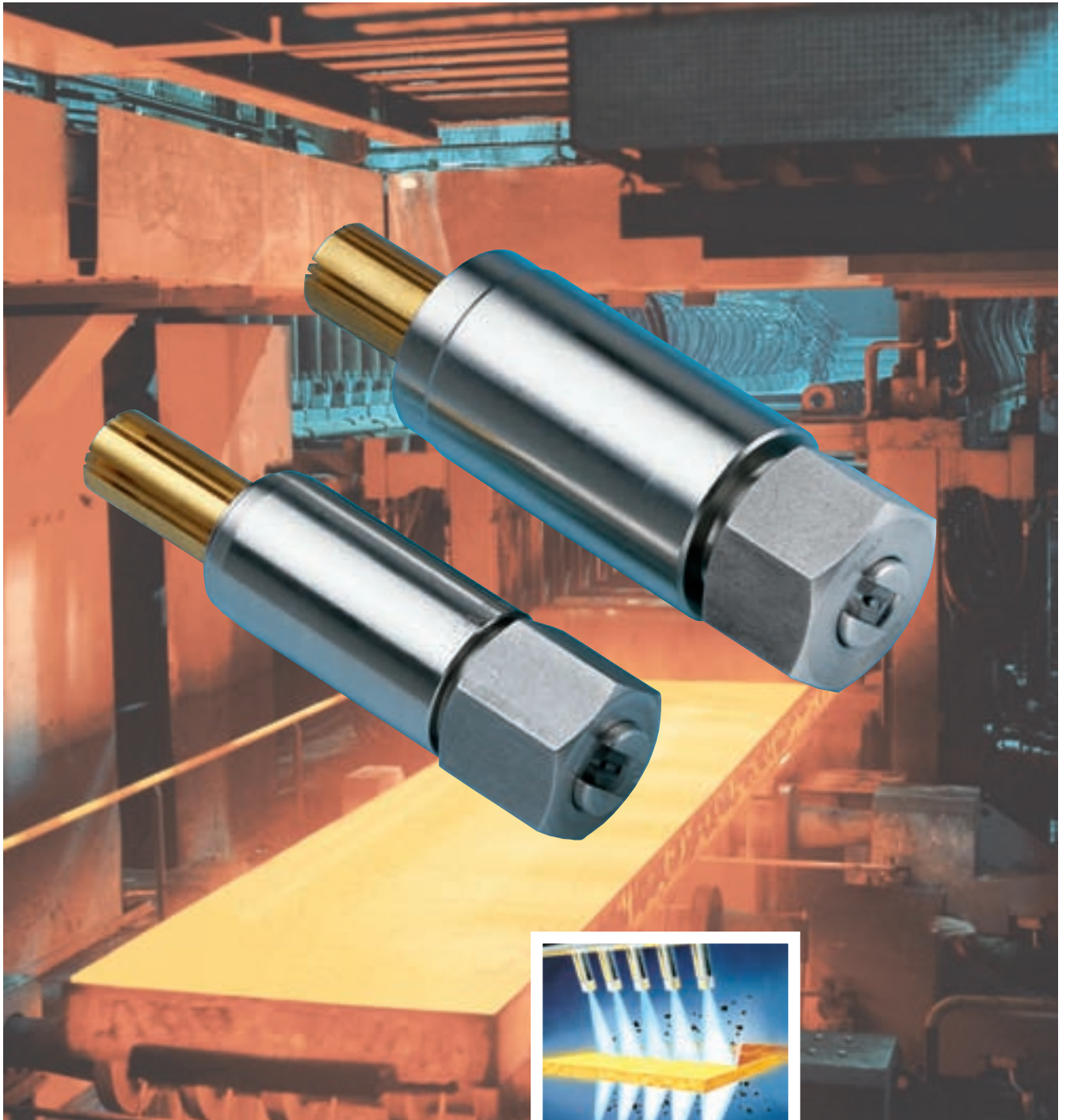




**SCALEMASTER® HP**  
**»High Performance«**



# SCALEMASTER® HP »High Performance« Descaling Nozzles with Distinctive Advantages

As a result of greater demands on product surface quality and plant efficiency, descaling systems need to perform more effectively and economically than in the past.

The key to improving a descaling process centers on the spray and the nozzle which produces it.

Improvements in the nozzle and spray designs should be focussed on:

- Improving the product quality
- Reducing operating costs
- Reducing chilling of the product by the sprays
- Reducing the pump energy consumption

The SCALEMASTER® system is essential for highly efficient and successful descaling, having been installed in over 200 sites world-wide.

**The success of the SCALEMASTER® has led to the development of the new SCALEMASTER® HP (High Performance).**

The most obvious benefit for the user of the SCALEMASTER® HP is its significantly increased spray impact density providing even better descaling and higher surface quality.

**All components are designed to produce a spray that focusses and concentrates the water energy for maximum impact.**

The SCALEMASTER® HP nozzle tips form a perfectly defined, razor sharp spray jet.

Critical elements in the design of the new SCALEMASTER® HP are the following parameters:

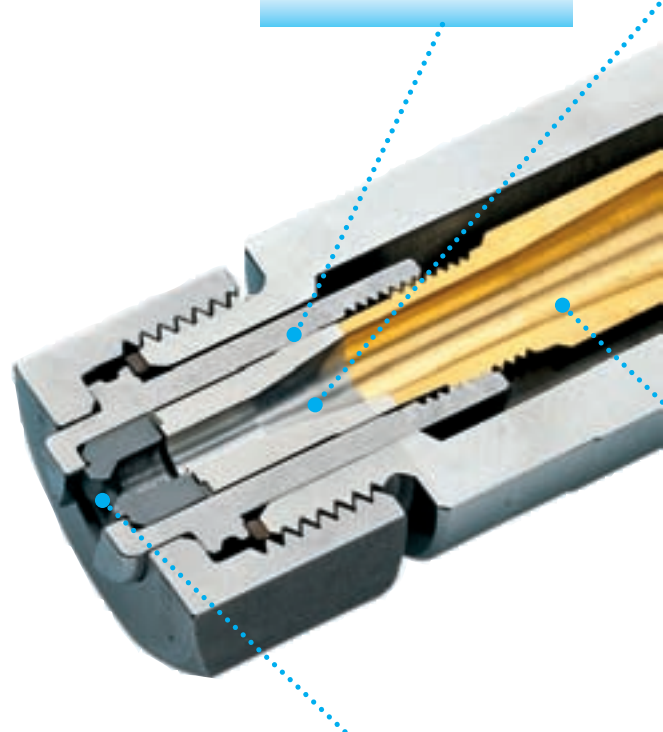
- Even impact distribution of each individual spray on the target surface
- Spray angle
- Spray thickness
- Flow rate

Additionally the new SCALEMASTER® HP is produced within tight tolerances for reproducible operating conditions.

**Utilising LECHLER's computer-based modelling techniques, we are the first spray nozzle manufacturer who can achieve totally predictable results by optimizing nozzle arrangements and header layouts.**

Many rolling mills throughout the world have profited from these computer models, by improving product quality and reducing costs.

**The nozzle tips of the SCALEMASTER® HP and MiniSCALEMASTER® HP are interchangeable with those of the standard SCALEMASTER® and MiniSCALEMASTER®**



**Improved nozzle geometries within the orifice and flow zone  
→ reduces wear and improves jet quality**

**Optimized parameters in  
water flow zone**  
⇒ maximised water velocity

**Reduced stabilizer wall  
thickness**  
⇒ reduces flow resistance

**Larger flow zone**  
⇒ reduces turbulence and  
improves laminar flow.

### **Lechler Descaling Pressure Gauge for precise pressure data**

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 in instead.

With the exact value of the water pressure available at the nozzle a much more accurate simulation of the existing situation and the proposed modification can be made with the Lechler DESCALE software. It is also possible to detect potential pressure losses in the pipe work.



Lechler descaling pressure gauge  
Ordering-no. 06P.M00

# Standard SCALEMASTER® HP Series 682

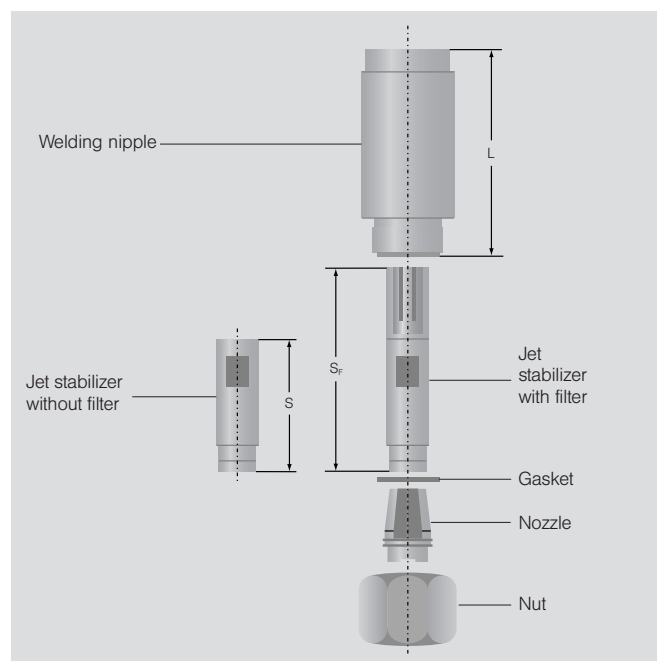
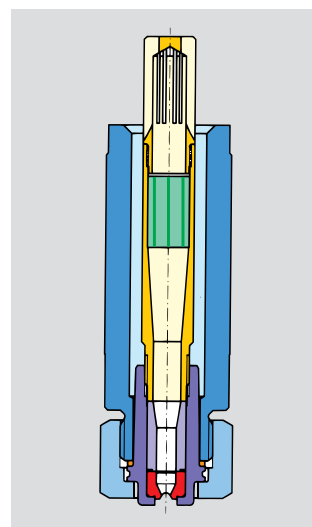
The descaling system is available from LECHLER in two distinct designs: The larger 682 series SCALEMASTER® HP and the compact 642 series MiniSCALEMASTER® HP.

The 682 series is designed for use where there are no limitations on available space.

Flow rates and spray angles are determined by the nozzle tips, an identical range being available for both systems.

The minimum pitch (E) between nozzles is determined by the tip retaining nut. For the SCALEMASTER® HP the minimum pitch, using the standard nut (product no. 069.400.11) is 63 mm).

If a closer nozzle pitch is required, LECHLER offers a special retaining nut (product no. 069.402.11). This allows a minimum pitch of 50 mm.



| Component                                                           |                                  | Ordering No.            | Weight [kg] |
|---------------------------------------------------------------------|----------------------------------|-------------------------|-------------|
| Welding nipple<br>Material:<br>AISI 304                             | Length: L = 120 mm               | 069.411.1C.00           | 0.830       |
|                                                                     | L = 100 mm                       | 069.410.1C.00           | 0.690       |
|                                                                     | L = 73 mm                        | 069.410.1C.73           | 0.480       |
| Jet stabilizer<br>Material<br>Brass                                 | without filter S = 74            | 064.231.16              | 0.070       |
|                                                                     | without filter S = 94            | 064.233.16              | 0.080       |
|                                                                     | with filter S <sub>f</sub> = 110 | 064.250.16              | 0.110       |
|                                                                     | with filter S <sub>f</sub> = 130 | 064.252.16              | 0.140       |
|                                                                     | with filter S <sub>f</sub> = 150 | 064.253.16              | 0.160       |
| Gasket<br>Material: Copper                                          |                                  | 095.015.34.04.02.0      | 0.004       |
| Nozzle                                                              |                                  | 682.XXX.XX<br>see table | 0.085       |
| Nut<br>(Standard)<br>Material:<br>AISI 431                          | Hex 41                           | 069.400.11              | 0.153       |
| Nut with<br>hexagon socket<br>Material:<br>AISI 431                 | Hex 24/36<br>see page 5          | 069.402.11              | 0.240       |
| Alignment tip/<br>Blank tip<br>(see page 9)<br>Material: Mild steel | Data sheet<br>on request         | 069.490.01              | 0.072       |
| Tip extractor<br>Material: AISI 440 B                               | Data sheet<br>on request         | 069.492.12.00.10.0      | 0.250       |
| Extraction tool                                                     | Data sheet<br>on request         | 095.009.00.12.56.0      | 0.950       |

Max. permissible operating pressure: 450 bar

# Standard SCALEMASTER® HP

## Flow Rate Chart

### Ordering Data

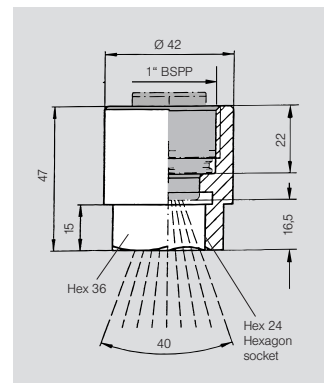
| Ordering No. |             |     |     |     |                                              | Flow rate for water (V)   |                           |                |                           |                |         |
|--------------|-------------|-----|-----|-----|----------------------------------------------|---------------------------|---------------------------|----------------|---------------------------|----------------|---------|
| Type         |             |     |     |     | Mat-<br>No.<br><br>Tungsten<br>carbide<br>27 |                           |                           |                |                           |                |         |
| Series       | Code        |     |     |     |                                              | p = 100 bar<br>(1450 psi) | p = 200 bar<br>(2900 psi) |                | p = 400 bar<br>(5800 psi) |                |         |
|              | Spray angle |     |     |     |                                              |                           | [l/min]                   | [US Gall./min] | [l/min]                   | [US Gall./min] | [l/min] |
|              | 22°         | 26° | 30° | 40° |                                              |                           |                           |                |                           |                |         |
| 682          | 495         | 496 | 497 | 498 | ○                                            | 12.00                     | 3.17                      | 16.97          | 4.50                      | 24.00          | 6.34    |
| 682          | 535         | 536 | 537 | 538 | ○                                            | 15.00                     | 3.96                      | 21.21          | 5.60                      | 30.00          | 7.92    |
| 682          | 565         | 566 | 567 | 568 | ○                                            | 18.00                     | 4.76                      | 25.46          | 6.73                      | 36.00          | 9.52    |
| 682          | 605         | 606 | 607 | 608 | ○                                            | 23.00                     | 6.08                      | 32.53          | 9.39                      | 46.00          | 12.16   |
| 682          | 645         | 646 | 647 | 648 | ○                                            | 28.00                     | 7.40                      | 39.60          | 10.46                     | 56.00          | 14.80   |
| 682          | 685         | 686 | 687 | 688 | ○                                            | 36.00                     | 9.51                      | 50.91          | 13.45                     | 72.00          | 19.02   |
| 682          | 725         | 726 | 727 | 728 | ○                                            | 45.00                     | 11.89                     | 63.64          | 16.81                     | 90.00          | 23.78   |
| 682          | 765         | 766 | 767 | 768 | ○                                            | 58.00                     | 15.32                     | 82.02          | 21.67                     | 116.00         | 30.64   |
| 682          | 805         | 806 | 807 | 808 | ○                                            | 72.00                     | 19.02                     | 101.82         | 26.90                     | 144.00         | 38.04   |
| 682          | 845         | 846 | 847 | 848 | ○                                            | 89.00                     | 23.51                     | 125.87         | 33.25                     | 178.00         | 47.02   |
| 682          | 885         | 886 | 887 | 888 | ○                                            | 112.00                    | 29.59                     | 158.39         | 41.85                     | 224.00         | 59.18   |
| 682          | -           | 906 | 907 | 908 | ○                                            | 125.00                    | 33.03                     | 176.78         | 46.70                     | 250.00         | 66.06   |
| 682          | -           | 916 | 917 | 918 | ○                                            | 134.00                    | 35.40                     | 189.50         | 50.07                     | 268.00         | 70.80   |

**Example** Series + Code + Mat.-No. = Ordering No.  
for Ordering: 682 + 495 + 27 = 682.495.27

**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**

### Dimensions

| Type<br>(Spray angle<br>22°) | E<br>Ø [mm] | A<br>Ø [mm] | Type<br>(Spray angle<br>26°) | E<br>Ø [mm] | A<br>Ø [mm] | Type<br>(Spray angle<br>30°) | E<br>Ø [mm] | A<br>Ø [mm] | Type<br>(Spray angle<br>40°) | E<br>Ø [mm] | A<br>Ø [mm] |
|------------------------------|-------------|-------------|------------------------------|-------------|-------------|------------------------------|-------------|-------------|------------------------------|-------------|-------------|
| 682.495                      | 1.20        | 1.50        | 682.496                      | 1.17        | 1.50        | 682.497                      | 1.16        | 1.50        | 682.498                      | 1.11        | 1.50        |
| 682.535                      | 1.40        | 1.75        | 682.536                      | 1.30        | 1.75        | 682.537                      | 1.30        | 1.75        | 682.538                      | 1.20        | 1.75        |
| 682.565                      | 1.60        | 2.00        | 682.566                      | 1.50        | 2.00        | 682.567                      | 1.40        | 2.00        | 682.568                      | 1.20        | 2.00        |
| 682.605                      | 1.80        | 2.10        | 682.606                      | 1.70        | 2.10        | 682.607                      | 1.60        | 2.10        | 682.608                      | 1.50        | 2.10        |
| 682.645                      | 2.00        | 2.50        | 682.646                      | 1.90        | 2.50        | 682.647                      | 1.80        | 2.50        | 682.648                      | 1.60        | 2.50        |
| 682.685                      | 2.20        | 2.80        | 682.686                      | 2.20        | 2.80        | 682.687                      | 2.10        | 2.80        | 682.688                      | 2.00        | 2.80        |
| 682.725                      | 2.50        | 3.00        | 682.726                      | 2.40        | 3.00        | 682.727                      | 2.30        | 3.00        | 682.782                      | 1.90        | 3.00        |
| 682.765                      | 2.80        | 3.50        | 682.766                      | 2.50        | 3.50        | 682.767                      | 2.40        | 3.50        | 682.768                      | 2.30        | 3.50        |
| 682.805                      | 3.20        | 3.80        | 682.806                      | 3.00        | 3.80        | 682.807                      | 2.90        | 3.80        | 682.808                      | 2.70        | 3.80        |
| 682.845                      | 3.50        | 4.30        | 682.846                      | 3.50        | 4.30        | 682.847                      | 3.20        | 4.30        | 682.848                      | 3.00        | 4.30        |
| 682.885                      | 3.90        | 4.70        | 682.886                      | 3.90        | 4.70        | 682.887                      | 3.70        | 4.70        | 682.888                      | 3.40        | 4.70        |
|                              |             |             | 682.906                      | 4.00        | 5.00        | 682.907                      | 3.90        | 5.00        | 682.908                      | 3.70        | 5.00        |
|                              |             |             | 682.916                      | 4.20        | 5.20        | 682.917                      | 4.00        | 5.20        | 682.918                      | 3.80        | 5.20        |

A = equivalent bore diameter · E = narrowest cross section

# MiniSCALEMASTER® HP

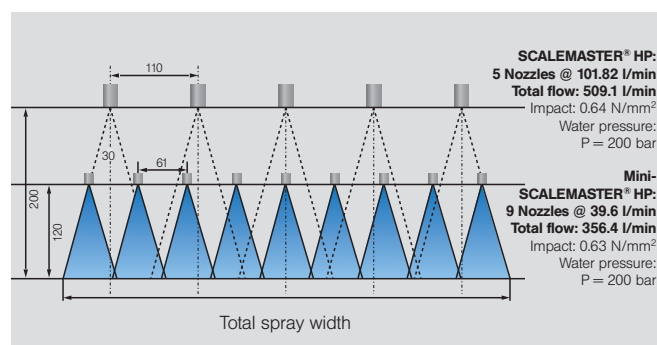
## Compact Nozzle System for Lower Spray Heights

### Series 642

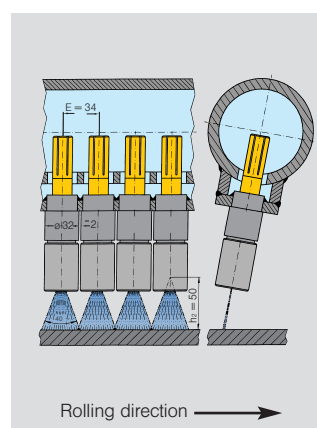
The MiniSCALEMASTER® HP (642 Series) is a compact system for use where lower spray heights are necessary. Such as in the descaling of thin slabs, beam blanks, rails, billets and rounds.

The minimum spray height ( $h_2$ ) is normally 50 mm, because the nozzles cannot be physically placed closer together.

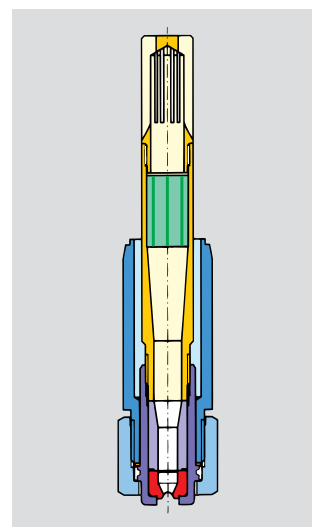
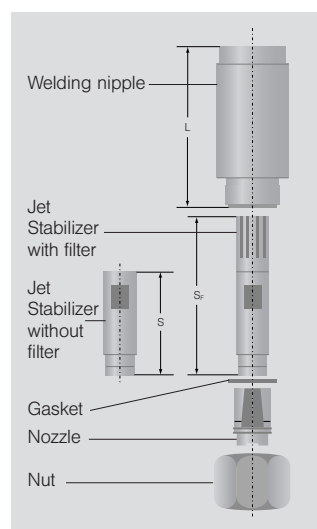
If a spray height of less than 50 mm is required, LECHLER offers a special retaining nut (product no. 064.401.11). (See below)



An example of saving water by using MiniSCALEMASTER® HP



Possible arrangement of welding nipples for MiniSCALEMASTER® HP (with hexagon socket)



| Component                                                           |                                  | Ordering-No.            | Weight [kg] |
|---------------------------------------------------------------------|----------------------------------|-------------------------|-------------|
| Welding nipple<br>Material:<br>AISI 304                             | Length: L = 32 mm                | 060.020.1C.01           | 0.065       |
|                                                                     | L = 39 mm                        | 060.020.1C.00           | 0.082       |
|                                                                     | L = 80 mm                        | 060.020.1C.02           | 0.192       |
| Jet stabilizer<br>Material:<br>Brass                                | without filter S = 74            | 064.231.16              | 0.070       |
|                                                                     | without filter S = 94            | 064.233.16              | 0.080       |
|                                                                     | with filter S <sub>F</sub> = 110 | 064.250.16              | 0.110       |
|                                                                     | with filter S <sub>F</sub> = 130 | 064.252.16              | 0.140       |
|                                                                     | with filter S <sub>F</sub> = 150 | 064.253.16              | 0.160       |
| Gasket<br>Material: Copper                                          |                                  | 095.015.34.02.07.0      | 0.001       |
| Nozzle                                                              |                                  | 642.XXX.XX<br>see table | 0.067       |
| Nut<br>(Standard)<br>Material:<br>AISI 431                          | Hex 32                           | 064.400.11              | 0.085       |
| Nut with<br>hexagonal socket<br>Material:<br>AISI 431               | Hex 22                           | 064.401.11              | 0.120       |
| Alignment tip/<br>blank tip<br>(see page 9)<br>Material: Mild steel | Data sheet<br>on request         | 064.490.01              | 0.056       |
| Tip extractor<br>Material: AISI 440 B                               | Data sheet<br>on request         | 064.492.12.00.10.0      | 0.210       |
| Extraction tool                                                     | Data sheet<br>on request         | 095.009.00.12.56.0      | 0.950       |

Max. permissible operating pressure: 450 bar

# MiniSCALEMASTER® HP

## Flow Rate Chart

### Ordering Data

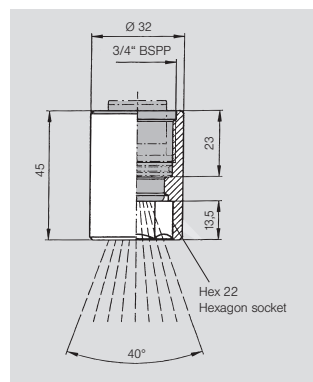
| Ordering No. |             |     |     |     |                                        | Flow rate for water (V̇)  |                           |                           |                |         |                |
|--------------|-------------|-----|-----|-----|----------------------------------------|---------------------------|---------------------------|---------------------------|----------------|---------|----------------|
| Type         |             |     |     |     | Mat.-No.<br><br>Tungsten carbide<br>27 |                           |                           |                           |                |         |                |
| Series       | Code        |     |     |     |                                        | p = 100 bar<br>(1450 psi) | p = 200 bar<br>(2900 psi) | p = 400 bar<br>(5800 psi) |                |         |                |
|              | Spray angle |     |     |     |                                        |                           |                           |                           |                |         |                |
|              | 22°         | 26° | 30° | 40° |                                        | [l/min]                   | [US Gall./min]            | [l/min]                   | [US Gall./min] | [l/min] | [US Gall./min] |
| 642          | 495         | 496 | 497 | 498 | ○                                      | 12.00                     | 3.17                      | 16.97                     | 4.50           | 24.00   | 6.34           |
| 642          | 535         | 536 | 537 | 538 | ○                                      | 15.00                     | 3.96                      | 21.21                     | 5.60           | 30.00   | 7.92           |
| 642          | 565         | 566 | 567 | 568 | ○                                      | 18.00                     | 4.76                      | 25.46                     | 6.73           | 36.00   | 9.52           |
| 642          | 605         | 606 | 607 | 608 | ○                                      | 23.00                     | 6.08                      | 32.53                     | 9.39           | 46.00   | 12.16          |
| 642          | 645         | 646 | 647 | 648 | ○                                      | 28.00                     | 7.40                      | 39.60                     | 10.46          | 56.00   | 14.80          |
| 642          | 685         | 686 | 687 | 688 | ○                                      | 36.00                     | 9.51                      | 50.91                     | 13.45          | 72.00   | 19.02          |
| 642          | 725         | 726 | 727 | 728 | ○                                      | 45.00                     | 11.89                     | 63.64                     | 16.81          | 90.00   | 23.78          |
| 642          | 765         | 766 | 767 | 768 | ○                                      | 58.00                     | 15.32                     | 82.02                     | 21.67          | 116.00  | 30.64          |
| 642          | 805         | 806 | 807 | 808 | ○                                      | 72.00                     | 19.02                     | 101.82                    | 26.90          | 144.00  | 38.04          |
| 642          | 845         | 846 | 847 | 848 | ○                                      | 89.00                     | 23.51                     | 125.87                    | 33.25          | 178.00  | 47.02          |
| 642          | 885         | 886 | 887 | 888 | ○                                      | 112.00                    | 29.59                     | 158.39                    | 41.85          | 224.00  | 59.18          |
| 642          | -           | 906 | 907 | 908 | ○                                      | 125.00                    | 33.03                     | 176.78                    | 46.70          | 250.00  | 66.06          |
| 642          | -           | 916 | 917 | 918 | ○                                      | 134.00                    | 35.40                     | 189.50                    | 50.07          | 268.00  | 70.80          |

**Example** Series + Code + Mat.-No. = Ordering No.  
for Ordering: 642 + 495 + 27 = 642.495.27

**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.: 064.401.11**

### Dimensions

| Type<br>(Spray angle<br>22°) | E<br>Ø [mm] | A<br>Ø [mm] | Type<br>(Spray angle<br>26°) | E<br>Ø [mm] | A<br>Ø [mm] | Type<br>(Spray angle<br>30°) | E<br>Ø [mm] | A<br>Ø [mm] | Type<br>(Spray angle<br>40°) | E<br>Ø [mm] | A<br>Ø [mm] |
|------------------------------|-------------|-------------|------------------------------|-------------|-------------|------------------------------|-------------|-------------|------------------------------|-------------|-------------|
| 642.495                      | 1.20        | 1.50        | 642.496                      | 1.17        | 1.50        | 642.497                      | 1.16        | 1.50        | 642.498                      | 1.11        | 1.50        |
| 642.535                      | 1.40        | 1.75        | 642.536                      | 1.30        | 1.75        | 642.537                      | 1.30        | 1.75        | 642.538                      | 1.20        | 1.75        |
| 642.565                      | 1.60        | 2.00        | 642.566                      | 1.50        | 2.00        | 642.567                      | 1.40        | 2.00        | 642.568                      | 1.20        | 2.00        |
| 642.605                      | 1.80        | 2.10        | 642.606                      | 1.70        | 2.10        | 642.607                      | 1.60        | 2.10        | 642.608                      | 1.50        | 2.10        |
| 642.645                      | 2.00        | 2.50        | 642.646                      | 1.90        | 2.50        | 642.647                      | 1.80        | 2.50        | 642.648                      | 1.60        | 2.50        |
| 642.685                      | 2.20        | 2.80        | 642.686                      | 2.20        | 2.80        | 642.687                      | 2.10        | 2.80        | 642.688                      | 2.00        | 2.80        |
| 642.725                      | 2.50        | 3.00        | 642.726                      | 2.40        | 3.00        | 642.727                      | 2.30        | 3.00        | 642.782                      | 1.90        | 3.00        |
| 642.765                      | 2.80        | 3.50        | 642.766                      | 2.50        | 3.50        | 642.767                      | 2.40        | 3.50        | 642.768                      | 2.30        | 3.50        |
| 642.805                      | 3.20        | 3.80        | 642.806                      | 3.00        | 3.80        | 642.807                      | 2.90        | 3.80        | 642.808                      | 2.70        | 3.80        |
| 642.845                      | 3.50        | 4.30        | 642.846                      | 3.50        | 4.30        | 642.847                      | 3.20        | 4.30        | 642.848                      | 3.00        | 4.30        |
| 642.885                      | 3.90        | 4.70        | 642.886                      | 3.90        | 4.70        | 642.887                      | 3.70        | 4.70        | 642.888                      | 3.40        | 4.70        |
|                              |             |             | 642.906                      | 4.00        | 5.00        | 642.907                      | 3.90        | 5.00        | 642.908                      | 3.70        | 5.00        |
|                              |             |             | 642.916                      | 4.20        | 5.20        | 642.917                      | 4.00        | 5.20        | 642.918                      | 3.80        | 5.20        |

A = equivalent bore diameter · E = narrowest cross section

# Nozzle Arrangement on a Descaling Header

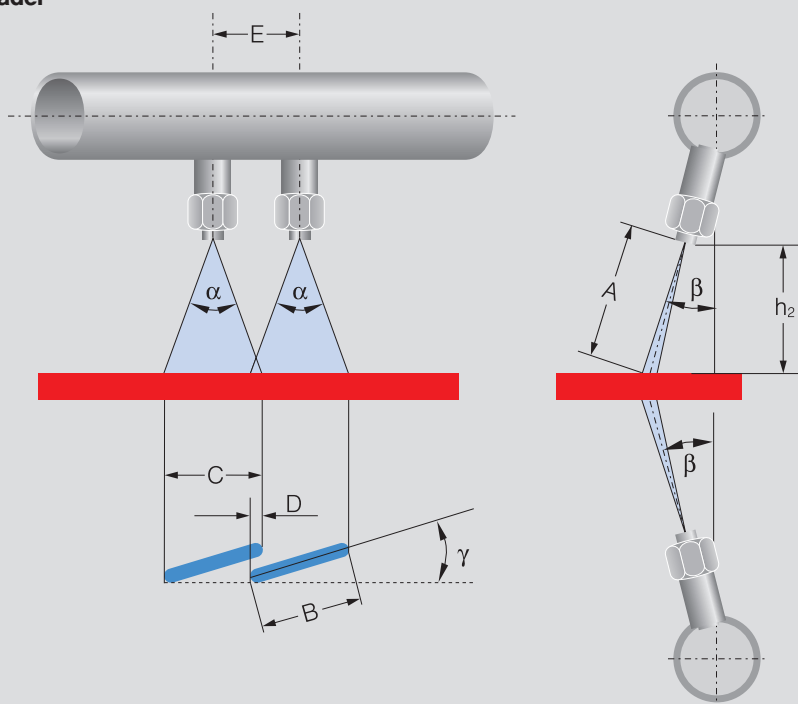
## Positioning of nozzles on a spray header

$$E = C - D$$

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

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

A = spray length  
B = spray width  
C = spray width in rolling direction  
D = overlap  
E = nozzle distance  
 $h_2$  = vertical spray height  
 $\alpha$  = nozzle spray angle  
 $\beta$  = angle of inclination  
 $\gamma$  = offset angle of nozzle against pipe roll axis



**Spray length (A), spray width (B, C), overlapping (D), nozzle distance (E) with vertical spray height ( $h_2$ ), nozzle spray angle ( $\alpha$ ) and angle of inclination ( $\beta$ )**

| Vertical spray height<br>$h_2$<br>[mm] | angle of inclination<br>$\beta = 15^\circ$<br>A<br>[mm] | Nominal nozzle spray angle $\alpha$ 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                  |
| 50                                     | 52                                                      | 28                                                   | 27.0  | - | -                  | 34                  | 32.7  | - | -                  | 38                  | 36.9  | - | -                  | 50                  | 47.3  | 4  | 43.8 <sup>2)</sup> |
| 75                                     | 78                                                      | 40                                                   | 38.8  | 4 | 34.8 <sup>1)</sup> | 48                  | 45.9  | 4 | 41.9 <sup>1)</sup> | 54                  | 52.3  | 4 | 48.3 <sup>2)</sup> | 71                  | 68.3  | 4  | 64.3               |
| 100                                    | 104                                                     | 52                                                   | 49.8  | 5 | 44.8 <sup>2)</sup> | 60                  | 57.7  | 5 | 52.7 <sup>3)</sup> | 69                  | 66.3  | 5 | 61.3 <sup>3)</sup> | 90                  | 87.2  | 5  | 82.2               |
| 150                                    | 155                                                     | 73                                                   | 70.0  | 5 | 65                 | 81                  | 78.3  | 5 | 73.3               | 94                  | 90.9  | 5 | 85.9               | 126                 | 121.2 | 8  | 113.2              |
| 175                                    | 181                                                     | 82                                                   | 79.4  | 5 | 74.4               | 91                  | 87.6  | 5 | 82.6               | 106                 | 102.2 | 5 | 97.2               | 142                 | 137.1 | 8  | 129.1              |
| 200                                    | 207                                                     | 92                                                   | 88.4  | 5 | 83.4               | 100                 | 96.6  | 5 | 91.6               | 117                 | 113.0 | 5 | 108                | 158                 | 152.4 | 10 | 142.4              |
| 225                                    | 233                                                     | 101                                                  | 96.9  | 5 | 91.9               | 109                 | 105.5 | 5 | 100.5              | 128                 | 123.5 | 5 | 118.5              | 174                 | 167.5 | 10 | 157.5              |
| 250                                    | 259                                                     | 109                                                  | 104.9 | 8 | 96.9               | 119                 | 114.3 | 8 | 106.3              | 139                 | 134.0 | 8 | 126                | 189                 | 182.4 | 12 | 170.4              |
| 270                                    | 280                                                     | 115                                                  | 110.6 | 8 | 102.6              | 126                 | 121.5 | 8 | 113.5              | 148                 | 142.4 | 8 | 134.4              | 202                 | 194.4 | 12 | 182.4              |
| 300                                    | 311                                                     | 123                                                  | 118.1 | 8 | 110.1              | 137                 | 132.5 | 8 | 124.5              | 161                 | 155.2 | 8 | 147.2              | 221                 | 212.5 | 15 | 197.5              |

<sup>1)</sup> Only MiniSCALEMASTER® HP with hexagon socket nut   <sup>2)</sup> Only MiniSCALEMASTER® HP   <sup>3)</sup> Standard SCALEMASTER® HP only with hexagon socket nut

## Explanation of the table:

### 1. Spray width:

The listed values are based on  $p = 150$  bar spray pressure. The convergence of the spray 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:

+  $3^\circ$  at  $\alpha = 22^\circ, 26^\circ$  and  $30^\circ$ ,  
+  $5^\circ$  at  $\alpha = 40^\circ$ .

Therefore B + C are minimum values.

# 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)

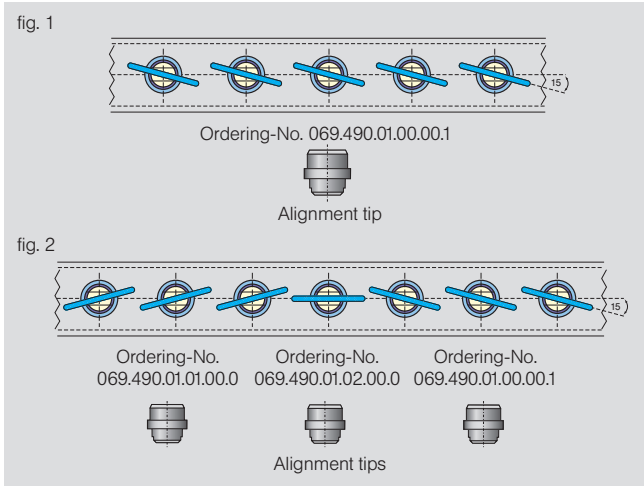
## Nozzle Arrangements

To guarantee the correct alignment of the nozzle tip (15 degree offset - see fig. 1, 2), the welding nipple must be positioned on the spray header such that the flats on the tip are parallel to the header longitudinal axis. We recommend that you do this with our alignment tip (fig. 1, 2, 4).

It ensures proper positioning of the nipple 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 nipple.

## 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 new 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 (Standard SCALEMASTER®) and 200 Nm (MiniSCALEMASTER®) 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. Once the cap is tightened, the nozzle is in the proper position.

## Equipment

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

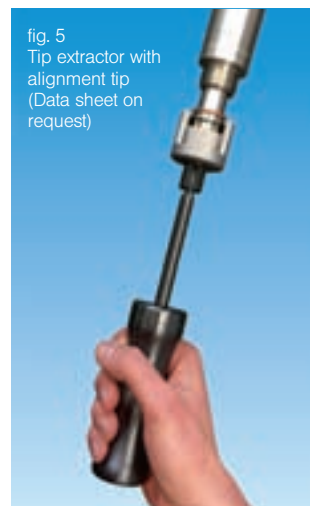
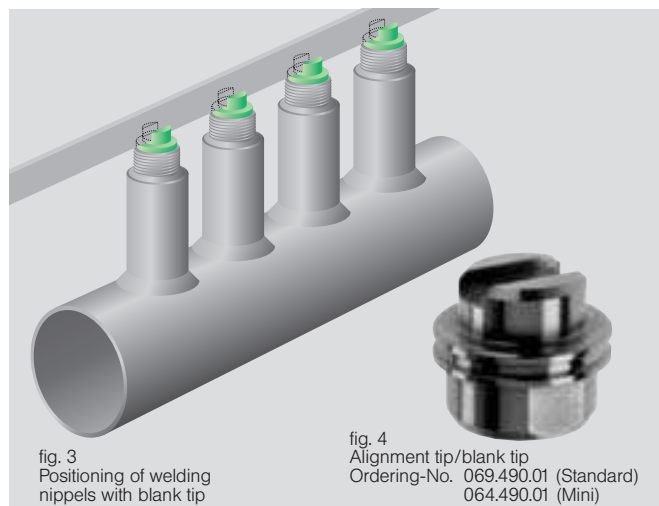
## General Information

### Flow Requirements

The flow velocity should not exceed 5 m/s in the water mains and 1 m/s 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.



## Improved Measurement Techniques - the Basis of Optimal Nozzle Design

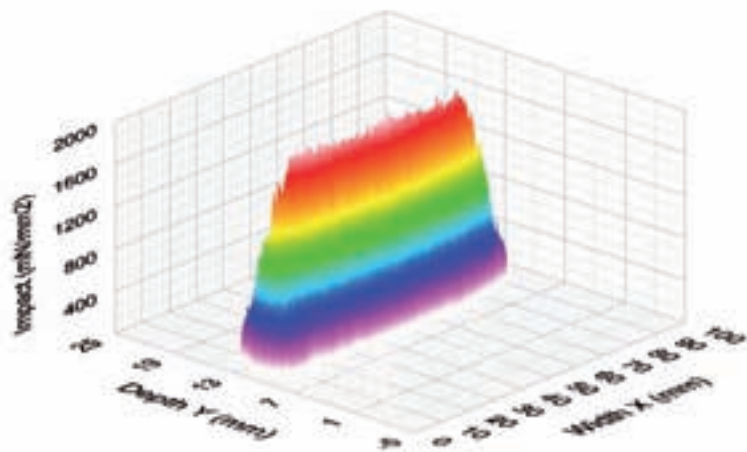
The basis for optimal design is the ability to accurately and precisely measure and analyse performance. LECHLER has developed the techniques to do this. Using these techniques, reliable data on volume, pressure, impact force and droplet size can be acquired in the design phase of nozzles.

This data is used directly in the development process to optimize product design and manufacture.

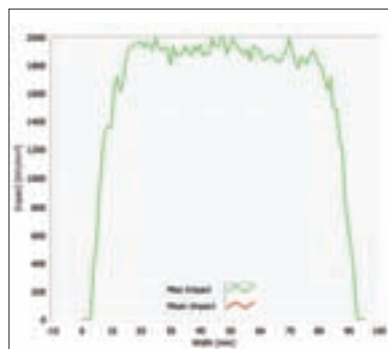
Important factors in the design and evaluation of descaling nozzles are impact and distribution.

The LECHLER computer aided measuring system can represent this in three dimensions.

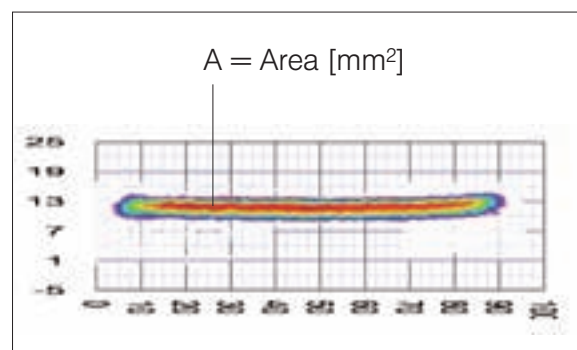
3D-diagrams enable us to represent the forces across the entire impact area.



3D measurement protocol, impact measurement



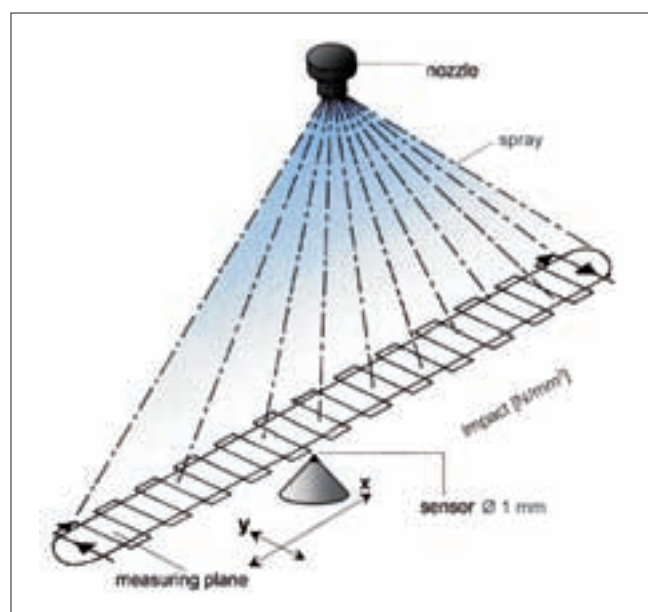
Impact distribution against spray width



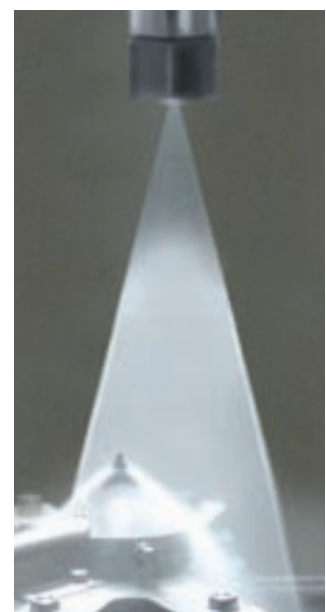
Spray foot print diagram

### Principal of operation for assessing Impact Force

LECHLER measures impact using a single point load cell which is traversed in a zig-zag-pattern through all areas of the spray, building up a precise image of all forces in the spray which are illustrated as a topographic view.



Measuring principle

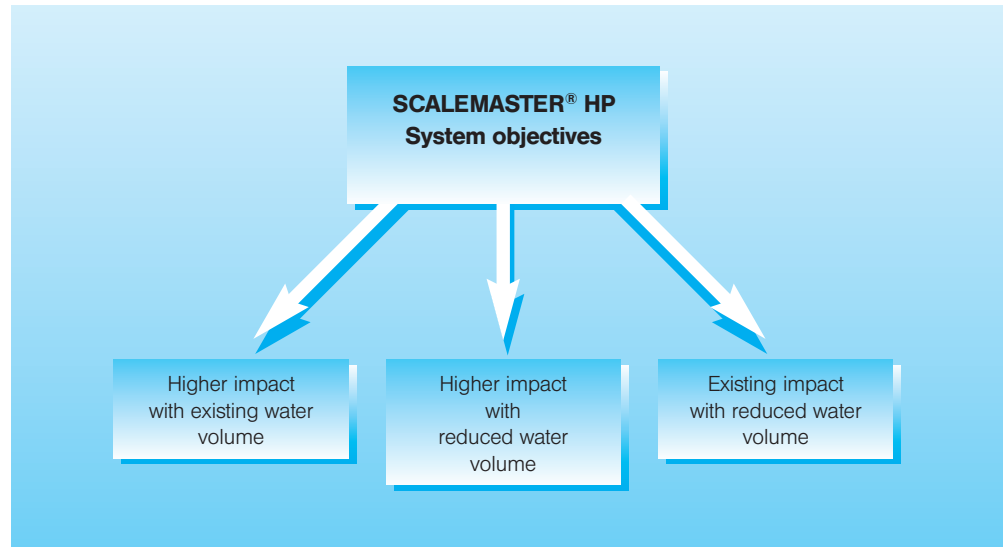


New impact measurement in operation

## Optimization of System Parameters with SCALEMASTER® HP

Optimising an existing system can be best achieved by targeting one of the three main design objectives (see diagram).

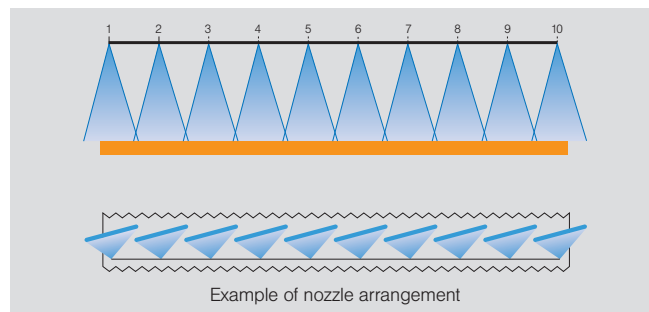
LECHLER will work with you to target the objectives at the beginning of an improvement project.



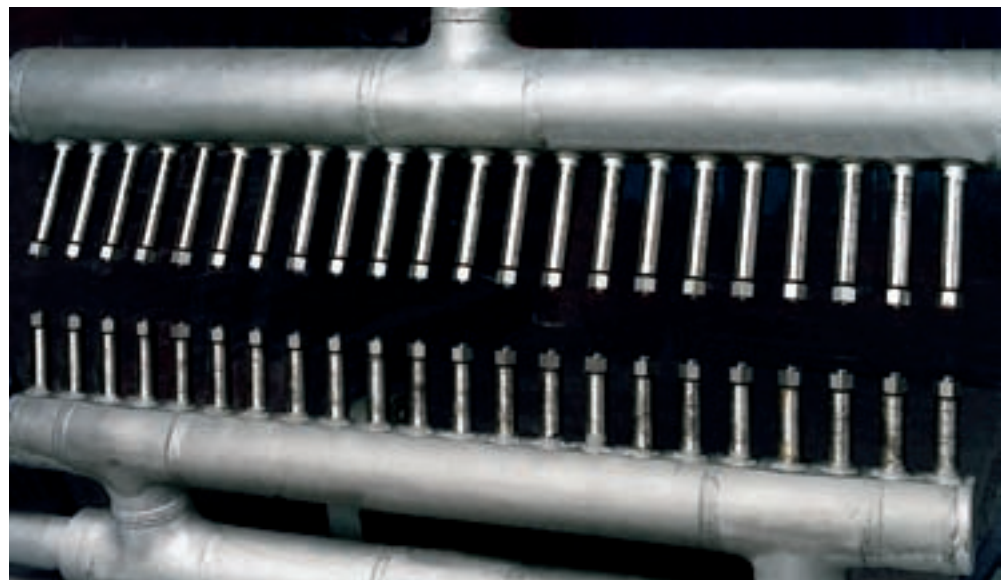
### Nozzle arrangements

LECHLER utilizes its own inhouse developed software to produce proposals quickly and economically.

**To receive a proposal from LECHLER, please complete the questionnaire at the back of this brochure and return it by telefax.**



Lechler designs and manufactures complete descaling systems, and is pleased to place this expertise at your service.



# Data Sheet for Nozzle Arrangement



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Company

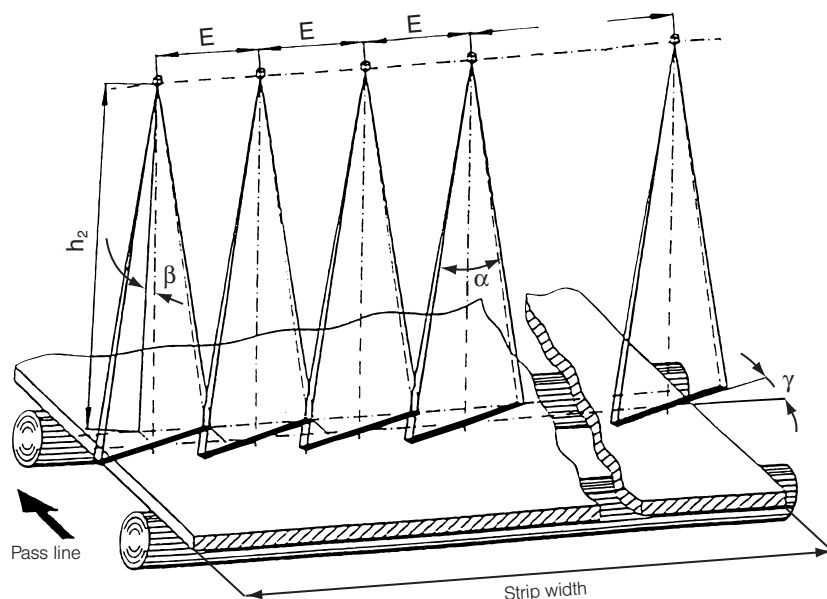
Responsible

Address

Phone

Fax

E-mail



## Questionnaire about existing Descaling Nozzle Arrangement

|                                     |                        |                                             |     |                                               |    |
|-------------------------------------|------------------------|---------------------------------------------|-----|-----------------------------------------------|----|
| Name                                |                        | Date                                        |     | Department                                    |    |
| Location of descaling installation: |                        | <input type="checkbox"/> Behind the furnace |     | <input type="checkbox"/> RSB                  |    |
|                                     |                        | <input type="checkbox"/> FSB                |     | <input type="checkbox"/> Interstand descaling |    |
| <b>Format</b>                       | <b>Dimensions [mm]</b> | <b>Nozzle Data</b>                          |     |                                               |    |
| Strip                               |                        |                                             | top | bottom                                        |    |
| Slab                                |                        | Number of headers                           |     |                                               |    |
| Plate                               |                        | Nozzle type                                 |     |                                               |    |
| Bloom                               |                        | Horizontal distance (E)                     |     | mm                                            | mm |
| Billet                              |                        | Vertical spray height ( $h_2$ )             |     | mm                                            | mm |
| Rounds                              |                        | Spray angle ( $\alpha$ )                    |     | °                                             | °  |
| <b>Material speed</b>               | m/s                    | Offset angle ( $\gamma$ )                   |     | °                                             | °  |
| <b>Pressure at header</b>           | bar                    | Impingement angle ( $\beta$ )               |     | °                                             | °  |
| <b>Available max. water flow</b>    | l/min                  | Room for sketch:                            |     |                                               |    |
|                                     | l/h                    |                                             |     |                                               |    |

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