NYVALVES

WATER HAMMER SECTION

NYVALVES THE SOLUTION
IN SPECIAL VALVES
PHONE:1888 441 3986
www.nyvalves.com

Z-TIDE

Painting Your Life

What is it ?

- Give some, Water Hammer Noise !
- Everyone hate this noise !
- Please take off !

Z-TIDE

Painting Your Life

WATER HAMMER ARRESTER

L Style
Water Hammer Arrester

I Style
Water Hammer Arrester

Angle Valve
Water Hammer Arrester

PUMP CONTROL VALVE

- Perfectly prevents water hammer effect.
- Pump Control Valve =
  Pump's Variable Drive + Check Valve + Water Hammer Arrester.
  No need to use “Inverter Duty Motor” and save costs.
- Speed of valve opening and closing are adjustable upon request.
- Simple installation and outstanding function.
- Piston design structure resists high pressure and makes maintenance & replacement easy.
- It is convenient to clean the impurities inside valve gate from the cleaning plug.

www.nyvalves.com

Z-TIDE

Painting Your Life

Content

- 1. Why your system get water hammer problem ?
- 2. How to avoid water hammer problem ?
- 3. How to choice the correct water hammer arrester & check valve ?
- 4. Why choice Z-Tide Water Hammer Arrester ?
- 5. The Installation of Water Hammer Arrester !
- 6. Pump control Valve for special system !
- 7. The assemble & testing !
- 8. Where to find the order & handle the project with design ?

Z-TIDE

Painting Your Life

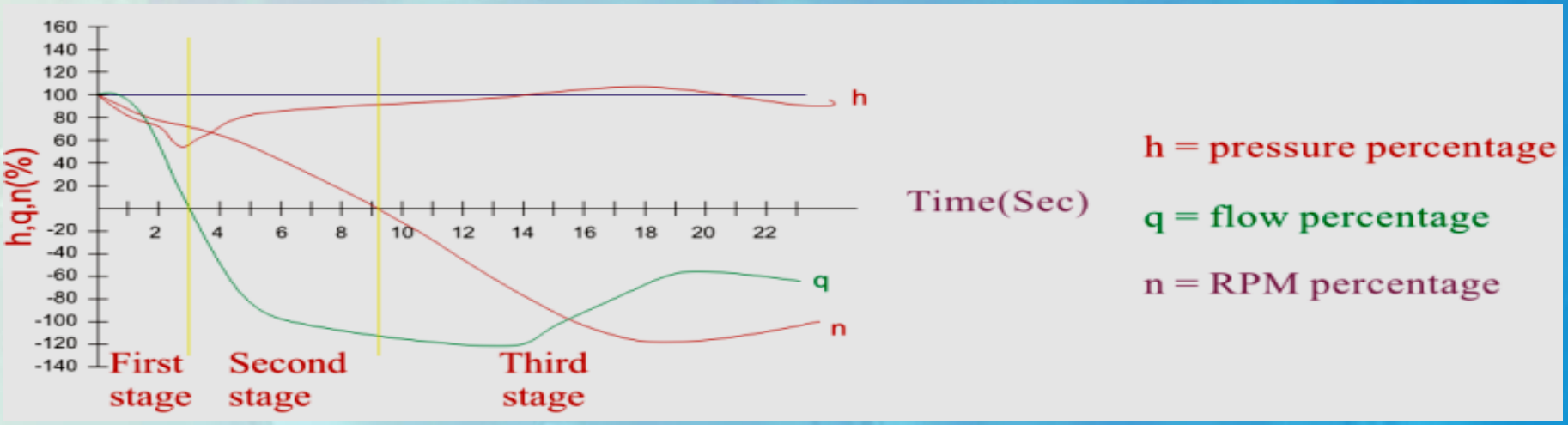
Why your system get water hammer problem ?

Z-TIDE

Painting Your Life

POWER FAILURE OF FOUNTAIN PUMP AND WATER

HAMMER EFFECT



- **First stage:**
- As the running pump loses its power supply suddenly, due to inertia the impellers of pump still perform for a while and slow down gradually. Then the flow and head will be also less and less. Meanwhile, the operating of pump & current are in the normal direction.
- **Second stage:**
- The lift of pump still lower continuously due to power loss, and water flows backward once the lift becomes lower than the static pressure inside the pipe. However pump blades are still rotating, and backward pressure (negative pressure) collides directly with pump outlet pressure (positive pressure), generating series of unstable pressure and causes internal friction and collision. This is called water hammer effect. at this time, pressure inside the pipe escalates and backward water imposes obstructing force on the rotating pump blades, which reduces the rotating speed and flow rate rapidly.
- **Third stage:**
- Pump rotating continues to drop. At the next instant to blades stopping, the on-going backward water rotates the blade, causing reverse rotation.

Z-TIDE

Painting Your Life

www.nyvalves.com

h = pressure percentage

q = flow percentage

n = RPM percentage

How to avoid water hammer problem ?

Z-TIDE

Painting Your Life

WATER HAMMER ARRESTER

THREE MODEL STYLES
FIVE MATERIALS

Angle Valve Style
Two Functions

I-Style

- **Non-Friction**
- **Diaphragm Type**
- **High Pressure Against**
- **Absorbs Noise Directly**
- **Large Size & Widely Fluid Used**

L-Style

www.nyvalves.com

Z-TIDE

Z-TIDE

Painting Your Life

How to choice the correct water hammer arrester & check valve ?

Z-TIDE

Painting Your Life

DIAPHRAGM TYPE WATER HAMMER ARRESTER

The occurrence and prevention of water hammer effect:

When the fluid flows in the pipe, if the gate closes suddenly and stops the flow, the kinetic energy will be changed into elastic resilience and create a serial positive and negative pressure wave vibrating back and forth in the pipe until the energy is lost by friction. Especially when the pump stops, the fluid still flows by inertia and gravity also causes the fluid to flow back, and these two forces will cause the positive and negative pressure waves. The friction caused by the two waves will make the pipe vibrate and create noise. Hence, the life of the pump and the piping accessories will be affected and, at the same time, cause the uncomfortable noise under such situation, to set up one or more sets of water hammer arrester will improve the situation.

Our company make use of the airbag principle to design water hammer arresters which will reduce the vibration by pressing air when the in-pipe pressure transfer to air chamber.

The features of water hammer arresters：

- ►The airbag adopts the ball-pressing-type design, which without friction, less function progresses, prompt and quick response and has obvious result. In addition, the life of the arrester will be increased several times.
- ►The arrester will absorb water hammer directly and has the functions of water hammer prevention and absorption.
- ►Special design of the air diaphragm rubber will not release pressure and its life won't be affected by the bad water quality.
- ►To prevent the air leakage, the pressed air chamber is covered by permeating prevention rubber.
- ►The design of structure is excellent and easy to maintain.

The fluid pressure of the water hammer effect.

The water hammer effect caused by closing the valve should be added at the largest water head in the pipe to calculate the height of the pressure water head and fluid pressure .

Vensano's formula：

$$Zo=\frac{2LVo}{gT}$$

Ho = the pressure water head before closing the valve
Vo = the flow speed before closing the valve
T = the time needed to close the valve
L = the pipe length between the inlet and outlet of free water surface
Zo = the largest pressure water head increased by water hammer effect
H =full pressure water head after adding water hammer at the end of the pipe
Remark: the transferring speed of in-pipe pressure and acceleration (about 1000 m / second)

Example：Assume Vo = 5 m/ sec, Ho = 72 m, L = 210 m, if the it takes 3 seconds to close the valve, then, what is the pressure of water hammer?

$$Zo=\frac{2LVo}{gT}=\frac{2\times210\times5}{9.81\times3}=\frac{2100}{29.43}=71.35\ m$$

The full pressure water head including water hammer is：H=Zo+Ho=71.35+72=143.35 m
Assume the pressure water head 10 m = 1 kgf/cm^2
Then, The fluid pressure including water hammer is： 143.35 /10=14.335 kgf/cm^2

Z-TIDE

Painting Your Life

Water Hammer Arrester

Request topic :

- **Project system / Name :**
- Project experience suggest & filling : Absorbing the water Hammer Arrester for Water Supply system, Fire protection, HVAC, Food production processing, Industrial Production line…
- **Fluid type :**
- Main Body and Diaphragm material choice : Water, Steam with Water, Chemical Liquid or others
- **System temperature :**
- Diaphragm material Choice : NBR, Viton, Teflon or others
- **System Working Pressure and Water Hammer Pressure :**
- Main Body material choice : up 20 Bar-Stainless Steel, 20 ~ 16 Bar-Ductile Iron, under 16 Bar –Bronze or Cast Iron
- **System Pipe Size :**
- Propose Valve size : inch ; mm
- **Connection End :**
- Thread End - NPT ; PT & BSPT ; Flange End – JIS 10K/16K, PN16, DN16,...
- **Parts Request :**
- Our complete offer or customer request parts : Pressure Gauge Spring or Diaphragm
- **System Cleaning request :**
- Special for Food or Industrial project : Normal Clearing or Super Clearing
- **System Layout :**
- For installation or model suggest

Z-TIDE

Painting Your Life

Full Open Style Silent Check Valve

Request topic :

- **Project system / Name :**
- Project experience suggest & filling : System Close when current pressure loose for Water Supply system, Fire protection, HVAC, Food production processing, Industrial Production line…
- **Fluid type :**
- Main Body and parts material choice : Water, Salt Water, Chemical Liquid or others
- **System temperature :**
- Available working temp. : -15 ~ 80 C
- **System Working pressure :**
- Main Body material choice : up 20 Bar-Stainless Steel, 20 ~ 16 Bar-Ductile Iron, under 16 Bar –Bronze or Cast Iron
- **System Pipe Size :**
- Propose Valve size : inch ; mm
- **Connection End :**
- Thread End - NPT ; PT & BSPT ; Flange End – JIS 10K/16K, PN16, DN16,...
- **Parts Request :**
- Our complete offer or customer request : With By Pass Valve set or not
- **System Cleaning request :**
- Special for Food or Industrial project : Normal Clearing or Super Clearing
- **Request topic for different model**

Z-TIDE

Painting Your Life

Why choice NYVALVES Water Hammer Arrester ?

Z-TIDE

Painting Your Life

Comparison :

Old Design
Waste of space
Only one shape
Easily to fray by function
For water system only

Exclusive Design
Precise
3 types to meet all needs
Absorb the vibration by diaphragm
Suitable for wild usage

Z-TIDE
Painting Your Life

2.) WATER HAMMER ARRESTER

(L-Style / I-Style / Angle-Style)

THREE MODEL STYLES

FIVE TYPE OF MATERIALS

Diaphragm Type

Non-Friction

High Pressure Against

Absorbs Noise Directly

Large Size & Widely Fluid

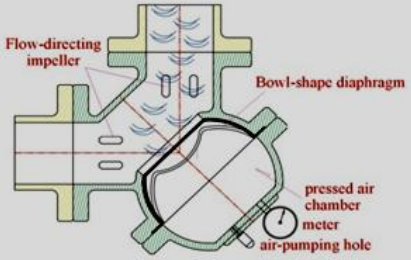
Z-TIDE

Painting Your Life

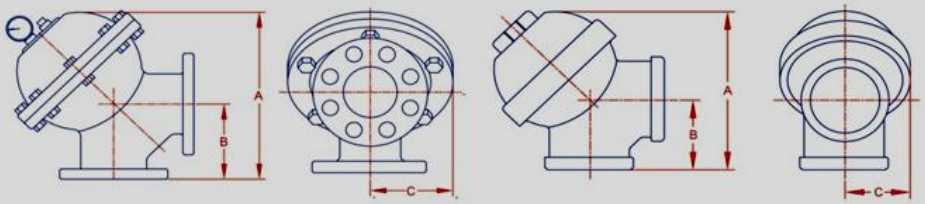
www.nyvalves.com

L STYLE WATER HAMMER ARRESTER

- The flow-directing mechanism in the valve can guide the flow and stabilize pressure.
- In the corner of pipe, the water hammer is the most obvious. The design is for meeting the requirement and set the arrester at the corner directly. This design not only saves the space and is easy to set up, but also can replace the traditional crooked head to reduce the cost of setting up.
- L style absorbs water hammer effect in two ways and brings excellent result.



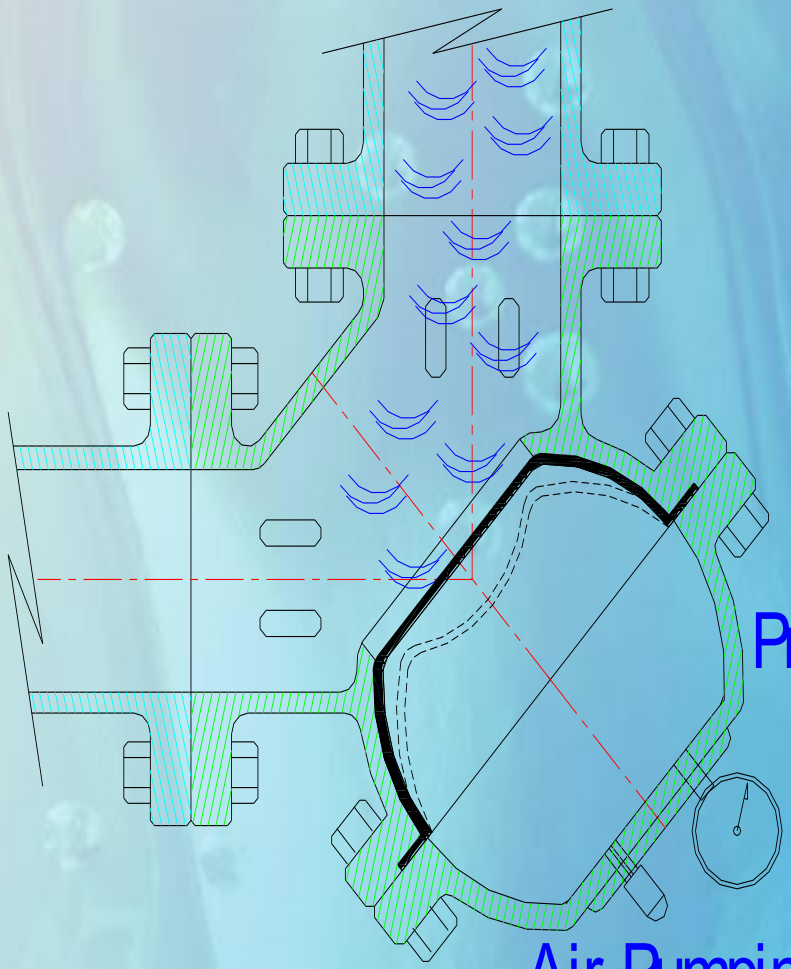
- The test pressure of valve body
  Cast iron：21 kgf/cm^2
  Stainless steel：35 kgf/cm^2
- Diaphragm material：NBR or Viton
- Normal air chamber pressure：2.5 kgf/cm^2
- Appiled conditions：Fluid
- Applied temperature：-15～80°C
- Maximum applied pressure：
  Cast iron and Bronze：12 kgf/cm^2
  Stainless steel 316：20 kgf/cm^2
  (1 kgf/cm^2=14.2 psi)



Flange type (Material：Cast Iron or Stainless Steel)						
Item No	Size	A(mm)	B(mm)	C(mm)	Weight(kg)	Air Chamber(cm^3)
ALF-50	2"	230	110	105	17.0	1490
ALF-65	2.5"	260	130	115	19.0	2130
ALF-80	3"	275	140	125	22.0	2465
ALF-100	4"	345	155	150	34.0	5535
ALF-150	6"	467	200	200	70.0	15325
ALF-200	8"	560	235	232	95.0	27230

Thread type (Material：Bronze)						
Item No	Size	A(mm)	B(mm)	C(mm)	Weight(kg)	Air Chamber(cm^3)
ALT-15C	1/2"	50	25	25	0.4	17
ALT-20C	3/4"	65	30	30	0.5	30
ALT-25C	1"	80	35	35	0.7	63
ALT-32C	1.25"	95	43	45	0.9	130
ALT-40C	1.5"	115	50	50	1.5	205
ALT-50C	2"	170	110	68	4	650

Pressure Shock



Pressed Air Chamber

Gauge

Air-Pumping Hole

Z-TIDE

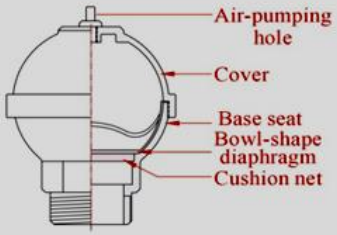
Painting Your Life

www.nyvalves.com

I STYLE WATER HAMMER ARRESTER

Patent Number：140580

- Can be installed at vertical, horizontal or upside-down.
- If the fluid is acid/alkaline or oil, the air bag made of special material should be applied.
- Vertical, horizontal and upside-down installation is acceptable.
- Please contact us for special fluid and temperature.
- Normal air chamber pressure：2.5 kgf/cm^2
- Diaphragm material：NBR



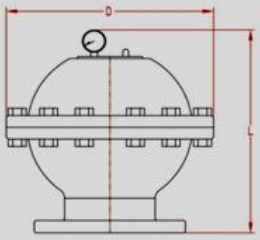
▲ Thread end(AIT)
Without Pressure Gauge

(Thread end)

Item No	Thread(PT)	L (mm)	D (mm)	Weight(kg)	Air Chamber(cm^3)
AIT-15	1/2"	74	46	0.3	17
AIT-20	3/4"	82	52	0.4	30
AIT-25	1"	95	62	0.5	65
AIT-40	1.5"	120	110	1.4	250
AIT-50	2"	162	135	3.2	650
AIT-65	2.5"	180	155	3.9	1125
AIT-80	3"	218	188	6.5	2000
AIT-100	4"	260	238	18.0	4400

• Stock Items

Material	Test Pressure	Max Applied Pressure	1/2"	3/4"	1"	1.5"	2"	2.5"	3"	4"
Bronze	21	10	•	•	•	•	•	•	•	•
Stainless Steel	21	12	•	•	•	•	•	•		



▲ Flang end (AIF)
With Pressure Gauge

(Flange end)

Item No	Flange	L (mm)	D (mm)	Air Chamber(cm^3)
AIF-80	3"	240	155	2465
AIF-100	4"	330	330	5535
AIF-125	5"	330	330	5535
AIF-150	6"	420	400	15325
AIF-200	8"	510	460	27230
AIF-250	10"	510	460	27230
AIF-300	12"	620	625	67860

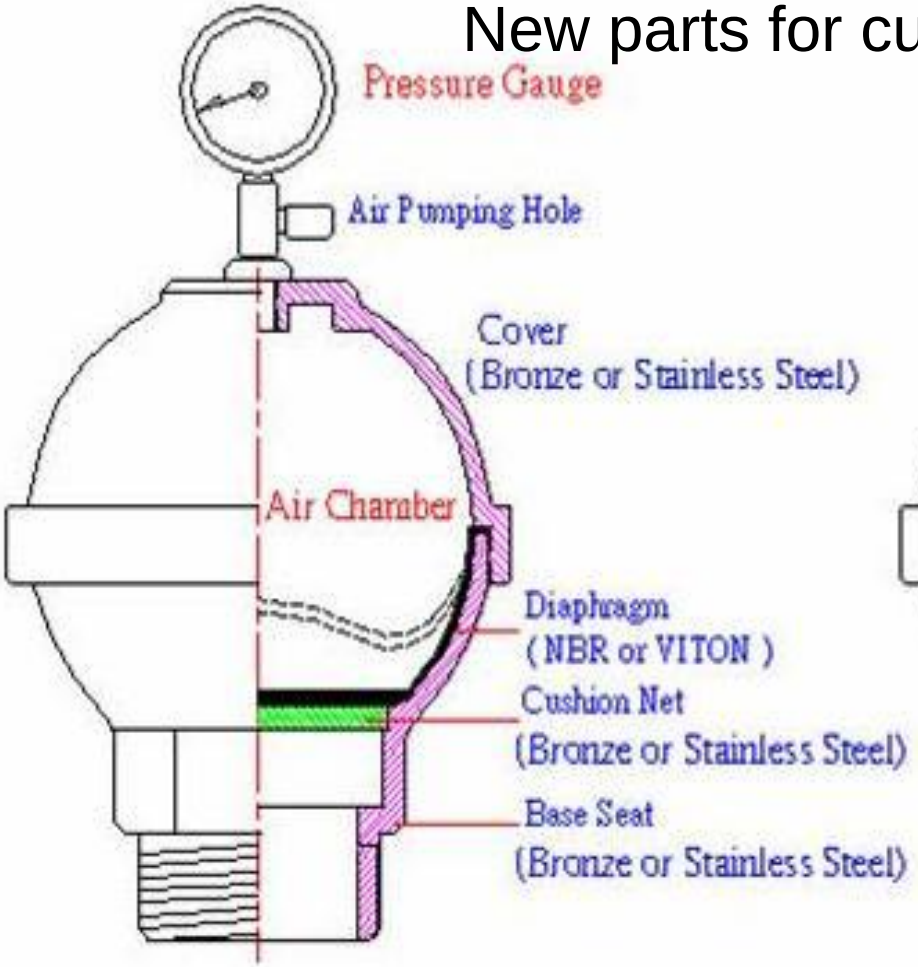
• Stock Items

Material	Test Pressure	Max Applied Pressure	3"	4"	5"	6"	8"	10"	12"
Bronze	21	12	•	•	•	•	•	•	•
Ductile Iron	21	12	•	•	•	•	•	•	•
Stainless Steel	42	20	•	•	•	•	•	•	•

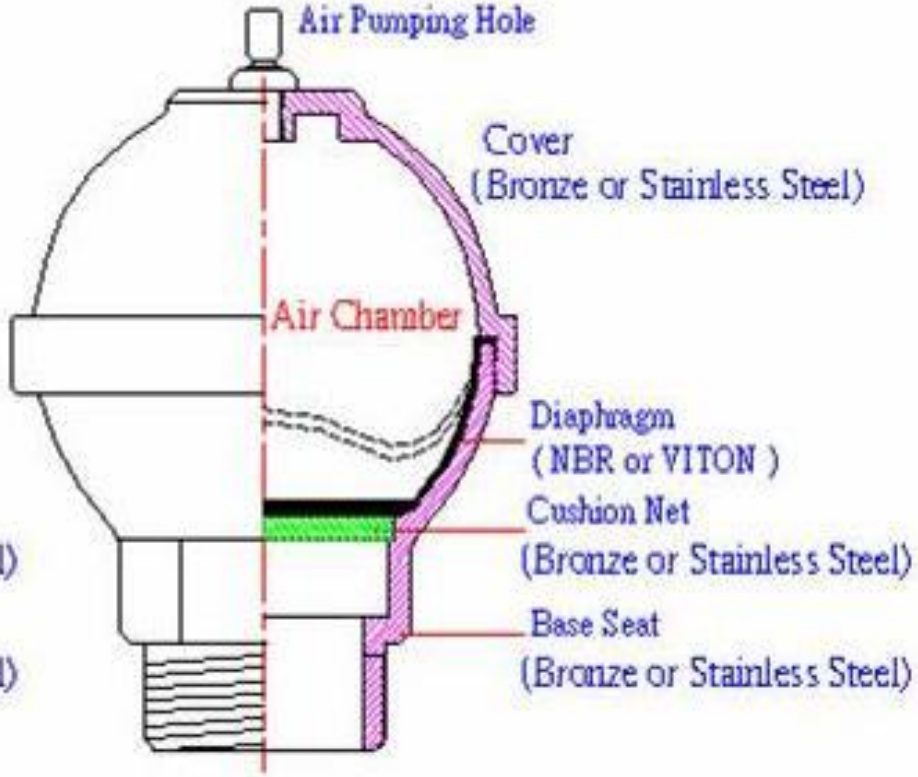
Z-TIDE

Painting Your Life

New parts for customer request



< Special ordering product >



< Standard product >

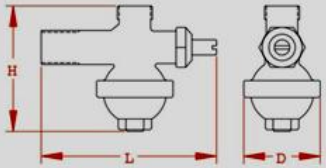
Z-TIDE VALVES	Article Name I Style Water Hammer Arrester (With Pressure Gauge)		MM 5.10.2001	

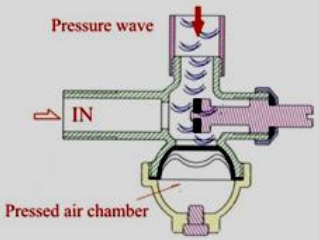
ANGLE VALVE WATER HAMMER ARRESTER

Patent Number：149364

The design of angle valve style water hammer arrester is special for normal resident application. The air chamber is set up of the angle valve. It can match with the bathroom system and is easy to install. Its excellent result can maintain the tranquility of indoor environment.

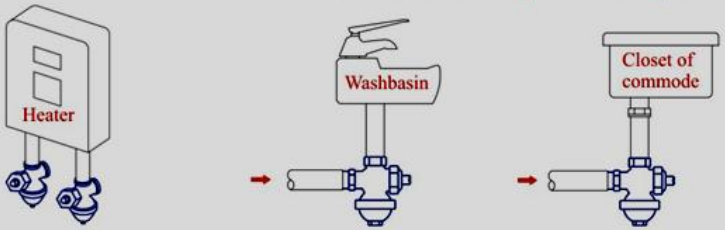
Pressure wave generated by quick valve close will be absorbed by air chamber.





Item No	Size	L(mm)	H(mm)	D(mm)
AXT-15	1/2"	105	85	45
AXT-20	3/4"	120	95	42

- Applied temperature range： - 15 ~ 110°C
- Air chamber pressure：1.5 kgf/cm²
- Valve material：Brass
- Valve test pressure：12 kgf/cm² (1 kgf/cm²=14.2 psi)
- Nomal air chamber pressure：2.5 kgf/cm²



Heater is the easiest water-hammer-effect creator at home. The major reason is heater has complicated piping system inside and will cause unstable pressure impact when turn on and turn off. The situation can be improved by installing angle valve style water hammer arrester at the inlet of the heater. The shower nozzle is also easy to cause water hammer effect, which can be improved by installing angle style arrester at the outlet of the heater to prevent the vibration and noise.

At present, the fast turn-off faucet is applied at most of the household and it is easy to cause water hammer effect, which will cause noise and affect the environment quality. Install the angle valve style water hammer arrester at the inlet of the faucet can improve the situation.

When the water level in the closet of the commode is approaching the full level, the float ball will fluctuate and hinder the water flow. Moreover, it will create a serial of pressure wave and cause vibration and noise. Install the angle valve style water hammer arrester at the inlet of the water tank can improve the situation.

Z-TIDE

Painting Your Life

- The most complete size range

for your choice:
From 1”
Up to 12”
(For General Usage)

Do you need the larger one?
Let’s do it through our professional R&D group together.

Z-TIDE
Painting Your Life

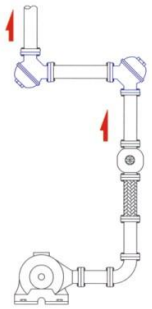
The Installation of WHA ！

Z-TIDE

Painting Your Life

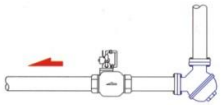
THE INSTALLATION CONDITIONS OF L STYLE WATER HAMMER ARRESTER

When pump shuts off, pressure decreases instantly and forms unstable gap of positive and negative pressure that causes water hammer effect and creates noise and pipe vibration. To set up water hammer arrester at the pipe corner upside of the pump (shown as the figure) can prevent the water hammer effect and protect the machine.

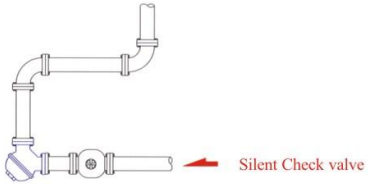


►Remark：

When lift is longer than 50m and pressure is above 5 kgf/cm^2, we suggest to set up arresters each at the downside of the long pipe and the upside corner of the check valve.



It's easy to cause water hammer effect when the gate closes fast. To set up arrester at the first corner away from the fast-shut-down valve can Absorb and prevent the water hammer effect directly and eliminate the noise.



When the fluid flow through the serial corner, the change of flow speed and direction and friction effect will cause unstable pressure wave, which will lead to vibration and noise. To set up arrester and silent check valve can eliminate the pressure wave.

Remark

- ► The pressure meter on the valve shows the air chamber pressure before piping and will show the pipeline pressure after piping.
- ► To leave a 10 cm opening between valve and wall for easy to maintain.
- ► Considering the high-pressure situation, cast iron or stainless steel valve body is suggested for the valve which diameter is larger than 2".
- ► When lift is longer than 50m and pressure is above 5 kgf/cm^2,we suggest to set up arrester each at the downside of the long pipe and the corner upside of the check Valve.
- ► Before installation, make sure the pressure of water hammer arrester air chamber is lower than pipe pressure.
- ► When the pressure of the air chamber of the water hammer arrester is maintained at the 40% ~ 60% of pipe pressure, the arrester will have the best water-hammer-preventing result.
- ► If the water pressure in the pipe is lower or the air pressure of the arrester air chamber is lower, both can be corrected by pumped into air or release air from the air-pumping hole at the top of the arrester.
- ► When the outlet is under open pressure like float valve, bathroom equipment and faucet, input pressure 1 ~ 1.3 kgf/cm^2 is preferred.

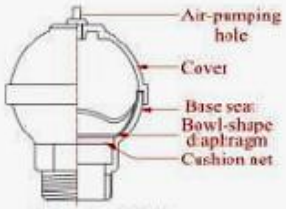
Z-TIDE

Painting Your Life

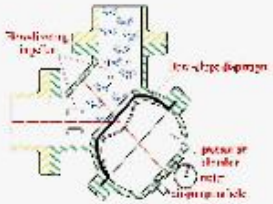
nyvalves.com
Phone: 1888 441 3986
www.nyvalves.com

The Installation of Water Hammer Arresters:

- Before installation, make sure the pipeline pressure is not lower than the pressure inside the air chamber that is 2.5 kgf/cm2.
- Maintain the pressure inside water hammer arrester air chamber at 40% ~ 60% of pipeline pressure to get the best effect.
- If the pipeline water pressure or air chamber pressure gets lower, please pump more air or release air from the air-pumping hole at the top of the arrester.
- Vertical, horizontal and upside-down installation ways are acceptable.



▲ Thread end(AIT)
Without Pressure Gauge



Z-TIDE

Painting Your Life

Figure - 1

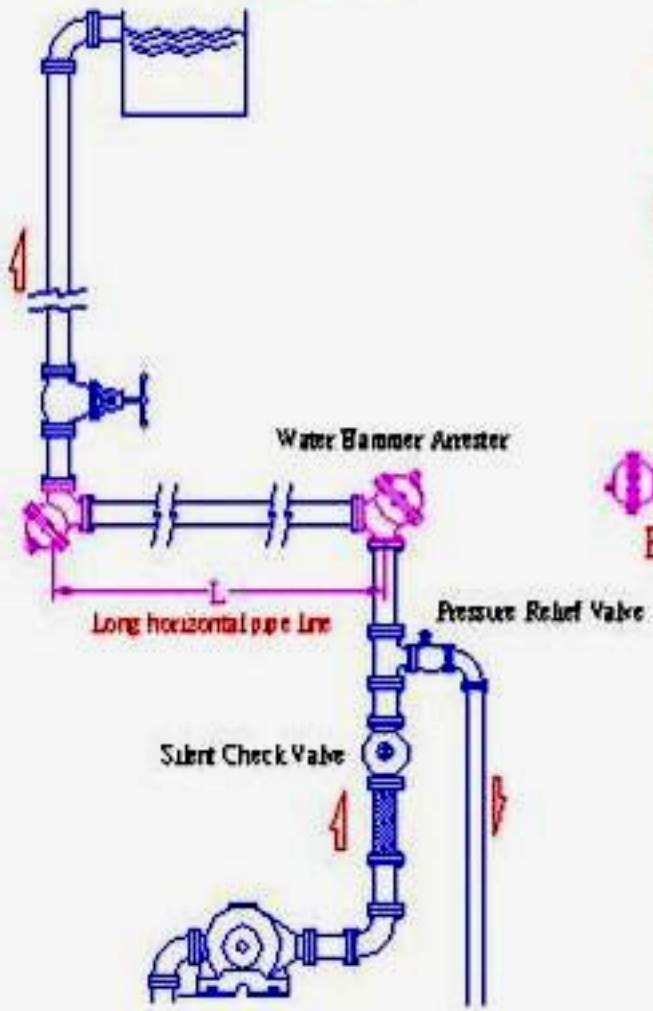


Figure - 2

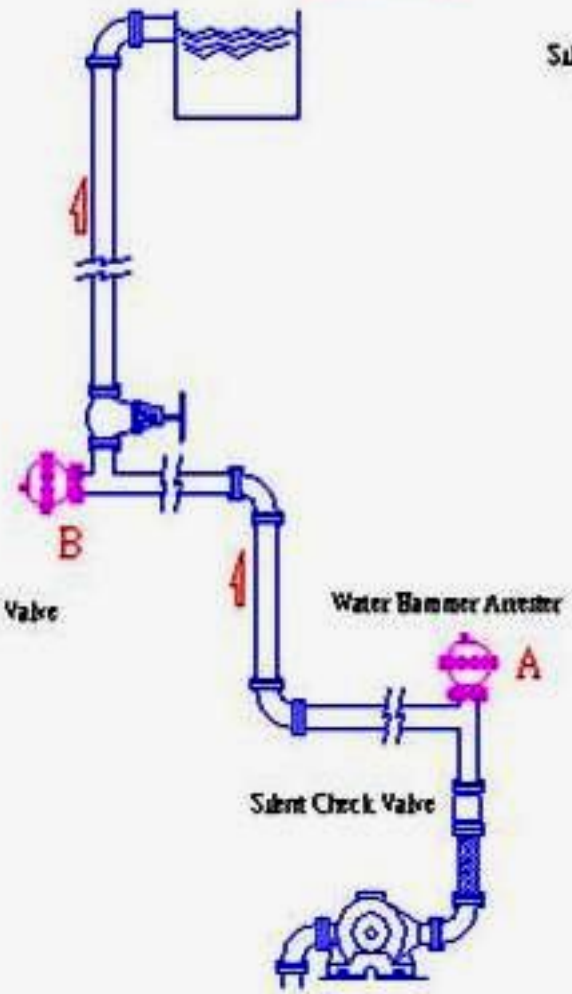


Figure - 3

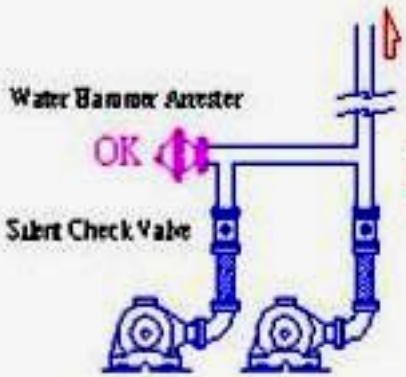


Figure - 4

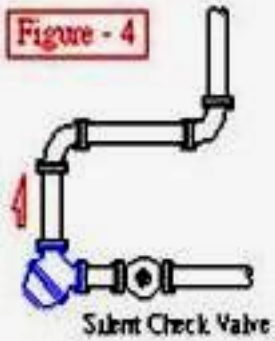
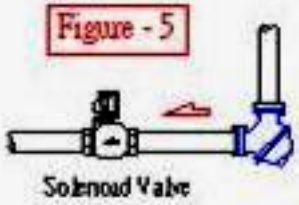


Figure - 5



- Figure1. Generally, the water hammer effect happens above the check valve so installing a water hammer arrester can prevent the bad influence by water hammer effect. The length of horizontal pipe is longer than 50 meter in the figure 1, installing a water hammer arrester at corner between horizontal pipe and vertical pipe can avoid the water hammer effect.
- Figure 2. The distance between A and B is longer than 50 meter, installing a water hammer arrester at B can reduce the water hammer effect.
- Figure 3. Two pumps is used alternately, installing a water hammer arrester at horizontal pipe can avoid water hammer effect.
- Figure 4. There is a anfractuous pipe line in the figure with a serious water hammer effect, installing a check valve at the lowest place of pipe line and installing a water hammer arrester above check valve can reduce the noise and vibration which make by water hammer arrester.
- There are stop valves like solenoid valve or air operated valve which close the gate very fast and produce the water hammer effect, installing a water hammer arrester at inlet of gate valve can reduce the noise and vibration which make by water hammer arrester.

Z-TIDE

Painting Your Life

Installation on Yu Chen pumping

Z-TIDE

Painting Your Life

Installation on ChiMei Optoelectronics

Z-TIDE

Painting Your Life

Installation Quanta Computer-01

Z-TIDE

Painting Your Life

TSMC-04

Z-TIDE

Painting Your Life

www.nyvalves.com

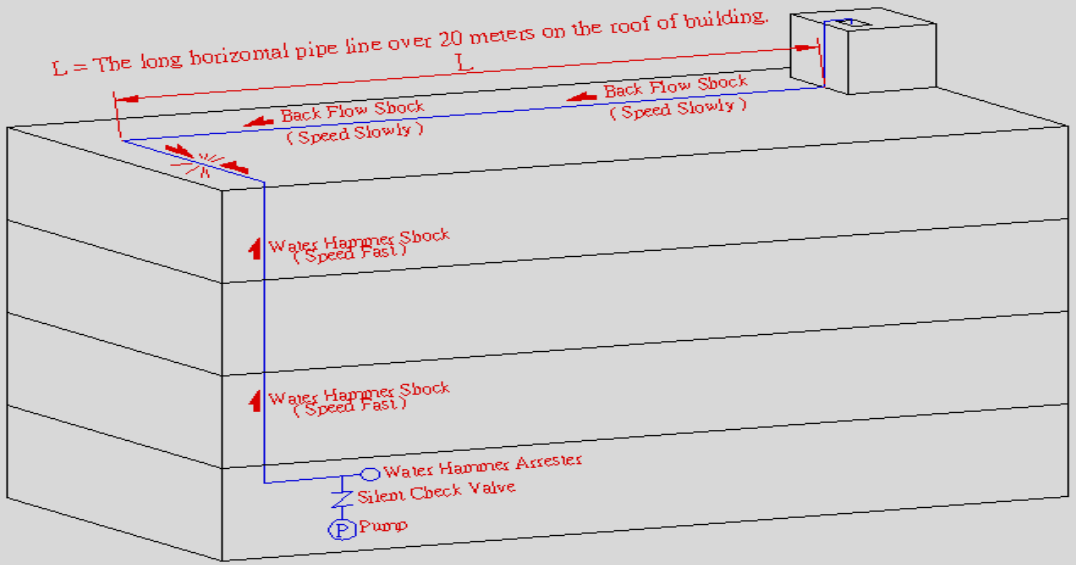
Winbond Electronic-02

Z-TIDE

Painting Your Life

www.nyvalves.com

Not available with Water Hammer Arrester

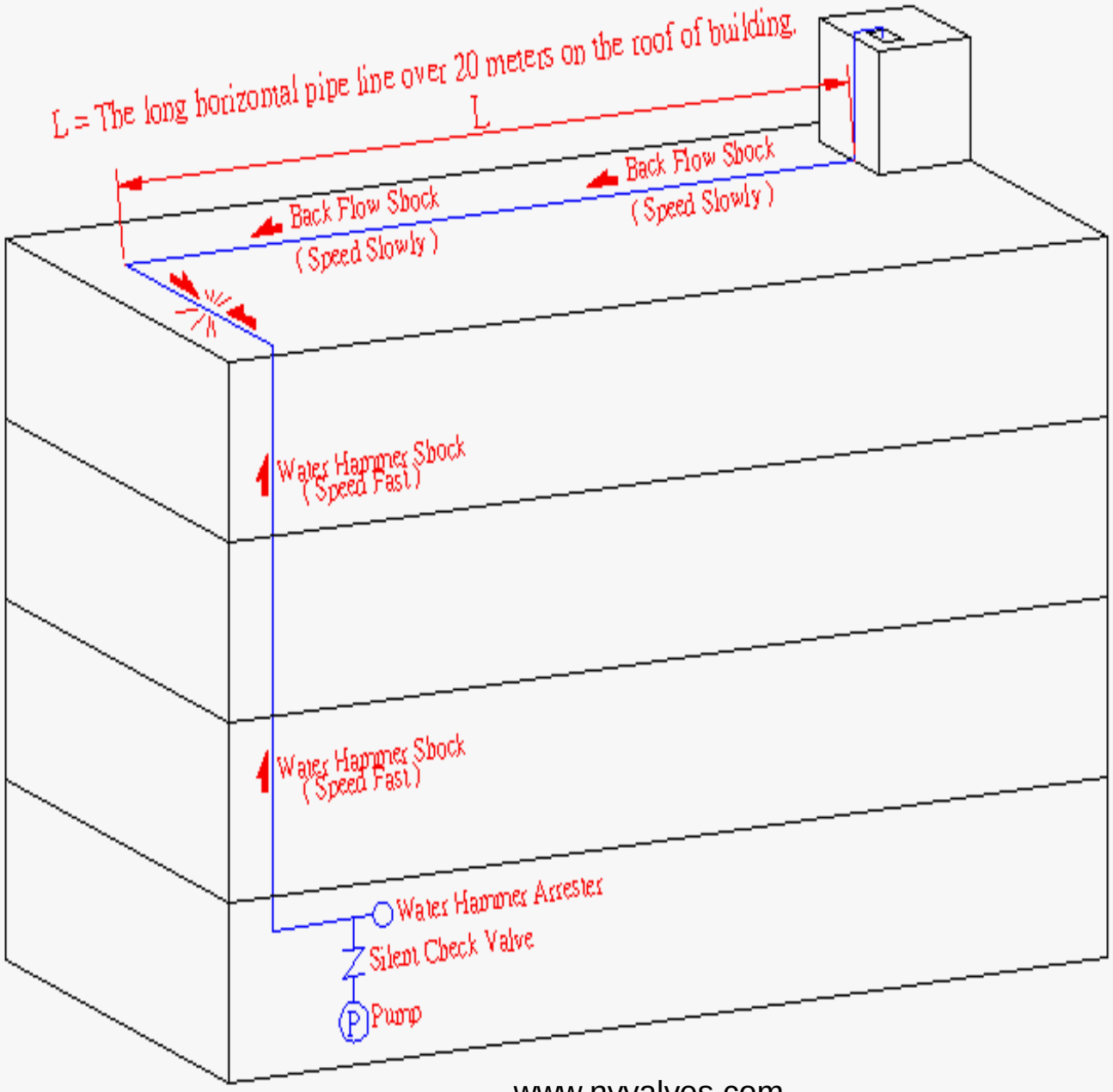


EX: There is a horizontal pipe line longer than 20 meter at roof of building in the figure and a pump at low level of building, it can't reduce the water hammer effect by installing a water hammer arrester above the pump.

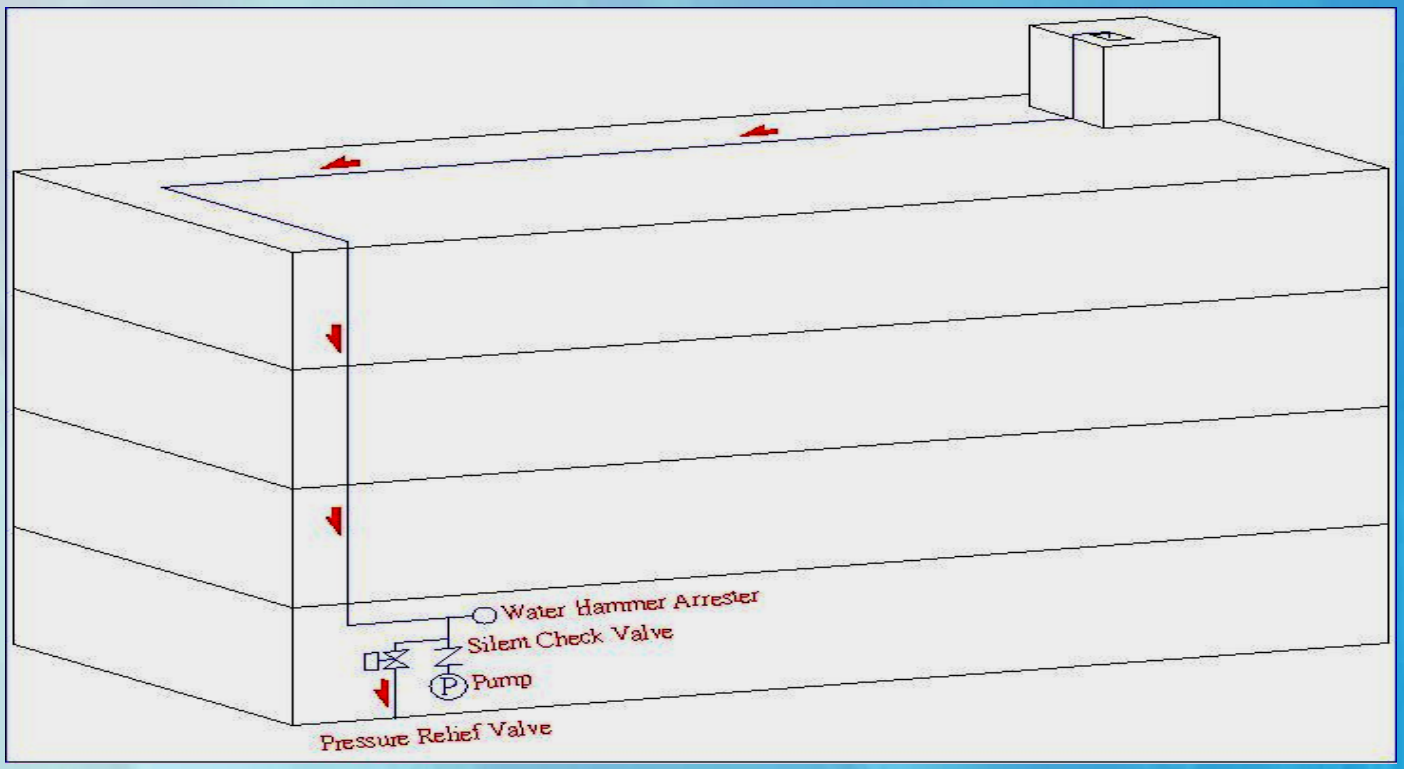
In the case of pipe line over 20 meter, as the pump shut down and create a wave which transfers very fast but the wave transfers slow in the pipe line of roof, two waves would crash together at high level of building, installing a water hammer arrester can't reduce the water hammer effect and a pump control valve can solve this problem.

Z-TIDE

Painting Your Life



Another Solution For Previous Problem



For the previous problem, now we have another solution With Z-Tide product, the solution is add a pressure relief valve in the system. This can resolve this problem

Z-TIDE

Painting Your Life

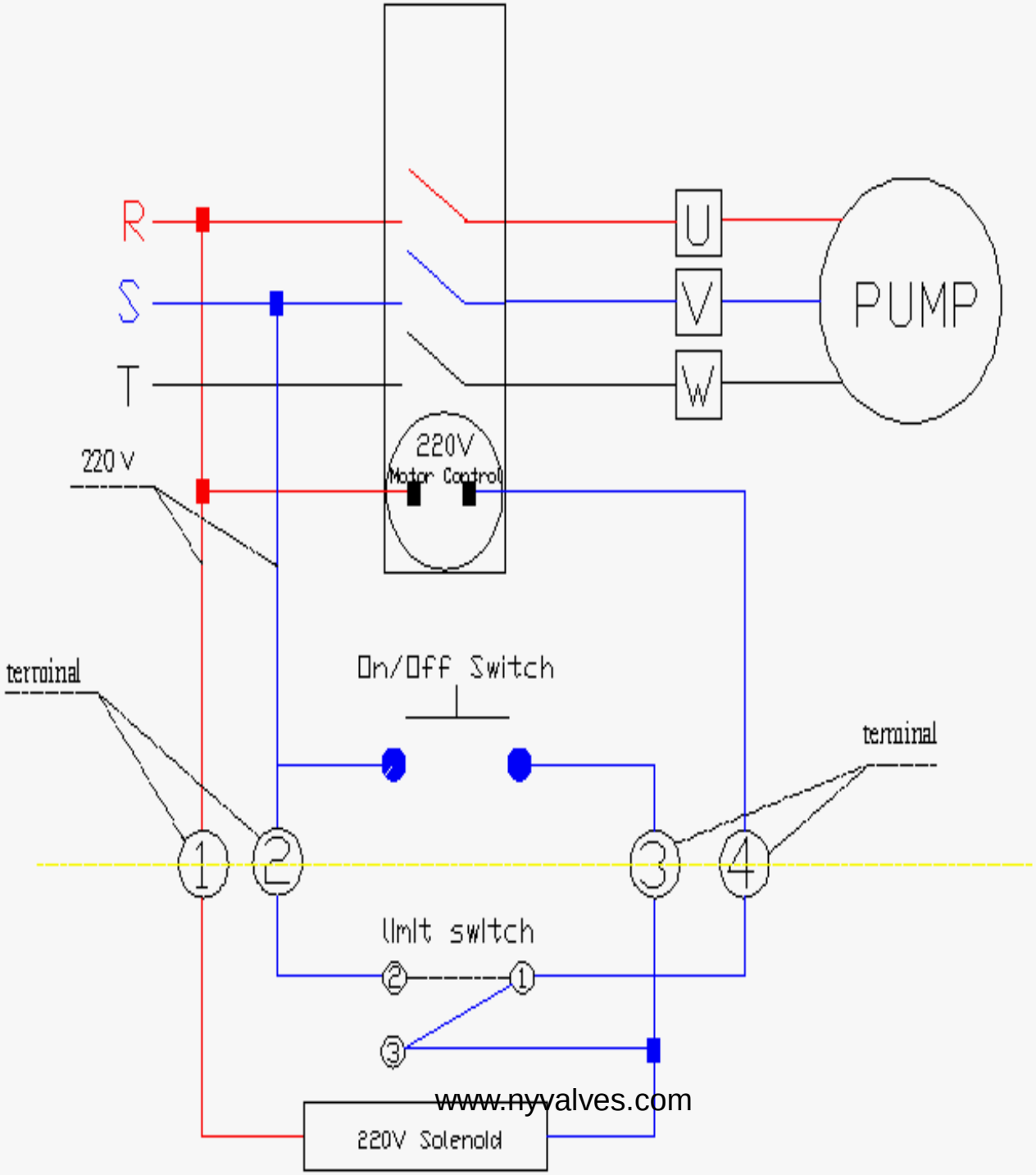
Pump control Valve

for special system !

Z-TIDE

Painting Your Life

www.nyvalves.com

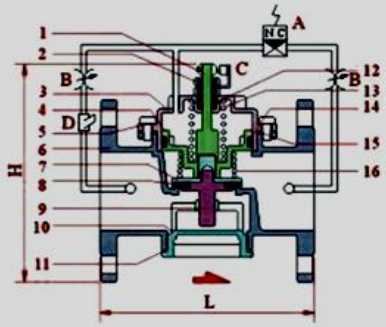


PUMP CONTROL VALVE

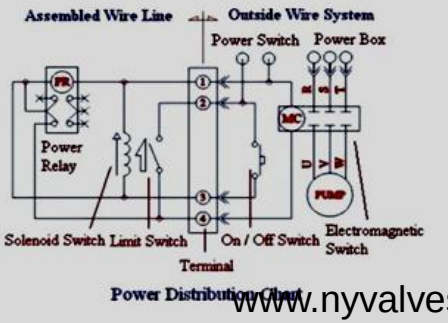
- Perfectly prevents water hammer effect.
- Pump Control Valve = Pump's Variable Drive + Check Valve + Water Hammer Arrester. No need to use "Inverter Duty Motor" and save costs.
- Speed of valve opening and closing are adjustable upon request.
- Simple installation and outstanding function.
- Piston design structure resists high pressure and makes maintenance & replacement easy.
- It is convenient to clean the impurities inside valve gate from the cleaning plug.

- Maximum Working Pressure : 20 kgf/cm²
- Valve Body Testing Pressure : 35 kgf/cm²
- Applied Temperature : -15 ~ 80°C

No	Part Name	Material
1	Positioning Shaft	Stainless Steel 316
2	Screw Nut	Stainless Steel 316
3	Upper Cover	Stainless Steel 316
4	Piston	Stainless Steel 316
5	Cover Fixing Bolt	Stainless Steel 304
6	Main Body	Stainless Steel 316
7	Valve Gate	Stainless Steel 316
8	Sealing	NBR / Viton / Teflon
9	Shaft	Stainless Steel 316
10	Lower Cover	Stainless Steel 316
11	Cleaning Plug O-ring	NBR / Viton
12	U-ring	NBR / Viton
13	Spring	Stainless Steel 316
14	UH-ring	NBR / Viton
15	O-ring	NBR / Viton
16	Spring	Stainless Steel 316
A	Solenoid Valve	Bronze / SS#304
B	Flow Control Valve	Bronze / SS#304
C	Limit Switch	Photoelectric / Ball
D	Filter	Bronze / SS#304



Item No	Size	H(mm)	L(mm)	CV
RPF65-S	2.5"	180	210	85
RPF80-S	3"	180	225	95
RPF100-S	4"	205	250	50
RPF150-S	6"	240	310	320
RPF200-S	8"	290	420	750
RPF250-S	10"	370	470	1400
RPF300-S	12"	430	530	2200



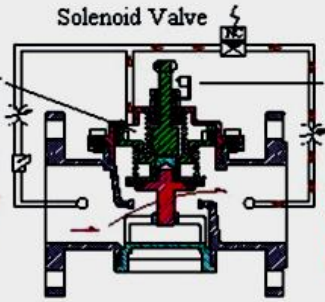
Power Distribution Chart

Z-TIDE

Painting Your Life

Function of Pump Control Valve

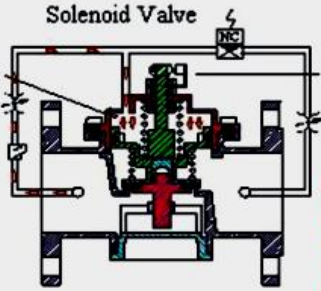
(1)



When pump is starting, valve slowly opens that prevents instant increase of pressure and flow to protect the pipeline and equipment.

When power is starting, the pump and solenoid valve will open at the same time. Then, the valve will be opened by pumping pressure.

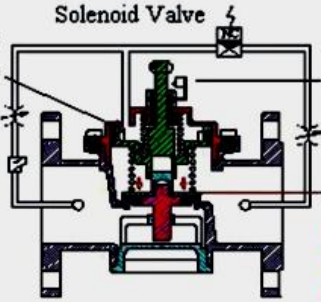
(2)



When pump is closing, valve slowly closes that prevents water hammer effect and protect the pipeline and equipment.

Before pump shuts off, solenoid valve closes and valve gate will slowly close to limit switch point by chamber's accumulative pressure. Then, pump shuts off and valve finally closes that prevents reverse flow and water hammer effect.

(3)

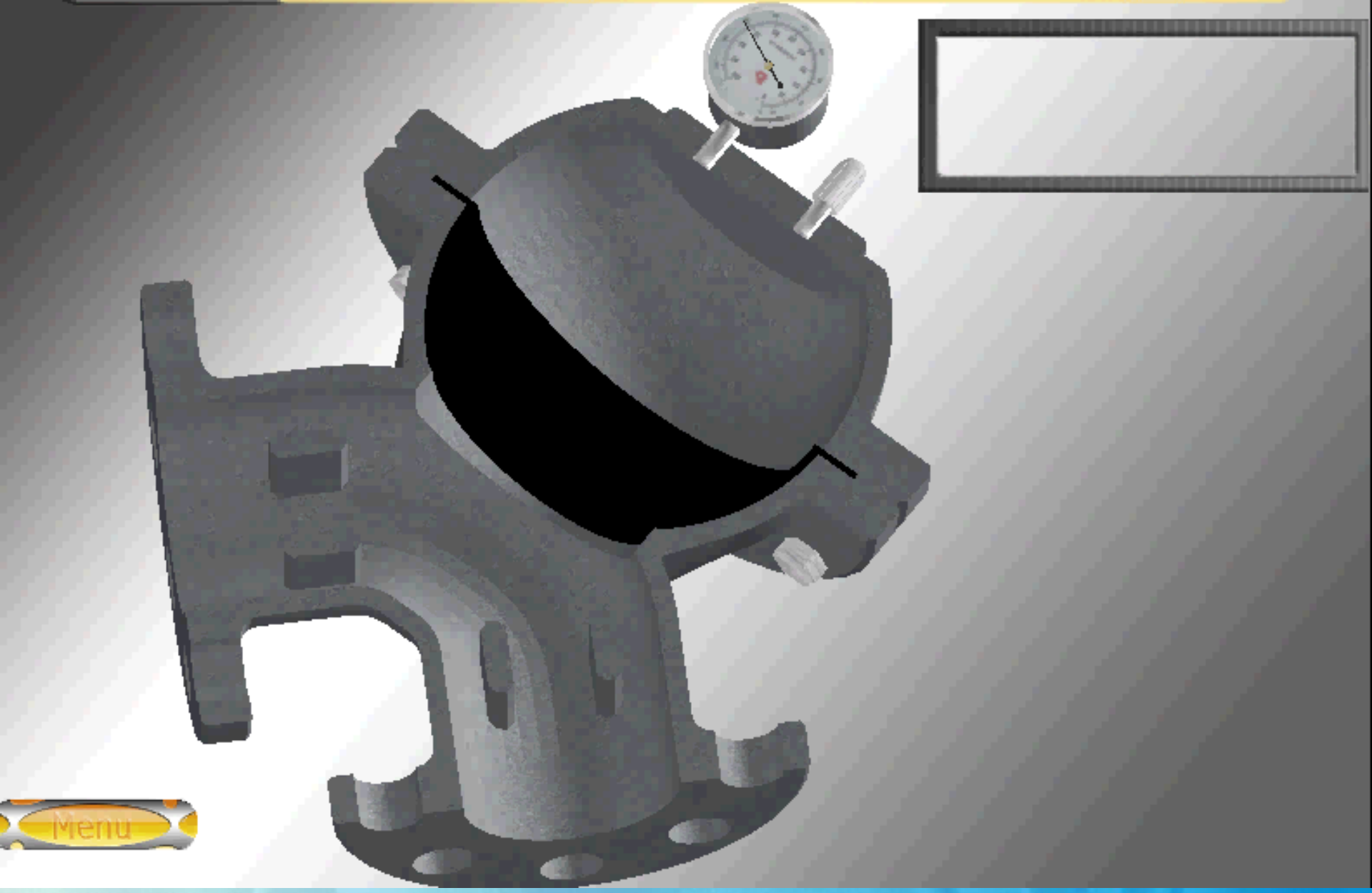


If powers suddenly shuts off while pump is operating, valve gate functions as silent check valve gate that quickly closes to prevent reverse flow and protect pipeline and equipment.

The assemble & testing ！

Z-TIDE

Painting Your Life


Menu

Assemble NYVALVES Z-TIDE Water Hammer Arrester

Z-TIDE

Painting Your Life

Assemble Z-TIDE DAPRV

Assemble Z-Tide Water Hammer Arrester Step by Step

1. Parts

Z-TIDE

Painting Your Life

Assemble Z-TIDE DAPRV

Assemble Z-Tide Water Hammer Arrester Step by Step

2. Step1

Put 3.diaphragm
inside 2.Cove

5.Base seat

1.Plug

Assemble Z-TIDE DAPRV

Assemble Z-Tide Water Hammer Arrester Step by Step

3. Step2

Screw 2.Cover on 4.Base seat

1.Plug

Assemble Z-TIDE DAPRV

Assemble Z-Tide Water Hammer Arrester Step by Step

4. Step3

Screw 1.Plug on 2.
Cover

Z-TIDE
Painting Your Life

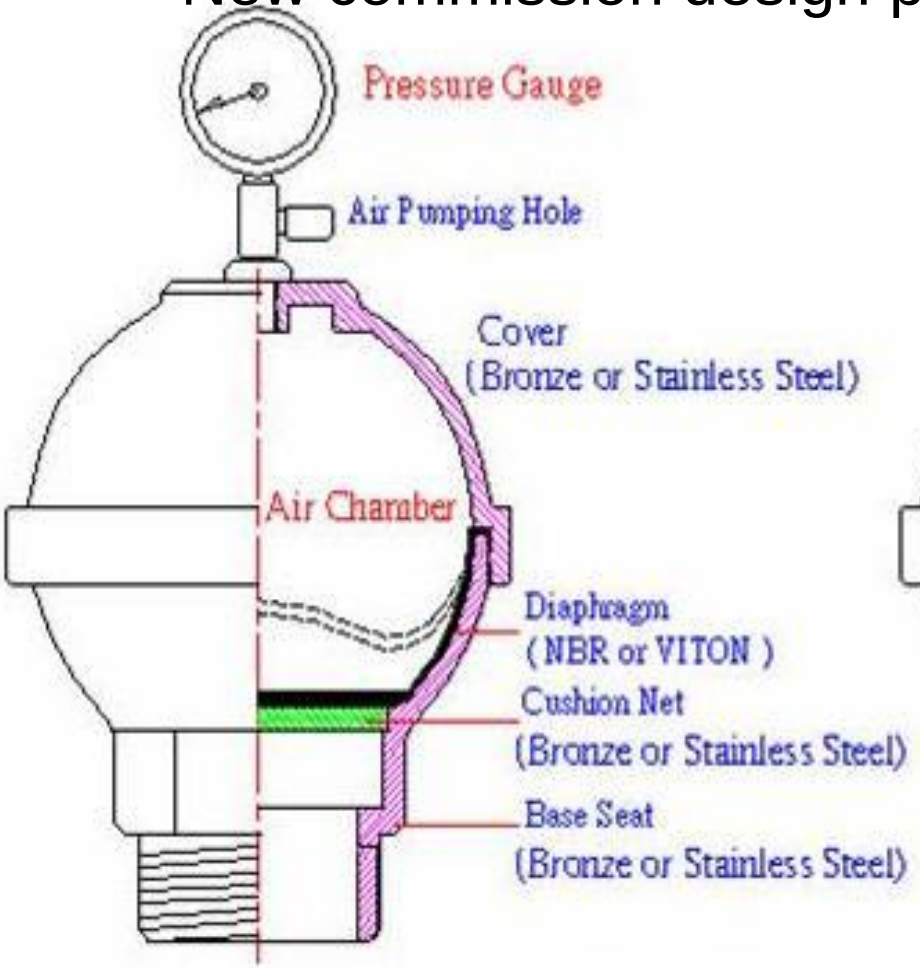
It's Done!!

Where to find the order & handle the project with design ?

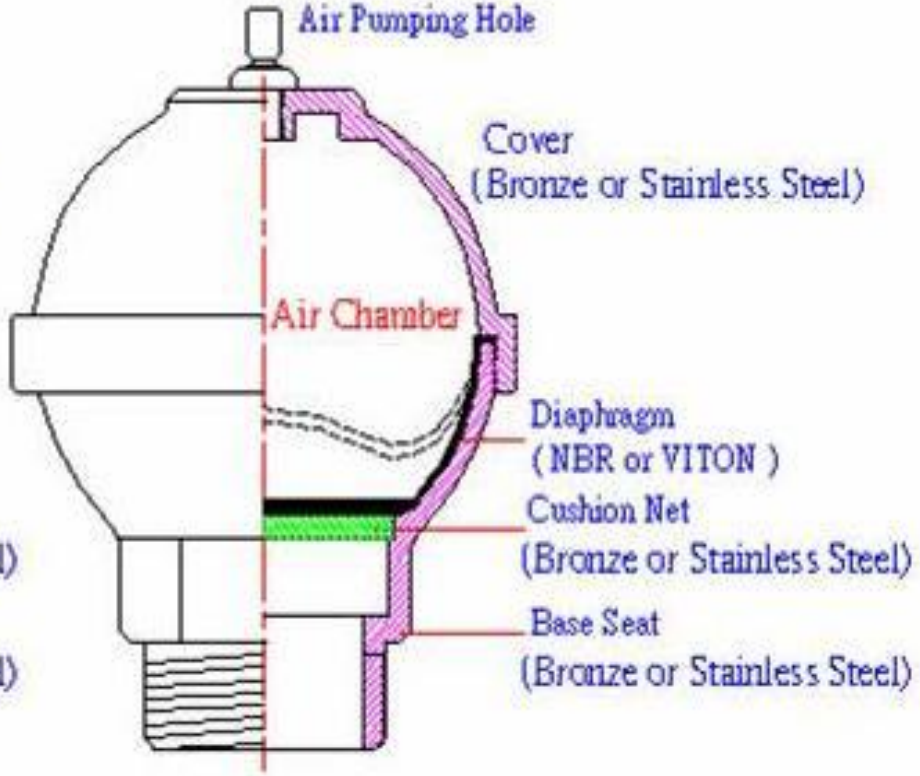
Z-TIDE

Painting Your Life

New commission design parts for customer request



< Special ordering product >



< Standard product >

Z-TIDE VALVES	Article Name I Style Water Hammer Arrester (With Pressure Gauge)		MM 5.10.2001

Specification Inspection

- **Diaphragm type water hammer arrester**
- **Usage:**
- The water hammer arrester is installed in the piping and purposed to absorb the water hammer. The water hammer is caused by slam of pump or valve gate and causes bad effect on piping.
- **Style & function:**
- The construction inside is diaphragm type pressed air chamber.
- The water hammer arrester is settled
- The whole water hammer arrester should be made by stainless steel 316.
- The water hammer arrester has the gauge that can show the air pressure inside.
- The water hammer arrester has air-pumping hole and the pressure of pressed air chamber can be adjusted.
- **Standard Size:**
- (1) I style: 15mm ~ 65mm (Stainless steel, Threaded)
- (2) I style: 80mm ~ 300mm (Stainless steel, Flanged)
- (3) L style: 50mm ~ 200mm (Stainless steel, Flanged)

Z-TIDE

Painting Your Life

Specification Inspection

- **Stainless Silent Check Valve**
- **Usage:**
- The stainless silent check valve is installed in the piping and purposed to prevent the fluid flow backward.
- **Style & function:**
- Designed with full flow lift type.
- The whole valve should be made by stainless steel 316.
- The plug is designed as semi-round and resists the high pressure. When the plug closes the valve, the plug is automatically located in suitable position no matter high or low pressure.
- The stainless steel spring inside can helps the plug to close the valve with suitable speed. That will prevent the water hammer.
- The valve with size under 150mm has a stainless steel bypass. The bypass can be opened for any necessity and then the fluid flow backward.
- **Standard Size:**
- >50mm: Flanged

Z-TIDE

Painting Your Life

NYVALVES THE SOLUTION
IN SPECIAL VALVES
PHONE:1888 441 3986
www.nyvalves.com