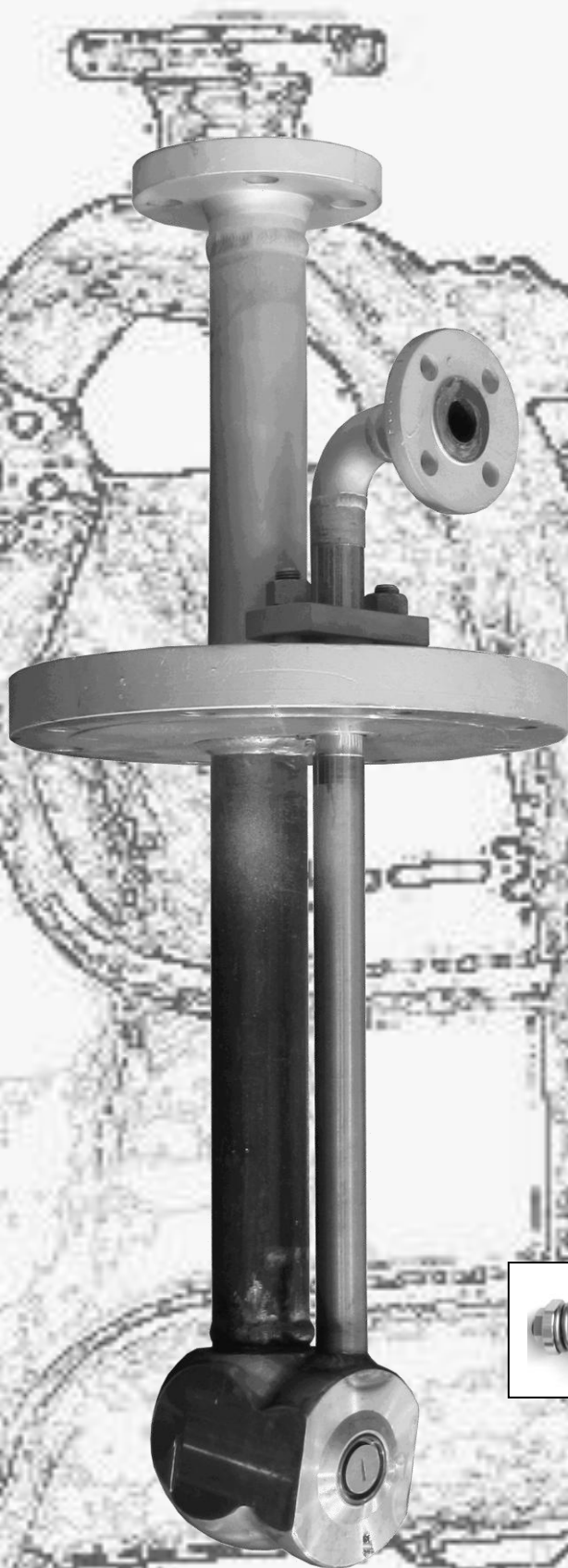




3-4200 SERIES STEAM ASSISTED DESUPERHEATERS



LVA – STEAM ASSISTED SPRAY NOZZLES

LVA nozzle, based on standard LV series, is the most advanced solution for steam desuperheating by water injection.

Starting from LV-3 size, LVA nozzles are provided with advanced steam assisted atomizing system.

Working principle

When a very high system turn-down is required, at minimum steam flow rates with low desuperheating flow, pressure drop across nozzle can be not enough to warrant a perfect water atomization and, due to the low steam velocity inside the pipe, water droplets cannot be sufficiently held by steam flow: the mixing process loses efficiency and the cooling effect is significantly reduced.

Water atomization is provided both by mechanical and thermal actions of the hot steam jet so water heating occurs together with atomization.

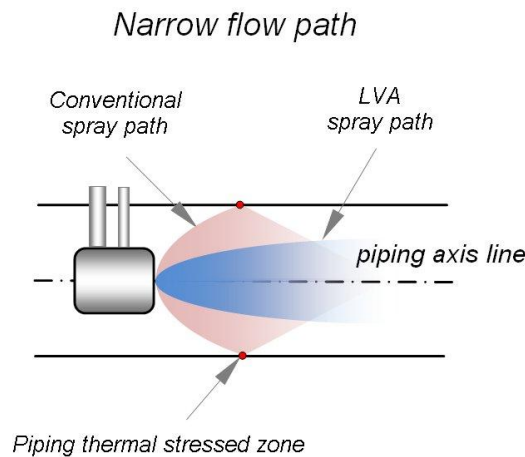
LVA Solution

LVA, combining variable area water spray nozzle with steam atomizing, requires the injection of a smaller quantity of superheated steam compared with other traditional steam atomized nozzles.

This combination produces a very good water atomization at very low water flow, allowing to obtain fine droplets along the whole working range: the micro droplets produced by steam assisted LVA nozzles improve water evaporation and whole desuperheating system efficiency.

Probe type LVA desuperheaters (3-4211 or 3-4212) have been especially engineered to **reduce the spraying angle** in order to minimize droplets contact with pipe wall especially in small line diameters at very low steam velocities. The spray path is located close to the pipe axis avoiding dangerous thermal stresses and impingement damages caused by cold, unevaporated water droplets reaching the piping surface.

On the contrary, side-mounted configuration (3-4221 or 3-4222), LVA nozzles are specialty designed to spread the atomized flow in a wider angle.



The **double-tube feeding configuration** with separated passages for water and steam with fully jacketed water pipe, improves probe stiffness allowing to avoid thermal stresses due to temperature differential between superheated steam and cooling water thank to the **free-expanding design**.

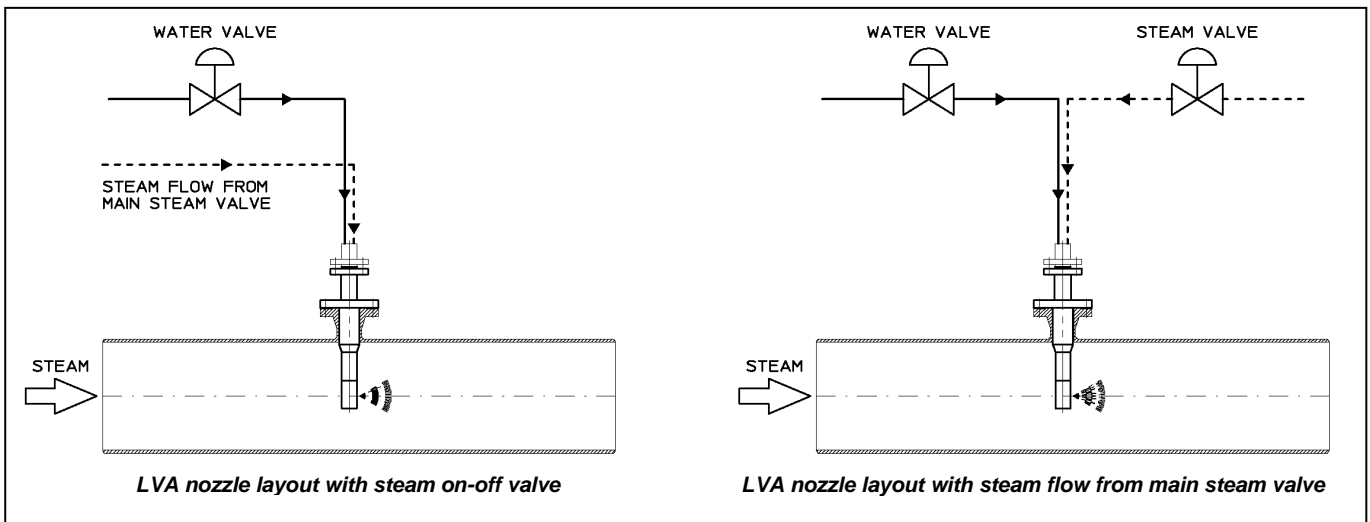
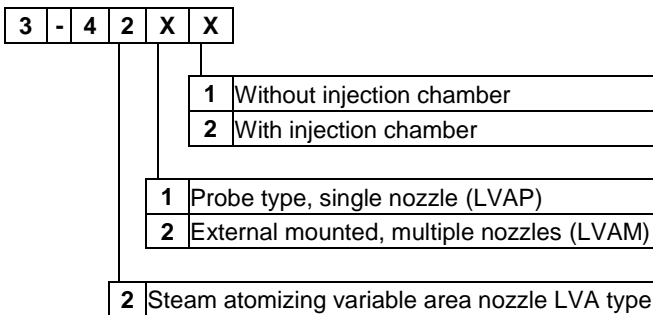
Finally, the **improved mixing chamber** design optimizes, with high level of turbulence downstream the injection point, the water atomization and water/steam mixing process allowing a very low steam velocity into the pipe (up to 2-3 m/s).

Atomizing steam can be operated by an external on/off valve or can be internally controlled by the main steam valve.

MAIN FEATURES

- Size:** LVA-3, LVA-5, LVA-7 and LVA-8.
- Connections:** water side: from ½" to 2"
atomizing steam side: from ¼" to 1"½
main steam side: from 8"
- Ratings:** water side: ANSI 150 ÷ 1500 (PN 16 ÷ 250)
main and atomizing steam side: ANSI 150 ÷ 1500 (PN16 ÷ 250)
higher ratings on request
- Flow Rates:** Steam mass flow equal to 3% of the maximum water flow rate of the selected nozzle is able to ensure an excellent water atomization.
The water mass flow must not exceed 25% ÷ 26% of the steam flow.
- Sprayability** +25% turndown improvement is achieved by LVA steam assisted nozzles.
- Design:** Forged and Fabricated by welding
- Materials:** Body: Carbon or Cr-Mo steels according to operating temperatures
Injection chamber: the same piping material

CLASSIFICATION



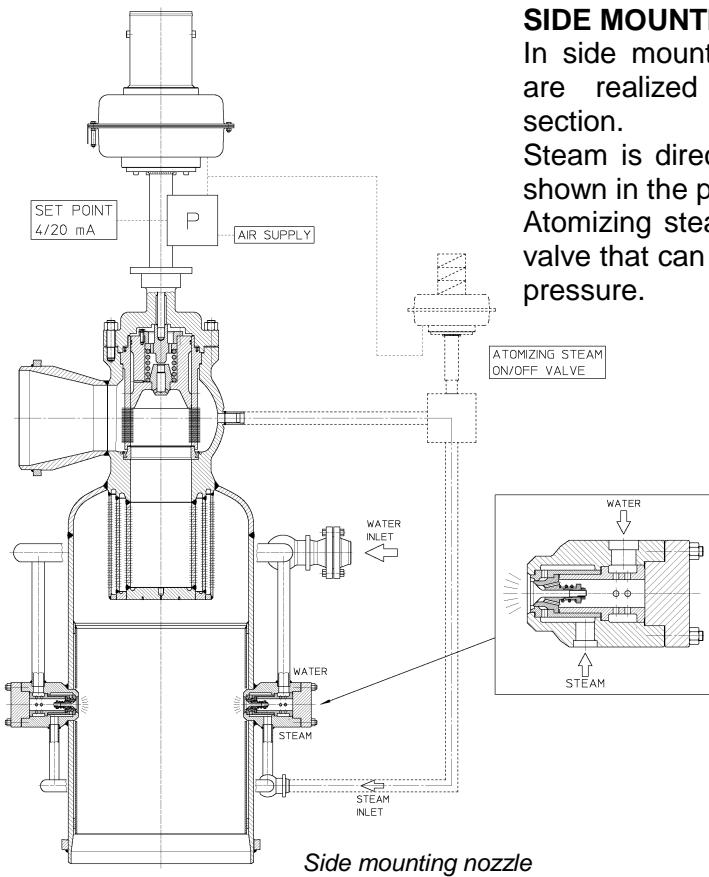
As per conventional nozzles, LVA are available in both probe and wall mounting configuration. Conical pattern is calibrated according to desuperheating and piping layout (probe version generally requires narrower spraying angles).

SIDE MOUNTING (3-4211 or 3-4212)

In side mounting configuration, steam and water paths are realized directly around desuperheating outlet section.

Steam is directly taken from main steam valve body as shown in the picture.

Atomizing steam flow is controlled by an auxiliary on-off valve that can be operated directly by main valve actuator pressure.



Side mounting nozzle



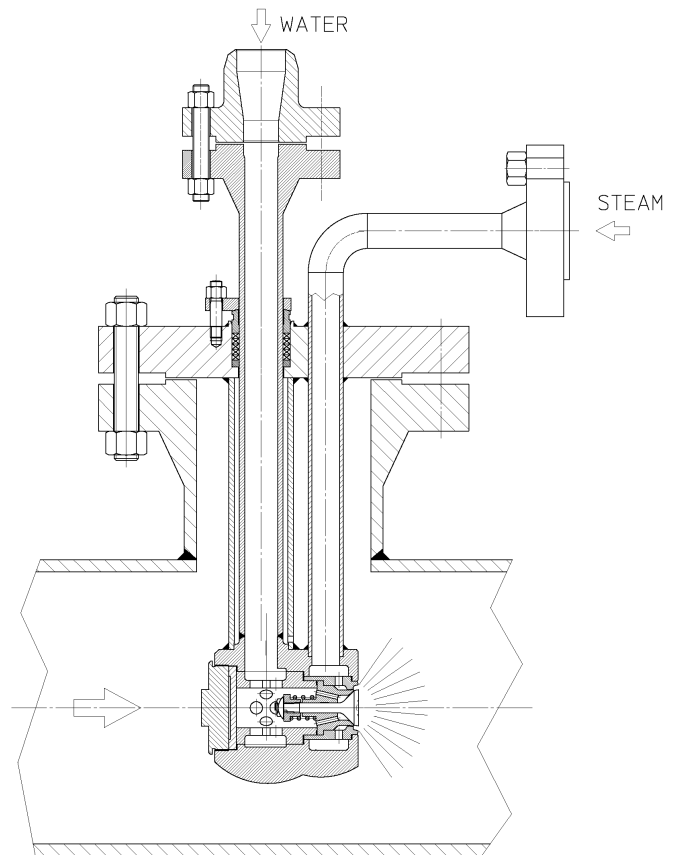
Wide spray pattern for side wall mounting

PROBE MOUNTING (3-4221 or 3-4222)

In probe mounting configuration the spray nozzle is axially mounted inside the piping. The angle of the water spraying pattern is very narrow in order to improve mixing effect avoiding droplets contact with pipe wall also for small pipe diameters and very low steam velocities.



Narrow spray pattern for probe mounting



Probe mounting nozzle

Steam injector calculation

For each size of LVA nozzles a complete series of fixed area steam passages has been defined to match the appropriate steam/water flow ratio.

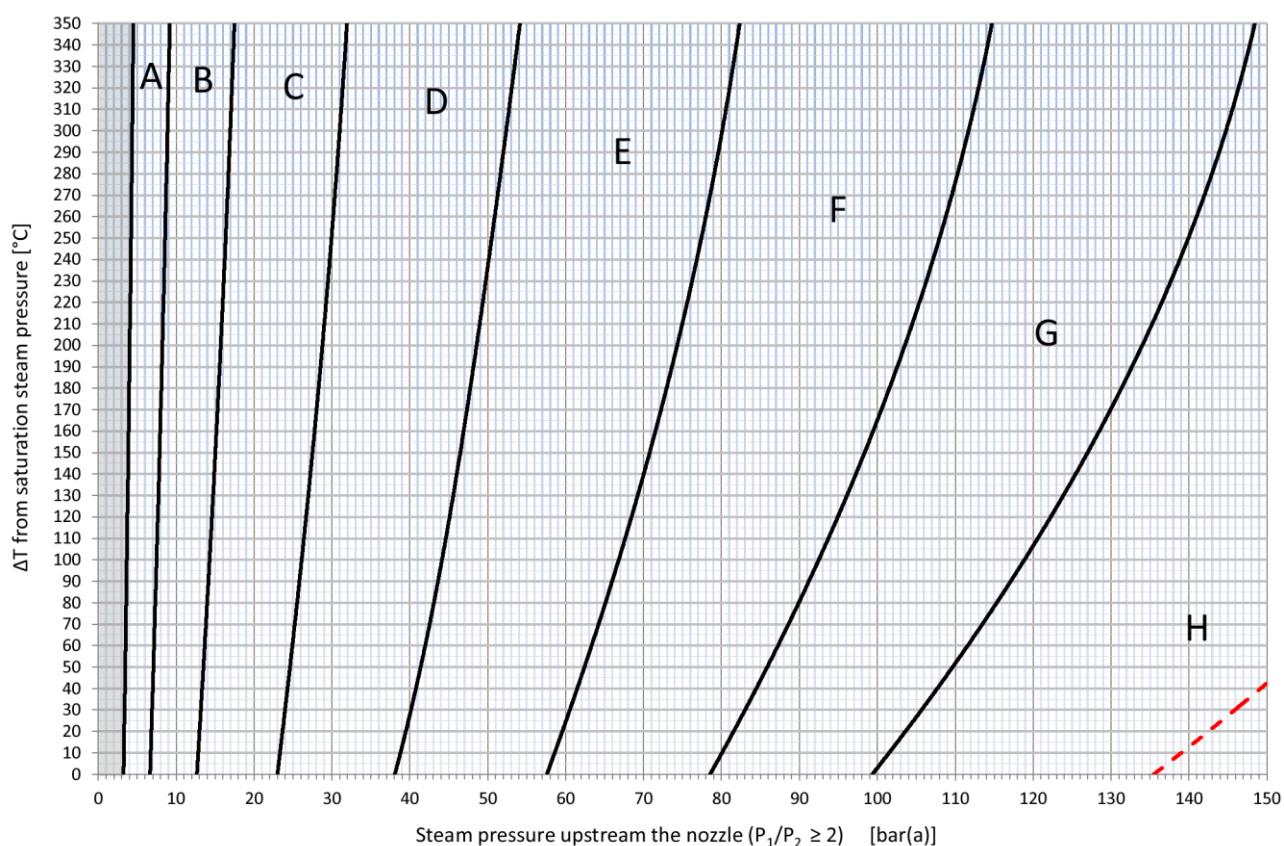
The required atomizing **steam flow rate** can be obtained by the following table, starting from the size of the selected spray nozzle:

Nozzle size	LVA-3	LVA-5	LVA-7	LVA-8
Water maximum flow rate [m ³ /h] ¹	7.5	15	30	42
Steam (atomizing) flow rate [kg/h] ²	225	450	900	1260

¹ at maximum continuous pressure drop (30 bar)

² 3% of water mass flow assuming water density equal to 1000 kg/m³

The size of steam nozzle can be draw out by the following graph, knowing steam pressure to be desuperheated and superheating degree (ΔT from saturated temperature at given pressure*):

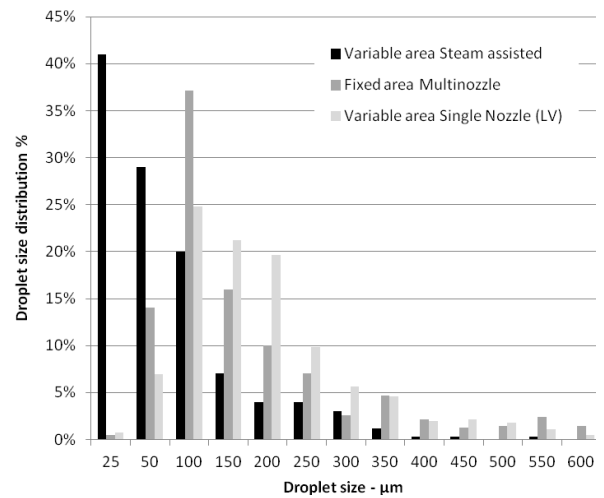


* the pressure drop across the on/off steam valve, if installed, must be considered for nozzle selection

LVA Cv Table

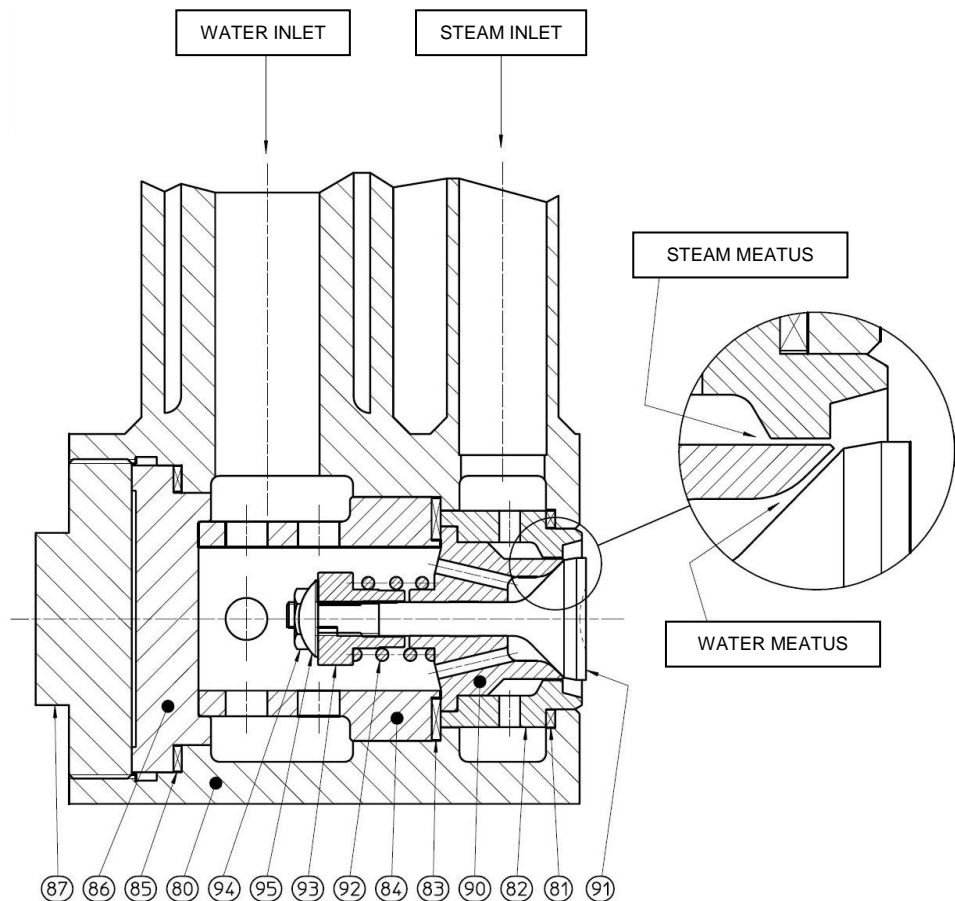
STEAM PATH - FLOW COEFFICIENTS * [gpm]					
Size	LVA-1	LVA-3	LVA-5	LVA-7	LVA-8
A	3.17	6.34	12.7	25.4	35.9
B	1.59	3.17	6.33	12.7	17.9
C	0.85	1.69	3.38	6.77	9.57
D	0.47	0.94	1.88	3.76	5.32
E	0.28	0.56	1.13	2.26	3.19
F	0.19	0.37	0.75	1.49	2.11
G	0.13	0.27	0.54	1.08	1.53
H	0.10	0.21	0.42	0.84	1.19

* please refer to Parcol 3-4000 series bulletin (ACA 0531) for water Cv and flow rates.



Droplet size typical distribution for different spray nozzles types

ITEM	PART NAME
80	NOZZLE CASE
81	SEALING RING
82	STEAM CAGE
83	SEALING RING
84	WATER CAGE
85	SEALING RING
86	SPACER
87	LOCKING END
90	NOZZLE BODY
91	PLUG
92	SPRING
93	SPRING HOLDER
94	NUT
95	WASHER





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