

ENGINEERING
YOUR SPRAY SOLUTION



SCALEMASTER® – the Standard in Descaling Technology



SCALEMASTER®



HENNLICH -
ŽIJEME TECHNIKOU

o.z. HYDRO-TECH HENNLICH s.r.o.
Českolipská 9, 412 01 Litoměřice

Telefon: +420 416 711 222
E-mail: hydro-tech@hennlich.cz

www.hennlich.cz/hydro-tech

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.

Give scale a hard time – with the SCALEMASTER® descaling nozzles from Lechler. They don't give scale any chance at all by delivering razor-sharp, powerful and uniform jets. The water is focused to create extremely high jet pressure, thereby guaranteeing optimum descaling results.

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.



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NOZZLE DATA

When a descaling system is being designed the following nozzle performance parameters must be known:

- The water flow rate at a given pressure
- The spray width at a given vertical spray height (this defines the spray angle)
- The spray impact and its distribution across the spray width

The impact (also called impact pressure) is the momentum or force distribution over the spray foot print area.

Therefore the impact can be defined as $I = F/A$

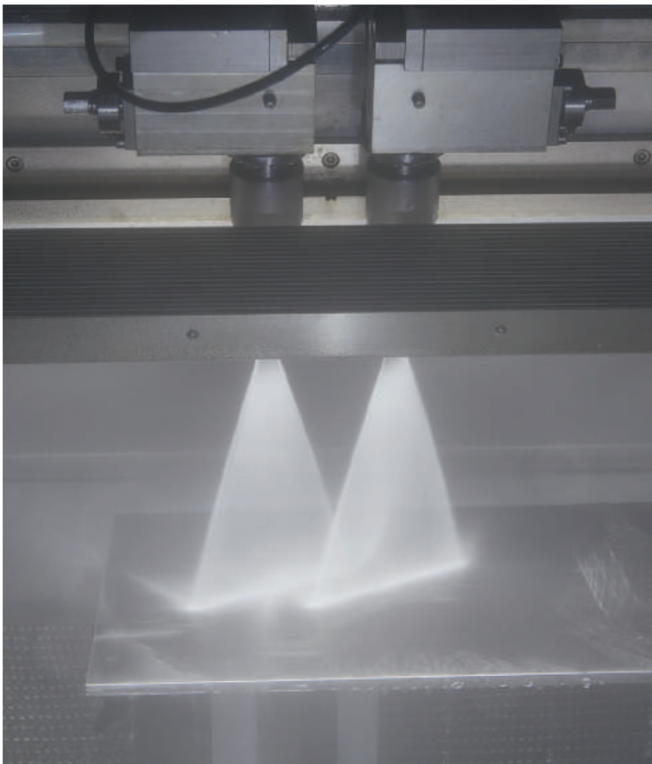
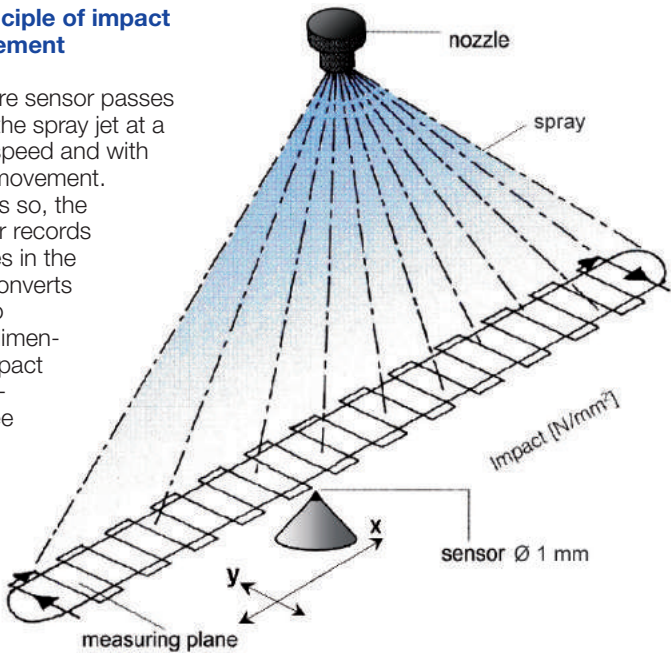
I = Impact [N/mm²]
 F = Force [N]
 A = Area [mm²]

When modern descaling nozzles such as the Lechler SCALEMASTER® and lower spray heights are being combined, spray foot print thicknesses of only 3 mm become a challenge for the impact measurement facilities. Spray overlaps below 10 mm also require a much higher precision of the spray width data.

Only the new Lechler 3D impact measurement technology utilizing a sensor with only 1.0 mm diameter provides the resolution required for the design of an optimal nozzle arrangement. The impact distribution is measured and documented 3-dimensionally throughout the entire spray in one sensor scan.

The principle of impact measurement

A pressure sensor passes through the spray jet at a defined speed and with defined movement. As it does so, the computer records the pulses in the jet and converts them into a three-dimensional impact representation (see below).



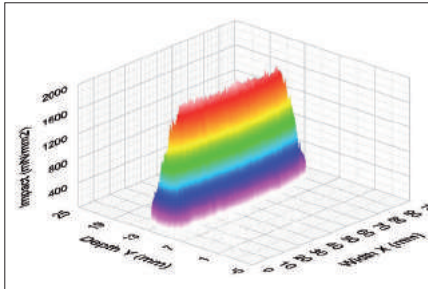
Impact measurement with twin nozzle arrangement

Lechler high pressure spray lab

Impact measurements under real installation conditions in terms of nozzle inclination and offset angles can now be performed with the new Lechler high pressure spray lab. Additionally the well proven sensor technology (1 mm diameter) has been integrated into a plate, allowing the measurement of two adjacent sprays. With such a descaling nozzle arrangement Lechler can now investigate the effect on various spray overlap situations in order to fight surface striping especially on rolled plates. Impact measurements up to 500 bars water pressure can be performed.



Lechler high pressure spray lab



3D measurement protocol, impact measurement

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.



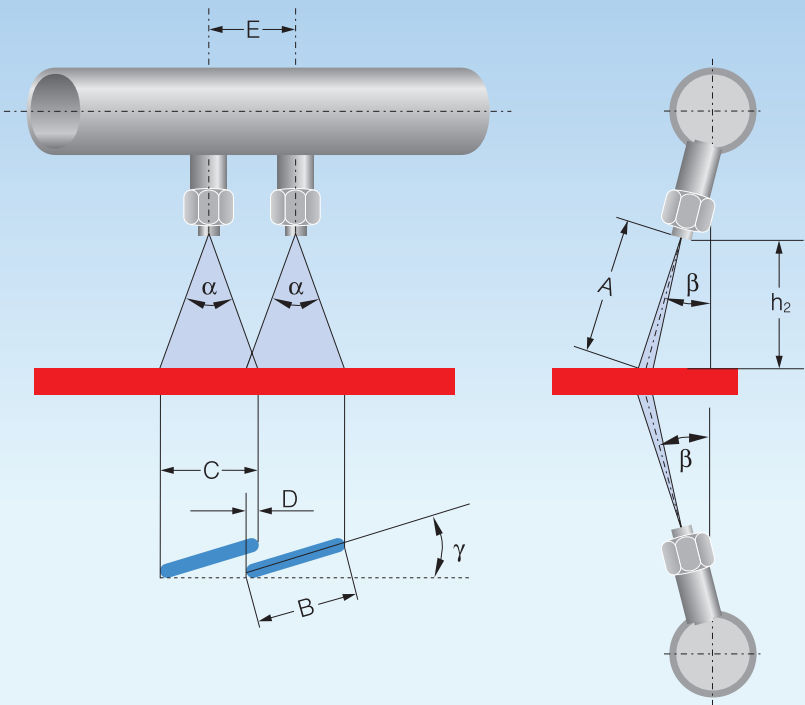
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NOZZLE ARRANGEMENT ON THE SPRAY HEADER

The following apply to the arrangement on the 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 = Overlap
- E = Nozzle distance
- h_2 = Vertical spray height
- α = Nozzle spray angle
- β = Angle of inclination
- γ = Offset angle of the nozzle against pipe roll axis



Spray length (A), Spray width (B, C), Overlap (D), Nozzle distance (E) at vertical spray height (h_2), Nozzle spray angle (α) and Angle of inclination (β)

Vertical spraying height h_2 [mm]	Angle of inclination $\beta = 15^\circ$ A [mm]	Nominal nozzle spray angle α at p = 150 bar																			
		$\alpha = 22^\circ$				$\alpha = 26^\circ$				$\alpha = 30^\circ$				$\alpha = 34^\circ$				$\alpha = 40^\circ$			
		B [mm]	C [mm]	D [mm]	E [mm]	B [mm]	C [mm]	D [mm]	E [mm]	B [mm]	C [mm]	D [mm]	E [mm]	B [mm]	C [mm]	D [mm]	E [mm]	B [mm]	C [mm]	D [mm]	E [mm]
50	52	26	25	-	-	30	29	-	-	35	34	-	-	39	38	-	-	47	45	5	40 ¹⁾
75	78	36	35	-	-	43	42	5	37 ¹⁾	49	47	5	42 ¹⁾	55	53	6	47 ²⁾	67	65	7	58 ²⁾
100	104	47	45	7	38 ¹⁾	56	54	5	49 ²⁾	64	62	5	57 ³⁾	71	69	7	62 ³⁾	88	85	8	77
125	129	57	55	7	48 ²⁾	68	66	7	59 ³⁾	78	75	7	68	87	84	9	75	108	104	10	94
150	155	68	66	8	58 ³⁾	81	78	7	71	93	90	8	82	103	99	9	90	128	124	10	114
200	207	89	86	9	77	106	102	10	92	122	118	10	108	134	129	13	116	168	162	15	147
250	259	111	107	11	96	132	128	10	118	151	146	15	131	166	160	15	145	209	202	15	187

¹⁾ only **MiniSCALEMASTER®** with hexagon socket nut

²⁾ only **MiniSCALEMASTER®**

³⁾ only with hexagon socket nut

DESCALING PRESSURE GAUGE



Hand held pressure reading



Installation example: pressure sensor with spray protection mounted on spray header

Hand held pressure reading

With the new Lechler descaling pressure gauge the water pressure can be measured directly at the spray header in front of a descaling nozzle by simply taking one nozzle out and putting the pressure sensor instead.

For detailed information please ask for the special product data sheet.

- Simple and user-friendly key operation
- 2 sensor inputs, automatic sensor recognition

Sensor details

- Measuring range: 0...600 bar
- Burst pressure: 2,000 bar
- Accuracy of sensor: $\pm 0.25\%$ of full scale (± 1.5 bar)
- Protection class: IP67

Complete Descaling Pressure Gauge

(Ordering No 06P.M00.00.00.00.0)
Sensor adaptors for 644 (MiniSCALEMASTER®) and 694 (SCALEMASTER®) nozzle tips included.



NOZZLE DATA

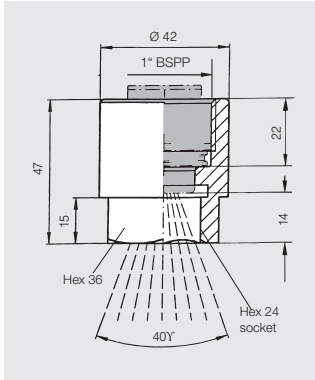
CORRECT NOZZLE ARRANGEMENT

Order No. for nozzle tip							A ø [mm]	Water flow rate (V)					
Type						Material code		p = 100 bar (1450 psi)		p = 200 bar (2900 psi)		p = 400 bar (5800 psi)	
Series	Code												
	Nominal spray angle							[l/min]	[US Gall./min]	[l/min]	[US Gall./min]	[l/min]	[US Gall./min]
22°	26°	30°	34°	40°									
694	495	496	497	491	498	27	1.50	12.00	3.17	16.97	4.50	24.00	6.34
694	535	536	537	531	538	27	1.75	15.00	3.96	21.21	5.60	30.00	7.92
694	565	566	567	561	568	27	2.00	18.00	4.76	25.46	6.73	36.00	9.52
694	605	606	607	601	608	27	2.10	23.00	6.08	32.53	8.59	46.00	12.16
694	645	646	647	641	648	27	2.50	28.00	7.40	39.60	10.46	56.00	14.80
694	685	686	687	681	688	27	2.80	36.00	9.51	50.91	13.45	72.00	19.02
694	725	726	727	721	728	27	3.00	45.00	11.89	63.64	16.81	90.00	23.78
694	765	766	767	761	768	27	3.50	58.00	15.32	82.02	21.67	116.00	30.64
694	805	806	807	801	808	27	3.80	72.00	19.02	101.82	26.90	144.00	38.04
694	845	846	847	841	848	27	4.30	89.00	23.51	125.87	33.25	178.00	47.02
694	885	886	887	881	888	27	4.70	112.00	29.59	158.39	41.85	224.00	59.18
694	-	906	907	901	908	27	5.00	125.00	33.03	176.78	46.70	250.00	66.06
694	-	916	917	911	918	27	5.20	134.00	35.40	189.50	50.07	268.00	70.80

Ordering	Series	+	Code	+	Mat.-Code	=	Order no.
example:	694	+	495	+	27	=	694.495.27

A ø = equivalent bore diameter
Material code 27: Stainless steel nozzle tip with tungsten carbide insert

Flow rate conversion for table

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


Nozzle spray positions

1. All nozzle jets turned parallel in one direction.
2. Nozzle jets, half of them turned outwards in opposite directions. This directs the spray water to both sides (see Fig. 1).

Nipple installation

So that the correct alignment of the nozzle mouthpiece (15° offset angle to the header's longitudinal axis—see Fig. 1) is guaranteed, the welding nipple on the spray header must be positioned so that its flat inner surfaces are parallel to the header's longitudinal axis. This is best achieved with the alignment aid supplied as an accessory (Fig. 2, Order No. 069.490.01).

To do this, it is inserted into the flat nipple opening. A rule (or similar) can now be used to easily bring the nipple into the correct parallel position where it can be welded in place (see Fig. 3).

Alignment tip

The installation aid (Fig. 2, Order No. 069.490.01) is also used as a dummy part to shut off nozzle connections or for hydrostatic pressure testing.



Fig. 2: Alignment tip / dummy part

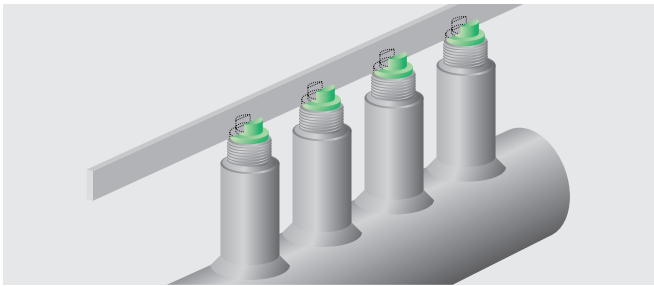
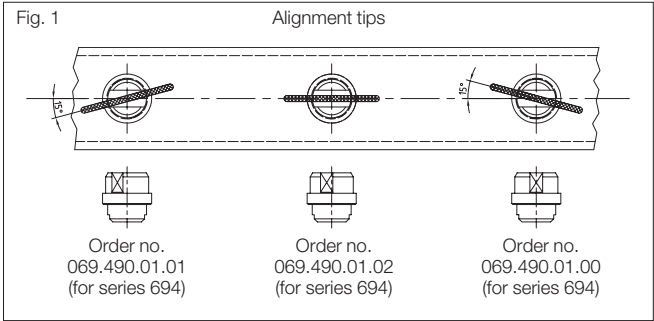
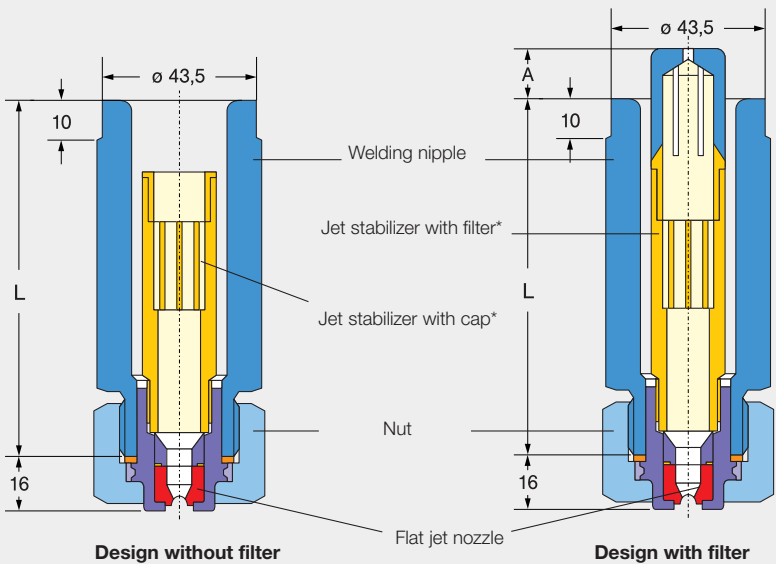


Fig. 3: Installation example for welding nipple



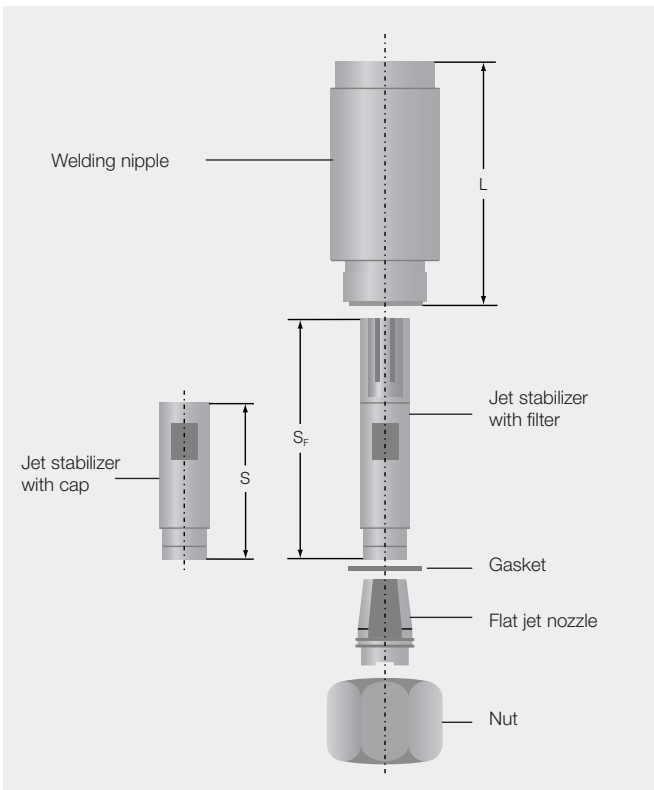
TECHNICAL DATA, INDIVIDUAL COMPONENTS, ORDERING NUMBERS



* max. torque: 30 Nm (22 ft.lbs.)

L	A with jet stabilizer 069.455.16	A with jet stabilizer 069.454.16
120	16	-
100	36	16
73	63	43

(all dimensions in mm)



Component	Model	Ordering 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: Brass	without Filter with kap 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: AISI 430 F		069.400.11	0.153
Alignment Tip Blank Tip Material: Mild Steel		069.490.01	0.072
Tip extractor Material: Stainless steel	Data sheet on request	069.492.12.00.10.0	0.250
Extraction tool	Data sheet on request	095.009.00.12.56.0	0.95

Max. permissible operating pressure: 450 bar

Lechler GmbH · Precision Nozzles · Nozzle Systems
P.O. Box 13 23 · 72544 Metzingen, Germany · Phone +49 7123 962-0 · Fax +49 7123 962-333 · info@lechler.de · www.lechler.com