Fast acting anti-water hammer valve
Mod. VRCA

The CSA fast acting, surge prevention, pressure relief valve Mod. VRCA has been designed to avoid the devastating effects of water hammers in pipeline networks. The purpose is actually to prevent pressure from rising above a pre-set value, thanks to its capability of discharging the excessive volume of water directly into the atmosphere.

Technical features and benefits

- Solid and compact design suitable for treated and raw water and to reduce blow-back.
- Negligible inertia of the internal mobile parts ensuring the absence of friction and long lasting performances.
- Perfect water tightness and excellent resistance to cavitation and harsh working conditions due to the floating obturator technology and to the use of special gaskets and high resistant stainless steel grades.
- Fast and accurate response without any hysteresis effect thanks to high frequency annealed springs.
- Reduced overpressure thanks to a wide selection of spring and ranges in pressure.
- Water vertical discharge deflector.

Applications

- Downstream of pumping stations to cushion sudden overpressure as a result of pump start up and power failure (in case of one of more pumps in parallel).
- Downstream and upstream of main transmission lines, or pipe segments, not able to endure critical conditions such as sudden and unexpected rise in pressure, and to guarantee reliable system protection.
- Downstream of a pressure reducing valve as a safety device.
- Upstream of modulating and sectioning devices with rapid response time, likely to generate unwanted surges.
- In general, whenever and wherever pipe bursts are expected.

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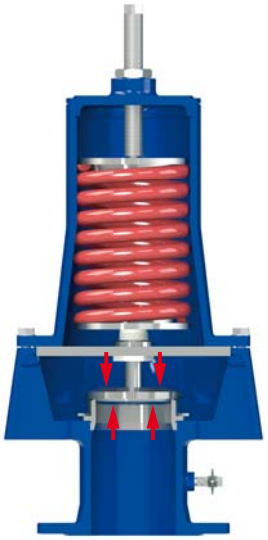
Operating principle

The valve must be pre-set at first, simply acting on the spring, to open whenever the pressure rises above a certain value considered critical for the system.
The particular shape and construction, along with the perfect centring of the mobile block, will protect the upper part against water spurts coming from VRCA operation cycles. The valve is supplied with a pressure gauge and drainage ball valve, in order to facilitate the pressure measurement and setting procedure directly on the field.

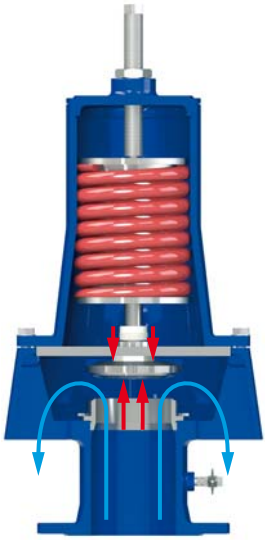


Valve closed

Should the pressure remain below the valve's set point the VRCA will be perfectly closed, thanks to the compression of the spring pushing the obturator down to the seat.

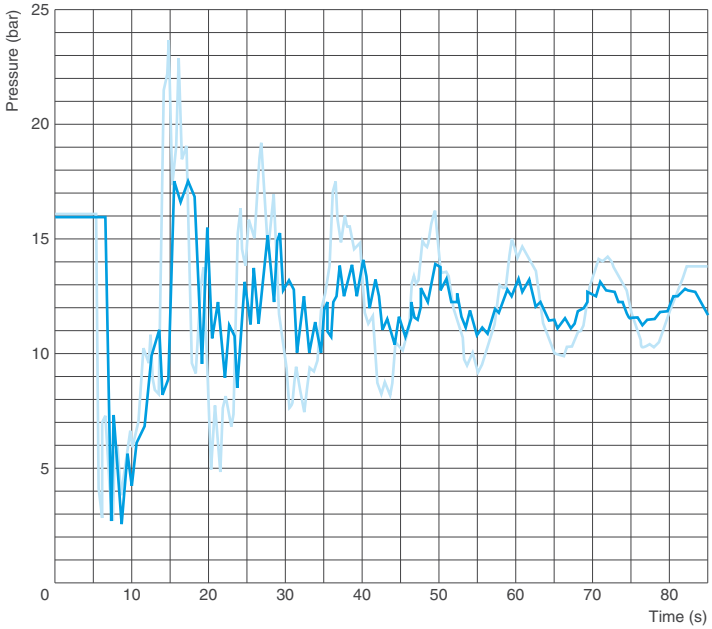
Valve open

Should the pressure rise above the valve's set point the obturator will rise, discharging to the atmosphere the excessive fluid volume necessary to avoid the upsurge.



Fast acting performance

The graph below shows the response of the fast acting pressure relief valve VRCA under transient conditions. In this particular case we have actual pressure recordings from a pump station subject to frequent power failures. Without any protection the system was subject to a decrease in pressure at first followed by a dangerous surge, depicted on the plot in light blue, while with the installation of the VRCA fast acting relief valve the increase in pressure was contained with no further damage to the pipeline. The frequency of the recording with the valve shows the absence of delay with regards to the same without, proving the adequate response time. On the picture on the right particular of the valve during discharge, the vertical deflector on the lower body ensures the absence of spurts around it.



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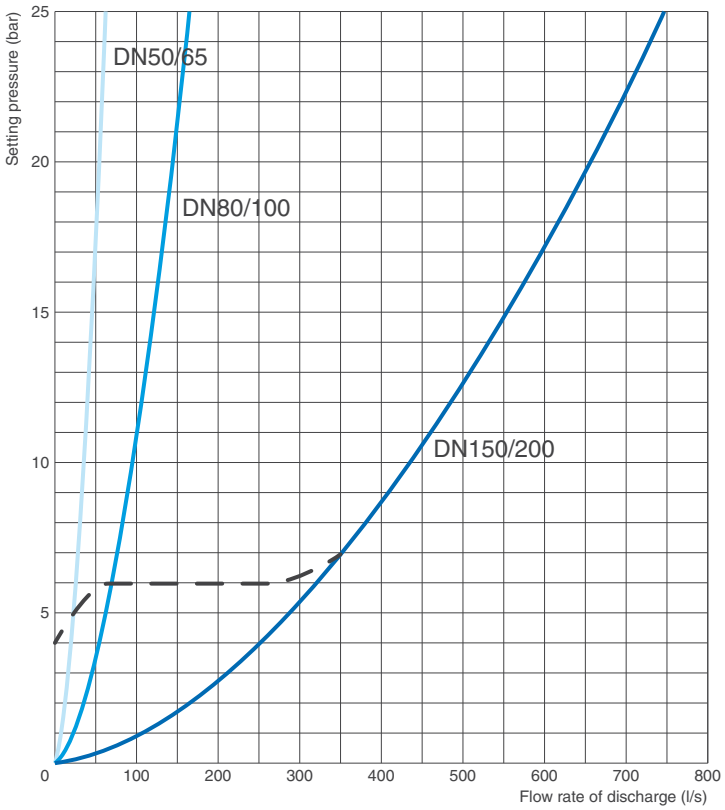
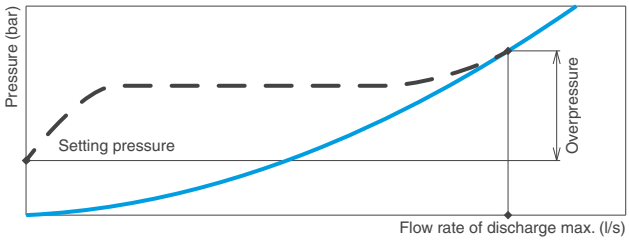
Technical data



Valve discharge sizing chart

The plot on the left shows the valve's capacity during discharge with full opening of the obturator. For the adequate protection of the pipeline we strongly advice to size the valve in order to cope with at least 35% of the nominal flow, while a more comprehensive and detailed surge analysis is available from CSA on request.
The overpressure is another important aspect to be considered during sizing, with an indication of the behaviour of the valve under transient events depicted below by a tolerance between static and dynamic expressed by the overpressure value.

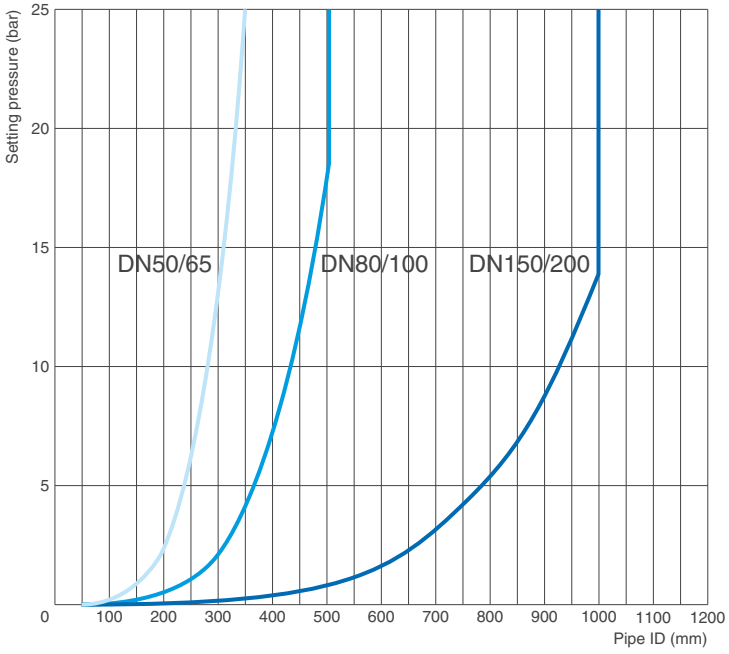


DN mm	PN bar	Setting bar	Flow rate max. l/s	Overpressure bar
50/65	10	1-8	36	0,8
50/65	16	8-16	47	1,5
50/65	25	16-25	62	2,2
80/100	10	1-8	95	1
80/100	16	8-16	126	2
80/100	25	16-25	165	2,5
150/200	10	1-8	435	2
150/200	16	8-16	577	2,5
150/200	25	16-25	745	3,5

Discharge rate and overpressure

The table shows the discharge flow rates of the valve with different pressure set-points, and the corresponding overpressure. The VRCA are supplied with three springs to cover the following pressure ranges:
- 1-8 bar,
- 8-16 bar,
- 16-25 bar.

Higher values are available on request for the DN 50/65 and the DN 80/100.



Preliminary sizing chart

The function of the fast acting relief valve CSA Mod. VRCA is to protect piping systems, pumps, vessels and other equipment from excess in pressure and potential damages.
For the sizing overpressure values, blow-down effects and installation criteria must be taken into account, purely as an indication and for a preliminary assessment use the following chart showing the recommended valve's DN versus pressure setting and pipe ID. Ensure that the operating conditions fall on the left of the curve of the chosen valve.

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Installation

The fast acting pressure relief valve VRCA must be installed in a vertical position with isolation device to ensure the proper maintenance and, if required, setting on the field. The installation chamber, if within a closed environment of underground, shall be provided with a proper drainage system to avoid the risk of flooding during the valve's discharge. Shouldn't a valve be enough for the purpose we recommend the installation of two units in parallel with a manifold to be sized on request, and/or two or even more valves in series located on separated outlets.

Working conditions

Treated and row water with a maximum temperature of 70°C.
Maximum pressure 25 bar. Spring setting ranges: 1-8 bar, 8-16 bar, 16-25 bar.
Higher pressure values on request.

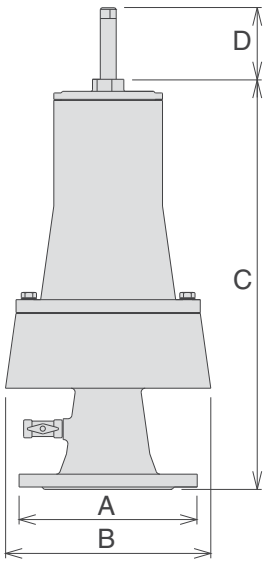
Standard

Certified and tested in compliance with EN 1074/5. Flanges according to EN 1092/2.
Epoxy painting blue RAL 5005 applied through fluidized bed technology.
Changes on flanges and painting on request.

Weights and dimensions

DN mm	A mm	B mm	C mm	D mm	Seat DN mm	Weight Kg
50/65	185	185	417	40	40	14
80/100	235	242	540	50	62	28
150	300	404	720	220	137	75
200	360	404	720	220	137	79

Values are approximate, consult CSA service for more details.



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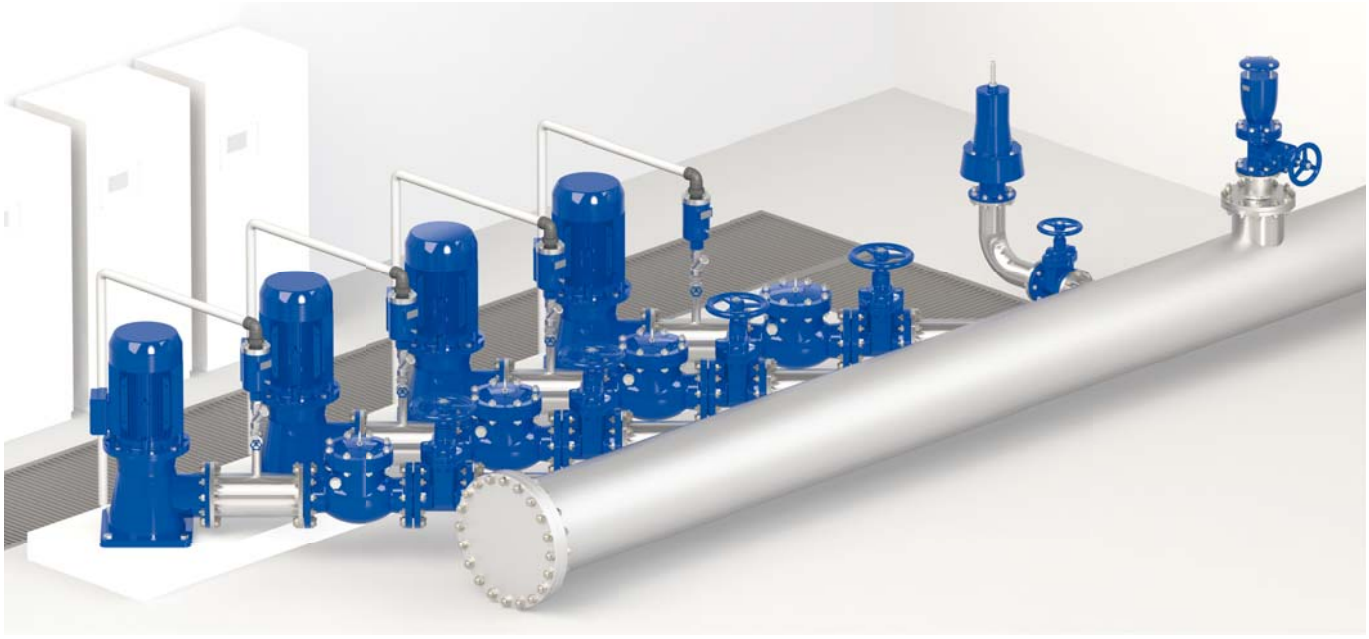
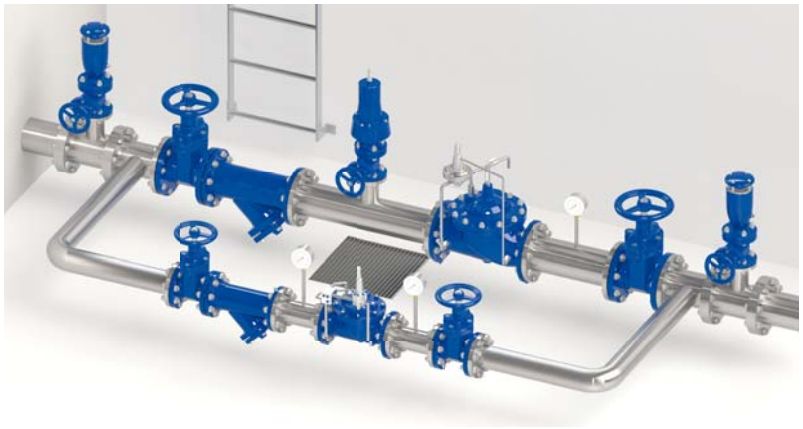
Example of common applications

Pumping station. The following pictures shows some common applications for the fast acting pressure relief valve VRCA. The VRCA is installed downstream of pumps check valves, as close to the drain as possible. The installation in vertical position, away from the main pipe, avoid potential spurts generated during discharge. Particular of the installation with an anti surge combination air valve CSA FOX / Lynx 3F AS for the protection against negative pressure conditions.





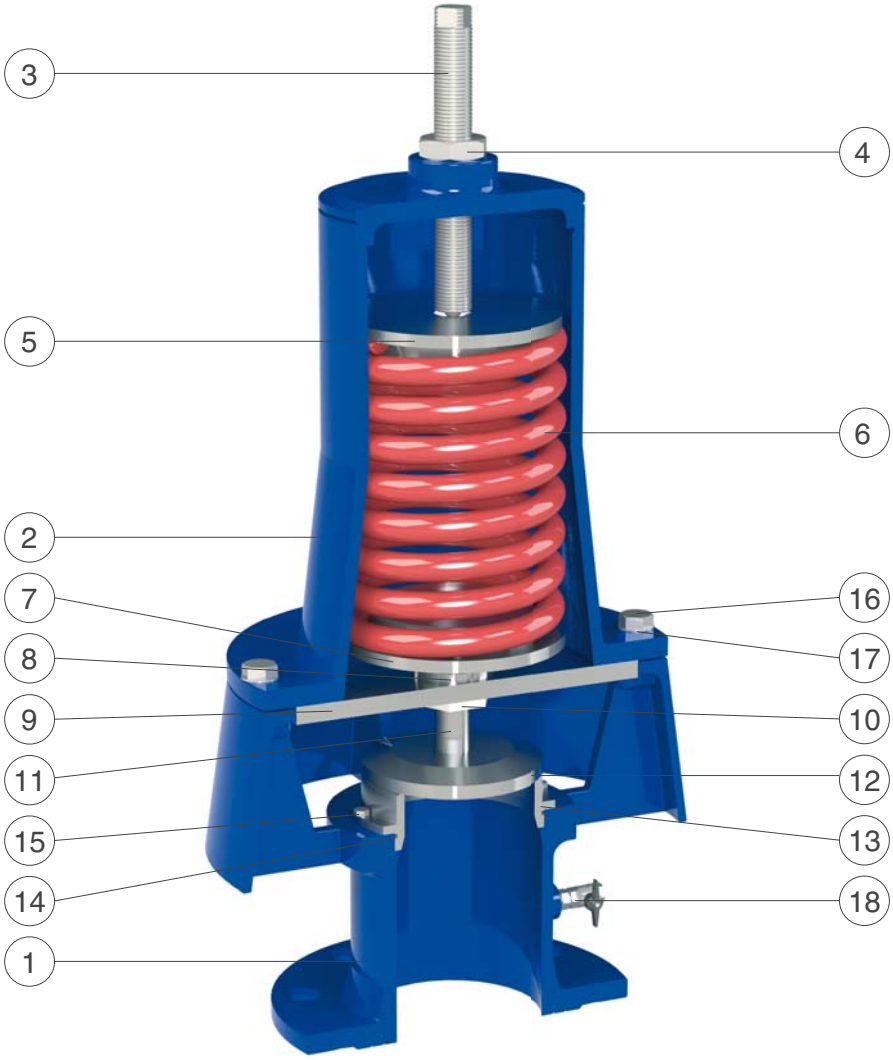
Burst valves and opening/closing devices

The VRCA is installed upstream of fast closing devices, such as burst flow automatic control valve Mod XLC 380/480 model, due to the potential upsurge created by the flow interruption. Air valves CSA combination anti-surge FOX or LYNX 3F AS or RFP are always recommended upstream and downstream of the installation.

Level control

In case of level control, especially with valve controlling the minimum and maximum, the risk of overpressure and danger to the pipeline has to be considered. We strongly recommend, should that be the case, to install a VRCA upstream of the regulating device or to contact CSA for different solutions.

Technical details



N.	Component	Standard material	Optional
1	Body	ductile cast iron GJS 500-7 or GJS 450-10	
2	Cap	duct. cast iron GJS 500-7 or 450-10 and painted steel	
3	Driving screw	stainless steel AISI 304	stainless steel AISI 316
4	Nut	stainless steel AISI 304	stainless steel AISI 316
5	Spring support	stainless steel AISI 303 (304 for DN 150-200)	stainless steel AISI 316
6	Spring	spring painted steel 52SiCrNi5	
7	Spring housing	stainless steel AISI 303 (304 for DN 150-200)	stainless steel AISI 316
8	Ring	stainless steel AISI 304	stainless steel AISI 316
9	Separation plate	s.s. AISI 304 (painted steel for DN 150-200)	stainless steel AISI 316
10	Driving sleeve	Delrin (s. s. AISI 304 for DN 150-200)	
11	Shaft	stainless steel AISI 304	stainless steel AISI 316
12	Obturator	stainless steel AISI 303 (304 for DN 150-200)	stainless steel AISI 316
13	Sealing seat	stainless steel AISI 304 (303 for DN 50/65)	stainless steel AISI 316
14	O-ring	NBR	EPDM/Viton
15	Screws	stainless steel AISI 304	stainless steel AISI 316
16	Screws	stainless steel AISI 304	stainless steel AISI 316
17	Washers	stainless steel AISI 304	stainless steel AISI 316
18	Ball valve 1/4”	nickel-plated brass	stainless steel AISI 316

The list of materials and components is subject to changes without notice.

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