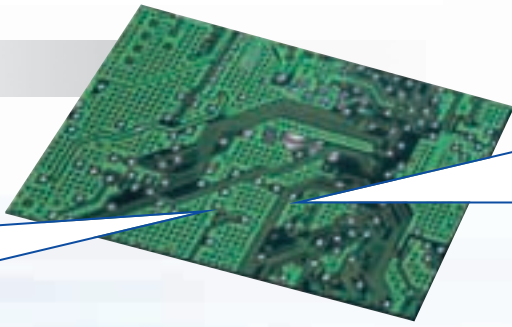
Rotating cleaning nozzles for printed circuit board manufacture **series 500.191. Rotating cleaning nozzles** are used in horizontal continuous through-put systems for printed circuit board manufacture. The nozzles are made entirely of PVDF, which makes them optimally suited for use in sulphuric acid-based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



## Nozzles for alkaline texturing

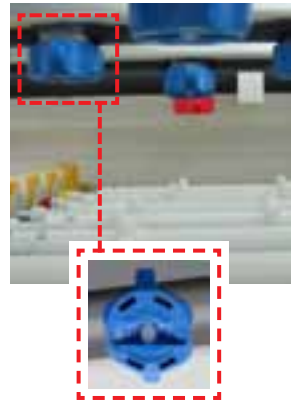
Flat fan nozzles in several series-connected modules are used in this process. Nozzles made of PVDF are preferred, because they are resistant to the chemicals used.





### 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

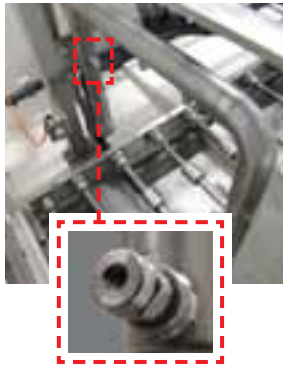


are already familiar, such as **series 646 bayonet quick-locking system**.



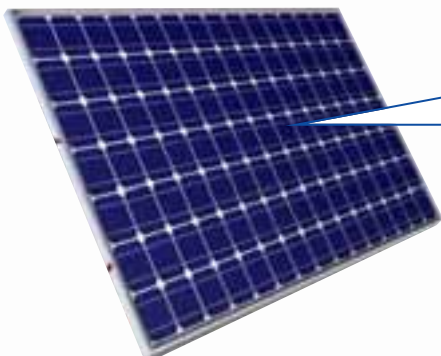
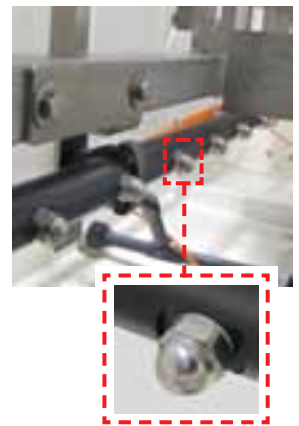
### Wafer cleaning

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.

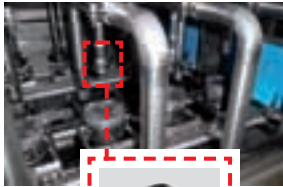




# PART CLEANING WITH LECHLER FLAT FAN NOZZLES AND TONGUE-TYPE NOZZLES

## Cleaning engine pistons

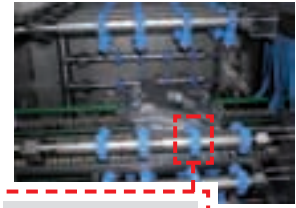
Dual-lane continuous cyclic cleaning system for cleaning aluminium engine pistons. Increasing volumes require efficient and reliable nozzles. **Series 612 nozzles** can be used if only a small installation space is available at the same time.



## 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 high 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 632 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 clean 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 BEAR 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 surface technology. The ratio of the impact force (F) to the sprayed surface (A) is referred to as the impact (I).

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

The following explains the parameters with which the impact can be influenced.

### Impact surface and jet shape

The impact surface represents the area that droplets strike. In other words the area impacted by the liquid jet. Nozzles with a small impact surface also attain the highest impact values. These nozzles include, for example, solid jet nozzles and flat fan nozzles with a narrow spray angle.

### Pressure

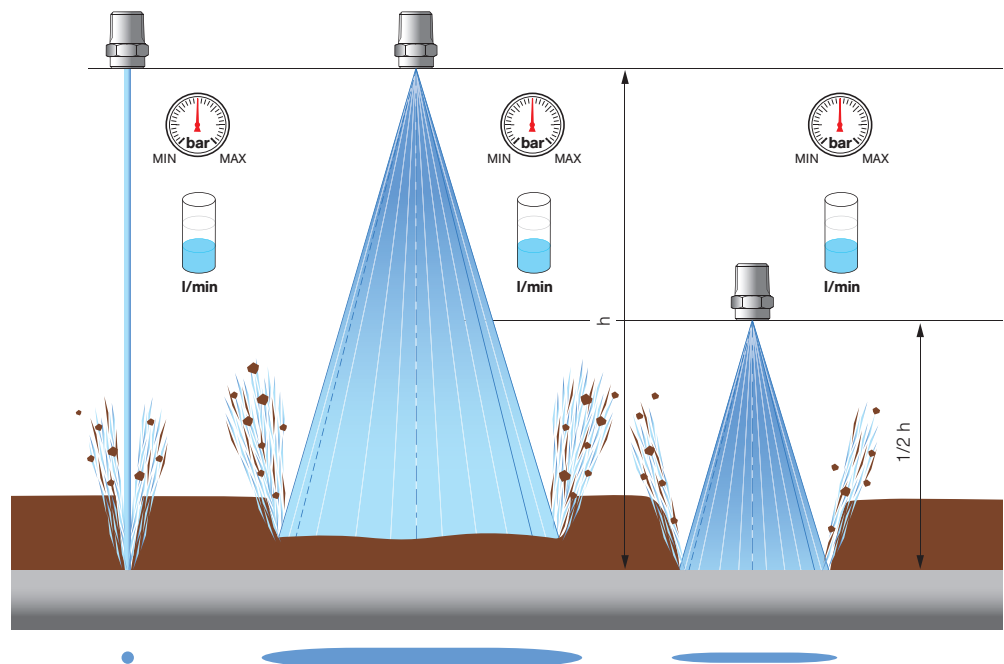
Increasing the connected pressure results in an increase in the spray impact. Doubling the pressure while maintaining the same flow rate results in a doubling of the impact.

### Flow rate

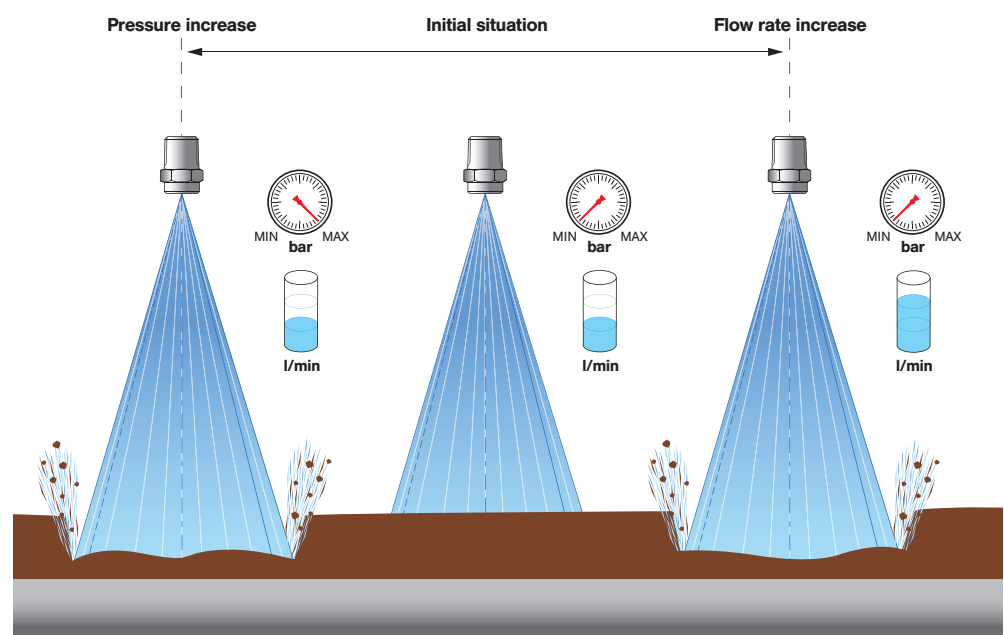
Increasing the flow rate by using a larger nozzle increases the impact, assuming that the other parameters (spray angle, pressure and medium) remain the same.

## Nozzle selection criteria:

- ① **Impact**
  - Impact surface and jet shape
  - Spraying distance
  - Pressure
  - Flow rate
  - Jet depth
- ② **Spray angle and spraying behaviour**
- ③ **Liquid distribution**
- ④ **Droplet sizes**
- ⑤ **Factors influencing the temperature behaviour of nozzle materials**
- ⑥ **Material and wear**



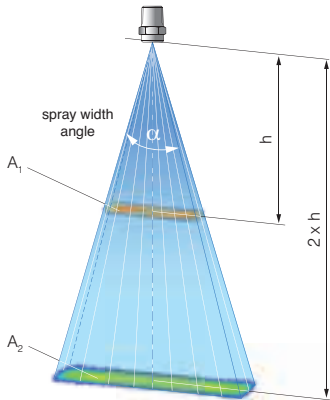
Comparison of the cleaning result of three nozzles with identical pressure and flow rate.



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.

Theoretically, for atomization nozzles, the greater the distance the greater also the surface area sprayed, resulting in the impact being reduced accordingly.

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

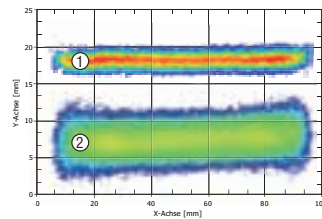
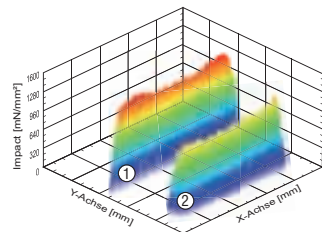
In theory, the following applies to flat fan nozzles: If the spraying distance is doubled, the sprayed surface area quadruples. Consequently, the impact decreases four-fold.

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 jet geometries (Lechler high-pressure flat fan nozzles) or a high flow quality, 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 depth 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

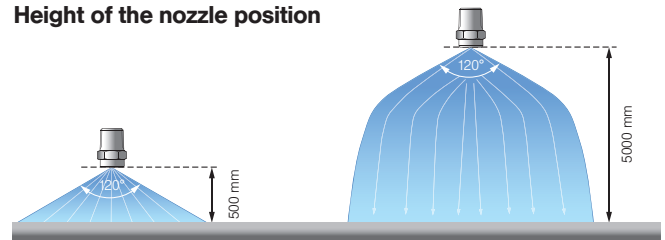
### ② Spray angle and spraying behaviour

Depending on the version and job, single-fluid nozzles are available with differently stepped spray angles from 0° (solid jet nozzles) to 360° (tank-cleaning nozzles). The spray angles quoted by Lechler apply close to the nozzle and in a still atmosphere. Gravity and flow processes in the ambient atmosphere alter the spray pattern. Depending on the version, single-fluid nozzles can spray the liquid as a hollow cone, full cone or flat fan.

The solid jet nozzle does not spray, but rather produces a closed jet that hits at a concentrated point.

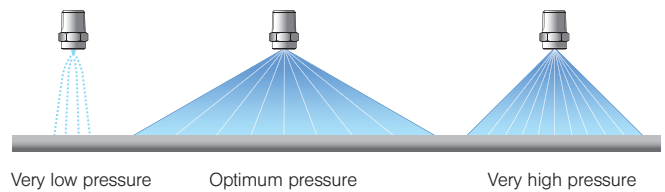
The jet only begins to break up after some distance. Twin-fluid nozzles have a narrow spray angle of approximately 20° due to the high speed at which the compressible medium exits. However, as the distance from the nozzle increases, the spray pattern becomes increasingly less sharply defined. Twin-fluid nozzles normally produce full cone or flat fan spray patterns, and some versions can be changed over accordingly.

### Height of the nozzle position

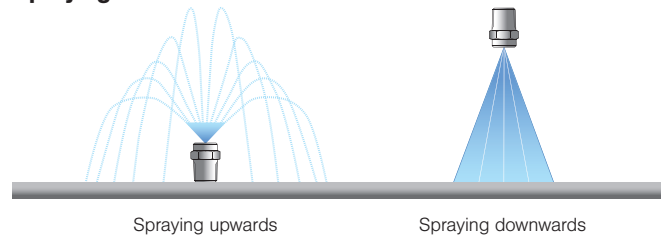


The diagram above illustrates how height influences the spray pattern.

### Changing the nozzle pressure



### Spraying direction



Horizontal spraying

# WHAT YOU SHOULD BEAR IN MIND WHEN PLANNING

## ③ Liquid distribution

In coating processes, for example, it is attached to the homogenous distribution of the sprayed liquid. In order to obtain an even liquid distribution, several nozzles must be arranged next to each other because one nozzle alone would produce a parabolic liquid distribution as standard. The arrangement of several nozzles enables an almost even distribution to be obtained by overlapping.



## Measuring the distribution

The liquid distribution in a measuring plane is determined by collecting the volume of liquid in a combination of Plexiglas cylinders. The filling level of the individual cylinders is determined completely automatic. This measuring process is also suitable for recording the liquid distribution of a nozzle across a moving measuring plane. This enables conveyor belt spraying to be simulated, for example.

## ④ Droplet sizes

Twin-fluid nozzles can produce very fine to extremely fine droplets, this being mainly dependent on the flow rate ratio of the compressible medium being used ( $m^3/h$ ) to the atomized liquid ( $l/min$ ). The greater this ratio, the finer the atomization. In the case of single-fluid nozzles, the droplet spectrum is determined primarily by the pressure, the nozzle design and the flow rate. Increasing pressure results in finer atomization, but mostly only up to a certain level.



Provided that the pressure and flow rate are the same, hollow cone nozzles produce very fine to fine droplets, full cone nozzles produce somewhat coarser droplet spectrums and flat fan nozzles have the coarsest droplet spectrum. If we compare nozzles of one series at a particular pressure, nozzles with a lower flow rate produce finer droplet spectrums than nozzles with a higher flow rate.

## ⑤ Factors that influence the temperature behaviour of nozzle materials

A distinction must be made here between low-temperature behaviour and high-temperature behaviour. Applications with temperatures up to  $140^\circ C$  are very common, because this is the range within which for example most cleaning applications and sterilisation processes fall. Applications with higher temperatures are rare, and applications at very low temperatures are even more rare.

The general temperature information from material data sheets must always be scrutinised for every single

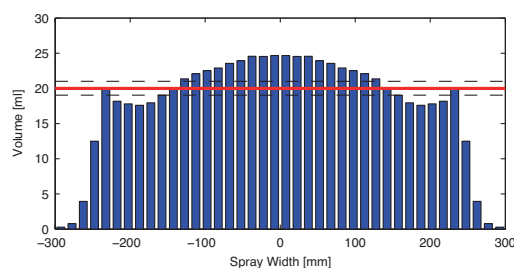
case of nozzle use. The main factors that influence the suitability of a nozzle material at higher temperatures are: Pressure and the associated mechanical stress type along with chemistry and time. Chemical processes can be more aggressive at high temperatures. A material may be able to withstand them if this temperature occurs for a short period only. In all materials, high temperatures result in reduced strength values. The mechanical stress type must therefore also be taken into account in high-pressure applications, in particular. In addition, vibrations in the system can cause premature failure.

Chemistry (accelerated by high temperatures)

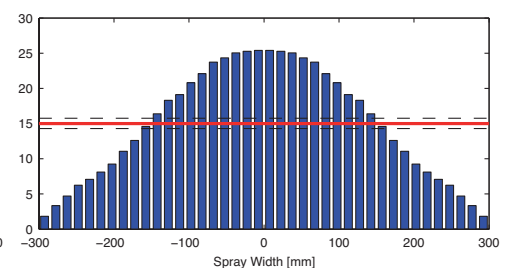
Pressure and mechanical stress (e.g. vibrations)

Temperature behaviour of nozzle materials

Time (permanently high temperatures)



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 primarily on the conditions of use and the nozzle material. Normally, the nozzle's liquid 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 liquid 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 liquid opening that results from material abrasion. This means that if a pressure is permanently set, more liquid is discharged than it was originally intended.

The result of this is higher fresh water and waste water costs.

Fig. 1 shows an example of a heavily corroded spray ball.



Fig. 1: Chemical corrosion of a spray ball



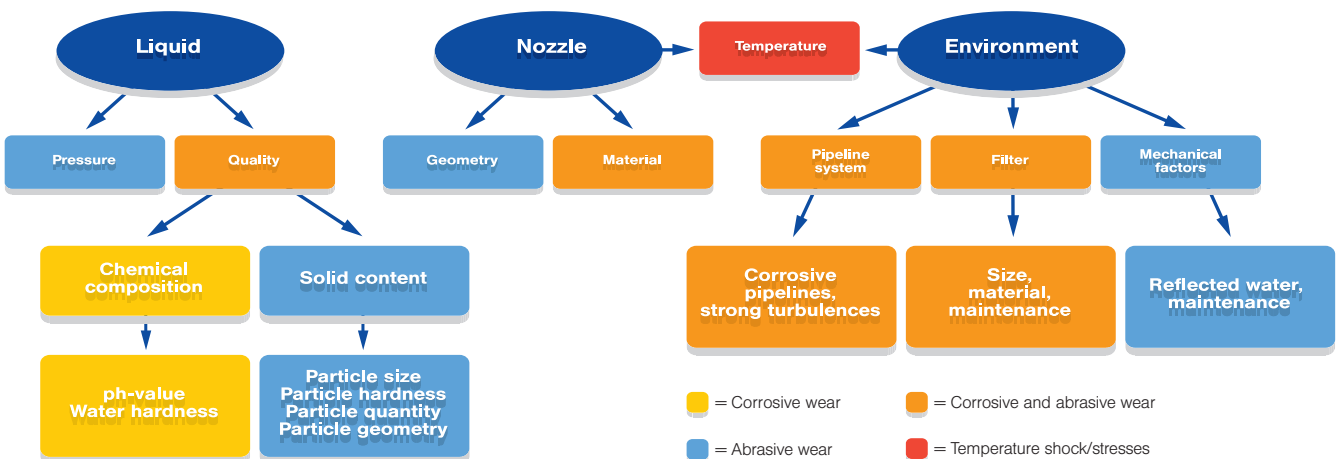
Fig. 2: Wear of a full cone nozzle

## 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. Such particle-laden liquids 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 for the purpose of rough estimates only.

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.



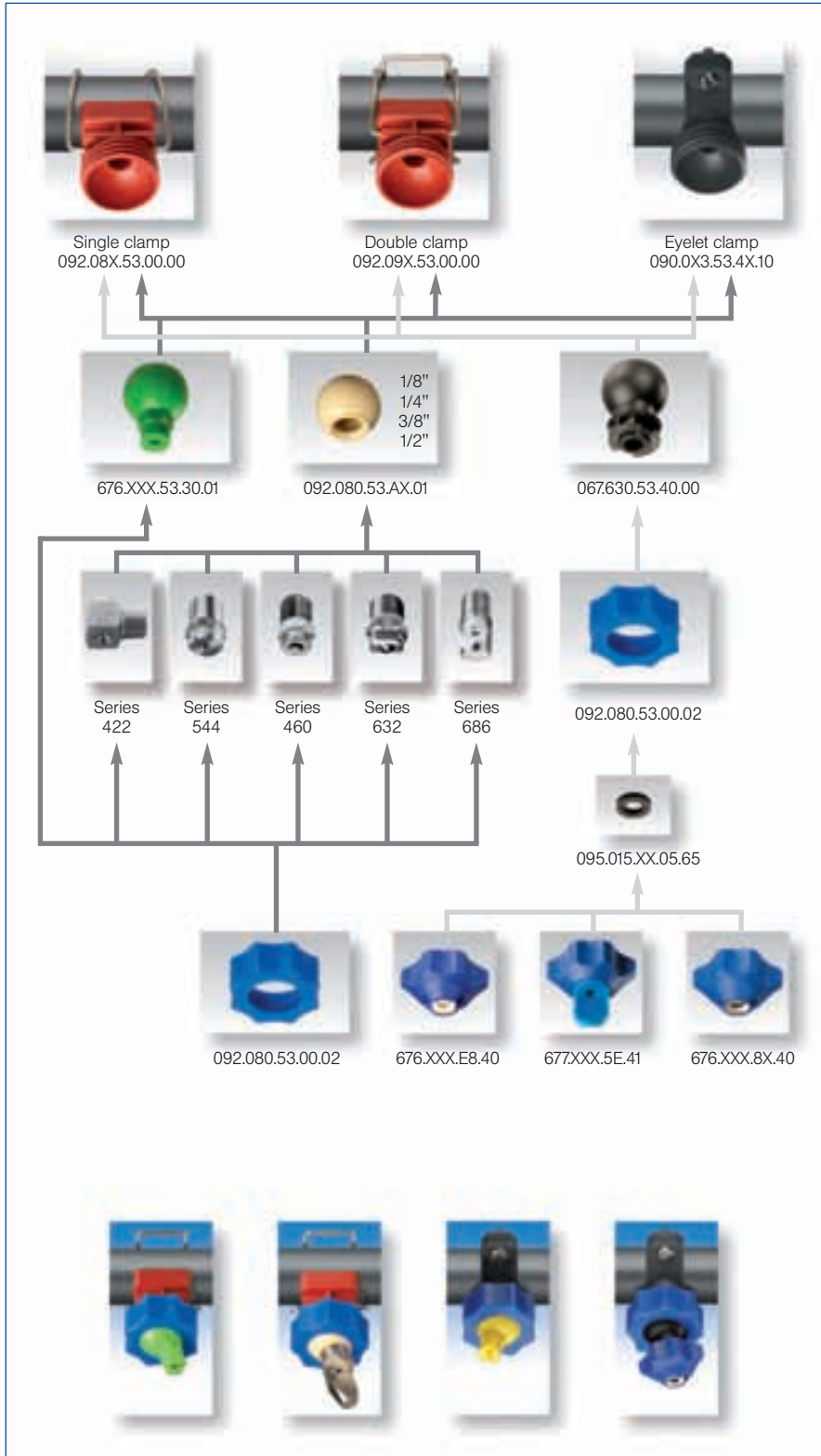


# Nozzle systems for surface treatment

## MEMOSPRAY®/Easy-Clip



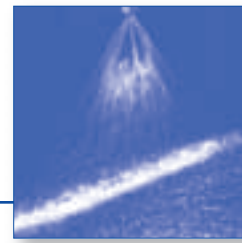
### MEMOSPRAY® / Easy-Clip combination





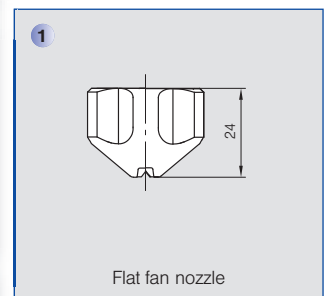
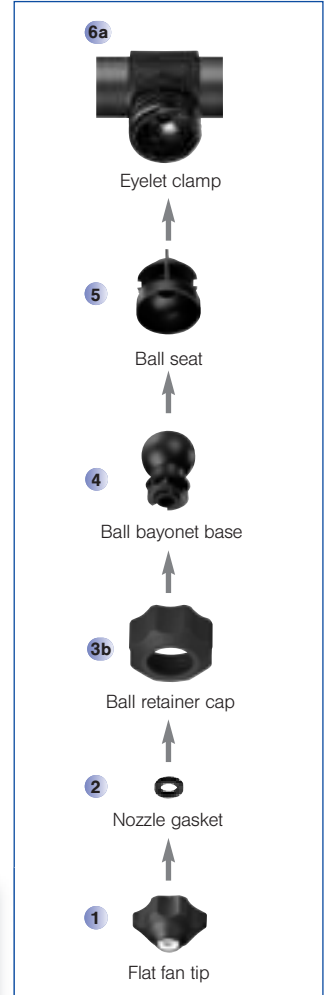
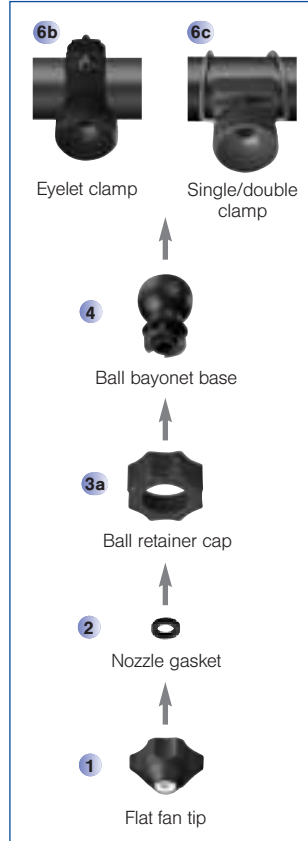
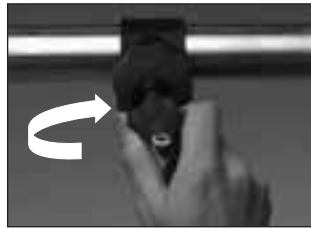
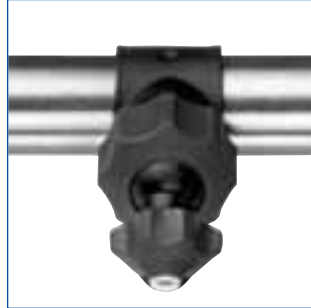
# Nozzle systems for surface treatment

## MEMOSPRAY® nozzle system



**Special pressure-resistant pipe connector, which maintains the adjusted spray direction using the »Memory Method«. Very easy assembly and maintenance without the need for special tools.**

Application:  
Degreasing, phosphating in surface treatment, cleaning.



Type	Ordering no.	Material-no.				E Ø [mm]	Flow rate [l/min] at p [bar]					Weight [g]				
		8F	8R	E8	53		1.0	1.5	2.0	2.5	5.0	PP/ 303 SS	PP/ 316 L	PP/Ceramic	PP	
1 Flat fan nozzle	30°	676. 642. xx. 40	○	○	-	-	1.6	2.83	3.46	4.00	4.47	6.33	15	15	-	-
	30°	676. 722. xx. 40	○	○	-	-	2.1	4.46	5.46	6.30	7.04	9.96	15	15	-	-
	30°	676. 762. xx. 40	○	○	-	-	2.3	5.66	6.93	8.00	8.94	12.65	15	15	-	-
	30°	676. 802. xx. 40	○	○	-	-	2.6	7.07	8.66	10.00	11.18	15.81	15	15	-	-
	30°	676. 842. xx. 40	○	○	-	-	3.0	8.84	10.82	12.50	13.97	19.76	15	15	-	-
	30°	676. 882. xx. 40	○	○	-	-	3.4	11.31	13.86	16.00	17.89	25.30	15	15	-	-
	30°	676. 922. xx. 40	○	○	-	-	4.1	14.14	17.32	20.00	22.36	31.62	15	15	-	-
1 Flat fan nozzle	30°	676. 962. xx. 40	○	○	-	-	4.2	17.68	21.65	25.00	27.95	39.53	15	15	-	-
	30°	677. 002. xx. 40	○	-	-	-	4.7	22.27	27.28	31.50	35.22	49.81	15	-	-	-
	60°	676. 644. xx. 40	○	○	-	-	1.6	2.83	3.46	4.00	4.47	6.33	15	15	-	-
	60°	676. 724. xx. 40	○	○	-	-	2.1	4.46	5.46	6.30	7.04	9.96	15	15	-	-
	60°	676. 764. xx. 40	○	○	-	-	2.3	5.66	6.93	8.00	8.94	12.65	15	15	-	-
	60°	676. 804. xx. 40	○	○	-	-	2.6	7.07	8.66	10.00	11.18	15.81	15	15	-	-
	60°	676. 844. xx. 40	○	○	-	-	3.0	8.84	10.82	12.50	13.97	19.76	15	15	-	-
	60°	676. 884. xx. 40	○	○	○	○	3.4	11.31	13.86	16.00	17.89	25.30	15	15	10	8
	60°	676. 924. xx. 40	○	○	○	○	4.1	14.14	17.32	20.00	22.36	31.62	15	15	10	8
	60°	676. 964. xx. 40	○	○	○	○	4.2	17.68	21.65	25.00	27.95	39.53	15	15	10	8
	60°	677. 004. xx. 40	○	○	○	○	4.7	22.27	27.28	31.50	35.22	49.81	15	15	10	8
60°	677. 044. xx. 40	○	○	-	-	5.5	28.28	34.64	40.00	44.72	63.25	15	15	-	-	
60°	677. 084. xx. 40	○	○	-	-	6.2	35.36	43.30	50.00	55.90	79.06	15	15	-	-	

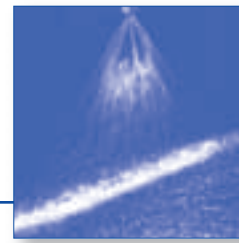
Continued on next page.

Conversion formula for the above series:  $\dot{V}_2 = \dot{V}_1 * \sqrt{\frac{P_1}{P_2}}$

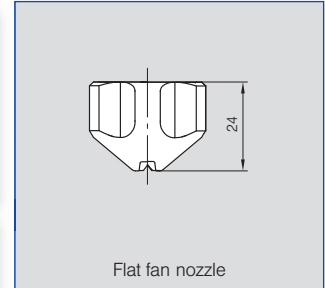


# Nozzle systems for surface treatment

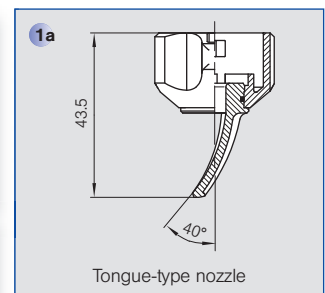
## MEMOSPRAY® nozzle system



Type		Ordering no.	Material-no.				E Ø [mm]	Flow rate [l/min] at p [bar]					Weight [g]			
			8F	8R	E8	53		1.0	1.5	2.0	2.5	5.0	PP/ 303 SS	PP/ 316 L	PP/Ceramic	PP
1 Flat fan nozzle		90° 676. 646. xx. 40	○	○	-	-	1.6	2.83	3.46	4.00	4.47	6.33	15	15	-	-
		90° 676. 726. xx. 40	○	○	-	-	2.1	4.46	5.46	6.30	7.04	9.96	15	15	-	-
		90° 676. 766. xx. 40	○	○	-	-	2.3	5.66	6.93	8.00	8.94	12.65	15	15	-	-
		90° 676. 806. xx. 40	○	○	-	-	2.6	7.07	8.66	10.00	11.18	15.81	15	15	-	-
		90° 676. 846. xx. 40	○	○	-	-	3.0	8.84	10.82	12.50	13.97	19.76	15	15	-	-
		90° 676. 886. xx. 40	○	○	-	-	3.4	11.31	13.86	16.00	17.89	25.30	15	15	-	-
		90° 676. 926. xx. 40	○	○	-	-	4.1	14.14	17.32	20.00	22.36	31.62	15	15	-	-
		90° 676. 966. xx. 40	○	○	-	-	4.2	17.68	21.65	25.00	27.95	39.53	15	15	-	-
1 Flat fan nozzle		120° 676. 647. xx. 40	○	○	-	-	1.6	2.83	3.46	4.00	4.47	6.33	15	15	-	-
		120° 676. 727. xx. 40	○	○	-	-	2.1	4.46	5.46	6.30	7.04	9.96	15	15	-	-
		120° 676. 767. xx. 40	○	○	-	-	2.3	5.66	6.93	8.00	8.94	12.65	15	15	-	-
		120° 676. 807. xx. 40	○	○	-	-	2.6	7.07	8.66	10.00	11.18	15.81	15	15	-	-
		120° 676. 847. xx. 40	○	○	-	-	3.0	8.84	10.82	12.50	13.97	19.76	15	15	-	-
		120° 676. 887. xx. 40	○	○	-	-	3.4	11.31	13.86	16.00	17.89	25.30	15	15	-	-
		120° 676. 927. xx. 40	○	○	-	-	4.1	14.14	17.32	20.00	22.36	31.62	15	15	-	-



Type		Ordering no.	Material-no.				E Ø [mm]	Flow rate [l/min] at p [bar]					Weight [g]			
			8F	8R	E8	5E		1.0	1.5	2.0	2.5	5.0	PP/ 303 SS	PP/ 316 L	PP/Ceramic	PVDF
1a Tongue-type nozzle		70° 677. 005. xx. 41	-	○	-	○	6.0	22.27	27.28	31.50	35.22	49.81	-	25	-	11



E = narrowest free cross section

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





# Nozzle systems for surface treatment

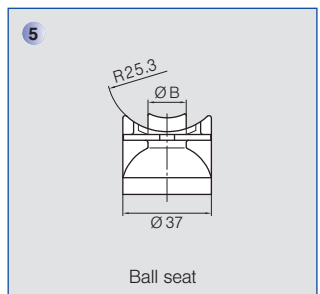
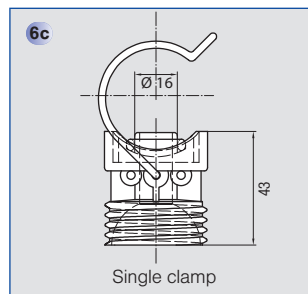
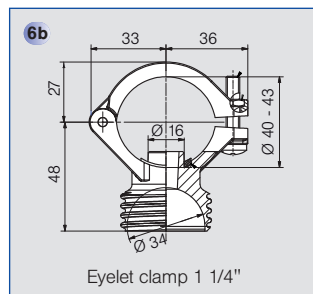
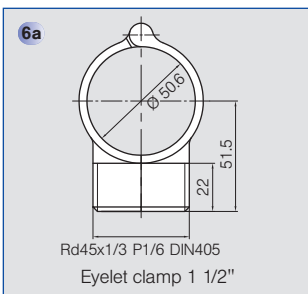
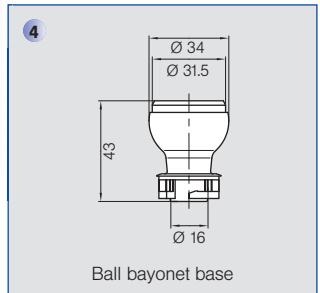
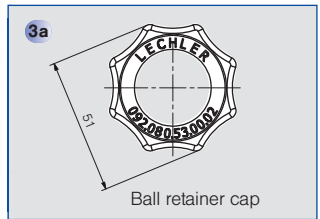
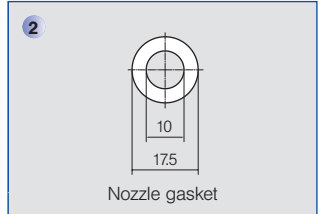
## MEMOSPRAY® nozzle system



	Type	Ordering no.	Material-no.				Bore-Ø B	For pipe-Ø	Weight [g]	
			53	6M	6C	7A			PP	EPDM/Viton
			Polypropylene (PP)	PP reinforced	EPDM	Viton				
2	Nozzle gasket	095.015.xx.05.65	-	-	○	○			-	1
3a	Ball retainer cap	092.080.xx.00.02	○	-	-	-			18	-
3b	Ball retainer cap	067.600.xx.40	○	-	-	-			18	-
4	Ball bayonet base	067.630.xx.40	○	-	-	-			12	-
5	Ball seat for ball retainer cap no. 067.631.xx.40.00.0	067.631.xx.40.22	-	○	-	-	13.8 mm	1 1/4" (40.0-43.0 mm)	9	-
		067.631.xx.40.02	-	○	-	-	16.0 mm	1 1/4" (40.0-43.0 mm)	11	-
		067.631.xx.40.12	-	○	-	-	19.8 mm	1 1/4" (40.0-43.0 mm)	13	-
	Ball seat for ball retainer cap no. 067.631.xx.50.00.0	067.631.xx.50.22	-	○	-	-	13.8 mm	1 1/2" (46.0-49.0 mm)	9	-
		067.631.xx.50.02	-	○	-	-	16.0 mm	1 1/2" (46.0-49.0 mm)	11	-
		067.631.xx.50.12	-	○	-	-	19.8 mm	1 1/2" (46.0-49.0 mm)	13	-
6a	Eyelet clamp	067.631.xx.40.00	○	-	-	-	-	1 1/4" (40.0-43.0 mm)	31	-
		067.631.xx.50.00	○	-	-	-	-	1 1/2" (46.0-49.0 mm)	33	-
6b	Eyelet clamp	090.023.xx.44.10	○	-	-	-	13.8 mm	1" (32.0-34.5 mm)	48	-
		090.023.xx.43.10	○	-	-	-	16.0 mm	1" (32.0-34.5 mm)	48	-
		090.033.xx.44.10	○	-	-	-	13.8 mm	1 1/4" (40.0-43.0 mm)	50	-
		090.033.xx.43.10	○	-	-	-	16.0 mm	1 1/4" (40.0-43.0 mm)	50	-
		090.033.xx.40.10	○	-	-	-	20.0 mm	1 1/4" (40.0-43.0 mm)	50	-
		090.043.xx.44.10	○	-	-	-	13.8 mm	1 1/2" (46.0-49.0 mm)	52	-
	Eyelet clamp	090.043.xx.43.10	○	-	-	-	16.0 mm	1 1/2" (46.0-49.0 mm)	52	-
		090.043.xx.40.10	○	-	-	-	20.0 mm	1 1/2" (46.0-49.0 mm)	52	-
6c	Single clamp*	092.080.xx.00	○	-	-	-	16.0 mm	1" (32.0-34.5 mm)	36	-
		092.081.xx.00	○	-	-	-	16.0 mm	1 1/4" (40.0-43.0 mm)	38	-
		092.082.xx.00	○	-	-	-	16.0 mm	1 1/2" (46.0-49.0 mm)	40	-
		092.083.xx.00	○	-	-	-	16.0 mm	2" (58.0-62.0 mm)	42	-

\* Other bore-Ø on request  
E = narrowest free cross section

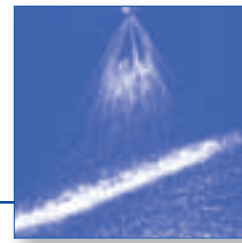
**Example**    **Type**                    + **Material-no.**    = **Ordering no.**  
for ordering: 095.015.xx.05.65 + 6C                    = 095.015.6C.05.65





# Nozzle systems for surface treatment

## Easy-Clip nozzle system



**Quick and easy assembly with clamp. No tools required. Allround swivelling by 30°. Easy adjustment and cleaning.**

Applications:  
Degreasing, phosphating in surface treatment.

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

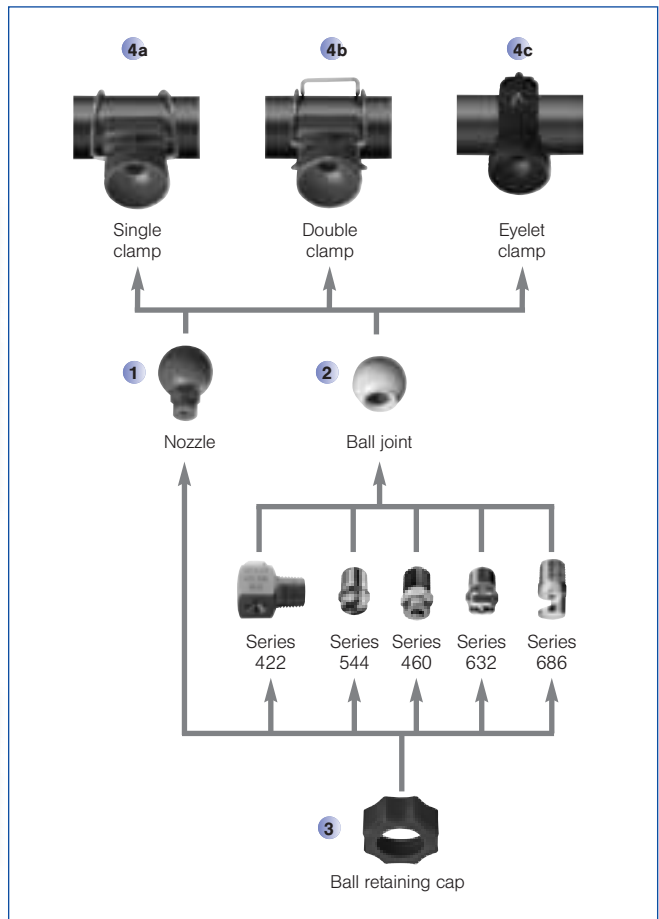
- Nozzle
- Single clamp for 1 1/4" pipe
- Ball retainer cap

Ordering no.	Nozzle colour	↻	V̇ [l/min]				
			p [bar]				
			0.5	1.0	1.5	2.0	2.5
676. 724. 53. 31	grey	60°	3.15	4.45	5.45	6.30	7.04
676. 764. 53. 31	brown	60°	4.00	5.66	6.93	8.00	8.94
676. 804. 53. 31	lilac	60°	5.00	7.07	8.66	10.00	11.18
676. 844. 53. 31	yellow	60°	6.25	8.84	10.83	12.50	13.98
676. 884. 53. 31	red	60°	8.00	11.31	13.85	16.00	17.89
676. 904. 53. 31	blue	60°	9.10	12.87	15.76	18.20	20.35
676. 924. 53. 31	green	60°	10.00	14.14	17.32	20.00	22.36

existing of

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

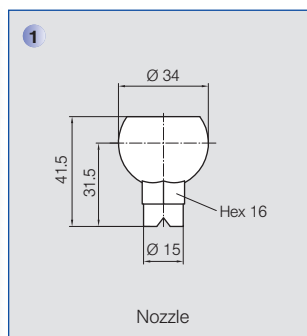
Ordering no.	Ball colour	Nozzle connection	For nozzle series
092. 081. 53. AB	beige	1/8"	460, 632, 686, 544
092. 081. 53. AD	beige	1/4"	422, 460, 544, 632, 686
092. 081. 53. AF	beige	3/8"	422, 460, 632, 686, 688
092. 081. 53. AH	beige	1/2"	422, 460, 632, 686



### Components

#### 1 Nozzle

Ordering no.	Colour	↻	V̇ [l/min]				
			p [bar]				
			0.5	1.0	1.5	2.0	2.5
676. 724. 53. 30. 01	grey	60°	3.15	4.45	5.45	6.30	7.04
676. 764. 53. 30. 01	brown	60°	4.00	5.66	6.93	8.00	8.94
676. 804. 53. 30. 01	lilac	60°	5.00	7.07	8.66	10.00	11.18
676. 844. 53. 30. 01	yellow	60°	6.25	8.84	10.83	12.50	13.98
676. 884. 53. 30. 01	red	60°	8.00	11.31	13.85	16.00	17.89
676. 904. 53. 30. 01	blue	60°	9.10	12.87	15.67	18.20	20.35
676. 924. 53. 30. 01	green	60°	10.00	14.14	17.32	20.00	22.36
092. 080. 53. 00. 01	grey		Blind nozzle				





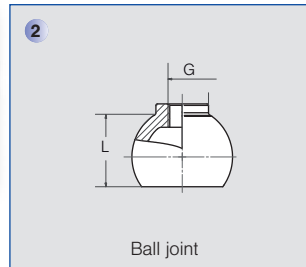
## Nozzle systems for surface treatment

### Easy-Clip nozzle system



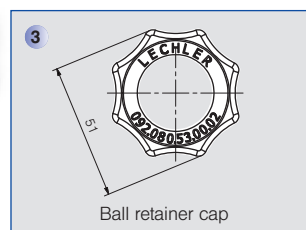
#### 2 Ball joint

Ordering no.	Colour	Nozzle connection	L [mm]	For nozzle series
092. 080. 53. AB. 01	beige	1/8"	24.8	460, 544, 632, 686
092. 080. 53. AD. 01	beige	1/4"	24.8	422, 460, 544, 632, 686
092. 080. 53. AF. 01	beige	3/8"	31.4	422, 460, 632, 686, 688
092. 080. 53. AH. 01	beige	1/2"	24.8	422, 460, 632, 686



#### 3 Ball retainer cap

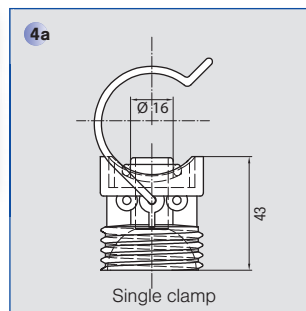
Ordering no.
092. 080. 53. 00. 02



#### 4a Single clamp

Ordering no.	Bore-Ø	For Pipe-Ø
092. 080. 53. 00	16 mm	1" (32.0-34.5 mm)
092. 081. 53. 00	16 mm	1 1/4" (40.0-43.0 mm)
092. 082. 53. 00	16 mm	1 1/2" (46.0-49.0 mm)
092. 083. 53. 00	16 mm	2" (58.0-62.0 mm)

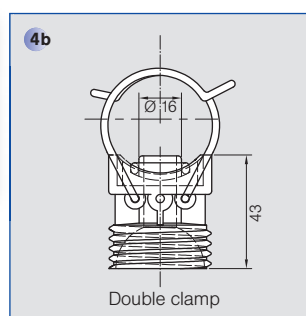
Other bore-Ø (13.8/20.0 mm) on request.



#### 4b Double clamp

Ordering no.	Bore-Ø	For Pipe-Ø
092. 090. 53. 00	16 mm	1" (32.0-34.5 mm)
092. 091. 53. 00	16 mm	1 1/4" (40.0-43.0 mm)
092. 092. 53. 00	16 mm	1 1/2" (46.0-49.0 mm)
092. 093. 53. 00	16 mm	2" (58.0-62.0 mm)

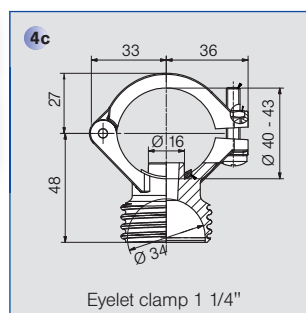
Other bore-Ø (13.8/20.0 mm) on request.



#### 4c Eyelet clamp

Ordering no.	Bore-Ø	For Pipe-Ø
090. 023. 53. 43. 10	16 mm	1" (32.0-34.5 mm)
090. 033. 53. 43. 10	16 mm	1 1/4" (40.0-43.0 mm)
090. 043. 53. 43. 10	16 mm	1 1/2" (46.0-49.0 mm)

Other bore-Ø (13.8/20.0 mm) on request.







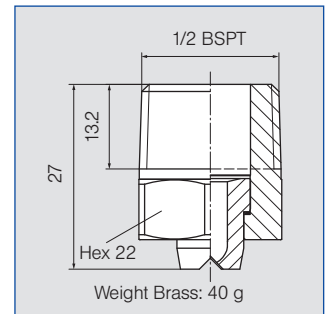
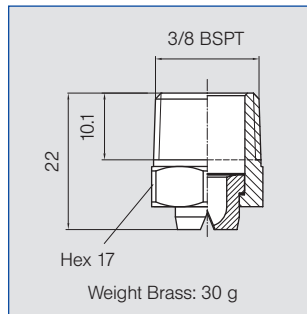
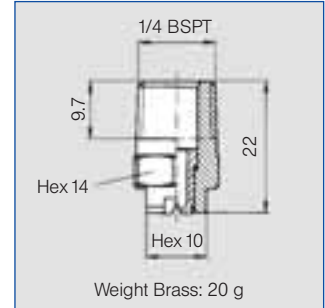
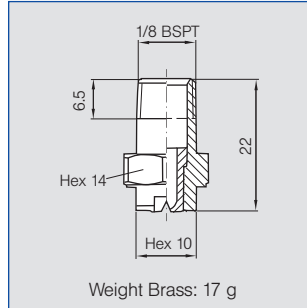
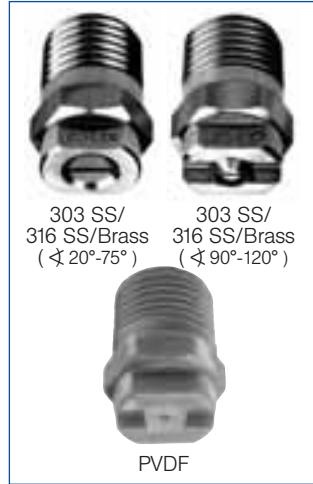
# Flat fan nozzles

## Series 632 / 633



**Standard design with conical, self-sealing thread connection. Stable spray angle. Uniform, parabolic distribution of liquid. Spray pipes equipped with these nozzles show an extremely uniform total distribution of liquid.**

Applications:  
Spray cleaning, surface treatment, filter cleaning, belt cleaning, lubricating, coating.



Spray angle	Type	Ordering no.								A ∅ [mm]	E ∅ [mm]	ṽ [l/min]								Spray width B at p = 2 bar	
		Material-no.				Code						p [bar]								H =	
		16	17 <sup>1)</sup>	30	5E							0.5	1.0	2.0	3.0	5.0	7.0	10.0	250 mm	500 mm	
20°	632. 301	○	○	○	○	CA	CC	-	-	0.70	0.60	0.16*	0.23*	0.32	0.39	0.51	0.60	0.72	65	120	
	632. 361	○	○	○	○	CA	CC	-	-	1.00	0.80	0.31*	0.44*	0.63	0.77	1.00	1.18	1.40	70	130	
	632. 441	○	○	○	○	CA	CC	-	-	1.35	1.10	0.62*	0.88	1.25	1.53	1.98	2.34	2.80	75	145	
	632. 481	○	○	○	○	CA	CC	-	-	1.50	1.20	0.80*	1.13	1.60	1.96	2.53	2.99	3.58	75	150	
30°	632. 302	○	○	○	○	CA	CC	-	-	0.60	0.50	0.16*	0.23*	0.32	0.39	0.51	0.60	0.72	120	235	
	632. 362	○	○	○	○	CA	CC	-	-	1.00	0.70	0.31*	0.44*	0.63	0.77	1.00	1.18	1.40	120	235	
	632. 402	○	○	○	○	CA	CC	-	-	1.20	0.90	0.50*	0.71	1.00	1.23	1.58	1.87	2.24	120	235	
	632. 482	○	○	○	○	CA	CC	-	-	1.50	1.10	0.80*	1.13	1.60	1.96	2.53	2.99	3.58	120	235	
	632. 562	○	○	○	○	CA	CC	-	-	2.00	1.50	1.25	1.77	2.50	3.06	3.95	4.68	5.59	120	235	
	632. 642	○	○	○	-	-	CC	-	-	2.50	1.80	2.00	2.83	4.00	4.90	6.33	7.48	8.94	120	240	
	632. 722	○	○	○	-	-	CC	-	-	3.00	2.40	3.15	4.46	6.30	7.72	9.96	11.79	14.09	125	240	
	632. 762	○	○	○	-	-	CC	-	-	3.50	2.70	4.00	5.66	8.00	9.80	12.65	14.97	17.89	125	240	
632. 802	○	○	○	-	-	CC	-	-	4.00	3.10	5.00	7.07	10.00	12.25	15.81	18.71	22.36	130	250		

<sup>1)</sup> We reserve the right to deliver 316 SS or 316 L under the material no. 17.

A = Equivalent bore diameter · E = narrowest free cross section

\*Differing spray pattern

Subject to technical modifications.

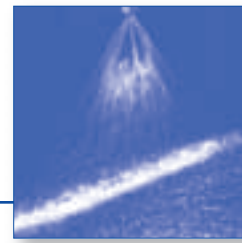
Continued on next page.

**Example**    Type    +    Material-no.    +    Code    =    Ordering no.  
**for ordering:**    632. 301    +    16    +    CA    =    632. 301. 16. CC



# Flat fan nozzles

## Series 632 / 633



Spray angle	Ordering no.								A Ø [mm]	E Ø [mm]	V̇ [l/min]								Spray width B at p = 2 bar		
	Type	Material-no.				Code					p [bar]										
		16	17 <sup>1)</sup>	30	5E	1/8 BSPT	1/4 BSPT	3/8 BSPT			1/2 BSPT	0.5	1.0	2.0	3.0	5.0	7.0	10.0			
		303 SS	316 SS/316 L	Brass	PVDF																CA
45°	632.303	○	○	○	-	CA	CC	-	-	0.70	0.50	0.16*	0.23*	0.32	0.39	0.51	0.60	0.72	150	270	
	632.363	○	○	○	○	CA	CC	-	-	1.00	0.60	0.31*	0.44*	0.63	0.77	1.00	1.18	1.40	155	280	
	632.403	○	○	○	○	CA	CC	-	-	1.20	0.90	0.50*	0.71	1.00	1.23	1.58	1.87	2.24	175	320	
	632.483	○	○	○	○	CA	CC	-	-	1.50	1.10	0.80*	1.13	1.60	1.96	2.53	2.99	3.58	180	340	
	632.563	○	○	○	○	CA	CC	-	-	2.00	1.40	1.25	1.77	2.50	3.06	3.95	4.68	5.59	185	355	
	632.643	○	○	○	○	CA	CC	-	-	2.50	1.80	2.00	2.83	4.00	4.90	6.33	7.48	8.94	195	370	
	632.673	○	○	○	-	-	CC	CE	-	-	2.70	2.00	2.83	3.36	4.75	5.82	7.51	8.89	10.62	200	375
	632.723	○	○	○	-	-	CC	CE	-	-	3.00	2.40	3.15	4.46	6.30	7.72	9.96	11.79	14.09	200	375
	632.763	○	○	○	-	-	CC	CE	-	-	3.50	2.60	4.00	5.66	8.00	9.80	12.65	14.97	17.89	200	380
	632.803	○	○	○	-	-	CC	CE	CG	-	4.00	3.00	5.00	7.07	10.00	12.25	15.81	18.71	22.36	205	385
	632.843	○	○***	○	-	-	CC	-	CG	-	4.50	3.40	6.25	8.84	12.50	15.31	19.76	23.39	27.95	205	385
	632.883	○	○	○	-	-	-	-	CG	-	5.00	3.80	8.00	11.31	16.00	19.60	25.30	29.93	35.78	220	440
	632.923	○	○	○	-	-	-	-	CG	-	5.50	4.20	10.00	14.14	20.00	24.50	31.62	37.42	44.72	220	440
632.963	○	○	○	-	-	-	-	CG	-	6.00	4.40	12.50	17.68	25.00	30.62	39.53	46.77	55.90	220	440	
60°	632.304	○	○	○	○	CA	CC	-	-	0.70	0.40	0.16*	0.23*	0.32	0.39	0.51	0.60	0.72	215	425	
	632.334	○	○	○	○	CA	CC	-	-	0.90	0.50	0.22*	0.32*	0.45	0.55	0.71	0.84	1.01	220	440	
	632.364	○	○	○	○	CA	CC	-	-	1.00	0.60	0.31*	0.44*	0.63	0.77	1.00	1.18	1.40	230	460	
	632.404	○	○	○	○	CA	CC	-	-	1.20	0.80	0.50*	0.71	1.00	1.23	1.58	1.87	2.24	245	485	
	632.444	○	○	○	○	CA	CC	-	-	1.35	0.90	0.62*	0.88	1.25	1.53	1.98	2.34	2.80	255	495	
	632.484	○	○	○	○	CA	CC	-	-	1.50	1.00	0.80*	1.13	1.60	1.96	2.53	2.99	3.58	260	510	
	632.514	○	○	○	○	CA	CC	-	-	1.65	1.10	0.95*	1.34	1.90	2.33	3.00	3.56	4.25	270	520	
	632.564	○	○	○	○	CA	CC	-	-	2.00	1.30	1.25	1.77	2.50	3.06	3.95	4.68	5.59	280	535	
	632.604	○	○	○	○	CA	CC	-	-	2.20	1.50	1.58	2.23	3.15	3.86	4.98	5.89	7.04	290	550	
	632.644	○	○	○	○**	-	CC	CE	-	-	2.50	1.60	2.00	2.83	4.00	4.90	6.33	7.48	8.94	295	565
	632.674	○	○	○	○**	-	CC	CE	-	-	2.70	1.80	2.38	3.36	4.75	5.82	7.51	8.89	10.62	300	575
	632.724	○	○	○	○**	-	CC	CE	-	-	3.00	2.10	3.15	4.46	6.30	7.72	9.96	11.79	14.09	305	590
	632.764	○	○	○	-	-	CC	CE	-	-	3.50	2.30	4.00	5.66	8.00	9.80	12.65	14.97	17.89	310	595
	632.804	○	○***	○	○**	-	CC	-	CG	-	4.00	2.60	5.00	7.07	10.00	12.25	15.81	18.71	22.36	310	595
	632.844	○	○***	○	○**	-	CC	-	CG	-	4.50	3.00	6.25	8.84	12.50	15.31	19.76	23.39	27.95	310	590
	632.884	○	○***	○	○**	-	CC	-	CG	-	5.00	3.40	8.00	11.31	16.00	19.60	25.30	29.93	35.78	300	570
	632.924	○	○	○	-	-	-	-	CG	-	5.50	4.10	10.00	14.14	20.00	24.50	31.62	37.42	44.72	330	630
	632.964	○	○	○	-	-	-	-	CG	-	6.00	4.20	12.50	17.68	25.00	30.62	39.53	46.77	55.90	330	630
	633.004	○	○	-	-	-	-	-	CG	-	7.00	4.80	15.75	22.27	31.50	38.57	49.80	58.92	70.43	330	630
	633.044	○	○	-	-	-	-	-	CG	-	8.00	5.50	20.00	28.28	40.00	48.99	63.25	74.83	89.44	340	640
633.084	○	○	-	-	-	-	-	CG	-	9.00	6.80	25.00	35.36	50.00	61.24	79.06	93.54	111.80	340	640	
75°	632.145	○	-	○	-	CA	CC	-	-	0.20	0.12	-	0.04*	0.05	0.06	0.08	0.09	0.11	280	550	
	632.165	○	-	○	-	CA	CC	-	-	0.20	0.08	-	0.05*	0.07	0.08	0.10	0.12	0.15	290	560	
	632.185	○	-	○	-	CA	CC	-	-	0.20	0.15	-	0.06*	0.08	0.10	0.13	0.15	0.18	300	575	
	632.215	○	-	○	-	CA	CC	-	-	0.40	0.20	-	0.08*	0.11	0.14	0.18	0.21	0.25	300	580	
	632.245	○	-	○	-	CA	CC	-	-	0.50	0.30	-	0.12*	0.16	0.20	0.26	0.30	0.36	310	585	
	632.275	○	-	○	-	CA	CC	-	-	0.60	0.30	0.11*	0.16*	0.22	0.27	0.35	0.41	0.49	310	590	

<sup>1)</sup> We reserve the right to deliver 316 SS or 316 L under the material no. 17.

A = Equivalent bore diameter · E = narrowest free cross section

\* Differing spray pattern

\*\* Only available with code CC.

\*\*\* Only available with code CG.

Subject to technical modifications.

Continued on next page.

**Example** Type + Material-no. + Code = Ordering no.  
**for ordering:** 632.303. + 16 + CA = 632.303.16.CA



# Flat fan nozzles

## Series 632 / 633



Spray angle	Ordering no.								A ∅ [mm]	E ∅ [mm]	V̇ [l/min]								Spray width B at p = 2 bar		
	Type	Material-no.				Code					p [bar]										
		16	17 <sup>1)</sup>	30	5E	1/8 BSPT	1/4 BSPT	3/8 BSPT			1/2 BSPT	0.5	1.0	2.0	3.0	5.0	7.0	10.0			H = 250 mm
		303 SS	316 SS/316 L	Brass	PVDF														CA	CC	
90°	632. 216	○	-	○	-				CA	CC									-	-	0.40
	632. 276	○	-	○	-	CA	CC	-	-	0.60	0.30	0.11*	0.16*	0.22	0.27	0.35	0.41	0.49	375	720	
	632. 306	○	○	○	-	CA	CC	-	-	0.70	0.40	0.16*	0.23*	0.32	0.39	0.51	0.60	0.72	380	740	
	632. 336	○	○	○	○	CA	CC	-	-	0.90	0.50	0.22*	0.32*	0.45	0.55	0.71	0.84	1.01	415	800	
	632. 366	○	○	○	○	CA	CC	-	-	1.00	0.50	0.31*	0.44*	0.63	0.77	1.00	1.18	1.41	420	810	
	632. 406	○	○	○	○	CA	CC	-	-	1.20	0.70	0.50*	0.71	1.00	1.23	1.58	1.87	2.24	430	820	
	632. 446	○	○	○	○	CA	CC	-	-	1.35	0.80	0.62*	0.88	1.25	1.53	1.98	2.34	2.80	435	830	
	632. 486	○	○	○	○	CA	CC	-	-	1.50	0.80	0.80*	1.13	1.60	1.96	2.53	2.99	3.58	440	835	
	632. 516	○	○	○	○	CA	CC	-	-	1.65	0.90	0.95*	1.34	1.90	2.33	3.00	3.56	4.25	440	840	
	632. 566	○	○	○	○	CA	CC	-	-	2.00	1.10	1.25	1.77	2.50	3.06	3.95	4.68	5.59	445	850	
	632. 606	○	○	○	○	CA	CC	-	-	2.20	1.20	1.58	2.23	3.15	3.86	4.98	5.89	7.04	450	860	
	632. 646	○	○	○	○**	-	CC	CE	-	2.50	1.30	2.00	2.83	4.00	4.90	6.33	7.48	8.94	455	865	
	632. 676	○	○	○	○**	-	CC	CE	-	2.70	1.40	2.38	3.36	4.75	5.82	7.51	8.89	10.62	465	875	
	632. 726	○	○	○	○**	-	CC	CE	-	3.00	1.70	3.15	4.46	6.30	7.72	9.96	11.79	14.09	470	885	
	632. 766	○	○	○	○**	-	CC	CE	-	3.50	1.90	4.00	5.66	8.00	9.80	12.65	14.97	17.89	475	890	
	632. 806	○	○***	○	○**	-	CC	-	CG	4.00	2.40	5.00	7.07	10.00	12.25	15.81	18.71	22.36	480	900	
632. 846	○	○***	○	○**	-	CC	-	CG	4.50	2.40	6.25	8.84	12.50	15.31	19.76	23.39	27.95	480	900		
632. 886	○	○***	○	○**	-	CC	-	CG	5.00	3.10	8.00	11.31	16.00	19.60	25.30	29.93	35.78	480	910		
632. 926	○	○	○	-	-	-	-	CG	5.50	3.60	10.00	14.14	20.00	24.50	31.62	37.42	44.72	525	1020		
632. 966	○	○	○	-	-	-	-	CG	6.00	3.90	12.50	17.68	25.00	30.62	39.53	46.77	55.90	525	1020		
120°	632. 187	○	-	○	-	CA	CC	-	-	0.35	0.20	-	0.06*	0.08	0.10	0.13	0.15	0.18	630	1200	
	632. 217	○	-	○	-	CA	CC	-	-	0.40	0.20	-	0.08*	0.11	0.14	0.18	0.21	0.25	640	1210	
	632. 247	○	-	○	-	CA	CC	-	-	0.50	0.20	-	0.12*	0.16	0.20	0.26	0.30	0.36	650	1230	
	632. 277	○	-	○	-	CA	CC	-	-	0.60	0.30	-	0.16*	0.22	0.27	0.35	0.41	0.49	660	1250	
	632. 307	○	○	○	○	CA	CC	-	-	0.70	0.30	0.16*	0.23*	0.32	0.39	0.51	0.60	0.72	660	1250	
	632. 337	○	○	○	○	CA	CC	-	-	0.90	0.40	0.22*	0.32*	0.45	0.55	0.71	0.84	1.01	670	1270	
	632. 367	○	○	○	○	CA	CC	-	-	1.00	0.50	0.31*	0.44*	0.63	0.77	1.00	1.18	1.41	670	1270	
	632. 407	○	○	○	○	CA	CC	-	-	1.20	0.60	0.50*	0.71	1.00	1.23	1.58	1.87	2.24	670	1270	
	632. 447	○	○	○	○	CA	CC	-	-	1.35	0.60	0.62*	0.88	1.25	1.53	1.98	2.34	2.80	675	1270	
	632. 487	○	○	○	○	CA	CC	-	-	1.50	0.60	0.80*	1.13	1.60	1.96	2.53	2.99	3.58	680	1275	
	632. 517	○	○	○	○	CA	CC	-	-	1.65	0.90	0.95*	1.34	1.90	2.33	3.00	3.56	4.25	685	1280	
	632. 567	○	○	○	○	CA	CC	-	-	2.00	0.90	1.25	1.77	2.50	3.06	3.95	4.68	5.59	690	1285	
	632. 607	○	○	○	○	CA	CC	-	-	2.20	1.10	1.58	2.23	3.15	3.86	4.98	5.89	7.04	700	1300	
	632. 647	○	○	○	-	-	CC	CE	-	2.50	1.30	2.00	2.83	4.00	4.90	6.33	7.48	8.94	700	1300	
	632. 677	○	○	○	○**	-	CC	CE	-	2.70	1.40	2.38	3.36	4.75	5.82	7.51	8.89	10.62	720	1330	
	632. 727	○	○	○	○**	-	CC	CE	-	3.00	1.60	3.15	4.46	6.30	7.72	9.96	11.79	14.09	740	1360	
	632. 767	○	○	○	○**	-	CC	CE	-	3.50	1.70	4.00	5.66	8.00	9.80	12.65	14.97	17.89	760	1400	
	632. 807	○	○***	○	-	-	CC	-	CG	4.00	2.00	5.00	7.07	10.00	12.25	15.81	18.71	22.36	790	1450	
	632. 847	○***	○***	○***	○**	-	CC	-	CG	4.50	2.30	6.25	8.84	12.50	15.31	19.76	23.39	27.95	790	1450	
632. 887	○	○	○	-	-	-	-	CG	5.00	2.60	8.00	11.31	16.00	19.60	25.30	29.93	35.78	800	1460		
632. 927	○	○	○	-	-	-	-	CG	5.00	2.90	10.00	14.14	20.00	24.50	31.62	37.42	44.72	800	1460		

<sup>1)</sup> We reserve the right to deliver 316 SS or 316 L under the material no. 17.  
 A = Equivalent bore diameter · E = narrowest free cross section  
 \*Differing spray pattern  
 \*\*Only available with code CC.  
 \*\*\*Only available with code CG.  
 Subject to technical modifications.

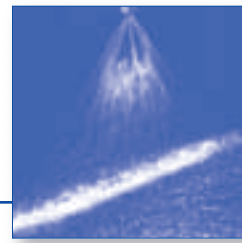
**Example for ordering:** Type + Material-no. + Code = Ordering no.  
 632. 216. + 16 + CA = 632. 216. 16. CA





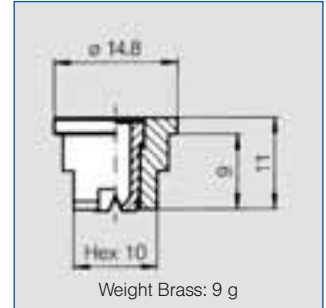
# Flat fan nozzles for retaining nut

## Series 652



**Assembly with retaining nut. Easy nozzle changing, simple jet alignment. Uniform, parabolic distribution of liquid. Spray pipes equipped with these nozzles show an extremely uniform total liquid distribution.**

**Applications:**  
Spray cleaning, surface treatment, filter cleaning, belt cleaning, lubricating, coating.



Spray angle	Ordering no.				A ∅ [mm]	E ∅ [mm]	$\dot{V}$ [l/min]										Spray width B at p = 2 bar		
	Type	Material-no.					p [bar]												
		16	17 <sup>1)</sup>	30			5E												
		303 SS	316 SS/316 L	Brass			PVDF	0.5	1.0	2.0	[US gal/min] at 40 psi	3.0	5.0	10.0	H = 250 mm	H = 500 mm			
20°	652.301	○	○	○	○	0.70	0.60	0.16*	0.23*	0.32	0.10	0.39	0.51	0.72	65	125			
	652.361	○	○	○	○	1.00	0.80	0.31*	0.44*	0.63	0.20	0.77	1.00	1.40	65	125			
	652.441	○	○	○	○	1.35	1.10	0.62*	0.88	1.25	0.39	1.53	1.98	2.80	65	125			
	652.481	○	○	○	○	1.50	1.20	0.80*	1.13	1.60	0.50	1.96	2.53	3.58	65	125			
30°	652.302	○	○	○	○	0.60	0.50	0.16*	0.23*	0.32	0.10	0.39	0.51	0.72	115	230			
	652.362	○	○	○	○	1.00	0.70	0.31*	0.44*	0.63	0.20	0.77	1.00	1.40	115	230			
	652.402	○	○	○	○	1.20	0.90	0.50*	0.71	1.00	0.31	1.23	1.58	2.24	115	230			
	652.482	○	○	○	○	1.50	1.10	0.80*	1.13	1.60	0.50	1.96	2.53	3.58	115	230			
	652.562	○	○	○	○	2.00	1.50	1.25	1.77	2.50	0.78	3.06	3.95	5.59	115	230			
	652.642	○	○	○	-	2.50	1.80	2.00	2.83	4.00	1.24	4.90	6.33	8.94	120	230			
	652.722	○	○	○	-	3.00	2.40	3.15	4.46	6.30	1.95	7.72	9.96	14.09	120	235			
	652.762	○	○	○	-	3.50	2.70	4.00	5.66	8.00	2.48	9.80	12.65	17.89	120	235			
652.802	○	○	○	-	4.00	3.10	5.00	7.07	10.00	3.10	12.25	15.81	22.36	120	240				
45°	652.303	○	○	○	-	0.70	0.50	0.16*	0.23*	0.32	0.10	0.39	0.51	0.72	180	340			
	652.363	○	○	○	○	1.00	0.60	0.31*	0.44*	0.63	0.20	0.77	1.00	1.40	185	340			
	652.403	○	○	○	○	1.20	0.90	0.50*	0.71	1.00	0.31	1.23	1.58	2.24	185	340			
	652.483	○	○	○	○	1.50	1.10	0.80*	1.13	1.60	0.50	1.96	2.53	3.58	185	340			
	652.563	○	○	○	○	2.00	1.40	1.25	1.77	2.50	0.78	3.06	3.95	5.59	185	340			
	652.643	○	○	○	○	2.50	1.80	2.00	2.83	4.00	1.24	4.90	6.33	8.94	185	345			
	652.723	○	○	○	-	3.00	2.40	3.15	4.46	6.30	1.95	7.72	9.96	14.09	190	355			
	652.763	○	○	○	-	3.50	2.60	4.00	5.66	8.00	2.48	9.80	12.65	17.89	190	355			
652.803	○	○	○	-	4.00	3.00	5.00	7.07	10.00	3.10	12.25	15.81	22.36	195	360				
60°	652.304	○	○	○	○	0.70	0.40	0.16*	0.23*	0.32	0.10	0.39	0.51	0.72	275	525			
	652.334	○	○	○	○	0.90	0.50	0.22*	0.32*	0.45	0.14	0.55	0.71	1.01	275	525			
	652.364	○	○	○	○	1.00	0.60	0.31*	0.44*	0.63	0.20	0.77	1.00	1.40	275	525			
	652.404	○	○	○	○	1.20	0.80	0.50*	0.71	1.00	0.31	1.23	1.58	2.24	275	525			
	652.444	○	○	○	○	1.35	0.90	0.62*	0.88	1.25	0.39	1.53	1.98	2.80	280	530			
	652.484	○	○	○	○	1.50	1.00	0.80*	1.13	1.60	0.50	1.96	2.53	3.58	280	530			
	652.514	○	○	○	○	1.65	1.10	0.95*	1.34	1.90	0.59	2.33	3.00	4.25	280	530			
	652.564	○	○	○	○	2.00	1.30	1.25	1.77	2.50	0.78	3.06	3.95	5.59	280	525			
	652.604	○	○	○	○	2.20	1.50	1.58	2.23	3.15	0.98	3.86	4.98	7.04	280	520			
	652.644	○	○	○	○	2.50	1.60	2.00	2.83	4.00	1.24	4.90	6.33	8.94	275	520			
	652.674	○	○	○	○	2.70	1.80	2.38	3.36	4.75	1.47	5.82	7.51	10.62	275	520			
	652.724	○	○	○	○	3.00	2.10	3.15	4.46	6.30	1.95	7.72	9.96	14.09	275	520			
	652.764	○	○	○	-	3.50	2.30	4.00	5.66	8.00	2.48	9.80	12.65	17.89	270	515			
	652.804	○	○	○	○	4.00	2.60	5.00	7.07	10.00	3.10	12.25	15.81	22.36	270	510			
	652.844	○	-	-	○	4.50	3.00	6.25	8.84	12.50	3.88	15.31	19.76	27.95	270	510			
	652.884	○	-	○	-	5.00	3.40	8.00	11.31	16.00	4.96	19.60	25.30	35.78	270	505			

<sup>1)</sup> We reserve the right to deliver 316 SS or 316 L under the material-no. 17.  
A = Equivalent bore diameter · E = narrowest free cross section · \* Differing spray pattern.

Continued on next page.

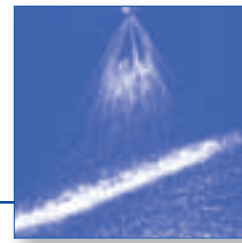
Conversion formula for the above series:  $\dot{V}_2 = \dot{V}_1 \cdot \sqrt{\frac{p_1}{p_2}}$





# Flat fan nozzles for retaining nut

## Series 652



Spray angle	Ordering no.					A Ø [mm]	E Ø [mm]	$\dot{V}$ [l/min]							Spray width B at p = 2 bar	
	Type	Material-no.						p [bar]								
		16	17 <sup>1)</sup>	30	5E											
		303 SS	316 SS/316 L	Brass	PVDF			0.5	1.0	2.0	[US gal/min] at 40 psi	3.0	5.0	10.0	H = 250 mm	H = 500 mm
75°	652. 145	○	-	○	-	0.20	0.12	-	0.04*	0.05	0.02	0.06	0.08	0.11	285	550
	652. 165	○	-	○	-	0.20	0.08	-	0.05*	0.07	0.02	0.08	0.10	0.15	285	555
	652. 185	○	-	○	-	0.20	0.15	-	0.06*	0.08	0.02	0.10	0.13	0.18	290	560
	652. 215	○	-	○	-	0.40	0.20	-	0.08*	0.11	0.03	0.14	0.18	0.25	290	560
	652. 245	○	-	○	-	0.50	0.30	-	0.12*	0.16	0.05	0.20	0.26	0.36	290	560
	652. 275	○	-	○	-	0.60	0.30	0.11*	0.16*	0.22	0.07	0.27	0.35	0.49	290	560
90°	652. 216	○	-	○	-	0.40	0.20	0.06*	0.08*	0.11	0.03	0.14	0.18	0.25	380	760
	652. 246	○	-	○	-	0.50	0.30	0.08*	0.12*	0.16	0.05	0.20	0.26	0.36	380	760
	652. 276	○	-	○	-	0.60	0.30	0.11*	0.16*	0.22	0.07	0.27	0.35	0.49	450	795
	652. 306	○	○	○	○	0.70	0.40	0.16*	0.23*	0.32	0.10	0.39	0.51	0.72	450	795
	652. 336	○	○	○	○	0.90	0.50	0.22*	0.32*	0.45	0.14	0.55	0.71	1.01	450	795
	652. 366	○	○	○	○	1.00	0.50	0.31*	0.44*	0.63	0.20	0.77	1.00	1.41	450	795
	652. 406	○	○	○	○	1.20	0.70	0.50*	0.71	1.00	0.31	1.23	1.58	2.24	450	800
	652. 446	○	○	○	○	1.35	0.80	0.62*	0.88	1.25	0.39	1.53	1.98	2.80	450	800
	652. 486	○	○	○	○	1.50	0.80	0.80*	1.13	1.60	0.50	1.96	2.53	3.58	450	800
	652. 516	○	○	○	○	1.65	0.90	0.95*	1.34	1.90	0.59	2.33	3.00	4.25	450	800
	652. 566	○	○	○	○	2.00	1.10	1.25	1.77	2.50	0.78	3.06	3.95	5.59	450	805
	652. 606	○	○	○	○	2.20	1.20	1.58	2.23	3.15	0.98	3.86	4.98	7.04	450	805
	652. 646	○	○	○	○	2.50	1.30	2.00	2.83	4.00	1.24	4.90	6.33	8.94	450	805
	652. 676	○	○	○	○	2.70	1.40	2.38	3.36	4.75	1.47	5.82	7.51	10.62	450	810
	652. 726	○	○	○	○	3.00	1.70	3.15	4.46	6.30	1.95	7.72	9.96	14.09	450	810
	652. 766	○	○	○	-	3.50	1.90	4.00	5.66	8.00	2.48	9.80	12.65	17.89	450	815
	652. 806	○	○	○	○	4.00	2.40	5.00	7.07	10.00	3.10	12.25	15.81	22.36	450	820
	652. 846	-	-	○	○	4.50	2.40	6.25	8.84	12.50	3.88	15.31	19.76	27.95	450	820
	652. 886	○	-	○	○	5.00	3.10	8.00	11.31	16.00	4.96	19.60	25.30	35.78	450	835
	120°	652. 187	○	-	○	-	0.35	0.20	-	0.06*	0.08	0.02	0.10	0.13	0.18	640
652. 217		○	-	○	-	0.40	0.20	-	0.08*	0.11	0.03	0.14	0.18	0.25	650	1230
652. 247		○	-	○	-	0.50	0.20	-	0.12*	0.16	0.05	0.20	0.26	0.36	655	1245
652. 277		○	-	○	-	0.60	0.30	-	0.16*	0.22	0.07	0.27	0.35	0.49	655	1250
652. 307		○	-	○	○	0.70	0.30	0.16*	0.23*	0.32	0.10	0.39	0.51	0.72	660	1260
652. 337		○	○	○	○	0.90	0.40	0.22*	0.32*	0.45	0.14	0.55	0.71	1.01	660	1260
652. 367		○	○	○	○	1.00	0.50	0.31*	0.44*	0.63	0.20	0.77	1.00	1.41	660	1265
652. 407		○	○	○	○	1.20	0.60	0.50*	0.71	1.00	0.31	1.23	1.58	2.24	660	1270
652. 447		○	○	○	○	1.35	0.60	0.62*	0.88	1.25	0.39	1.53	1.98	2.80	665	1270
652. 487		○	○	○	○	1.50	0.60	0.80*	1.13	1.60	0.50	1.96	2.53	3.58	665	1270
652. 517		○	○	○	○	1.65	0.90	0.95*	1.34	1.90	0.59	2.33	3.00	4.25	670	1275
652. 567		○	○	○	○	2.00	0.90	1.25	1.77	2.50	0.78	3.06	3.95	5.59	670	1280
652. 607		○	○	○	○	2.20	1.10	1.58	2.23	3.15	0.98	3.86	4.98	7.04	675	1285
652. 647		○	○	○	-	2.50	1.30	2.00	2.83	4.00	1.24	4.90	6.33	8.94	680	1295
652. 677		○	○	○	-	2.70	1.40	2.38	3.36	4.75	1.47	5.82	7.51	10.62	685	1300
652. 727		○	○	○	○	3.00	1.60	3.15	4.46	6.30	1.95	7.72	9.96	14.09	695	1315
652. 767		○	○	○	-	3.50	1.70	4.00	5.66	8.00	2.48	9.80	12.65	17.89	705	1330
652. 807		○	-	○	-	4.00	2.00	5.00	7.07	10.00	3.10	12.25	15.81	22.36	705	1330
652. 847		-	-	-	○	4.50	2.30	6.25	8.84	12.50	3.88	15.31	19.76	27.95	800	1460
652. 887		-	-	-	○	5.00	2.60	8.00	11.31	16.00	4.96	19.60	25.30	35.78	800	1460

<sup>1)</sup> We reserve the right to deliver 316 SS or 316 L under the material no. 17.  
 A = Equivalent bore diameter · E = narrowest free cross section  
 \*Differing spray pattern  
 Subject to technical modifications.

<b>Example</b>	<b>Type</b>	<b>+</b>	<b>Material-no.</b>	<b>=</b>	<b>Ordering no.</b>
<b>for ordering:</b>	<b>652. 145</b>	<b>+</b>	<b>16</b>	<b>=</b>	<b>652. 145. 16</b>



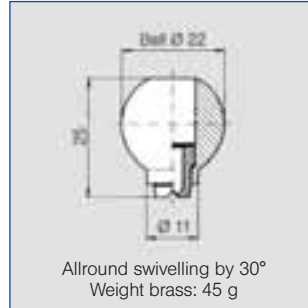
# Flat fan nozzles with ball joint

## Series 676



**Swivelling nozzle for precise adjusting of jet direction. No gaskets necessary. Long, unproblematic service life.**

Applications:  
Cleaning, cooling, lubricating.



 Spray angle	Ordering no.		A Ø [mm]	E Ø [mm]	$\dot{V}$ [l/min]						Spray width B at p = 2 bar		
	Type	Mat.-Nr.			p [bar] (p <sub>max</sub> = 30 bar)								
		16	30										
	303 SS	Brass	0.5	1.0	2.0	3.0	5.0	10.0	H = 250 mm	H = 500 mm			
45°	676. 303	○	○	0.70	0.50	0.16*	0.23*	0.32	0.39	0.51	0.72	150	270
	676. 363	○	○	1.00	0.60	0.31*	0.44*	0.63	0.77	1.00	1.40	155	280
	676. 403	○	○	1.20	0.90	0.50*	0.71	1.00	1.23	1.58	2.24	175	320
	676. 483	○	○	1.50	1.10	0.80	1.13	1.60	1.96	2.53	3.58	180	340
	676. 563	○	○	2.00	1.40	1.25	1.77	2.50	3.06	3.95	5.59	185	355
	676. 643	○	○	2.50	1.80	2.00	2.83	4.00	4.90	6.33	8.94	195	370
	676. 723	○	○	3.00	2.40	3.15	4.46	6.30	7.72	9.96	14.09	200	375
	676. 763	○	○	3.50	2.60	4.00	5.66	8.00	9.80	12.65	17.89	200	380
676. 803	○	○	4.00	3.00	5.00	7.07	10.00	12.25	15.81	22.36	205	385	
60°	676. 304	○	○	0.70	0.40	0.16*	0.23*	0.32	0.39	0.51	0.72	215	425
	676. 334	○	○	0.90	0.50	0.22*	0.32*	0.45	0.55	0.71	1.01	220	440
	676. 364	○	○	1.00	0.60	0.31*	0.44*	0.63	0.77	1.00	1.40	230	460
	676. 404	○	○	1.20	0.80	0.50*	0.71	1.00	1.23	1.58	2.24	245	485
	676. 444	○	○	1.35	0.90	0.62*	0.88	1.25	1.53	1.98	2.80	255	495
	676. 484	○	○	1.50	1.00	0.80*	1.13	1.60	1.96	2.53	3.58	260	510
	676. 514	○	○	1.65	1.10	0.95*	1.34	1.90	2.33	3.00	4.25	270	520
	676. 564	○	○	2.00	1.30	1.25	1.77	2.50	3.06	3.95	5.59	280	535
	676. 604	○	○	2.20	1.50	1.58	2.23	3.15	3.86	4.98	7.04	290	550
	676. 644	○	○	2.50	1.60	2.00	2.83	4.00	4.90	6.33	8.94	295	565
	676. 674	○	○	2.70	1.80	2.38	3.36	4.75	5.82	7.51	10.62	300	575
	676. 724	○	○	3.00	2.10	3.15	4.46	6.30	7.72	9.96	14.09	305	590
676. 764	○	○	3.50	2.30	4.00	5.66	8.00	9.80	12.65	17.89	310	595	
90°	676. 216	○	○	0.40	0.20	-	0.08*	0.11	0.14	0.18	0.25	370	700
	676. 276	○	○	0.60	0.30	0.11*	0.16*	0.22	0.27	0.35	0.49	375	720
	676. 306	○	○	0.70	0.40	0.16*	0.23*	0.32	0.39	0.51	0.72	380	740
	676. 336	○	○	0.90	0.50	0.22*	0.32*	0.45	0.55	0.71	1.01	415	800
	676. 366	○	○	1.00	0.50	0.31*	0.44*	0.63	0.77	1.00	1.40	420	810
	676. 406	○	○	1.20	0.70	0.50*	0.71	1.00	1.23	1.58	2.24	430	820
	676. 446	○	○	1.35	0.80	0.62*	0.88	1.25	1.53	1.98	2.80	435	830
	676. 486	○	○	1.50	0.80	0.80*	1.13	1.60	1.96	2.53	3.58	440	835
	676. 516	○	○	1.65	0.90	0.95*	1.34	1.90	2.33	3.00	4.25	440	840
	676. 566	○	○	2.00	1.10	1.25	1.77	2.50	3.06	3.95	5.59	445	850
	676. 606	○	○	2.20	1.20	1.58	2.23	3.15	3.86	4.98	7.04	450	860
	676. 646	○	○	2.50	1.30	2.00	2.83	4.00	4.90	6.33	8.94	455	865
	676. 676	○	○	2.70	1.40	2.38	3.36	4.75	5.82	7.51	10.62	465	875
	676. 726	○	○	3.00	1.70	3.15	4.46	6.30	7.72	9.96	14.09	470	885

A = Equivalent bore diameter · E = narrowest free cross section  
\* Differing spray pattern

Continued on next page.

Conversion formula for the above series:  $\dot{V}_2 = \dot{V}_1 \cdot \sqrt{\frac{p_1}{p_2}}$





# Flat fan nozzles with ball joint

## Series 676

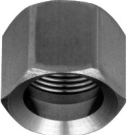
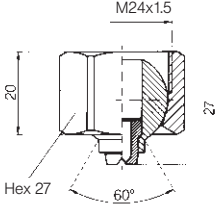

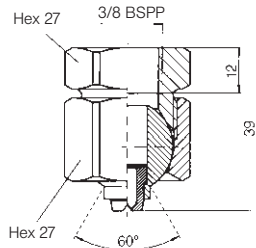

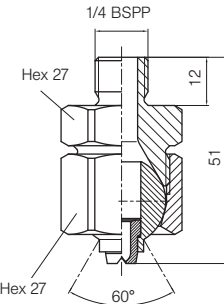

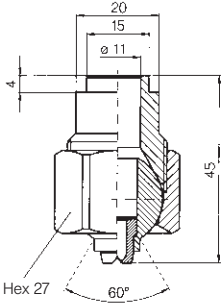


Spray angle	Ordering no.		A Ø [mm]	E Ø [mm]	$\dot{V}$ [l/min]						Spray width B at p = 2 bar		
	Type	Mat.-no.			p [bar] (p <sub>max</sub> = 30 bar)						H =		
		16			30	0.5	1.0	2.0	3.0	5.0	10.0	250 mm	500 mm
120°	676. 187	○	○	0.35	0.20	-	0.06*	0.08	0.10	0.13	0.18	630	1200
	676. 217	○	○	0.40	0.20	-	0.08*	0.11	0.14	0.18	0.25	640	1210
	676. 247	○	○	0.50	0.20	-	0.12*	0.16	0.20	0.26	0.36	650	1230
	676. 277	○	○	0.60	0.30	-	0.16*	0.22	0.27	0.35	0.49	660	1250
	676. 307	○	○	0.70	0.30	0.16*	0.23*	0.32	0.39	0.51	0.72	660	1250
	676. 337	○	○	0.90	0.40	0.22*	0.32*	0.45	0.55	0.71	1.01	670	1270
	676. 367	○	○	1.00	0.50	0.31*	0.44*	0.63	0.77	1.00	1.40	670	1270
	676. 407	○	○	1.20	0.60	0.50*	0.71	1.00	1.23	1.58	2.24	670	1270
	676. 447	○	○	1.35	0.60	0.62*	0.88	1.25	1.53	1.98	2.80	675	1270
	676. 487	○	○	1.50	0.60	0.80*	1.13	1.60	1.96	2.53	3.58	680	1275
	676. 517	○	○	1.65	0.90	0.95*	1.34	1.90	2.33	3.00	4.25	685	1280
	676. 567	○	○	2.00	0.90	1.25	1.77	2.50	3.06	3.95	5.59	690	1285
	676. 607	○	○	2.20	1.10	1.58	2.23	3.15	3.86	4.98	7.04	700	1300
	676. 647	○	○	2.50	1.30	2.00	2.83	4.00	4.90	6.33	8.94	700	1300
	676. 677	○	○	2.70	1.40	2.38	3.36	4.75	5.82	7.51	10.62	720	1330
	676. 727	○	○	3.00	1.60	3.15	4.46	6.30	7.72	9.96	14.09	740	1360
676. 767	○	○	3.50	1.70	4.00	5.66	8.00	9.80	12.65	17.89	760	1400	

A = Equivalent bore diameter · E = narrowest free cross section  
 \* Differing spray pattern

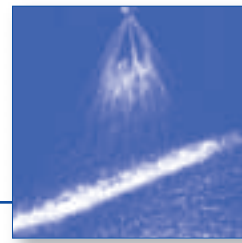
<b>Example for ordering:</b>	<b>Type</b>	<b>+</b>	<b>Material-no.</b>	<b>=</b>	<b>Ordering no.</b>
	676. 187	+	16	=	676. 187. 16

### Accessories

<p><b>Retaining nut</b>            092. 020. 16. 00. 02            Material: 303 SS            092. 020. 30. 00. 02            Material: Brass</p>  	<p><b>Socket</b>            092. 020. 16. AF. 03            Material: 303 SS            092. 020. 30. AF. 03            Material: Brass</p>  	<p><b>Retaining nipple</b>            092. 024. 16. AC. 03            Material: 303 SS            092. 024. 30. AC. 03            Material: Brass</p>  	<p><b>Welding nipple</b>            092. 020. 17. 00. 04            Material: 316 SS</p>  
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

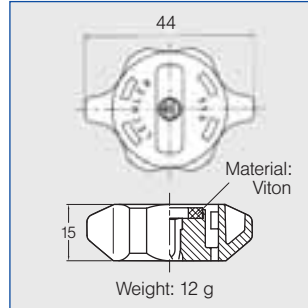


# Flat fan nozzles with bayonet quick release cap Series 646



**Quick and easy assembly with bayonet quick release cap. Adjusted spray direction. Uniform liquid distribution.**

Applications:  
Belt cleaning, surface treatment, cleaning, coating processes.



Spray angle	Ordering no.		A Ø [mm]	E Ø [mm]	$\dot{V}$ [l/min]							Spray width B at p = 2 bar	
	Type	Mat.-no. 5E			p [bar]							H =	
					0.5	1.0	2.0	3.0	5.0	7.0	10.0	250 mm	500 mm
45°	646. 363	○	1.00	0.60	0.31*	0.44*	0.63	0.77	1.00	1.18	1.40	185	340
	646. 403	○	1.20	0.90	0.50*	0.71	1.00	1.23	1.58	1.87	2.24	185	340
	646. 483	○	1.50	1.10	0.80*	1.13	1.60	1.96	2.53	2.99	3.58	185	340
	464. 563	○	2.00	1.40	1.20	1.77	2.50	3.06	3.95	4.68	5.59	185	340
	464. 643	○	2.50	1.80	200	2.83	4.00	4.90	6.33	7.48	8.94	185	345
60°	646. 304	○	0.70	0.40	0.16*	0.23*	0.32	0.39	0.51	0.60	0.72	245	490
	646. 334	○	0.90	0.50	0.22*	0.32*	0.45	0.55	0.71	0.84	1.01	250	495
	646. 364	○	1.00	0.60	0.31*	0.44*	0.63	0.77	1.00	1.18	1.40	255	500
	646. 404	○	1.20	0.80	0.50*	0.71	1.00	1.23	1.58	1.87	2.24	260	510
	646. 444	○	1.35	0.90	0.62	0.88	1.25	1.53	1.98	2.34	2.80	260	510
	646. 484	○	1.50	1.00	0.80	1.13	1.60	1.96	2.53	2.99	3.58	270	525
	646. 514	○	1.65	1.10	0.95	1.34	1.90	2.33	3.00	3.56	4.25	260	510
	646. 564	○	2.00	1.30	1.25	1.77	2.50	3.06	3.95	4.68	5.59	260	505
646. 604	○	2.20	1.50	1.58	2.23	3.15	3.86	4.98	5.89	7.04	265	505	
90°	646. 306	○	0.70	0.40	0.16*	0.23*	0.32	0.39	0.51	0.60	0.72	425	840
	646. 336	○	0.90	0.50	0.22*	0.32*	0.45	0.55	0.71	0.84	1.01	425	840
	646. 366	○	1.00	0.50	0.31*	0.44*	0.63	0.77	1.00	1.18	1.41	425	840
	646. 406	○	1.20	0.70	0.50*	0.71	1.00	1.23	1.58	1.87	2.24	425	835
	646. 446	○	1.35	0.80	0.62*	0.88	1.25	1.53	1.98	2.34	2.80	425	835
	646. 486	○	1.50	0.80	0.80*	1.13	1.60	1.96	2.53	2.99	3.58	425	830
	646. 516	○	1.65	0.90	0.95*	1.34	1.90	2.33	3.00	3.56	4.25	425	830
	646. 566	○	2.00	1.10	1.25	1.77	2.50	3.06	3.95	4.68	5.59	425	825
	646. 606	○	2.20	1.20	1.58	2.23	3.15	3.86	4.98	5.89	7.04	425	820
120°	646. 307	○	0.70	0.30	0.16*	0.23*	0.32	0.39	0.51	0.60	0.72	625	1175
	646. 337	○	0.90	0.40	0.22*	0.32*	0.45	0.55	0.71	0.84	1.01	630	1180
	646. 367	○	1.00	0.50	0.31*	0.44*	0.63	0.77	1.00	1.18	1.41	635	1190
	646. 407	○	1.20	0.60	0.50*	0.71	1.00	1.23	1.58	1.87	2.24	640	1195
	646. 447	○	1.35	0.60	0.62*	0.88	1.25	1.53	1.98	2.34	2.80	645	1200
	646. 487	○	1.50	0.60	0.80*	1.13	1.60	1.96	2.53	2.99	3.58	650	1200
	646. 517	○	1.65	0.90	0.95*	1.34	1.90	2.33	3.00	3.56	4.25	650	1205
	646. 567	○	2.00	0.90	1.25	1.77	2.50	3.06	3.95	4.68	5.59	655	1210
	646. 607	○	2.20	1.10	1.58	2.23	3.15	3.86	4.98	5.89	7.04	660	1215

A = Equivalent bore diameter · E = narrowest free cross section

\* Differing spray pattern

Subject to technical modifications.

Continued on next page.

**Example for ordering:** Type 646. 363 + Material-no. 5E = Ordering no. 646. 363. 5E

Conversion formula for the above series:  $\dot{V}_2 = \dot{V}_1 * \sqrt{\frac{p_1}{p_2}}$



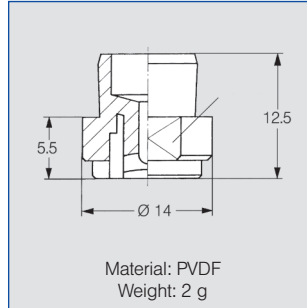
# Flat fan nozzles for pressing into pipes

## Series 612. XXX. 5E. 03



**For pressing into pipes.  
Stable spray pattern.  
Uniform, parabolic distribu-  
tion of liquid.**

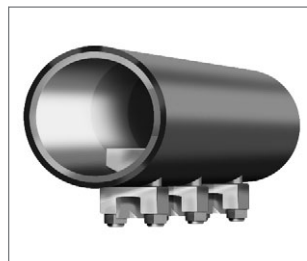
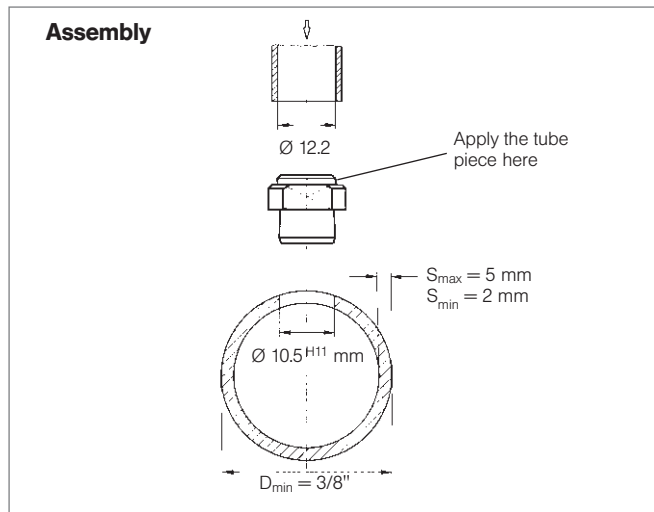
Applications:  
Cleaning and rinsing, dish  
washing.



Spray angle	Ordering no.		A Ø [mm]	E Ø [mm]	$\dot{V}$ [l/min]						Spray width B at p = 3 bar	
	Type	Mat.- no.			p [bar] P <sub>max</sub> = 2 bar						H =	
					5E. 03	0.3	0.5	0.7	1.0	1.5	2.0	250 mm
90°	612. 366	○	1.0	0.5	0.24	0.31	0.37	0.44	0.55	0.63	505	980
	612. 486	○	1.5	0.6	0.62	0.80	0.95	1.13	1.39	1.60	525	1020
120°	612. 487	○	1.5	0.6	0.62	0.80	0.95	1.13	1.39	1.60	800	1460
	612. 647	○	2.5	1.2	1.55	2.00	2.37	2.83	3.46	4.00	800	1460

A = Equivalent bore diameter · E = narrowest free cross section

Futher nozzle sizes on request.



**Assembly:**  
Drill pipe (Ø 10 mm), ream to Ø 10.5<sup>H11</sup> mm, adjust, put tube (Ø 12,2 mm) on nozzle and drive in with a rubber mallet. Flow velocity in the pipe max. 2–3 m/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  
0.05 - 4.00 l/min at 2 bar.

Available on request.



**Full cone nozzle for pressing into pipes**

Flow rate range  
1.6 l/min at 2 bar.

Spray angle 60°

Available on request.



# High pressure flat fan nozzles

## Series 602 / 608 / 652



### Sharp uniform flat fan with an extremely narrow jet depth.

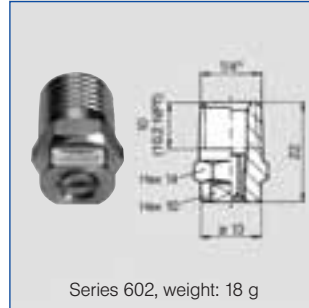
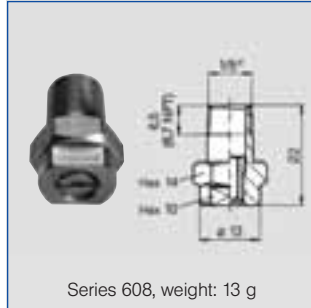
Applications:

High pressure cleaners, steam jet cleaners

Materials:

Nozzle body: Stainless steel  
303 SS

Insert: Hardened  
stainless steel  
1.4034 S



US gal/min. at 40 psi	Nozzle code			Flow rate code				A Ø [mm]	ṽ [l/min]						
	Connection			Spray angle					p [bar]						
	1/8"	1/4"	Lock nut	↘20°	↘30°	↘45°	↘60°		40	60	80	100	120	150	200
02	608	602	652	361	362	363	364	1.00	2.86	3.50	4.04	4.52	4.95	5.53	6.39
025	608	602	652	381	382	383	384	1.10	3.54	4.33	5.00	5.59	6.12	6.85	7.91
03	608	602	652	401	402	403	404	1.18	4.31	5.28	6.10	6.82	7.47	8.35	9.64
034	608	602	652	411	412	413	414	1.30	4.95	6.06	7.00	7.83	8.57	9.59	11.07
04	608	602	652	451	452	453	454	1.35	5.80	7.10	8.20	9.17	10.04	11.23	12.97
045	608	602	652	471	472	473	474	1.40	6.51	7.97	9.20	10.29	11.27	12.60	14.55
05	608	602	652	481	482	483	484	1.55	7.29	8.92	10.30	11.52	12.62	14.11	16.29
055	608	602	652	501	502	503	504	1.60	7.96	9.74	11.25	12.58	13.78	15.41	17.79
06	608	602	652	521	522	523	524	1.72	8.70	10.66	12.31	13.76	15.07	16.85	19.46
065	608	602	652	531	532	533	534	1.75	9.38	11.49	13.26	14.83	16.25	18.16	20.97
07	608	602	652	541	542	543	544	1.80	10.06	12.32	14.22	15.90	17.42	19.47	22.49
075	608	602	652	551	552	553	554	1.90	10.75	13.16	15.20	16.99	18.62	20.81	24.04
08	608	602	652	571	572	573	574	2.05	11.48	14.06	16.23	18.15	19.88	22.23	25.67
09	608	602	652	591	592	593	594	2.10	13.01	15.93	18.40	20.57	22.53	25.19	29.09
10	608	602	652	601	602	603	604	2.30	14.43	17.76	20.40	22.81	24.99	27.94	32.26
125	-	602	652	641	642	643	644	2.50	17.82	21.82	25.20	28.17	30.86	34.51	39.85
15	-	602	652	671	672	673	674	2.70	21.35	26.15	30.20	33.76	36.98	41.35	47.74
175	-	602	652	701	702	703	704	3.00	25.03	30.66	35.40	39.58	43.36	48.47	55.97
20	-	602	652	-	-	723	724	3.05	28.85	35.33	40.80	45.62	49.97	55.87	64.52
30	-	602	652	-	-	793	-	3.90	42.43	51.96	60.00	67.08	73.48	82.16	94.88

A = Equivalent bore diameter

Connection code	Connection	p <sub>max</sub> [bar]
A3. 00	BSPT	ca. 350
A3. 07	NPT	ca. 350
A3. 29	Lock nut	ca. 200

<b>Example for ordering:</b>	<b>Nozzle code</b>	<b>+</b>	<b>Flow rate code</b>	<b>+</b>	<b>Connection-Code</b>	<b>=</b>	<b>Ordering no.</b>
	608		361		A3. 07		608. 361. A3. 07
							(Flat fan 20°; 4.52 l/min. at 100 bar; 1/4" NPT)

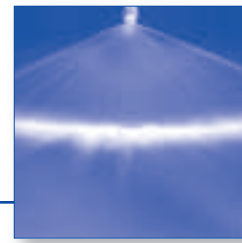
Conversion formula for the above series:  $\dot{V}_2 = \dot{V}_1 * \sqrt{\frac{p_1}{p_2}}$





# Tongue-type nozzles for retaining nut

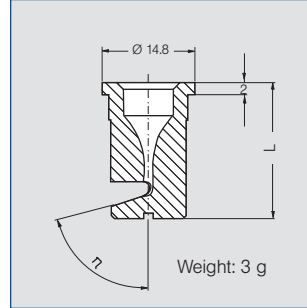
## Series 684



**Assembly with retaining nut.**  
**Wide flat fan with a sharply delimited spray pattern.**  
**Not prone to clogging. Easy nozzle changing, simple jet alignment.**

Applications:

Foam control in storage tanks and sewage treatment plants. Cleaning and washing process, requiring powerful and concentrated water jets.



Spray angle	$\eta$	Ordering no.		Colour**	B $\emptyset$ [mm]	$\dot{V}$ [l/min]			L [mm]	Spray width B at p = 2 bar  H = 250 mm	
		Type	Mat-no.			p [bar]					
			56			5E	1.0	2.0			5.0
140°	75°	684. 348	○	-	green	0.7	0.35*	0.50	0.79	20	1360
	75°	684. 368	○	○	yellow	0.8	0.45*	0.63	1.00	20	1360
	75°	684. 408	○	-	blue	1.0	0.71	1.00	1.58	20	1370
	75°	684. 448	○	-	red	1.2	0.88	1.25	1.98	20	1370
	75°	684. 488	○	○	brown	1.3	1.13	1.60	2.53	20	1370
	75°	684. 528	○	-	grey	1.5	1.41	2.00	3.16	20	1370
	75°	684. 568	○	○	white	1.7	1.77	2.50	3.95	19	1370
	75°	684. 608	○	-	light blue	1.9	2.23	3.15	4.98	19	1370
	75°	684. 688	○	-	green	2.4	3.54	5.00	7.91	17	1370
	75°	684. 728	○	○	black	2.7	4.45	6.30	9.96	17	1370
	75°	684. 808	○	-	purple	3.4	7.07	10.00	15.81	16	1370

B = Bore diameter

\* Differing spray pattern.

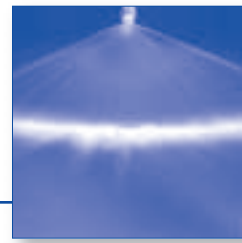
\*\* Material PVDF generally blue

<b>Example</b>	<b>Type</b>	<b>+</b>	<b>Material-no.</b>	<b>=</b>	<b>Ordering no.</b>
<b>for ordering:</b>	<b>684. 348</b>	<b>+</b>	<b>56</b>	<b>=</b>	<b>684. 348. 56</b>



# Tongue-type nozzles

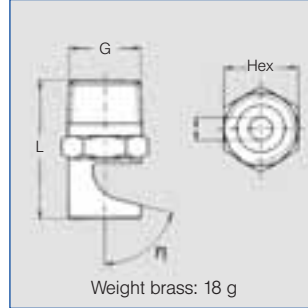
## Series 686



**Wide flat fan with a sharply delimited jet pattern.  
Not prone to clogging.**

Applications:

Foam control in storage tanks and sewage treatment plants, cleaning and washing process, requiring powerful and concentrated water jets.



Spray angle	$\eta$	Ordering no.								B Ø [mm]	$\dot{V}$ [l/min]			Dimensions								Spray width B at p = 2 bar
		Type	Material-no.			Code G					p [bar]			L [mm]				Hex [mm]				
			16	30	5E	1/8 BSPT	1/4 BSPT	3/8 BSPT	1/2 BSPT		1.0	2.0	5.0	R 1/8	R 1/4	R 3/8	R 1/2	R 1/8	R 1/4	R 3/8	R 1/2	
			303 SS	Brass	PVDF																	
90°	53°	686.366	-	○	-	CA	-	-	-	0.80	0.45	0.63	1.00	22	-	-	-	11	-	-	-	520
	75°	686.406	○	○	-	CA	-	-	-	1.00	0.71	1.00	1.58	23	-	-	-	11	-	-	-	525
	40°	686.686	○	○	-	CC	-	-	-	2.40	3.54	5.00	7.91	-	29	-	-	-	14	-	-	530
	40°	686.726	-	○	-	CA	-	-	-	2.70	4.45	6.30	9.96	26	-	-	-	11	-	-	-	530
	40°	686.806	○	○	-	CC	-	-	-	3.40	7.07	10.00	15.81	-	34	-	-	-	14	-	-	530
	40°	686.886	○	-	-	CC	-	-	-	4.20	11.31	16.00	25.30	-	36	-	-	-	17	-	-	530
	40°	686.926	○	-	-	CE	-	-	-	4.70	14.14	20.00	31.62	-	-	39	-	-	-	17	-	530
140°	75°	686.368	○	○	-	CA	-	-	-	0.80	0.45	0.63	1.00	23	-	-	-	11	-	-	-	1360
		686.408	○	○	-	CA	-	-	-	1.00	0.71	1.00	1.58	23	-	-	-	11	-	-	-	1370
		686.448	○	○	-	CC	-	-	-	1.20	0.88	1.25	1.98	-	28	-	-	-	14	-	-	1370
		686.488	○	○	-	CA	CC	-	-	1.30	1.13	1.60	2.53	23	28	-	-	11	14	-	-	1370
		686.528	○	○	-	CA	CC	-	-	1.50	1.41	2.00	3.16	23	28	-	-	11	14	-	-	1370
		686.568	○	○	○*	CA	CC	-	-	1.70	1.77	2.50	3.59	23	28	-	-	11	14	-	-	1370
		686.608	○	○	-	CA	CC	-	-	1.90	2.23	3.15	4.98	23	28	-	-	11	14	-	-	1370
		686.648	○	○	-	CC	-	-	-	2.20	2.83	4.00	6.32	-	28	-	-	-	14	-	-	1370
		686.688	○	○	-	CA	CC	-	-	2.40	3.54	5.00	7.91	23	28	-	-	11	14	-	-	1370
		686.728	○	○	-	CA	CC	-	-	2.70	4.45	6.30	9.96	23	28	-	-	11	14	-	-	1370
		686.768	○	○	-	CC	-	-	-	3.00	5.66	8.00	12.65	-	28	-	-	-	14	-	-	1370
		686.808	○	○	-	CA	CC	-	-	3.40	7.07	10.00	15.81	23	28	-	-	11	14	-	-	1370
		686.828	○	○	-	CC	-	-	-	3.60	7.92	11.20	17.71	-	28	-	-	-	14	-	-	1370
		686.848	○	○	-	CC	-	-	-	3.80	8.80	12.50	19.76	-	28	-	-	-	14	-	-	1370
		686.868	○	○	-	CC	-	-	-	4.00	9.90	14.00	22.14	-	28	-	-	-	14	-	-	1370
		686.888	○	○	-	CC	-	-	-	4.20	11.31	16.00	25.30	-	28	-	-	-	14	-	-	1370
		686.908	○	○	-	CC	-	-	-	4.50	12.73	18.00	28.46	-	28	-	-	-	14	-	-	1370
686.928	○	-	-	CE	-	-	-	4.70	14.14	20.00	31.62	-	-	32	-	-	-	17	-	1370		
686.968	-	○	-	CE	CG	-	-	5.30	17.68	25.00	39.53	-	-	32	40	-	-	17	22	1370		
686.988	○	-	-	CE	CG	-	-	5.60	19.80	28.00	44.27	-	-	32	40	-	-	17	22	1370		

B = Bore diameter

Can also be used for air or saturated steam

\* Only available with code CA.

**Example**    Type    + Material-no.    + Code    = Ordering no.  
for ordering:    686.366    + 30                    + CA        = 686.366.30.CA

Conversion formula for the above series:  $\dot{V}_2 = \dot{V}_1 * \sqrt{\frac{p_1}{p_2}}$



# Tongue-type nozzles

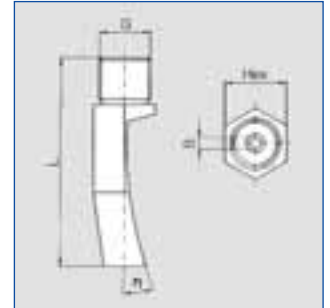
## Series 688 / 689



**Hard, sharp flat fan, narrowly delimited jet pattern. Not prone to clogging.**

Applications:

Cleaning, washing, degreasing and phosphating, preparation techniques.



Spray angle	$\eta$	Ordering no.						B $\emptyset$ [mm]	$\dot{V}$ [l/min]				Dimensions		Weight	Spray width B at p = 2 bar		
		Type	Mat.-no.			Code G			p [bar]				L [mm]	SW [mm]		H		
			16	30	5E	1/4 BSPT	3/8 BSPT		3/4 BSPP	0.5	1.0	2.0				5.0	H = 250 [mm]	H = 500 [mm]
45°	36°	688. 603	○	-	-	CC	-	-	1.9	1.57	2.23	3.15	4.98	31	114	50	220	440
	36°	688. 723	○	-	-	-	CE	-	2.7	3.15	4.45	6.30	9.96	44	17	107	220	400
	35°	688. 763	○	-	-	-	CE	-	3.0	4.00	5.66	8.00	12.65	43	19	120	220	440
	30°	688. 843	○	○	-	-	CE	-	3.8	6.25	8.84	12.50	19.76	50	19	140	220	440
	27°	688. 883	○	○	-	-	CE	-	4.3	8.00	11.31	16.00	25.30	67	22	240	220	400
	29°	689. 923	○	○	-	-	CE	-	4.8	10.00	14.14	20.00	31.62	59	22	260	220	440
	29°	688. 943	○	-	-	-	CE	-	4.9	11.20	15.84	22.40	35.41	62	22	300	220	400
	29°	688. 963	○	-	-	-	CE	-	5.4	12.50	17.68	25.00	39.53	74	22	432	220	400
	35°	689. 003	○	-	○	-	-	90	6.0	15.75	22.27	31.50	49.81	80	32/24	306/33	250	490
	21°	689. 043	○	○	-	-	CE	-	6.9	20.00	28.28	40.00	63.25	67	24	630	250	490
	18°	689. 083	○	○	-	-	CE	-	7.6	25.00	35.36	50.00	79.06	74	24	625	250	490
	18°	689. 123	○	○	-	-	CE	-	8.6	31.50	44.55	63.00	99.61	79	24	610	250	490

B = Bore diameter

**Example** Type + Material-no. + Code = Ordering no.  
**for ordering:** 688. 763 + 16 + CE = 688. 763.16. CE



# Axial-flow full cone nozzles

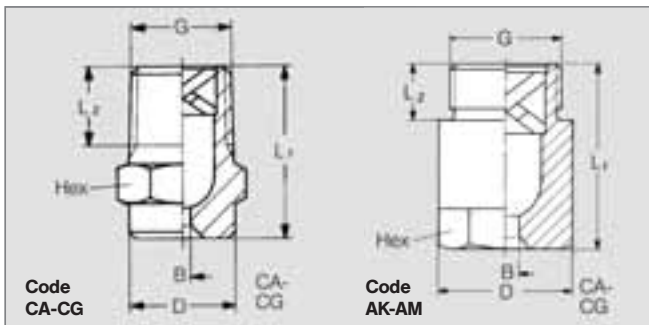
## Series 460



**Very uniform spray pattern.  
Large free cross-sections,  
due to optimized  
x-style swirl insert.**

Applications:

Cleaning and washing process, cooling of gaseous fluids and solids, surface spraying, spraying onto mats in air washers, improving of chemical reactions. Large free cross-sections due to optimized x-style swirl insert.



Code	G	Dimensions [mm]		D	Hex	Weight brass
		L <sub>1</sub>	L <sub>2</sub>			
<b>CA</b>	1/8 BSPT	18.0	6.5	10.0	11	15 g
<b>CC</b>	1/4 BSPT	22.0	10.0	13.0	14	17 g
<b>CE</b>	3/8 BSPT	24.5	10.0	16.0	17	30 g
CE	3/8 BSPT	30.0	10.0	16.0	17	50 g
<b>CG</b>	1/2 BSPT	32.5	13.0	21.0	22	67 g
CG	1/2 BSPT	43.5	13.0	21.0	22	85 g
<b>AK</b>	3/4 BSPP	42.0	15.0	32.0	27	170 g

Subject to technical modifications.  
Please enquire about the exact dimensions if the installation situation is critical!

Spray angle	Type	Ordering no.							B Ø [mm]	E Ø [mm]	ṽ [l/min]								Spray diameter D at p = 2 bar 	
		Material-no.			Code						p [bar]									
		17 <sup>1)</sup>	30	5E	316 SS/316L	Brass	PVDF	1/8 BSPT			1/4 BSPT	3/8 BSPT	1/2 BSPT	3/4 BSPP	0.5	1.0	2.0	3.0		5.0
45°	460.403	○	○	-	CA	-	-	-	-	1.20	0.85	0.57	0.76	1.00	1.18	1.44	1.65	1.90	160	400
	460.523	○	○	-	CA	-	-	-	-	1.50	1.35	1.15	1.52	2.00	2.35	2.89	3.30	3.81	160	400
	460.603	○	○	-	-	CC	CE*	-	-	1.90	1.80	1.81	2.39	3.15	3.70	4.54	5.20	6.00	160	400
	460.643	○	○	-	-	CC	CE*	-	-	2.15	2.00	2.30	3.03	4.00	4.70	5.77	6.60	7.61	160	400
	460.683	-	○	-	-	CC	CE	-	-	2.40	2.00	2.87	3.79	5.00	5.88	7.21	8.25	9.52	160	400
	460.703	-	○	-	-	-	CE	-	-	2.55	2.20	3.22	4.24	5.60	6.59	8.08	9.24	10.66	160	400
	460.723	○	○	-	-	-	CE	-	-	2.70	2.35	3.62	4.77	6.30	7.41	9.09	10.40	11.99	160	400
	460.783	-	○	-	-	-	-	CG	-	3.20	3.20	5.17	6.82	9.00	10.58	12.98	14.85	17.12	160	400
460.843	-	○	-	-	-	-	CG	-	3.80	3.70	7.18	9.47	12.50	14.70	18.03	20.63	23.80	160	400	
60°	460.404	○	○	-	CA	-	-	-	-	1.20	0.85	0.57	0.76	1.00	1.18	1.44	1.65	1.90	220	560
	460.444	○	-	-	CA	-	-	-	-	1.30	1.05	0.72	0.95	1.25	1.47	1.80	2.06	2.38	220	560
	460.484	○	○	-	CA	-	-	-	-	1.45	1.15	0.92	1.21	1.60	1.88	2.31	2.64	3.05	220	560
	460.524	○	○	-	CA	-	-	-	-	1.60	1.20	1.15	1.52	2.00	2.35	2.89	3.30	3.81	220	560
	460.604	○	○	-	CA	CC	CE*	-	-	2.05	1.40	1.81	2.39	3.15	3.70	4.54	5.20	6.00	220	560
	460.644	○	○	○	-	CC	CE*	-	-	2.40	1.90	2.30	3.03	4.00	4.70	5.77	6.60	7.61	220	560
	460.684	○	○	-	-	CC	CE	-	-	2.60	2.00	2.87	3.79	5.00	5.88	7.21	8.25	9.52	220	560
	460.724	○	○	-	-	CC	CE	-	-	2.90	2.00	3.62	4.77	6.30	7.41	9.09	10.40	11.99	220	560
	460.764	○	○	-	-	-	CE	-	-	3.25	2.85	4.59	6.06	8.00	9.41	11.54	13.20	15.22	220	560
	460.804	○	○	-	-	-	CE	-	-	3.60	2.95	5.74	7.58	10.00	11.76	14.43	16.51	19.04	220	560
	460.844	○	○	-	-	-	-	CG	-	4.00	3.30	7.18	9.47	12.50	14.70	18.03	20.63	23.80	220	560
	460.884	○	○	-	-	-	-	CG	-	4.50	3.70	9.19	12.13	16.00	18.82	23.08	26.41	30.46	220	560
	460.924	○	○	-	-	-	-	-	AK	5.20	4.50	11.49	15.16	20.00	23.52	28.85	33.01	38.07	220	560
	460.964	○	○	○	-	-	-	-	AK	5.80	4.90	14.36	18.959	25.00	29.40	36.07	41.26	47.59	220	560

<sup>1)</sup> We reserve the right to deliver 316 SS or 316 L under the material no. 17.  
B = bore diameter · E = narrowest free cross section      \*Only in material 30

Continued on next page.

Conversion formular for the above series:  $\dot{V}_2 = \dot{V}_1 * \left(\frac{p_2}{p_1}\right)^{0.4}$  ( $\leq 10$  bar)



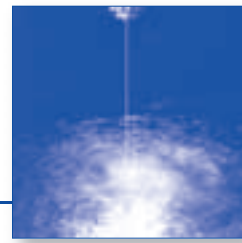






# High-pressure solid stream nozzles

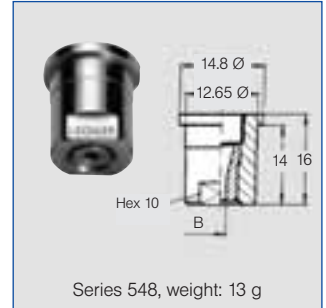
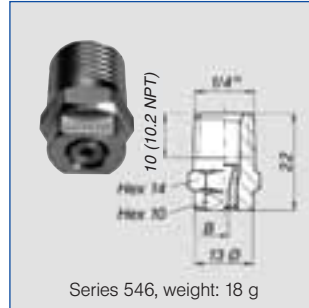
## Series 546 / 548 / 550



**Punctiform, extremely tight, non-dispersing solid stream. Highest impact.**

Applications:  
High-pressure cleaning, cutting and separating.

Materials:  
Nozzle body: Stainless steel 303 SS  
Insert: Hardened steel 1.4034S



US gal/min. at 40 psi	Nozzle code			Flow rate code	B Ø [mm]	$\dot{V}$ [l/min]						
	Connection		Retaining nut			p [bar]						
	1/8"	1/4"				40	60	80	100	150	200	300
02	550	546	548	360	0.84	2.86	3.50	4.04	4.52	5.54	6.39	7.83
03	550	546	548	400	1.03	4.31	5.28	6.10	6.82	8.35	9.64	11.81
034	550	546	548	410	1.07	4.70	5.80	6.70	7.49	9.17	10.59	12.97
035	550	546	548	420	1.11	5.06	6.20	7.16	8.00	9.80	11.32	13.86
04	550	546	548	450	1.19	5.80	7.10	8.20	9.17	11.23	12.97	15.88
045	550	546	548	470	1.26	6.54	8.00	9.25	10.34	12.66	14.62	17.91
05	550	546	548	480	1.33	7.29	8.92	10.30	11.52	14.11	16.29	19.95
055	550	546	548	500	1.39	7.96	9.75	11.26	12.59	15.42	17.80	21.81
06	550	546	548	520	1.46	8.70	10.66	12.31	13.76	16.85	19.46	23.83
08	550	546	548	570	1.69	11.48	14.06	16.23	18.15	22.23	25.67	31.44
10	550	546	548	600	1.88	14.32	17.54	20.25	22.64	27.73	32.02	39.21
15	550	546	548	670	2.30	21.60	26.46	30.55	34.16	41.84	48.31	59.17
20	550	546	548	720	2.66	28.85	35.34	40.80	45.62	55.87	64.52	79.02

B = bore diameter

Connection code	Connection	p <sub>max</sub> [bar]
A3. 00	BSPT	ca. 350
A3. 07	NPT	ca. 350
A3. 29	Lock nut	ca. 200

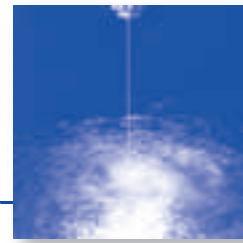
**Example for ordering:** Nozzle code 550 + Flow rate code 360 + Connection code A3. 07 = Ordering no. 550. 360. A3. 07 (Solid stream; 4.52 l/min. at 100 bar; 1/8" NPT)

Conversion formula for the above series:  $\dot{V}_2 = \dot{V}_1 * \sqrt{\frac{p_1}{p_2}}$



## Eductor nozzles

Series 500.262 / 500.428

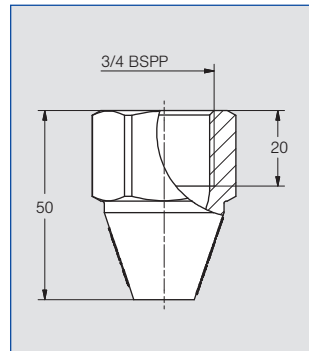
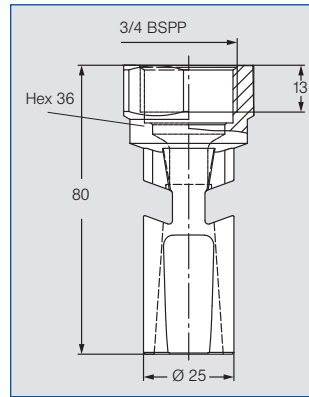
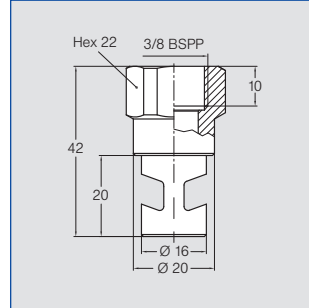


**No risk of blockage thanks to the large cross sections from 2.0 to 10.0 bar.**

Application:  
Tank mixing, liquid circulation,  
preventing sedimentation

Material:

- ❶ Polypropylene
- ❷ + ❸ Polypropylene  
Fibreglass reinforced



Ordering no.	B Ø [mm]	$\dot{V}$ [l/min]				
		p [bar]				
		2	4	6	8	10
❶ 500.262.53.02	2.2	4.4	6.3	7.7	8.9	9.9
500.262.53.04	3.6	11.1	15.7	19.2	22.1	27.7
500.262.53.06	4.5	18.3	26.0	31.8	36.7	41.0
500.262.53.08	6.0	31.6	44.7	54.8	63.2	70.7
❷ 500.262.53.20	10.6	96.1	136.0	166.5	192.3	215.0
❸ 500.428.53.00	9.7	86.6	122.5	150.1	173.3	193.7

Other sizes on request.

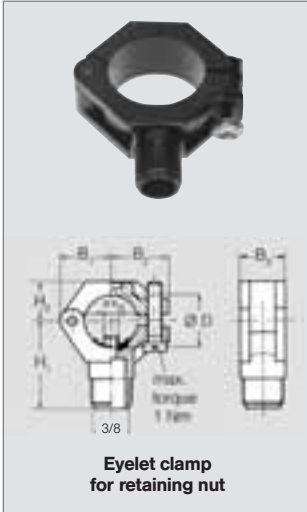


# Accessories

## Eyelet clamps / Retaining nuts

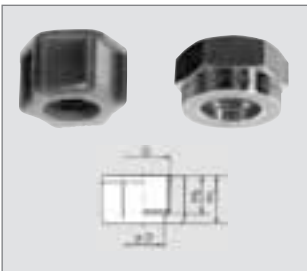
### Eyelet clamps with bajonett quick-release system

#### Eyelet clamps



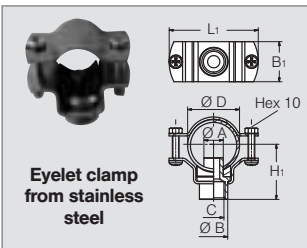
For series	Ordering no.				Screw (Material)	Dimensions [mm]										Weight (Polyamide)
	Type	Material-no.				BSPP	Pipe Ø	D Ø	B <sub>R</sub> Ø	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	H <sub>1</sub>	H <sub>2</sub>		
		51	53	5E												
302 / 684 / 652	090.053	○	○	○	AISI 304	3/8	3/8"	16.5-18.0	6.2	19.0	22.0	18.5	34.5	14.5	20 g	
	090.003	○	○	○		3/8	1/2"	20-22.0	6.2	21.2	23.8	18.5	36.5	16.5	20 g	
	090.013	○	○	○		3/8	3/4"	25-27.5	7.8	24.5	26.5	22.0	39.5	17.5	25 g	
	090.023	○	○	○		3/8	1"	32-34.5	10.8	30.0	31.0	22.0	44.0	21.0	32 g	
	090.033	○	○	○		3/8	1 1/4"	40-43.0	12.8	34.0	35.5	25.0	48.0	25.0	38 g	

#### Retaining nuts

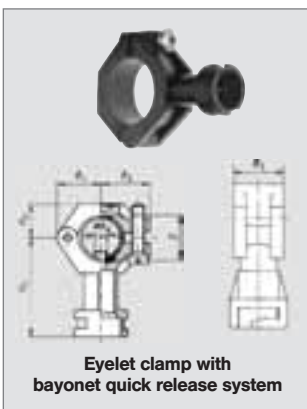


For series	Ordering no.						Dimensions [mm]					Weight (Brass)
	Type	Material-no.					BSPP	H <sub>1</sub>	H <sub>2</sub>	D	Hex	
		16	17	30	56	5E						
652 / 660 / 684	065.200	○	○	○	-	-	3/8	13.0	10.0	12.8	22	25 g
	065.200	-	-	-	○	○	3/8	14.5	11.5	12.8	22	

#### Eyelet clamps



For series	Ordering no.				Dimensions							
	Type	Female thread (C)			Pipe Ø	D	L <sub>1</sub>	B <sub>1</sub>	H <sub>1</sub>	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"	20-22.0	52	30	32	7	18
	090.010.16	-	AB	AD	-	3/4"	25-27.5	56	25	34.5	7	18
	090.020.16	-	-	AD	AF	1"	32-34.5	58	30	39	7	18
	090.030.16	-	-	AD	AF	1 1/4"	40-43.0	70	37	46.5	17.5	25.4



For series	Ordering no.					Screw (brass)	Pipe Ø	D Ø [mm]	Dimensions [mm]						Weight	
	Type	Material-no.							Code	H <sub>1</sub>	H <sub>2</sub>	B <sub>R</sub> Ø	B <sub>1</sub>	B <sub>2</sub>		B <sub>3</sub>
		51	53	5E	56											
302 bayonet 422 bayonet / 2TR 468/548 / 646 652 / 679 / 684	090.003	○	○	○	-	KA	AISI 304	1/2"	20 - 22.0	49.5	16.5	6.2	21.2	23.8	18.5	22g
	090.013	○	○	○	-	KA		3/4"	25 - 27.5	52.5	17.5	7.8	24.5	26.5	22.0	26g
	090.023	○	○	○	-	KA		1"	32 - 34.5	57.0	21.0	10.8	30.0	31.0	22.0	32g

Example    Type    +    Material-no.    =    Ordering no.  
for ordering: 090.053    +    51                                =    090.053.51







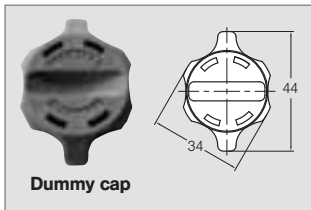
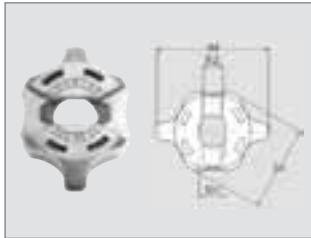
## Accessories

### Bayonet quick-release system

### Bayonet nipple

#### Bayonet quick-release system

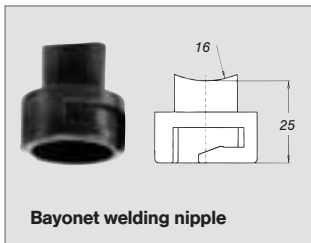
incl. gasket 065. 242. 73  
(Material: rubber)



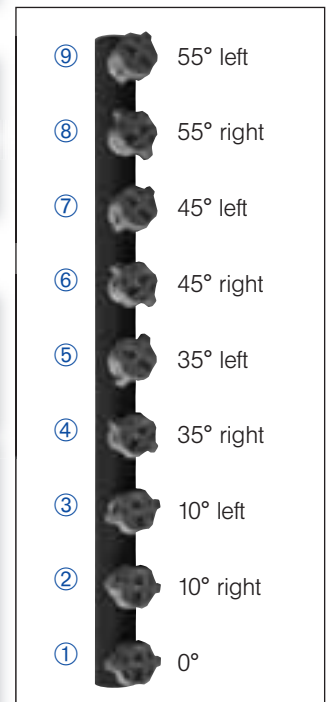
For series	Ordering no.	Material	Colour
	652	<b>065. 202. 56. 00</b>	POM
<b>065. 202. 53. 00</b>		Polypropylene	grey
<b>065. 202. 5E. 00</b>		PVDF	blue
548 / 684	<b>065. 202. 56. 11</b>	POM	black
	<b>065. 202. 53. 11</b>	Polypropylene	grey

Ordering no.	Material	Colour
<b>065. 202. 56. 40</b>	POM	beige
<b>065. 202. 53. 40</b>	Polypropylene	grey

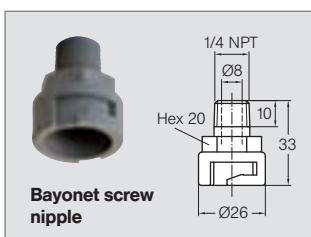
#### Bayonet-Nipple



For series	Ordering no.	Material	Twist angle to the pipe axis	
			Angle	Direction
646 / 652 / 684	<b>① 095. 016. 50. 10. 85</b>	PVC	0°	
	<b>② 095. 016. 53. 08. 05</b>	PP	10°	right
	<b>③ 095. 016. 53. 09. 29</b>	PP	10°	left
	<b>④ 095. 016. 53. 09. 99</b>	PP	35°	right
	<b>⑤ 095. 016. 53. 09. 98</b>	PP	35°	left
	<b>⑥ 095. 016. 53. 07. 36</b>	PP	45°	right
	<b>⑦ 095. 016. 53. 09. 30</b>	PP	45°	left
	<b>⑧ 095. 016. 53. 10. 87</b>	PP	55°	right
	<b>⑨ 095. 016. 53. 10. 88</b>	PP	55°	left



Nozzle mounting with different twist angles



For series	Ordering no.	Material	Connection
652 684	<b>090. 075. 53. 00</b>	PP	1/4 NPT



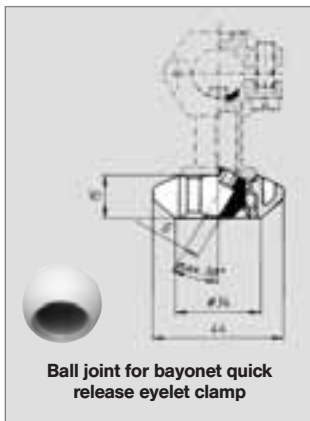
## Accessories

### Ball joint for bayonet quick-release system

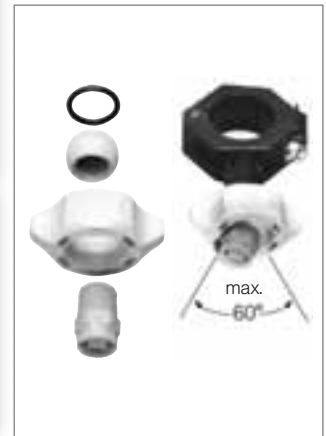
#### Compact ball joints for narrow installation conditions

## Ball joint for bayonet quick-release system

Inexpensive ball joint system for nozzles with 1/8" and 1/4" male thread.



For series	Ordering no.			Colour
	Type	Mat.-no.	Code	
		5E		
		PVDF	1/8 BSPP 1/4 BSPP	
For all nozzles with 1/8"- or 1/4"-male thread.	092. 150	●	AB AD	blue

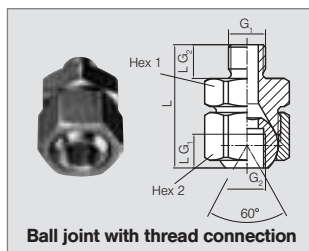


For series	Ordering no.	Material	Colour
For ball joint	092. 150. 5E. 00	PVDF	blue

Pressure/Temperature

T	P <sub>max</sub>
65 °C	10 bar
80 °C	8 bar
100 °C	4 bar

## Compact ball joints for narrow installation conditions



For Series	Ordering no.				Dimensions [mm]										Weight (Brass)	
	Type	Material-no.			Code	D <sub>1</sub>	D <sub>2</sub>	G <sub>1</sub> BSPP	G <sub>2</sub> BSPP	L <sub>G1</sub>	L <sub>G2</sub>	L	Hex <sub>1</sub>	Hex <sub>2</sub>		Hex <sub>3</sub>
		16	30													
For all nozzles with 1/8" male thread.	092. 010	-	●	●	AA	-	-	1/8	1/8	8.0	8.0	29.3	22	24	-	70 g
For all nozzles with 1/4" male thread.	092. 024	-	○	○	AC	-	-	1/4	1/4	12.0	12.0	44	27	27	-	140 g
For all nozzles with 3/8" male thread.	092. 030	-	○	○	AE	-	-	3/8	3/8	12.0	12.0	44	27	30	-	160 g

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



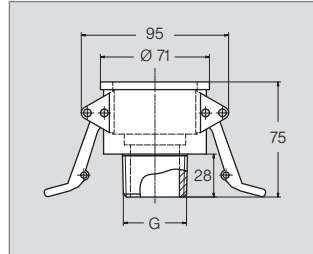
## Accessories

### Quick-release couplings

### Pipe spacer



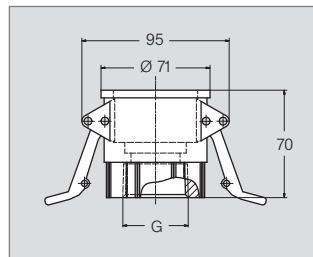
Quick-fit pipe connection (male thread)



Ordering no.	Material	G	Colour
092.300.53.32.B0	PP	1 1/4 BSPT	Red
092.300.53.40.B0	PP	1 1/2 NPT	Purple



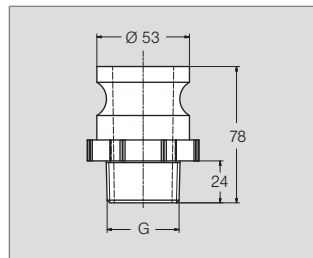
Quick-fit pipe connection (female thread)



Ordering no.	Material	G	Colour
092.300.53.32.D0	PP	1 1/4 BSPT	Red
092.300.53.40.D0	PP	1 1/2 NPT	Purple



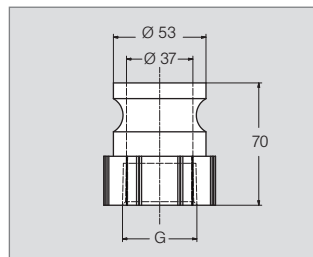
Adapter (male thread)



Ordering no.	Material	G	Colour
092.300.53.32.F0	PP	1 1/4 BSPT	Red
092.300.53.40.F0	PP	1 1/2 NPT	Purple



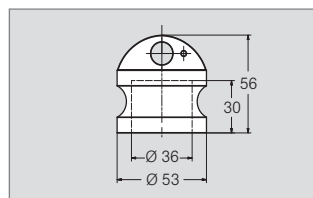
Adapter (female thread)



Ordering no.	Material	G	Colour
092.300.53.32.A0	PP	1 1/4 BSPT	Red
092.300.53.40.A0	PP	1 1/2 NPT	Purple

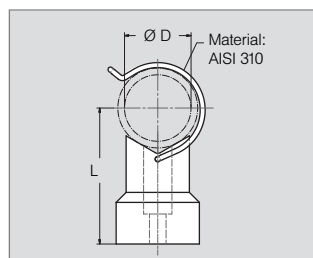


Plug



Ordering no.	Material		Colour
092.300.53.32.DP	PP	1 1/4 BSPT	Red
092.300.53.40.DP	PP	1 1/2 NPT	Purple

## Pipe spacer



Ordering no.	Material	For pipe-Ø	Dimensions (mm)	
			L	Ø D
092.400.53.25.00	PP/1.4310	1"	75	25
092.400.53.32.00	PP/1.4310	1 1/4"	79	32
092.400.53.40.00	PP/1.4310	1 1/2"	83	40
092.400.53.50.00	PP/1.4310	2"	89	50

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

Version with double bracket available on request


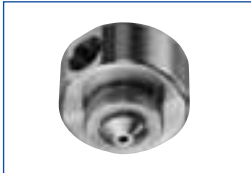






# YOU WILL FIND OTHER NOZZLES FOR USE IN SURFACE TECHNOLOGY IN OUR STANDARD CATALOGUE ...







Over the years, our catalogue for precision nozzles and accessories has become an in-demand nozzle technology

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

For a long time, many Lechler products have 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		$\dot{V}$ Water [l/h]	Application/Design	Catalogue Page
	136	Full cone or flat fan	Pressure principle or suction principle	Internal or external	20° 45° 60° 80°	0.10 – 132.90	Humidification of air, cooling.	1.3
Axial-flow hollow cone nozzles	Series		$\dot{V}$ [l/min] at p = 2 bar	Connection	Application/Design	Catalogue page		
	212	60° 80°	0.015 – 0.46 (at p = 7 bar)	1/4 BSPT 1/4 BSPP	Disinfection, humidification of air, spraying over germinating boxes, product dampening, humidification of textiles, oil spraying, absorption.	2.5		
Eccentric hollow cone nozzles	Series		$\dot{V}$ [l/min] at p = 2 bar	Connection	Application/Design	Catalogue page		
	302	60° 80° 90° 130°	0.40 – 25.00	3/8 BSPP	Humidification of air in air washers, dust control, spraying onto filters, foam control, cooling. <b>Non-clogging nozzle design, without swirl insert.</b>	2.8 2.9		
Full cone nozzles	Series		$\dot{V}$ [l/min] at p = 2 bar	Connection	Application/Design	Catalogue page		
	422 423	60° 90° 120°	1.00 – 100.00	1/4 BSPT 3/8 BSPT 1/2 BSPT 3/4 BSPT 1 BSPT	Cleaning and washing process, cooling of gaseous fluids and solids, surface spraying, spraying onto mats in air washers, improving on chemical reactions, continuous casting. <b>Without swirl inserts, non-clogging.</b>	3.10 3.11		



Full cone nozzles	Series		$\dot{V}$ [l/min] at $p = 2$ bar	Connection	Application/ Design	Catalogue page
	502 503	70° 130°	1.25 – 60.00	1/2 BSPP 3/4 BSPP	Cooling of gaseous and solid material, desuperheating, chlorine precipitation, absorption as well as for improvement of chemical reaction by enlarging the contact area. <b>Fine full cone atomization with the aid of several hollow cones spraying into one another.</b>	3.10 3.11
Flat fan nozzles	Series		$\dot{V}$ [l/min] at $p = 2$ bar	Connection	Application/ Design	Catalogue page
	660	20° 30° 45° 60° 75° 90° 120°	0.05 – 10.00	Assembly with 3/8" lock nut and dove-tail guide	Cleaning installations, cooling headers, spray pipes. <b>Automatic jet alignment, due to dove-tail guide.</b>	4.8

## ... AND IN DIFFERENT SPECIAL BROCHURES

We have a collection of information, included in individual subject brochures, covering special nozzles that are also of particular interest to surface technology applications.

All documents can be downloaded from our website at **www.lechler.com**. We would also be happy to send you the brochures.



Lechler Tank Cleaning Nozzles

Lechler nozzles for compressed air

Lechler full cone nozzle Series 490

### ON THE INTERNET YOU CAN FIND EVEN MORE INFORMATION AND SUPPORT FOR YOUR WORK AT: [www.lechler.com](http://www.lechler.com)

On the internet you can also find additional information about our entire range of services, work aids, our global presence and much more besides – we look forward to your visit.

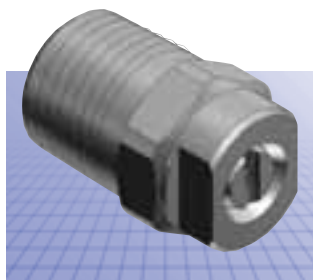


### AND AT <http://lechler.partcommunity.com> THERE'S 3D DESIGN DATA

**3D data on Lechler nozzles and accessories is available to you free of charge for your development and design work. Profit from these advantages:**

- Time-saving, direct download of design drawings and technical data.

- Simple product selection similar to the Lechler printed catalogue.
- Preview function with product photo and 3D graphic.
- Available in all common 3D file formats.
- Free use after once-only registration.



With this service, Lechler once again proves its competence and its high standards as a technology leader.

Take advantage of this offer to simplify your work. We would be happy to support you.



Lechler GmbH  
Precision Nozzles · Nozzle Systems  
P.O. Box 13 23  
72544 Metzingen / Germany  
Phone +49 (0 71 23) 962-0  
Fax +49 (0 71 23) 962-333

E-mail: [info@lechler.de](mailto:info@lechler.de)  
Internet: [www.lechler.com](http://www.lechler.com)



**Belgium:** Lechler S.A./N.V. · Avenue Mercatorlaan, 6 · 1300 Wavre · Phone: (10) 225022 · Fax: (10) 243901 · [info@lechler.be](mailto:info@lechler.be)  
**China:** Lechler Intl. Trad. Co. Ltd. · Beijing · Rm. 418 Landmark Tower · No. 8 Dong San Huan Bei Lu · Phone: (86) 1084537968, Fax: (86) 1084537458 · [info@lechler.com.cn](mailto:info@lechler.com.cn)  
**Finland:** Lechler Oy · Posliinitehtaankatu 7 · 04360 Kerava · Phone: (358) 207856880 · Fax: (358) 207856881 · [info@lechler.fi](mailto:info@lechler.fi)  
**France:** Lechler France, S.A. · Bât. CAP2 · 66-72, Rue Marceau · 93558 Montreuil cedex · Phone: (1) 49882600 · Fax: (1) 49882609 · [info@lechler.fr](mailto:info@lechler.fr)  
**Great Britain:** Lechler Ltd. · 1 Fell Street, Newhall · Sheffield, S9 2TP · Phone: (0114) 2492020 · Fax: (0114) 2493600 · [info@lechler.com](mailto:info@lechler.com)  
**India:** Lechler (India) Pvt. Ltd. · Plot B-2 · Main Road · Wagle Industrial Estate · Thane (W) · 400604 · Phone: (22) 40634444 · Fax: (22) 40634497 · [lechler@lechlerindia.com](mailto:lechler@lechlerindia.com)  
**Sweden:** Lechler AB · Spärrgatan 8 · SE-653 41 Karlstad · Phone: (46) 54137030 · Fax: (46) 54137031 · [info@lechler.se](mailto:info@lechler.se)  
**Spain:** Lechler S.A. · Avda. Pirineos 7 · Oficina B7, Edificio Inbisa I · 28700 San Sebastián de los Reyes, Madrid · Phone: (34) 916586346 · Fax: (34) 916586347 · [info@lechler.es](mailto:info@lechler.es)  
**USA:** Lechler Inc. · 445 Kautz Road · St. Charles, IL. 60174 · Phone: (630) 3776611 · Fax: (630) 3776657 · [info@lechlerUSA.com](mailto:info@lechlerUSA.com)