Flowserve - Edward Valves

Hermavalve® A Zero Emission Valve from Edward Valves

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Problem

Small bore valves located in hard to reach areas of nuclear power plants that cannot be serviced if they leak radioactive or other critical fluids.

Solution

The Flowserve-Edward Hermavalve. This design complies with the rules and requirements set forth in Section III of the ASME Boiler and Pressure Vessel Code.

Introduction

Excellent progress has been made in meeting the requirements for limiting fugitive emissions through the use of improved valve stem packings. In general, the new improved stem packings provide lower leakage rates, longer service life, and require less maintenance. Some of the newer packings are capable of handling higher pressures and temperatures without loss of their sealing abilities. However, packed valves can not meet all emissions requirements. In some applications, frequency of operation and thermal cycles require regular packing adjustments and leakage monitoring to meet stringent leakage requirements. In other applications no emissions can be permitted due to the characteristics of the fluid being handled.

When a packed valve cannot meet atmospheric leakage standards, Edward Valves can provide our hermetically sealed Hermavalve.

Unlike the numerous bellows type valves on the market, the Hermavalve provides the tight shutoff, enhanced flow, and durability characteristics of our wye pattern globe valve in a compact diaphragm sealed design.

History

The Hermavalve was designed, tested, and first sold in the early 1970's in response to a need in the nuclear power generation industry for a valve which would have zero leakage to the atmosphere. This requirement was driven by the need to contain radioactive or valuable fluids, to minimize maintenance in inaccessible areas, and to provide maximum reliability. All of the valve stem packings that were available at that time were asbestos based materials.

The Hermavalve was designed for applications at design conditions of 2500 psig at 650°F and to have a service life of at least 4000 cycles without any external leakage. The valve was designed to have flow coefficients that were comparable to the Edward Univalve, which provided high flows with low pressure drops.

Extensive flow and durability tests were conducted on prototype and initial production valves to prove the Hermavalve design. Followup testing and decades of outstanding service has proven that Edward Hermavalves can meet and exceed the most demanding requirements.

Features

The "heart" of the Hermavalve is the diaphragms that are welded to the bonnet, which in turn is seal welded to the body, providing assurance of no leak path to the atmosphere. The diaphragm set is composed of multiple layers of thin, high strength Ni-Cr-Fe Alloy 718 formed and heat treated to provide the maximum cycle life.

Since the deflection of the diaphragms must be limited and controlled to meet the design cycle life, the valve internals had to be specially designed to minimize disk lift while meeting the flow coefficient (C_v) requirements of the design objective. This requires the use of slightly larger seats and special flow shapes which includes radial diffusers to achieve or exceed the C_v requirements.

Hermavalves have a redundant packing set and a backseat that can be used to prevent leakage to the atmosphere until repair can be performed in the unlikely event that the diaphragms should fail. The bonnet has a monitoring "connection" or port that allows the installation of a pressure gage or leak detection instrumentation to verify that the diaphragms are not leaking to the atmosphere.

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The valves have a non-rotating rising stem to eliminate any torque being transmitted by the diaphragm disk to the diaphragms, which would severely reduce the cycle life of the diaphragms. Needle thrust bearings are used in the yoke bushing to reduce the operating torques.

The bonnet-body seal weld prevents any leakage through the bonnet-body connection. An Unwelded version of the Hermavalve is also available that replaces the body-to-bonnet seal weld with a static graphite gasket, permitting ease of disassembly for in-line repair. Stub-Acme threads are used in the body-to-bonnet connection to allow the easiest possible repairs.

The sealing surfaces of the seat and disk utilize a proven cobalt based material, Stellite 21, to provide the best in seat tightness and durability.

Product Standards

Hermavalves are designed to meet all of the applicable requirements of ASME/ANSI B16.34 (latest revision) for Limited Class. The carbon steel and low alloy valves are rated as ASME Class 1500 and the stainless steel are rated up to Class 1690. The valve is offered in Sizes 1/2 - 2 as full ported valves and in Sizes 1, 1- 1/2, 2, and 2-1/2 as reduced ports. Socket welding ends are standard (except size 2-1/2) with butt welding ends available in all sizes. Electric and pneumatic actuators must be factory mounted if required.

Materials of Construction

The material for each part has been selected to provide the maximum service life and performance at a reasonable price. Hermavalves are offered in A105 (carbon steel), A182 grade F22 (low alloy) and A182 grade F316 (stainless steel) as standard materials. A complete list of materials for the standard offering is shown in the Table 1. Other materials will be considered on application.

Hermavalves can be supplied to meet all of the applicable requirements of NACE Standard MR- 01-75 (latest revision).

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Description of Features

1. Position Indicator
2. Handwheel
3. Needle Thrust Bearings
4. Yoke Bushing
5. Non-revolving Stem
6. Yoke
7. Diaphragm Disc
8. Multiple Diaphragms
9. Body
10. Integral Hardfaced Seat
11. Solid Stellite Disc
12. Disc Guide Assembly
13. Diaphragm Seal Weld
14. Backseat
15. Body-to-Bonnet Seal
16. Bonnet
17. Backup Packing
18. Gland Screws

Edward Hermavalve Hermetically-Sealed Valve

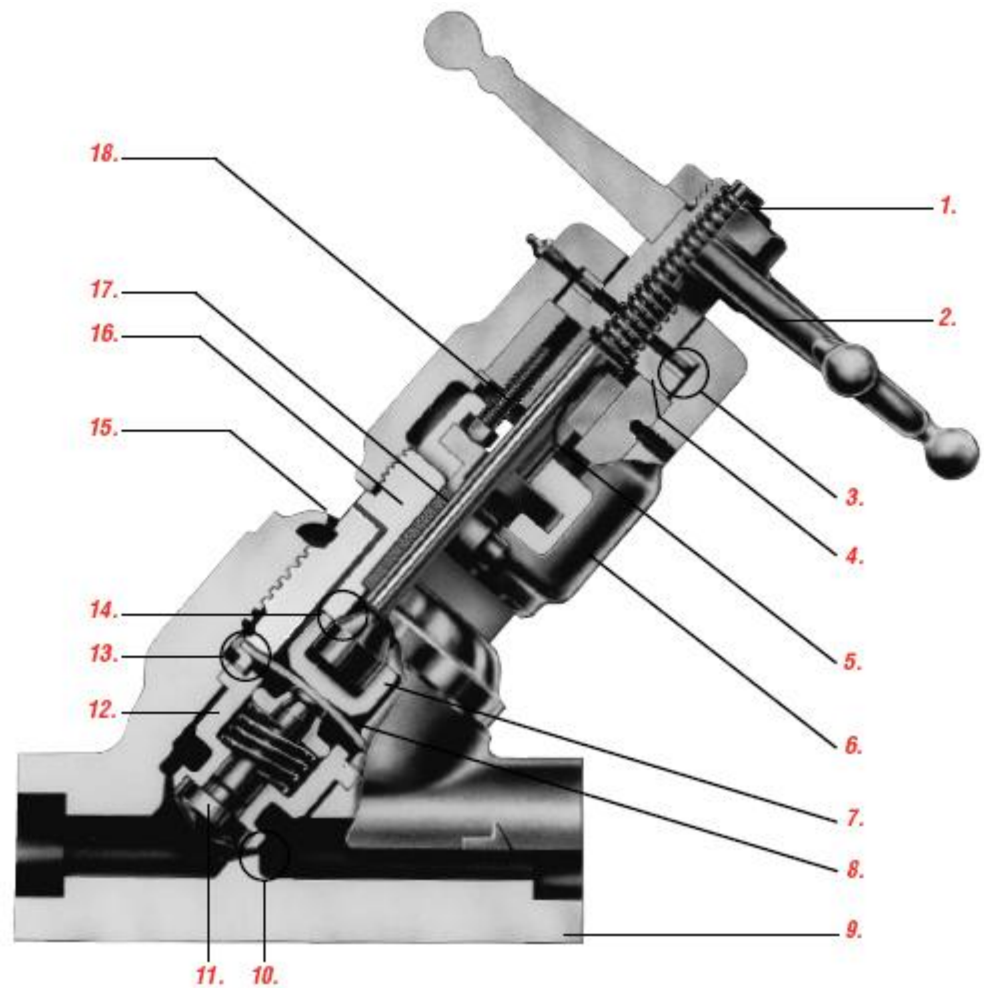

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Table 1: Materials of Construction

DESCRIPTION	ASTM NO.	ASTM NO.	ASTM NO.
Body	A-105	A-182 Grade F22	A-182 Grade F316
Disk	A[S] T615	AISI T615	A-732 Grade 21
Body Seat	Stellite* 21	Stellite 21	Stellite 21
Stem	A-479 T410 Class 3	A-479 T410 Class 3	A-479 T410 Class 3
Junk Ring	A-582 T416	A-552 T416	A-592 T416
Bonnet	A-696 Grade C	A-739 Grade B22	A-479 T316
Yoke Bolt	A-307 Grade A	A-307 Grade A	A-307' Grade A
Packing	Flexible Graphite System	Flexible Graphite System	Flexible Graphite System
Gland	A-696 Grade C	A-696 Grade C	A-696 Grade C
Retaining Ring	Wicket Plated Steel	Nickel Plated Steel	Nickel Plated Steel
Gland Adjusting Screw	A-193 Grade B6	A-193 Grade B6	A-193 Grade B6
Stem Guide Bushing	A-696 Grade C Nickel Plated	A-696 Grade C Nickel Plated	A-696 Grade C Nickel Plated
Yoke Bolt Nut	A-194 Grade 1	A-194 Grade 1	A-194 Grade1
Yoke	A-216 Grade WCB	A-216 Grade WCB	A-216 Grade WCB
Yoke Bushing	B-150 Alloy 64200	B-150 Alloy 64200	B-150 Alloy 64200
Drive Pin	Alloy steel	Alloy Steel	Alloy Steel
Key	A-331 Grade 4140	A-331Grade 4140	A-331 Grade 4140
Spring Housing	A-582 T416	A-582 T416	A479 T316
Diaphragm Ring	A-696 Grade C	A-739 Grade B22	A-479 T316
Diaphragm Assembly	B-670 Alloy 718 (Inconel)	B-670 Alloy 718 (Inconel)	B-670 Alloy 718 (Inconel)
Diaphragm Disk	A-732 Grade 21	A-732 Grade 21	A-732 Grade 21
Shims	A-167 T316	A-167 T316	A-167 T316
Disk Collar	AISI T615	AISI T615	A-479 T316
Spring	Inconel X-750	Inconel X-750	Inconel X-750
Handwheel	Malleable or Ductile Iron	Malleable or Ductile Iron	Malleable or Ductile Iron
Handwheel Nut	Steel	Steel	Steel
Indicator	A-479 T316	A-479 T316	A-479 T316
Thrust Bearing	Steel	Steel	Steel
Lube Fitting	Steel	Steel	Steel

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