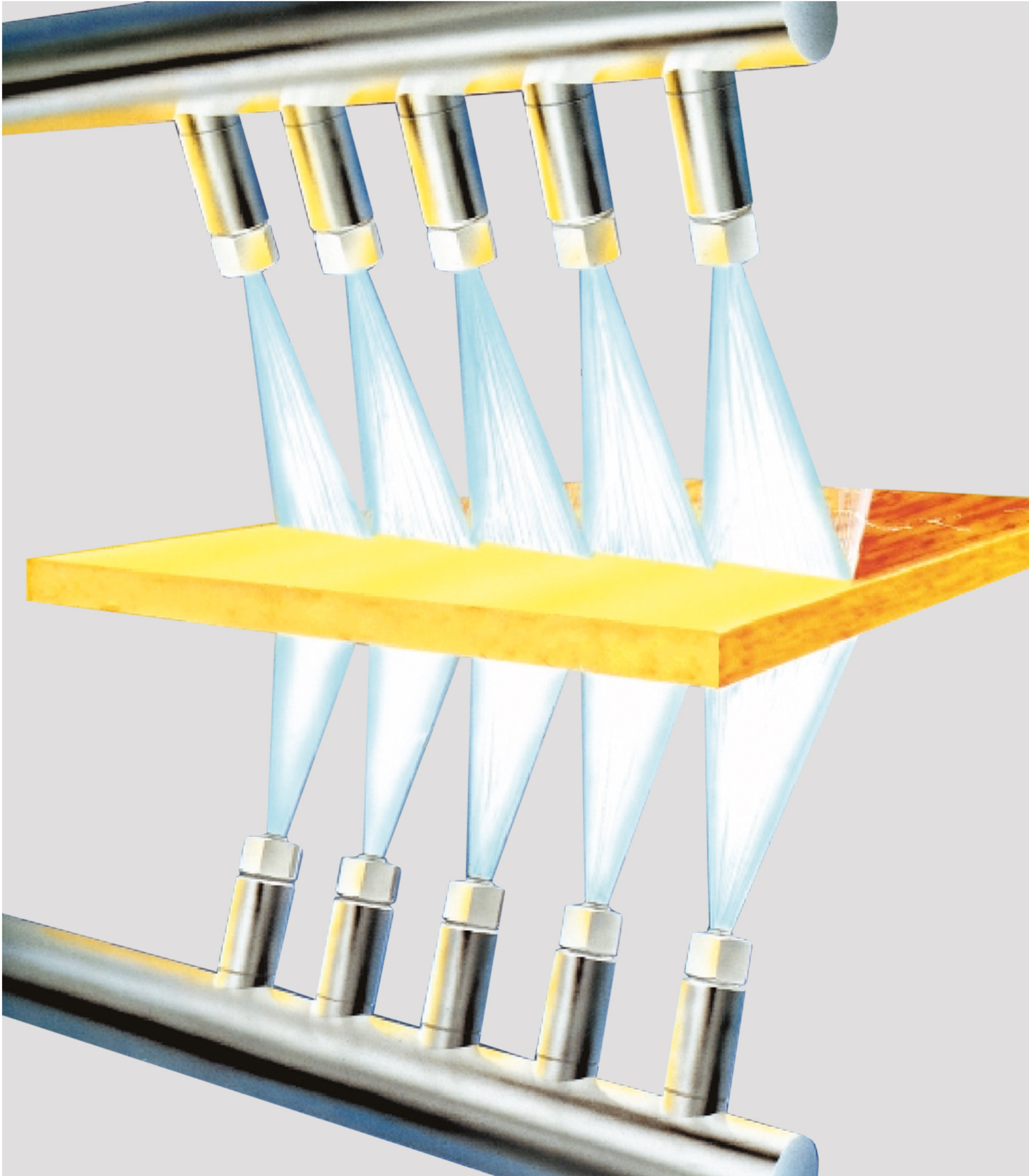


SCALEMASTER - the Standart  
in Descaling Nozzle



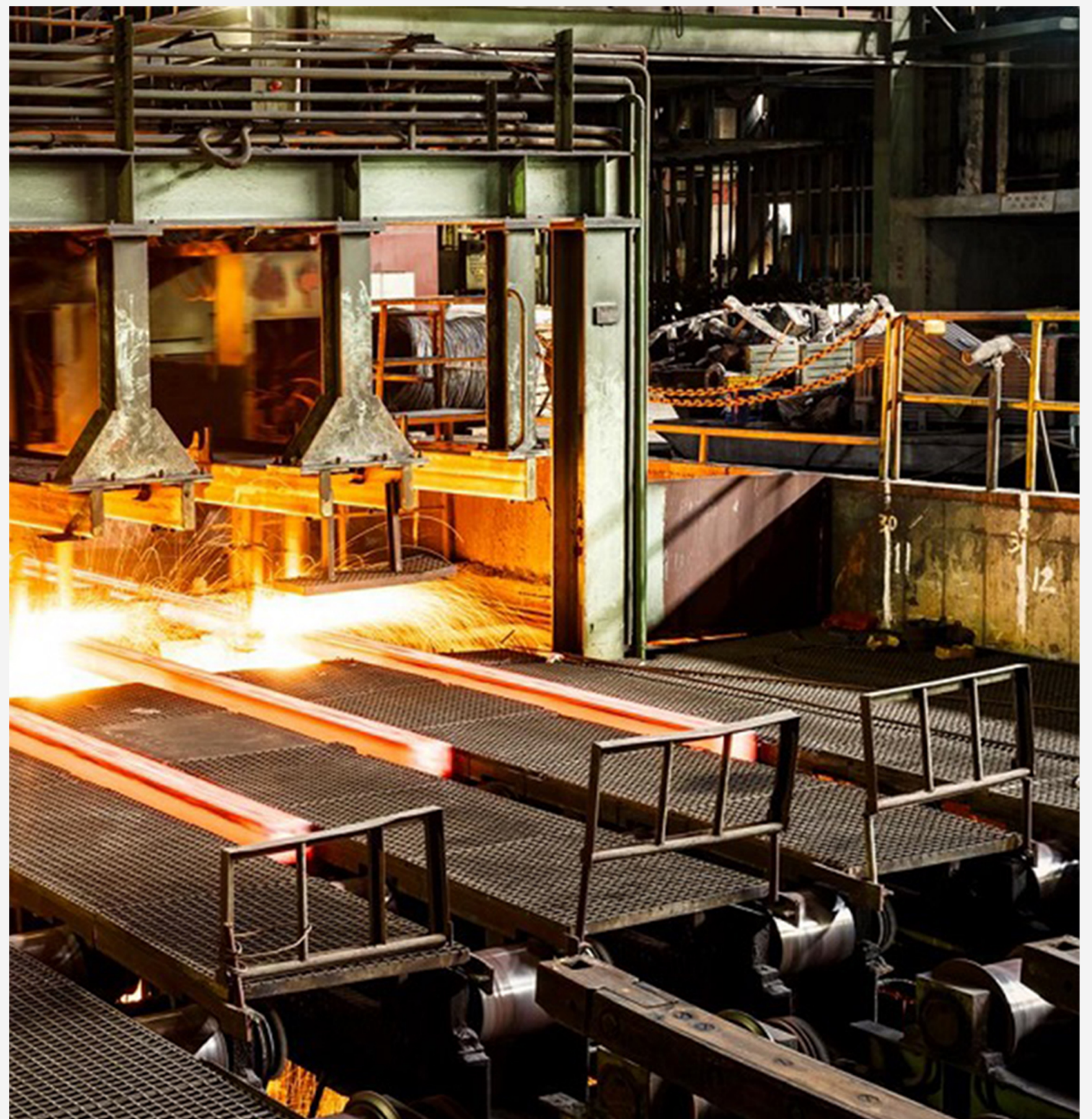
# Improved Descaling for Higher Product Quality with Lower Maintenance Costs

Primary and secondary scale deteriorate the rolling surface and affect the surface quality of such as ingots, plates, sheets, strips, profiles, and pipes. Scale also causes high wear of the rolls. To overcome those effects of the scale, Mitsuda has developed the SCALEMASTER nozzle. It provides an extremely high jet impact flow that achieves the best descaling.

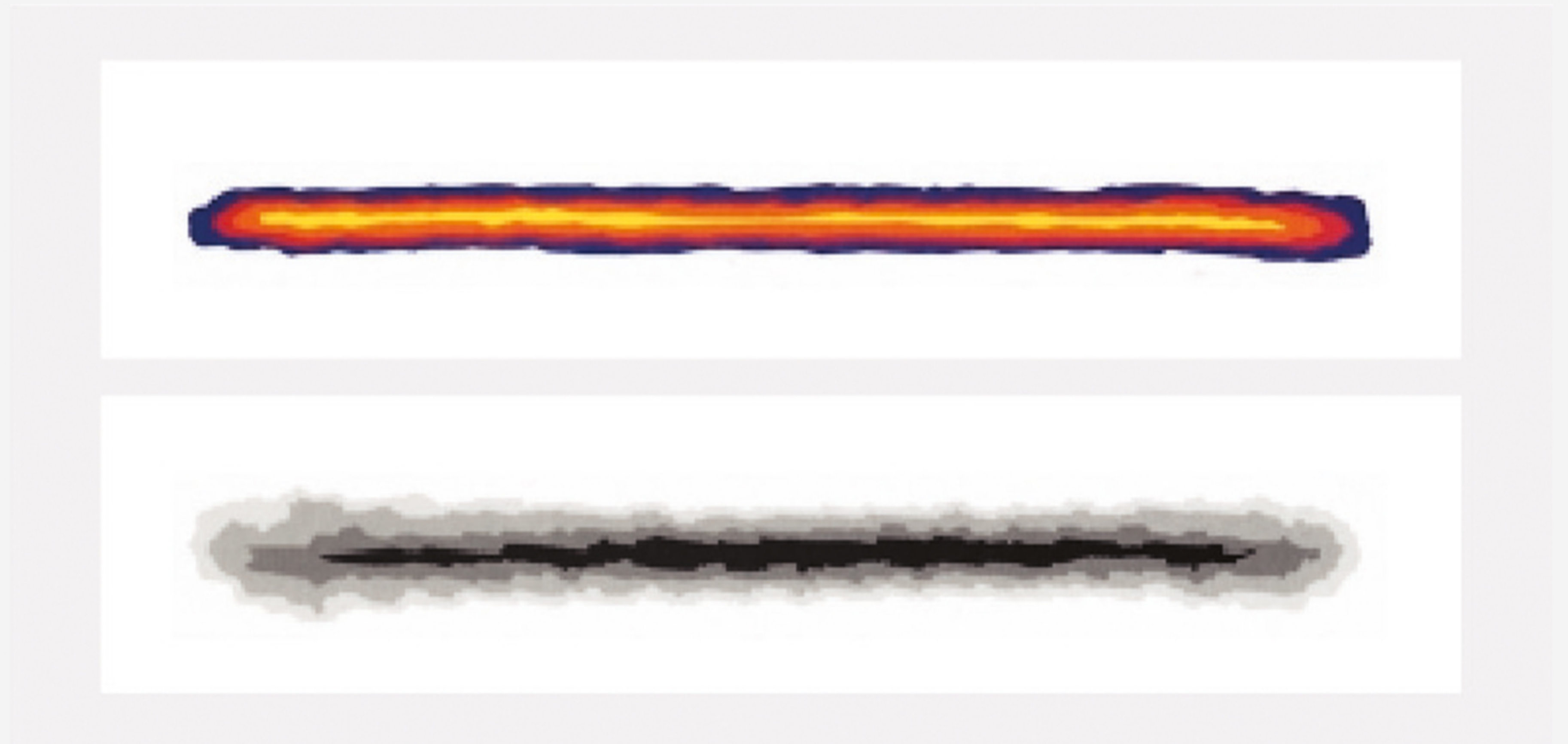
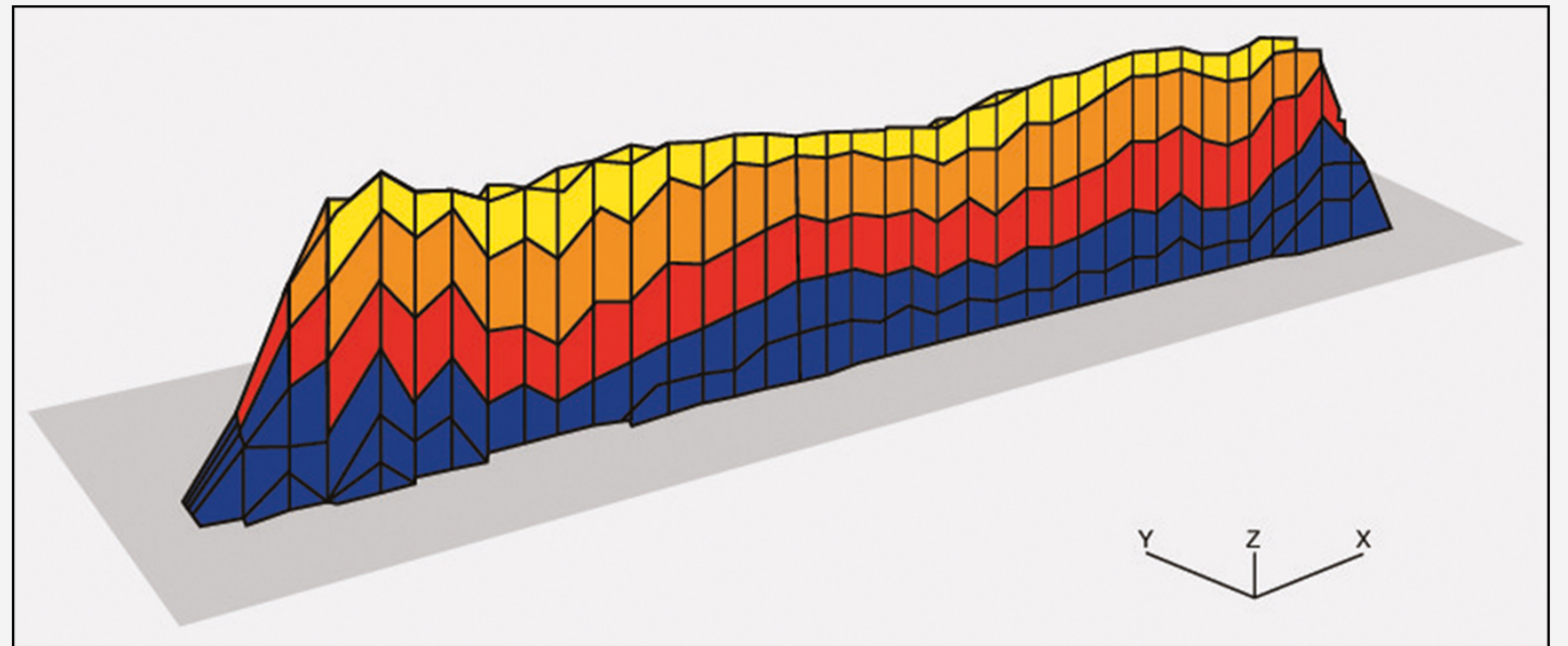
An optimal descaling provides following benefits:

- | High surface quality
- | Improved product quality
- | Low maintenance costs
- | Low roll wear

Mitsuda has been a leader in the design and development of descaling nozzles for many years. Mitsuda works closely with many rolling mills to provide descaling nozzles upon the users' exact needs. Our technical services group is committed to provide not only the best products, but also the best service.

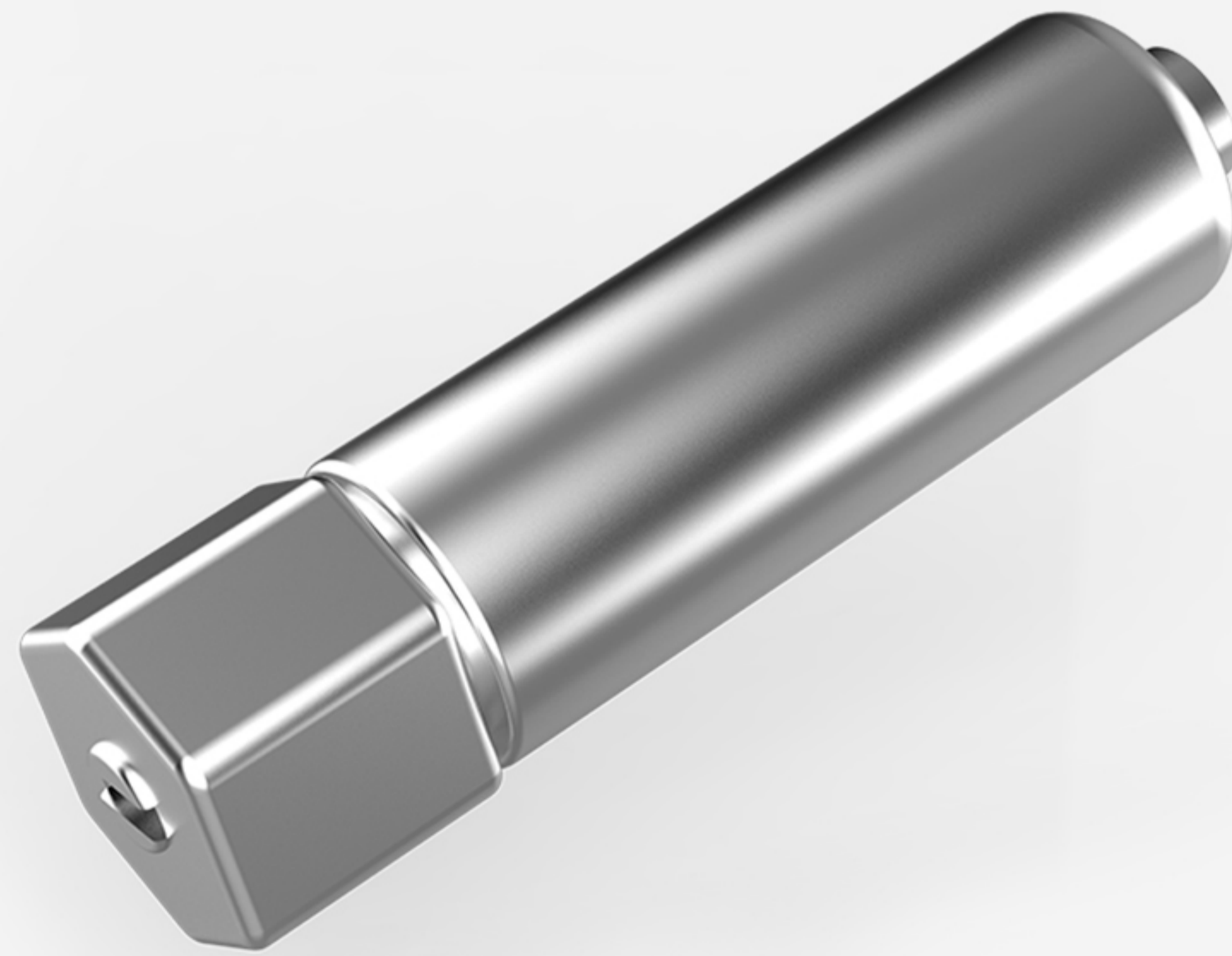


Our comprehensive measuring instruments provides accurate information in developing and designing Mitsuda nozzles. Using these techniques, reliable data on volume, pressure, impact force and droplet size can be obtained at the design stage of the nozzles. By this way, the best product design and manufacturing become available. An important factor in the design of descaling nozzles is impact and distribution. Our computer-based measuring device can show the exact quantity and quality of the impact in three dimensions.



Product No.	M6.694.XXX.27	spray width:	114.0 mm
Pressure:	240.0 bar	total force:	253.0 N
Flow rate:	69.0 l/min	average impact lav:	0.532 N/mm <sup>2</sup>
Height:	150 mm	average depth:	5.9 mm
Medium:	su		

# SCALEMASTER – the Economic Descaling Nozzle



**Enhanced quality, reduced water flow & energy consumption and increased efficiency are the key necessities of modern rolling mills. Scalemaster AP is developed to meet all those**

Through production of Scalemaster AP, Mitsuda offers many benefits in one nozzle that may combine all the advantages of a wide range of nozzles design. This becomes reality upon our research and experience in nozzle technology for many years.

## Improved Surface Quality

Thanks to its razor-sharp structure, Scalemaster AP descales the primary and secondary scale faster. Its high impact also leaves the surface clean and smooth than any other nozzles that seen until now.

## Easier to Use, Longer Working Life

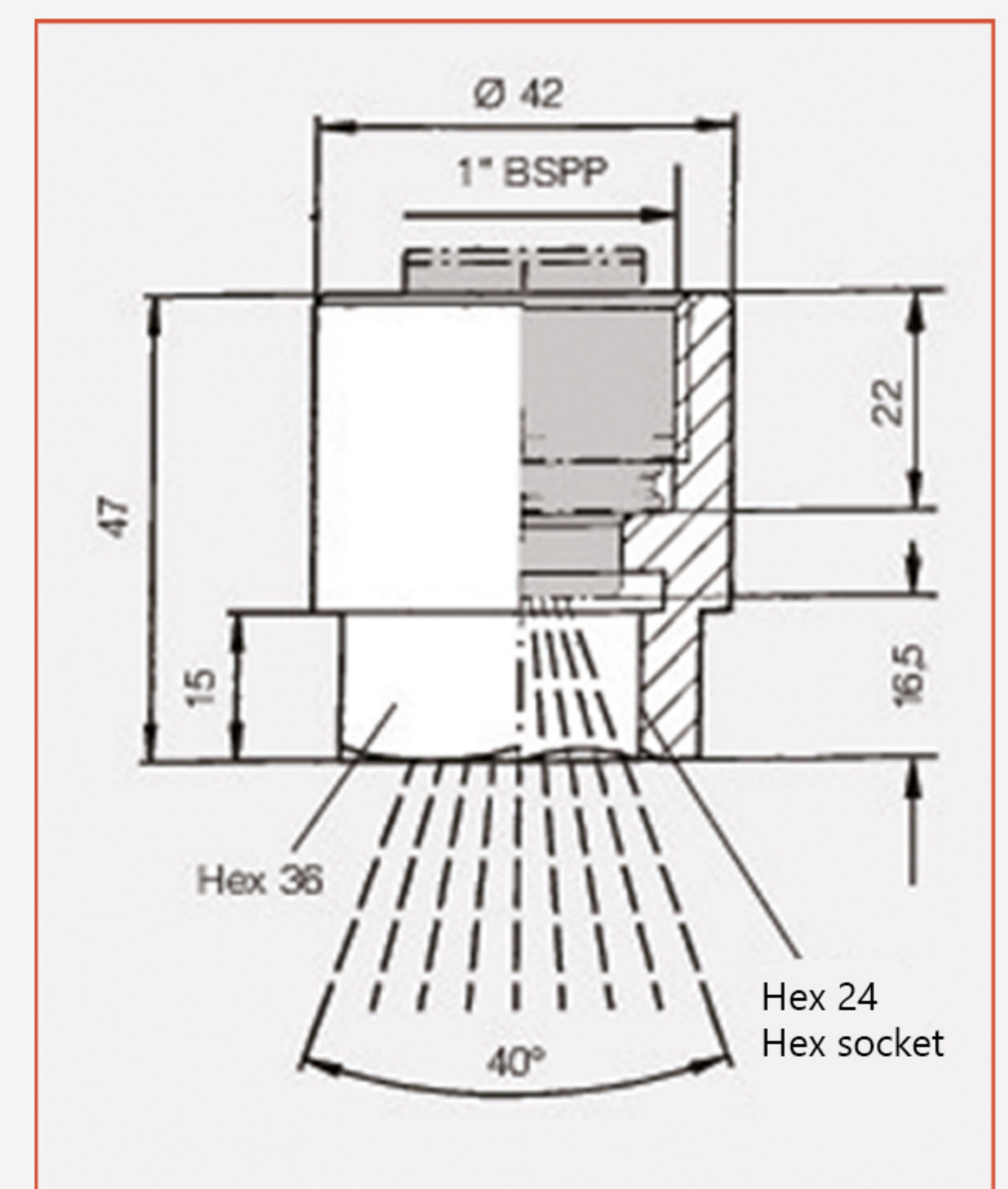
The SCALEMASTER AP is produced to stand upon the hard conditions in rolling mills. The tungsten carbide tip can resist upon the high pressures, particles and bad water quality. SCALEMASTER AP is created to achieve nozzle change faster and leaves no way for mistake. The Tip, stabilizer and filter can be pre-assembled and then assembled in the header as a single unit. By assembling this single unit instead of separate parts, installation can be carried out with one hand. The self-aligning feature of the nozzle ensures that the cap can only be tightened when alignment is achieved.

## Decreasing Energy and Water Consumption

SCALEMASTER AP uses up to 30% less water and can work at lower pressures. As a result, the required pump capacity is significantly reduced.

This means both lower operating costs for energy and lower capital expenditures for pumps .

Also, with the built-in filter on the SCALEMASTER AP, you can save on pre-filtering costs.



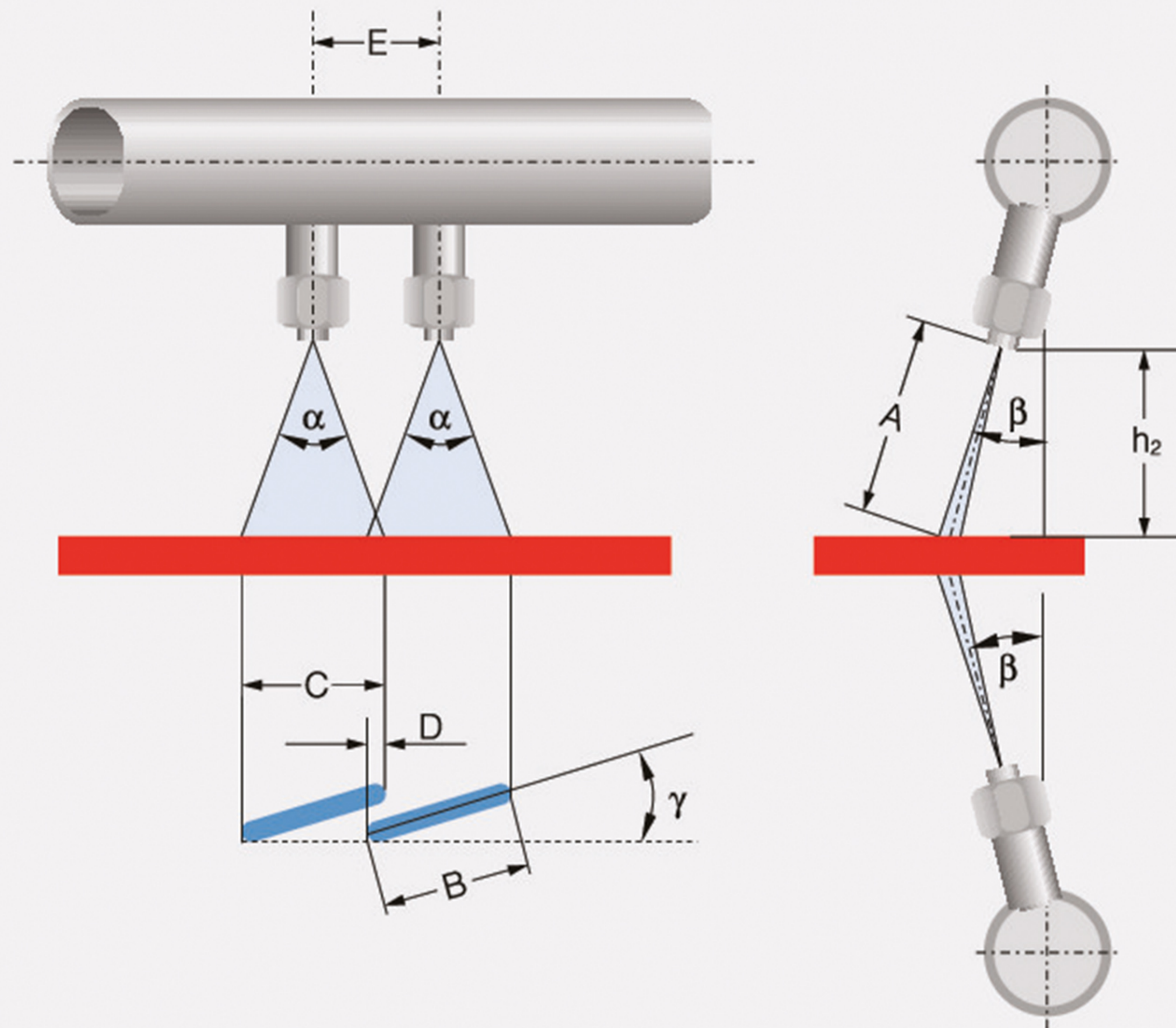
## Positioning of nozzles on a spray header

$$E = C - D$$

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

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

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



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

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

### Explanation of the table:

#### 1. Spray width:

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

#### 2. Tolerances of the spray angles:

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

## Nozzle Positions

1. All nozzle tips are placed in one direction and position in parallel
2. All nozzles 0 shifted towards the nearest outer edge - sprays are directed away from the center of the strip. This results in better drainage and it is easier to direct the strip.

## Nozzle Arrangements

To ensure correct alignment of the nozzle tip (15 degrees offset - see figure 1,2), the weld base should be placed in the spray head with the flat ends at the tip parallel to the longitudinal axis of the nozzle. We recommend doing this with our alignment tip (fig.1,2,4). ensures correct positioning. In Fig. 3 below, the alignment tips are placed in the base. Then a strip edge is used to easily position and weld each base.

## Automatic Adjustment of Nozzle Tip

The required 15-degree offset is integrated into each nozzle tip. As a result, it is impossible to install the nozzle tip incorrectly. When nozzle tips need to be replaced, once the cap is tightened down, you can be sure the nozzle is in the position required for most accurate operation.

## Easy Nozzle Assembly

One of the many other benefits of the new Scalemaster nozzle is its easy assembly as the most assembly is done before installation. The assembly unit that consist of the tip, stabilizer and strainer is inserted into the base and are rotated until flats are aligned, allowing more insertion and cover thread engagement. To preserve tip from damage, the cap should not be tightened to more than 250 Nm.

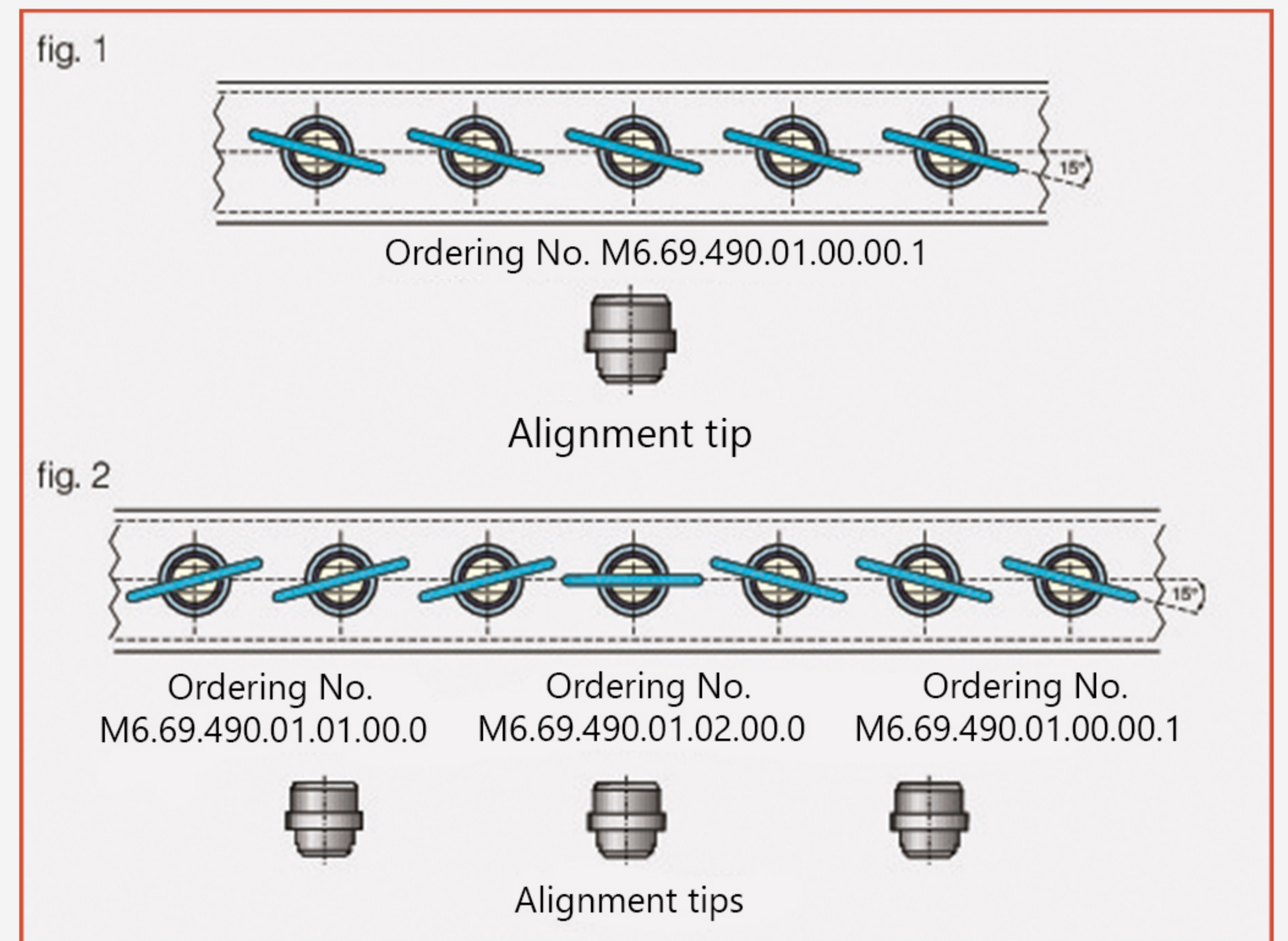
## The Equipment

Alignment tip (figure1,2,4) can also be used as for blanking off specific nozzle positions or for testing pressure on the entire spray head.

## General Information

### Flow Rate

Flow rate should not exceed 15ft./sec in the water main, and 3ft./sec. in descaling headers.



## Nozzle Check

Nozzles wear over time. Water quality and the environment can affect the nozzle life. Factors for instance solid contents in the water leads to higher nozzle wear rates. So, a regular inspection of nozzles within a scheduled calendar should be followed to ensure maximum nozzle effect.

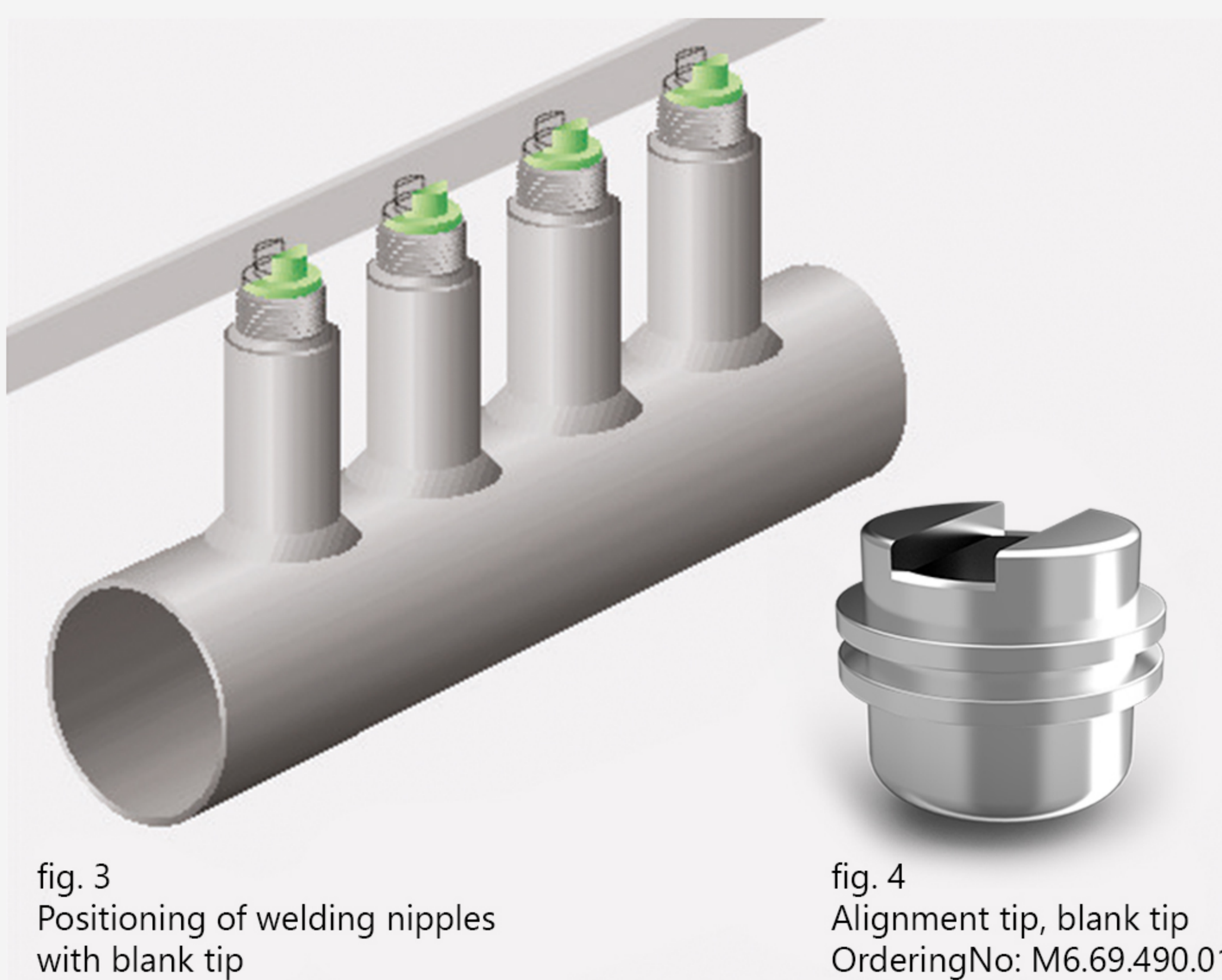


fig. 3  
Positioning of welding nipples with blank tip

fig. 4  
Alignment tip, blank tip  
OrderingNo: M6.69.490.01

# Technical Data

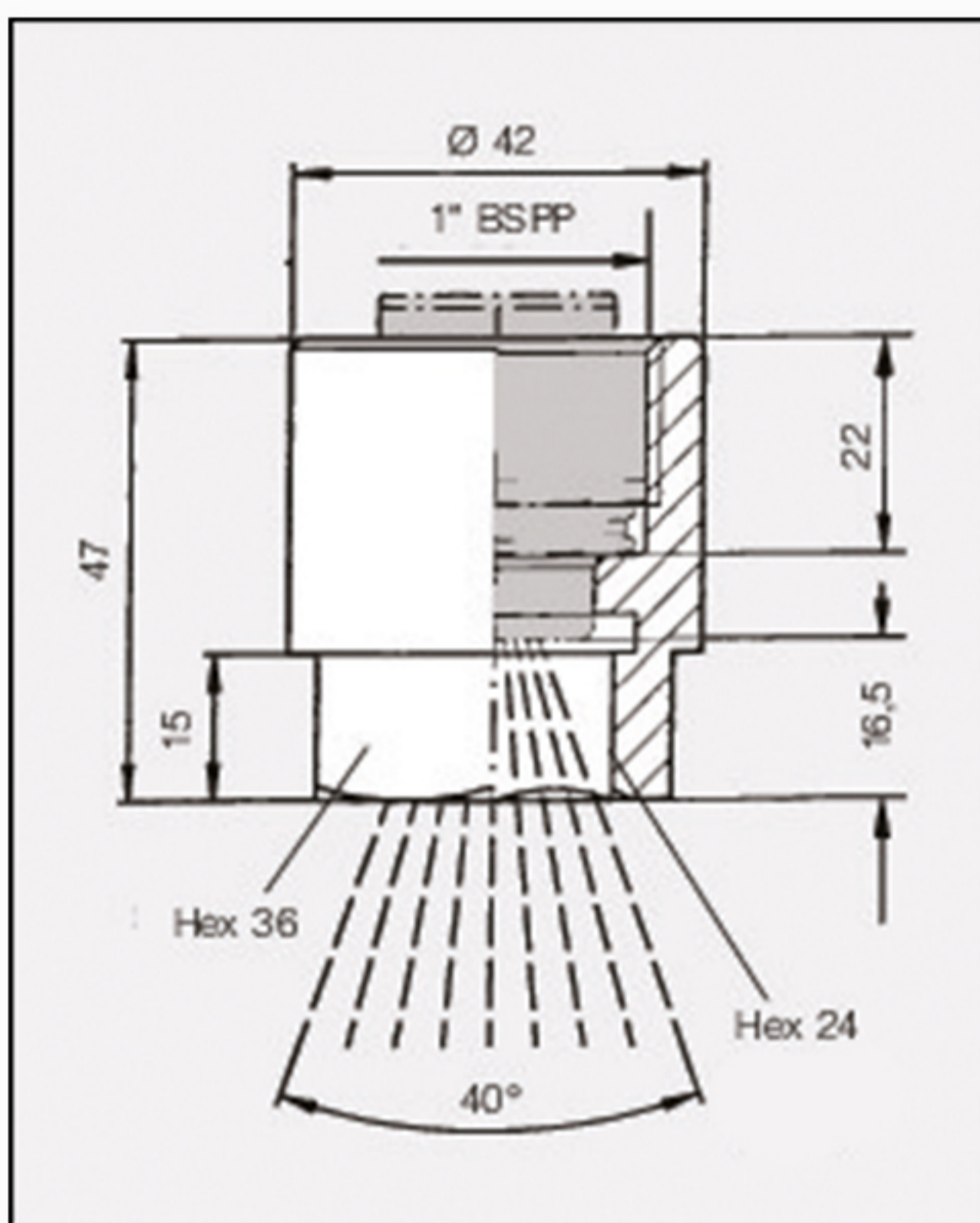
## Volume Flow Table

### Order Details

Volume rate conversion formula:

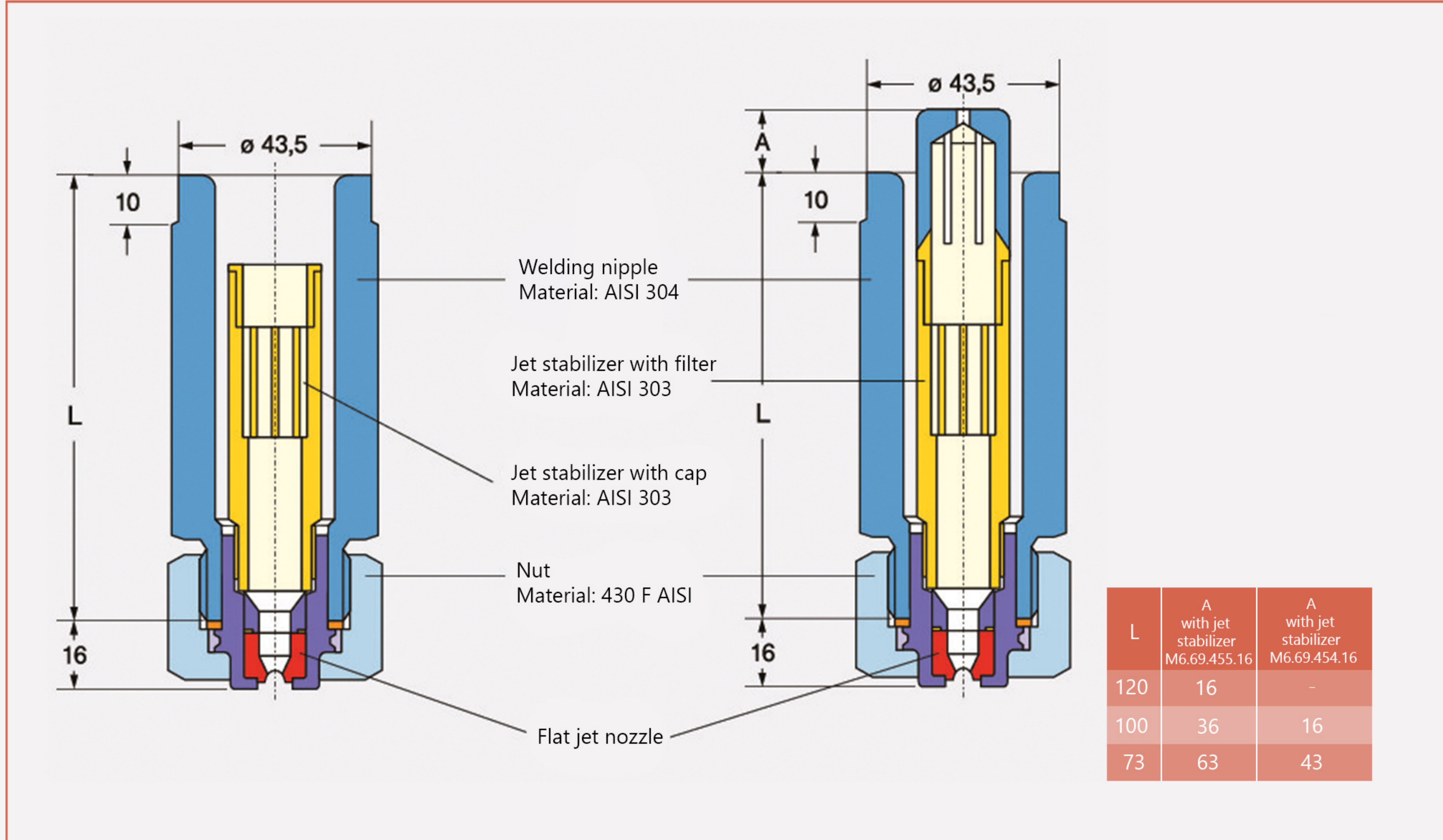
$$\dot{V}_2 = \sqrt{\frac{p_2}{p_1}} * \dot{V}_1 \text{ [l/min]}$$

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



Ordering No.		Flow rate for water (V)										
Series	Type				Mat.-No.		p = 100 bar (1450 psi)		p = 200 bar (2900 psi)		p = 400 bar (5800 psi)	
	Code Spray angle				Tungsten carbide 55	Stainless steel hardened S7	[l/min]	[US Gall./min]	[l/min]	[US Gall./min]	[l/min]	[US Gall./min]
22	26	30	40									
M6.694	495	496	497	498	○	-	12,00	3,17	16,97	4,50	24,00	6,34
M6.694	535	536	537	538	○	○	15,00	3,96	21,21	5,60	30,00	7,92
M6.694	565	566	567	568	○	○	18,00	4,76	25,46	6,73	36,00	9,52
M6.694	605	606	607	608	○	○	23,00	6,08	35,53	9,39	46,00	12,16
M6.694	645	646	647	648	○	○	28,00	7,40	39,60	10,46	56,00	14,80
M6.694	685	686	687	688	○	○	36,00	9,51	50,91	13,45	72,00	19,02
M6.694	725	726	727	728	○	○	45,00	11,89	63,64	16,81	90,00	23,78
M6.694	765	766	767	768	○	○	58,00	15,32	82,02	21,67	116,00	30,64
M6.694	805	806	807	808	○	○	72,00	19,02	101,82	26,90	144,00	38,04
M6.694	845	846	847	848	○	○	89,00	23,51	125,87	33,25	178,00	47,02
M6.694	885	886	887	888	○	○	112,00	29,59	158,39	41,85	224,00	59,18
M6.694	-	906	907	908	○	○	125,00	33,03	176,78	46,70	250,00	66,06
M6.694	-	916	917	918	○	○	134,00	35,40	189,50	50,07	268,00	70,80

Type (Spray angle 22°)	E [mm]	A [mm]	Type (Spray angle 26°)	E [mm]	A [mm]	Type (Spray angle 30°)	E [mm]	A [mm]	Type (Spray angle 40°)	E [mm]	A [mm]
M6.694.495	1,20	1,50	M6.694.496	1,17	1,50	M6.694.497	1,16	1,50	M6.694.498	1,11	1,50
M6.694.535	1,40	1,75	M6.694.536	1,30	1,75	M6.694.537	1,30	1,75	M6.694.538	1,20	1,75
M6.694.565	1,60	2,00	M6.694.566	1,50	2,00	M6.694.567	1,40	2,00	M6.694.568	1,20	2,00
M6.694.605	1,80	2,10	M6.694.606	1,70	2,10	M6.694.607	1,60	2,10	M6.694.608	1,50	2,10
M6.694.645	2,00	2,50	M6.694.646	1,90	2,50	M6.694.647	1,80	2,50	M6.694.648	1,60	2,50
M6.694.685	2,20	2,80	M6.694.686	2,20	2,80	M6.694.687	2,10	2,80	M6.694.688	2,00	2,80
M6.694.725	2,50	3,00	M6.694.726	2,40	3,00	M6.694.727	2,30	3,00	M6.694.728	2,90	3,00
M6.694.765	2,80	3,50	M6.694.766	2,50	3,50	M6.694.767	2,40	3,50	M6.694.768	2,30	3,50
M6.694.805	3,20	3,80	M6.694.806	3,00	3,80	M6.694.807	2,90	3,80	M6.694.808	2,70	3,80
M6.694.845	3,50	4,30	M6.694.846	3,50	4,30	M6.694.847	3,20	4,30	M6.694.848	3,00	4,30
M6.694.885	3,90	4,70	M6.694.886	3,90	4,70	M6.694.887	3,70	4,70	M6.694.888	3,40	4,70
			M6.694.906	4,00	5,00	M6.694.907	3,90	5,00	M6.694.908	3,70	5,00
			M6.694.916	4,20	5,20	M6.694.917	4,00	5,20	M6.694.918	3,80	5,20



Component	Model	Ordering No.	Weight(kg)
Welding Nipple Material: AISI 304	Length L=120 mm L=100 mm L=73 mm	M6.69.411.1C.00 M6.69.410.1C.00 M6.69.410.1C.73	0,83 0,69 0,48
Jet Stabilizer Material AISI 303	Without filter, with jet S = 74 mm With filter SF = 130 mm SF = 110 mm	M6.69.431.16 M6.69.455.16 M6.69.454.16	0,11 0,22 0,19
Gasket Material: Copper		M6.95.015.34.04.02.0	0,004
Nozzle		694.XXX.XX bkz. Tablo sayfası	0,085
Somun (Altıgen 41) Malzeme 430 F AISI		M6.69.400.11	0,153
Hızalama Ucu Boş Uç Malzemesi: Hafif Çelik		M6.69.490.01	0,072
Sökme Aleti Malzemesi: Hafif Çelik	Data sheet on request	M6.69.491.01	0,14
Tip Extractor	Data sheet on request	M6.95.009.00.12.56.0	0,95

