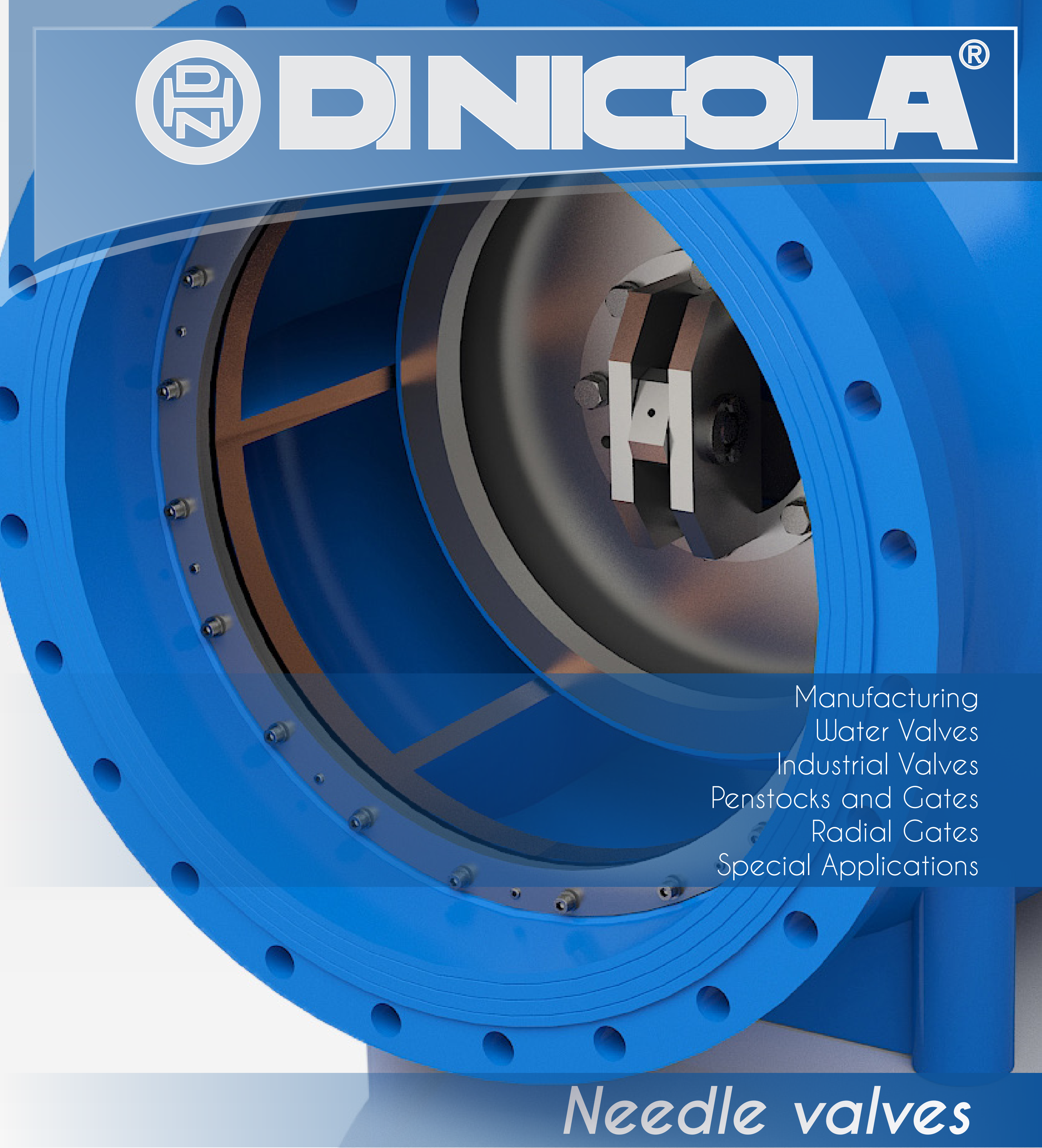
DINICOLA®



Manufacturing
Water Valves
Industrial Valves
Penstocks and Gates
Radial Gates
Special Applications

Needle valves

TÜVRheinland® CERTIFIED

Management System
ISO 9001:2015

www.tuv.com
ID 9105084789

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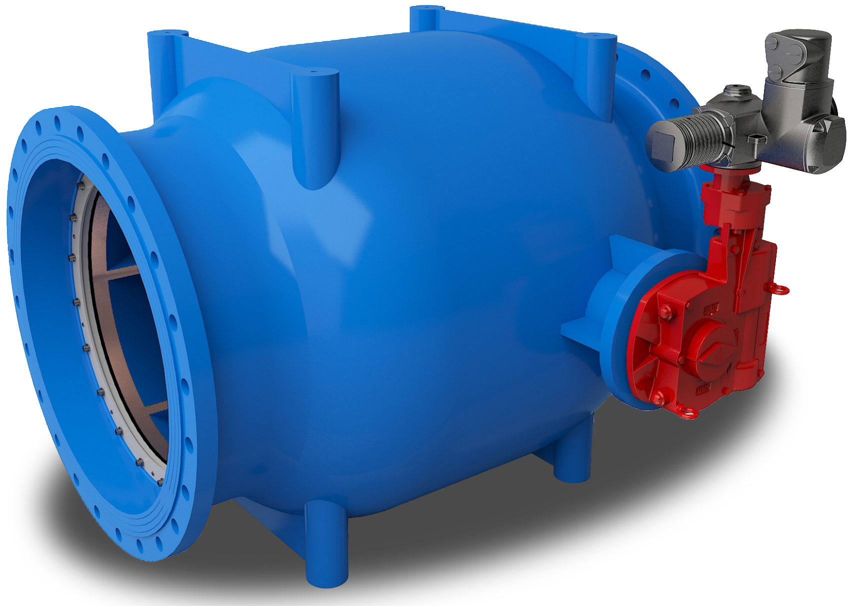
GENERAL CHARACTERISTICS

The network has gained increasing importance trying to conciliate available water reserves and the always increasing request for water. Usually, the network capacity is always greater than the effective request; this implies the necessity to utilize devices able to control the distribution of the water without wasting it.

Needle valve is especially designed to realize the function of regulating the water flow, maintaining an easy handling even in circumstances which comport heavy hydrostatic loads at its mouth and a very different exercise pressure.

The use of needle valve with the aid of actuators allows to utilize it in control systems with very different functions. Water flow regulation actuated by needle valve is done by the horizontal sliding of an obturator, mechanically acted by an handle with a connecting rod-movement.



Thanks to a special balanced chamber every kind of vibration or anomalous oleodynamic load are eliminated, moreover its internal shape is especially made to avoid the incurring of cavitation.

The obturator moves in position to close the valve following the direction of the flow and allowing to control the change of the water flow without efforts.

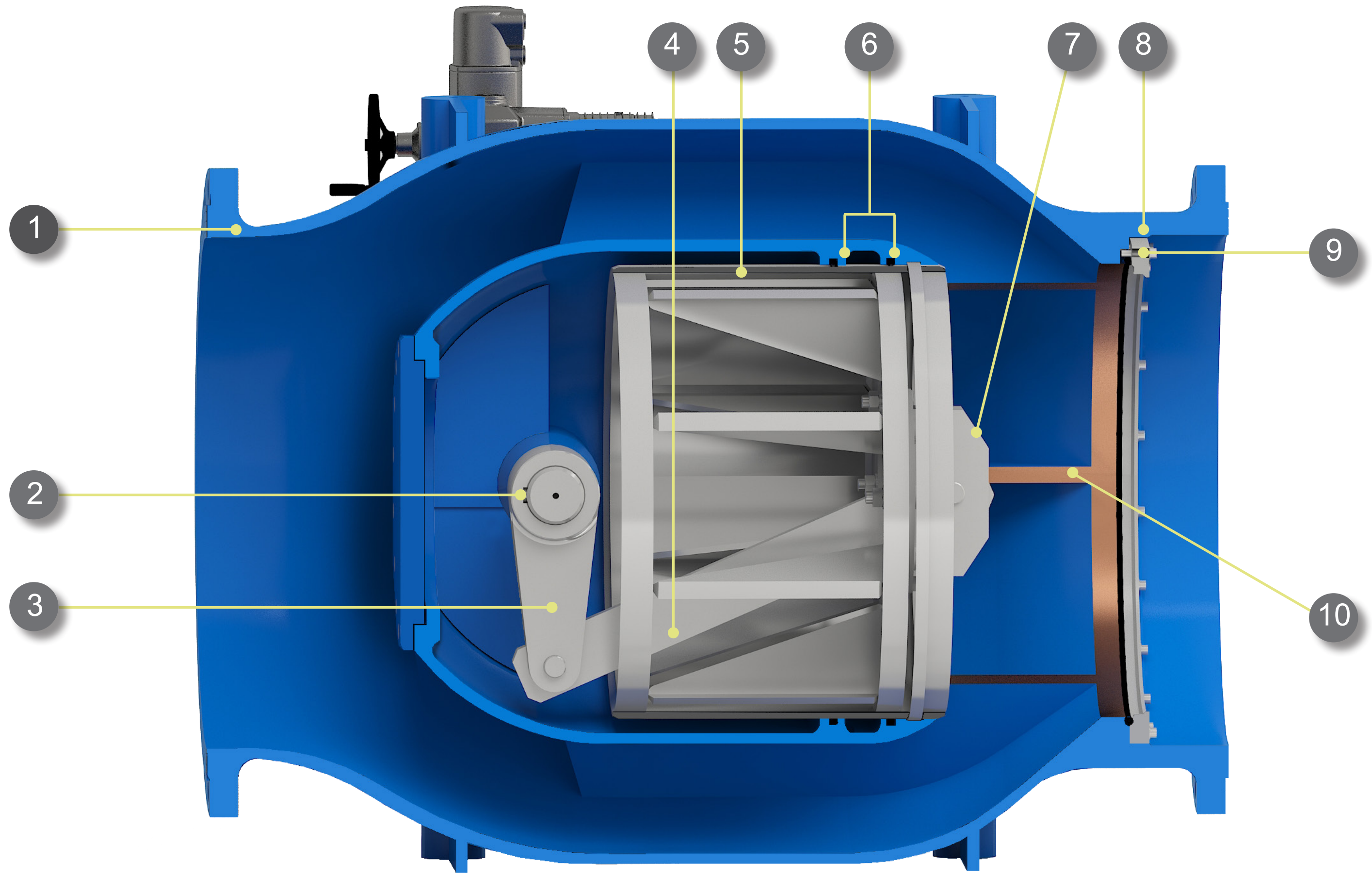
The sealing-ring of the shutter is made usually of EPDM for a perfect bubble tightness. Its position protected from the main flow allowing a longer life without maintenance.

The special design of the sealing retaining ring allow its dismounting from downstream without taking away the valve from the pipeline when a maintenance and inspection manhole is applied to conduit .

WHY TO CHOOSE A “DI NICOLA NEEDLE VALVE”

- The dimensioning is based on the exercise conditions
- Self-lubrificating bushing are used to sustain the stem
- DI NICOLA needle valve is certified by a third party
- Sealing by O-ring realized only in position “closed”
- The use of anti cavitation devices is rarely required
- Di Nicola builds and installs valves since 1981
- The costs are lower when using a valve with dimensions inferior to the conduit diameter
- Increased security even in condition of heavy load
- High durability of the O-ring and easy upkeep of the valve
- Trustfulness supported by a very long list of references
- Certified guarantee of performance
- Reduced head losses

MATERIALS AND DIMENSIONS



ANTICORROSIVE PROTECTION

Coating standard is realized on hot support by epoxy resins, with 200 micron minimum thickness. The epoxy powder is suitable for potable water according to specifications of most important European certification agencies (DM 102/78). Every single part of the needle valve is coated before assembly except for machined parts.

HYDRAULIC TESTS

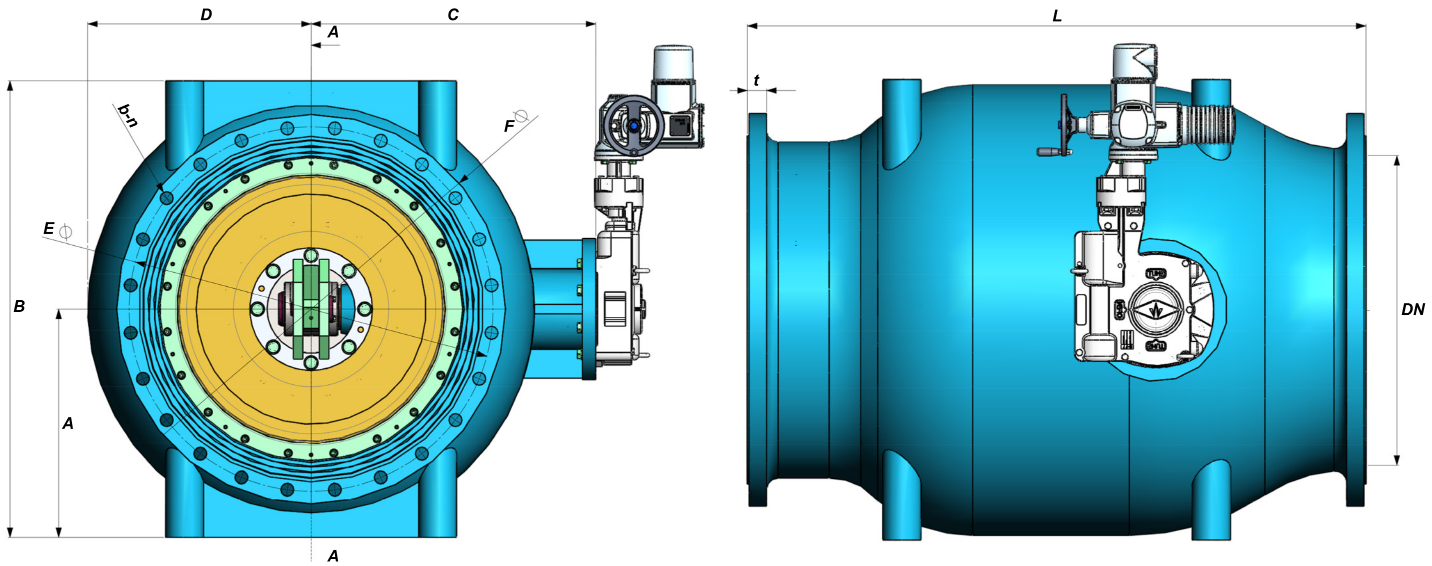
All the Di Nicola needle valves are hydraulically tested to verify the conformity to ISO 5208 or EN 12266-1. Shell test is performed to 1,5 times the nominal pressure with obturator slightly open . Seat tests are performed to 1,1 times the nominal pressure with no leak for a period of 2 min. Backseat tests are Not applicable.

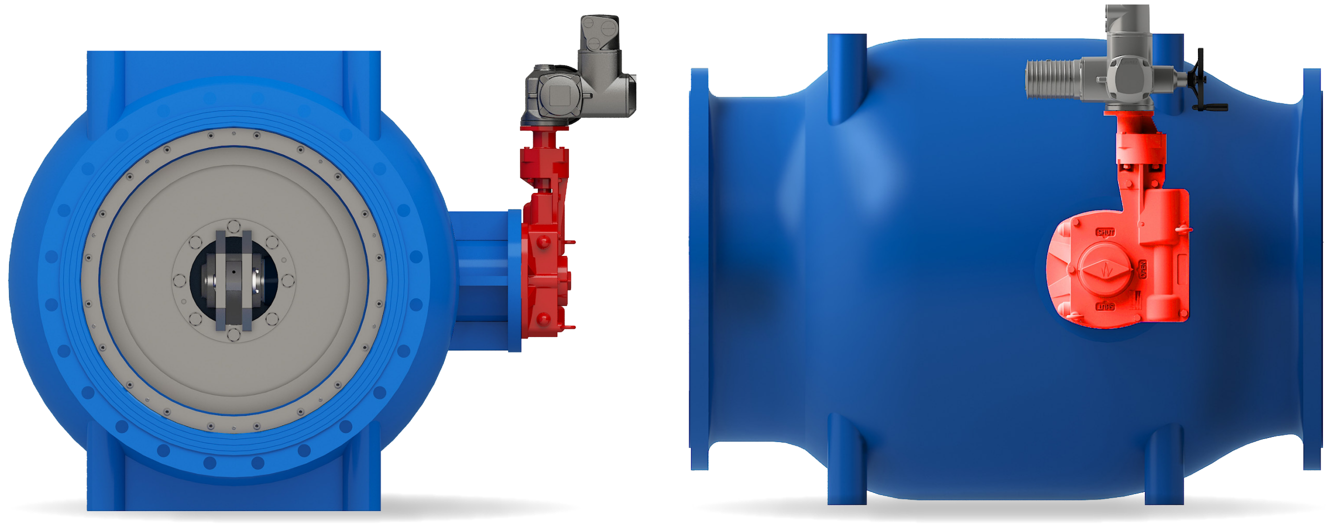
Item	Description	Materials
1	Body	Ductil iron EN GJS 500-7
2	Shaft	St. st. AISI 420 EN 1.4021
3	Crank	Ductil iron EN GJS 500-7 - Fe S275JR
4	Connecting rod	St. st. AISI 304 - EN 1.4301
5	Shutter	St. st. AISI 304 - EN 1.4301
6	O-ring	neoprene
7	Support	St. st. AISI 304 - EN 1.4301/Fe S275JR
8	Sealing Rubber	Neoprene
9	Collar	St. st. AISI 304 - EN 1.4301/Fe S275JR
10	Guide	Brazed Bronze

VALVE SECTION

NOTES ON INSTALLATION

Di Nicola Needle valve can be installed vertically remembering to follow flow direction arrow show on the valve body. It is recomanded to install Di Nicola needle valves following main office dimensioning and advices because flow control valves must be dimensioned based on Flow and water speed data . Most of times max and min. flow rate require an application on two section of Venturi pipes in order to connect the correct dimensioned valve to the main pipeline .





In case of installation long a pipeline together with a main shout off valve it is reccomanded to keep a minimum distance from the main valve of three times the diameter of the conduit, to avoid flow interferences and turbolences .

DIMENSIONS IN MM

DN	PN	A	B	C	D	E	F	n-d	L	t	Nm	ISO	N. turn	Kg
	10					160	200	8-19						
80	16	100	200	136	72	160	200	8-19	160	19	7	F10	10	20
	25					160	200	8-19						
	10	110	220			180	220	8-19						
100	16	110	220	154	86	180	220	8-19	200	23	15	F10	10	32
	25	118	235			190	235	8-23						
	10					210	250	8-19						
125	16	125	250	185	125	210	250	8-19	250	24	16	F10	10	40
	25					220	270	8-28						
	10	143	285			240	285	8-23						
150	16	143	285	210	125	240	285	8-23	300	26	27	F10	11	70
	25	150	300			250	300	8-28						
	10					295	340	8-23						
200	16	190	380	231	160	295	340	12-23	400	31	45	F10	11	140
	25					310	360	12-28						
	10					350	395	12-23						
250	16	220	440	290	203	355	405	12-28	500	32	54	F10	11	190
	25					370	425	12-31						
	10					400	445	12-23						
300	16	247	495	310	238	410	460	12-28	600	32	34	F10	31	290
	25					430	485	16-31						
	10					460	505	16-23						
350	16	300	600	377	272	470	520	16-28	700	41	39	F10	31	380
	25					490	555	16-34						
	10					515	565	16-28						
400	16	315	630	372	304	525	580	16-31	800	38	52	F10	40	550
	25					550	620	16-37						
	10					565	615	20-28						
450	16	360	720	385	340	585	640	20-31	900	35	51	F10	43	700
	25					600	670	20-37						
	10					620	670	20-28						
500	16	390	780	455	373	650	715	20-34	1000	45	54	F10	50	850
	25					660	730	20-37						
	10					725	780	20-31						
600	16	490	980	555	438	770	840	20-37	1200	50	52	F10	70	1100
	25					770	845	20-41						
	10					840	895	24-31						
700	16	535	1070	643	523	840	910	24-37	1400	45	51	F10	77	1750
	25					875	960	24-44						
	10					950	1015	24-34						
800	16	595	1190	743	583	950	1025	24-41	1600	50	89	F10	91	2000
	25					990	1085	24-50						
	10					1050	1115	28-34						
900	16	655	1310	780	658	1050	1125	28-41	1350	55	85	F10	114	2400
	25					1090	1185	28-50						
	10					1160	1230	28-37						
1000	16	750	1590	945	730	1170	1255	28-44	1500	60	122	F10	108	3750
	25					1210	1320	28-57						

Larger diameters are also available on request in electrowelded steel.

TECHNICAL REPORT ON HYDRAULIC BEHAVIOUR

Report made on the bases of the "Di Nicola" valve testing, realized by "Istituto di Idraulica Agraria Università di Napoli" (1991).

Aim:
The following report is to illustrate the technical reasons by which the valve is not subject to cavitation phenomena when used in a correct way.

Pressure course within the valve (fig. 1)

Piezometric pressure in the hydraulic network follows the direction indicated on fig. n° 1

Section A= Upstream pressure (Hm)
Section C= Minimum pressure within the valve
Section D= Downstream pressure (Hv)

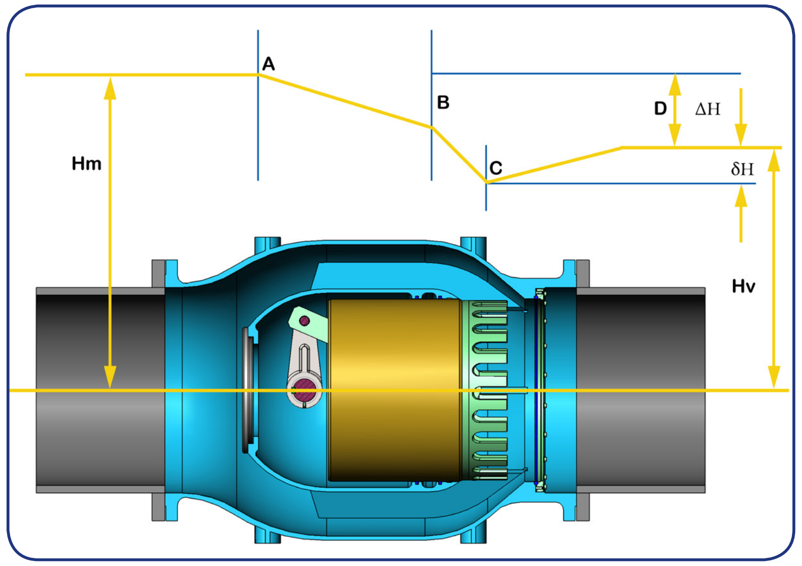


Fig. 1

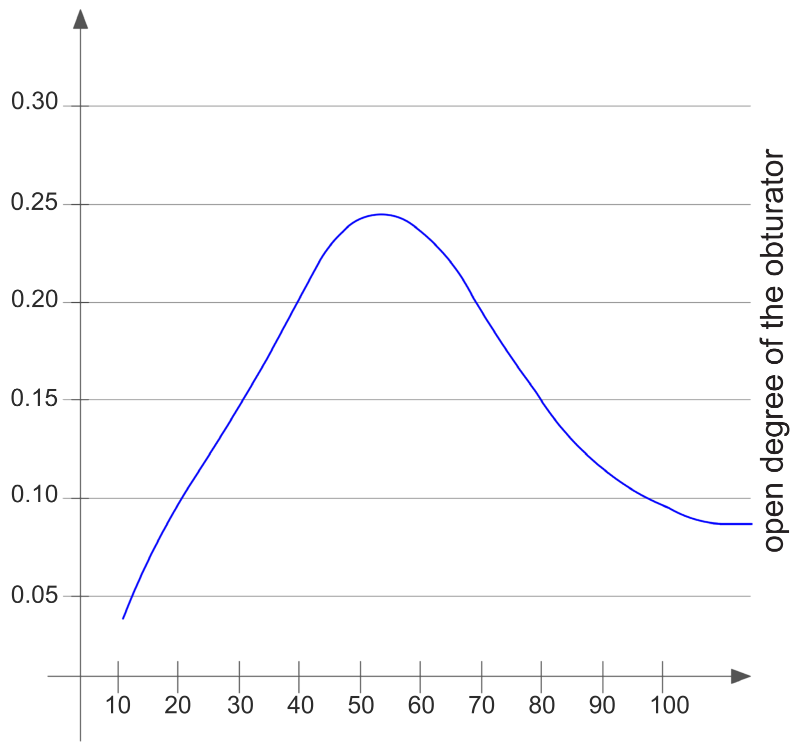
The difference (Hm-Hv) = ΔH represents the effective head loss.
The value of the head loss is defined at each step by the following formula $\Delta H = Kn\, V^2/2g$

Kn = Head loss coefficient at the opening degree. The apparent head loss (δH) is instead recovered by downstream conduit after few diameters (D section), so it is not taken in account in the head losses, anyway it is very important to define the value of the pressure within the valve.

CALCULATION OF THE MINIMUM PRESSURE VALUE IN SECTION "C"

During the tests on the sample have been studied the minimum values of the pressure on the section C. Medium values of ΔH and δH at different opening degrees have been scheduled to obtain diagram (fig. 2) To evaluate the minimum value of the pressure on section C, is necessary to observe the piezometric curve at the different opening degrees.
The C pressure is valid at every opening degree.
Pc = Hv - δH
If the "C" pressure is > than atmospheric pressure, cavitation does not occur. If the "C" pressure is < than atmospheric pressure, it is necessary to analyze the situation to provide the system with devices able to prevent cavitation.

δH/ΔH Water head chart inside the valve



δH/ΔH open degree chart

Fig. 2

CONCLUSIONS:
Analyzing the diagram (FIG.2) it is easy to see the good behaviour of the valve in relation of cavitation, since the ratio $\frac{\delta H}{\Delta H}$ is low.

NEEDLE VALVE DIMENSIONING

The needle valve dimensioning is not based on the conduit diameter but on the pressure conditions in exercise and on the maximum and minimum values of the water flow.

Required data

Maximum flow required (Q - m 3/s.)
Maximum upstream pressure (Hm stat- meters of water column)
Upstream pressure at maximum flow (Hm min - m.w.c.)
Maximum downstream pressure (Hv max - m.w.c.)

Dimensioning example

Q = 0, 80m 3/sec.
Hm stat= 30m. w. c.
Hm min = 16m. w. c.
Hv max = 12 m. w. c.

1 . Determination ΔH available on the valve to deliver the flow Q:
ΔH = Hm min - Hv max ⟶ ΔH = 16 - 12 = 4 m. w. c.

2. Determination of the nominal pressure class (NP)
PN = 1, 5 x Hmstat ⟶ PN = 30 x 1, 5 = 45 m. c. a≈. 4, 5 Bar

The nominal pressure chosen for the valve will be those immediately above the calculated value.
The choice among the standardized ISO classes, in our case, will be NP 6.

3. Determination of the nominal diameter. The value of the diameter will be obtained by the following formula:

$$D = 0,7194\sqrt{Q\sqrt{1/\Delta H}} \longrightarrow 0,7194\sqrt{0,8\sqrt{1/4}} \longrightarrow 0,455 \text{ m.}$$

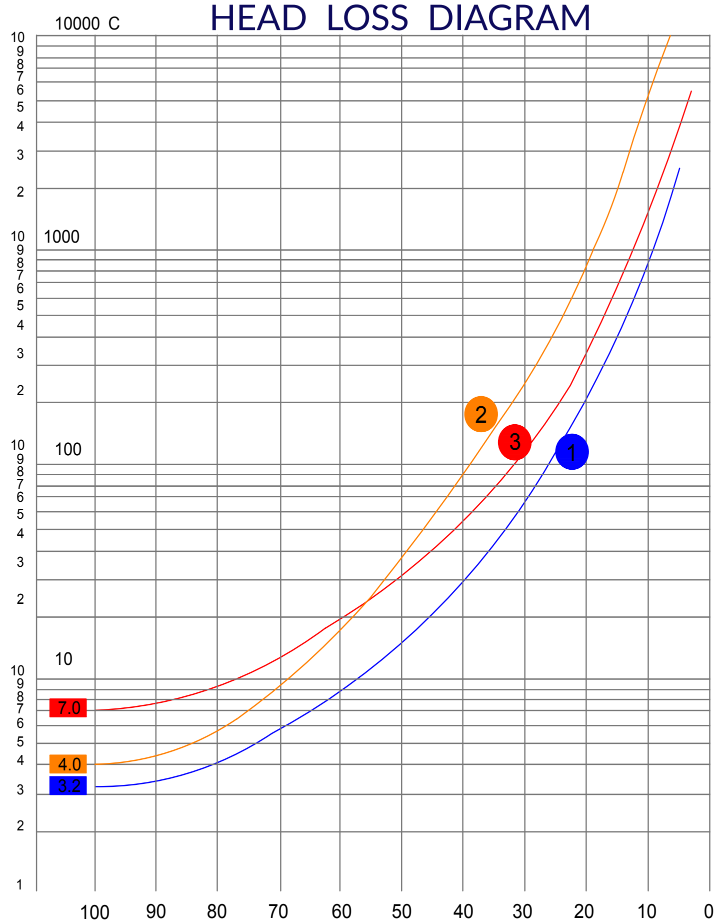
The chosen diameter among the standardized ISO diameters will be: ND 500
This formula is not available when a slotted cylinder is required

OUTLET FLOW:

The outlet flow can put on three sections:

1. Standard section for normal control flow (see curve 1. head loss coefficient diagram).
2. Discharge section for control flow in presence of high pressure into the pipe line. (see curve 2. head loss coefficient diagram)
3. Discharge section with very high pressure into the pipe line. In this case the inner cylinder shall have longitudinal slot. (see curve 3. head loss coefficient diagram)

HEAD LOSS DIAGRAM

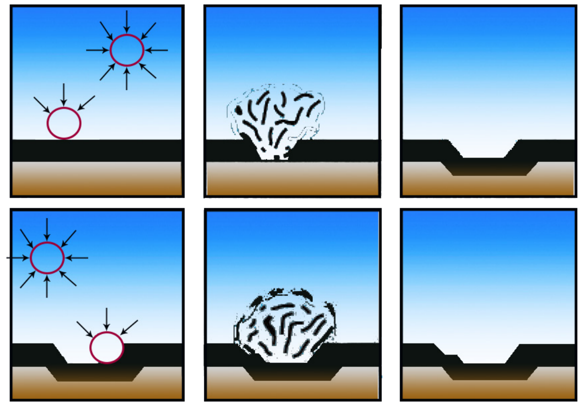


OPENING DEGREE %

Our firm reserves the right to make any technical changes without any notice to the client.

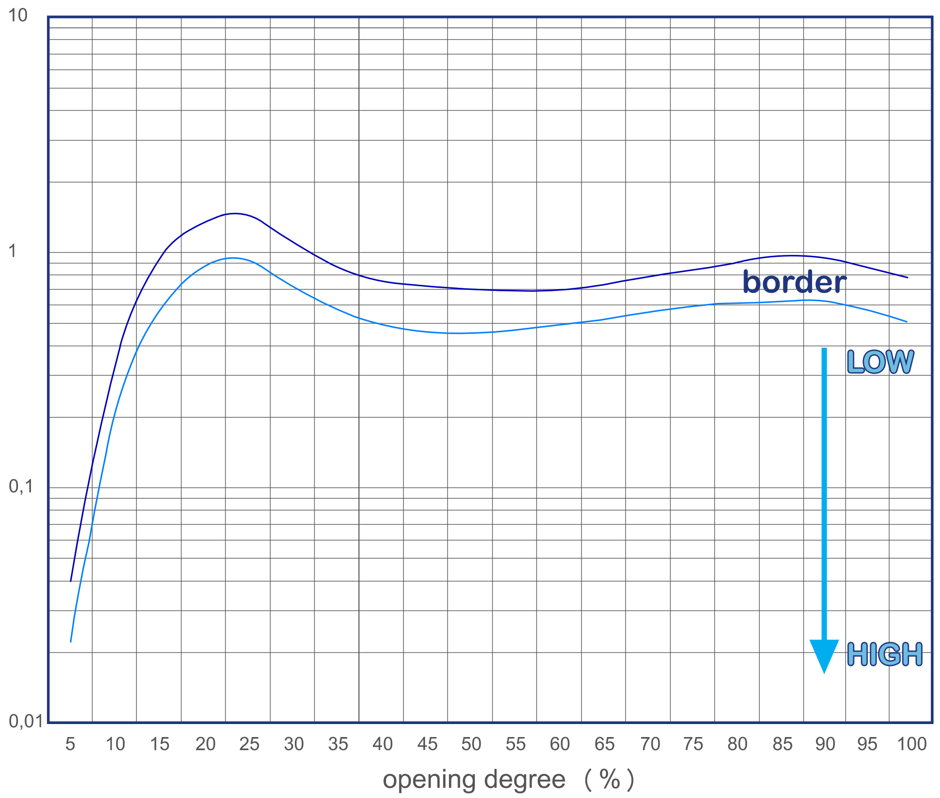
CAVITATION CAUSES AND EFFECTS

Either we regulate or stop a water flow in the concentration area, a reduction of the pressure occurs. When the pressure drops below the vapour saturation in the water, gases are generated with subsequent release of vapourbubbles in the zone of depression. In this environment the bubbles, pushed by the flow, caused by the pressure difference downstream, implode reverting back to liquid form and damagin the inner walls of the piping. The shocks due to the high pressure localized on the walls of the valves and the pipes cause great damages. to them added to the heavy noise and destructive vibrations. The special profile of the DI NICOLA valve, drives the water flow against the walls of the body of the valve and of the nearby conduit creating, in its interior, a collapse area for the vapour bubbles that prevents them to reach the walls of the valve or of the conduit creating, in its interior, a collapse area for the vapour bubbles that prevents them to reach the walls of the valve or of the conduit and to damage them.



OPENING DEGREE - CAVITATION COEFFICIENT DIAGRAM VALVE NEEDLE TYPE STANDARD CAST TYPE DN 200 - DN 800

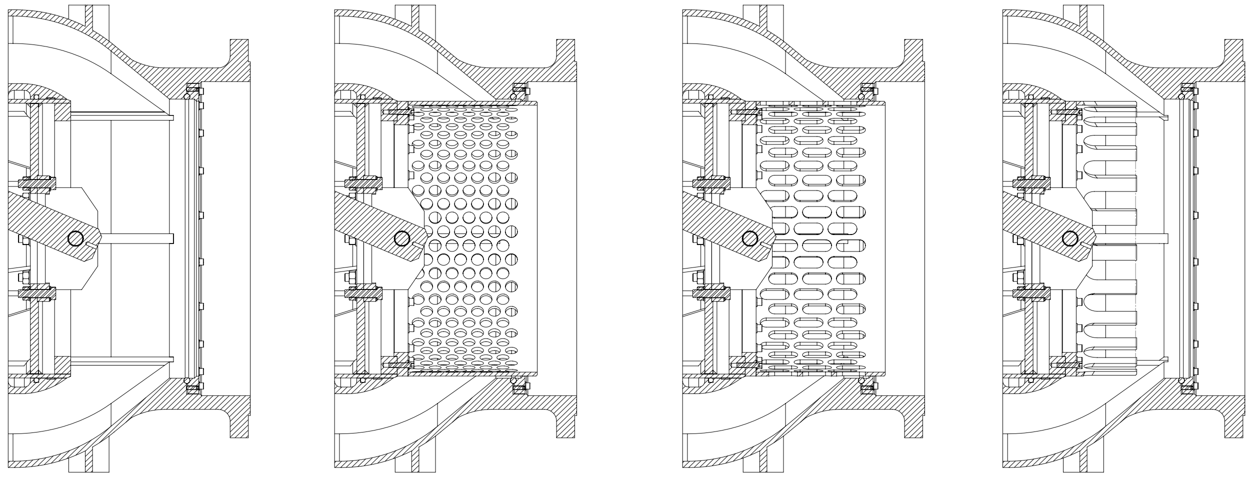
$$\text{Cavitation coefficient} = \frac{P_2 + P_a - P_v}{P_1 - P_2 + \frac{V^2}{2g}}$$



Where:

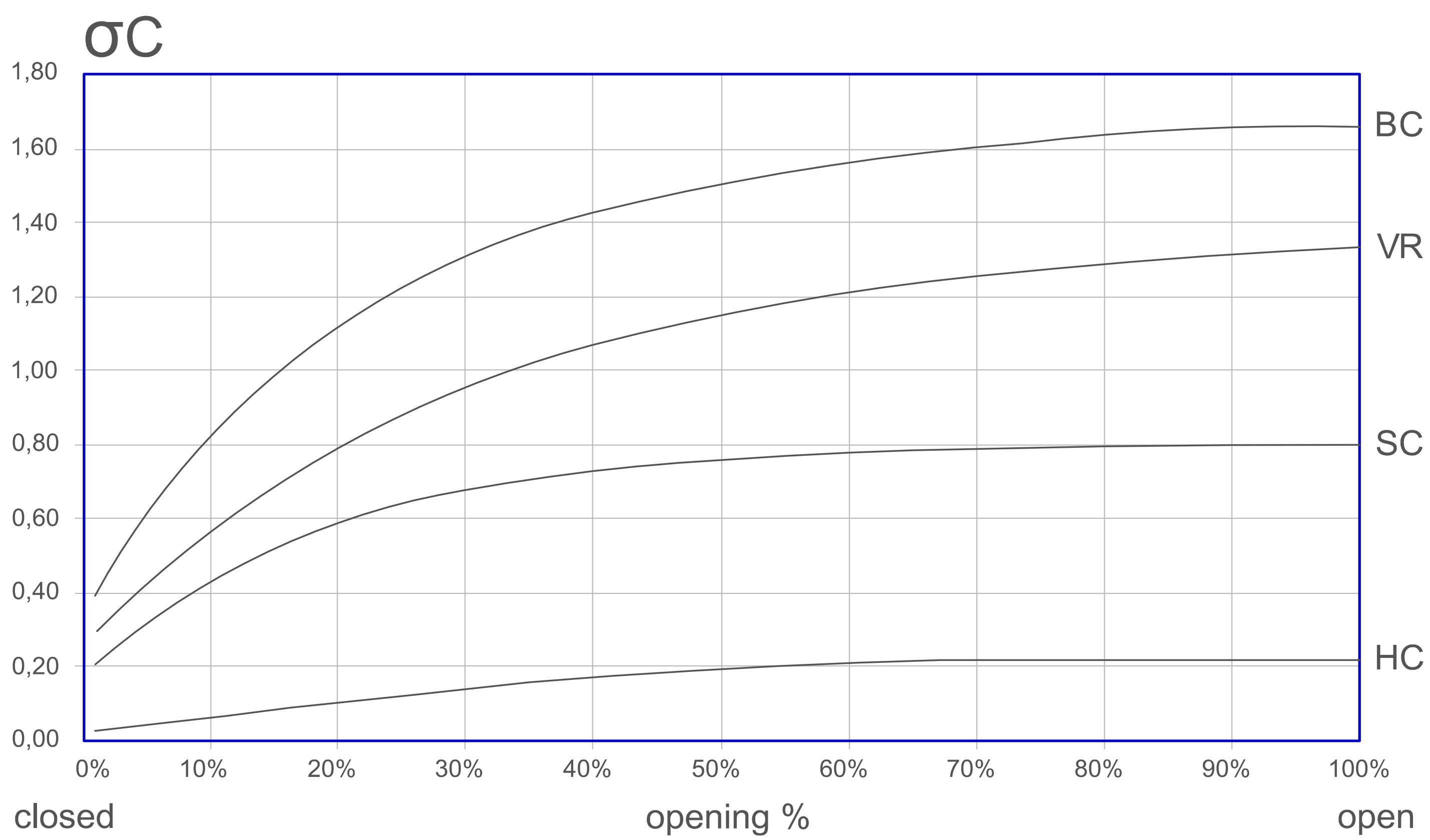
P_1 = upstream pressure(mH_2O)
P_2 = downstream pressure(mH_2O)
P_a = absolute pressure(=10 mH_2O)
P_v = vapour pressure
V = nominal velocity (m/s)
g = gravity acceleration

CAVITATION DIAGRAM "SIGMA"



CILINDRO NUDO/ BARE CYLINDER — CILINDRO FORATO HOLED CYLINDER — CILINDRO ASOLATO SLOTTED CYLINDER — ANELLO ASOLATO VANED RING

TYPE OF OBTURATOR	DESCRIPTION	USE
BC	Flat obturator.	- primarily as a throttling body. - when medium pressure differences (sufficient counter-pressure exist).
VR	Obturatort with V-PORT.	- primarily as a regulation body. - when large pressure differences (sufficient counter-pressure exist). - possible adjustment of control characteristics according to requirements.
HC - SC	Obturator with a perforated cylinder or slotted cylinder.	- primarily as a regulation body. - when large pressure differences (small counter-pressure exist). - possible adjustment of control characteristics according to requirements.



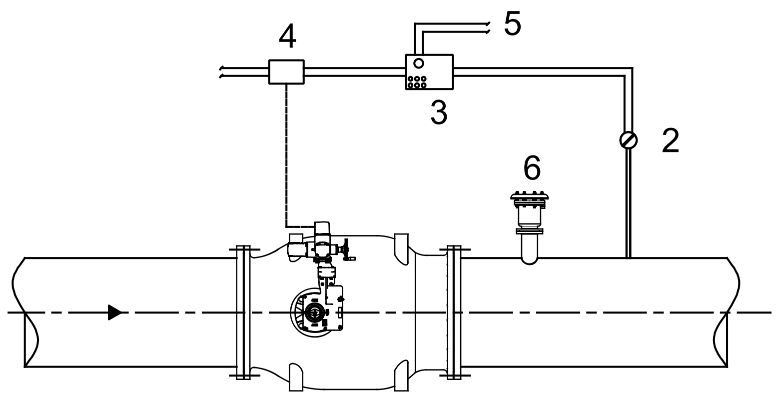
USE OF THE VALVE

THIS TYPE OF VALVE CAN BE SUPPLIED AS A SOLUTION TO SEVERAL FLOW CONTROL PROBLEMS.
THE FOLLOWINGS ARE THE MOST FREQUENTLY ENCOUNTERED

PRINCIPLE SKETCH- PLAN N° 1

a. Down pressure control

Needle valve, with down stream positioned pressure gauge controlled by computer, is a very good solution to keep the pressure constant into the down stream pipe line even in presence of big changes of pressure range into the upper stream adductor pipe line.

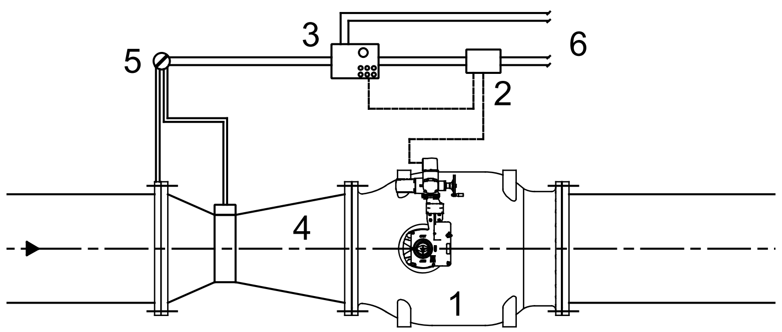


1.Needle valve
2.Pressure gauge
3.Computer
4.Local control electric diagram
5.Remote control and signaling panel
6.Relief valve

PRINCIPLE SKETCH- PLAN N° 2

b. Flow control valve

On very big hydraulic plants, these valves are also used for flow control systems. In this case the Needle valve provided of flow meter is an excellent instrument for flow control crossing a fixed point of a complicate hydraulic circuit. It is also possible to program a water delivery according to a prefixed law that can be changed during the time, as required in modern irrigation plants.

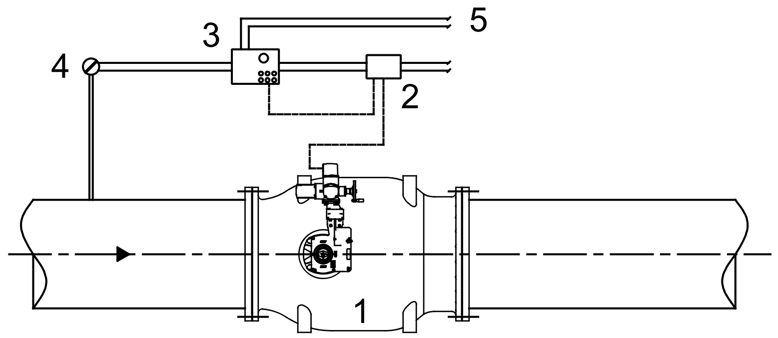


1.Needle valve
2.Valve control
3.Computer
4.Flow meter
5.Flow indicator
6.Remote control

PRINCIPLE SKETCH- PLAN N° 3

c. Upper stream pressure control

Needle valve with an upper stream pressure gauge controlled by a computer is an effective system to control the piezometric energy of the upper pipe line. This system is normally used on big hydraulic circuit as for acqueduct and irrigation plants.



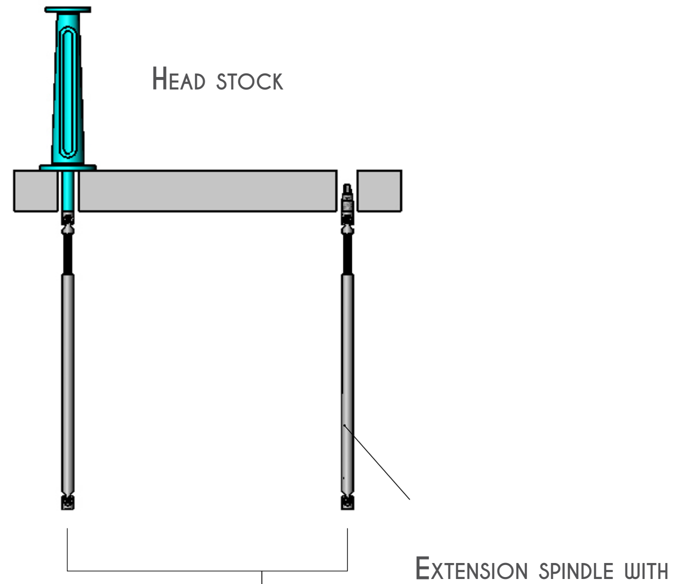
1.Needle valve
2.Valve control
3.Computer
4.Pressure gauge
5.Remote control

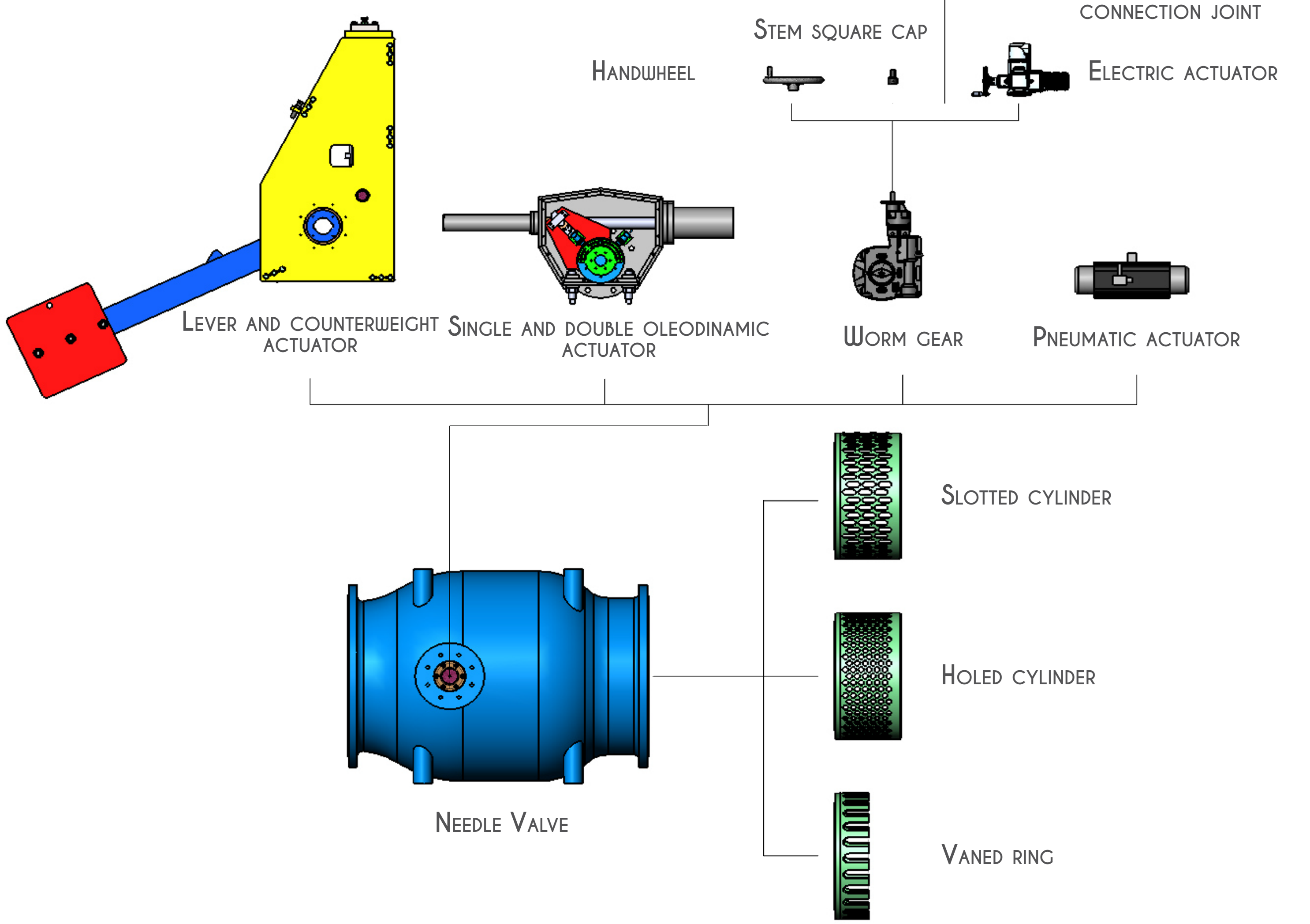
NEEDLE VALVES WITH ACCESSORIES

OPERATING UNITS AND ACCESSORIES

Di Nicola Needle valves can be equipped with alternative operating units and a wide range of accessoried :

- Electric actuator
- Handwheel
- Cap and operating key
- Floor pillar with handwheel and extension stem
- Pneumatic actuator
- Gravity hydraulic actuator
- Double effect hydraulic actuator
- Anticavitation slotted cylinder
- Anticavitation Holed cylinder
- Anticavitation vaned ring





DI NICOLA NEEDLE VALVES CAN BE USED IN SEVERAL APPLICATIONS:

- Shut-off valves in condition of high exercise pressure and high flow speed
- Anti water-hammer control valve
- Pressure regulating valve
- Pressure relief valve
- Security valve
- Bottom outlet for dams
- Tank level control system

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