



SOLUTIONS FOR FLOW CONTROL

KAVAL INDUSTRIES

www.kaval.ca





About us

KAVAL is a Canadian valve fabricator, providing customers with gate, globe, check, as well as floating and trunnion ball valves, etc., of a complete range of sizes and ratings for industries oil and gas production, chemistry, power generation, etc.

Kaval has production and distribution centers in Calgary, Canada and Nanjing, China, consisting of experienced RD, QA/QC, Engineering and production teams, to provide customers in the world with flow control solutions, products and technical supports.

KAVAL is ISO 9000 certified. Kaval valve designs meet industry standards, including API 6D, API 600, API 594, ASME B16.34, CSA Z245.15, and tested as per API 598, API 6D, API 607. Our products meet the most stringent requirements in quality, pricing, delivery and services by our customers.

In the very tough competitive market, KAVAL wins its share by high quality products, quick delivery, excellent service and competitive price. In KAVAL we are proud of our quality control, knowledge of materials, valve design, fabrication, our services, and our understanding about requirements in oil and gas industries in North America and the world.

Our international team is composed of experts of valve design, valve manufacture, material production, oil and gas production, EPC, etc. Based on know-how and know-why, we provide our clients with result-oriented flow control solutions for their projects, including selection of materials, specification of valves, etc. rather than only valve products, to meet our client particular applications.

Matching up the market requirement and technology development, we have been dedicating on developing products and services to best meet our client's needs in various industries. Client's success is our achievement. Our experienced staff, high standards of excellence, expertise in problem solving and variety of our products will provide our clients with fully satisfaction.





PRODUCTS AND STANDARDS



Supply List For Axial Flow Check Valve

| NPS \ Pressure | 150lb | 300lb | 400lb | 600lb | 900lb | 1500lb | 2500lb |
|----------------|-------|-------|-------|-------|-------|--------|--------|
| 1/2" | ● | ● | ● | ● | ● | ● | ● |
| 3/4" | ● | ● | ● | ● | ● | ● | ● |
| 1" | ● | ● | ● | ● | ● | ● | ● |
| 1-1/4" | ● | ● | ● | ● | ● | ● | ● |
| 1-1/2" | ● | ● | ● | ● | ● | ● | ● |
| 2" | ● | ● | ● | ● | ● | ● | ● |
| 2-1/2" | ● | ● | ● | ● | ● | ● | ● |
| 3" | ● | ● | ● | ● | ● | ● | ● |
| 4" | ● | ● | ● | ● | ● | ● | ● |
| 5" | ● | ● | ● | ● | ● | ● | ● |
| 6" | ● | ● | ● | ● | ● | ● | ● |
| 8" | ● | ● | ● | ● | ● | ● | ● |
| 10" | ● | ● | ● | ● | ● | ● | ● |
| 12" | ● | ● | ● | ● | ● | ● | ● |
| 14" | ● | ● | ● | ● | ● | ● | ● |
| 16" | ● | ● | ● | ● | ● | ● | ● |
| 18" | ● | ● | ● | ● | ● | ● | ● |
| 20" | ● | ● | ● | ● | ● | ● | ● |
| 22" | ● | ● | ● | ● | ● | ● | ● |
| 24" | ● | ● | ● | ● | ● | ● | ● |
| 28" | ● | ● | ● | ● | ● | ● | ● |
| 30" | ● | ● | ● | ● | ● | ● | ● |
| 32" | ● | ● | ● | ● | ● | ● | ● |
| 36" | ● | ● | ● | ● | ● | ● | ● |
| 40" | ● | ● | ● | ● | ● | ● | ● |
| 42" | ● | ● | ● | ● | ● | ● | ● |
| 48" | ● | ● | ● | ● | ● | ● | ● |
| 56" | ● | ● | ● | ● | ● | ● | ● |
| 60" | ● | ● | ● | ● | ● | ● | ● |
| 64" | ● | ● | ● | ● | ● | ● | ● |



Axial Flow Check Valve

Design Specification

| | |
|----------------------|--|
| Design Specification | Refer To ASME B16.34,API 6D |
| Face-to-Face | API 6D |
| Flange Dimension | ASME B16.5,ASME B16.47,GB,JB,HG etc |
| Butt Welding | ASME B16.25, ASME B31.4, ASME B31.8 |
| Materials | ASTM ,GB etc |
| | Sulfur-Resistant NACE MR01-75,NACE MR01-03 |
| Inspection & Testing | API 6D、 API598 、 ISO5208 |

Versions And Function

| Versions And Function Of Axial Flow Check Valve | | | | | |
|--|---------------|---|---------------|--|---------------|
| ACHS | | ACHH | | ACHA | |
| Nominal Diameter | NPS1/2"~64" | Nominal Diameter | NPS1/2"~64" | Nominal Diameter | NPS1/2"~64" |
| | DN15~1600 | | DN15~1600 | | DN15~1600 |
| Pressure | Class150~2500 | Pressure | Class150~2500 | Pressure | Class150~2500 |
| | PN10~420 | | PN10~420 | | PN10~420 |
| It is a non-return device,service for non-corrosive or corrosive fluid medium with the temperature range from -46~540°C,It is especially applicable to zero leakage and fire fighting working condition. | | Applicable for high temperature,low temperature or harsh working condition. | | ACHA version check valve closing time can be adjustable according to working condition and can be applicable for more severe occasion on water hammer. | |



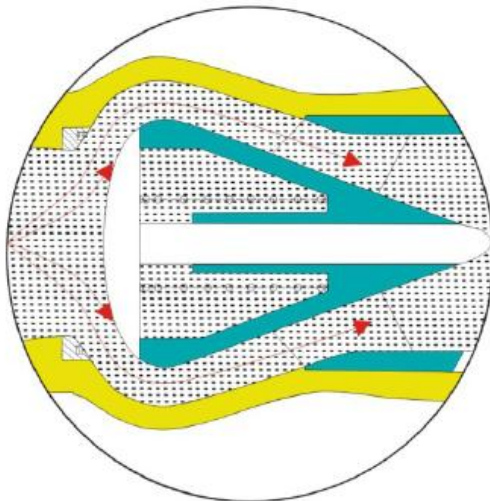
Working Principle

The unique and perfection axial flow check valve technology is formed from the analyze and research on fluid dynamics, and the comprehensive conclusion on manufacturing, assembly and stable analyzing in running process. Dipper Valve laid stress on every detail from the design information input to products put into operation and service. As a professional axial flow check valve manufacturer, over thousands large amount of different sizes axial flow check valve have been supplied to critical crude oil pipeline, long distance transmission natural gas pipeline, storage facility as well as LNG plant in home and abroad.

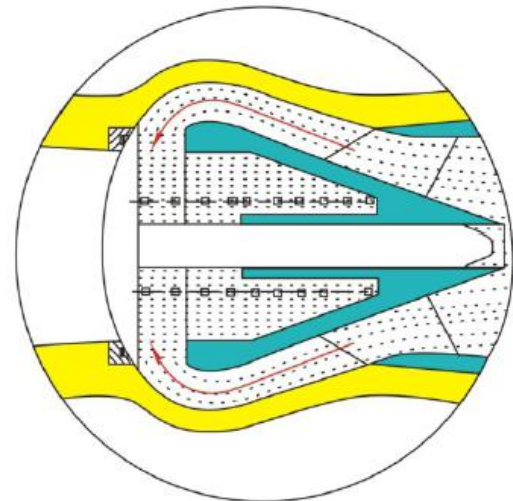
The axial flow check valve is a protective device to prevent the back flow, it is installed on the equipment (eg. compressor, pump), device (eg. gathering system, Measuring unit), or pipeline. When the medium flows to the disc, the flow will meet resistance, some power will be converse to PV to push the disc, open the valve. With the reduction of flow amount, the force of spring and medium back pressure will effect to close the valve to prevent return flow.

The check valve working characteristic is the loading force change sharply, small frequency in open and close, once it is in open or close status, it will keep a long period for this status, however once there have "shift" request, the operation shall be very easily,

Therefore it has a more sever requirement on check valve compared to other ordinary mechanical operation.



Valve Opening



Valve Closing



Axial Flow Check Valve

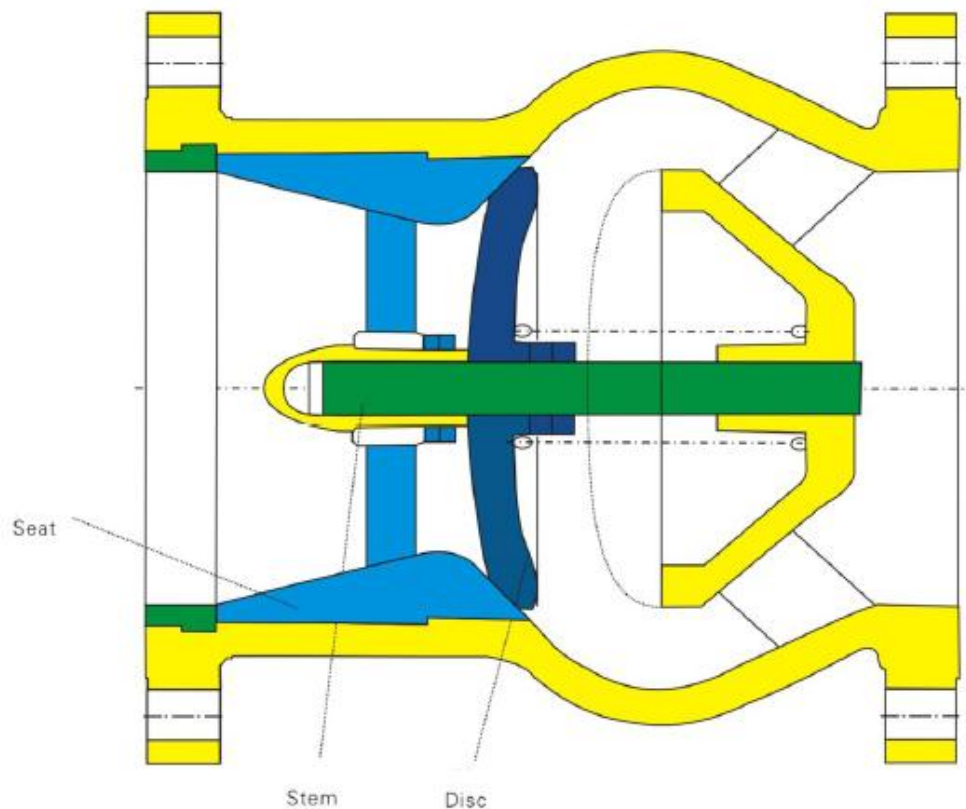
Characteristics

Single Body Structure-No Leakage

By adopting the independent patent technology, the sealing face of axial flow check valve be located on the sealing ring not on the valve body, thus ensure the machining precision of the sealing face and no leakage point in the body, then zero leakage have achieved.

Streamlined Flow Passage Design-Small In Fluid Resistance, Good In Flow Pattern

Full opening flow passage and venture valve body design, so there is enough and same flow passage area, the medium flows in streamline, stable in flow pattern, no cavitation, low noise, only with little pressure loss and operation cost.





Unique Design Of Stem-No Obstruction,Reliable In Running

Special design for the guide bush and the stem,avoid stuck which often occurs during the operation of the same kind valves, and keeps smooth open and close operation,meanwhile avoid the poor alignment of disc which is result from gravity and sealing face leakage which caused by unequal loading force.

Precise Design Of Spring-Opening And Sealing At Low Pressure

Dipper will special design spring for every specific working condition,which ensure the valve working performance meet the best parameter of pipeline system running.

Various Sealing Structures-Wide Range Of Application

- | Full metal disc(metal to metal seat) valve can be supplied for the operating temperature which from +280~+540°C.
- | Compound sealing with intrinsically fire safe design (ACHS) valve can be supplied for the operating temperature which from -46~+120°C and pressure lower than 10.0MPa.
- | Compound sealing with nylon insert and intrinsically fire safe design (ACHS) valve can be supplied for operating temperature which from -46~+80°C and pressure higher than 15.0MPa.
- | Compound sealing with polyphenyl ester insert and intrinsically fire safe design valve can be supplied for operating temperature which from +120~+280°C and pressure lower than 15.0MPa.

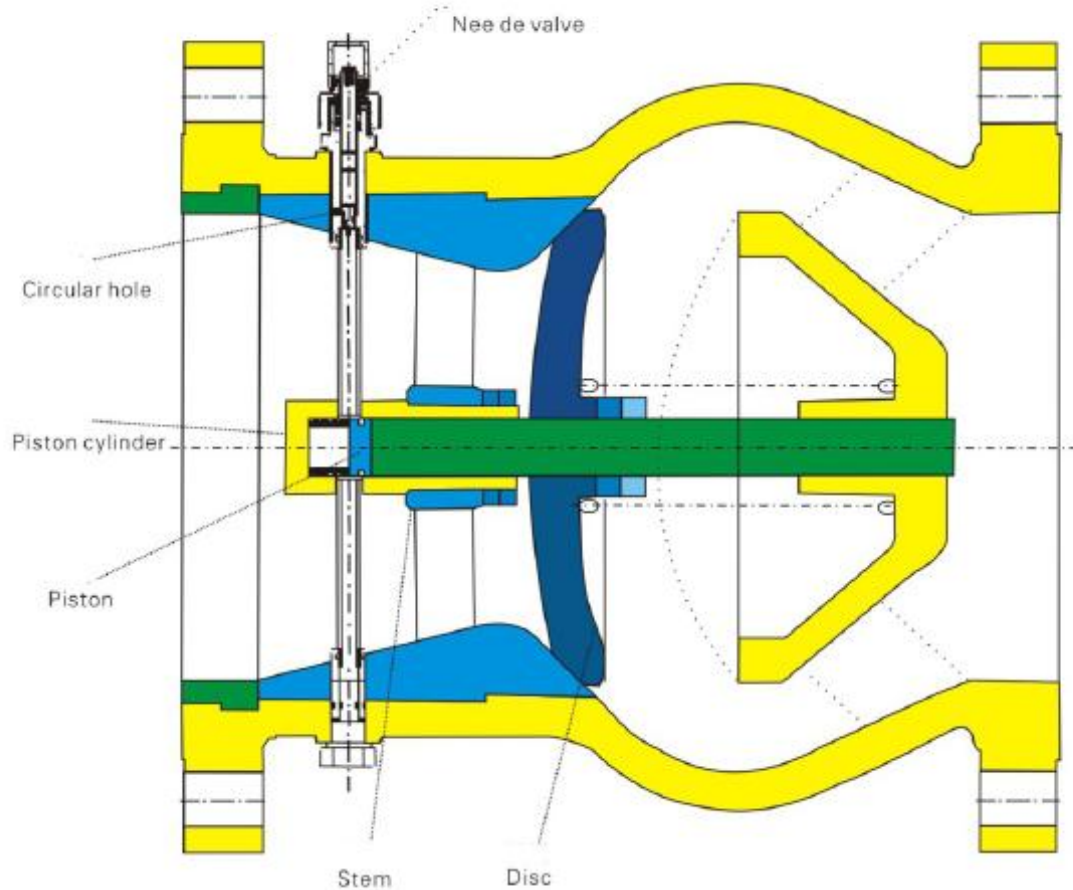
Non-slam Operation

Due to the unique working principle,, axial flow check valve response very smoothly and operation stable to the changes in flow amount.

Compact Structure, Any Angle Of Installation

The precise design of spring based on specified working condition,ensure the valve are always in closed position even without the effect of medium.the good design of guide bush keep the good alignment in disc and seat no matter the valve been installed vertical or horizontal.so that it can be installed at any angle.

Adjustable And Slow Closing Axial Flow Check Valve

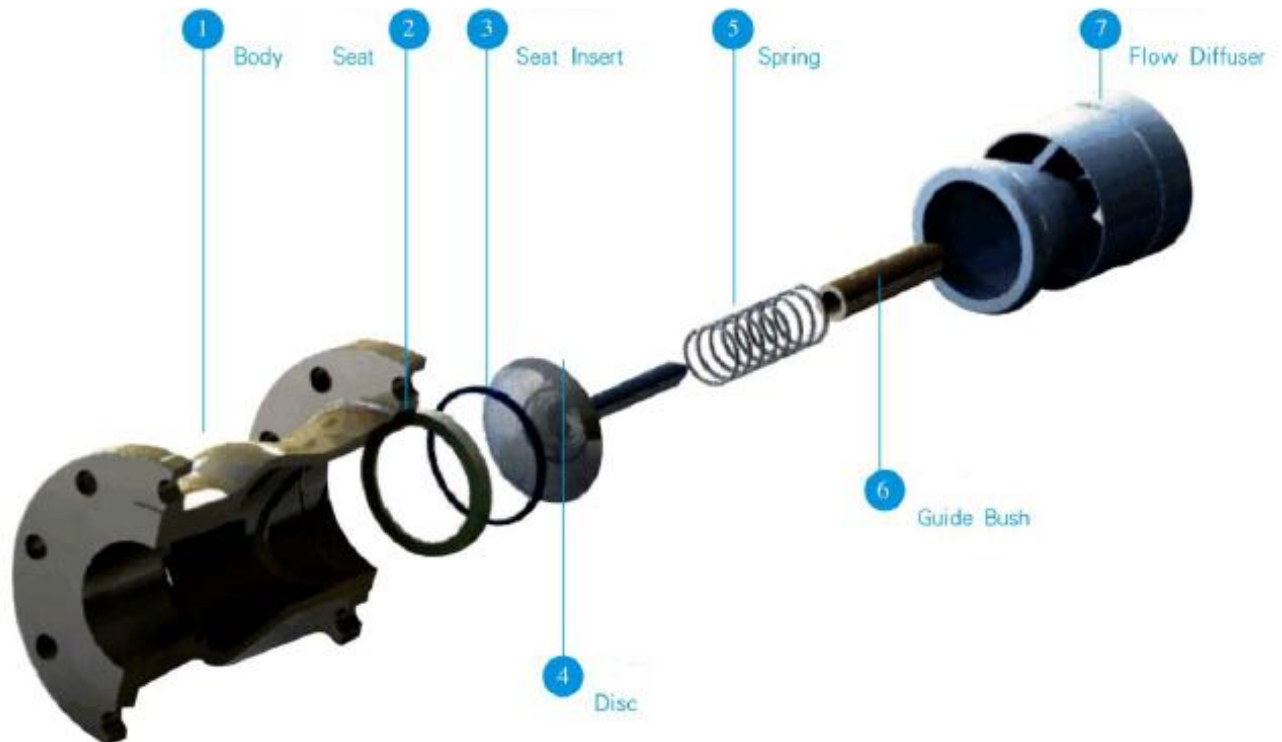


Function

As the pump protection valve, check valve is required to close quickly, in order to prevent the large amount of back flow reverse pump rotation, then burnout the motor. At the meantime, for protecting pipeline, check valve is required to closing slowly, as the generate water hammer may cause pipeline breakage. ACHA version check valve make a good combination in the pump protection as well as water hammer prevention, it is an perfection valve for protect pump and prevent water hammer.



Main Parts And Materials

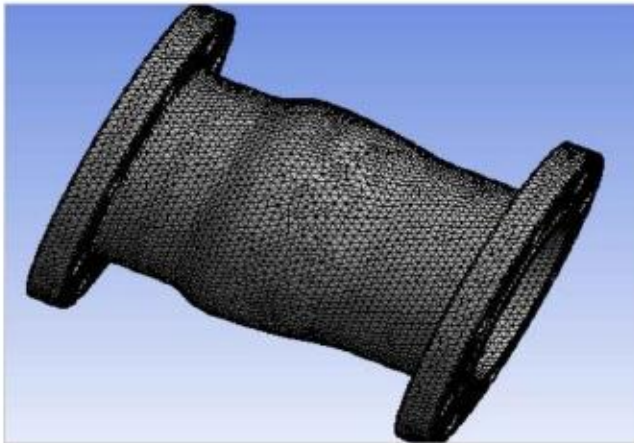


| Parts | Carbon Steel Series | Stainless Steel Series | Sulfur-resistant Series | | Special Materials Series |
|---------------|-----------------------------|---------------------------------------|-------------------------|---------------------------------------|--------------------------|
| | | | C.S. Valve Body | S. S. Valve Body | |
| Body | A105 A216-WCB | A182-F304 F316 A351-CF8 CF8M | A105 A216-WCB | A182-F304 F316 A351-CF8 CF8M | 2205, Hastelloy, Monel |
| Seat | 13Cr, 304, 316+Stellite | | | | HVOF Co-Cr-W HVOF Ni-Cr |
| Seat Insert | PTFE/RPTFE/PPL/NYLON/DEVLON | | | | DEVLON / PEEK |
| Disc | 13Cr, 304, 316+Stellite | | | | HVOF Co-Cr-W HVOF Ni-Cr |
| Spring | 304, Inconel-X 750 | | | | Inconel-X 750 |
| Guide Bush | A182-F6a | F304/316 | | | |
| Flow Diffuser | A105 A216-WCB | A182-F304 F316 A351-CF8 CF8M | A105 A216-WCB | A182-F304 F316 A351-CF8 CF8M | 2205, Monel |

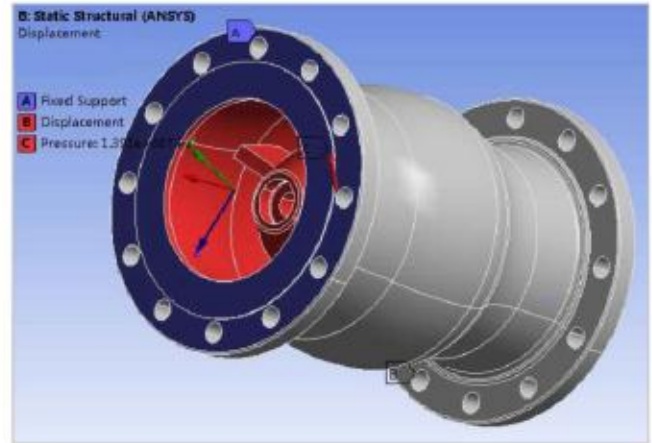
Note: According to customers request, the material such as Low Temperature Carbon Steel, Duplex Stainless Steel, Nickel-Aluminium-Bronze, 6Mo etc are available.

Axial Flow Check Valve

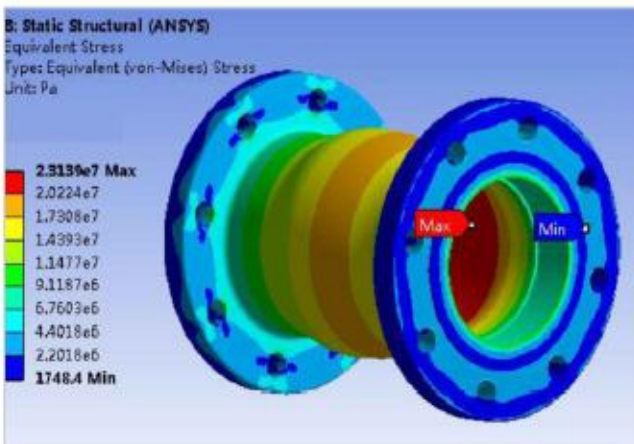
The Strength Analysis On Axial Flow Check Valve



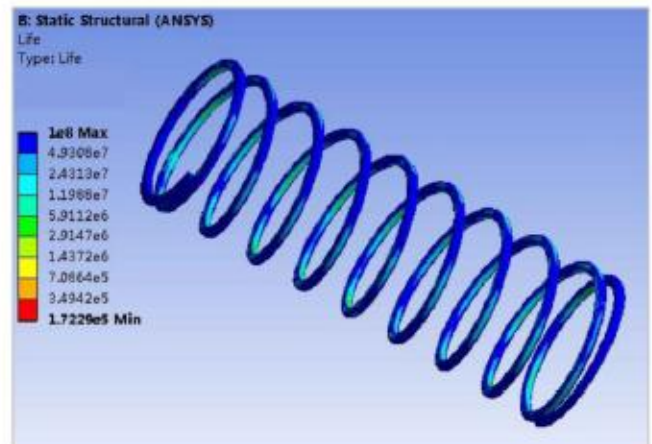
Rebuild model, mesh generation of body model



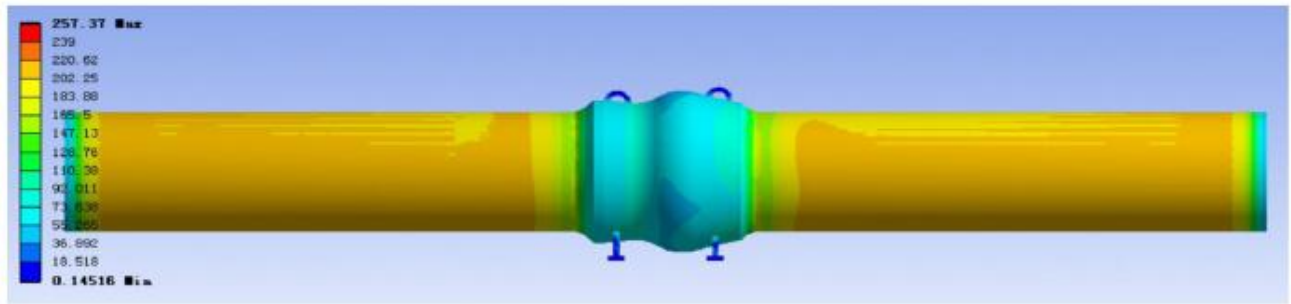
Loading on valve model



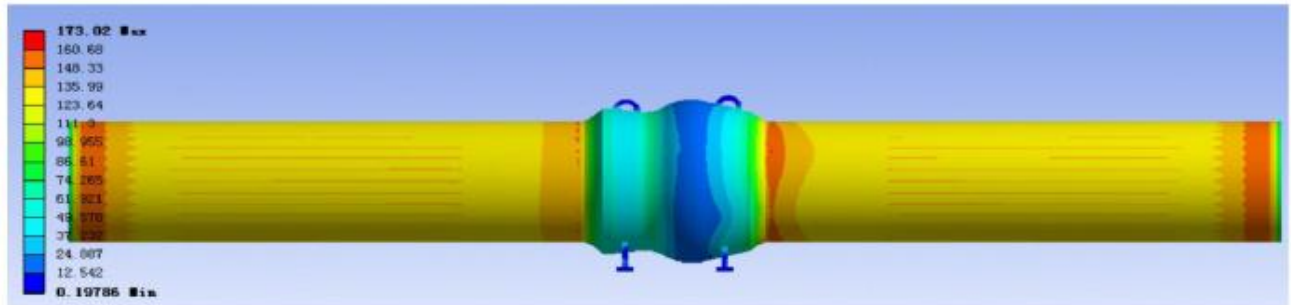
After simulation calculation, generate the equivalent (Von-mises) stress contours



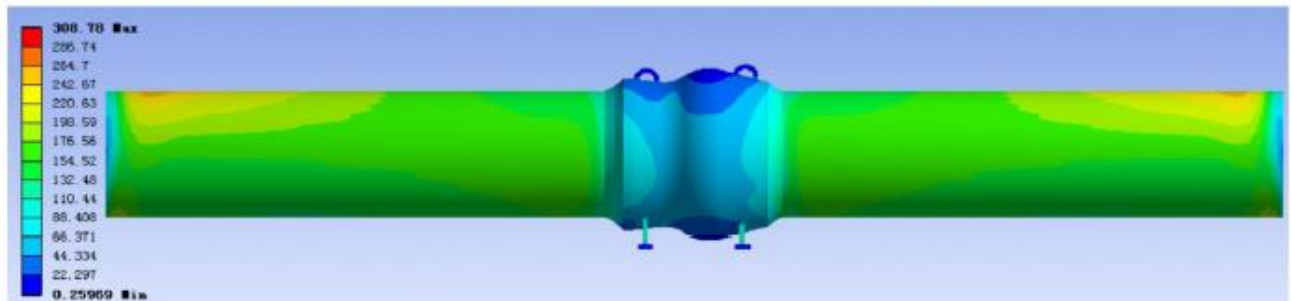
According to medium condition, establish working model of spring, verification the strength and life of spring



Body And Pup Piece Stress Contours Under Tensile



Body And Pup Piece Stress Contours Under Extrusion



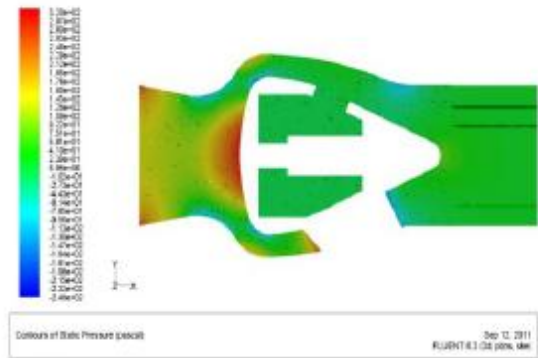
Valve Stress Distribution Under Bending

Axial Flow Check Valve

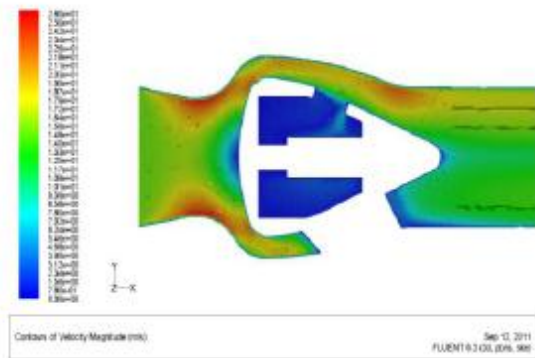
The Flow Field Analysis On Axial Flow Check Valve



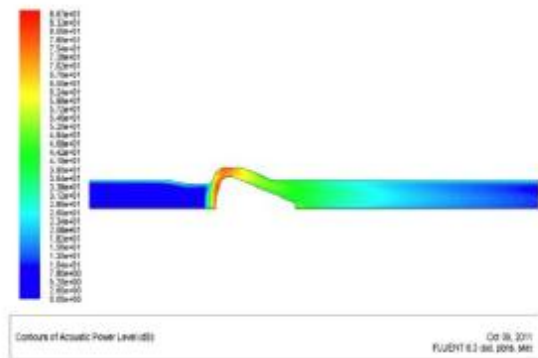
Establish the flow passage model, use the computer program, Fluent, to optimum the design of valve structure



Contours of flow passage pressure after optimum (Pascal)



The contours of flow passage velocity magnitude after optimum (m/s)



The contours of acoustic power level after optimum (dB)



Axial Flow Check Valve

The CV Value Of Axial Flow Check Valve

| 【 gpm 】 Axial Flow Check Valve CV Value (gpm) | | | | | | | |
|---|------|-----------------|--------|--------|-------|-------|-------|
| Nominal Diameter | | Pressure Rating | | | | | |
| NPS | DN | 150 | 300 | 600 | 900 | 1500 | 2500 |
| 1/2 | 15 | 5 | 5 | 5 | 5 | 5 | 5 |
| 3/4 | 20 | 11 | 11 | 11 | 11 | 11 | 11 |
| 1 | 25 | 23 | 23 | 23 | 23 | 23 | 23 |
| 1-1/2 | 40 | 67 | 67 | 67 | 67 | 67 | 67 |
| 2 | 50 | 95 | 95 | 95 | 95 | 95 | 95 |
| 2-1/2 | 65 | 157 | 157 | 157 | 145 | 138 | 116 |
| 3 | 80 | 253 | 253 | 253 | 240 | 228 | 177 |
| 4 | 100 | 474 | 474 | 474 | 451 | 428 | 381 |
| 6 | 150 | 1027 | 1027 | 1027 | 976 | 927 | 653 |
| 8 | 200 | 1479 | 1479 | 1479 | 1405 | 1335 | 1128 |
| 10 | 250 | 2654 | 2654 | 2654 | 2521 | 2395 | 2156 |
| 12 | 300 | 4172 | 4172 | 4172 | 3964 | 3766 | 3267 |
| 14 | 350 | 6233 | 6233 | 6233 | 5825 | 4504 | 3989 |
| 16 | 400 | 7315 | 7315 | 7315 | 6358 | 5704 | 4863 |
| 18 | 450 | 9533 | 9533 | 9533 | 7181 | 6872 | 5905 |
| 20 | 500 | 11813 | 11813 | 11813 | 9635 | 8976 | 7680 |
| 24 | 600 | 15957 | 15957 | 15957 | 15364 | 14275 | 12159 |
| 28 | 700 | 24026 | 24026 | 24026 | 21333 | 18727 | |
| 32 | 800 | 32402 | 32402 | 32402 | 28368 | | |
| 36 | 900 | 35903 | 35903 | 35903 | 31182 | | |
| 40 | 1000 | 48867 | 48867 | 48867 | 45568 | | |
| 48 | 1200 | 63296 | 63296 | 63296 | 58618 | | |
| 56 | 1400 | 81862 | 81862 | 81862 | 73655 | | |
| 60 | 1500 | 97430 | 97430 | 97430 | | | |
| 64 | 1600 | 108125 | 108125 | 108125 | | | |

The CV value list above are indicative, the product CV value is different as the different design in valve structure.



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