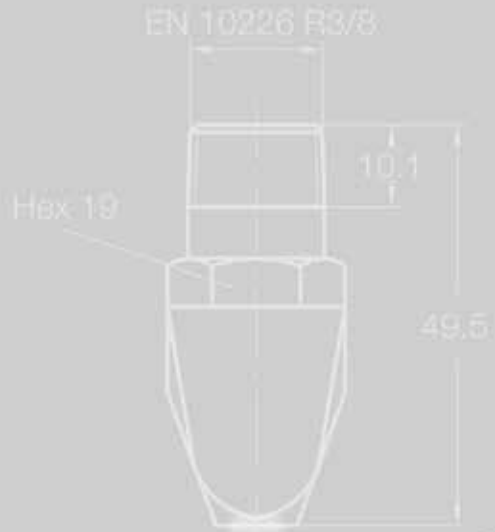
ENGINEERING
YOUR SPRAY SOLUTION

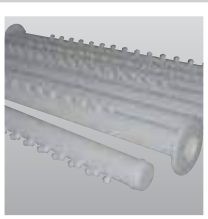
LECHLER

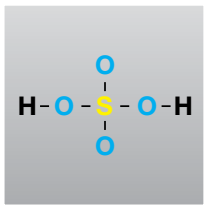
Precision Spray Nozzles for Pickling Lines









Pickling Lines

HIGH QUALITY NOZZLES FOR YOUR HIGH QUALITY PROCESS

The closer it comes to the final step of a production process the more important the direct result is. Hence, the pickling line has a decisive function in the entire production chain of steel.

There is an amazing number of options to improve and optimize your process by nozzles and nozzle arrange-ments. Lechler will be pleased to assist you.

Lechler develops and manufactures precision nozzles for various applications. For this we can fall back on all the experience of our 135-year history. The extensive knowledge of nozzles among our 670-strong workforce and a deep understanding of typical industry processes mean that we have been at the forefront of innovation in nozzle technology for many years.

Today, Lechler manufactures nozzles in Germany, England, Hungary, India, China and the USA. Lechler also has subsidiary company plants and offices in the United States, the UK, China, India, France, Belgium, Spain, Sweden, Finland and Hungary. We also have a network of sales offices and representatives covering many other countries.

WIDE RANGE OF SERVICES FOR YOUR SUCCESS

LECHLER | COMPETENCE | CUSTOMER ADVANTAGES

- Wide product range
- Service
- Experience
- Custom made solutions
- Process-optimization
- Process reliability
- Cost savings

Nozzles for pickling lines

In this brochure we have compiled for you an overview of our most common nozzles used in pickling lines.
In addition to the information given in this brochure our local sales staff will be glad to offer the best nozzle solution for your specific challenge.

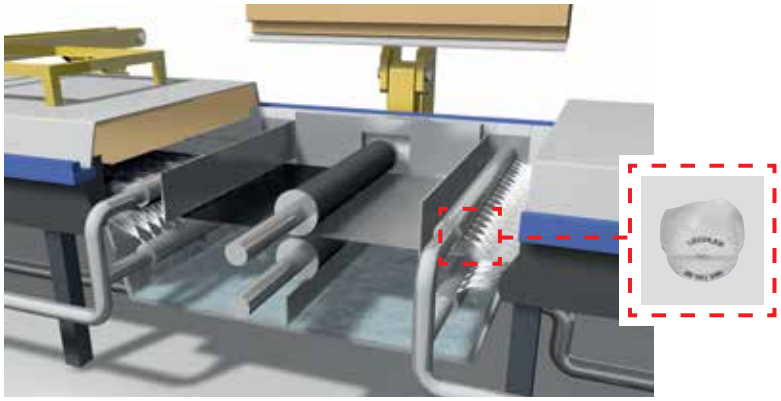
Thanks to our detailed knowledge and long-time experience we will be able to elaborate also innovative customized solutions.

We would like to accompany you to your success. With our vision of a life-time partnership we will always be available to inform you about the latest developments in nozzle technology.

CONTENT

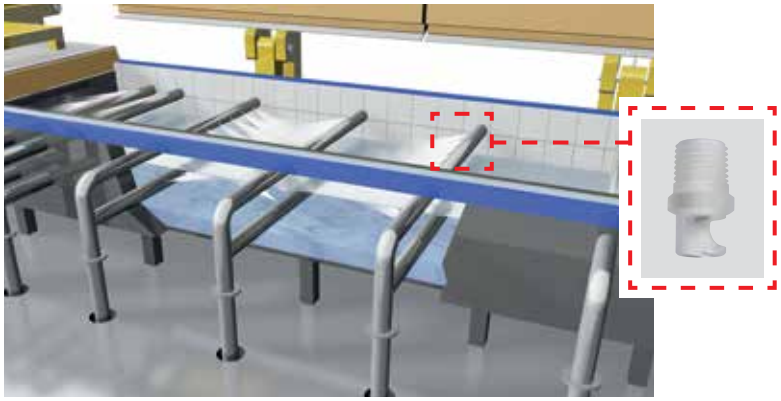
TYPICAL PROCESS: TURBULENCE PICKLING LINE

Turbulent pickling



Series 664/665 flat jet nozzles with 45° or 60° spray angle and dovetail connection generate high turbulence. The automatic self-adjusting orientation of the flat jet ensures optimum alignment and easy maintenance. Also flat jet nozzles **series 621/625** with a male thread connection fulfill the job of generating turbulence.

Rinsing



Series 686 tongue-type flat jet nozzles with 90° or 140° spray angle offer a powerful spray. The large free cross sections minimize the risk of clogging.

WHAT YOU SHOULD KEEP IN MIND WHEN PLANNING

Nozzle selection

① Material

The basis for all other following steps is to select an adequate material for the nozzles and the accessories. Also the life-time of these components depends on the material and the atmosphere they are used in. As the resistance of the material depends very much on the specific operation conditions (such as temperature, acid concentration, residence time, mechanical stress, etc.) the table shown below could only give a rough and general recommendation.

② Turbulence pickling

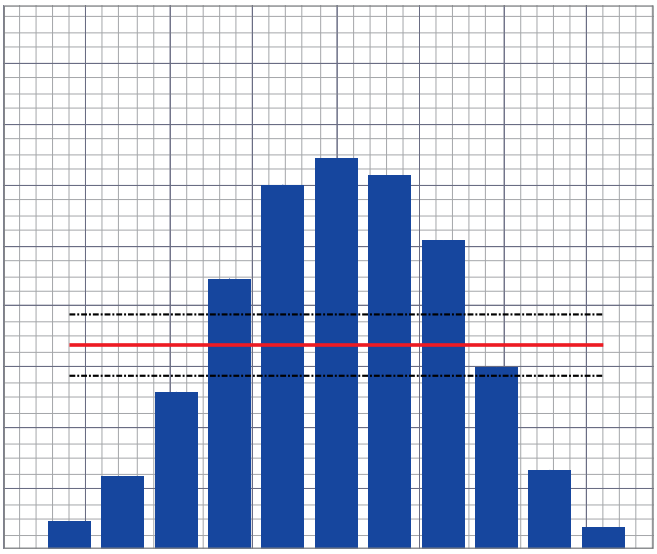
In the turbulence pickling section, the nozzles have to offer a homogeneous liquid distribution over the entire material width.

At the same time they are responsible for creating turbulence in the pickling liquid. The nozzle sprays have to force continuously the heated acid into the cracks of the scale layer on the strip. This is most important for effective pickling and helps to accelerate the chemical process, which will lead to an optimum capacity of the entire line. Flat jet nozzles could fulfill these demands to perfection.

Whenever possible, a staggered nozzle arrangement (see adjoining graphic) is preferred, to avoid any linear spray pattern on the strip.

Furthermore, optimal overlapping of the adjacent sprays is a fundamental factor when defining the nozzle arrangement.

Lechler will be pleased to assist you.



Liquid distribution measurement (standard parabolic liquid distribution of a flat jet nozzle)

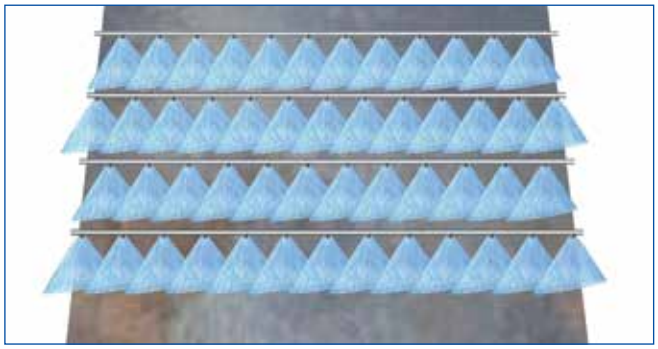
Chemical Resistance

	Code	17 / 1Y	5E	53
	Material	AISI 316Ti / AISI 316L	PVDF	PP
Acetic Acid	C2H4O2	○	○	only at room temperature
Caustic Soda	NaOH	only low concentration and only at room temperature	-	○
Formic Acid	CH2O2	only at room temperature	○	only at room temperature
Hydrochloric Acid	HCl	-	○	max. 60 – 80 °C (depending on concetration)
Hydrofluoric Acid	HF	-	○	only low concentration and only at room temperature
Hydroxypropionic Acid	C3H6O3	only at room temperature	only at room temperature	only at room temperature
Nitric Acid	HNO3	only low concentration	max.concentration 70%	-
Phosphoric Acid	H3PO4	max.concentration 10% if temperature higher than room temperature	○	only low concentration and only at room temperature
Sulfuric Acid	H2SO4	only low concentration (max.7,5%) and only at room temperature	○	only low concentration and only at room temperature

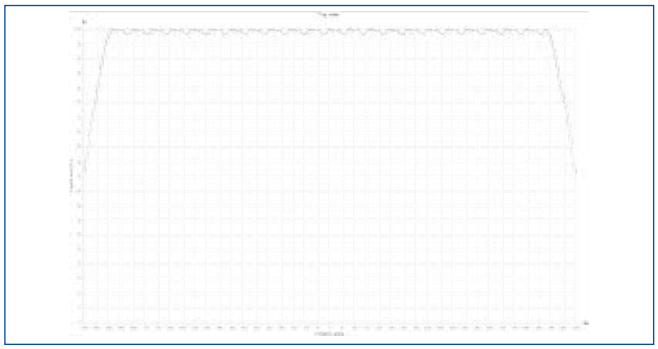
This table is only a rough recommendation. It is not to be considered as any kind of guarantee. The resistance in detail is highly dependent on the combination of thermal, mechanical and chemical load as well as on the exact material composition and the duration of the mentioned loads.

③ Rinsing

The rinsing section is absolutely necessary because as it has to stop the chemical reaction and prevent over-pickling. An effective rinsing by an appropriate nozzle installation has a significant influence to the optimum result. Areas with a lower rinsing water density or even gaps in between the sprays could lead to severe quality issues. Therefore, an adequate nozzle selection and arrangement with an even liquid distribution is as important as good maintenance work.



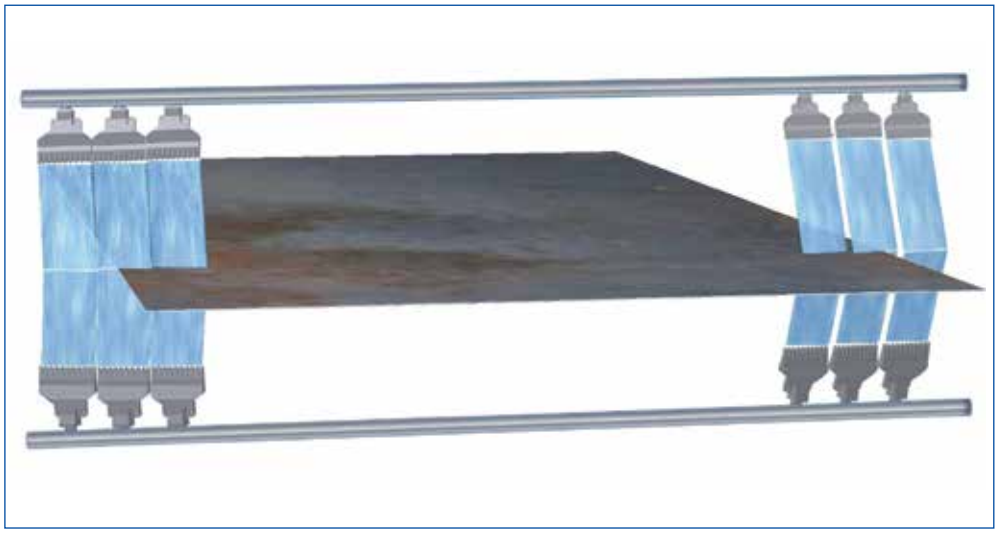
Example of a staggered nozzle arrangement



Simulation of liquid distribution

④ Blow-off

After leaving the rinsing section, the water should be removed from the strip. Typically, nozzles for compressed air could manage this job. Especially, at the edges of the strip where water droplets remain from rinsing, have to be blown off. The multi-channel Whisperblast nozzles are specifically designed to offer the highest performance. When installed properly they are most effective. The air nozzles must cover the full range of the possible strip edges. Therefore, minimum and maximum strip width as well as the accuracy of the horizontal strip guidance has to be taken into account.

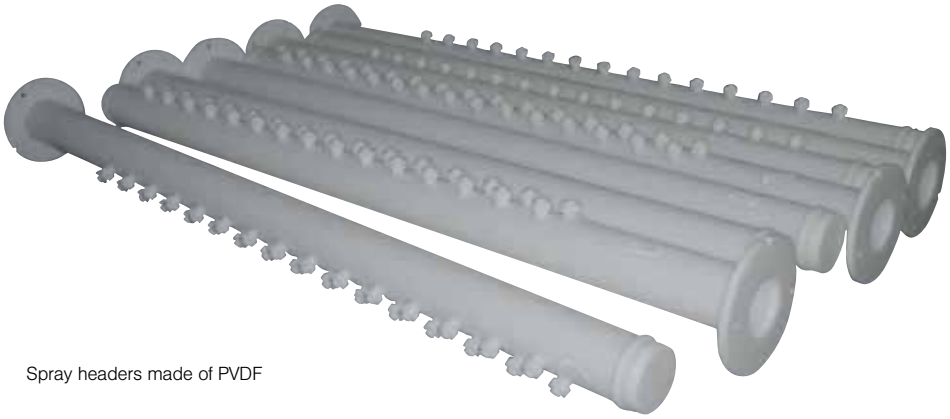


Strip edge blow-off with multi-channel nozzles for compressed air

WHAT YOU SHOULD KEEP IN MIND WHEN PLANNING

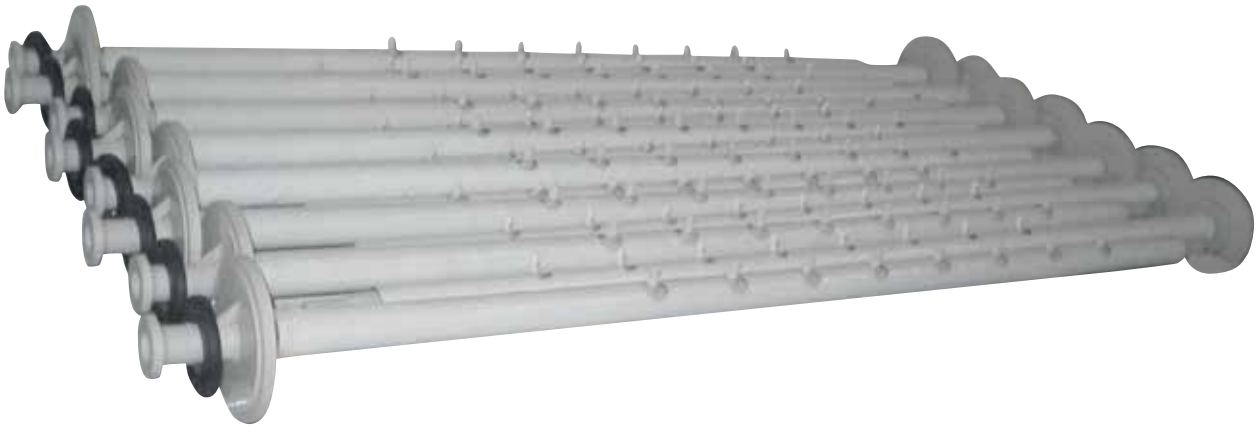
⑤ Spray Headers

Precise nozzle sprays need to be installed accurately on precise spray headers. Complete spray headers can be manufactured by Lechler, according to your drawings. Lechler can produce headers in stainless steel material, as well as in plastics according to your specifications.



Spray headers made of PVDF

Spray header made of stainless steel



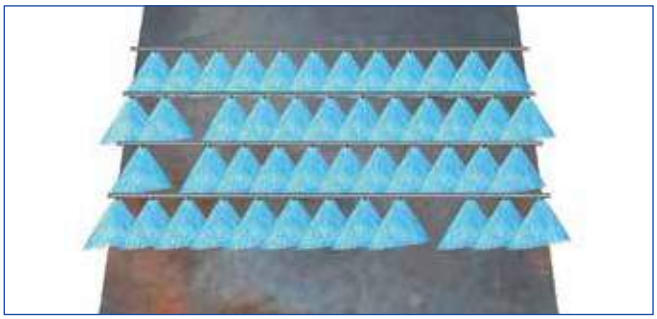
Spray headers equipped with tongue type nozzles

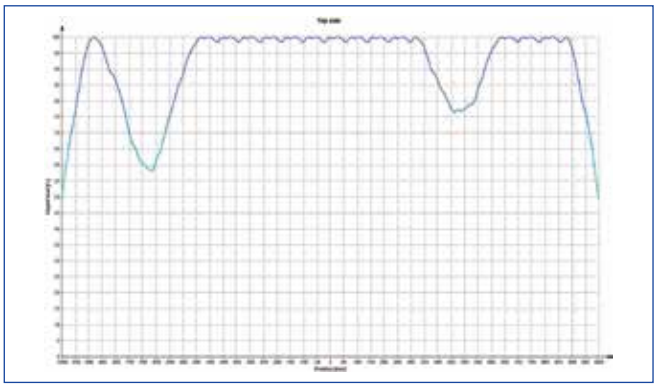
⑥ Maintenance

As the nozzles and accessories are exposed to the rough operation conditions, their state should be checked regularly. Especially if the nozzles themselves are subject to wear, clogging or damage.

A worn out nozzle could not fulfill the high functional demand anymore. An uneven overall liquid distribution and a non-uniform product surface could be the result. Worn out or clogged nozzles must be replaced by new ones in regular intervals to ensure optimum operation.

Worn out bayonet cap





Influence of clogged nozzles to the liquid distribution

Clogged nozzle (front side)

Clogged nozzle (back side)

Flat fan nozzles

Series 632 / 633

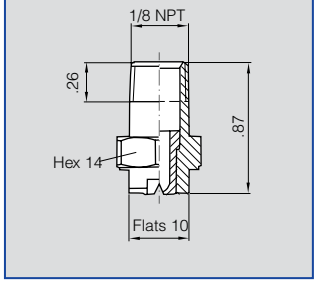
Standard design with high-precision spray angle, exact flow rate, and extremely narrow spray depth, achieved through close manufacturing tolerances. Parabolic distribution of liquid ensures that spray pipes equipped with these nozzles show an extremely uniform total liquid distribution. Conical, self-sealing thread connection. The design of spray headers is very easy due to the thread connection of the nozzles. The entire product range is available at short notice, due to the modular design.

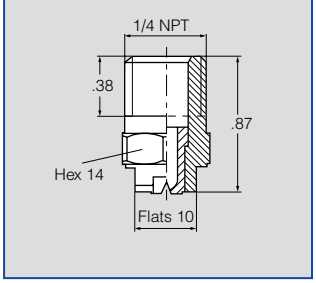
Applications:
Cleaning, pickling, coating, surface treatment, rinsing.

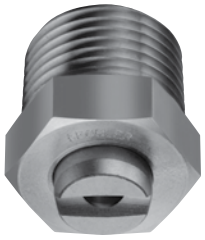
Mat. no. 17
(∢ 20°-75°)

Mat. no. 17
(∢ 90°-120°)

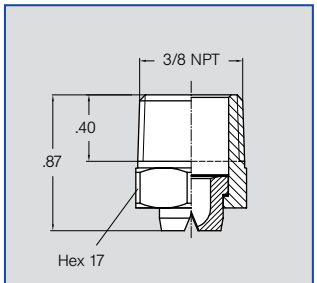
Mat no. 5E

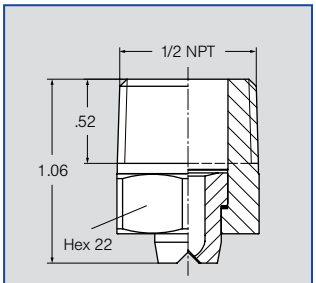






3/8" or 1/2" version





Spray angle	Ordering no.							Equivalent Orifice diam. [in]	Free passage [in]	Flow Rate (Gallons Per Minute)							Spray width B at p=30 psi	
	Type	Mat. no. 17[1] AISI 316Ti / AISI 316L	Mat. no. 5E PVDF	Connection Male NPT 1/8"	1/4"	3/8"	1/2"			10 psi	20 psi	liters per minute 2 bar	40 psi	60 psi	80 psi	100 psi	H=10"	H=20"
20°	**632. 441**	○	○	**BA**	**BC**	-	-	.053	.043	.19*	.27	1.3	.39	.48	.55	.61	3	6
	632. 481	○	○	**BA**	**BC**	-	-	.059	.047	.25*	.35	1.6	.50	.61	.70	.78	3	6
30°	**632. 482**	○	○	**BA**	**BC**	-	-	.059	.043	.25*	.35	1.6	.50	.61	.70	.78	5	9
	632. 562	○	○	**BA**	**BC**	-	-	.079	.059	.39	.55	2.5	.78	.95	1.1	1.2	5	9
	632. 642	○	-	-	**BC**	-	-	.099	.071	.62	.88	4.0	1.2	1.5	1.8	2.0	5	9
	632. 722	○	-	-	**BC**	-	-	.118	.095	.98	1.4	6.3	2.0	2.4	2.8	3.1	5	9
	632. 762	○	-	-	**BC**	-	-	.138	.106	1.1	1.5	8.0	2.6	3.3	4.0	4.7	5	10
	632. 802	○	-	-	**BC**	-	-	.158	.122	1.6	2.2	10.0	3.1	3.8	4.4	4.9	5	10

[1] We reserve the right to deliver AISI 316Ti or AISI 316L under the material no. 17.
*differing spray pattern
Subject to technical modifications.

Continued on next page.

Example of ordering:	Type	+	Material no.	+	Conn.	=	Ordering no.
	632. 441	+	**17**	+	**BC**	=	**632. 441. 17. BC**

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

Flat fan nozzles

Series 632 / 633

Spray angle	Ordering no.							Equivalent Orifice diam. [in]	Free passage [in]	Flow Rate (Gallons Per Minute)							Spray width B at p=psi	
	Type	Mat. no. 17[1] AISI 316Ti / AISI 316L	Mat. no. 5E PVDF	Connection Male NPT 1/8"	1/4"	3/8"	1/2"			10 psi	20 psi	liters per minute 2 bar	40 psi	60 psi	80 psi	100 psi	H=10"	H=20"
45°	**632. 483**	○	○	**BA**	**BC**	**-**	**-**	.059	.043	.25*	.35	1.6	.50	.61	.70	.78	7	13
	632. 563	○	○	**BA**	**BC**	**-**	**-**	.079	.055	.39	.55	2.5	.78	.95	1.1	1.2	7	14
	632. 643	○	○	**BA**	**BC**	**-**	**-**	.098	.071	.53	.75	4.0	1.3	1.7	2.0	2.4	8	15
	632. 673	○	**-**	**-**	**BC**	**BE**	**-**	.106	.083	.74	1.0	4.8	1.5	1.8	2.1	2.3	8	15
	632. 723	○	**-**	**-**	**BC**	**BE**	**-**	.118	.095	.98	1.4	6.3	2.0	2.4	2.8	3.1	8	15
	632. 763	○	**-**	**-**	**BC**	**BE**	**-**	.138	.102	1.1	1.5	8.0	2.6	3.3	4.0	4.7	8	15
	632. 803	○	**-**	**-**	**BC**	**BE**	**BG**	.158	.118	1.6	2.2	10.0	3.1	3.8	4.4	4.9	8	15
	632. 843	○***	**-**	**-**	**BC**	**-**	**BG**	.177	.138	1.9	2.7	12.5	3.9	4.8	5.5	6.1	8	15
	632. 883	○	**-**	**-**	**-**	**-**	**BG**	.197	.157	2.5	3.5	16.0	5.0	6.1	7.0	7.9	9	17
	632. 923	○	**-**	**-**	**-**	**-**	**BG**	.217	.165	3.1	4.4	20.0	6.2	7.6	8.8	9.8	9	17
	632. 963	○	**-**	**-**	**-**	**-**	**BG**	.236	.185	3.9	5.5	25.0	7.8	9.5	11.0	12.3	9	17
60°	**632. 484**	○	○	**BA**	**BC**	**-**	**-**	.059	.039	0.2*	0.4	1.6	0.5	0.6	0.7	0.8	10	20
	632. 514	○	○	**BA**	**BC**	**-**	**-**	.065	.043	0.3*	0.4	1.9	0.6	0.7	0.8	0.9	11	20
	632. 564	○	○	**BA**	**BC**	**-**	**-**	.079	.051	0.4	0.5	2.5	0.8	1.0	1.1	1.2	11	21
	632. 604	○	○	**BA**	**BC**	**-**	**-**	.087	.059	0.5	0.7	3.2	1.0	1.2	1.4	1.6	11	22
	632. 644	○	○**	**-**	**BC**	**BE**	**-**	.099	.063	0.6	0.9	4.0	1.2	1.5	1.8	2.0	12	22
	632. 674	○	○**	**-**	**BC**	**BE**	**-**	.106	.071	0.7	1.1	4.8	1.5	1.8	2.1	2.4	12	23
	632. 724	○	○**	**-**	**BC**	**BE**	**-**	.118	.083	1.0	1.4	6.3	2.0	2.4	2.8	3.1	12	23
	632. 764	○	**-**	**-**	**BC**	**BE**	**-**	.138	.091	1.2	1.8	8.0	2.5	3.0	3.5	3.9	12	23
	632. 804	○***	○**	**-**	**BC**	**-**	**BG**	.158	.102	1.6	2.2	10.0	3.1	3.8	4.4	4.9	12	23
	632. 844	○***	○**	**-**	**BC**	**-**	**BG**	.177	.118	1.9	2.7	12.5	3.9	4.8	5.5	6.1	12	23
	632. 884	○***	○**	**-**	**BC**	**-**	**BG**	.197	.134	2.5	3.5	16.0	5.0	6.1	7.0	7.8	12	22
	632. 924	○	**-**	**-**	**-**	**-**	**BG**	.217	.165	3.1	4.4	20.0	6.2	7.6	8.8	9.8	13	25
	632. 964	○	**-**	**-**	**-**	**-**	**BG**	.236	.185	3.9	5.5	25.0	7.8	9.5	11.0	12.3	13	25
	633. 004	○	**-**	**-**	**-**	**-**	**BG**	.276	.205	4.9	6.9	31.5	9.8	12.0	13.8	15.5	13	25
	633. 044	○	**-**	**-**	**-**	**-**	**BG**	.315	.217	6.2	8.8	40.0	12.4	15.2	17.6	19.6	13	25
	633. 084	○	**-**	**-**	**-**	**-**	**BG**	.354	.268	7.8	11.0	50.0	15.5	19.0	21.9	24.5	13	25
90°	**632. 566**	○	○	**BA**	**BC**	**-**	**-**	.079	.043	0.4	0.5	2.5	0.8	1.0	1.1	1.2	18	33
	632. 606	○	○	**BA**	**BC**	**-**	**-**	.087	.047	0.5	0.7	3.2	1.0	1.2	1.4	1.6	18	34
	632. 646	○	○**	**-**	**BC**	**BE**	**-**	.098	.051	0.6	0.9	4.0	1.2	1.5	1.8	2.0	18	34
	632. 676	○	○**	**-**	**BC**	**BE**	**-**	.106	.055	0.7	1.1	4.8	1.5	1.8	2.1	2.4	18	34
	632. 726	○	○**	**-**	**BC**	**BE**	**-**	.118	.067	1.0	1.4	6.3	2.0	2.4	2.8	3.1	18	34
	632. 766	○	○**	**-**	**BC**	**BE**	**-**	.138	.075	1.2	1.8	8.00	2.5	3.0	3.5	3.9	19	35
	632. 806	○***	○**	**-**	**BC**	**-**	**BG**	.158	.095	1.6	2.2	10.0	3.1	3.8	4.4	4.9	19	35
	632. 846	○***	○**	**-**	**BC**	**-**	**BG**	.177	.095	1.9	2.7	12.5	3.9	4.8	5.5	6.1	19	35
	632. 886	○***	○**	**-**	**BC**	**-**	**BG**	.197	.122	2.5	3.5	16.0	5.0	6.1	7.0	7.8	19	36
	632. 926	○	**-**	**-**	**-**	**-**	**BG**	.217	.165	3.1	4.4	20.0	6.2	7.6	8.8	9.8	21	40
	632. 966	○	**-**	**-**	**-**	**-**	**BG**	.236	.185	3.9	5.5	25.0	7.8	9.5	11.0	12.3	21	40

[1] We reserve the right to deliver AISI 316Ti or AISI 316L under the material no. 17.

Continued on next page.

*differing spray pattern
**only available with code BC
***only available with code BG
Subject to technical modifications.

Example of ordering:	Type	+	Material no.	+	Conn.	=	Ordering no.
	632. 483	+	**17**	+	**BA**	=	**632. 483. 17. BA**

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

Flat fan nozzles

Series 632 / 633

Spray angle	Ordering no.							Equivalent Orifice diam. [in]	Free passage [in]	Flow Rate (Gallons Per Minute)							Spray width B at p=30 psi	
	Type	Mat. no. 17[1] AISI 316Ti / AISI 316L	Mat. no. 5E PVDF	Connection Male NPT 1/8"	1/4"	3/8"	1/2"			10 psi	20 psi	2 bar (liters per minute)	40 psi	60 psi	80 psi	100 psi	H=10"	H=20"
120°	**632.607**	○	-	**BA**	**BC**	-	-	.087	.043	.49	.69	3.2	.98	1.2	1.4	1.5	27	51
	632.647	○***	○**	-	**BC**	**BE**	-	.099	.051	.62	.88	4.0	1.2	1.5	1.8	2.0	27	51
	632.677	○***	○**	-	**BC**	**BE**	-	.106	.055	.74	1.0	4.8	1.5	1.8	2.1	2.3	28	52
	632.727	○***	○**	-	**BC**	**BE**	-	.118	.063	.98	1.4	6.3	2.0	2.4	2.8	3.1	29	54
	632.767	○	-	-	**BC**	**BE**	-	.138	.067	1.2	1.8	8.0	2.5	3.0	3.5	3.9	30	55
	632.807	○	-	-	**BC**	-	**BG**	.158	.079	1.6	2.2	10.0	3.1	3.8	4.4	4.9	31	57
	632.847	○	-	-	**BC**	-	**BG**	.177	.091	1.9	2.7	12.5	3.9	4.8	5.5	6.1	31	57
	632.887	○	-	-	-	-	**BG**	.197	.102	2.5	3.5	16.	5.0	6.1	7.0	7.9	31	57
	632.927	○	-	-	-	-	**BG**	.217	.114	3.1	4.4	20.0	6.2	7.6	8.8	9.8	31	57

[1] We reserve the right to deliver AISI 316Ti or AISI 316L under the material no. 17.

*differing spray pattern
**only available with conn. BC
***only available with conn. BG
Subject to technical modifications.

Example of ordering:	**Type**	**632. 607**	**+**	**Material no.**	**17**	**+**	**Conn.**	**BA**	**=**	**Ordering no.**	**632. 607. 17. BA**

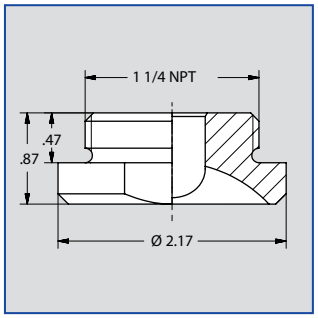
Conversion formula for the above series: $V_2 = V_1 \sqrt{\frac{P_2}{P_1}}$

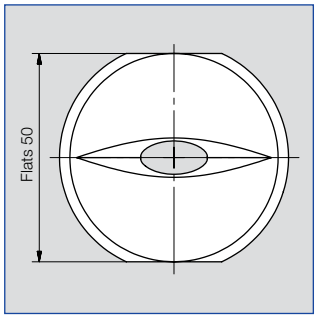
Flat fan nozzles

Series 621

Parabolic distribution of liquid.

Applications:
Cleaning, pickling, surface treatment, rinsing.





Spray angle	Ordering no. Type	Mat. no. 5E PVDF	Equivalent Orifice diam. [in]	Free passage [in]	Flow Rate (Gallons Per Minute) 10 psi	20 psi	liters per minute 2 bar	40 psi	60 psi	80 psi	100 psi	Spray width B at p=30 psi H=10"	H=20"
20°	**621. 121**	○	.315	.256	9.8	13.8	63	19.5	23.9	27.6	30.9	5	8
45°	**621. 123**	○	.394	.287	9.8	13.8	63	19.5	23.9	27.6	30.9	10	19
	621. 203	○	.472	.386	15.5	21.9	100	31.0	38.0	43.9	49.1	10	19
	621. 243	○	.524	.402	19.4	27.4	125	38.8	47.5	54.9	61.3	10	19
	621. 263	○	.559	.417	21.7	30.7	140	43.4	53.2	61.4	68.7	10	19
	621. 283	○	.591	.453	24.8	35.1	160	49.6	60.8	70.2	78.5	10	19
	621. 343	○	.709	.567	34.8	49.1	224	69.5	85.1	98.3	109.9	10	19
60°	**621. 124**	○	.394	.291	9.8	13.8	63	19.5	23.9	27.6	30.9	13	25
	621. 204	○	.472	.374	15.5	21.9	100	31.0	38.0	43.9	49.1	13	25
	621. 284	○	.591	.370	24.8	35.1	160	49.6	60.8	70.2	78.5	13	25
90°	**621. 126**	○	.394	.256	9.8	13.8	63	19.5	23.9	27.6	30.9	21	40
	621. 206	○	.472	.343	15.5	21.9	100	31.0	38.0	43.9	49.1	21	40
	621. 286	○	.591	.470	24.8	35.1	160	49.6	60.8	70.2	78.5	21	40

incl. gasket 062.140.72.00 (Material: EWP 210)

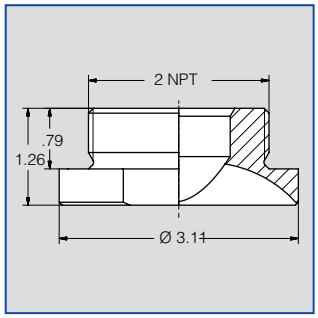
Example of ordering:	**Type** **621. 121**	**+**	**Material no.** **5E**	**=**	**Ordering no.** **621. 121. 5E**

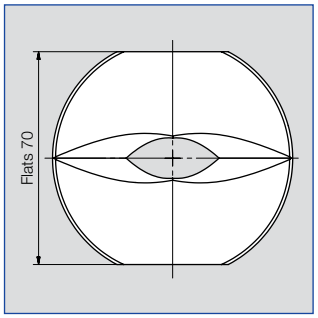
Flat fan nozzles

Series 625

Parabolic distribution of liquid. Headers, equipped with these nozzles, show a highly uniform total distribution of liquids, even at different installation heights and centers.

Applications:
Cleaning, pickling, surface treatment, rinsing.





Spray angle	Ordering no. Type	Mat. no. 5E PVDF	Equivalent Orifice diam. [in]	Free passage [in]	Flow Rate (Gallons Per Minute) 10 psi	20 psi	liters per minute 2 bar	40 psi	60 psi	80 psi	100 psi	Spray width B at p=30 psi H=10"	H=20"
20°	**625. 301**	○	.630	.520	23.8	33.5	180	58.1	75.3	89.0	106.2	5	8
	625. 321	○	.669	.559	26.4	37.2	200	64.7	83.5	98.8	118.1	5	8
	625. 361	○	.748	.642	33.0	46.8	250	80.8	104.3	123.6	147.7	5	8
	625. 421	○	.886	.756	48.3	68.2	365	118.1	152.4	180.4	215.6	5	8
	625. 451	○	.965	.823	56.3	79.5	425	137.6	177.5	210.0	251.0	5	8
60°	**625. 404**	○	.827	.520	41.7	58.9	315	102.0	131.6	155.6	186.0	13	25
	625. 454	○	.965	.638	56.3	79.5	425	137.6	177.5	210.0	251.0	13	25
120°	**625. 367**	○	.748	.591	33.0	46.8	250	80.8	104.3	123.6	147.7	32	57
	625. 407	○	.827	.709	41.7	58.9	315	102.0	131.6	155.6	186.0	32	57
	625. 427	○	.886	.709	48.3	68.2	365	118.1	152.4	180.4	215.6	32	57

Incl. gasket 062.540.72.00 (Material: EWP 210)

Example of ordering:	Type	+	Material no.	=	Ordering no.
	625. 301	+	**5E**	=	**625. 301. 5E**

Flat fan nozzles for retaining nut

Series 652

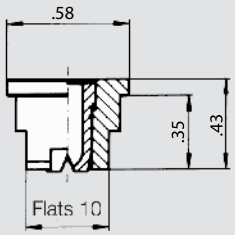
Assembly with retaining nut. Easy nozzle changing, simple jet alignment. Parabolic distribution of liquid. Spray pipes equipped with these nozzles show an extremely uniform total liquid distribution.

Applications:
Cleaning, surface treatment, pickling, rinsing.

Mat. no. 17
(∢ 20°-60°)

Mat. no. 17
(∢ 90°-120°)

PVDF



Spray angle	Ordering no. Type	Mat. no. 17[1] AISI 316Ti/ AISI 316L	Mat. no. 5E PVDF	Equivalent Orifice diam. [in]	Free passage [in]	Flow Rate (Gallons Per Minute) 10 psi	20 psi	liters per minute 2 bar	40 psi	60 psi	80 psi	100 psi	Spray width B at p=30 psi H=10"	H=20"
20°	**652. 441**	○	○	.053	.043	.19*	.27	1.3	.39	.48	.55	.61	3	5
	652. 481	○	○	.059	.047	.25	.35	1.6	.50	.61	.70	.78	3	5
30°	**652. 482**	○	○	.059	.043	.25*	.35	1.6	.50	.61	.70	.78	5	9
	652. 562	○	○	.079	.059	.39	.55	2.5	.78	.95	1.1	1.2	5	9
	652. 642	○	-	.099	.071	.62	.88	4.0	1.2	1.5	1.8	2.0	5	9
	652. 722	○	-	.118	.095	.98	1.4	6.3	2.0	2.4	2.8	3.1	5.	9
	652. 762	○	-	.138	.106	1.2	1.8	8.0	2.5	3.0	3.5	3.9	5	9
	652. 802	○	-	.158	.122	1.6	2.2	10.0	3.1	3.8	4.4	4.9	5	9
45°	**652. 483**	○	○	.059	.043	.25*	.35	1.6	.50	.61	.70	.78	7	13
	652. 563	○	○	.079	.055	.39	.55	2.5	.78	.95	1.1	1.2	7	13
	652. 643	○	○	.099	.071	.62	.88	4.0	1.2	1.5	1.8	2.0	7	14
	652. 723	○	-	.118	.095	.98	1.4	6.3	2.0	2.4	2.8	3.1	7	14
	652. 763	○	-	.138	.102	1.2	1.8	8.0	2.5	3.0	3.5	3.9	7	14
	652. 803	○	-	.158	.118	1.6	2.2	10.0	3.1	3.8	4.4	4.9	8	14
60°	**652. 484**	○	○	.059	.039	.25*	.35	1.6	.50	.61	.70	.78	11	21
	652. 514	○	○	.065	.43	.29	.42	1.9	.59	.72	.83	.93	11	21
	652. 564	○	○	.079	.051	.39	.55	2.5	.78	.95	1.1	1.2	11	21
	652. 604	○	○	.087	.059	.49	.69	3.2	.98	1.2	1.4	1.5	11	20
	652. 644	○	○	.099	.063	.62	.88	4.0	1.2	1.5	1.8	2.0	11	20
	652. 674	○	○	.106	.071	.74	1.0	4.8	1.5	1.8	2.1	2.3	11	20
	652. 724	○	○	.118	.083	.98	1.4	6.3	2.0	2.4	2.8	3.1	11	20
	652. 764	○	-	.138	.091	1.2	1.8	8.0	2.5	3.0	3.5	3.9	11	20
	652. 804	○	○	.158	.102	1.6	2.2	10.0	3.1	3.8	4.4	4.9	11	20
	652. 844	-	○	.177	.118	1.9	2.7	12.5	3.9	4.8	5.5	6.1	11	20
90°	**652. 566**	○	○	.079	.043	.39	.55	2.5	.78	.95	1.1	1.2	18	22
	652. 606	○	○	.087	.047	.49	.69	3.2	.98	1.2	1.4	1.5	18	32
	652. 646	○	○	.099	.051	.62	.88	4.0	1.2	1.5	1.8	2.0	18	32
	652. 676	○	○	.106	.055	.74	1.0	4.8	1.5	1.8	2.1	2.3	18	32
	652. 726	○	○	.118	.067	.98	1.4	6.3	2.0	2.4	2.8	3.1	18	32
	652. 766	○	-	.138	.075	1.2	1.8	8.0	2.5	3.0	3.5	3.9	18	32
	652. 806	○	○	.158	.095	1.6	2.2	10.0	3.1	3.8	4.4	4.9	18	32
	652. 846	-	○	.177	.095	1.9	2.7	12.5	3.9	4.8	5.5	6.1	18	32
	652. 886	-	○	.197	.122	2.5	3.5	16.0	5.0	6.1	7.0	7.8	18	33
120°	**652. 607**	○	○	.087	.043	.49	.69	3.2	.98	1.2	1.4	1.5	27	51
	652. 647	○	-	.099	.051	.62	.88	4.0	1.2	1.5	1.8	2.0	27	51
	652. 677	○	-	.106	.055	.74	1.0	4.8	1.5	1.8	2.1	2.3	27	51
	652. 727	○	○	.118	.063	.98	1.4	6.3	2.0	2.4	2.8	3.1	27	52
	652. 767	○	-	.138	.067	1.2	1.8	8.0	2.5	3.0	3.5	3.9	28	52
	652. 847	-	○	.177	.091	1.9	2.7	12.5	3.9	4.8	5.5	6.1	31	57
	652. 887	-	○	.197	.102	2.5	3.5	16.0	5.0	6.1	7.0	7.8	31	57

[1] We reserve the right to deliver AISI 316Ti or AISI 316L under the material no. 17.A · *differing spray pattern

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

Example of ordering:	Type	+	Material no.	= Ordering no.
	652. 441	+	17	= 652. 441. 17

Flat fan dovetail nozzles

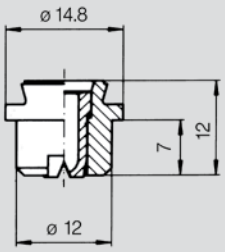
Series 660

Assembly with retaining nut. Automatic jet alignment due to dovetail guide. Stable spray angle. Parabolic distribution of liquid. Spray pipes with these nozzles show an extremely uniform total liquid distribution.

Applications:
Cleaning, pickling, coating, rinsing.

Mat. no. 17

Mat. no. 5E



Spray angle	Ordering no.			Equivalent Orifice diam. [in]	Free passage [in]	Flow Rate (Gallons Per Minute)							Spray width B at p=30 psi	
	Type	Mat. no. 17[1] AISI 316Ti/ AISI 316L	Mat. no. 5E PVDF			10 psi	20 psi	liters per minute 2 bar	40 psi	60 psi	80 psi	100 psi	H=10"	H=20"
45°	**660. 443**	○	○	.053	.039	0.2	0.3	1.25	0.4	0.5	0.5	0.6	7	13
	660. 483	○	○	.059	.043	0.2	0.4	1.6	0.5	0.6	0.7	0.8	7	13
	660. 513	○	○	.065	.047	0.3	0.4	1.90	0.6	0.7	0.8	0.9	7	14
	660 .563	○	○	.079	.055	0.4	0.5	2.5	0.8	1.0	1.1	1.2	7	14
	660. 603	○	○	.087	.063	0.5	0.7	3.15	1.0	1.2	1.4	1.5	7	14
	660. 643	○	○	.099	.071	0.6	0.9	4.0	1.2	1.5	1.8	2.0	7	14
	660. 673	○	○	.106	.079	0.7	1.0	4.75	1.5	1.8	2.1	2.3	7	14
	660. 723	○	○	.118	.094	1.0	1.4	6.30	2.0	2.4	2.8	3.1	7	14
	660. 763	○	○	.138	.102	1.2	1.8	8.00	2.5	3.0	3.5	3.9	7	14
	660. 803	○	○	.157	.118	1.6	2.2	10.00	3.1	3.8	4.4	4.9	7	14
	660. 843	○	○	.177	.134	1.9	2.7	12.50	3.9	4.8	5.5	6.1	7	14
	660. 883	○	○	.197	.150	2.5	3.5	16.00	5.0	6.1	7.0	7.8	7	14
	660. 923	○	○	.217	.165	3.1	4.4	20.00	6.2	7.6	8.8	9.8	7	14
60°	**660. 484**	○	○	.059	.039	0.2	0.4	1.6	0.5	0.6	0.7	0.8	11	21
	660. 514	○	○	.065	.043	0.3	0.4	1.9	0.6	0.7	0.8	0.9	11	21
	660. 564	○	○	.079	.051	0.4	0.5	2.5	0.8	1.0	1.1	1.2	11	21
	660. 604	○	○	.087	.059	0.5	0.7	3.2	1.0	1.2	1.4	1.6	11	21
	660. 644	○	○	.099	.063	0.6	0.9	4.0	1.2	1.5	1.8	2.0	11	21
	660. 674	○	○	.106	.071	0.7	1.0	4.75	1.5	1.8	2.1	2.3	11	21
	660. 724	○	○	.118	.083	1.0	1.4	6.3	2.0	2.4	2.8	3.1	11	20
	660. 764	○	○	.138	.091	1.2	1.8	8.00	2.5	3.0	3.5	3.9	11	20
	660. 804	○	○	.158	.102	1.6	2.2	10.0	3.1	3.8	4.4	4.9	11	20
	660. 844	○	○	.177	.118	1.9	2.7	12.50	3.9	4.8	5.5	6.1	11	20
	660. 884	○	○	.197	.134	2.5	3.5	16.00	5.0	6.1	7.0	7.8	11	20
	660. 924	○	○	.217	.161	3.1	4.4	20.00	6.2	7.6	8.8	9.8	11	20
75°	**660. 565**	○	○	.079	.043	0.4	0.5	2.50	0.8	1.0	1.1	1.2	14	25
	660. 645	○	○	.098	.051	0.6	0.9	4.00	1.2	1.5	1.8	2.0	14	25
	660. 725	○	○	.118	.067	1.0	1.4	6.30	2.0	2.4	2.8	3.1	14	25
	660. 765	○	○	.138	.075	1.2	1.8	8.00	2.5	3.0	3.5	3.9	14	25
	660. 805	○	○	.157	.094	1.6	2.2	10.00	3.1	3.8	4.4	4.9	14	25
	660. 845	○	○	.177	.102	1.9	2.7	12.50	3.9	4.8	5.5	6.1	14	25
	660. 885	○	○	.197	.122	2.5	3.5	16.00	5.0	6.1	7.0	7.8	14	25
	660. 925	○	○	.217	.142	3.1	4.4	20.00	6.2	7.6	8.8	9.8	14	25

[1] We reserve the right to deliver AISI 316Ti or AISI 316L under the material no. 17.

Continued on next page.

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

Flat fan dovetail nozzles

Series 660

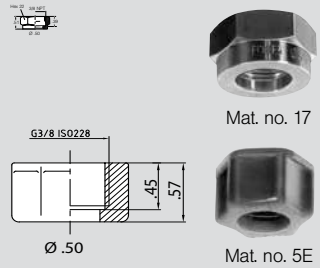
Spray angle	Ordering no.			Equivalent Orifice diam. [in]	Free passage [in]	Flow Rate (Gallons Per Minute)							Spray width B at p=30 psi	
	Type	Mat. no. 17[1] AISI 316Ti/ AISI 316L	Mat. no. 5E PVDF			10 psi	20 psi	2 bar (liters per minute)	40 psi	60 psi	80 psi	100 psi	H=10"	H=20"
90°	**660. 566**	○	○	.079	.043	0.4	0.5	2.5	0.8	1.0	1.1	1.2	20	36
	660. 606	○	○	.087	.047	0.5	0.7	3.2	1.0	1.2	1.4	1.6	20	36
	660. 646	○	○	.099	.051	0.6	0.9	4.0	1.2	1.5	1.8	2.0	19	36
	660. 674	○	○	.106	.142	0.7	1.0	4.75	1.5	1.8	2.1	2.3	19	36
	660. 726	○	○	.118	.067	1.0	1.4	6.3	2.0	2.4	2.8	3.1	19	35
	660. 766	○	○	.138	.075	1.2	1.8	8.00	2.5	3.0	3.5	3.9	19	34
	660. 806	○	○	.158	.095	1.6	2.2	10.0	3.1	3.8	4.4	4.9	19	34
	660. 846	○	○	.177	.094	1.9	2.7	12.5	3.9	4.8	5.5	6.1	19	19
	660. 886	○	○	.197	.122	2.5	3.5	16.0	5.0	6.1	7.0	7.8	19	19
	660. 926	○	○	.217	.142	3.1	4.4	20.0	6.2	7.6	8.8	9.8	19	19
120°	**660. 607**	○	○	.087	.043	0.5	0.7	3.2	1.0	1.2	1.4	1.6	27	51
	660. 647	○	○	.099	.051	0.6	0.9	4.0	1.2	1.5	1.8	2.0	28	51
	660. 677	○	○	.106	.055	0.7	1.1	4.8	1.5	1.8	2.1	2.4	29	52
	660. 727	○	○	.118	.063	1.0	1.4	6.4	2.0	2.4	2.8	3.1	29	52
	660. 767	○	○	.138	.067	1.2	1.8	8.0	2.5	3.0	3.5	3.9	31	52
	660. 807	○	○	.158	.079	1.6	2.2	10.0	3.1	3.8	4.4	4.9	31	53
	660. 847	○	○	.177	.091	1.9	2.7	12.5	3.9	4.8	5.5	6.1	31	52
	660. 887	○	○	.197	.102	2.5	3.5	16.0	5.0	6.1	7.0	7.8	31	52
	660. 927	○	○	.197	.102	3.1	4.4	20.0	6.2	7.6	8.8	9.8	31	52

[1] We reserve the right to deliver AISI 316Ti or AISI 316L under the material no. 17.

Example of ordering:	**Type** **660. 566**	**+**	**Material no.** **17**	**=**	**Ordering no.** **660. 566. 17**

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

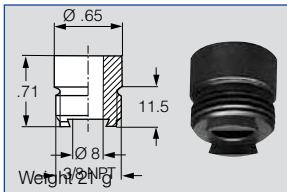
Flat fan dovetail nozzles
Accessories
Series 660



Mat. no. 17

Mat. no. 5E

Retaining nut:
065.200.17[1]
(AISI 316Ti/AISI 316L)
065.200.5E (PVDF)

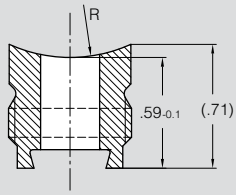


Weight 21 g

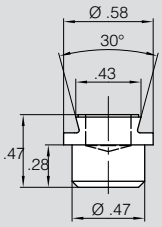
Welding nipple: **066.011.17**[1] (AISI 316Ti/AISI 316L)
066.011.5E (PVDF)
066.011.53 (PP)

Other lengths on request.

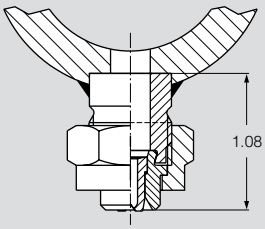
Nipple with radius

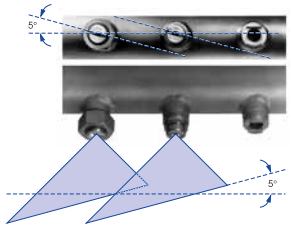


Welding nipple: **066.017.17**[1] (AISI 316Ti/AISI 316L)



Blind Tips: **006.600.17**[1] (AISI 316Ti/AISI 316L)
006.600.5E (PVDF)





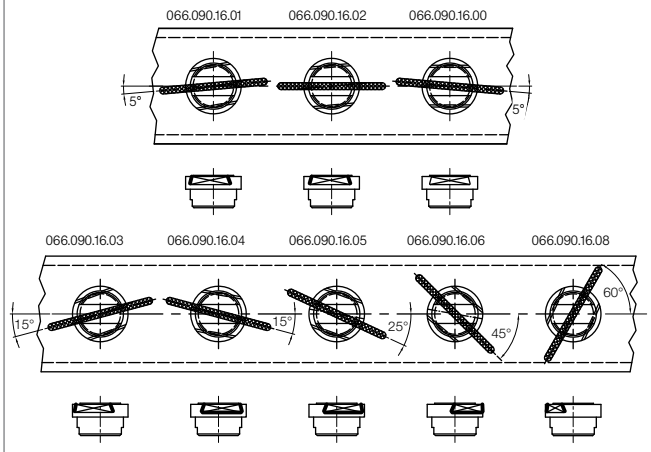
Other offset angles are available on request

Standard radiuses for welding nipples (others on request)

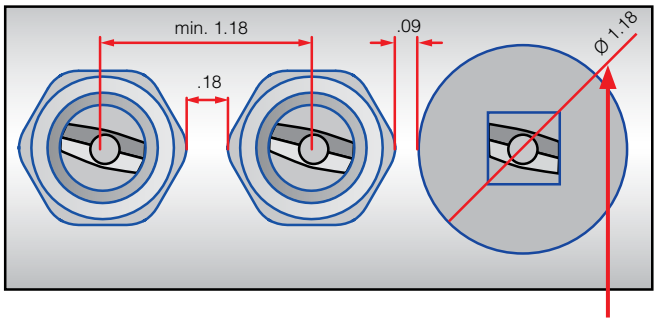
Ordering no.	Radius
066.017.17.10	10
066.017.17.13	12.5
066.017.17.16	16
066.017.17.20	20
066.017.17.25	25
066.017.17.31	31

Alignment Tips

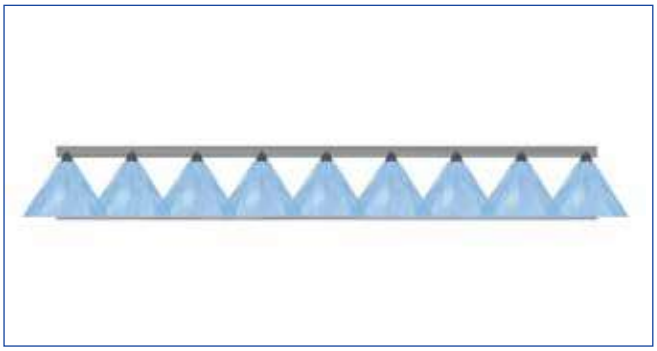
Material AISI 303



Minimum pitch for series 660



Required clearance for box nut



Front view of nozzle arrangement

3D View of nozzle arrangement

[1] We reserve the right to deliver AISI 316Ti or AISI 316L under the material no. 17.

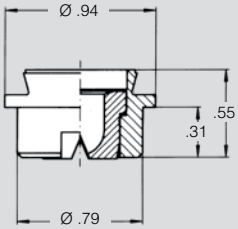
Flat fan dovetail nozzles

Series 664 / 665

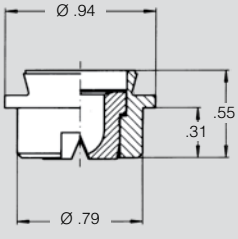
Assembly with retaining nut. Automatic jet alignment due to dovetail guide. Stable spray angle. Parabolic distribution of liquid. Spray pipes with these nozzles show an extremely uniform total liquid distribution.

Applications:
Cleaning, pickling, coating, rinsing.

Mat. no. 17



Mat. no. 5E



Spray angle	Ordering no. Type	Mat. no. 17[1] AISI 316Ti/ AISI 316L	Mat. no. 5E PVDF	Mat. no. 53 PP	Equivalent Orifice diam. [in]	Free passage [in]	Flow Rate (Gallons Per Minute) 10 psi	20 psi	liters per minute 2 bar	40 psi	60 psi	80 psi	100 psi	Spray width B at p=30 psi H=10"	H=20"
45°	**664. 723**	○	○	○	.118	.095	.98	1.4	6.3	2.0	2.4	2.8	3.1	10	19
	664. 763	○	○	○	.138	.102	1.2	1.8	8.0	2.5	3.	3.5	3.9	10	19
	664. 803	○	○	○	.158	.118	1.6	2.2	10.0	3.1	3.8	4.4	4.9	10	19
	664. 843	○	○	○	.177	.134	1.9	2.7	12.5	3.9	4.8	5.5	6.1	10	19
	664. 883	○	○	○	.197	.150	2.5	3.5	16.0	5.0	6.1	7.0	7.8	10	20
	664. 923	○	○	○	.217	.165	3.1	4.4	20	6.2	7.6	8.8	9.8	11	20
	664. 943	○	○	○	.224	.169	3.5	4.9	22.4	7	8.5	9.8	11	8	16
	664. 963	○	○	○	.236	.043	3.9	5.5	25.0	7.8	9.5	11.0	12.3	11	20
	664. 983	○	○	○	.248	.185	4.3	6.1	28	8.7	10.6	12.3	13.7	18	16
	665. 003	○	○	○	.260	.205	4.9	6.9	31.5	9.8	12	13.8	15.5	18	16
	665. 013	○	○	○	.268	.205	4.4	6.3	33.5	10.8	14.0	16.6	19.8	8	16
	665. 043	○	○	○	.315	.232	6.2	8.8	40.0	12.4	15.2	17.6	19.6	11	20
	665. 063	○	○	○	.343	.244	7	9.9	45	14	17.1	19.8	22.1	8	16
	665. 083	○	○	○	.354	.260	7.8	11	50	15.5	19	22	24.5	8	16
	665. 123	○	○	○	.394	.291	9.8	13.8	63	19.6	23.9	27.7	31	8	16
	665. 163	○	○	○	.425	.331	12.4	17.6	80	24.8	30.4	35.1	39.3	8	16
	665. 183	○	○	○	.445	.362	14	19.8	90	28	34.2	39.5	44.2	8	16
	665. 203	○	○	○	.472	.386	15.5	21.9	100	31	38	43.9	49.1	8	16
60°	**664. 724**	○	○	○	.118	.083	.98	1.4	6.3	2.0	2.4	2.8	3.1	12	22
	664. 764	○	○	○	.138	.091	1.2	1.8	8.0	2.5	3.0	3.5	3.9	12	22
	664. 804	○	○	○	.158	.102	1.6	2.2	10.0	3.1	3.8	4.4	4.9	12	22
	664. 844	○	○	○	.177	.118	1.9	2.7	12.5	3.9	4.8	5.5	6.1	12	22
	664. 884	○	○	○	.197	.134	2.5	3.5	16.0	5.0	6.1	7.0	7.8	12	22
	664. 924	○	○	○	.217	.162	3.1	4.4	20	6.2	7.6	8.8	9.8	12	23
	664. 944	○	○	○	.224	.165	3.5	4.9	22.4	7	8.5	9.8	11	12	23
	664. 964	○	○	○	.236	.165	4.3	6.1	28	8.7	10.6	12.3	13.7	12	23
	664. 984	○	○	○	.248	.177	3.7	5.2	28.0	9.1	11.7	13.8	16.5	12	23

[1] We reserve the right to deliver AISI 316Ti or AISI 316L under the material no. 17.

Continued on next page.

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

Flat fan dovetail nozzles

Series 664 / 665

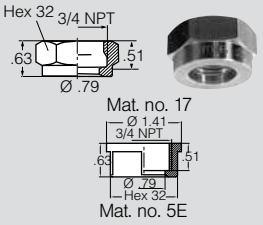
Spray angle	Ordering no. Type	Mat. no. 17[1] AISI 316Ti/ AISI 316L	Mat. no. 5E PVDF	Mat. no. 53 PP	Equivalent Orifice diam. [in]	Free passage [in]	Flow Rate (Gallons Per Minute) 10 psi	20 psi	liters per minute 2 bar	40 psi	60 psi	80 psi	100 psi	Spray width B at p=30 psi H=10"	H=20"
60°	**665. 004**	○	○	○	.260	.189	4.9	6.9	31.5	9.8	12	13.8	15.5	12	23
	665. 014	○	○	○	.268	.193	5.2	7.4	33.5	10.4	12.7	14.7	16.4	12	23
	665. 044	○	○	○	.315	.217	6.2	8.8	40.0	12.4	15.2	17.6	19.6	12	23
	665. 064	○	○	○	.343	.228	7	9.9	45	14	17.1	19.8	22.1	12	23
	665. 084	○	○	○	.355	.244	7.8	11.0	50.0	15.5	19.0	21.9	24.5	13	23
	665. 124	○	○	○	.394	.292	9.8	13.8	63.0	19.5	23.9	27.6	30.9	13	24
	665. 164	○	○	○	.425	.327	12.4	17.6	80	24.8	30.4	35.1	39.3	13	24
	665. 184	○	○	○	.445	.350	14	19.8	90	28	34.2	39.5	44.2	13	24
	665. 204	○	○	○	.472	.374	15.5	21.9	100	31	38	43.9	49.1	13	24
75°	**664. 725**	○	○	○	.118	.075	0.98	1.4	6.3	2	2.4	2.8	3.1	14	25
	664. 765	○	○	○	.138	.083	1.2	1.8	8	2.5	3	3.5	4	14	25
	664. 805	○	○	○	.157	.102	1.6	2.2	10	3.1	3.8	4.4	4.9	14	25
	664. 845	○	○	○	.177	.118	1.9	2.7	12.5	3.9	4.8	5.5	6.1	14	25
	664. 885	○	○	○	.197	.130	2.5	3.5	16	5	6.1	7	7.9	14	25
	664. 925	○	○	○	.217	.150	3.1	4.4	20	6.2	7.6	8.8	9.8	14	25
	664. 965	○	○	○	.236	.161	3.9	5.5	25	7.8	9.5	11	12.3	14	25
	665. 005	○	○	○	.260	.169	4.9	6.9	31.5	9.8	12	13.8	15.5	14	25
	665. 015	○	○	○	.268	.181	5.2	7.4	33.5	10.4	12.7	14.7	16.4	14	25
	665. 045	○	○	○	.315	.209	6.2	8.8	40	12.4	15.2	17.6	19.6	14	25
	665. 085	○	○	○	.354	.240	7.8	11	50	15.5	19	22	24.5	14	25
	665. 125	○	○	○	.394	.268	9.8	13.8	63	19.6	23.9	27.7	31	14	25
90°	**664. 726**	○	○	○	.118	.067	0.98	1.4	6.3	2	2.4	2.8	3.1	17	31
	664. 766	○	○	○	.138	.075	1.2	1.8	8	2.5	3	3.5	4	17	31
	664. 806	○	○	○	.158	.095	1.6	2.2	10.0	3.1	3.8	4.4	4.9	17	31
	664. 846	○	○	○	.177	.095	1.9	2.7	12.5	3.9	4.8	5.5	6.1	17	31
	664. 886	○	○	○	.197	.122	2.5	3.5	16.0	5.0	6.1	7.0	7.8	17	31
	664. 926	○	○	○	.217	.142	3.1	4.4	20.0	6.2	7.6	8.8	9.8	17	31
	664. 966	○	○	○	.236	.154	3.9	5.5	25.0	7.8	9.5	11.0	12.3	17	31
	665. 046	○	○	○	.315	.193	6.2	8.8	40.0	12.4	15.2	17.6	19.6	17	31
	665. 126	○	○	○	.394	.252	9.8	13.8	63.0	19.5	23.9	27.6	30.9	17	31
120°	**664.727**	○	○	○	.118	.063	.98	1.4	6.3	2.0	2.4	2.8	3.1	49	85
	664.767	○	○	○	.138	.067	1.2	1.8	8.0	2.5	3.0	3.5	3.9	49	85
	664.807	○	○	○	.158	.079	1.6	2.2	10.0	3.1	3.8	4.4	4.9	49	85
	664.847	○	○	○	.177	.091	1.9	2.7	12.5	3.9	4.8	5.5	6.1	49	85
	664.887	○	○	○	.197	.102	2.5	3.5	16	5	6.1	7	7.9	49	85
	664.927	○	○	○	.217	.114	3.1	4.4	20	6.2	7.6	8.8	9.8	49	85
	664.967	○	○	○	.236	.126	3.9	5.5	25.0	7.8	9.5	11.0	12.3	49	85
	665.047	○	○	○	.236	.126	6.2	8.8	40	12.4	15.2	17.6	19.6	49	85
	665.127	○	○	○	.394	.224	9.8	13.8	63	19.6	23.9	27.7	31	49	85

[1] We reserve the right to deliver AISI 316Ti or AISI 316L under the material no. 17.

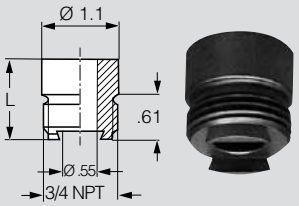
Example of ordering:	Type	+	Material no.	=	Ordering no.
	665. 004	+	**17**	=	**665. 004. 17**

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

Flat fan dovetail nozzles
Accessories
Series 664 / 665

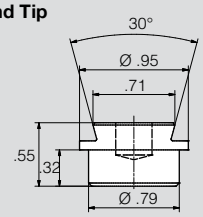


Retaining nut: **065.600.17**[1] (AISI 316Ti/AISI 316L) **065.600.5E** (PVDF)



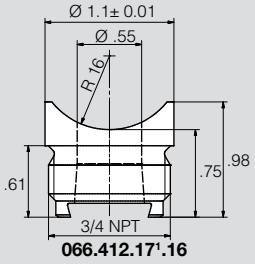
Welding nipple:
066.410.17[1] (AISI 316Ti/AISI 316L): L= 27 mm
066.410.5E (PVDF): L= 27 mm
066.411.17[1] (AISI 316Ti/AISI 316L): L= 60 mm
066.411.17[1]**.04** (AISI 316Ti/AISI 316L): L= 110 mm
Other lengths on request.

Blind Tip

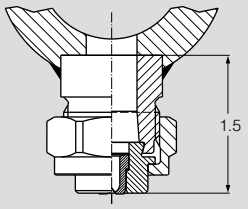


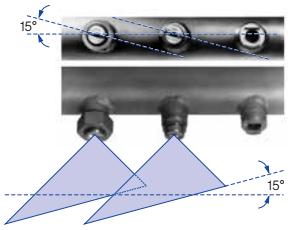
Blind Tip: **006.642.17**[1] (AISI 316Ti/AISI 316L) **006.642.5E** (PVDF)

Nipple with radius

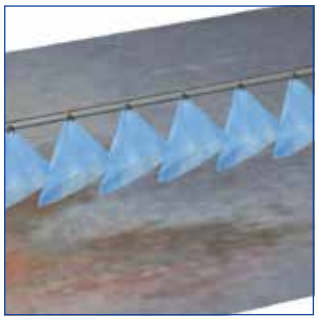


066.412.17[1]**.16**



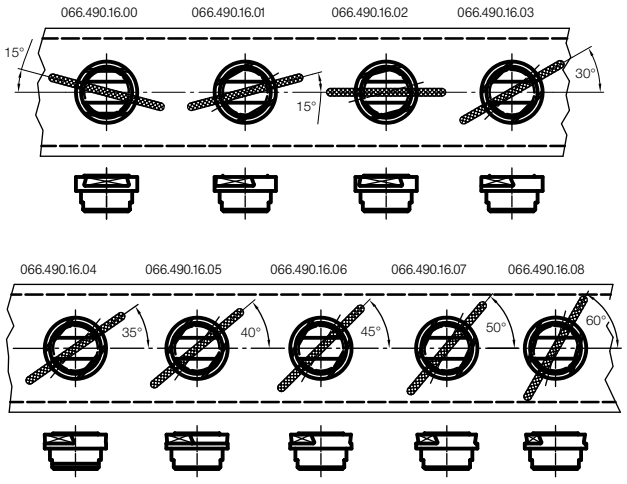


Other offset angles are available on request

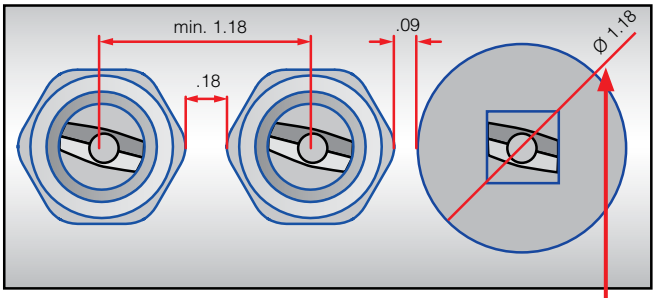


Alignment Tips

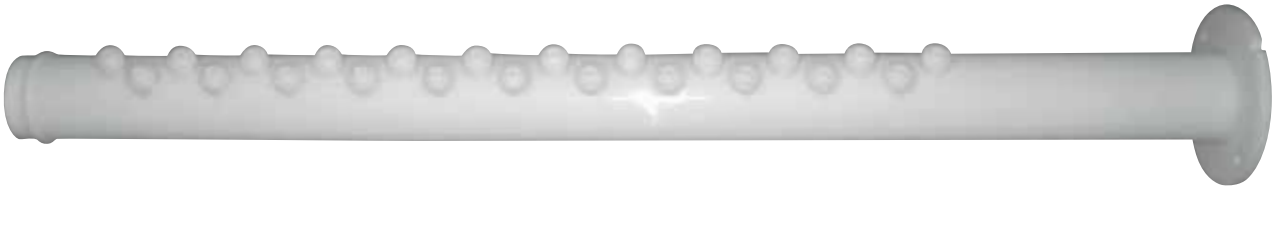
Material AISI 303



Minimum pitch for series 664/665



Required clearance for box nut



Spray header for pickling line with nozzles series 664/665

[1] We reserve the right to deliver AISI 316Ti or AISI 316L under the material no. 17.

Flat fan dovetail nozzles

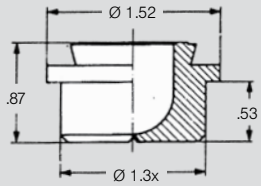
Series 669

Spray pipes with these nozzles show an extremely uniform total liquid distribution.

Applications:
Cleaning, pickling, coating, rinsing.

Mat. no. 17

Mat. no. 5E



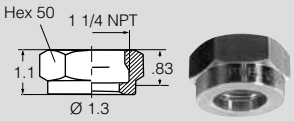
Spray angle	Ordering no.			Equivalent Orifice diam. [in]	Free passage [in]	Flow Rate (Gallons Per Minute)								Spray width B at p=30 psi	
	Type	Mat. no. 17[1] AISI 316Ti/ AISI 316L	Mat. no. 5E PVDF			10 psi	20 psi	liters per minute 2 bar	40 psi	60 psi	80 psi	100 psi	145 psi	H=10"	H=20"
20°	**669. 041**	○	○	.315	.256	6.2	8.8	40.0	12.4	15.2	17.6	19.6	23.6	5	8
	669. 121	○	○	.394	.327	9.8	13.8	63.0	19.5	23.9	27.6	30.9	37.2	5	8
	669. 201	○	○	.472	.417	15.5	21.9	100.0	31.0	38.0	43.9	49.1	59.1	5	8
	669. 281	○	○	.591	.512	24.8	35.1	160.0	49.6	60.8	70.2	78.5	94.5	5	8
30°	**669. 042**	○	○	.315	.252	6.2	8.8	40.0	12.4	15.2	17.6	19.6	23.6	6	12
	669. 122	○	○	.394	.323	9.8	13.8	63.0	19.5	23.9	27.6	30.9	37.2	6	12
	669. 202	○	○	.472	.409	15.5	21.9	100.0	31.0	38.0	43.9	49.1	59.1	6	12
	669. 282	○	○	.591	.476	24.8	35.1	160.0	49.6	60.8	70.2	78.5	94.5	6	12
45°	**669. 043**	○	○	.315	.232	6.2	8.8	40.0	12.4	15.2	17.6	19.6	23.6	10	19
	669. 123	○	○	.394	.287	9.8	13.8	63.0	19.5	23.9	27.6	30.9	37.2	10	19
	669. 163	○	○	.425	.331	15.5	21.9	80.0	31.0	38.0	43.9	49.1	59.1	10	19
	669. 203	○	○	.472	.386	24.8	35.1	100.0	49.6	60.8	70.2	78.5	94.5	10	19
	669. 243	○	○	.528	.402	19.4	27.4	125.0	38.8	47.5	54.9	61.3	73.8	10	19
	669. 263	○	○	.559	.417	21.7	30.7	140.0	43.4	53.2	61.4	68.7	82.7	10	19
	669. 283	○	○	.591	.453	24.8	35.1	160.0	49.6	60.8	70.2	78.5	94.5	10	19
	669. 343	○	○	.709	.567	34.8	49.1	224.0	69.5	85.1	98.3	109.9	132.3	10	19
60°	**669. 044**	○	○	.315	.217	6.2	8.8	40.0	12.4	15.2	17.6	19.6	23.6	13	25
	669. 124	○	○	.394	.291	9.8	13.8	63.0	19.5	23.9	27.6	30.9	37.2	13	25
	669. 204	○	○	.472	.374	15.5	21.9	100.0	31.0	38.0	43.9	49.1	59.1	13	25
	669. 284	○	○	.591	.370	24.8	35.1	160.0	49.6	60.8	70.2	78.5	94.5	13	25
90°	**669. 046**	○	○	.315	.193	6.2	8.8	40.0	12.4	15.2	17.6	19.6	23.6	21	40
	669. 126	○	○	.394	.256	9.8	13.8	63.0	19.5	23.9	27.6	30.9	37.2	21	40
	669. 206	○	○	.472	.343	15.5	21.9	100.0	31.0	38.0	43.9	49.1	59.1	21	40
	669. 286	○	○	.591	.372	24.8	35.1	160.0	49.6	60.8	70.2	78.5	94.5	21	40
120°	**669. 047**	○	○	.315	.173	6.2	8.8	40.0	12.4	15.2	17.6	19.6	23.6	31	57
	669. 127	○	○	.394	.232	9.8	13.8	63.0	19.5	23.9	27.6	30.9	37.2	31	57
	669. 207	○	○	.472	.299	15.5	21.9	100.0	31.0	38.0	43.9	49.1	59.1	31	57
	669. 287	○	○	.591	.348	24.8	35.1	160.0	49.6	60.8	70.2	78.5	94.5	31	57

[1] We reserve the right to deliver AISI 316Ti or AISI 316L under the material no. 17.

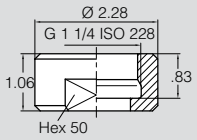
Example of ordering:	Type	+	Material no.	=	Ordering no.
	669.041	+	**17**	=	**669.041.17**

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

Flat fan dovetail nozzles
Accessories
Series 669

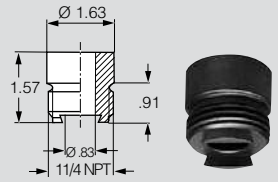


Mat. no. 17



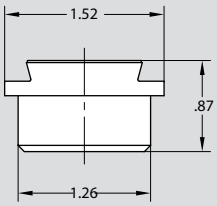
Mat. no. 5E

Retaining nut:
066.900.17[1] (AISI 316Ti/AISI 316L)
066.900.5E (PVDF)

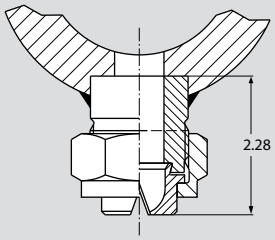


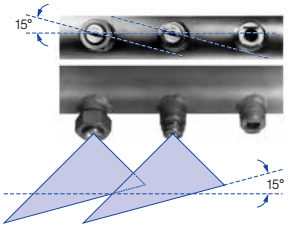
Welding nipple: **066.910.17**[1] (AISI 316Ti/AISI 316L)
066.910.5E (PVDF)

Blind Tip



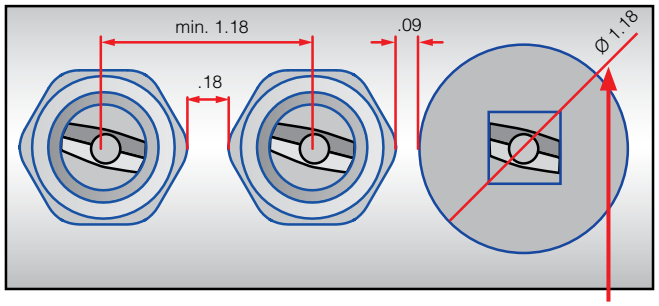
006.690.00



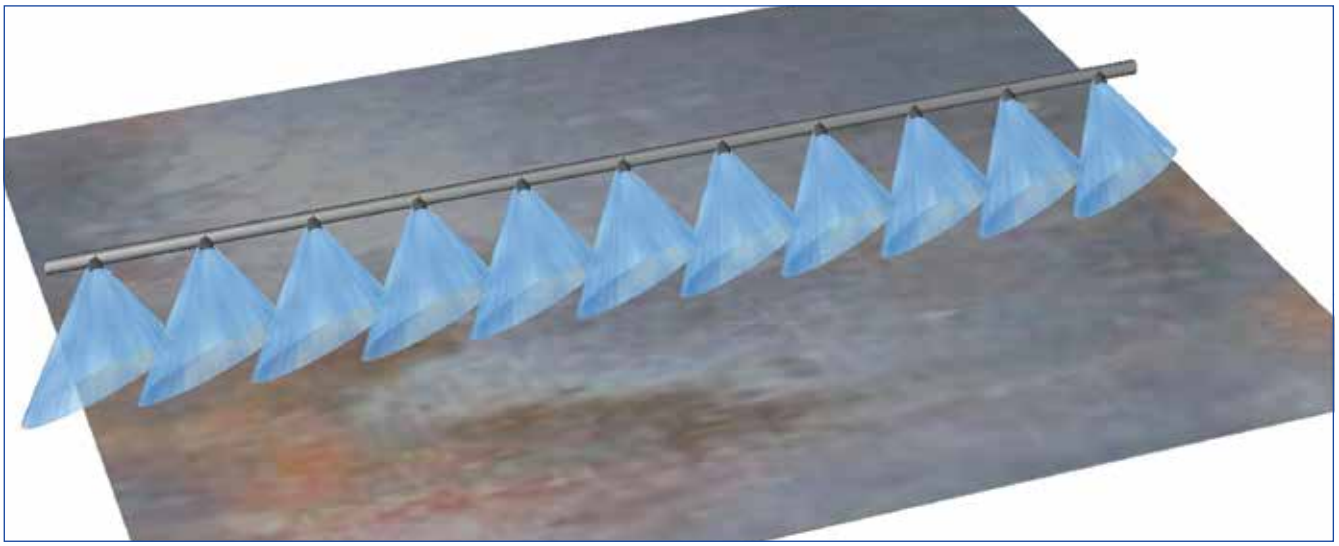


Other offset angles
are available on request

Minimum pitch for series 669



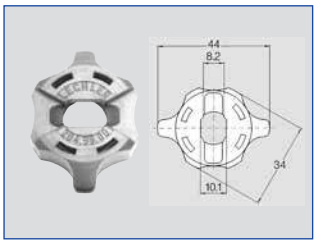
Required clearance for box nut



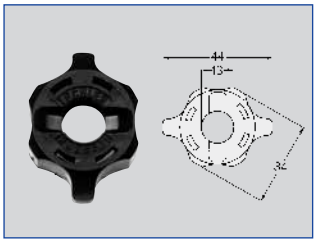
[1] We reserve the right to deliver AISI 316Ti or AISI 316L under the material no. 17.

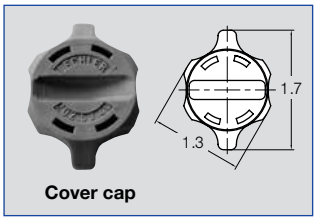
Accessories
Bayonet quick-release system
Bayonet nipple

Bayonet quick-release system



For series	Ordering no.	Material	Color	
652	**065. 202. 53. 17**	Polypropylene	grey	incl. gasket 065.242.7A (Material: Viton, Color: black)
	065. 202. 5E. 00	PVDF	blue	incl. gasket 065.242.7A (Material: Viton, Color: black)



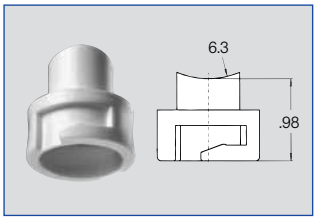


Cover cap

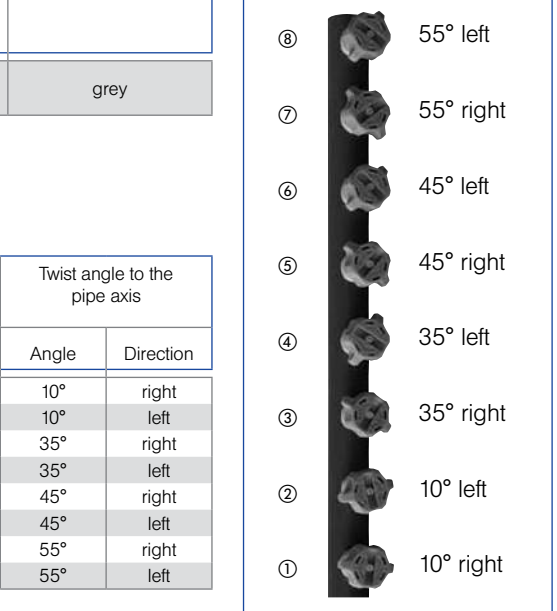
Ordering no.	Material	Color
065. 202. 53. 40	Polypropylene	grey

Incl. gasket 065.242.73 (Material: rubber, Color: white)
Other gasket material on request.

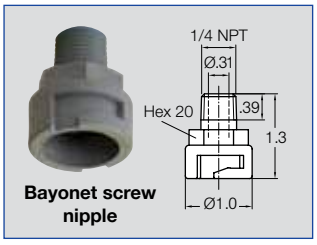
Bayonet-Nipple



For series	Ordering no.	Material	Twist angle to the pipe axis	
			Angle	Direction
652	① **095. 016. 53. 08. 05**	PP	10°	right
	② **095. 016. 53. 09. 29**	PP	10°	left
	③ **095. 016. 53. 09. 99**	PP	35°	right
	④ **095. 016. 53. 09. 98**	PP	35°	left
	⑤ **095. 016. 53. 07. 36**	PP	45°	right
	⑥ **095. 016. 53. 09. 30**	PP	45°	left
	⑦ **095. 016. 53. 10. 87**	PP	55°	right
	⑧ **095. 016. 53. 10. 88**	PP	55°	left



Nozzle mounting with different twist angles

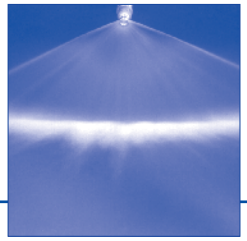


Bayonet screw nipple

For series	Ordering no.	Material	Connection
652	**090.075.53.00**	PP	1/4 NPT

Tongue-type nozzles

Series 686

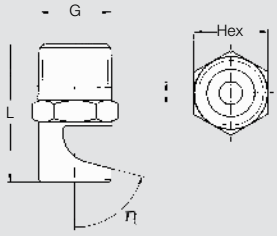


Wide flat fan with a sharply delimited jet pattern. Non-clogging.

Applications:
Cleaning, pickling, rinsing, requiring powerful and concentrated water jets.

Mat. no. 17
(∢ 140°)

Mat. no. 5E
(∢ 140°)



Schematic design
for ∢ 140°

Spray angle	η	Ordering no.							Orifice diameter [in]	Flow Rate (Gallons Per Minute)			Dimensions								Spray width B at p=30 psi
		Type	Mat. no.		Code G								L [in]				Hex [in]				
			17[1]	5E	Connection																
					Male NPT																
			AISI 316Ti/ AISI 316L	PVDF	1/8"	1/4"	3/8"	1/2"		14.5	2.0	72.5	R 1/8	R 1/4	R 3/8	R 1/2	R 1/8	R 1/4	R 3/8	R 1/2	H=10"
90°	40°	**686. 646**	○	-	**BA**	-	-	-	.087	.75	4.0	1.7	.97	-	-	-	.43	-	-	-	21
		686. 686	○	-	**BA**	**BC**	-	-	.094	.94	5.0	2.1	.98	1.6	-	-	.43	.55	-	-	21
		686. 726	○	-	-	**BC**	-	-	.106	1.2	6.3	2.6	-	1.2	-	-	-	.55	-	-	21
		686. 766	○	-	-	**BC**	-	-	.118	1.5	8.0	3.3	-	1.3	-	-	-	.55	-	-	21
		686. 806	○	○	-	**BC**	-	-	.134	1.9	10.0	4.2	-	1.3	-	-	-	.55	-	-	21
		686. 846	○	-	-	**BC**	**BE**	-	.150	2.3	12.5	5.2	-	1.3	1.3	-	-	.55	.67	-	21
		686. 846	-	○	-	**BC**	-	-	.150	2.3	12.5	5.2	-	1.3	-	-	-	.55	-	-	21
		686. 886	○	-	-	**BC**	-	-	.165	3.0	16.0	6.7	-	1.4	-	-	-	.67	-	-	21
		686. 926	○	-	-	-	**BE**	-	.185	3.7	20.0	8.4	-	-	1.5	-	-	-	.67	-	21
		686. 926	-	○	-	-	**BE**	**BG**	.185	3.7	20.0	8.4	-	-	1.5	1.7	-	-	.67	.87	21
		686. 966	-	○	-	-	-	**BG**	.209	4.7	25.0	10.4	-	-	-	1.81	-	-	-	.87	21
		686. 966	○	-	-		**BE**	**BG**	.209	4.7	25.0	10.4	-	-	1.6	1.8	-	-	.67	.87	21
		686. 986	○	-	-	-	-	**BG**	.220	5.2	28.0	11.7	-	-	-	1.8	-	-	-	.87	21
140°	75°	**686. 648**	○	-	-	**BC**	-	-	.087	.75	4.0	1.7	-	.95	-	-	-	.55	-	-	54
		686. 688	○	-	**BA**	**BC**	-	-	.094	.94	5.0	2.1	.91	1.1	-	-	.43	.55	-	-	54
		686. 728	○	-	**BA**	**BC**	-	-	.106	1.2	6.3	2.6	.91	1.1	-	-	.43	.55	-	-	54
		686. 728	-	○	-	**BC**	-	-	.106	1.2	6.30	2.6	-	1.1	-	-	-	.55	-	-	54
		686. 768	○	-	**BA**	**BC**	-	-	.118	1.5	8.00	3.3	.91	1.1	-	-	.43	.55	-	-	54
		686. 808	○	-	**BA**	**BC**	-	-	.134	1.9	10.0	4.2	.91	1.1	-	-	.43	.55	-	-	54
		686. 808	-	○	-	**BC**	-	-	.134	1.9	10.0	4.2	-	1.1	-	-	-	.55	-	-	54
		686. 828	○	-	**BA**	**BC**	-	-	.142	2.1	11.2	4.7	.91	1.1	-	-	.43	.55	-	-	54
		686. 848	○	-	**BA**	**BC**	-	-	.150	2.3	12.5	5.2	.91	1.1	-	-	.43	.55	-	-	54
		686. 848	-	○	-	**BC**	-	-	.150	2.3	12.5	5.2	-	1.1	-	-	-	.55	-	-	54
		686. 868	-	○	-	**BC**	-	-	.157	2.6	14.0	5.9	-	1.1	-	-	-	.55	-	-	54
		686. 888	○	○	-	**BC**	-	-	.165	3.0	16.0	6.7	-	1.1	-	-	-	.55	-	-	54
		686. 908	○	-	-	**BC**	**BE**	-	.177	3.4	18.0	7.5	-	1.1	1.2	-	-	.55	.67	-	54
		686. 928	○	○	-	-	**BE**	-	.185	3.7	20.0	8.35	-	-	1.2	-	-	-	.67	-	54
		686. 948	○	-	-	-	**BE**	-	.193	4.2	22.4	9.36	-	-	1.3	-	-	-	.67	-	54
		686. 968	○	-	-	-	**BE**	**BG**	.209	4.7	25.0	10.44	-	-	1.3	1.5	-	-	.67	.87	54
		686. 988	○	-	-	-	**BE**	**BG**	.220	5.2	28.0	11.69	-	-	1.3	1.5	-	-	.67	.87	54

[1] We reserve the right to deliver AISI 316Ti or AISI 316L under the material no. 17.

Other types on request.

Example of ordering:	Type	+	Material no.	+	Conn.	=	Ordering no.
	686. 646	+	**17**	+	**BA**	=	**686. 646. 17. BA**

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

Tongue-type nozzles

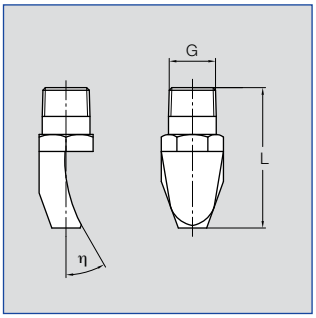
Series 688 / 689

Hard, sharp flat fan, narrowly delimited jet pattern. Non-clogging.

Applications:
Cleaning, pickling, rinsing, cross spray, requiring powerful and concentrated water jets.

Mat. no. 17
(≤ 45°)

Mat. no. 5E
(≤ 45°)



Spray angle	η	Ordering no. Type	Mat. no. 17[1] AISI 316Ti/ AISI 316L	Mat. no. 5E PVDF	Connection Male NPT 1/8"	Connection Male NPT 3/4"	Orifice diameter [in]	Flow Rate (Gallons Per Minute) 10 psi	Flow Rate 2 bar	Flow Rate 80 psi	Dimensions L [in] R 3/8	Dimensions L [in] R 1/2	Dimensions L [in] R 3/4	Dimensions Hex [in] R 3/8	Dimensions Hex [in] R 1/2	Dimensions Hex [in] R 3/4	Spray width B at p=30 psi H=10"	Spray width B at p=30 psi H=20"
15°	9°	**689. 001**	○	-	-	**BK**	.236	5.88	31.50	13.16	-	-	5.55	-	-	1.06	3	5
	9°	**689. 121**	○	-	-	**BK**	.339	11.77	63.00	26.31	-	-	168	-	-	1.06	3	5
45°	35°	**688. 763**	○	-	**BE**	-	.118	1.50	8.00	3.34	1.65	-	-	.75	-	-	9	17
	29°	**688. 923**	○	-	**BE**	-	.189	3.74	20.00	8.35	2.30	-	-	.87	-	-	9	17
	35°	**689. 003**	○	-	**BE**	**BK**	.236	5.88	31.50	13.16	2.56	-	2.89	.96	-	1.06	10	19

[1] We reserve the right to deliver AISI 316Ti or AISI 316L under the material no. 17.

Other types on request.

Example of ordering:	Type	+	Material no.	+	Conn.	=	Ordering no.
	688. 763	+	**17**	+	**BE**	=	**688. 763. 17. BE**

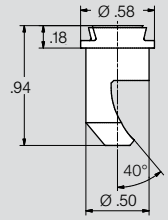
Conversion formula for the above series: $V_2 = V_1 \sqrt{\frac{P_2}{P_1}}$

Tongue-type nozzles with dovetail

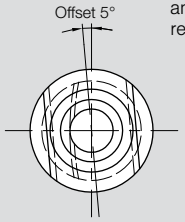
Series 686. XXX.WW.08

Wide, sharply defined flat fan pattern.
Non-clogging.
Automatic jet alignment due to dovetail guide.

Applications:
Pickling, rinsing.



Example: 686.846.17.08
Dimensions for other types on request.



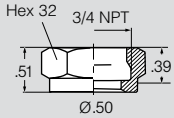
Other offset angles on request.

Spray angle	η	Ordering no. Type	Mat. no. 17[1] AISI 316Ti/ AISI 316L	Orifice diameter [in]	Flow Rate (Gallons Per Minute) 14.5 psi	liters per minute 2.0 bar	72.5 psi	Spray width B at p=30 psi H=10"
90°	40°	**686. 646**	○	.087	.75	4.0	1.4	21
		686. 686	○	.094	.94	5.0	2.1	21
		686. 726	○	.106	1.2	6.3	2.6	21
		686. 766	○	.118	1.5	8.0	3.3	21
		686. 806	○	.134	1.9	10.0	4.2	21
		686. 846	○	.150	2.3	12.5	5.2	21
		686. 886	○	.165	3.0	16.0	6.7	21
		686. 926	○	.185	3.7	20.0	8.4	21
140°	75°	**686. 648**	○	.087	0.8	4.0	1.7	54
		686. 688	○	.094	0.9	5.0	2.1	54
		686. 728	○	.106	1.2	6.3	2.6	54
		686. 768	○	.118	1.5	8.0	3.3	54
		686. 808	○	.134	1.9	10.0	4.2	54
		686. 828	○	.142	2.1	11.2	3.1	54
		686. 848	○	.150	2.3	12.5	5.2	54
		686. 888	○	.165	3.0	16.0	6.7	54
		686. 908	○	.177	3.4	18.0	7.5	54
		686. 928	○	.185	3.7	20.0	8.4	54

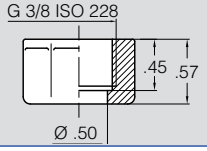
[1] We reserve the right to deliver AISI 316Ti or AISI 316L under the material no. 17.

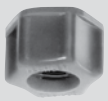
Other types and materials on request.

Example of ordering:	Type	+	Material no.	+	Code	=	Ordering no.
	686. 646	+	**17**	+	**08**	=	**686. 646. 17. 08**



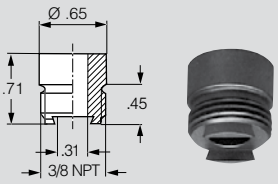
Mat. no. 17





Mat. no. 5E

Retaining nut:
065.200.17[1]
(AISI 316Ti/AISI 316L)
065.200.5E (PVDF)



Welding nipple: **066.011.17**[1]
(AISI 316Ti/AISI316L)
066.011.5E (PVDF)
Other nipple lengths on request.

Welding nipples and cap nuts must be ordered separately. Please see pages 44-45 for suitable accessories.

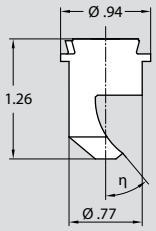
Conversion formula for the above series: $V_2 = V_1 \sqrt{\frac{P_2}{P_1}}$

Tongue-type nozzles with dovetail

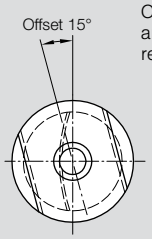
Series 686. XXX.WW.15

Wide, sharply defined flat fan pattern.
Non-clogging.
Automatic jet alignment due to dovetail guide.

Applications:
Pickling, rinsing.



Example: 686.926.17.15
Dimensions for other types on request.



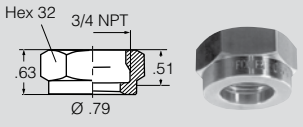
Other offset angles on request.

Spray angle	η	Ordering no. Type	Mat. no. 17[1] AISI 316Ti/ AISI 316L	Orifice diameter [in]	Flow Rate (Gallons Per Minute) 14.5 psi	liters per minute 2.0 bar	72.5 psi	Spray width B at p=30 psi H=10"
90°	40°	**686. 646**	○	.087	.75	4.0	1.7	21
		686. 686	○	.094	.94	5.0	2.1	21
		686. 726	○	.106	1.2	6.3	2.6	21
		686. 766	○	.118	1.5	8.0	3.3	21
		686. 806	○	.134	1.9	10.0	4.2	21
		686. 846	○	.150	2.3	12.5	5.2	21
		686. 886	○	.165	3.0	16.0	6.7	21
		686. 926	○	.185	3.7	20.0	8.4	21
		686. 966	○	.209	4.7	25.0	10.4	21
		686. 986	○	.220	5.2	28.0	11.7	21
140°	75°	**686. 648**	○	.087	0.8	4.0	1.7	54
		686. 688	○	.094	0.9	5.0	2.1	54
		686. 728	○	.106	1.2	6.3	2.7	54
		686. 768	○	.118	1.5	8.0	3.3	54
		686. 808	○	.134	1.9	10.0	4.2	54
		686. 828	○	.142	2.1	11.2	4.7	54
		686. 848	○	.150	2.3	12.5	5.2	54
		686. 888	○	.165	3.0	16.0	6.7	54
		686. 908	○	.177	3.4	18.0	7.5	54
		686. 928	○	.185	3.7	20.0	8.4	54
		686. 948	○	.193	4.2	22.4	9.4	54
		686. 968	○	.209	4.7	25.0	10.4	54
		686. 988	○	.220	5.2	28.0	11.7	54

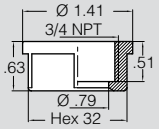
[1] We reserve the right to deliver AISI 316Ti or AISI 316L under the material no. 17.

Other types and materials on request.

Example of ordering:	Type	+	Material no.	+	Code	=	Ordering no.
	686. 646	+	**17**	+	**15**	=	**686. 646. 17. 15**

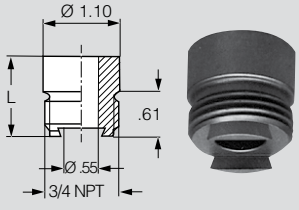


Mat. no. 17



Mat. no. 5E

Retaining nut:
065.600.17[1] (AISI 316Ti/AISI 316L)
065.600.5E (PVDF)



Welding nipple:
066.410.17[1]
(AISI 316Ti/AISI 316L):
L= 27 mm
066.410.5E (PVDF):
L= 27 mm
Other nipple lengths on request.

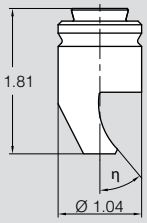
Welding nipples and cap nuts must be ordered separately. Please see pages 44 and 45 for suitable accessories.

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

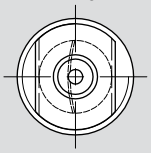
Tongue-type nozzles with dovetail and captive cap nut Series 686. XXX.WW.09

Wide, sharply defined flat fan pattern.
Non-clogging.
Automatic jet alignment due to dovetail guide.
Captive cap nut for easy maintenance.

Applications:
Pickling, rinsing.



Example: 686.986.1709
Dimensions for other types on request.



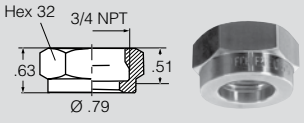
Other offset angles on request.

Spray angle	η	Ordering no. Type	Mat. no. 17[1] AISI 316Ti/ AISI 316L	Orifice diameter [in]	Flow Rate (Gallons Per Minute) 14.5 psi	liters per minute 2.0 bar	72.5 psi	Spray width B at p=30 psi H=10"
90°	40°	**686. 646**	○	.087	0.75	4.0	1.7	21
		686. 686	○	.087	0.94	5.0	2.1	21
		686. 726	○	.094	1.2	6.3	2.6	21
		686. 766	○	.106	1.5	8.0	3.3	21
		686. 806	○	.118	1.9	10.0	4.2	21
		686. 846	○	.134	2.3	12.5	5.2	21
		686. 886	○	.150	3.0	16.0	6.7	21
		686. 926	○	.165	3.7	20.0	8.4	21
		686. 966	○	.185	4.7	25.0	10.4	21
		686. 986	○	.209	5.2	28.0	11.7	21
140°	75°	**686. 648**	○	.220	.75	4.0	1.7	54
		686. 688	○	.087	.94	5.0	2.1	54
		686. 728	○	.094	1.2	6.3	2.6	54
		686. 768	○	.106	1.5	8.0	3.3	54
		686. 808	○	.118	1.9	10.0	4.2	54
		686. 828	○	.134	2.1	11.2	4.7	54
		686. 848	○	.142	2.3	12.5	5.2	54
		686. 888	○	.150	3.0	16.0	6.7	54
		686. 908	○	.165	3.4	18.0	7.6	54
		686. 928	○	.177	3.7	20.0	8.3	54
		686. 948	○	.185	4.2	22.4	9.4	54
		686. 968	○	.193	4.7	25.0	10.4	54
		686. 988	○	.209	5.2	28.0	11.7	54

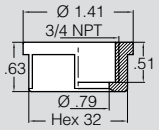
[1] We reserve the right to deliver AISI 316Ti or AISI 316L under the material no. 17.

Other types and materials on request.

Example of ordering:	Type	+	Material no.	+	Code	=	Ordering no.
	686. 646	+	**17**	+	**09**	=	**686. 646. 17. 09**

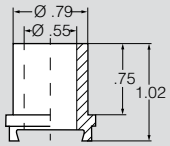


Mat. no. 17



Mat. no. 5E

Retaining nut: **065.600.17**[1] (AISI 316Ti/AISI 316L)
065.600.5E (PVDF)



Welding nipple:
600.277.17[1].01
(AISI 316Ti/AISI 316L)
Other nipple lengths on request.

[1] We reserve the right to deliver AISI 316Ti or AISI 316L under the material no. 17.

Welding nipples and cap nuts must be ordered separately. Please see pages 44 and 45 for suitable accessories.

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

Axial-flow full cone nozzles
Stainless steel version
Series 490 / 491

NEW Patent pending

Non-clogging nozzle design. Stable spray angle. Particularly even liquid distribution.

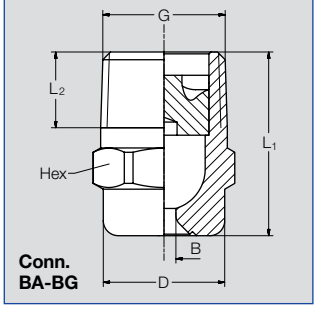
Applications:
Pickling, Surface treatment, rinsing, acid fume scrubbing.

Series 490

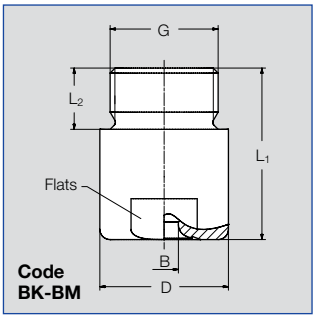
Series 491

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

Nozzles of series 490/491 replace series 460/461 which are still available on request.



Conn. BA-BG



Code BK-BM

Conn.	Dimensions [in]					Weight
	G	L_1	L_2	D	Hex/Flats	
BA	1/8 NPT	.71	.26	.39	11	.42 lb
BC	1/4 NPT	.87	.39	.51	14	.53 lb
BE	3/8 NPT	.96	.39	.63	17	1.02 lb
BE	3/8 NPT	1.18	.39	.63	17	1.69 lb
BG	1/2 NPT	1.28	.51	.83	22	2.01 lb
BG	1/2 NPT	1.71	.51	.83	22	2.86 lb
BK	3/4 NPP	1.65	.59	1.26	27	6.38 lb
BM	1 NPT	2.20	.67	1.57	36	11.75 lb

Subject to technical modification.
In a critical installation situation, please ask for the exact dimensions.

Spray angle	Ordering no.								Orifice diameter [in]	Free passage [in]	Flow Rate (Gallons Per Minute)									Spray diameter D at p=30 psi	
	Type	Mat. no. 1Y AISI 316L	Connection Male NPT 1/8"	1/4"	3/8"	1/2"	3/4"	1"			10 psi	20 psi	2 liters per minute bar	30 psi	40 psi	60 psi	80 psi	100 psi	150 psi	H=8"	H=20"
45°	**490. 403**	○	**BA**	-	-	-	-	-	.049	.049	.17	.23	1.0	.027	.30	.35	.40	.43	.51	6	16
	490. 523	○	**BA**	-	-	-	-	-	.067	.067	.35	.46	2.0	.54	.60	.71	.79	.87	1.02	6	16
	490. 603	○	-	**BC**	**BE**	-	-	-	.079	.079	.54	.72	3.2	.084	.95	1.1	1.3	1.4	1.6	6	16
	490. 723	○	-	-	**BE**	-	-	-	.112	.112	1.1	1.4	6.3	1.7	1.9	2.2	2.5	2.7	3.2	6	16
60°	**490. 404**	○	**BA**	-	-	-	-	-	.045	.045	.17	.23	1.0	.27	.30	.35	.40	.43	.51	9	22
	490. 444	○	**BA**	-	-	-	-	-	.049	.049	.22	.29	1.2	.33	.38	.44	.49	.54	.64	9	22
	490. 484	○	**BA**	-	-	-	-	-	.057	.057	.28	.36	1.6	.43	.48	.57	.63	.69	.82	9	22
	490. 524	○	**BA**	-	-	-	-	-	.063	.063	.35	.46	2.0	.54	.60	.71	.79	.87	1.0	9	22
	490. 564	○	**BA**	-	-	-	-	-	.071	.071	.43	.57	2.5	.67	.75	.88	.99	1.1	1.3	9	22
	490. 604	○	**BA**	**BC**	**BE**	-	-	-	.081	.081	.54	.72	3.2	.84	.95	1.1	1.25	1.4	1.6	9	22
	490. 644	○	-	**BC**	**BE**	-	-	-	.091	.091	.69	.91	4.0	1.1	1.2	1.4	1.59	1.73	2.0	9	22
	490. 684	○	-	**BC**	**BE**	-	-	-	.102	.102	.86	1.1	5.0	1.3	1.5	1.8	1.98	2.2	2.6	9	22
	490. 724	○	-	**BC**	**BE**	-	-	-	.112	.110	1.09	1.4	6.3	1.7	1.9	2.2	2.5	2.7	3.2	9	22
	490. 764	○	-	-	**BE**	-	-	-	.128	.128	1.4	1.8	8.0	2.1	2.4	2.8	3.2	3.5	4.1	9	22
	490. 804	○	-	-	**BE**	-	-	-	.146	.146	1.7	2.3	10.0	2.7	3.0	3.5	3.9	4.3	5.1	9	22
	490. 844	○	-	-	-	**BG**	-	-	.159	.159	2.2	2.9	12.5	3.4	3.8	4.4	4.9	5.4	6.4	9	22
	490. 884	○	-	-	-	**BG**	-	-	.183	.183	2.8	3.6	16.0	4.3	4.8	5.7	6.3	6.9	8.2	9	22
	490. 924	○	-	-	-	-	**BK**	-	.205	.205	3.5	4.6	20.0	5.4	6.0	7.1	7.9	8.7	10.2	9	22
	490. 964	○	-	-	-	-	**BK**	-	.228	.228	4.3	5.7	25.0	6.7	7.5	8.8	9.9	10.8	12.7	9	22
	491. 044	○	-	-	-	-	-	**BM**	.285	.285	6.9	9.11	40.0	10.7	12.0	14.1	15.7	17.3	20.4	9	22
	491. 084	○	-	-	-	-	-	**BM**	.321	.321	8.6	11.4	50.0	13.4	15.0	17.7	19.8	21.7	25.5	9	22

Continued on next page.

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

Axial-flow full cone nozzles
Stainless steel version
Series 490 / 491

NEW Patent pending

Spray angle	Ordering no. Type	Mat. no. 1Y AISI 316L	Connection Male NPT 1/8"	1/4"	3/8"	1/2"	3/4"	1"	Orifice diameter [in]	Free passage [in]	Flow Rate (Gallons Per Minute) 10 psi	20 psi	liters per minute 2 bar	30 psi	40 psi	60 psi	80 psi	100 psi	150 psi	Spray diameter D at p=30 psi H=8"	H=20"
90°	**490. 406**	○	**BA**	-	-	-	-	-	.047	.047	.17	.23	1.0	.27	.30	.35	.40	.43	.51	15	34
	490. 486	○	**BA**	-	-	-	-	-	.051	.051	.22	.29	1.3	.33	.38	.44	.49	.54	.64	15	34
	490. 526	○	**BA**	-	-	-	-	-	.057	.057	.28	.36	1.6	.43	.48	.57	.63	.69	.82	15	34
	490. 566	○	**BA**	-	-	-	-	-	.075	.075	.43	.57	2.5	.67	.75	.88	.99	1.1	1.3	15	34
	490. 606	○	**BA**	-	**BE**	-	-	-	.081	.081	.54	.72	3.2	.84	.95	1.1	1.3	1.4	1.6	15	34
	490. 646	○	-	**BC**	**BE**	-	-	-	.094	.094	.69	.91	4.0	1.1	1.2	1.4	1.6	1.7	2.0	15	38
	490. 686	○	-	**BC**	**BE**	-	-	-	.106	.106	.86	1.1	5.0	1.3	1.5	1.8	1.9	2.2	2.6	15	38
	490. 726	○	-	**BC**	**BE**	-	-	-	.126	.110	1.1	1.4	6.3	1.7	1.9	2.2	2.5	2.7	3.2	15	38
	490. 746	○	-	-	**BE**	-	-	-	.124	.124	1.2	1.6	7.1	1.9	2.1	2.5	2.8	3.1	3.6	15	38
	490. 766	○	-	-	**BE**	-	-	-	.134	.134	1.4	1.8	8.0	2.1	2.4	2.8	3.2	3.5	4.1	15	38
	490. 806	○	-	-	**BE**	-	-	-	.154	.154	1.7	2.3	10.0	2.7	3.0	3.5	3.9	4.3	5.1	15	38
	490. 846	○	-	-	**BE**	-	-	-	.183	.157	2.2	2.9	12.5	3.4	3.76	4.4	4.9	5.4	6.4	15	38
	490. 886	○	-	-	-	**BG**	-	-	.215	.177	2.8	3.6	16.0	4.3	4.8	5.7	6.3	6.9	8.2	15	38
	490. 926	○	-	-	-	**BG**	-	-	.232	.177	3.5	4.6	20.0	5.4	6.0	7.1	7.9	8.7	10.2	15	38
	490. 966	○	-	-	-	**BG**	**BK**	-	.258	.191	4.3	5.7	25.0	6.7	7.5	8.8	9.9	10.8	12.7	15	38
	491. 006	○	-	-	-	-	**BK**	-	.297	.285	5.4	7.2	31.5	8.4	9.47	11.1	12.5	13.7	16.1	15	38
	491. 046	○	-	-	-	-	**BK**	-	.339	.315	6.9	9.1	40.0	10.7	12.0	14.1	15.9	17.3	20.4	15	38
	491. 086	○	-	-	-	-	-	**BM**	.372	.285	8.6	11.4	50.0	13.4	15.0	17.7	19.8	21.7	25.5	15	38
	491. 126	○	-	-	-	-	-	**BM**	.409	.315	10.9	14.4	63.0	16.9	18.9	22.3	24.9	27.3	32.1	15	38
	491. 146	○	-	-	-	-	-	**BM**	.433	.295	12.3	16.2	71.0	19.0	21.3	25.1	28.2	30.8	36.2	15	38
120°	**490. 368**	○	**BA**	-	-	-	-	-	.066	.026	.11	.14	.63	.17	.19	.22	.25	.27	.32	27	48
	490. 408	○	**BA**	-	-	-	-	-	.047	.047	.17	.23	1.0	.27	.30	.35	.40	.43	.51	27	48
	490. 448	○	**BA**	-	-	-	-	-	.051	.051	.22	.29	1.3	.33	.38	.44	.49	.54	.64	27	48
	490. 488	○	**BA**	-	-	-	-	-	.057	.057	.28	.36	1.6	.43	.48	.57	.63	.69	.82	27	48
	490. 528	○	**BA**	-	-	-	-	-	.067	.067	.35	.46	2.0	.54	.60	.71	.79	.87	1.0	27	48
	490. 568	○	**BA**	-	-	-	-	-	.075	.075	.43	.57	2.5	.67	.75	.88	.99	1.1	1.3	27	48
	490. 608	○	**BA**	-	-	-	-	-	.083	.081	.54	.72	3.2	.84	.95	1.1	1.3	1.4	1.6	27	48
	490. 648	○	-	**BC**	**BE**	-	-	-	.094	.094	.69	.91	4.0	1.1	1.2	1.4	1.6	1.7	2.0	27	52
	490. 688	○	-	**BC**	**BE**	-	-	-	.108	.108	.86	1.1	5.0	1.3	1.5	1.8	1.9	2.2	2.6	27	52
	490. 728	○	-	**BC**	**BE**	-	-	-	.126	.110	1.1	1.4	6.3	1.7	1.9	2.2	2.5	2.7	3.2	27	52
	490. 748	○	-	-	**BE**	-	-	-	.126	.126	1.2	1.6	7.1	1.9	2.1	2.5	2.8	3.1	3.6	27	52
	490. 768	○	-	-	**BE**	-	-	-	.136	.136	1.4	1.9	8.0	2.1	2.4	2.8	3.2	3.5	4.1	27	52
	490. 808	○	-	-	**BE**	-	-	-	.154	.154	1.7	2.3	10.0	2.7	3.0	3.5	3.9	4.3	5.1	27	52
	490. 848	○	-	-	**BE**	-	-	-	.185	.157	2.2	2.9	12.5	3.4	3.8	4.4	4.9	5.4	6.4	27	52
	490. 888	○	-	-	-	**BG**	-	-	.201	.177	2.8	3.6	16.0	4.3	4.8	5.6	6.3	6.9	8.2	27	52
	490. 928	○	-	-	-	**BG**	-	-	.228	.228	3.4	4.6	20.0	5.4	6.0	7.1	7.9	8.7	10.2	27	52
	490. 968	○	-	-	-	**BG**	**BK**	-	.262	.191	4.3	5.7	25.0	6.7	7.5	8.8	9.9	10.8	12.7	27	52
	491. 048	○	-	-	-	-	**BK**	-	.362	.230	6.9	9.1	40.0	10.7	12.0	14.1	15.9	17.3	20.4	27	52
	491. 128	○	-	-	-	-	-	**BM**	.425	.305	10.9	14.4	63.0	16.9	18.9	22.3	24.9	27.3	32.1	27	52
	491. 148	○	-	-	-	-	-	**BM**	.449	.301	12.3	16.2	71.0	19.0	21.3	25.1	28.2	30.8	36.2	27	52

Example for ordering:	Type	+	Material no.	+	Conn.	=	Ordering no.
	490. 406	+	**1Y**	+	**BA**	=	**490. 406. 1Y. BA**

Other nozzle materials (special alloys, plastics) are available on request.

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

Axial-flow full cone nozzles

Application example

Advantages of new series 490 / 491

- **Non-clogging**
- **Very stable spray angle**
- **Homogeneous liquid distribution**

Acid fume scrubbing

Stainless steel
Series 490 /491

PVDF
Series 490 /491

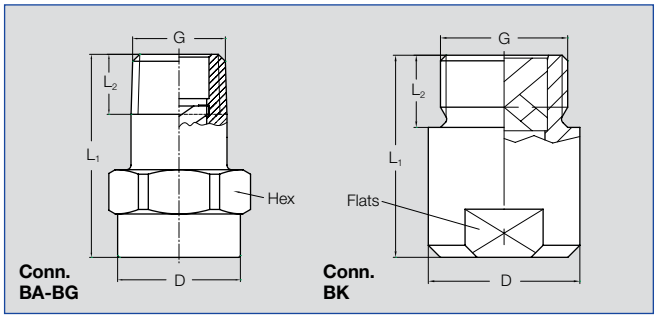
For cleaning the acid fume Lechler **full cone nozzles** in material stainless steel or PVDF are commonly used.

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

Axial-flow full cone nozzles
PVDF version
Series 460 / 461

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

Applications:
Pickling, Surface treatment, rinsing, acid fume scrubbing.



Code	Dimensions [mm]				
	Male NPT G	L_1	L_2	D	Hex/Flats
BA	1/8 NPT	.87	.26	.51	14
BC	1/4 NPT	.87	.38	.51	14
BE	3/8 NPT	1.18	.39	.67	17
BG	1/2 NPT	1.71	.52	.87	22
BK	3/4 NPT	1.65	.59	1.24	27

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

Spray angle	Ordering no.							Orifice diameter [in]	Free passage [in]	Flow Rate (Gallons Per Minute)								Spray diameter D at p=30 psi	
	Type	Mat. no. 5E PVDF	Connection Male NPT 1/8"	1/4"	3/8"	1/2"	3/4"			10 psi	20 psi	liters per minute 2 bar	30 psi	40 psi	60 psi	80 psi	100 psi	150 psi	H=8"	H=20"
60°	**460. 644**	○	-	**BC**	-	-	-	.095	.075	.69	.91	4.0	1.1	1.2	1.4	1.6	1.7	2.0	9	22
	460. 964	○	-	-	-	-	**BK**	.229	.193	4.3	5.7	25	6.7	7.5	8.8	9.9	10.8	12.7	9	22
90°	**460. 326**	○	**BA**	-	-	-	-	.032	.022	.07	.09	0.4	.11	.12	.14	.16	.17	.20	15	34
	460. 406	○	**BA**	-	-	-	-	.047	.033	.17	.23	1.0	.27	.30	.35	.40	.43	.51	15	34
	460. 486	○	**BA**	-	-	-	-	.057	.047	.28	.36	1.6	.43	.48	.57	.63	.69	.82	15	34
	460. 526	○	**BA**	-	-	-	-	.065	.051	.35	.46	2.0	.54	.60	.71	.79	.87	1.0	15	34
	460. 606	○	**BA**	-	**BE**	-	-	.081	.057	.54	.72	3.2	.84	.95	1.1	1.2	1.4	1.6	15	34
	460. 646	○	-	**BC**	-	-	-	.091	.071	.69	.91	4.0	1.1	1.2	1.4	1.6	1.7	2.0	15	38
	460. 726	○	-	-	**BE**	-	-	.116	.079	1.1	1.4	6.3	1.7	1.9	2.2	2.5	2.7	3.2	15	38
	460. 746	○	-	-	**BE**	-	-	.130	.075	1.2	1.6	7.1	1.9	2.1	2.5	2.8	3.1	3.6	15	38
	460. 766	○	-	-	**BE**	-	-	.130	.095	1.4	1.8	8.0	2.1	2.4	2.8	3.2	3.5	4.1	15	38
	460. 806	○	-	-	**BE**	-	-	.146	.106	1.7	2.3	10.0	2.7	3.0	3.5	4.0	4.3	5.1	15	38
	460. 846	○	-	-	**BE**	-	-	.160	.126	2.2	2.8	12.5	3.3	3.8	4.4	5.0	5.4	6.4	15	38
	460. 886	○	-	-	-	**BG**	-	.185	.122	2.8	3.6	16.0	4.3	4.8	5.7	6.3	6.9	8.2	15	38
	460. 966	○	-	-	-	**BG**	-	.229	.150	4.3	5.7	25	6.7	7.5	8.8	9.9	10.8	12.7	15	38
	461. 006	○	-	-	-	**BG**	-	.252	.150	5.4	7.2	32	8.4	9.5	11.1	12.5	13.7	16.1	15	38
	461. 046	⊗	-	-	-	-	**BK**	.284	.209	6.9	9.1	40	10.7	12.0	14.1	15.9	17.3	20	15	38

Continued on next page.

⊗ material PP (material no. 53), connection 3/4 NPT (Conn. BK)

Example for ordering:	Type	+	Material no.	+	Conn.	=	Ordering no.
	460. 644	+	**5E**	+	**BC**	=	**460. 644. 5E. BC**

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

Axial-flow full cone nozzles
PVDF version
Series 460 / 461

Spray angle	Ordering no.						Orifice diameter [in]	Free passage [in]	Flow Rate (Gallons Per Minute)							Spray diameter D at p=30 psi	
	Type	Mat. no.	Connection														
		5E	Male NPT														
		PVDF	1/8"	1/4"	3/8"	1/2"			10 psi	20 psi	2 bar	40 psi	80 psi	100 psi	150 psi	H=8"	H=20"
120°	**460. 408**	○	**BA**	**-**	**-**	**-**	.047	.033	.17	.23	1.0	.30	.40	.43	.51	27	52
	460. 488	○	**BA**	**-**	**-**	**-**	.059	.039	.28	.36	1.6	.48	.63	.69	.82	27	52
	460. 528	○	**BA**	**-**	**-**	**-**	.065	.047	.35	.46	2.0	.60	.79	.87	1.0	27	52
	460. 608	○	**BA**	**-**	**-**	**-**	.083	.055	.54	.72	3.5	.95	1.2	1.4	1.6	27	52
	460. 648	○	**-**	**BC**	**-**	**-**	.096	.063	.69	.91	4.0	1.2	1.6	1.7	2.0	27	52
	460. 728	○	**-**	**-**	**BE**	**-**	.122	.075	1.1	1.4	6.3	1.9	2.5	2.7	3.2	27	52
	460. 748	○	**-**	**-**	**BE**	**-**	.130	.075	1.2	1.6	7.1	2.1	2.8	3.1	3.6	27	52
	460. 768	○	**-**	**-**	**BE**	**-**	.138	.075	1.4	1.8	8.0	2.4	3.2	3.5	4.1	27	52
	460. 808	○	**-**	**-**	**BE**	**-**	.150	.094	1.7	2.3	10.0	3.0	4.0	4.3	5.1	27	52
	460. 848	○	**-**	**-**	**BE**	**-**	.165	.106	2.2	2.8	12.5	3.8	5.0	5.4	6.4	27	52
	460. 888	○	**-**	**-**	**-**	**BG**	.181	.122	2.8	3.6	16.0	4.8	6.3	6.9	8.2	27	52
	460. 968	○	**-**	**-**	**-**	**BG**	.232	.161	4.3	5.7	25.0	7.5	9.9	10.8	12.7	27	52
	461. 048	⊗	**-**	**-**	**-**	**-**	.299	.193	6.9	9.1	40.0	12.0	15.9	17.3	20	27	52

⊗ material PP (material no. 53), connection 3/4 NPT (Conn. BK)

	Type	+	Material no.	+	Conn.	=	Ordering no.
Example for ordering:	**460. 408**	+	**5E**	+	**BA**	=	**460. 408. 5E. BA**

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

Multi-channel flat fan nozzles for air Whisperblast®
Series 600.130 / 600.493 / 600.562

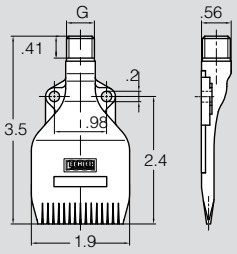
Highly efficient air stream, acting upon areas.
Reduced noise levels.
Low air consumption.

Applications:
Blowing off and blowing out, cleaning, drying, cooling, conveying with air.

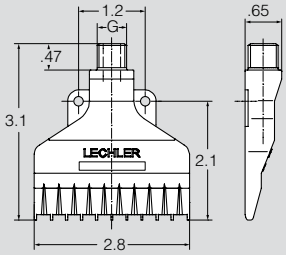
600.130.S2
(PP colorless)

600.493.1Y
(Stainless steel AISI 316L)

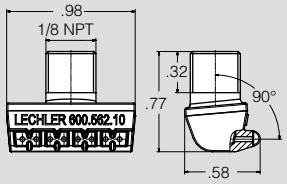
600.562.1Y.10
(Stainless steel AISI 316L)



Weight: .03 lb · Tmax: 140 °F

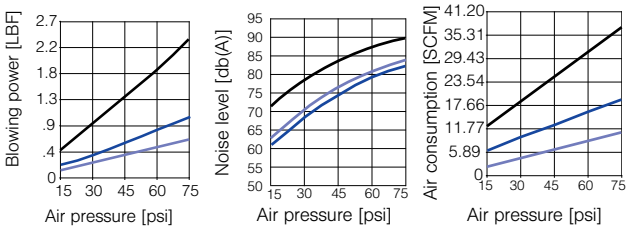


Weight: .28 lb · Tmax: 1022 °F



Weight: .04 lb · Tmax: 356 °F

Technical data



Ordering no.					
Type	Mat. no.		Connection		
	1Y Stainless steel	S2 PP colorless	1/8 BSPP	1/4 BSPP	1/4 NPT
600.130	-	○	-	**AC**	**BC**
600.493	○	-	-	**AC**	**BC**
600.562.1Y.10	○	-	○	-	-

Example for ordering:	Type	+	Material no.	+	Conn.	=	Ordering no.
	600. 130	+	**S2**	+	**BC**	=	**600. 130. S2. BC**

Flat fan nozzles for air or saturated steam

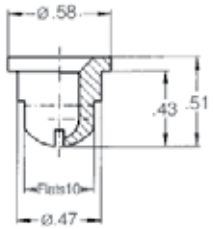
Series 679

Particularly wide-angle, powerful air jet. Assembling with retaining nut. Easy nozzle changing. Simple jet alignment.

Applications:
Blowing off liquids, cooling, reheating, drying.

Mat. no. 17

Mat. no. 5E

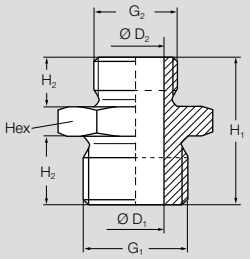


Spray angle	Ordering no. Type	Mat. no. 17¹ AISI 316Ti/ AISI 316L	Mat. no. 5E PVDF	Equivalent Orifice diam. [in]	V_n L = Air [SCFM] MS = Saturated Steam [lb/h] p [psi] 0.5 L	0.5 S	2.0 L	2.0 S	5.0 L	5.0 S	10.0 L	10.0 S
ca. 70°	**679. 085**	○	○	.051	1.2	3.5	2.4	6.8	2.8	6.1	8.7	13.5
	679. 117	○	○	.059	1.2	3.8	2.5	7.3	2.9	6.5	9.1	14.3
	679. 165	○	○	.071	1.5	4.4	3.0	9.0	3.6	8.0	11.1	17.6
	679. 255	○	○	.083	2.1	6.2	4.3	12.6	5.0	11.2	15.7	24.7
	679. 365	○	○	.110	3.7	11.0	7.5	22.1	8.8	19.6	27.4	43.2
	679. 415	○	○	.142	6.0	17.6	11.9	35.3	14.1	31.4	43.9	69.2
	679. 495	○	○	.169	9.2	27.3	18.3	54.7	21.6	48.5	67.1	106.9

A = Equivalent bore diameter

Example of ordering:	Type	+	Material no.	=	Ordering no.
	679. 085	+	**17**	=	**679. 085. 17**

Double nipple

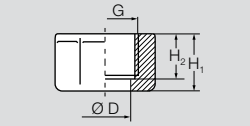


Ordering no. Type	Mat. no. 17¹ AISI 316Ti/ AISI 316L	Mat. no. 5E PVDF	Dimensions [mm] G_1 NPT	G_2 NPT	H_1	H_2	D_1	D_2	Hex	Weight
065. 215	○	○	3/8 A	1/4 A	.98	.40	.40	.28	22	.063 lb
065. 211	○	○	3/8 A	3/8 A	.98	.40	.45	-	22	.052 lb

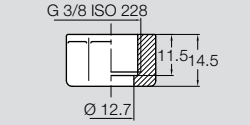
Nuts

Mat. no. 17

Mat. no. 5E



Mat. no. 17



Mat. no. 5E

Ordering no. Type	Mat. no. 17¹ AISI 316Ti/ AISI 316L	Mat. no. 5E PVDF	Dimensions [mm] G NPT	H_1	H_2	D	Hex	Weight
065. 200	○	-	3/8	.512	.394	.504	22	.052 lb
065. 200	-	○	3/8	.571	.453	.504	22	.052 lb

¹ We reserve the right to deliver AISI 316Ti or AISI 316L under the material no. 17.

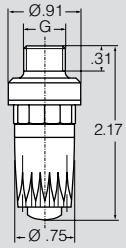
Multi-channel round jet nozzles for air

Series 600.326

Powerful air jet, producing punctiform impact patterns. Low noise level. Low air consumption.

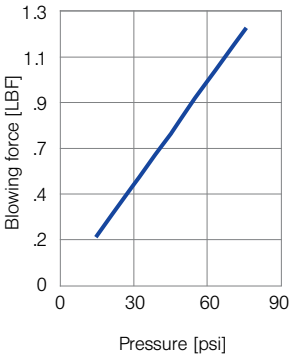
Applications:
Targeted blowing out and blowing off with compressed air.

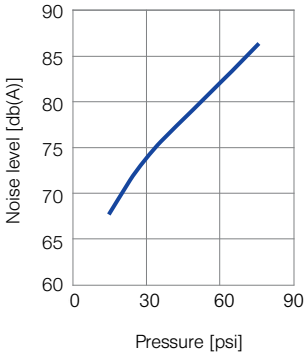
600.326.5K (ABS)

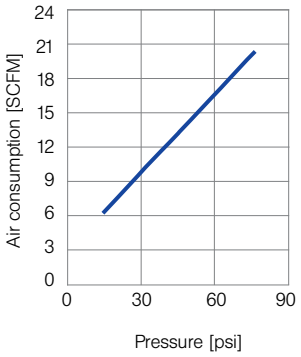


Tmax: 50 °C

Technical data





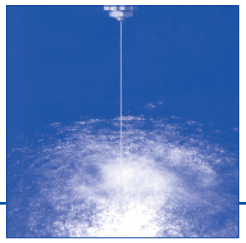


Ordering no.		Connection thread
Type	Conn.	
600. 326. 5K (Material: ABS)	**AC**	1/4" Male BSPP
	AA	1/8" Male BSPP
	BA	1/8" Male NPT
	BC	1/4" Male NPT
	HG	M12 x 1.25

Example of ordering:	**Type**	**+**	**Conn.**	**=**	**Ordering no.**
	600. 326. 5K	**+**	**BC**	**=**	**600. 326. 5K. BC**

Eductor nozzles

Series 500.262 / 500.428

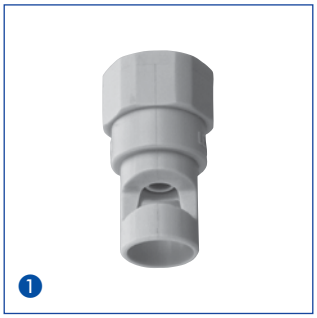


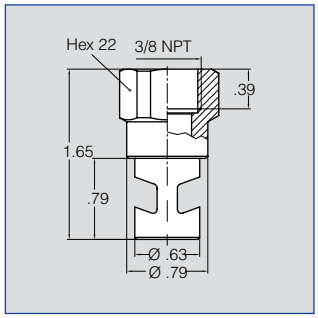
No risk of blockage thanks to the large cross sections from 2.0 to 10.0 bar.

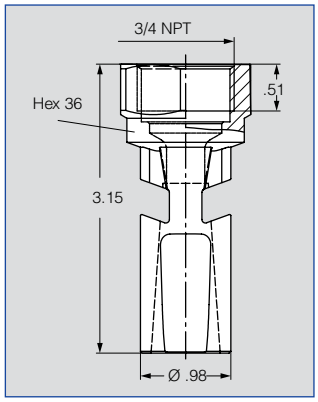
Applications:
Tank mixing, liquid circulation, preventing sedimentation

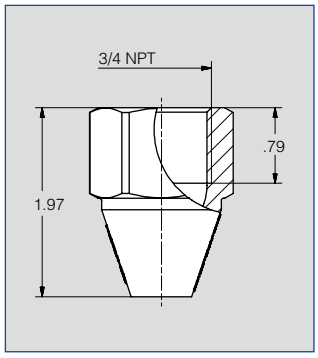
Material:
❶ Polypropylene

❷ + ❸ Polypropylene Fibreglass reinforced







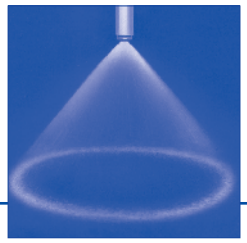


	Ordering no.	Orifice diameter [in]	Flow Rate (Gallons Per Minute) 30 psi	40 psi	60 psi	liters per minute 6 bar	80 psi	100 psi
❶	**500. 262. 53. 02**	.087	1.2	1.4	1.7	7.7	2.0	2.2
	500. 262. 53. 04	.142	3.0	3.4	4.2	19.2	4.9	5.4
	500. 262. 53. 06	.177	4.9	5.7	7.0	31.8	8.1	9.0
	500. 262. 53. 08	.236	8.5	9.8	12.0	54.8	13.9	15.5
❷	**500. 262. 53. 20**	.417	25.8	29.8	36.5	166.5	42.2	47.0
❸	**500. 428. 53. 00**	.382	23.3	26.9	32.9	150.1	39.0	42.5

Other sizes on request.

Tangential Nozzles

Series 300.185

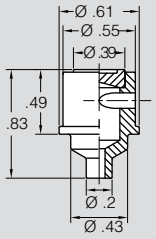


Very homogeneous and stable hollow cone spray pattern. Not prone to clogging due to tangential design.

Applications:
Acid regeneration.

Material: Aluminium oxide

Material: Silicon carbide



Typical dimensions
(details on request)

For the acid regeneration a very precise spray pattern even at low flow rates is required.

The nozzles are fitted in a plate with multiple borings allowing the flow to pass through to the nozzles and to position them correctly.

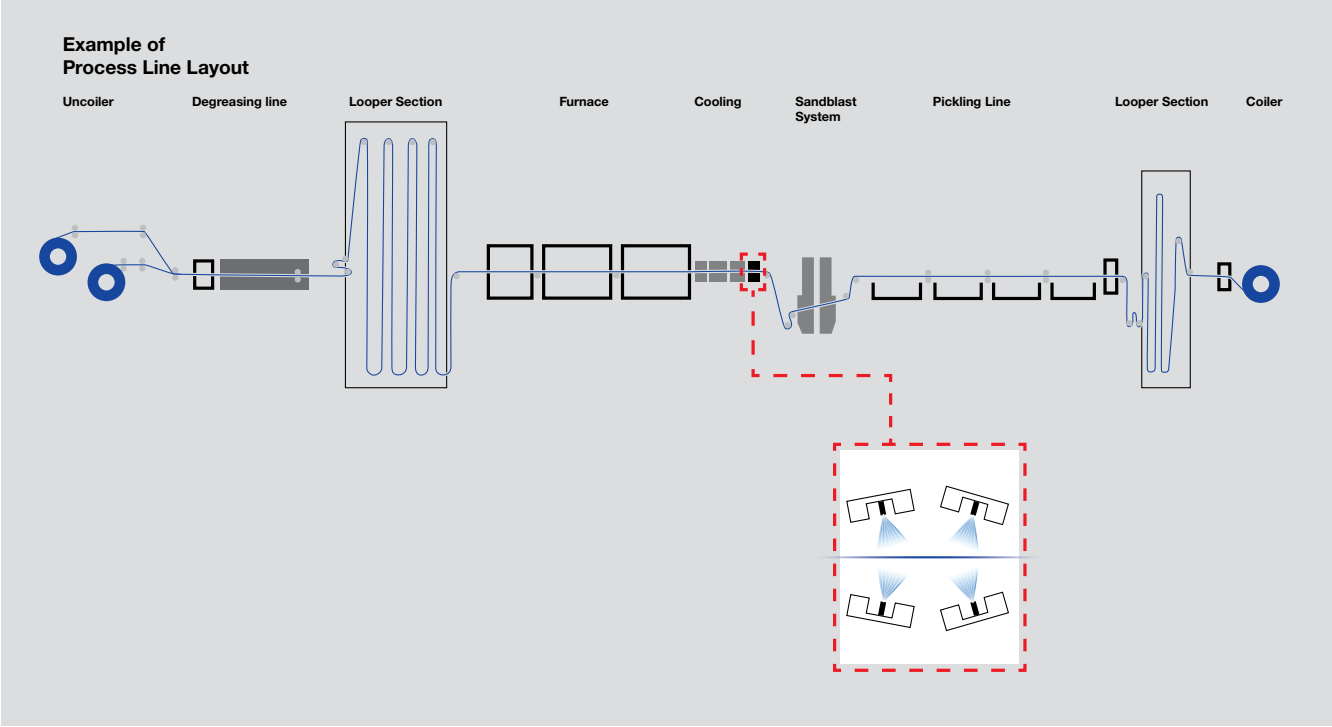
Special materials such as sintered silicon carbide or aluminium oxide are used for the nozzles to prolong the life-time in this demanding atmosphere.

Please contact Lechler for available flow rates and spray angles.

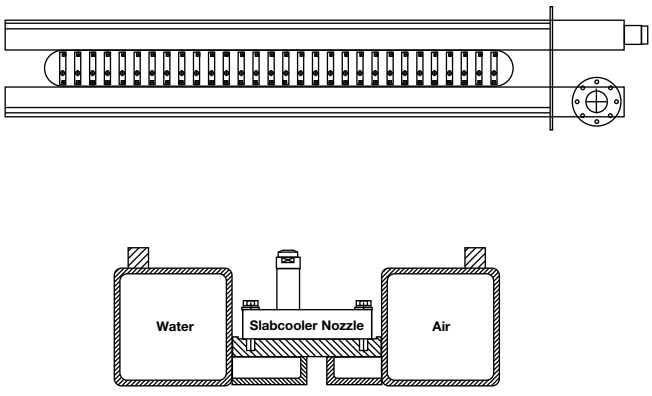
Schematic view of reactor

OPTIMIZED STRIP COOLING IN COLD CONTINUOUS ANNEALING AND PICKLING LINES (CAPL) WITH LECHLER AIR MIST SPRAY COOLING HEADERS

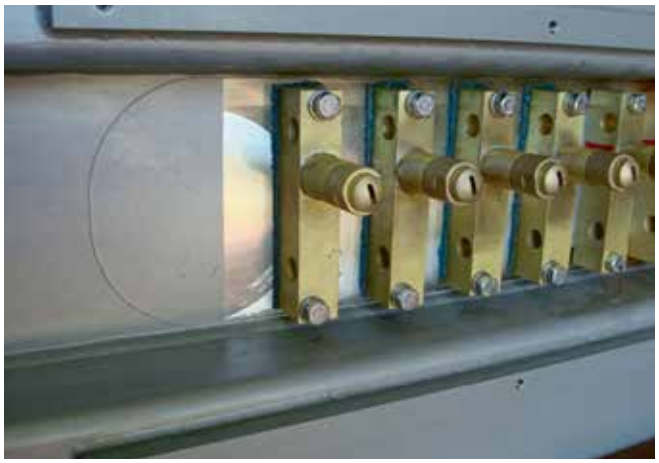
It is in the cold continuous annealing and pickling line where the treatment of the strip is performed, providing the metallurgical structure of the stainless steel.
At temperatures between 1472 °F and 2192 °F the recrystalisation takes place in the furnace before the strip is cooled from top and bottom by means of air blowing, conventional water spray cooling and air-mist spray cooling. Often it is a combination of all three methods. Varying steel grades and line speeds require specific cooling rates to avoid carbide precipitation at grain boundaries.
The special Lechler AirMist Cooling Header design is providing exactly that. The 1 : 10 water control ratio (turn down ratio) allows a precise setting with perfect spray patterns from min. to max. line speeds. The large spray overlaps ensure a uniform cooling over the entire strip width for an optimal thermal homogeneity across the strip.



Typical process scheme with a twin Lechler air mist header set up in the final strip cooling section



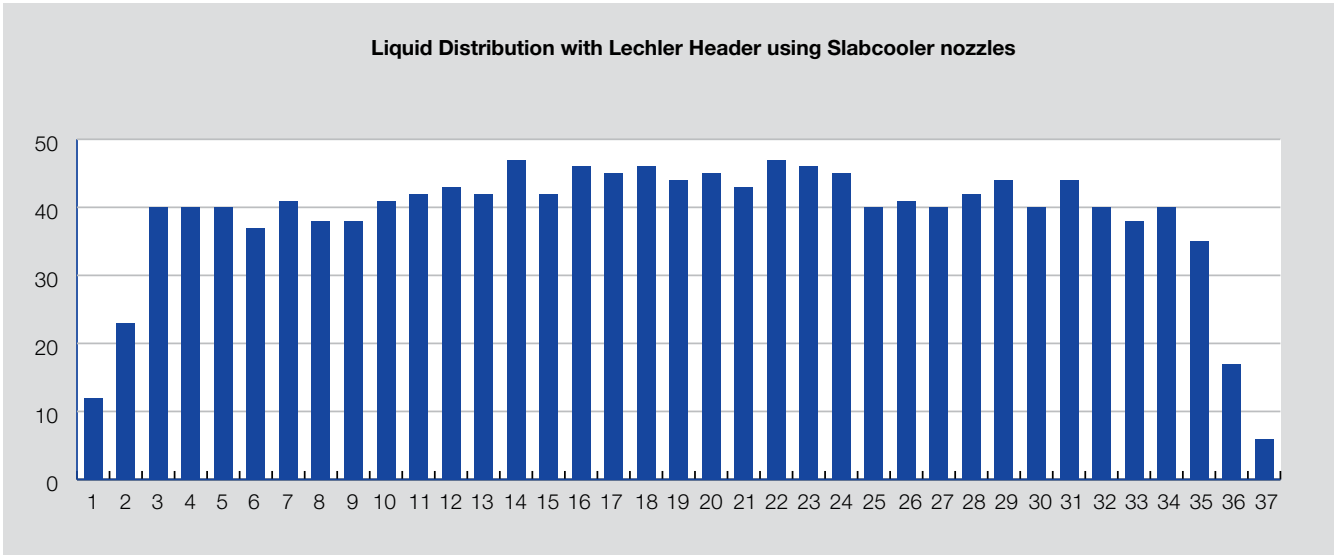
Example of Lechler air mist header design without cover plate on



Front view

Lechler air mist quench header in operation

Sprays in operation with cover plate on



Water density measurement showing a very uniform liquid distribution over entire strip width

Air mist nozzles with a very wide water control range (turn down ratio)	**Specify cooling rate can be set for every steel grade and line speed for greatest machine flexibility**
SlabCooler air mist nozzles with reduced compressed air consumption	**Reduced energy costs**
SlabCooler air mist Nozzles with stable spray angle over control range	**Perfect cooling conditions at each cooling rate for perfect strip quality and flatness**
Uniform cooling pattern over entire strip width at fluctuating strip level	**Optimal thermal and grain structure homogeneity across the strip**
Tailored header design to match existing line design	**Optimal solution can be found for every condition**
Nozzles protected by nozzles cover plate (if space available)	**High operation safety and plant availability**

Stamm® shower headers with built-in cleaning device

Engineered and manufactured by Lechler Inc. in the USA under license by the STAMM® Company in Germany, these shower headers with built-in cleaning device are recognized worldwide as the original "brush and flush" shower system.

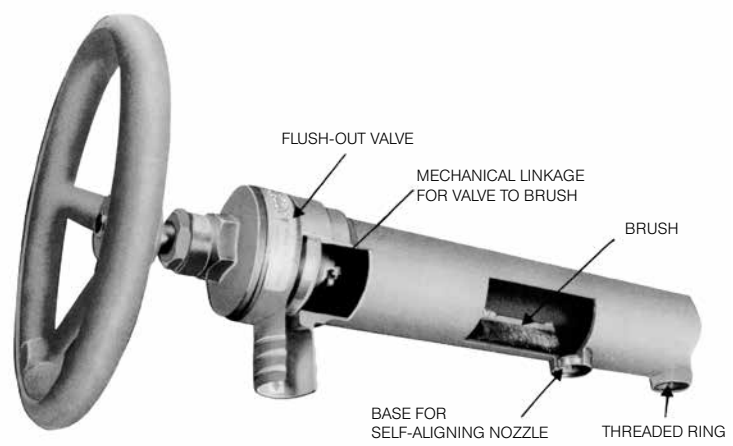
Shower pipe and nozzles remain clog-free due to the unique flush system design. A simple turn of the handwheel sweeps contaminants away from the nozzle orifices and directs the debris down the flush-out valve. Since these showers eliminate costly down time for cleaning, they are especially cost-effective in applications subject to high fluid contamination.

Some features of the self-cleaning shower system are:

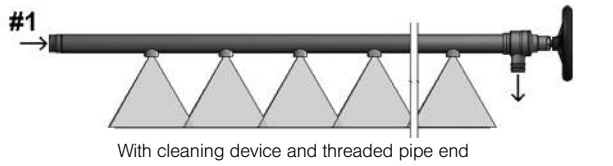
- Header pipe available in sizes from 1½" to 6" in diameter.
- Contaminants flushed via special valve, preventing them from clogging orifices or reaching showered surface.
- System accommodates wide range of flow rates.
- Stainless steel construction throughout.
- Highly efficient, interchangeable nozzles are self-aligning.
- Systems are tailored to your specific application.

Refer to the next page for a selection of nozzles specifically designed for use in STAMM® showers.

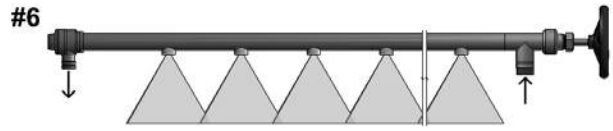
Applications:
Pickle line rinse, cleaning of wires and felts, humidification, knock-off, lubrication



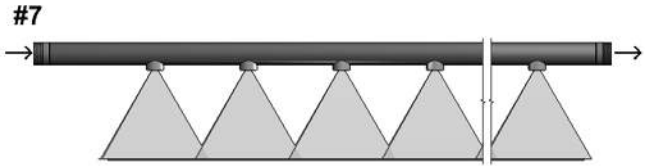
Standard shower models (Other configurations also available)



With cleaning device and threaded pipe end



With opposite cleaning device



With threaded pipe ends

Fabricated Headers — Our Specialty

In addition to single nozzles and accessories, Lechler can make fabricated headers in any size or shape for any application you may have in mind. With our knowledge of nozzles and applications, we can design and build a header specifically to perform the task you need for your process. Here are some examples of systems we have designed over the years:

STAMM® Headers (without a self-cleaning device)

Applications

- Pickle lines
- Cleaning
- Coating

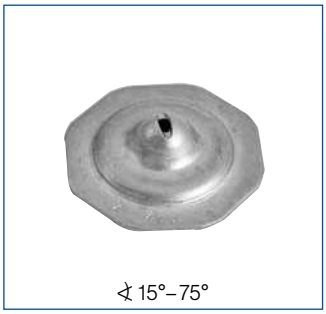
Features

- Rinse off chemicals after acid bath
- Renowned STAMM® quality
- Self-aligning nozzles
- Easy nozzle replacement

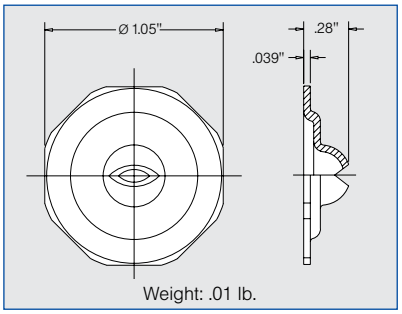
Nozzles
for STAMM® shower headers
Series 626 / 5SW

Designed specifically for STAMM® shower headers, these nozzles can serve as replacements or to change the flow rate of an existing unit. Self aligning when used with STAMM® or Lechler bases. 317 LN stainless steel construction for long service life. Available in 75°, 60°, 30°, and 15° flat fans or 0° solid stream ("needle jet") versions.

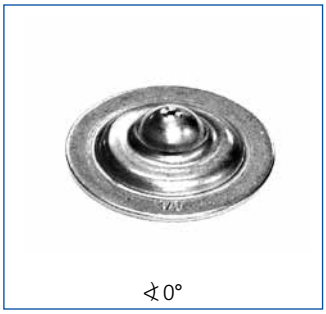
Applications:
For use on STAMM® showers, pickle line rinse, paper production, belt filter press cleaning in wastewater treatment



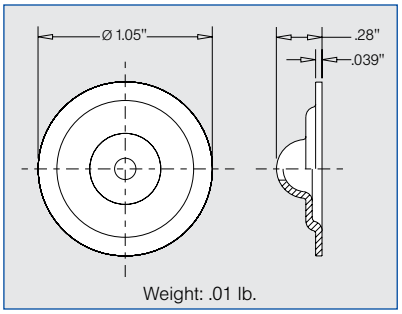
∢ 15°–75°



Weight: .01 lb.



∢ 0°



Weight: .01 lb.

Notes: Also available upon request are: (1) nozzles with other flow rates and (2) solid stream nozzles (0°) with a ruby tip orifice. The number in the Equiv. Orifice Diam. column represents the Nozzle # and spray angle stamped on each nozzle; e.g., the nozzle stamped 1.0 / 60 refers to 626.364.1F.37. Lechler has blank shower nozzles with no orifices which can be used on STAMM® showers when a particular nozzle opening needs to be blocked. The part number for this blank nozzle is **006.261.1F.00**.

Spray angle ∢	Ordering no.	Equiv. Orifice Diam. (mm)	Flow Rate (Gallons Per Minute) 40 psi	60 psi	100 psi	150 psi	250 psi	500 psi	1000 psi
75°	**626. 485. 1F. 37**	1.5	.50	.61	.79	.96	1.2	1.8	2.5
	626. 565. 1F. 37	2.0	.77	.95	1.2	1.5	1.9	2.7	3.9
	626. 645. 1F. 37	2.5	1.2	1.5	2.0	2.4	3.1	4.4	6.2
	626. 725. 1F. 37	3.0	2.0	2.4	3.1	3.8	4.9	6.9	9.8
60°	**626. 364. 1F. 37**	1.0	.20	.24	.31	.38	.49	.69	.98
	626. 404. 1F. 37	1.2	.31	.38	.49	.60	.77	1.1	1.6
	626. 464. 1F. 37	1.5	.50	.61	.79	.96	1.2	1.8	2.5
	626. 564. 1F. 37	2.0	.77	.95	1.2	1.5	1.9	2.7	3.9
	626. 644. 1F. 37	2.5	1.2	1.5	2.0	2.4	3.1	4.4	6.2
	626. 724. 1F. 37	3.0	2.0	2.4	3.1	3.8	4.9	6.9	9.8
	626. 804. 1F. 37	4.0	3.1	3.8	4.9	6.0	7.8	11.0	15.5
	626. 884. 1F. 37	5.0	4.9	6.0	7.8	9.6	12.3	17.4	25
	626. 964. 1F. 37	6.0	7.8	9.5	12.3	15.0	19.4	27	39
	627. 004. 1F. 37	7.0	9.8	12.0	15.5	18.9	24	35	49
	627. 044. 1F. 37	8.0	12.4	15.2	19.6	24	31	44	62
30°	**626. 362. 1F. 37**	1.0	.20	.24	.31	.38	.49	.69	.98
	626. 482. 1F. 37	1.5	.50	.61	.79	.96	1.2	1.8	2.5
	626. 562. 1F. 37	2.0	.77	.95	1.2	1.5	1.9	2.7	3.9
	626. 642. 1F. 37	2.5	1.2	1.5	2.0	2.4	3.1	4.4	6.2
	626. 722. 1F. 37	3.0	2.0	2.4	3.1	3.8	4.9	6.9	9.8
	626. 802. 1F. 37	4.0	3.1	3.8	4.9	6.0	7.8	11.0	15.5
	626. 882. 1F. 37	5.0	4.9	6.0	7.8	9.6	12.3	17.4	25
15°	**626. 361. 1F. 37**	1.0	.20	.24	.31	.38	.49	.69	.98
	626. 561. 1F. 37	2.0	.77	.95	1.2	1.5	1.9	2.7	3.9
	626. 721. 1F. 37	3.0	2.0	2.4	3.1	3.8	4.9	6.9	9.8
0°	**5SW. 300. 1F. 00**	0.7	.09	.11	.14	.17	.22	.31	.44
	5SW. 320. 1F. 00	0.8	.13	.15	.20	.24	.32	.45	.63
	5SW. 340. 1F. 00	0.9	.15	.19	.25	.30	.39	.55	.77
	5SW. 360. 1F. 00	1.0	.20	.24	.31	.38	.49	.69	.98
	5SW. 390. 1F. 00	1.2	.31	.38	.49	.60	.77	1.1	1.6
	5SW. 460. 1F. 00	1.5	.50	.61	.79	.96	1.2	1.8	2.5
	5SW. 540. 1F. 00	2.0	.77	.95	1.2	1.5	1.9	2.7	3.9
	5SW. 620. 1F. 00	2.5	1.2	1.5	2.0	2.4	3.1	4.4	6.2
	5SW. 680. 1F. 00	3.0	2.0	2.4	3.1	3.8	4.9	6.9	9.8
	5SW. 780. 1F. 00	4.0	3.1	3.8	4.9	6.0	7.8	11.0	15.5
	5SW. 860. 1F. 00	5.0	4.9	6.0	7.8	9.6	12.3	17.4	25

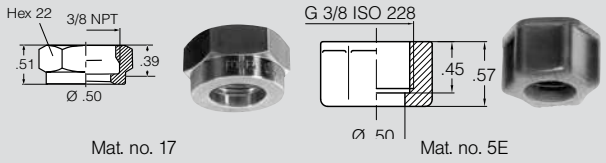
Conversion formula for the above series: $V_2 = V_1 \sqrt{\frac{P_2}{P_1}}$

Accessories

Welding Nipples and Retaining Nuts

For series 652

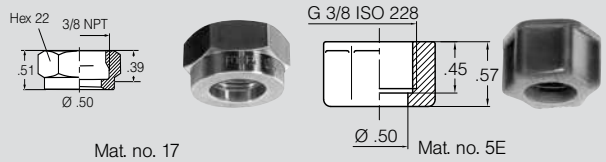
Nipples see page 45



Mat. no. 17 Mat. no. 5E

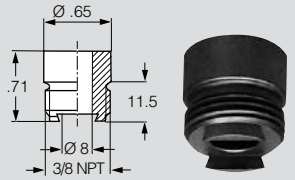
Retaining nut:
065.200.17[1] (AISI 316Ti/AISI 316L)
065.200.5E (PVDF)

For series 660 and 686.XXX.WW.08



Mat. no. 17 Mat. no. 5E

Retaining nut:
065.200.17[1] (AISI 316Ti/AISI 316L)
065.200.5E (PVDF)

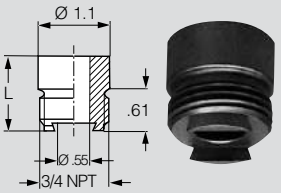


Welding nipple:
066.011.17[1] (AISI 316Ti/AISI 316L)
066.011.5E (PVDF)
066.011.53 (PP)
Other nippel lengths on request.

For series 664/665 and 686.XXX.WW.15

Mat. no. 17 Mat. no. 5E

Retaining nut:
065.600.17[1] (AISI 316Ti/AISI 316L)
065.600.5E (PVDF)

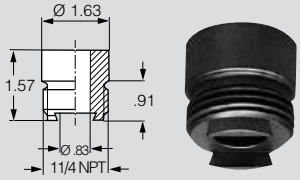


Welding nipple:
066.410.17[1]
(AISI 316Ti/AISI 316L): L= 27 mm
066.410.5E
(PVDF): L= 27 mm
066.411.17[1]
(AISI 316Ti/AISI 316L): L= 60 mm
066.411.17[1]**.04**
(AISI 316Ti/AISI 316L): L= 110 mm
Other nippel lengths on request.

For series 669

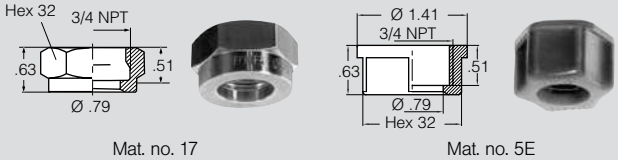
Mat. no. 17 Mat. no. 5E

Retaining nut:
066.900.17[1] (AISI 316Ti/AISI 316L)
066.900.5E (PVDF)



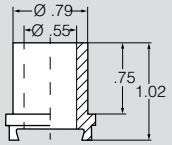
Welding nipple:
066.910.17 (AISI 316Ti/AISI 316L)
066.910.5E (PVDF)
Other nipple lengths on request.

For series 686.XXX.WW.09



Mat. no. 17 Mat. no. 5E

Retaining nut: **065.600.17**[1] (AISI 316Ti/AISI 316L)
065.600.5E (PVDF)



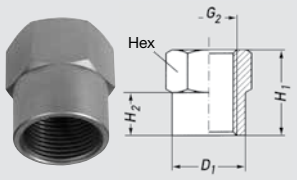
Welding nipple:
600.277.17[1]**.01**
(AISI 316Ti/AISI 316L)
Other nipple lengths on request.

[1] We reserve the right to deliver AISI 316Ti or AISI 316L under the material no. 17.

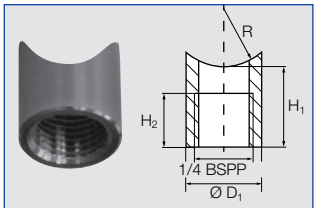
Accessories

Sockets / Nipples

For nozzles with male thread



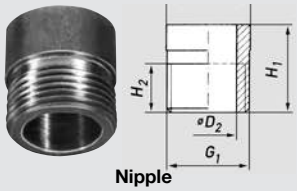
Sockets



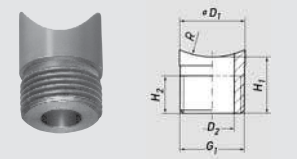
Sockets with radius
(R = 10/13 /16/20/25 or 31 mm)

For Series	Type	Ordering no. Material no. 1Y AISI 316L	17[1] AISI 316Ti/ AISI 316L	5E PVDF	53 Polypropylene	G_1	G_2	H_1	H_2	D_1	D_2	Hex
For all nozzles with 1/8" male thread.	**040. 270**	○	-	○	-	-	1/8 NPT	.79	.39	.54	-	.55
For all nozzles with 1/4" male thread.	**061. 220**	○	-	○	-	-	1/4 NPT	.79	.39	.66	-	.67
For all nozzles with 3/8" male thread.	**040. 271**	-	○	-	-	-	3/8 NPT	.79	.39	.85	-	.87
	040. 271	-	-	○	○		3/8 NPT	.79	.39	.96	-	.87
For all nozzles with 1/4" male thread.	**040. 228. xx. yy***	○	-	-	-	-	1/8 NPT	.79	.39	.54	-	.55

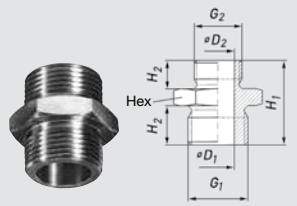
For series 652



Nipple
Other nipple lengths on request.



Nipple with radius
(R = 10/13 /16/20/25 or 31 mm)



Double nipples

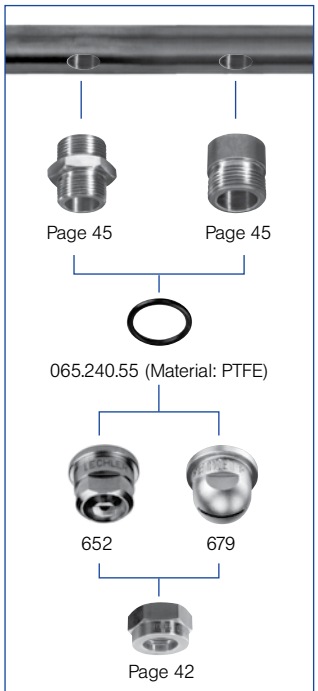
652	**065. 210**	○	○	○	○	3/8 NPT	-	.71	.39	.68	.45	-
652	**065. 217. xx. yy***	-	○	-	-	3/8 NPT	-	.71	.39	.68	.45	-
652	**065 .215**	-	○	○	-	3/8 NPT	1/4 NPT	.98	.39	.39	.28	.87
	065. 211	-	○	○	-	3/8 NPT	3/8 NPT	.98	.39	.45	-	.87

* Replace **xx** by material no. and **yy** by radius R

[1] We reserve the right to deliver AISI 316Ti or AISI 316L under the material no. 17.

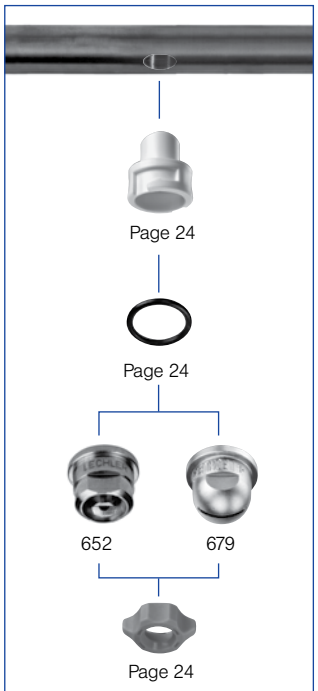
IN THIS WAY YOU CAN MATCH NOZZLE ASSEMBLING TO YOUR VERY SPECIAL REQUIREMENTS.

Assembling accessories for nozzles series 652 and 679



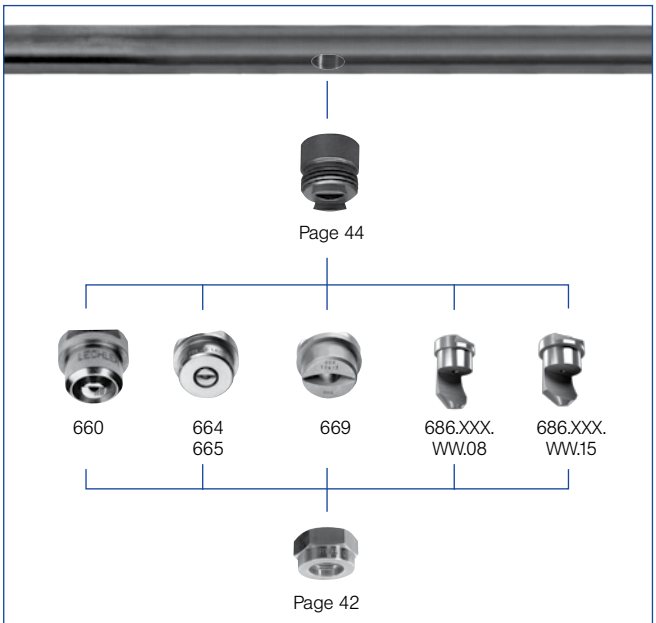
Assembling accessories for nozzles without thread. Standard accessories.

Assembling accessories for nozzles series 652 and 679 with quick-release system



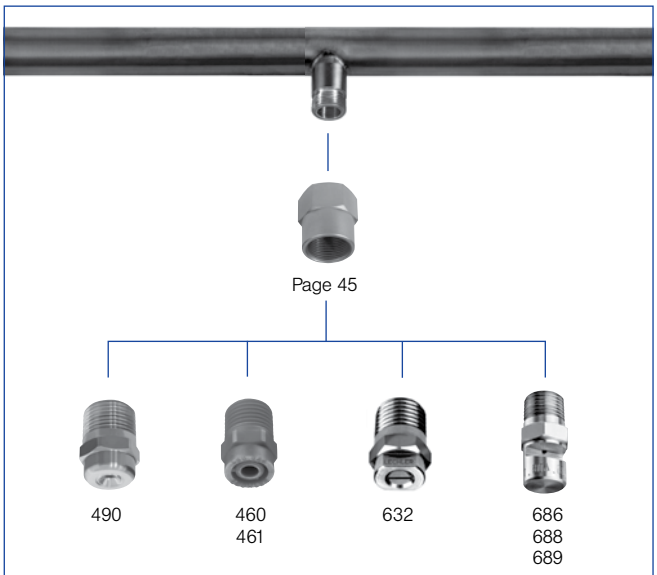
Assembling accessories for nozzles without thread. Standard accessories.

Assembling accessories for nozzles series 660, 664/665, 669, 686.XXX.WW.08 and 686.XXX.WW.15



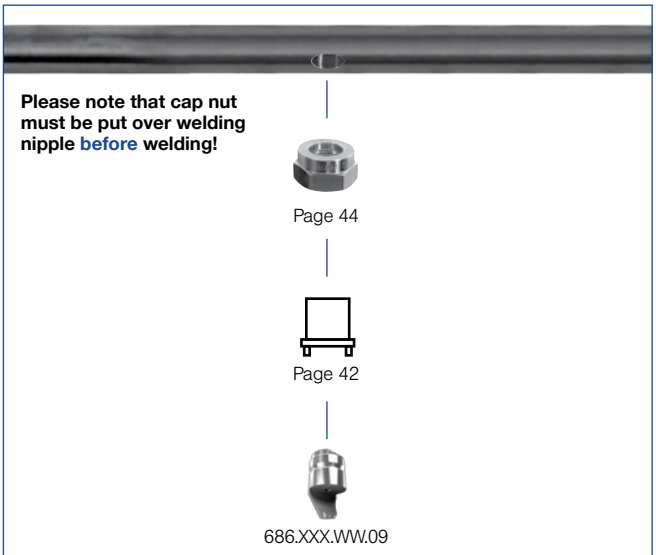
Assembling accessories for nozzles with dove-tail design.

Assembling accessories for nozzles with male thread series 460/461, 490 and 686/688/689



Assembling accessories for nozzles with male thread. Standard accessories.

Please note that cap nut must be put over welding nipple before welding!



Assembling accessories for series 686.XXX.WW.09 with captive cap nut.

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