ENGINEERING
YOUR SPRAY SOLUTION

DESCALING SOLUTIONS

One step ahead in
the evolution of descaling

METALLURGY

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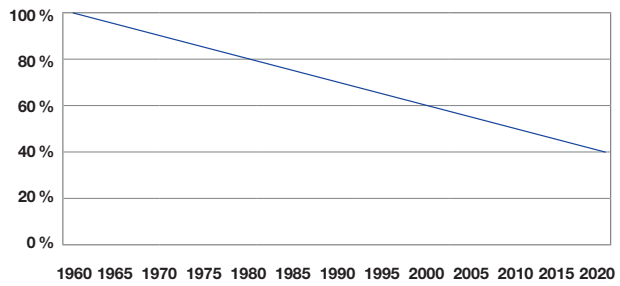
WHY GREEN STEEL NEEDS GREY MATTER ...

Emission trading systems in various parts of the world will lead to higher prices for CO_2 emission allowances and rising energy costs. In addition to this, more stringent emission reduction targets can be expected, highlighting growing environmental awareness and the pressure governments are exerting on steel producers to step up their efforts in reducing CO_2 emissions by improving their energy efficiency in every process.

Energy consumption % reduction 1960–2020



Indexed global energy consumption/tonne of crude steel production

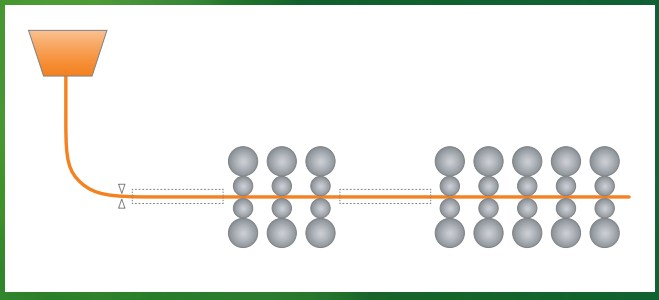
Iron and steel production is very energy-intensive. According to the World Steel Association, the joint efforts of steel producers and the plant suppliers have led to reductions of about 60 % in the energy required to produce a tonne of crude steel since 1960. Subsequently greenhouse gas emissions per tonne of steel have also been reduced.

The future use of green hydrogen by integrated steel mills to replace carbon in their ironmaking reduction process will make a major contribution to reducing CO_2 emissions further. Nevertheless, downstream processors have to continue improving their energy efficiency.

Innovation in reduction of CO_2 emissions in existing processes

- Engineering
- Consulting
- System studies
- Implementation of reduction technologies

Amongst the downstream processes, one of the most energy-intensive processes in flat steel production is in hot strip and plate mills, where up to 15 % of total energy is consumed by the descaling system's high pressure pumps. Cutting energy bills and the subsequent CO_2 emissions will definitely be on the agenda sooner rather than later. It is crucial to have a holistic approach because of the third factor, which is the consumption of plant water. In fact, monitoring and managing the ecological plant water footprint will appear on the same agenda in the near future.



The modern, uninterrupted processes, known also as CSP, DUE, ESP or QSP, represent a very energy-efficient method of producing hot rolled steel coils. Avoiding heat losses of the relatively thin transfer bar from strand to strip, much less high pressure water for descaling is used in these plants. However, due to the significantly higher water pressures and the very low spray heights, special descaling nozzles providing very high impact values and very precise sprays are required.

Challenge

Green steel requires large amounts of energy for the production of hydrogen and the operation of EAFs. All downstream processes must intensify their efforts in increasing their energy efficiency in parallel.

AND WHAT LECHLER CAN DO ABOUT IT

Lechler set a new standard when it introduced the first generation of SCALEMASTER descaling nozzles in 1992 together with the world's first and widely applied DESCALE nozzle configuration software.

The Lechler MiniSCALEMASTER's role in the success of first generation thin slab rolling plants – known as compact strip production – was not insignificant because of its contribution to minimizing the cooling of the transfer bar by reducing the volume of descaling water. The smaller physical size of the MiniSCALEMASTER was instrumental in the reduction of the spray height, a key parameter for increasing the impact.

Today, the company's latest addition, the SCALEMASTER ECO^{+}, continues the good work, especially for the modern versions of compact or endless strip production plants. This innovative new product with its new application concept offers additional options and solutions for surface quality improvements and unlocks further potential of energy efficiency and cost optimizations, as well as helping to reduce greenhouse gas emissions.

The Lechler claim of "Engineering your spray solution" has been adopted and extended to "Engineering your DESCALING solution" and goes far beyond simply offering a new series of nozzles. With the addition of the MillConfig.Descale simulation package a very sophisticated tool for decision-making is now available when it comes to the investigating potentials for increasing the energy efficiency and for improving surface quality.

The new SCALEMASTER ECO^{+} with its innovative Booster design is setting new impact records for descaling nozzles. Offering additional standard offset angle options when battling surface striping, Lechler is once again the leader in high pressure descaling.

Enhancing sustainability

Contribution

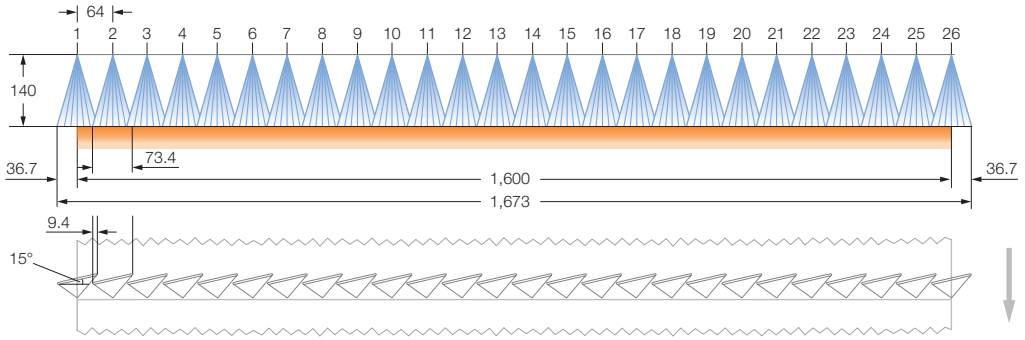
The new Lechler SCALEMASTER ECO^{+} descaling nozzle concept offers additional options and solutions for surface quality improvements and unlocks further potential of energy efficiency and cost optimizations, as well as helping to reduce greenhouse gas emissions.

PERFECT SYSTEM DESIGN
LECHLER DESCALE SOFTWARE

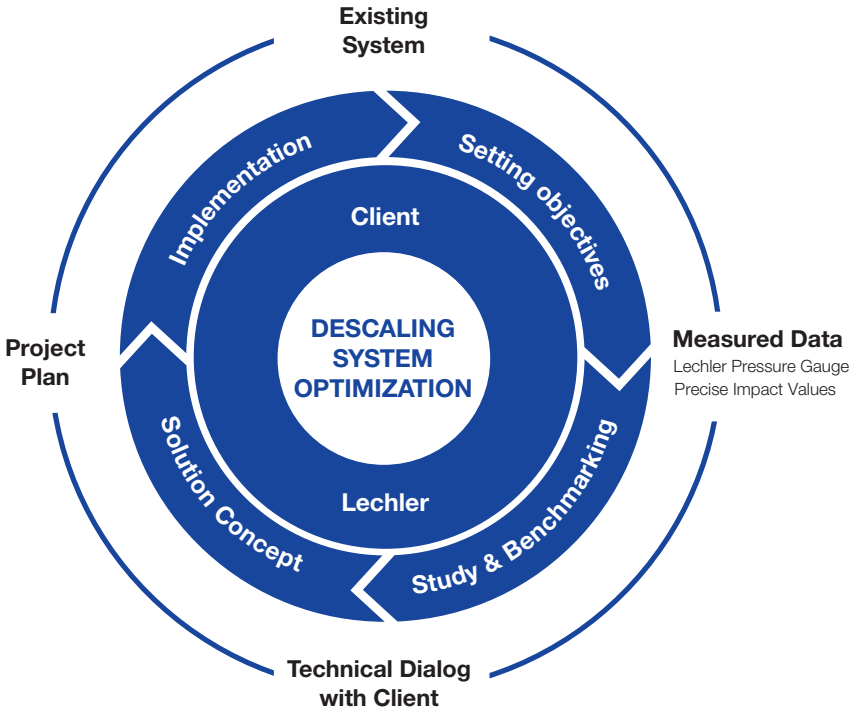
Benefit from the SCALEMASTER ECO+ when designing or optimizing a descaling system

Choose the experts. Since 1992 thousands of descaling systems have been designed using the Lechler DESCALE software and were equipped with Lechler SCALEMASTER nozzles.

- Let Lechler help you with the latest release of the Lechler DESCALE configuration software
- Scan and download, print, fill in and return the DESCALE questionnaire with the QR code below to Lechler
- Lechler will send you a proposal for an optimized nozzle configuration



Example of optimization with Lechler DESCALE software. (Dimensions in mm)



Optimize your descaling system

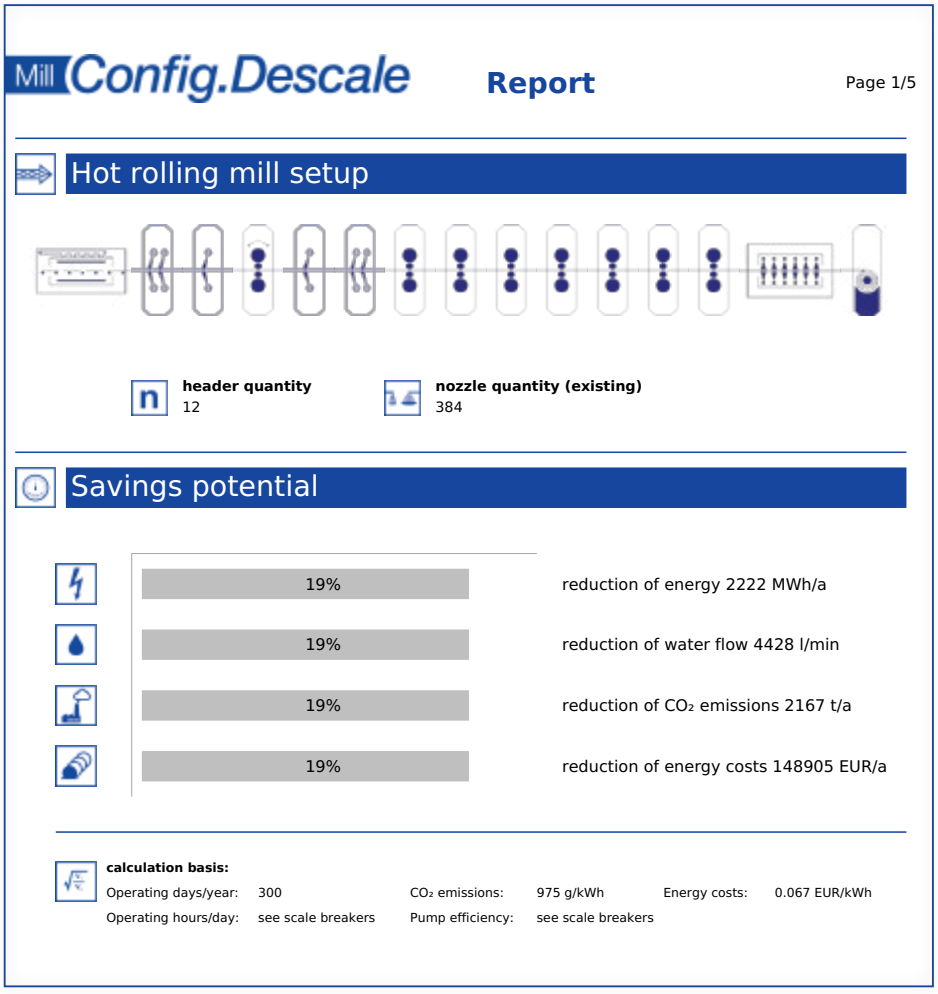
Increasing your descaling efficiency and quality is easy. Just scan the QR code and complete a questionnaire. Lechler will calculate your optimized nozzle configuration and notify you immediately.
lechler-event.de/r/nozzlearrangement

STUDY YOUR FULL POTENTIAL
MILLCONFIG.DESCALE

Get a system study to benefit from SCALEMASTER ECO+

A descaling system study is a systematic and structured procedure for defining how an existing system nozzle arrangement and header configuration performs regarding **surface quality and energy efficiency**.

- Scan and download, print, fill in and return the MillConfig.Descale questionnaire with the QR code below to Lechler
- Lechler will investigate the potentials for increasing the energy efficiency and for improving the surface quality by performing a detailed study of the descaling system of the entire rolling mill



Mill Config.Descale **Report** Page 1/5

Hot rolling mill setup

header quantity 12

nozzle quantity (existing) 384

Savings potential

19%	reduction of energy 2222 MWh/a
19%	reduction of water flow 4428 l/min
19%	reduction of CO_2 emissions 2167 t/a
19%	reduction of energy costs 148905 EUR/a

calculation basis:

Operating days/year:	300	CO_2 emissions:	975 g/kWh	Energy costs:	0.067 EUR/kWh
Operating hours/day:	see scale breakers	Pump efficiency:	see scale breakers		

Management summary of a MillConfig.Descale study report

How much can you save?

Identify your savings potential now. Simply scan the QR code and complete the questionnaire. Lechler will investigate your potentials and provide you with a proposal on how to achieve them.
lechler-event.de/r/millconfigdescale

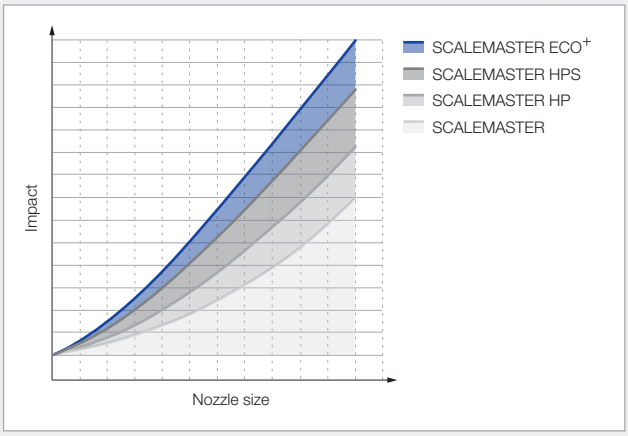
SCALEMASTER ECO+
THE NEW BOOSTER FOR HIGHEST IMPACT

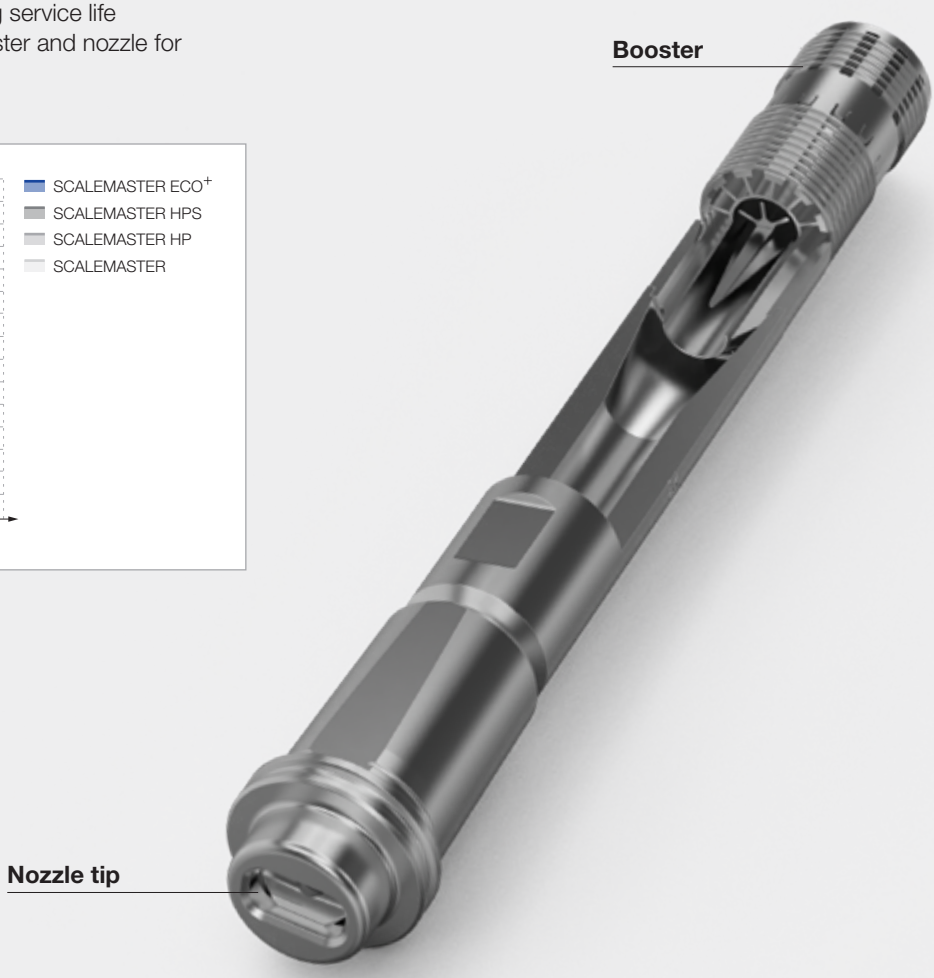
SCALEMASTER ECO+

Impact equals steel quality. Availability equals profitability. That's why we designed SCALEMASTER ECO+ to deliver even more impact while protecting its long-term functionality. We achieved this by developing a new Booster.

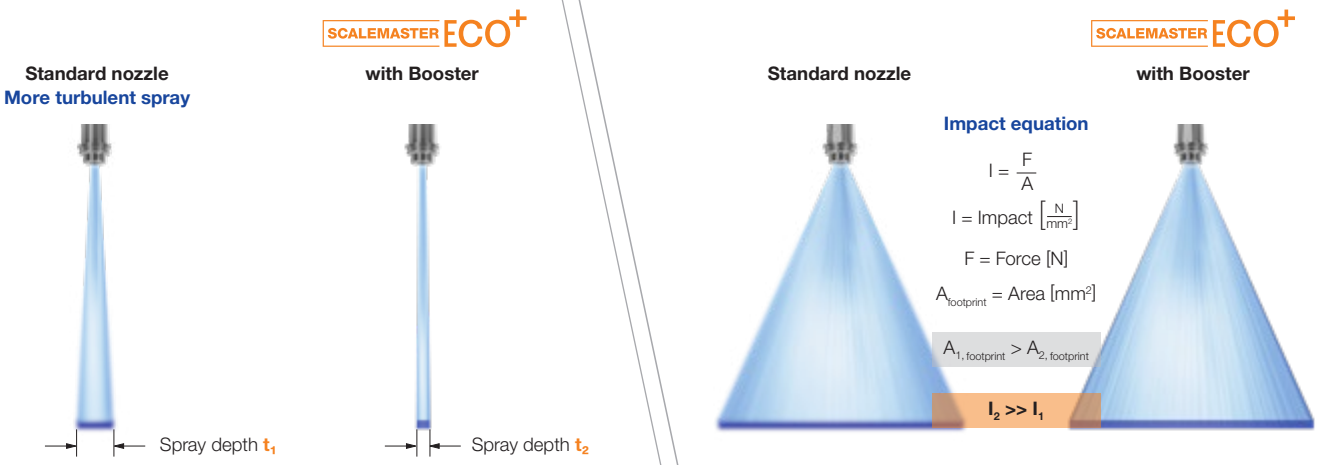
The new Booster from the nozzle innovators

- Patented multi channel design for highest impact
- Rigid mechanical design for roughest system conditions
- Made from stainless steel for long service life
- Integrated fine filter protects Booster and nozzle for clogging-free and safe operation





BOOST YOUR IMPACT
SAVE ENERGY COSTS



By further reducing the spray depth, the Booster concentrates the high pressure water on a smaller footprint, thereby increasing the impact and hence the descaling performance

- **SCALEMASTER ECO+** is fully compatible with all other SCALEMASTER nozzles (check overall length) – no header modifications necessary
- Optimized Booster design reduces the spray footprint area resulting in a higher impact
- An increased spray impact can lead to an improvement in the surface quality with no additional energy input
- A nozzle family providing higher impacts allows the use of a smaller nozzle size so that the impact can be maintained with a lower water flow and reduced energy consumption

MAXIMIZE IMPACT

Change to SCALEMASTER ECO+

- Maximize impact
- Keep water pressure
- Keep nozzle size

Additional option

- Reduce vertical spray height and increase impact even further

SAVE ENERGY

Change to SCALEMASTER ECO+

- Maintain impact values
- Install smaller nozzle size and reduce water flow
- Keep nozzle size and reduce water pressure

Additional option

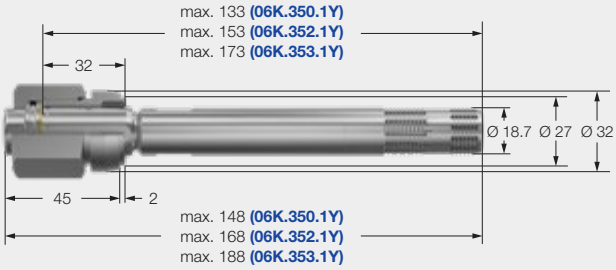
- Reduce vertical spray height allowing a further reduction in the water flow

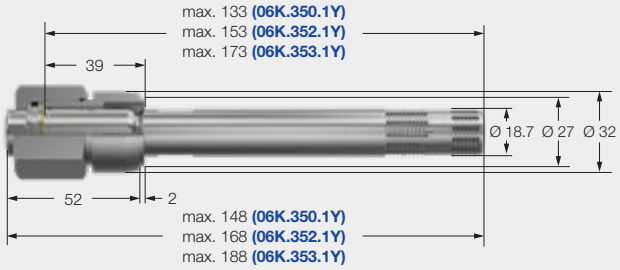
MiniSCALEMASTER ECO+
More clearance in confined settings

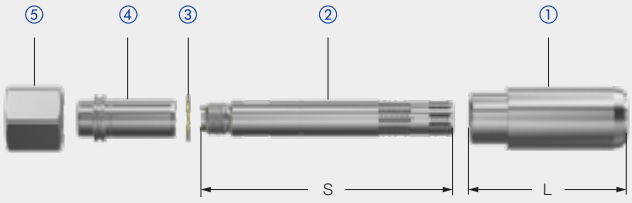
- **Spray height reduction to increase impact**
- **Improved rolled material surface quality**
- **Saves on pump energy**
- **Water flow rate reduced**
- **Less cooling of rolled product**

All dimensions in technical drawings and tables are in millimetres (unless stated otherwise).

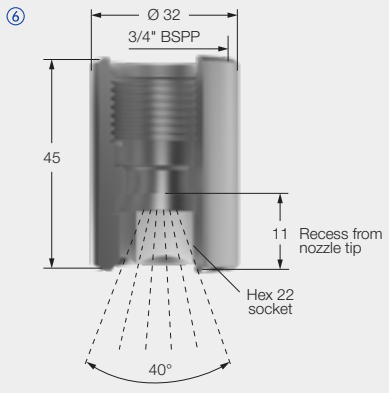
MiniSCALEMASTER ECO+







The new SCALEMASTER ECO+ with the innovative Booster combined with the additional offset angle options form the next step in the evolution of the SCALEMASTER family of descaling nozzles. It is interchangeable with all other SCALEMASTER nozzles of an equivalent overall length.



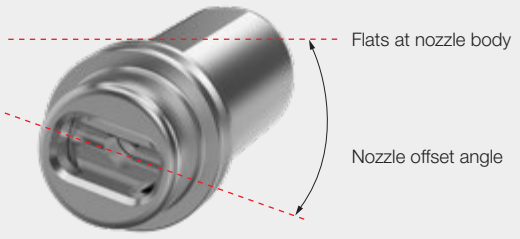
Special nut with hexagon socket for very narrow distances between nozzles

Designation	Order No. Type	Material	Dimensions	Weight [kg]
① **Welding nipple**	**060.020.1C.01** **060.020.1C.00** **060.020.1C.02**	AISI 304	Length [mm] L = 32 L = 39 L = 80 Other length on request	0.060 0.080 0.190
② **Booster**	**06K.350.1Y** **06K.352.1Y** **06K.353.1Y**	Stainless steel	With filter [mm] S = 110 S = 130 S = 150	0.117 0.145 0.174
③ **Gasket**	**095.015.34.02.07**	Copper	–	0.001
④ **Nozzle tip**	**6K3.XXX.XX.XX** See order table	–	–	0.140
⑤ **Nut (standard)**	**064.400.11**	AISI 430 F	Hex 32 Max. torque 180 Nm	0.085
⑥ **Special nut with hexagon socket**	**064.401.11**	–	Hex 22 socket	0.120

Max. permissible operating pressure: 450 bar

Order No. for nozzle tip										Equivalent bore diameter A [mm]	Water flow rate (V̇)					
Series	Code Nominal spray angle					Material No.[1]	Offset angle				p = 100 bar (1,450 psi)		p = 200 bar (2,900 psi)		p = 400 bar (5,800 psi)	
	22°	26°	30°	34°	40°		0°	5°	15°		[l/min]	[US gal/min]	[l/min]	[US gal/min]	[l/min]	[US gal/min]
6K3	**495**	**496**	**497**	**491**	**498**	**27**	**00**	**05**	**15**	1.50	12.00	3.17	16.97	4.50	24.00	6.34
6K3	**535**	**536**	**537**	**531**	**538**	**27**	**00**	**05**	**15**	1.75	15.00	3.96	21.21	5.60	30.00	7.92
6K3	**565**	**566**	**567**	**561**	**568**	**27**	**00**	**05**	**15**	2.00	18.00	4.76	25.46	6.73	36.00	9.52
6K3	**605**	**606**	**607**	**601**	**608**	**27**	**00**	**05**	**15**	2.10	23.00	6.08	32.53	8.59	46.00	12.16
6K3	**645**	**646**	**647**	**641**	**648**	**27**	**00**	**05**	**15**	2.50	28.00	7.40	39.60	10.46	56.00	14.80
6K3	**685**	**686**	**687**	**681**	**688**	**27**	**00**	**05**	**15**	2.80	36.00	9.51	50.91	13.45	72.00	19.02
6K3	**725**	**726**	**727**	**721**	**728**	**27**	**00**	**05**	**15**	3.00	45.00	11.89	63.64	16.81	90.00	23.78
6K3	**765**	**766**	**767**	**761**	**768**	**27**	**00**	**05**	**15**	3.50	58.00	15.32	82.02	21.67	116.00	30.64
6K3	**805**	**806**	**807**	**801**	**808**	**27**	**00**	**05**	**15**	3.80	72.00	19.02	101.82	26.90	144.00	38.04
6K3	**845**	**846**	**847**	**841**	**848**	**27**	**00**	**05**	**15**	4.30	89.00	23.51	125.87	33.25	178.00	47.02
6K3	**885**	**886**	**887**	**881**	**888**	**27**	**00**	**05**	**15**	4.70	112.00	29.59	158.39	41.85	224.00	59.18
6K3		**906**	**907**	**901**	**908**	**27**	**00**	**05**	**15**	5.00	125.00	33.03	176.78	46.70	250.00	66.06
6K3		**916**	**917**	**911**	**918**	**27**	**00**	**05**	**15**	5.20	134.00	35.40	189.50	50.07	268.00	70.80

[1] Material No. 27: Stainless steel nozzle tip with tungsten carbide insert.



Please be aware that digits 9 and 10 indicate the integrated nozzle offset angle! Conversion of former series 6P3/642/644.XXX.27.00 ► **6K3.XXX.27.15**

Flow rate conversion for table:

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

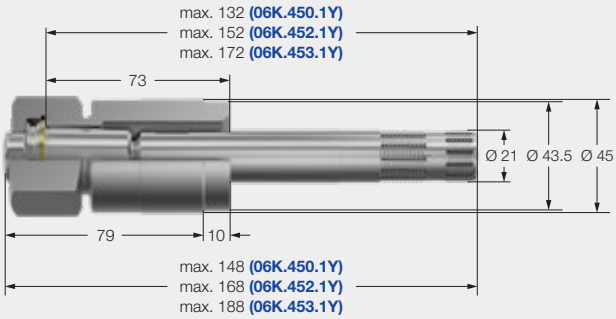
Ordering example:	Series	+	Code	+	Material No.	+	Offset angle	=	Order No.
	6K3	+	495	+	27	+	15	=	6K3.495.27.15

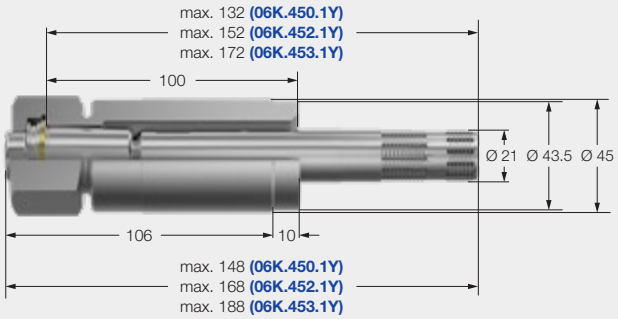
SCALEMASTER ECO+
The optimum descaling solution for conventional hot strip and plate mills

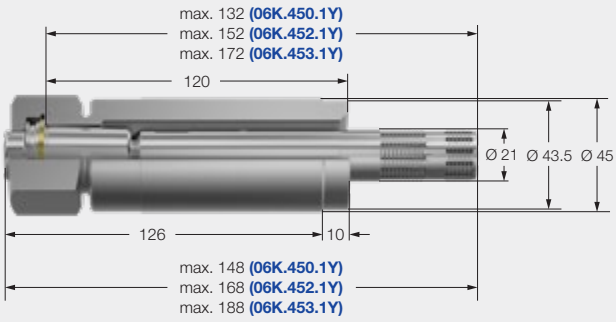
- Improved rolled material surface
- Saves on pump energy
- Splash water quantity reduced

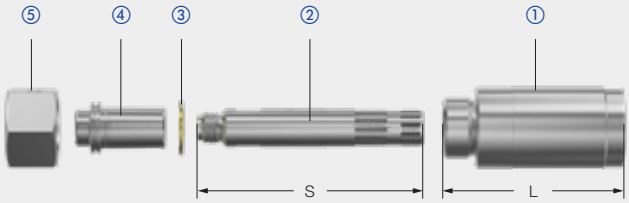
All dimensions in technical drawings and tables are in millimetres (unless stated otherwise).

SCALEMASTER ECO+









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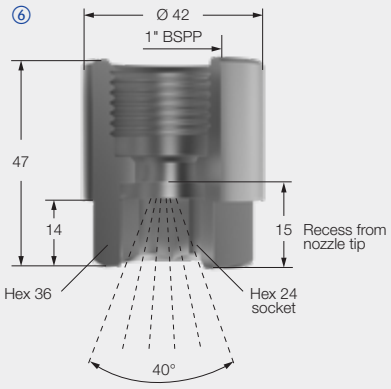

Special nut with hexagon socket for very narrow distances between nozzles

Designation	Order No. Type	Material	Dimensions	Weight [kg]
① **Welding nipple**	**069.410.1C.73** **069.410.1C.00** **069.411.1C.00**	AISI 304	Length [mm] L = 73 L = 100 L = 120 Other length on request	0.490 0.710 0.830
② **Booster**	**06K.450.1Y** **06K.452.1Y** **06K.453.1Y**	Stainless steel	With filter [mm] S = 110 S = 130 S = 150	0.142 0.182 0.222
③ **Gasket**	**095.015.34.04.02**	Copper	–	0.005
④ **Nozzle tip**	**6K4.XXX.XX.XX** See order table	–	–	0.140
⑤ **Nut (standard)**	**069.400.11**	AISI 430 F	Hex 41 Max. torque 200 Nm	0.150
⑥ **Special nut with hexagon socket**	**069.402.11**	–	Hex 24 socket	0.251

Max. permissible operating pressure: 450 bar

Order No. for nozzle tip										Equivalent bore diameter A [mm]	Water flow rate (V̇)					
Series	Code Nominal spray angle					Material No.[1]	Offset angle				p = 100 bar (1,450 psi)		p = 200 bar (2,900 psi)		p = 400 bar (5,800 psi)	
	22°	26°	30°	34°	40°		0°	5°	15°		[l/min]	[US gal/min]	[l/min]	[US gal/min]	[l/min]	[US gal/min]
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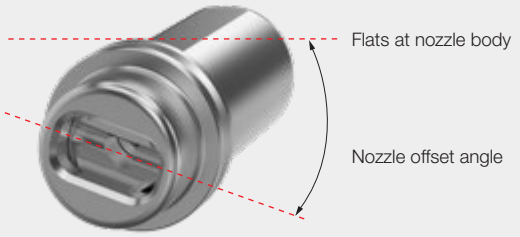
6K4		**916**	**917**	**911**	**918**	**27**	**00**	**05**	**15**	5.20	134.00	35.40	189.50	50.07	268.00	70.80

[1] Material No. 27: Stainless steel nozzle tip with tungsten carbide insert.



Please be aware that digits 9 and 10 indicate the integrated nozzle offset angle! Conversion of former series 6P4/682/694.XXX.27.00 ► **6K4.XXX.27.15**

Flow rate conversion for table:

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

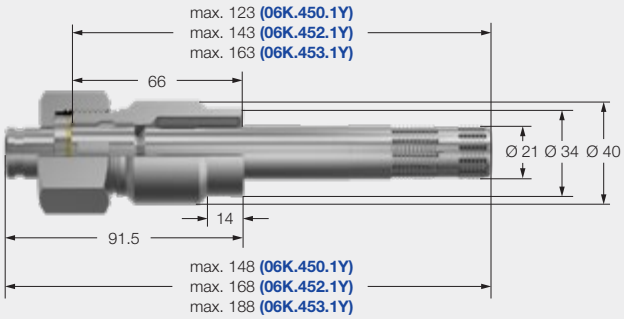
Ordering example:	Series	+	Code	+	Material No.	+	Offset angle	=	Order No.
	6K4	+	495	+	27	+	15	=	6K4.495.27.15

J-Type SCALEMASTER ECO+
The energy-efficient alternative with two alignment tabs at the nozzle tips

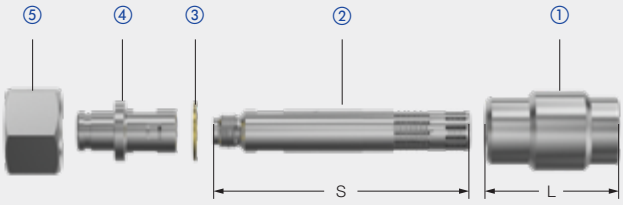
Dimensions in mm.

- Saves on pump energy
- Water flow rate reduced
- Less cooling of rolled product

J-Type SCALEMASTER ECO+



The new SCALEMASTER ECO+ with the innovative Booster is now also available for installations with two alignment tabs. It is interchangeable with all other SCALEMASTER nozzles of an equivalent overall length.

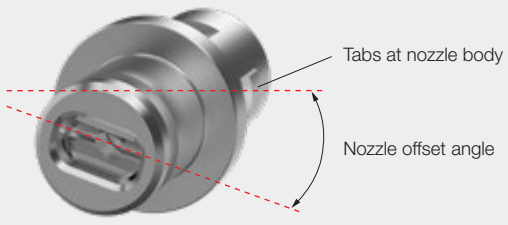


Designation	Order No. Type	Material	Dimensions	Weight [kg]
① Welding nipple	06S.J10.1C.00	AISI 304	Length [mm] L = 66	0.830
② Booster	06K.450.1Y 06K.452.1Y 06K.453.1Y	Stainless steel	With filter [mm] S = 110 S = 130 S = 150	0.142 0.182 0.222
③ Gasket	095.015.34.09.31	Copper	–	0.005
④ Nozzle tip	6KJ.XXX.XX.XX See order table	–	–	0.140
⑤ Nut (standard)	06S.J00.11	AISI 431	Hex 41	0.150

Max. permissible operating pressure: 450 bar

Order No. for nozzle tip										Equivalent bore diameter A [mm]	Water flow rate (V̇)					
Series	Code Nominal spray angle					Material No.[1]	Offset angle				p = 100 bar (1,450 psi)		p = 200 bar (2,900 psi)		p = 400 bar (5,800 psi)	
	22°	26°	30°	34°	40°		0°	5°	15°		[l/min]	[US gal/min]	[l/min]	[US gal/min]	[l/min]	[US gal/min]
6KJ	495	496	497	491	498	27	00	05	15	1.50	12.00	3.17	16.97	4.50	24.00	6.34
6KJ	535	536	537	531	538	27	00	05	15	1.75	15.00	3.96	21.21	5.60	30.00	7.92
6KJ	565	566	567	561	568	27	00	05	15	2.00	18.00	4.76	25.46	6.73	36.00	9.52
6KJ	605	606	607	601	608	27	00	05	15	2.10	23.00	6.08	32.53	8.59	46.00	12.16
6KJ	645	646	647	641	648	27	00	05	15	2.50	28.00	7.40	39.60	10.46	56.00	14.80
6KJ	685	686	687	681	688	27	00	05	15	2.80	36.00	9.51	50.91	13.45	72.00	19.02
6KJ	725	726	727	721	728	27	00	05	15	3.00	45.00	11.89	63.64	16.81	90.00	23.78
6KJ	765	766	767	761	768	27	00	05	15	3.50	58.00	15.32	82.02	21.67	116.00	30.64
6KJ	805	806	807	801	808	27	00	05	15	3.80	72.00	19.02	101.82	26.90	144.00	38.04
6KJ	845	846	847	841	848	27	00	05	15	4.30	89.00	23.51	125.87	33.25	178.00	47.02
6KJ	885	886	887	881	888	27	00	05	15	4.70	112.00	29.59	158.39	41.85	224.00	59.18
6KJ		906	907	901	908	27	00	05	15	5.00	125.00	33.03	176.78	46.70	250.00	66.06
6KJ		916	917	911	918	27	00	05	15	5.20	134.00	35.40	189.50	50.07	268.00	70.80

[1] Material No. 27: Stainless steel nozzle tip with tungsten carbide insert.



Please be aware that digits 9 and 10 indicate the integrated nozzle offset angle! Nozzle with 15° offset
► **6KJ.XXX.27.15**

Flow rate conversion for table:

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

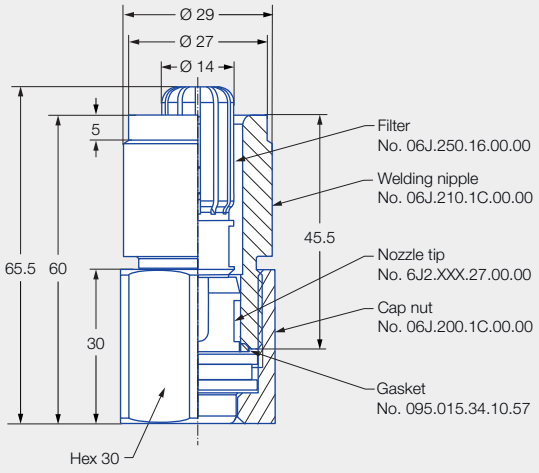
Ordering example:	Series	+	Code	+	Material No.	+	Offset angle	=	Order No.
	6KJ	+	495	+	27	+	15	=	6KJ.495.27.15

SCALEMASTER 6J2
The solution for confined spaces

Dimensions in mm.

- Short nozzle length with filter

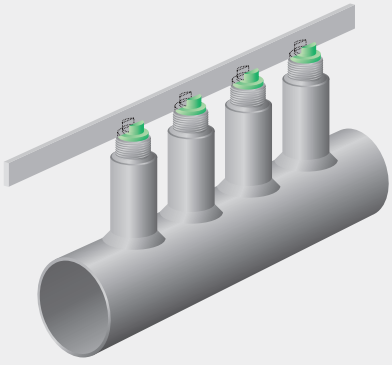
SCALEMASTER 6J2



The series SCALEMASTER 6J2 is designed for demanding descaling applications.

The short length of the nozzle together with the filter offers best performance whenever the space for descaling nozzles is limited.

The alignment tip (**Order No. 06J.290.01.00**) is also used as a dummy part to plug off nozzle connections or for pressure tests performed on the spray header.



	Designation	Order No. Type	Material	Dimensions	Remarks	Weight [kg]
	Nozzle tip	**6J2.XXX.27.00.00** See order table	Housing: stainless steel Insert: tungsten carbide Gasket: copper	–	1 gasket included	0.045
	Filter	**06J.250.16.00.00**	Stainless steel	Length [mm] L = 45.5	–	0.034
	Cap nut	**06J.200.1C.00.00**	Stainless steel	–	–	0.091
	Welding nipple	**06J.210.1C.00.00**	Stainless steel	Length [mm] L = 45.5 Other length on request	–	0.123
	Alignment tip/ blank tip	**06J.290.01.00.00**	Steel	–	For 15° offset Other offsets on request	0.052
	Gasket	**095.015.34.10.57**	Copper	–	–	0.001
	Tip extractor	**06J.292.12.00.00**	Steel/ Stainless steel	–	Special tool only for series 6J2	1.372

Max. permissible operating pressure: 450 bar

Order No. for nozzle tip						Equivalent bore diameter A [mm]	Water flow rate (V̇)					
Series	Code Nominal spray angle				Material No.[1]		p = 100 bar (1,450 psi)		p = 200 bar (2,900 psi)		p = 400 bar (5,800 psi)	
	22°	26°	30°	40°			[l/min]	[US gal/min]	[l/min]	[US gal/min]	[l/min]	[US gal/min]
6J2	**495**	**496**	**497**	**498**	**27**	1.50	12.00	3.17	16.97	4.50	24.00	6.34
6J2	**535**	**536**	**537**	**538**	**27**	1.75	15.00	3.96	21.21	5.60	30.00	7.92
6J2	**565**	**566**	**567**	**568**	**27**	2.00	18.00	4.76	25.46	6.73	36.00	9.52
6J2	**605**	**606**	**607**	**608**	**27**	2.10	23.00	6.08	32.53	9.39	46.00	12.16
6J2	**645**	**646**	**647**		**27**	2.50	28.00	7.40	39.60	10.46	56.00	14.80

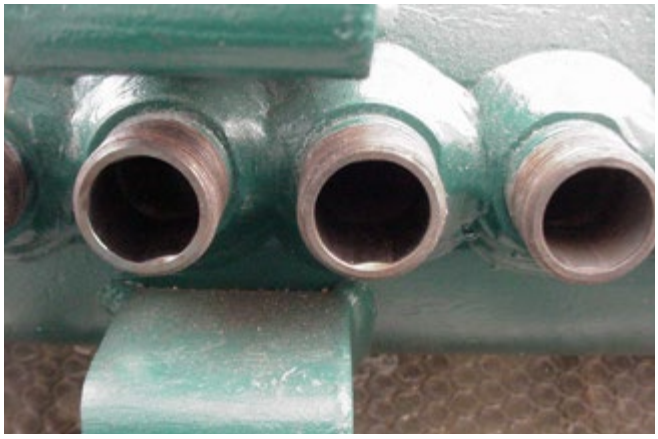
[1] Material No. 27: Stainless steel nozzle tip with tungsten carbide insert.

Flow rate conversion for table:

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

Ordering example:	Series	+	Code	+	Material No.	=	Order No.
	6J2	+	495	+	27	=	6J2.495.27.00

ALTERNATIVE NOZZLE MOUNTING
WHEN NOZZLES GET TOO CLOSE



MiniSCALEMASTER nipples at very narrow pitches with overlapping weld seams

Welding nipples have accommodated the descaling nozzle tips for decades. Those welding nipples, representing the number of nozzles, are welded on to pre-fabricated and pre-drilled header pipe.

When nozzle pitches become less than approximately 50 mm, the weld seams of the nipples overlap, which can lead to a triaxial state of stress that can form cracks. Welding difficulties in these narrow gaps can be an additional burden.

Lechler is well aware of the problems associated with cracked headers. As a result, Lechler offers a standard design solution for alternative header configurations, especially for new types of compact or uninterrupted strip production lines and plate mills, where the trend for lower spray heights continues.

THE NEW NOZZLE BRACKET **FOR BETTER HEADERS**

FEATURES

- Standardized and proven design
- Minimum nozzle pitch for MiniSCALEMASTER nozzles can now be realized without problems (40 mm with special nut, 43 mm with standard nut)
- Bracket is bolted to a flat surface
- Lechler precision-made, self-aligning bracket
- Available in any tailored length between 55 and 300 mm in 1.0 mm increments
- Each bracket can be replaced individually
- Available also for chevron header designs

THE NEW NOZZLE BRACKET

Lechler's new SCALEMASTER ECO^{+} bracket offers alternatives in both header design and nozzle mounting. It allows for alternative header configurations, especially for new types of compact or endless strip production lines and plate mills, where the trend for lower spray heights continues. Since the nipples are no longer welded on, all associated problems are also eliminated. Additionally, the nozzle offset angle against the centre axis of the header pipe is already built into the nozzle tips. The perfect alignment of the nozzles on the spray header ensures that the sprays hit the surface at an identical offset angle and distance, resulting in optimum descaling.

ADVANTAGES

- Interfacing dimensions can be downloaded
- Lowest spray heights for maximization of impact can be realized
- Welding of nipples eliminated
- Perfect nozzle positioning and alignment on header
- All kinds of headers possible
- Any type of special header can be designed
- Fast and cost effective repair of header

USER BENEFITS

- Greatest design flexibility
- Header designer does not have to design this crucial element of the header and saves time
- Single source for all relevant nozzle components
- The full potential of energy efficiency and surface quality optimizations can be utilized
- Costly cracked header failures avoided
- Increased operation safety and improved surface quality
- "Plug and spray" solution with all nozzle components from a single source
- Reduced downtime, maintenance cost savings

Nozzle bracket
for MiniSCALEMASTER nozzles
All details

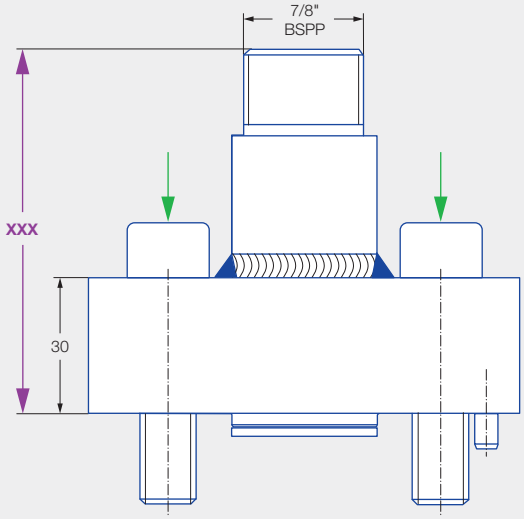
- The SCALEMASTER ECO^{+} bracket can be bolted directly to a pipe thus enabling the machining of a flat surface
- The SCALEMASTER ECO^{+} bracket is an ideal “bolt-on” interface between the header and the descaling nozzle. Welding of a large number of welding nipples with all the negative thermal consequences is no longer necessary
- When descaling headers are made from forged hollow shafts and the surface subsequently machined, the SCALEMASTER ECO^{+} bracket can be an ideal substitute for welding nipples

All dimensions in technical drawings and tables are in millimetres (unless stated otherwise).

Nozzle bracket

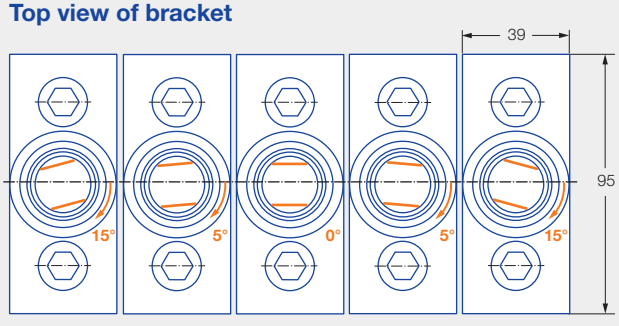
Part number: **06B.XXX.MM.YY.ZZ**

Length of bracket [mm]	Material of screws	Direction of offset angle	Nominal offset angle [°]
055–300	00 = steel 1C = 304 SS	7C = clockwise 7A = anti-clockwise 70 = 0°	00 05 15



Max. pressure 400 bar
Nozzle bracket itself is made from stainless steel 304

Top view of bracket



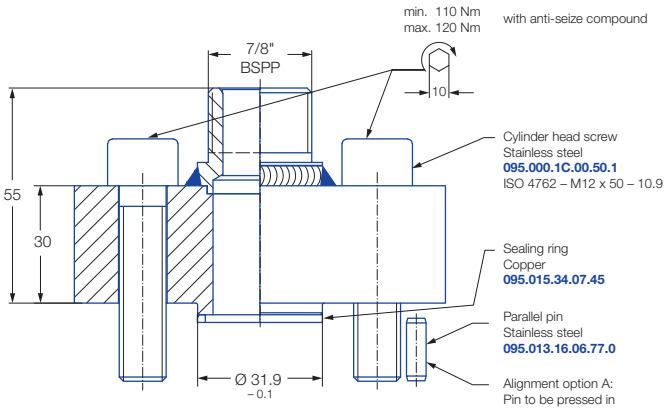
7A.15 **7A.05** **70.00** **7C.05** **7C.15**

In combination with nozzle offset angle 0° (nozzle type **6K3.XXX.27.00.00**) ZZ is the final offset angle of the spray pattern.

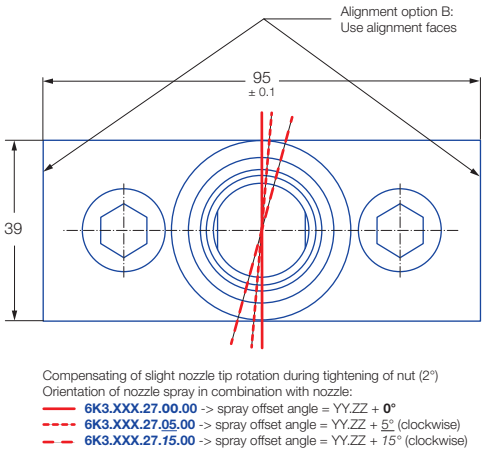
In order to compensate for the slight nozzle tip rotation during tightening of the nut, the as-built angle is 2° anti-clockwise rotated to the nominal offset. This helps to get the precise offset angle.

Example:
06B.055.1C.70.00

Dimensions in mm.



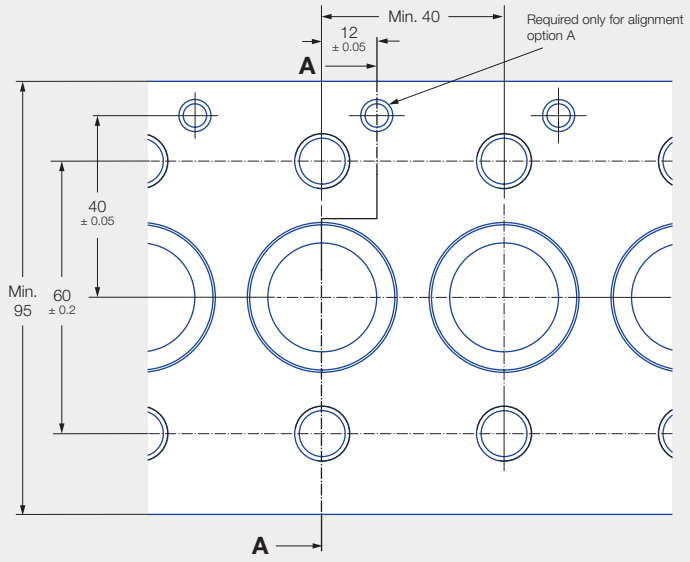
55 mm length,
0° bracket offset angle

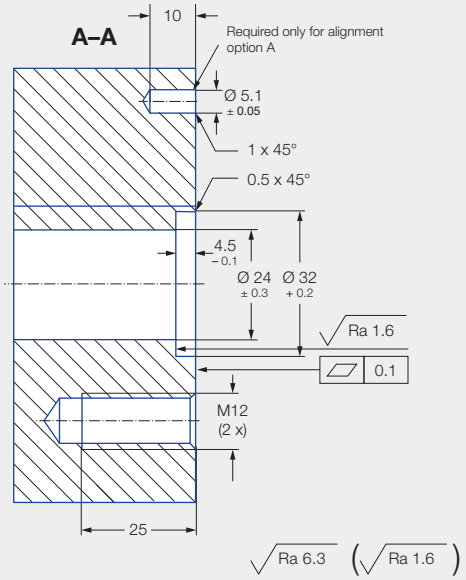


Compensating of slight nozzle tip rotation during tightening of nut (2°)
Orientation of nozzle spray in combination with nozzle:
6K3.XXX.27.00.00 -> spray offset angle = YY.ZZ + **0°**
6K3.XXX.27.05.00 -> spray offset angle = YY.ZZ + 5° (clockwise)
6K3.XXX.27.*15*.00 -> spray offset angle = YY.ZZ + *15°* (clockwise)

Bore pattern on spray header

Dimensions in mm.



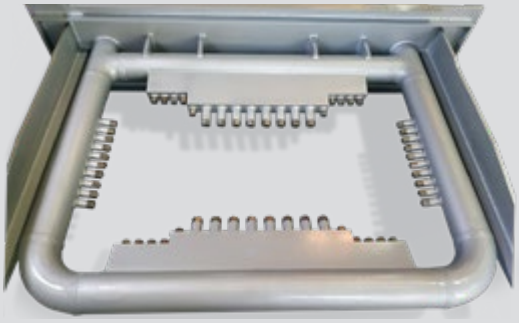


Accessories

Component	Order No.
Special nut with hexagon socket (material: stainless steel) (recommended for pitches less than 48 mm)	**064.401.11.70.00**
Nut (standard) (material: stainless steel)	**064.400.11.70.00**
Nozzle	**6K3.XXX.27.00.00**
Cylinder head screw (material: steel)	**095.000.00.00.50.1**
Cylinder head screw (material: stainless steel)	**095.000.1C.00.50.1**
Sealing ring (material: copper)	**095.015.34.07.45**

LECHLER DESCALING HEADERS
HOW TO GET SPRAYS IN LINE

Seamless pipe mills
Descaling header for a seamless pipe mill. Configuration with Lechler DESCALE application software.



Beam blank rolling mills
Special descaling header design for a beam blank with identical spray height at flanges, tips and web.

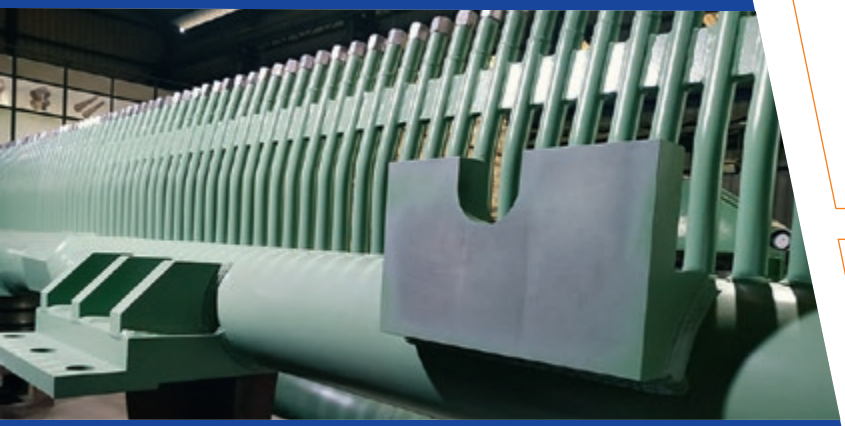


Plate and hot strip mills
Bottom descaling header for a 5,000 mm plate mill descaler.

The optimal nozzle arrangement on spray headers is as important as the selection of the correct nozzle. That's why Lechler also offers engineering and production of spray headers. With this service, the circle is now complete, starting from the development of the spray nozzle and measuring the spray performance through to application engineering and finally the spray header.

With transparent processes, audited and certified by world leading plant engineering companies, Lechler spray headers undergo dedicated QA procedures from production planning to dimensional control prior and during production. Quality control also includes nondestructive testing of the material, welds and the final header. Either performed according to a customer's special QA specifications or according to the internal Lechler NDT standards. No header leaves a Lechler factory without its test certificate.

YOUR BENEFITS

Header and nozzles from one source
- Reduced number of suppliers
- Fewer project interfaces to coordinate

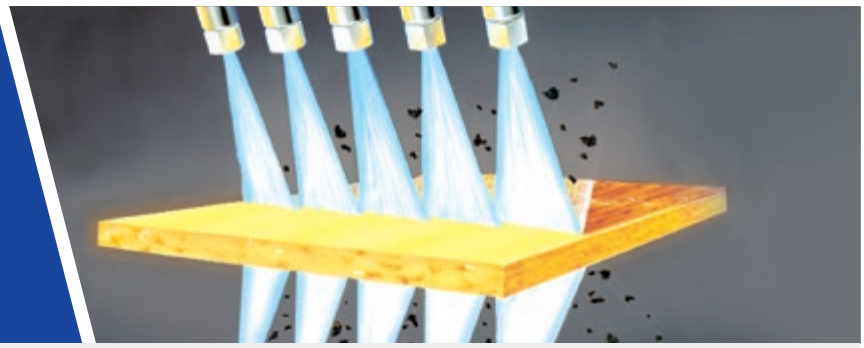
Optimized spray header design from the nozzle experts due to
- Process know-how
- Nozzle application know-how

Guaranteed overall spray performance
- Welding nipples and bases welded correctly
- Perfect nozzle alignment

Product quality and plant availability
- Approved and certified NDT and QA procedures
- Longer lifetime, less downtime

- **Headers engineered and manufactured by Lechler**
- **Header manufactured according to customer drawings**

NOZZLE ARRANGEMENT ON THE SPRAY HEADER

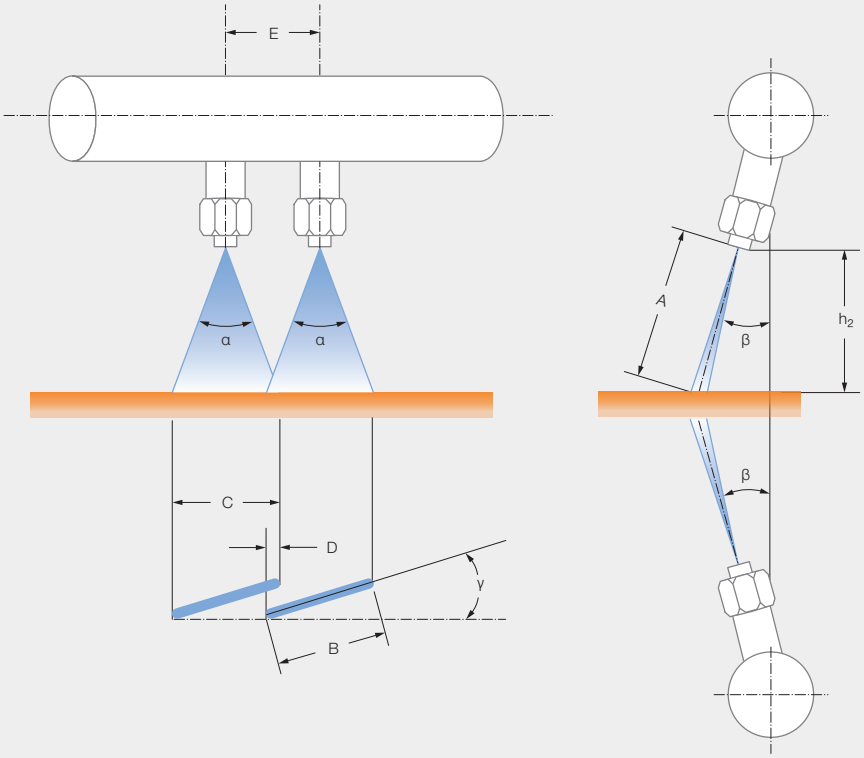


Data and terminology

E = C – D
C = cos γ · B
β = 5°, 10° or 15°

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
Standard: 0°, 5° and 15°



Vertical spraying height	Angle of inclination β = 15°	Nominal nozzle spray angle α at p = 150 bar																			
		α = 22°				α = 26°				α = 30°				α = 34°				α = 40°			
h_2 [mm]	A [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]	B [mm]	C [mm]	D [mm]	E [mm]
50	**52**	26	25	–	–	30	29	–	–	35	34	–	–	39	38	–	–	47	45	5	40*
75	**78**	36	35	–	–	43	42	5	37*	49	47	5	42*	55	53	6	47**	67	65	7	58**
100	**104**	47	45	7	38*	56	54	5	49**	64	62	5	57***	71	69	7	62***	55	85	8	77
125	**129**	57	55	7	48**	68	66	7	59***	78	75	7	68	87	84	9	75	108	104	10	94
150	**155**	68	66	8	58***	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

* Only **MiniSCALEMASTER ECO+** with hexagon socket nut.
** Only **MiniSCALEMASTER ECO+**.
*** Only with hexagon socket nut.
Dimensions in table apply for 15° offset angle only.

OUR WELDERS ARE ON FIRE

The welding process in header manufacturing depends on the header design and material of construction. Based on the competence and experience with those special processes and their specific requirements, Lechler is assuring the high quality of every weld.

The Lechler engineers, welders, NDT personnel, welding inspectors and welding coordinators do receive frequent training according to international standards and do meet all required qualifications. Independent bodies are providing the welding certifications in accordance under high compliance standards.

Descaling pressure gauge

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 fitting the pressure sensor instead.

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

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

Hand held pressure reading

Sensor details

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

Complete descaling pressure gauge

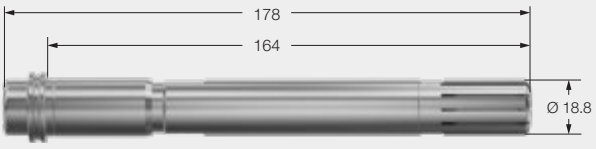
Sensor adaptors for 6K3 (Mini SM ECO+) and 6K4 (SM ECO+) nozzle tips included. Sensor adaptor for 6KJ available on request. **Order No. 06P.M00.00.00.00**

WSV Water Stop Valve
For thermomechanical rolling

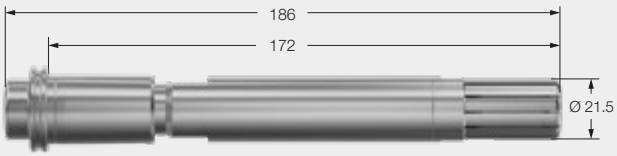
Dimensions in mm.

- The WSV is a check valve which includes the stabilizer
- Every WSV comes with a filter
- Material completely made of stainless steel
- Metallic sealing
- Piston hardened

MiniSCALEMASTER ECO+ **SCALEMASTER ECO+**



WSV with nozzle 6K3



WSV with nozzle 6K4

WSV (for series 6K3) without nozzle

WSV (for series 6K4) without nozzle

Advantages for users

During the thermomechanical rolling of steel plate and when rolling stainless steel strip, descaling is not performed for every roll pass. Nozzle check valves are used here to prevent undesired surface cooling of the rolling stock caused by the system prefilling water, which would otherwise flow unrestricted through the nozzle tip.

For series	Order No.	Opening pressure [bar]	Closing pressure [bar]	Material
SCALEMASTER ECO+ (6K4 and 6KJ)	**06K.470.16**	14	10	Stainless steel
MiniSCALEMASTER ECO+ (6K3)	**06K.370.16**	14	10	Stainless steel

Very large internal free cross sections	Non-clogging design	High operating safety
Simple design	Components can be replaced	Easy maintenance
Extended service life	Less maintenance	Low maintenance costs

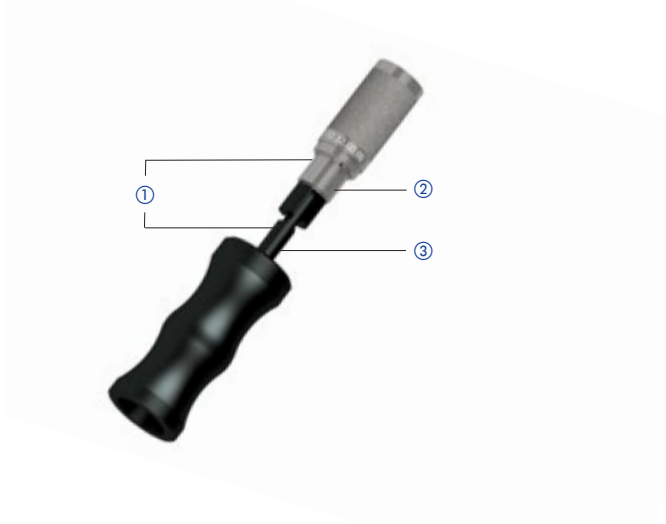
Accessories
That keep your rolling rolling

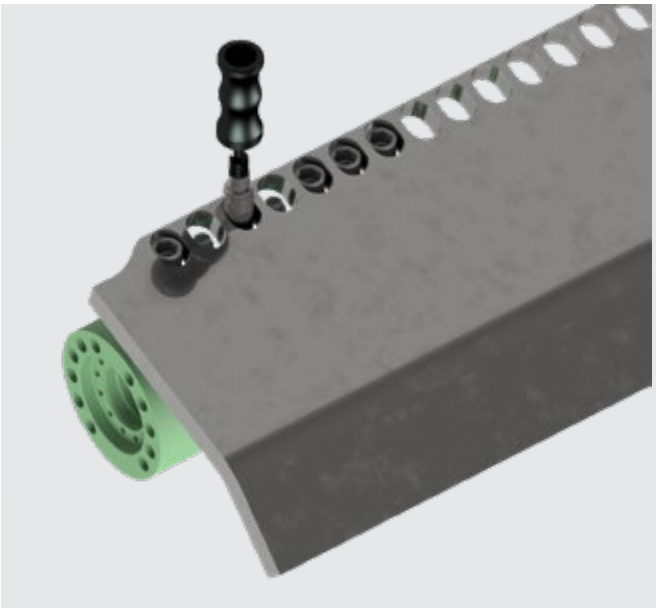
Disassembly set

The disassembly set is pushed onto the recess on the mouthpiece. The entire nozzle unit can be pulled out when the union nut is unscrewed.

The push-pull/push-twist type disassembly set is pushed on the mouthpiece after removal of cap nut. The entire nozzle unit can be pulled out and released by pulling/twisting the sleeve at the tip extractor.

Designation	Order No.		
	SCALEMASTER ECO+	MiniSCALEMASTER ECO+	SCALEMASTER ECO+ J-Type
① Disassembly set	06K.492.12.00.00	06K.392.12.00.00	06K.J92.12.00.00
② Tip extractor	06K.492.12.00.10	06K.392.12.00.10	06K.J92.12.00.10
③ Extraction tool	095.009.00.12.56	095.009.00.12.56	095.009.00.12.56





The disassembly tool could also be used, if free space around the nozzles is limited, e.g. because of a protection plate. For detailed dimensions please contact us.

Anti-seize compound

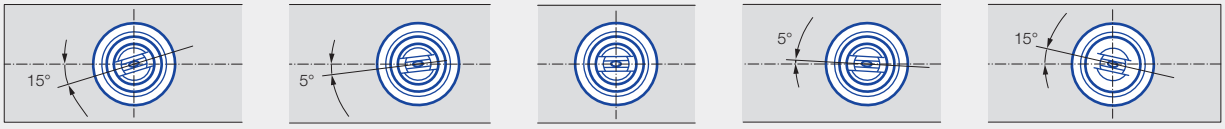
Application of the anti-seize compound on the thread of the welding nipples is recommended and ensures easy removal of the nut. **Order No. 9ET.048.29.00.00**; 80 g

Correct nozzle alignment
Accessories

Nozzle spray positions

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

Fig. 1



Nipple installation

For the standard installation with all nozzle jets turned parallel in one direction, the welding nipples on the spray header must be positioned so that the flat inner surfaces are parallel to the header's longitudinal axis. The required jet offset angle can be achieved by using the nozzle tips with the corresponding offset angle, e.g. **6K4.XXX.27.15** for 15° offset.

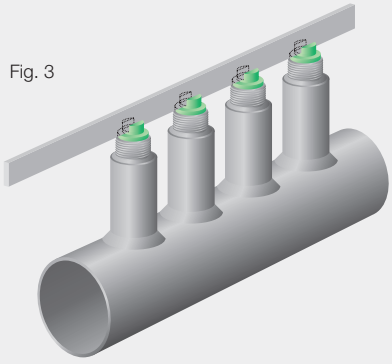
Order numbers for alignment tips

	MiniSCALEMASTER ECO+			SCALEMASTER ECO+			SCALEMASTER ECO+ J-Type	
	0° Offset angle	5° Offset angle	15° Offset angle	0° Offset angle	5° Offset angle	15° Offset angle	0° Offset angle	15° Offset angle
In-line installation (all sprays in one line)	**064.490.01.00** in combination with nozzle **6K3.XXX.27.00**	–	–	**069.490.01.00** in combination with nozzle **6K4.XXX.27.00**	–	–	**06S.J90.01.00** in combination with nozzle **6KJ.XXX.27.00**	–
Standard installation (all sprays turned parallel in one direction)	–	**064.490.01.00** in combination with nozzle **6K3.XXX.27.05**	**064.490.01.00** in combination with nozzle **6K3.XXX.27.15**	–	**069.490.01.00** in combination with nozzle **6K4.XXX.27.05**	**069.490.01.00** in combination with nozzle **6K4.XXX.27.15**	–	**06S.J90.01.00** in combination with nozzle **6KJ.XXX.27.15**
Chevron design (half of the sprays turned outwards in opposite directions, center perpendicular)	–	one half: **064.490.01.00** other half: **064.490.01.08** center: **064.490.01.05** in combination with nozzle **6K3.XXX.27.05**	one half: **064.490.01.00** other half: **064.490.01.01** center: **064.490.01.02** in combination with nozzle **6K3.XXX.27.15**	–	one half: **069.490.01.00** other half: **069.490.01.08** center: **069.490.01.05** in combination with nozzle **6K4.XXX.27.05**	one half: **069.490.01.00** other half: **069.490.01.01** center: **069.490.01.02** in combination with nozzle **6K4.XXX.27.15**	others on request	others on request

The alignment tip is inserted into the flat nipple opening. A ruler (or similar) can now be used to easily bring the nipples into the correct parallel positions where they can be tack welded in place (see Fig. 3).The alignment tips (see Fig. 2) can also be used as a dummy part for hydrostatic pressure testing.

Fig. 2

Fig. 3



QUESTIONNAIRE FOR NOZZLE ARRANGEMENT

We will be happy to advise you on how to achieve the best descaling results with minimum energy input. Simply fill out the form and send it to the relevant email address on the last page.

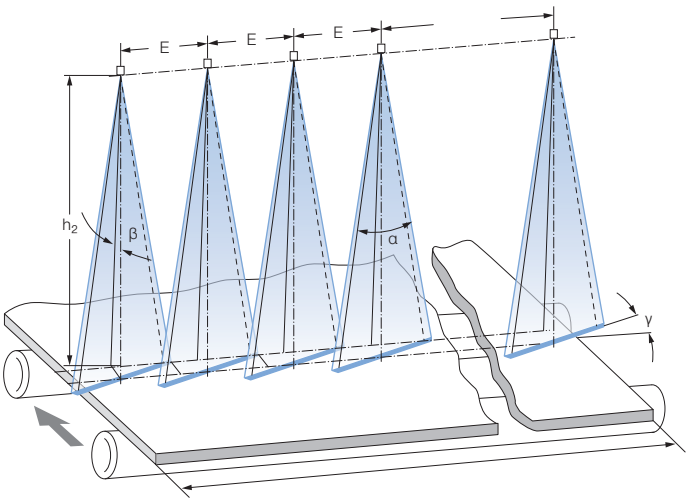
Company

Responsible

Adress

Phone

Email



Questionnaire on existing descaling nozzle arrangement

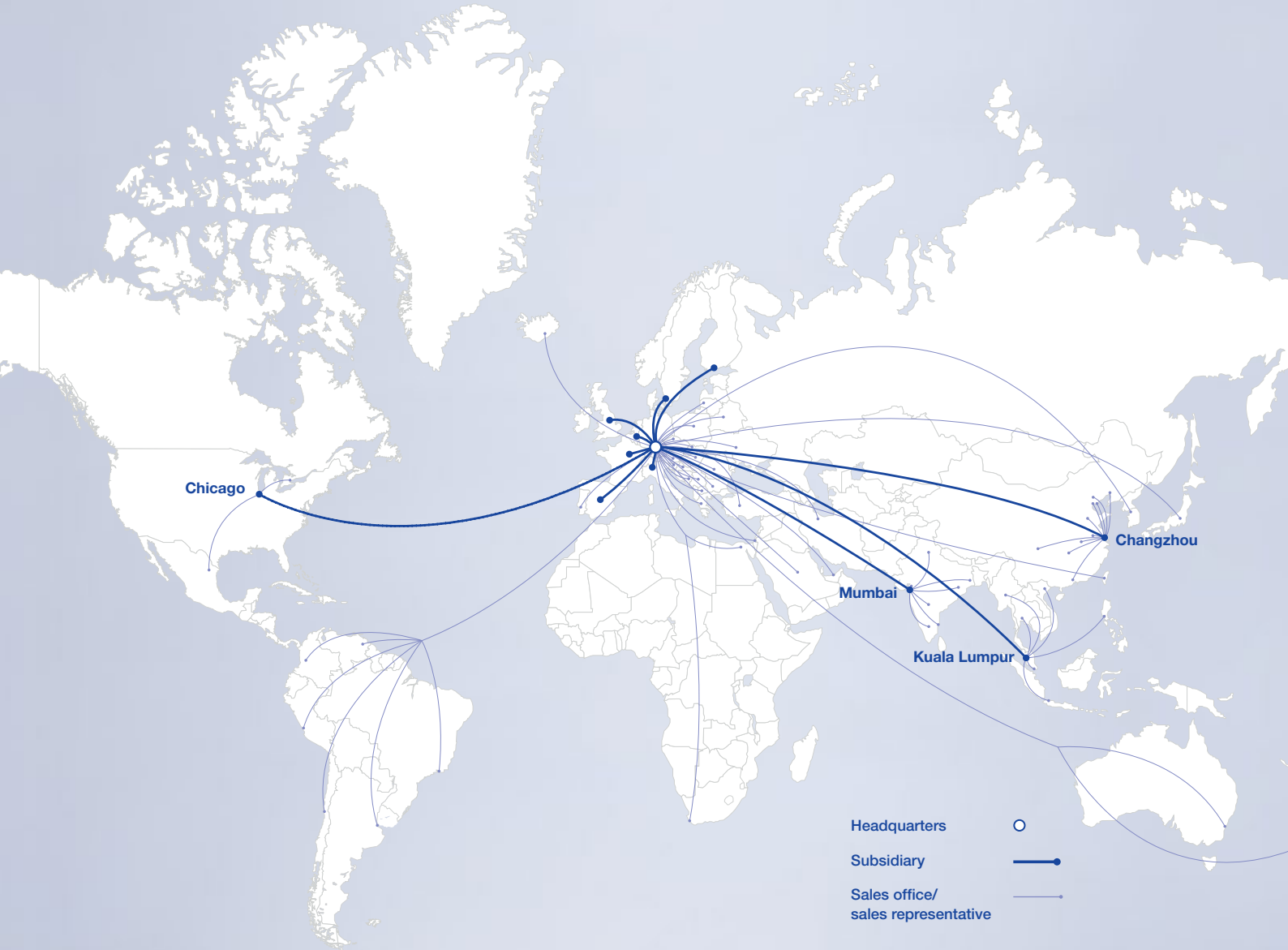
Name:		Date:		Department:	
Location of descaling installation:	☐ Behind the furnace	☐ RSB	☐ FSB	☐ Interstand descaling	
Format	**Dimensions [mm]**		**Nozzle data**	top	bottom
Strip			Number of headers		
Slab			Nozzle type		
Plate			Horizontal distance (E)	[mm]	[mm]
Bloom			Number of nozzles		
Billet			Vertical spray height (h_2)	[mm]	[mm]
Rounds			Spray angle (α)	[°]	[°]
Material speed	[m/s]		Offset angle (γ)	[°]	[°]
Pressure at header	[bar]		Impingement angle (β)	[°]	[°]
Available max. water flow	[l/min]				
	[l/h]				
Space for sketch:					

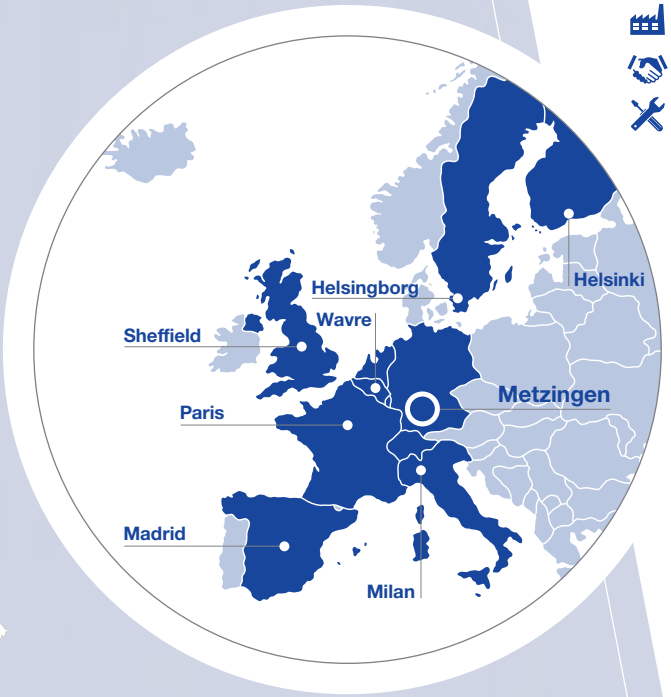
Good to know

You can also enter the required data online – either via the QR code on the right.
lechler-event.de/r/nozzlearrangement

METALLURGICAL SPRAY APPLICATIONS

WE HAVE THE WORLD COVERED





Headquarters
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Subsidiary
Sales office/sales representative

Full range from one source

Precise spray applications play a crucial part in many areas of steel production and non-ferrous metallurgy: from cooling in continuous casting processes and roller cooling through to descaling and strip treatment. Lechler offers special nozzles made of a wide range of different materials to cover all applications. The focus is always on achieving the optimum result with the lowest possible consumption of energy and spray media – thus also significantly reducing the overall carbon footprint.

Global representation

We are at home right at the heart of Europe. In Metzingen, Germany, we have developed unique expertise in planning, calculation and realization of metallurgical spray applications. From here, we support you with our highly qualified experts and sales partners all over the world.

We do not just see ourselves as a supplier, however. Because we also support you in process optimization on-site. Thanks to our international network of production locations, subsidiaries and sales offices/sales representatives, we can always guarantee fast part availability and short distances for service work. Contact us and experience this for yourself. We look forward to hearing from you.

Germany
Lechler GmbH
Ulmer Strasse 128
72555 Metzingen
Phone +49 7123 962-0
info@lechler.de

China
Lechler Nozzle Systems (Changzhou) Co., Ltd.
No.99 Decheng Rd, Jintan
Changzhou, JS 213200, P.R.C
Phone +86 400-004-1879
info@lechler.com.cn

India
Lechler (India) Pvt. Ltd.
Plot B-2
Main Road
Wagle Industrial Estate Thane
400604 Maharashtra
Phone +91 22 40634444
lechler@lechlerindia.com

USA
Lechler Inc.
445 Kautz Road
St. Charles, IL 60174
Phone +1 630 3776611
info@lechlerusa.com

ASEAN
Lechler Spray Technology Sdn. Bhd.
No. 22, Jalan Astaka 4B/KU2
Bandar Bukit Raja
41050 Klang, Selangor
Malaysia
Phone +603 3359 1118
info@lechler.com.my

Belgium
Lechler S.A./N.V.
Avenue Newton 4
1300 Wavre
Phone +32 10 225022
info@lechler.be

Finland
Lechler Oy
Ansatie 6 a C 3 krs
01740 Vantaa
Phone +358 207 856880
info@lechler.fi

France
Lechler France SAS
Parc de la Haute Maison
6, Allée Képler, Bâtiment C2
77420 Champs-sur-Marne
Phone +33 1 49882600
info@lecher.fr

Great Britain
Lechler Ltd.
1 Fell Street, Newhall
Sheffield, S9 2TP
Phone +44 114 2492020
info@lechler.com

Italy
Lechler Spray Technology S.r.l.
Via Don Dossetti, 2
20074 Carpiano (Mi)
Phone +39 02 98859027
info@lechleritalia.com

Spain
Lechler, S.A.
C / Isla de Hierro, 7 – Oficina 1.3
28703 San Sebastián de los Reyes (Madrid)
Phone +34 91 6586346
info@lechler.es

Sweden
Lechler AB
Hävertgatan 29
254 42 Helsingborg
Phone +46 18 167030
info@lechler.se

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Lechler GmbH · Precision Nozzles · Nozzle Systems
Ulmer Strasse 128 · 72555 Metzingen, Germany · Phone +49 7123 962-0 · info@lechler.de · www.lechler.com

ASEAN: Lechler Spray Technology Sdn. Bhd. • 22, Jln. Astaka 4B/KU2 • Bdr. Bukit Raja • 41050 Klang • Malaysia • Phone +603 3359 1118 • info@lechler.com.my
Belgium: Lechler S.A./N.V. • Avenue Newton 4 • 1300 Wavre • Phone +32 10 225022 • info@lechler.be
China: Lechler Nozzle Systems (Changzhou) Co., Ltd. • No.99 Decheng Rd, Jintan, Changzhou, JS 213200, P.R.C • Phone +86 400-004-1879 • info@lechler.com.cn
Finland: Lechler Oy • Ansatie 6 a C 3 krs • 01740 Vantaa • Phone +358 207 856880 • info@lechler.fi
France: Lechler France SAS • Parc de la Haute Maison • 6, Allée Képler, Bâtiment C2 • 77420 Champs-sur-Marne • Phone +33 1 49882600 • info@lechler.fr
Great Britain: Lechler Ltd. • 1 Fell Street, Newhall • Sheffield, S9 2TP • Phone +44 114 2492020 • info@lechler.com
India: Lechler (India) Pvt. Ltd. • Plot B-2 • Main Road • Wagle Industrial Estate Thane • 400604 Maharashtra • Phone +91 22 40634444 • lechler@lechlerindia.com
Italy: Lechler Spray Technology S.r.l. • Via Don Dossetti, 2 • 20074 Carpiano (Mi) • Phone +39 02 98859027 • info@lechleritalia.com
Spain: Lechler, S.A. • C / Isla de Hierro, 7 – Oficina 1.3 • 28703 San Sebastián de los Reyes (Madrid) • Phone +34 91 6586346 • info@lechler.es
Sweden: Lechler AB • Hävertgatan 29 • 254 42 Helsingborg • Phone +46 18 167030 • info@lechler.se
USA: Lechler Inc. • 445 Kautz Road • St. Charles, IL 60174 • Phone +1 630 3776611 • info@lechlerusa.com

Edition 04/25 · EN · PDF · www.dgm-kommunikation.de

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