

# DV VARIvent

Venturi-type fixed area desuperheater



### Suitable for:



Steam



Process gas

### Markets:



Oil & gas



Power



General industry

## Introduction

VARIvent desuperheater is a fixed area nozzles spraying device which injects water in the outlet of a venturi-shaped section. The excellent and rapid atomizing of sprayed water is obtained through the combination of increased velocity of steam in the throat section with the same high efficient nozzles of Variflow variable area desuperheaters. Also the intense turbulence enhanced by the sudden interruption of venturi profile after the injection point, improves the mixing of water and steam and results in quick evaporation of water.

One or more nozzles are available to fulfil a wide range of flowrates as outlined in the Cv table. Low velocity steam flows can be thoroughly handled as well with a minimum approach temperature of 5°C over saturation. They are primarily intended for moderate load changes and where an accurate temperature control is essential.

### Main applications:

- Steam process.
- Heat exchangers.
- Ejectors.
- Pressure reducing stations.
- Drum dryers.
- Gas process.

## Functional features

**Steam pipe size:** 3", 4", 6", 8", 10", 12", 14", 16", 18", 20" other sizes on request.

**Water connections:** 1/2", 1", 1-1/2", 2".

**Ratings:** up to ANSI 2500 depending on size as outlined in the table.

**Connection types:** steam: SW - BW - RF | water: RF - other on request.

**Nozzle sizes:** from DV1 to DV10 as per table list.

**Flow capacity:** one to three nozzle assemblies can provide a lot of combinations with Cv's available from 0,017 through 7,3. (see Cv table)

**Mounting:** steam - straight-in-line | water - in vertical upwards position unless different orientation was agreed.

**Materials:** see part list table.

## Main characteristics

**Approach temperature:** min 5°C.

**Max Δp water-to-steam:** 40 bar between inlet pressures.

**Min Δp water-to-steam:** 0,5 bar between inlet pressures.

**Max water/steam ratio:** 20% - by weight at inlet conditions.

**Min inlet steam velocity:** 4 m/s.

**Max water flow rate:** 40 m<sup>3</sup>/h.

**Min downstream straight run:** 3m or 15 DN.

**Temperature sensor distance:** 5÷7 m.

**Rangeability:** up to 7:1 depending on Δp water-to-steam.

### Steam pressure drop

can be estimated by the following relationship:

$$\Delta p = \frac{1}{625 \rho_1} \cdot \frac{q_m^2}{Cv_s^2}$$

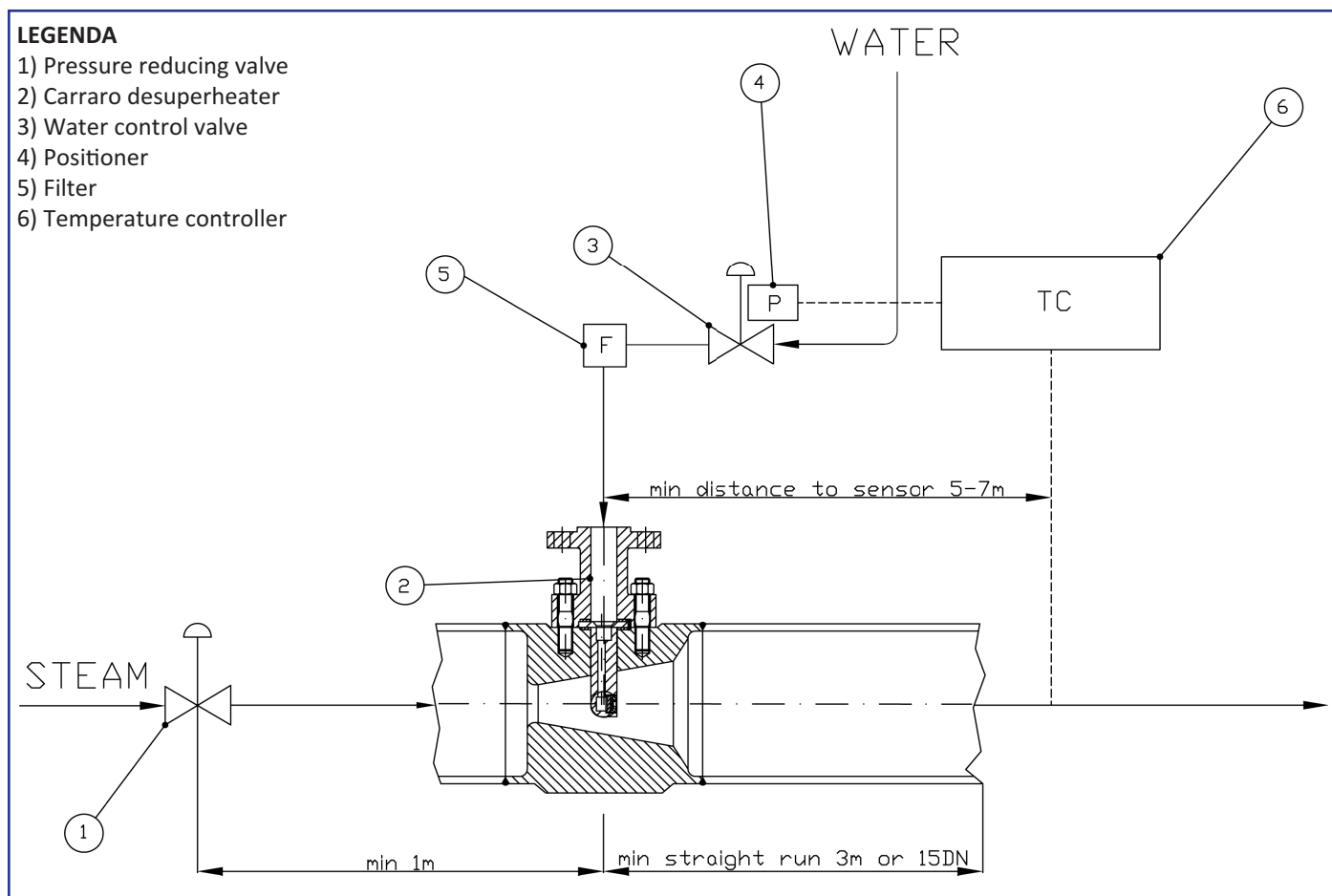
### Where

Δp bar-ρ<sub>1</sub> kg/m<sup>3</sup> -q<sub>m</sub> kg/h  
(steam inlet flow rate)

Body size	Water connection	Nozzle size	Cv of water			Cvs of steam flow passage	Water flow rate (m <sup>3</sup> /h)
			Number of nozzles				
			1	2	3		
3"	1/2"	DV1 - DV5	Max Cv = 0,22	//	//	120	1,2
4"	1/2"	DV1 - DV5	Max Cv = 0,22	//	//	200	1,2
6"	1/2"	DV1 - DV5	Max Cv = 0,22	//	//	450	1,2
8"	1"	DV1 - DV8	Max Cv = 1,3	//	//	800	7
10"	1-1/2"	DV1 - DV10	Max Cv = 2,7	//	//	1250	15
12"	1-1/2"	DV1 - DV10	Max Cv = 2,7	//	//	1750	15
14"	1-1/2"	DV1 - DV10	Max Cv = 2,7	Max Cv = 5,2	//	2100	28
16"	1-1/2"	DV1 - DV10	Max Cv = 2,7	Max Cv = 5,2	Max Cv = 7,3	2800	40
18"	2"	DV1 - DV10	Max Cv = 2,7	Max Cv = 5,2	Max Cv = 7,3	3500	40
20"	2"	DV1 - DV10	Max Cv = 2,7	Max Cv = 5,2	Max Cv = 7,3	4300	40

### Engineering practice for efficient desuperheating

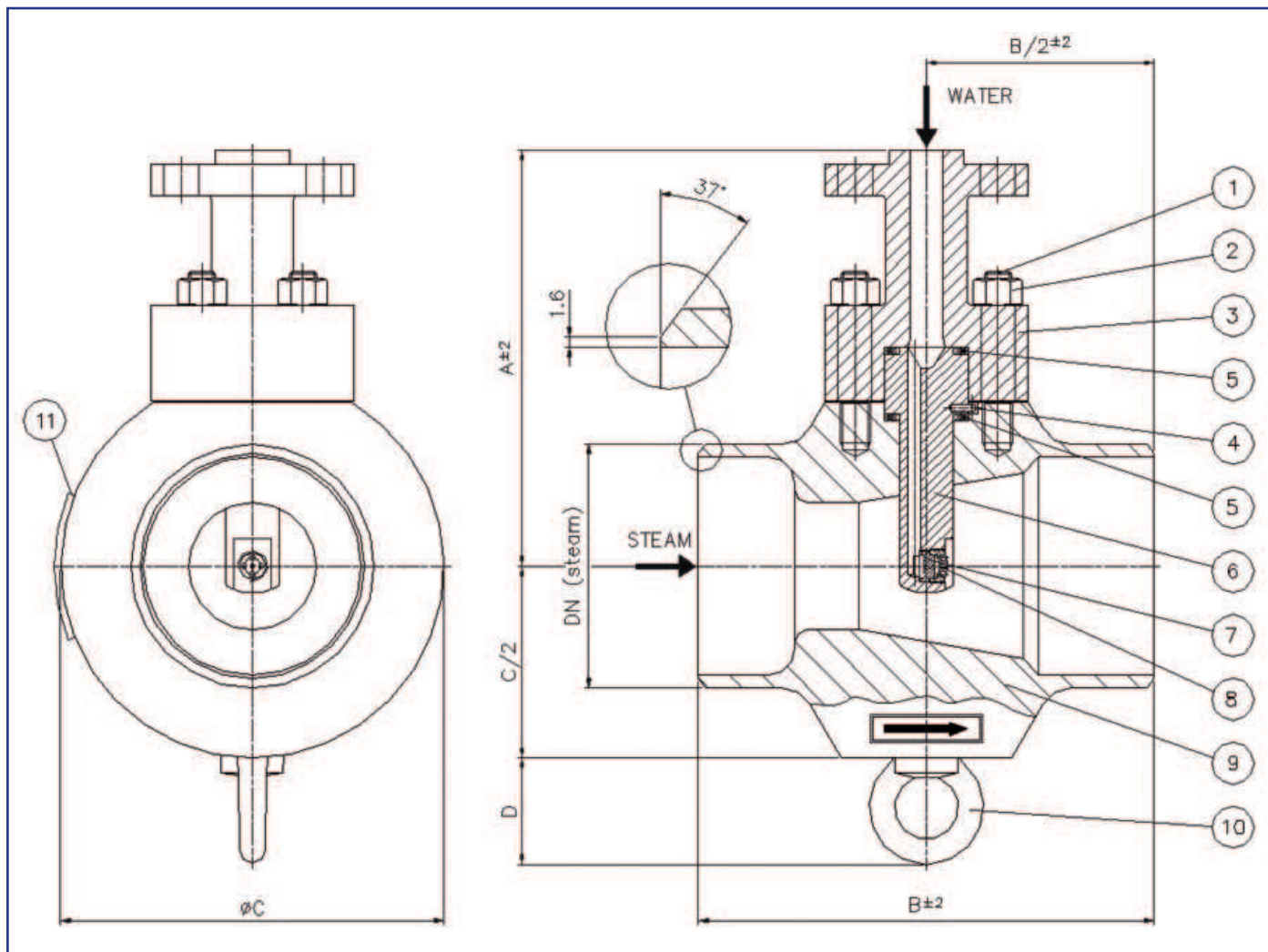
For efficient desuperheating the arrangement of installation is shown in figure. Filter is highly recommended. The mesh of the sieve must be not less than 35 for DV1-DV3, 25 for DV4-DV6 and 16 for DV7-DV10.



Flow coefficients	
DV1	0,0176
DV2	0,0308
DV3	0,0638
DV4	0,119
DV5	0,233
DV6	0,394
DV7	0,546
DV8	1,24
DV9	1,57
DV10	2,70

Rating	Size									
	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"
ANSI 150/300/600										
ANSI 900/1500										
ANSI 2500										

Overall dimensions and part list.



Number	Item	Material
1	Stud	A193 B7
2	Nut	A194 2H
3	Water flange	Carbon-, Cr-Mo steels
4	Pin	SS 304
5	Gasket (*)	St.St. / Graphite
6	Nozzle pipe	Carbon-, Cr-Mo steels
7	Vortex ring	SS 410
8	Nozzle	SS 410
9	Body	Carbon-, Cr-Mo steels
10	Eyebolt	C 15
11	Nameplate	SS 304

**LEGENDA**

(\*) Recommended spare parts.

**NOTE**

In nozzle pipe 6 items 7 and 8 are fitted and supplied.

DN Steam	DN Water	Rating	OD	Sch.	A	B (BW)	C (BW)	D	A	B (BW)	C (BW)	D
					millimeters				inch			
3"	1/2"	#600	88,9	40	185	180	156	50	7,30	7,10	6,15	2
		#1500		160	235		190		9,25		7,50	
		#2500		XXS								
4"		#600	114,3	40	200	210	179		7,90	8,30	7,05	
		#1500		160	250		196		9,85		7,70	
		#2500		XXS								
6"		#600	168,3	40	220	230	215		8,65	9,05	8,45	
		#1500		160	270		230		10,60		9,05	
		#2500		XXS								
8"	1"	#600	219,1	40	270	300	256	10,60	11,80	10,10		
		#1500		160	320		268			12,60	10,55	
		#2500		XXS								
10"	1 1/2"	#600	273,1	40	330	380	314	13,00	14,95	12,35		
		#1500		160	400		328	15,75		12,90		
		#2500		XXS								
12"		#600	323,9	40	330	420	340	13,00	16,55	13,40		
		#1500		160	400		354	15,75		13,95		
14"		#600	355,6	40	400	480	376	15,75	18,90	14,80		
16"			406,4	40	400	520	406,4	15,75	20,50	16,00		
18"			457,2	40	450	620	457,2	17,70	24,40	18,00		
20"		2"	#600	508	40	450	680	508	17,70	26,80	20,00	

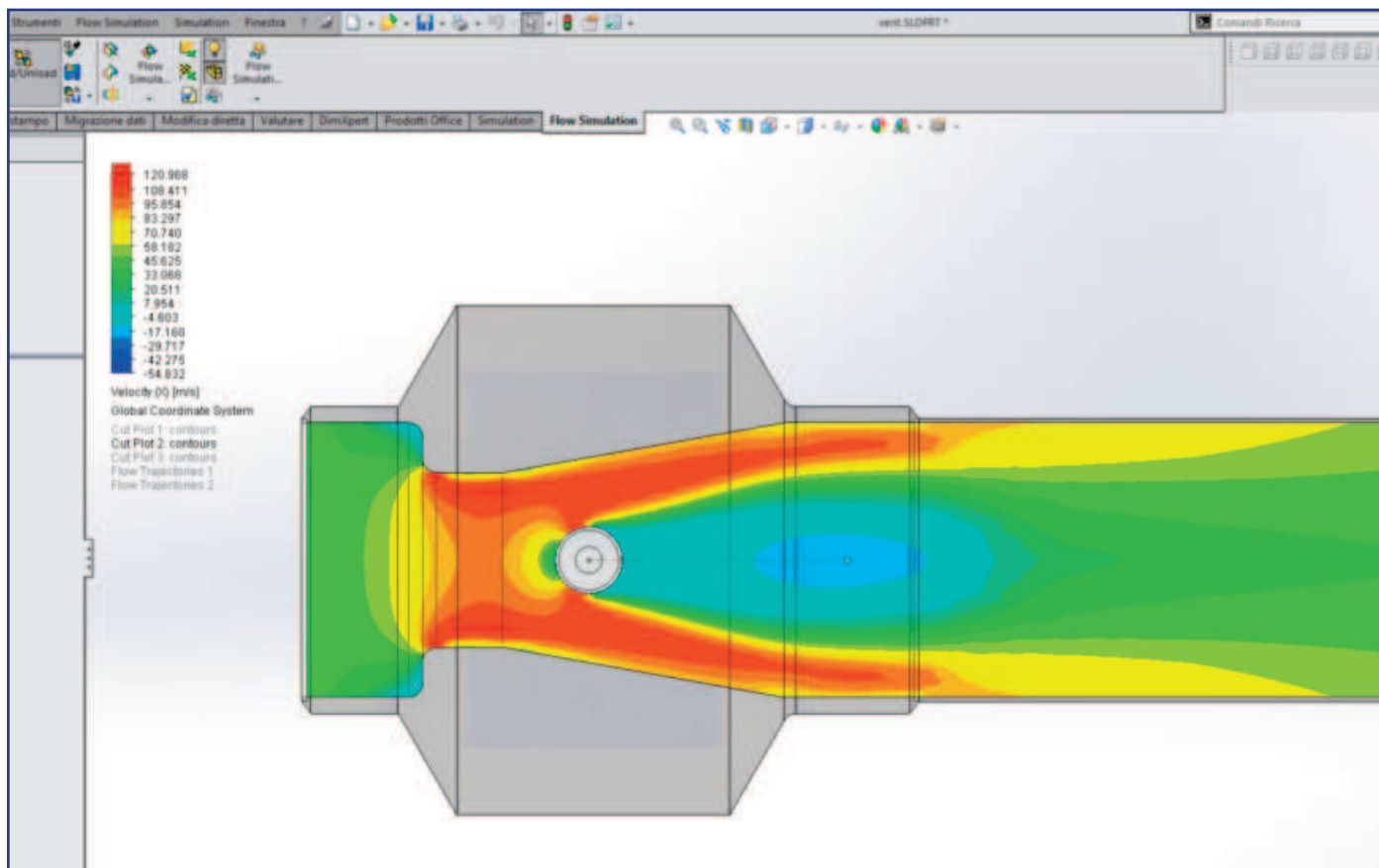
DN Steam	FLANGED (ANSI)   quote B											
	millimeters						inch					
	#150	#300	#600	#900	#1500	#2500	#150	#300	#600	#900	#1500	#2500
3"	316	336	346	384	414	516	12,44	13,23	13,62	15,12	16,30	20,31
4"	360	378	414	438	458	590	14,17	14,88	16,30	17,24	18,03	23,23
6"	404	424	464	510	572	776	15,91	16,69	18,27	20,08	22,52	30,55
8"	500	520	566	624	726	936	19,69	20,47	22,28	24,57	28,58	36,85
10"	580	612	684	748	888	1218	22,83	24,09	26,93	29,45	34,96	47,95
12"	646	678	732	820	986	//	25,43	26,69	28,82	32,28	38,82	//
14"	730	762	810	//	//	//	28,74	30,00	31,89	//	//	//
16"	770	808	876	//	//	//	30,31	31,81	34,49	//	//	//
18"	896	934	988	//	//	//	35,28	36,77	38,90	//	//	//
20"	966	1000	1060	//	//	//	38,03	39,37	41,73	//	//	//

DN Steam	FLANGED (PN)   quote B																	
	millimeters									inch								
	PN10	PN16	PN25	PN40	PN63	PN100	PN160	PN250	PN400	PN10	PN16	PN25	PN40	PN63	PN100	PN160	PN250	PN400
3"	280	280	296	296	324	336	420	384	480	11,02	11,02	11,65	11,65	12,76	13,23	16,54	15,12	18,90
4"	314	314	340	340	366	390	510	450	560	12,36	12,36	13,39	13,39	14,41	15,35	20,08	17,72	22,05
6"	340	340	380	380	420	460	650	550	680	13,39	13,39	14,96	14,96	16,54	18,11	25,59	21,65	26,77
8"	424	424	460	476	520	560	856	680	860	16,69	16,69	18,11	18,74	20,47	22,05	33,70	26,77	33,86
10"	516	520	556	590	630	694	1060	810	//	20,31	20,47	21,89	23,23	24,80	27,32	41,73	31,89	//
12"	556	576	604	650	700	760	1220	//	//	21,89	22,68	23,78	25,59	27,56	29,92	48,03	//	//
14"	616	644	680	730	780	858	//	//	//	24,25	25,35	26,77	28,74	30,71	33,78	//	//	//
16"	664	690	740	790	840	//	//	//	//	26,14	27,17	29,13	31,10	33,07	//	//	//	//
18"	764	786	840	890	//	//	//	//	//	30,08	30,94	33,07	35,04	//	//	//	//	//
20"	830	848	930	960	//	//	//	//	//	32,68	33,39	36,61	37,80	//	//	//	//	//





## VARivent flow simulation.



Technical department can analyze steam velocity inside Varivent. It's possible to study specific geometry for each application. The picture is the screen shoot of a flow simulation. With different colors it is easy to see the acceleration due to the Venturi geometry that can guarantee the good nebulization for a perfect temperature control.

## About Carraro

Carraro Srl is a private independent company, operative since 1924 in the field of industrial valves. The firm produces and commercializes worldwide a broad range of industrial pressure regulators, desuperheaters and safety valves for fluids such as steam, process gases and liquids.

The flexible organization of Carraro allows a great customization of the products and the production of “tailor made” constructions. Most of the Carraro’s product range can be realized also in “exotic” materials such as e.g. duplex, superduplex, monel, hastelloy, aluminum bronze and others. Supported by a global network of sales offices, representatives and distributors, Carraro offers a wide range of solutions for the Oil&Gas, the Power industry and all other diversified industrial applications.

## Carraro: product range

**UB Regulators:** direct-operated pressure regulators with compact design

**Maxomatic Series:** multifunction pilot-operated regulators for liquids

**MM-BPM series:** direct-operated, spring pressure regulators

**AT series:** direct-operated temperature regulators

**M51 series:** direct-operated, weight and lever pressure regulators

**CS series:** safety valves for vapours, gas, liquids

**CSV series:** safety valves for steam and gases

**VRE series:** electrically operated control valves

**MCP - ACP series:** pneumatically operated control valves

**AIRMATIC series:** electropneumatic safety valves

**DSH series:** desuperheaters

## Approvals and certifications

UNI EN ISO 9001: 2008 ✓

UNI EN ISO 14001: 2004 ✓

97 / 23 / CE (PED) ✓

94 / 09 / CE (ATEX) ✓

RINA ✓

GOST R+RTN ✓

CRN Canada ✓

## Cooperations with notified bodies

LLOYD’s REGISTER ✓

ABS ✓

BV ✓

DNV ✓

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