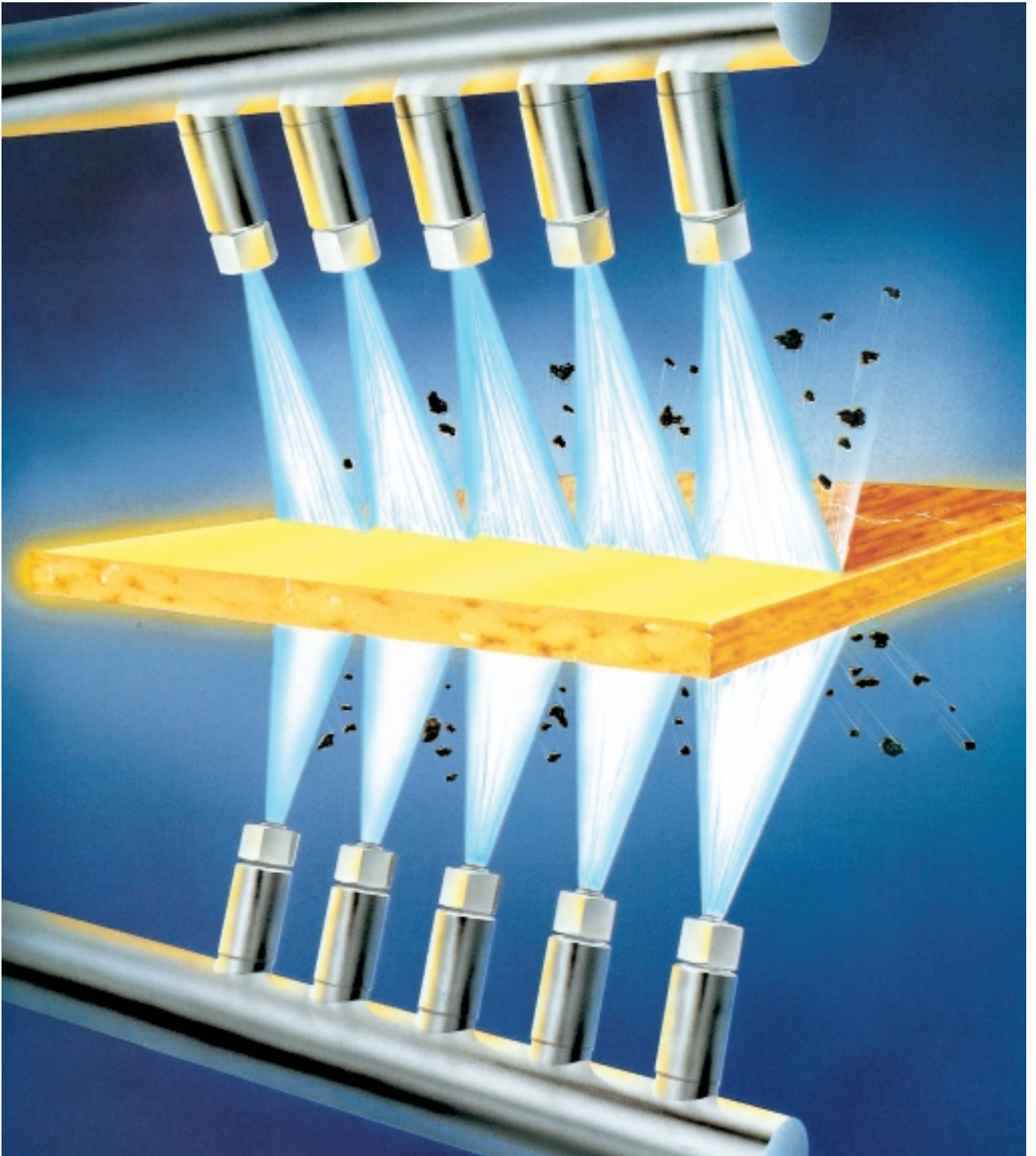




**SCALEMASTER® –
the Standard in
Descaling Technology**



Optimal Descaling for Higher Product Quality and Low Maintenance Costs

Primary and secondary scale ruin considerably the surface quality of ingots, slabs, blooms, plate bars, sheet metals, strips, profiles and pipes. Not only is the rolling stock surface affected but scale also causes high wear to the rolls. To fight scale effectively, Lechler has developed the SCALEMASTER® nozzle. It focuses water to a razor sharp, extremely high jet impact stream which guarantees optimal descaling.

And optimal descaling provides:

- perfect surface quality
- high product quality
- low maintenance costs
- low roll wear

For many years Lechler has been a leader in the design and development of descaling nozzles. By working closely with renowned rolling mills Lechler has consistently achieved many improvements to descaling, always tailored to the exact needs of the users.

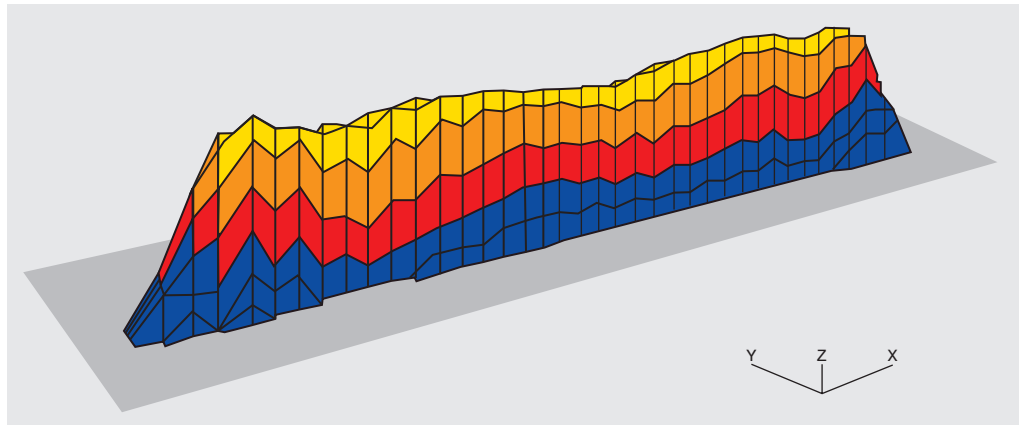
May we help you?
Our technical services group is committed to providing not only the best products but also the finest service to you.



Improved Measurement Techniques – the Basis of Optimal Nozzle Design

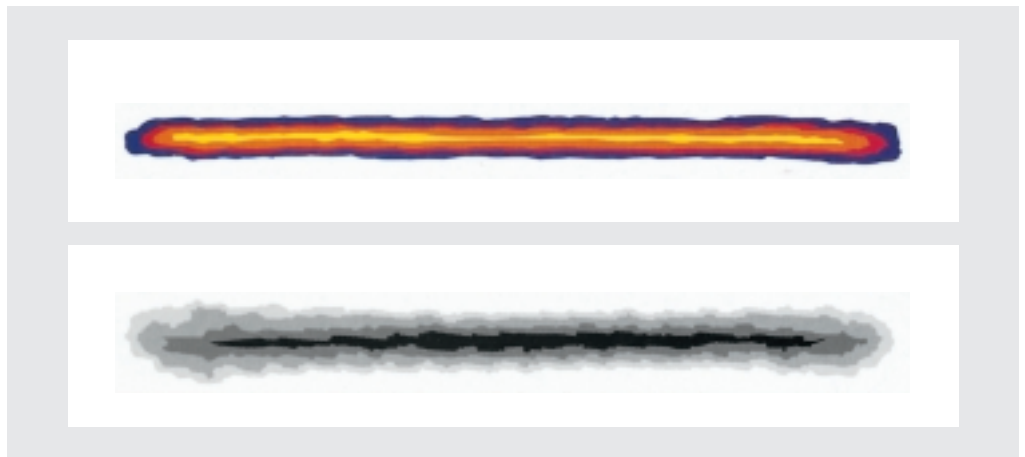
Our extensive, partly self developed measuring instruments have contributed to accurate and precise information to aid the development and design of Lechler nozzles. Using these techniques, reliable data on volume, pressure, impact force and droplet size can be acquired in the design phase of nozzles. This data is used directly in the development process to optimize product design and manufacture.

An important factor in the design and evaluation of descaling nozzles is impact and distribution. For the first time, our computer aided measuring instrument can represent this in three dimensions. More exact than the traditional two-dimensional representation, the 3D-diagram shows clearly the exact quantity and quality of impact across the entire impact area.



Three-dimensional representation of jet impact distribution

product no.:	694.XXX.27	spray width:	114.0 mm
pressure:	240.0 bar	total force:	253.0 N
flow rate:	69.0 l/min	average impact lav:	0.532 N/mm ²
height:	150 mm	average depth:	5.9 mm
medium:	water		



Comparison of impact areas



Spray impact measurement device



Spray pattern of a SCALEMASTER® nozzle

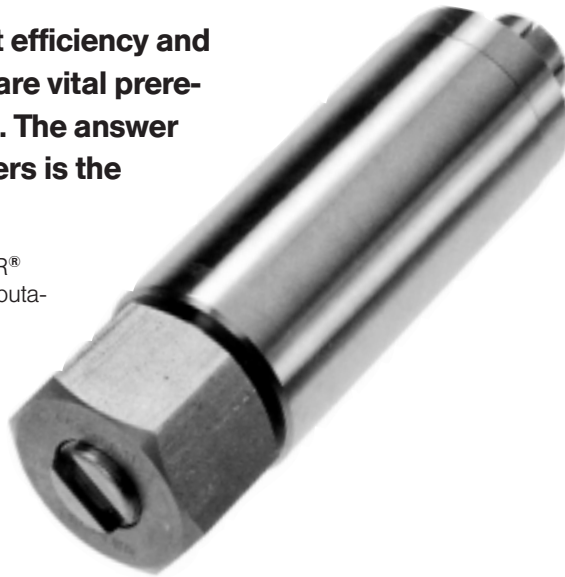


Computer controlled data preparation

SCALEMASTER® – the Economic Descaling Nozzle

Improved product quality, plant efficiency and reduction of energy and water are vital prerequisites of modern rolling mills. The answer to those needs for your descalers is the SCALEMASTER®.

With the development of the SCALEMASTER® Lechler once again lives up its innovative reputation in descaling and provides a major advancement in gaining worldclass surface finish. The SCALEMASTER® combines the advantages of many nozzle designs in a single package. It is based on the experience gained over a hundred years of nozzle design, combined with the latest research in nozzle technology.



Better Surface Quality

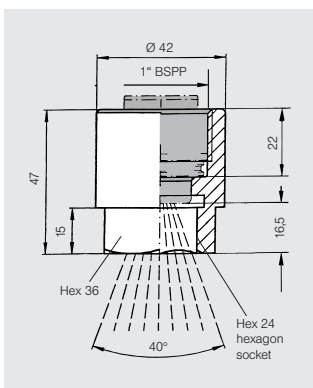
The razor sharp SCALEMASTER® slices through primary and secondary scale faster and more thoroughly than ever. The high impact jet is uniformly distributed eliminating surface streaks. This results in an absolutely clean, smooth surface over the entire width of the strip.

Lower Energy and Water Consumption

Compared to traditional nozzles, the SCALEMASTER® uses up to 30% less water and can operate at lower pressures. Consequently, the required pump capacity is considerably reduced. This translates into both lower operating costs for energy and lower capital outlays for pumps. Furthermore, with the built-in filter available on the SCALEMASTER®, you may save preliminary filtering costs.

Long Life and Easy Handling

The SCALEMASTER® is built to stand up the harshest mill conditions. The tungsten carbide tip can withstand the highest pressures, poor water quality and abrasive particles. When a nozzle must be changed, the SCALEMASTER® is designed to make it both fast and foolproof. The tip, stabilizer and filter can be preassembled and then assembled to the header as one unit. By assembling this single unit rather than separate parts, the installation can be performed with one hand and helps maintenance personnel install the nozzles quickly in the most difficult locations. The self alignment feature of the nozzle ensures that the cap can be tightened only when alignment is achieved.



Special version of nut, with hexagon socket

Nozzle Arrangement on a Descaling Header

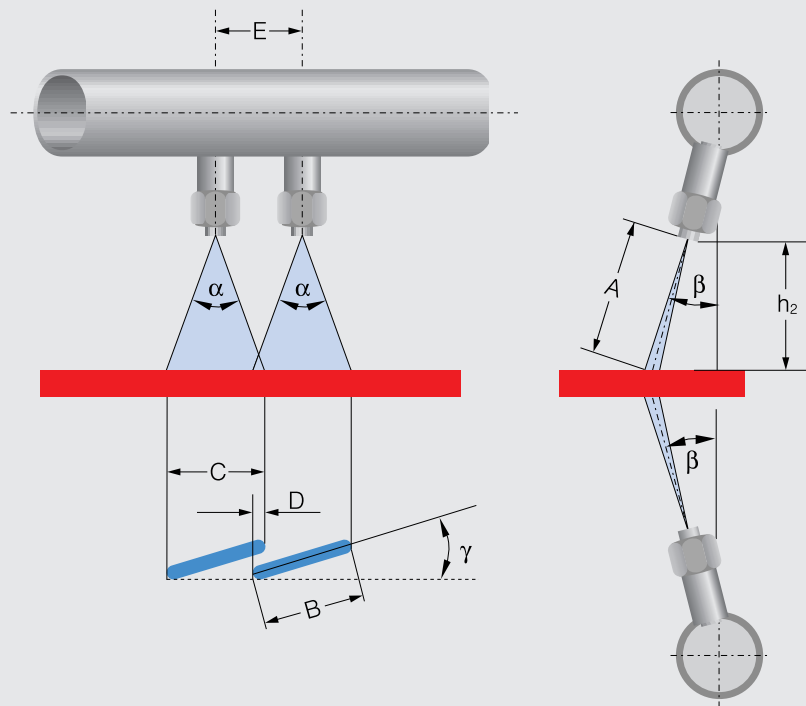
Positioning of nozzles on a spray header

$$E = C - D$$

$$C = \cos \gamma \cdot B$$

$$\beta = 5^\circ, 10^\circ \text{ or } 15^\circ$$

- A = spray length
- B = spray width
- C = spray width in rolling direction
- D = over lap
- E = nozzle distance
- h_2 = vertical spray height
- α = nozzle spray angle
- β = angle of inclination
- γ = offset angle of nozzle against pipe roll axis



Jet length (A), Jet width (B, C), overlapping (D), nozzle distance (E) and vertical spray height (h_2), angle of inclination $\beta = 15^\circ$, offset angle $\gamma = 15^\circ$ and nozzle spray angle (α).

Vertical spray height h_2 [mm]	angle of inclination $\beta = 15^\circ$ A [mm]	Nominal nozzle spray angle α at p = 150 bar															
		$\alpha = 22^\circ$				$\alpha = 26^\circ$				$\alpha = 30^\circ$				$\alpha = 40^\circ$			
		B	C	D	E	B	C	D	E	B	C	D	E	B	C	D	E
100	104	52	49,8	5	44,8 ¹⁾	60	57,7	5	44,9 ¹⁾	69	66,3	5	61,3 ²⁾	90	87,2	5	82,2
150	155	73	70,3	5	65,3	81	78,3	5	73,3	94	90,9	5	85,9	126	121,2	8	113,2
175	181	83	80,1	5	75,1	91	87,6	5	82,6	106	102,2	5	97,2	142	137,1	8	129,1
200	207	93	89,7	5	84,7	100	96,6	5	91,6	117	113,0	5	108,0	158	152,4	10	142,4
225	233	103	99,2	5	94,2	109	105,5	5	100,5	128	123,5	5	118,5	174	167,5	10	157,5
250	255,9	113	108,6	8	100,6	119	114,3	8	109,3	139	134,0	8	126,0	189	182,4	12	170,4
270	280	120	116,1	8	108,1	126	121,5	8	113,5	148	124,4	8	134,4	202	194,4	12	182,4
300	311	132	127,4	8	119,4	137	132,5	8	124,5	161	155,2	8	147,2	221	212,5	15	197,5

Explanation of the table:

1. Spray width:

The listed values are based on p = 150 bar spray pressure. The convergence of the jets is considered in the values of the table. Spray width data for other spray pressures is available on request.

2. Tolerances of the spray angles:

+ 3° at $\alpha = 22^\circ, 26^\circ$ and 30° ,
+ 5° at $\alpha = 40^\circ$.
Therefore, B + C are minimum values.

¹⁾ Only MiniSCALEMASTER ²⁾ Standard SCALEMASTER only with hexagon socket nut

Nozzle Position Nozzle Assembly

Nozzle Position Options

1. All nozzles offset in one direction. (see fig. 1)
2. All nozzles offset toward the nearest outside edge – sprays directed away from the center of the strip.

This results in better drainage and it is easier to guide the strip. (see fig. 2)

Nozzle Arrangements

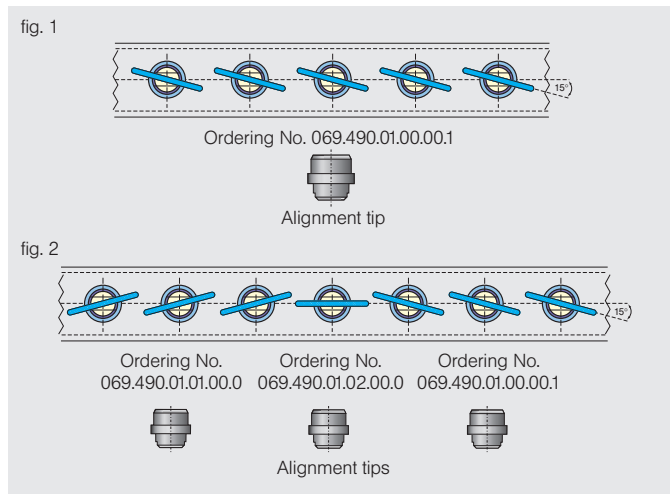
To guarantee the correct alignment of the nozzle tip (15 degree offset - see fig. 1,2), the weld base must be positioned on the spray header such that the flats on the tip are parallel to the header longitudinal axis. We recommend you do this with our alignment tip (fig. 1,2,4). It ensures proper positioning of the base during welding. Referring to fig. 3 below, alignment tips are inserted into the base. Then a strip edge is used to easily position and weld each base.

One-handed Nozzle Assembly

Descaling headers are often located in areas where it is difficult to reach every nozzle. This is particularly true of nozzles located underneath the rolls where you can often reach the nozzle with one hand only.

The SCALEMASTER® nozzle has been designed to ensure easy assembly in those locations by doing most of the assembly prior to installation. The tip, stabilizer and strainer are assembled as one unit. This assembly unit is then inserted into the base and rotated until the flats are aligned allowing further insertion and cap thread engagement.

Thread engagement cannot take place until alignment is accomplished. The cap should not be tightened to more than 250 Nm (185 ft. lbs.) of torque in order to prevent damage to the tip.



“Automatic” Adjustment of the Nozzle Tip

The required 15 degree offset is integrated into every nozzle tip.

Consequently, assembling the nozzle tip incorrectly is absolutely impossible. When changing tips, you can be assured that once the cap is tightened down, the nozzle is in the precise position required for it to perform correctly.

Equipment

The alignment tip (fig. 1,2,4) can also be used as “blind” tip for blanking off specific nozzle positions or for pressure testing the entire spray header.

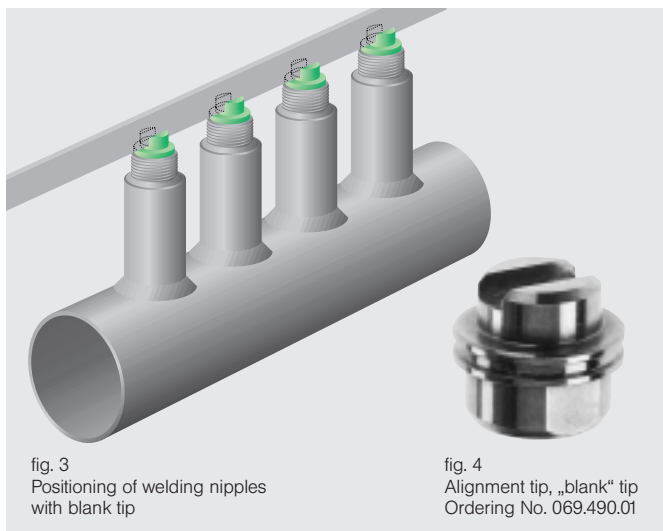
General Information

Flow Requirements

The flow velocity should not exceed 15 ft./sec. in the water mains and 3 ft./sec. in the descaling headers.

Nozzle Control

Nozzles are subject to wear. The condition of the water and the environment can both affect nozzle life. Therefore, a regular nozzle inspection program should be established to ensure proper performance of the nozzle at all times. The intervals for such a program must be established at each installation. Factors such as solid contents in the water can cause wide variations in nozzle wear rates.



Technical Data

Volume Flow Table

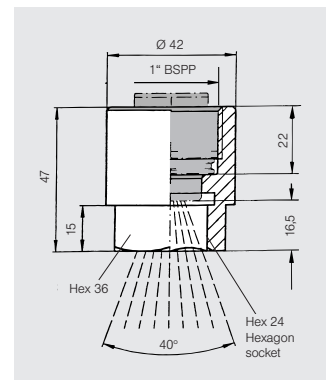
Order Details

Ordering No.							Flow rate for water (V̇)					
Type					Mat.-No.		p = 100 bar (1450 psi)		p = 200 bar (2900 psi)		p = 400 bar (5800 psi)	
Series	Code				Tungsten carbide 27	Stainless steel hardened 11	[l/min]	[US Gall./min]	[l/min]	[US Gall./min]	[l/min]	[US Gall./min]
	Spray angle											
	22°	26°	30°	40°								
694	495	496	497	498	○	–	12,00	3,17	16,97	4,50	24,00	6,34
694	535	536	537	538	○	○	15,00	3,96	21,21	5,60	30,00	7,92
694	565	566	567	568	○	○	18,00	4,76	25,46	6,73	36,00	9,52
694	605	606	607	608	○	○	23,00	6,08	35,53	9,39	46,00	12,16
694	645	646	647	648	○	○	28,00	7,40	39,60	10,46	56,00	14,80
694	685	686	687	688	○	○	36,00	9,51	50,91	13,45	72,00	19,02
694	725	726	727	728	○	○	45,00	11,89	63,64	16,81	90,00	23,78
694	765	766	767	768	○	○	58,00	15,32	82,02	21,67	116,00	30,64
694	805	806	807	808	○	○	72,00	19,02	101,82	26,90	144,00	38,04
694	845	846	847	848	○	○	89,00	23,51	125,87	33,25	178,00	47,02
694	885	886	887	888	○	○	112,00	29,59	158,39	41,85	224,00	59,18
694	-	906	907	908	○	○	125,00	33,03	176,78	46,70	250,00	66,06
694	-	916	917	918	○	○	134,00	35,40	189,50	50,07	268,00	70,80

Volume rate conversion formula:

$$\dot{V}_2 = \sqrt{\frac{p_2}{p_1}} * \dot{V}_1 \text{ [l/min]}$$

$$p_2 = \left(\frac{\dot{V}_2}{\dot{V}_1}\right)^2 * p_1 \text{ [bar]}$$



Special nut with hexagon socket.
For very short spray heights.
Ord.-No.: 069.402.11

Example Series + Code + Mat.-No. = Ordering No.
for Ordering: 694 + 495 + 27 = 694.495.27

Dimensions

Type (Spray angle 22°)	E ø [mm]	A ø [mm]	Type (Spray angle 26°)	E ø [mm]	A ø [mm]	Type (Spray angle 30°)	E ø [mm]	A ø [mm]	Type (Spray angle 40°)	E ø [mm]	A ø [mm]
694.495	1,20	1,50	694.496	1,17	1,50	694.497	1,16	1,50	694.498	1,11	1,50
694.535	1,40	1,75	694.536	1,30	1,75	694.537	1,30	1,75	694.538	1,20	1,75
694.565	1,60	2,00	694.566	1,50	2,00	694.567	1,40	2,00	694.568	1,20	2,00
694.605	1,80	2,10	694.606	1,70	2,10	694.607	1,60	2,10	694.608	1,50	2,10
694.645	2,00	2,50	694.646	1,90	2,50	694.647	1,80	2,50	694.648	1,60	2,50
694.685	2,20	2,80	694.686	2,20	2,80	694.687	2,10	2,80	694.688	2,00	2,80
694.725	2,50	3,00	694.726	2,40	3,00	694.727	2,30	3,00	694.782	1,90	3,00
694.765	2,80	3,50	694.766	2,50	3,50	694.767	2,40	3,50	694.768	2,30	3,50
694.805	3,20	3,80	694.806	3,00	3,80	694.807	2,90	3,80	694.808	2,70	3,80
694.845	3,50	4,30	694.846	3,50	4,30	694.847	3,20	4,30	694.848	3,00	4,30
694.885	3,90	4,70	694.886	3,90	4,70	694.887	3,70	4,70	694.888	3,40	4,70
			694.906	4,00	5,00	694.907	3,90	5,00	694.908	3,70	5,00
			694.916	4,20	5,20	694.917	4,00	5,20	694.918	3,80	5,20

A = equivalent bore diameter · E = narrowest cross section

Technical Data

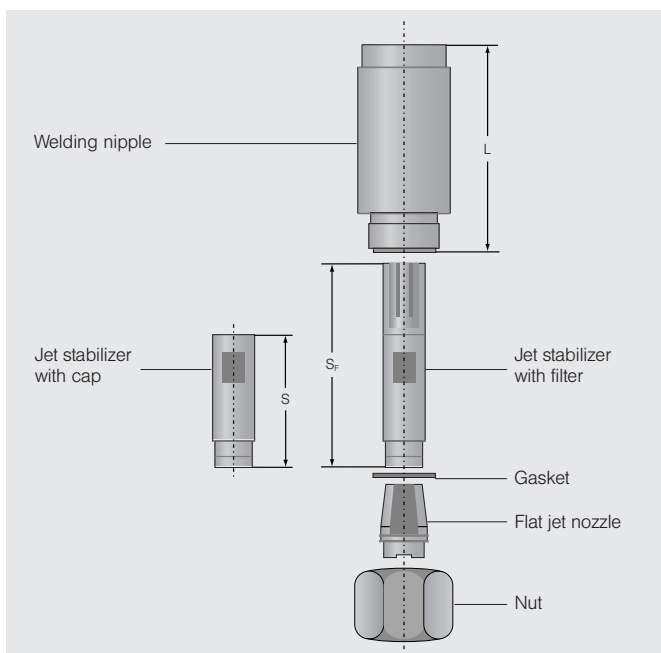
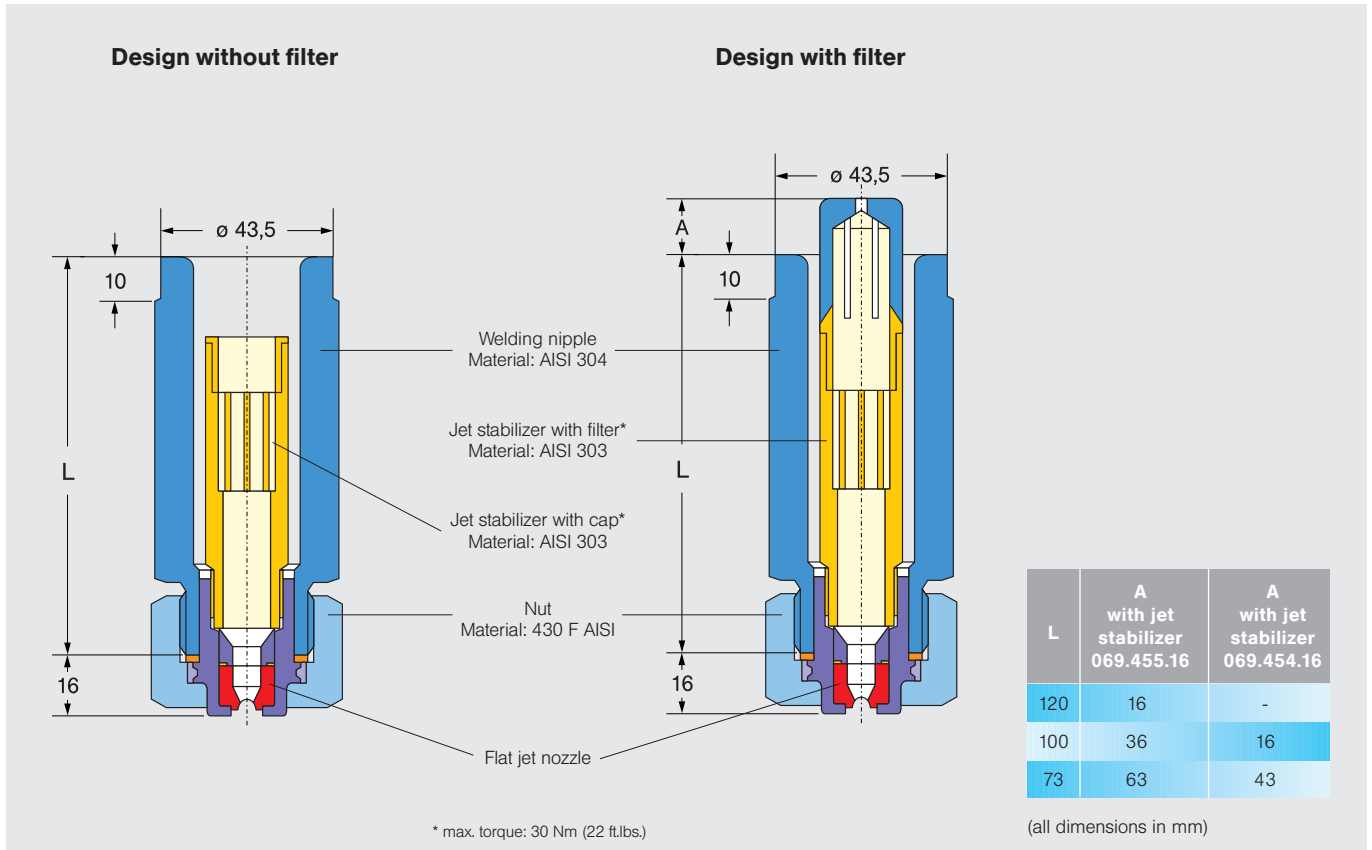
Individual Components

Ordering Numbers



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

E-mail: info@lechler.de
 Internet: www.lechler.de



Component	Model	Order No.	Weight (kg)	
Welding Nipple Material: AISI 304	Length L = 120 mm	069.411.1C.00	0,83	
	L = 100 mm	069.410.1C.00	0,69	
	L = 73 mm	069.410.1C.73	0,48	
Jet Stabilizer Material AISI 303	without filter, with cap S = 74 mm	069.431.16	0,11	
	with filter	S _F = 130 mm	069.455.16	0,22
		S _F = 110 mm	069.454.16	0,19
Gasket Material: Copper		095.015.34.04.02.0	0,004	
Nozzle		694.XXX.XX see table page 7	0,085	
Nut (Hex 41) Material 430 F AISI		069.400.11	0,153	
Alignment Tip Blank Tip Material: Mild Steel		069.490.01	0,072	
Disassembly Tool Material: Mild Steel	Data sheet on request	069.491.01	0,14	
Tip Extractor	Data sheet on request	095.009.00.12.56.0	0,95	