



**Severe Service
Ball Valves[®]**



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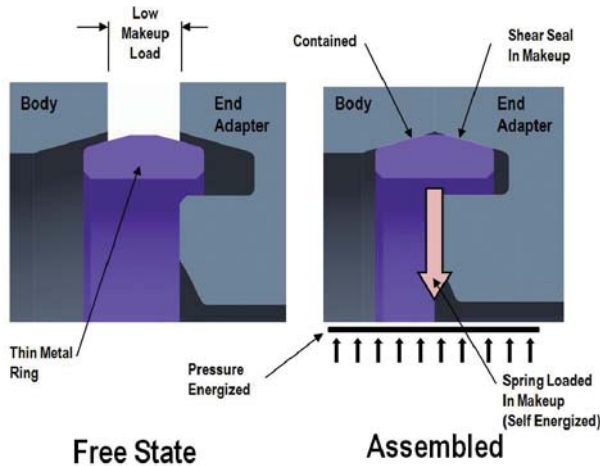
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Understanding expectations, delivering satisfaction!

Power Valves

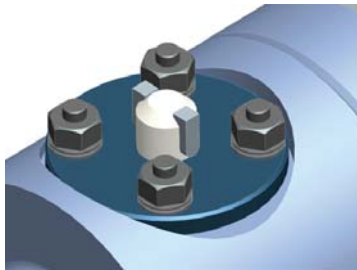
Metal Body Gasket



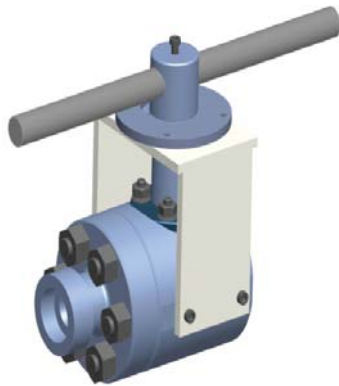
Unique self energizing and pressure energizing gasket ensures against leakage during thermal transients.

4 Bolt Gland

Generously spaced **4 bolt gland** plate allows easy access to “live loaded” packing bolts.

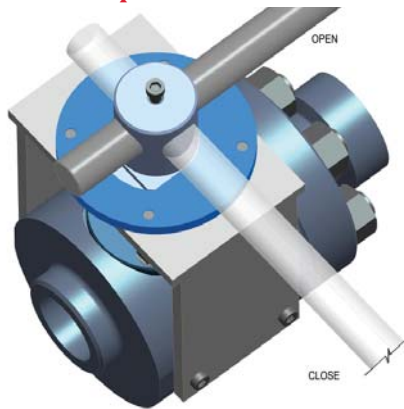


Standard ISO Bracket with Side Mounting



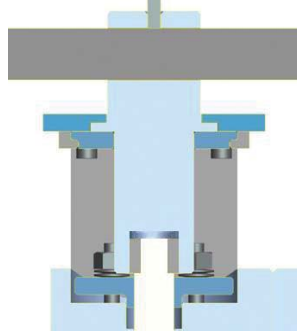
Mounting bracket prevents “side-load” and “bolt stress loads” by attaching to the **side of the body**, versus top of the valve with standard ISO pad.

Machined Stops



Integral 90 degree stop plate design prevents over rotation and maintains critical alignment on manual operated valves

Stem Adaptor



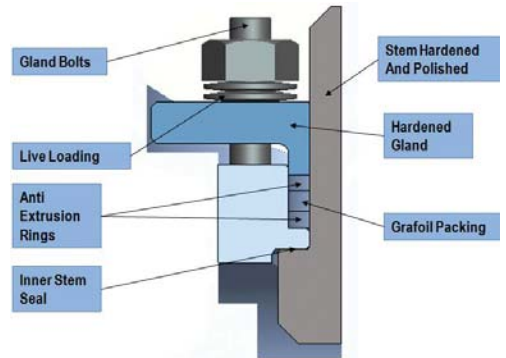
Contact proof **stem adaptor** design prevents the stem from being accidentally “knocked” into the ball slot causing miss-alignment and leakage.

Blow-out Proof Stem



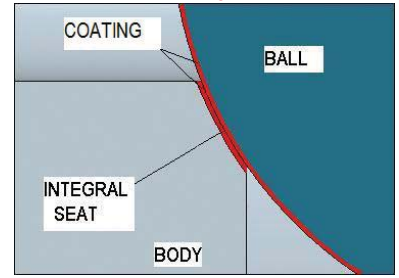
Large one-piece machined, hardened and polished stem is a true “**blow-out proof**” design. There are no pins to depend on. It is easily installed through the body bore of the valve.

Packing Area



With centerlines controlled inherently by the integral seat design, the critical stem **packing area** is protected from stem side-load issues. Our compact stuffing box and “live loaded” spring washers ensures packing is continuously “energized”.

Integral Seat

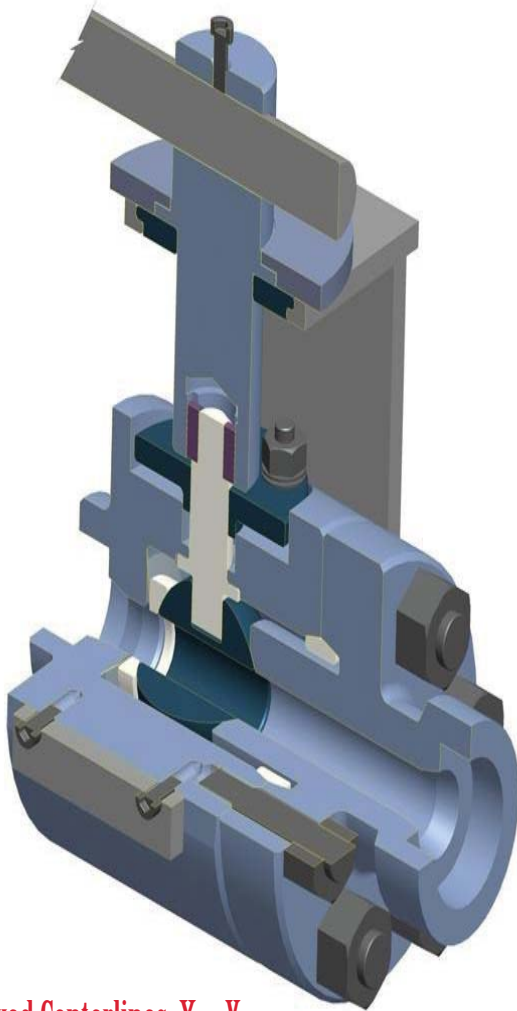


Our **integral seat** design eliminates a potential leak-path, while the spring ensures that the ball never leaves its mate-lapped seat.

Features and Benefits

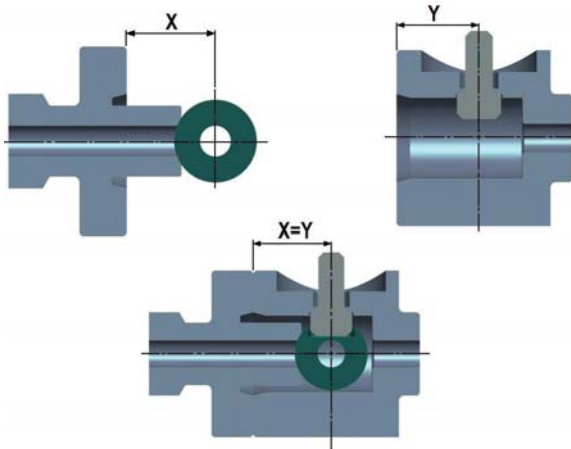


Metal-to-Metal Seated Designs



Fixed Centerlines X=Y

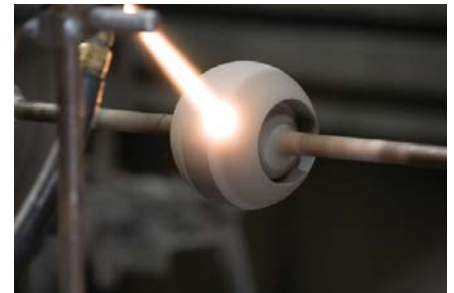
We coincidentally fix our centerlines. The large spring load continuously holds the ball in the integral seat preventing floatation. If centerlines are offset, floating results and side loads on the seat lead to seat damage and leakage.



High Tech Coatings

HVOF (High Velocity Oxygen Fueled)

EVS has selected HVOF as one of our standard coatings due to its hardness and corrosion resistance properties. This is a process taking oxygen, hydrogen and a powder like chromium carbide or tungsten carbide and detonating it in a gun, accelerating the powder at MACH 5 velocities to the surface of the base material. This forms a very hard and dense coating (.008" or .2mm) with a Mechanical Bond strength of approximately 25,000 psi tensile. This mechanical bond is much like a "brick wall". The hard particles (carbides) are the bricks while the soft metal matrix is the mortar that mechanically bonds the coating. After lapping, this coating provides an excellent finish (2-5 RMS) preventing process adhesion, excellent wear, erosion and corrosion resistance. This is an excellent and very successful coating used in very abrasive services. However, care must be taken when considering this coating for high temperatures above 1400°F or high cycling services. During high cycling operations the sealing components are constantly rubbing together, inducing shear forces against the mechanical bond, weakening the bond and causing failure. This coating is not recommended for use in high cycling service.



Photos courtesy of FW. Gartner Thermal Spraying, LTD.



Spray and Fused

In the high pressure more severe applications, EVS has standardized on Spray and Fused Coating. This process utilizes a nickel or cobalt based powder applied by the HVOF process. The coating is then "fused" at elevated temperatures (similar to welding) forming a METALLURGICAL BOND to the base material. This Metallurgical Bond is created by a small amount of coating and base material mixing together during the fusion process. The resulting alloy lattice structure provides superior corrosion resistance, eliminates the problems associated with temperature, and provides excellent wear in high cycling services. When selecting a coating EVS evaluates the key properties: Chemistry, Hardness, Bonding and Porosity.

Demanding service conditions found in today's power generation technologies easily justify the need for EVS Severe Service Ball Valves. With higher process temperatures, pressures and harsher service media pushing material limits, metal seated ball valves are a natural fit. Specifically designed for the toughest conditions, EVS valves provide years of trouble free, leak free operation. Other advantages of these designs are that they enhance safety in potentially dangerous operating parameters, while reducing costly valve maintenance. With many metal seated ball valves to choose from, EVS delivers a unique partnership that includes superior performance, outstanding customer service and an appreciation for your need to operate more efficiently.

Model FHP Power Valve

- Model EVS-FHP (Floating Ball with Integral Seat Design for Severe Service Water/Steam)

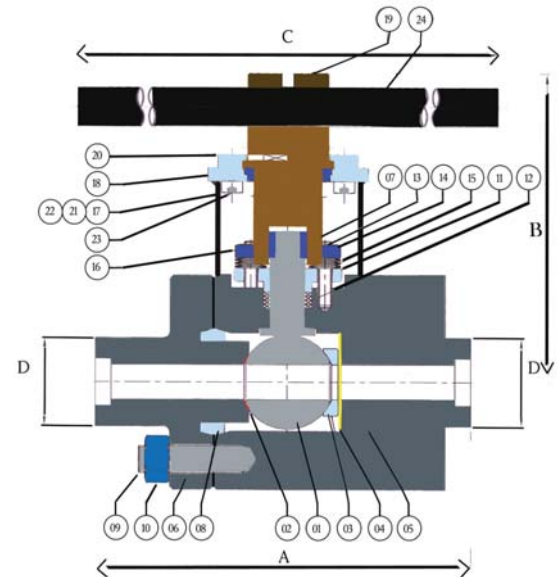
1/2" to 3", 1500, 2500, 4500 ASME Class, A105, F22 and F91 Forged Body Materials, Hard Coated Ball, Socket-weld or Butt-weld end connections. (1/2" to 2-1/2", 1500 and 2500 ASME Class are stocked. Additional sizes/classes/materials/end connections are available upon request).

Typical Parts/Bill of Materials

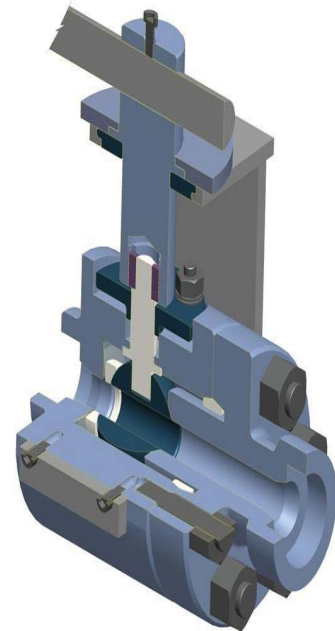
| Description | Materials/Coatings |
|-------------------------------|----------------------------------|
| 1 Ball | 410SS/HVOF Chrome Carbide Coated |
| 2 Seat Surface | HVOF Chrome Carbide Coated |
| 3 Upstream Seat | 410SS/HVOF Chrome Carbide Coated |
| 4 Disc Spring | Inconel 718 or equal |
| 5 Body | A105, F22 or F91 Forged |
| 6 End Adaptor/Integral Seat | A105, F22 or F91 Forged |
| 7 Stem | Inconel 718 or equal Hard Faced |
| 8 Body Gasket | Inconel 718 or equal |
| 9 Body Stud, | A193-B7 |
| 10 Body Nut | A194-Gr2H |
| 11 Packing Gland | Chrome Moly Steel Hard Faced |
| 12 Stem Packing | Grafoil®/Wire Reinforced |
| 13 Packing Gland Stud | A193 B7 |
| 14 Packing Gland Nut | A194 Gr 2H |
| 15 Gland "Live Loaded" Spring | Stainless Steel |
| 16 Stem Key | Carbon Steel |
| 17 Mounting Bracket | Carbon Steel |
| 18 Support Bushing | Carbon Steel Hard Faced |
| 19 Stem Adaptor | Carbon Steel |
| 20 Lever Plate | Carbon Steel |
| 21 Mounting Bolts | Carbon Steel |
| 22 Mounting Nuts | Carbon Steel |
| 23 Lever Cap Screws | Carbon Steel |
| 24 Lever | Carbon Steel |

1/2 " to 2 1/2 " 150# to 2500# ASME Class

| Nominal Size | Bore | A | B | C | D | Weight(lbs) |
|--------------|------|------|------|----|-------|-------------|
| 1/2" | 0.65 | 6.50 | 5.75 | 12 | 2.000 | 18 |
| 3/4" | 0.65 | 6.50 | 5.75 | 12 | 2.000 | 18 |
| 1" | 0.65 | 6.50 | 5.75 | 12 | 2.000 | 18 |
| 1 - 1/2" | 1.15 | 6.75 | 6.06 | 15 | 2.750 | 30 |
| 2" | 1.50 | 8.50 | 6.68 | 18 | 4.125 | 45 |
| 2 - 1/2" | 1.50 | 8.50 | 6.68 | 18 | 4.125 | 45 |



Size and dimensions shown are in inches for socket-weld ends. Additional sizes, special classes and end connections are available upon request.



Model FS Power Valve

- Model EVS-FS (Floating Ball with Integral Seat Design for Severe Service Temperatures, Pressures and Service Media)

1/2" to 36" 150 to 2500 ASME Class, Carbon Steel, Chrome Moly, Stainless Steel and exotic body materials, with various trim/coating options or end connections available to fit customer specifications.

The FS model is our customized valve, built specifically to meet customer needs for sizes beyond our FHP sizes. For that reason, there is not a "standard" bill of material or features. Based on your application data, our engineers will design a valve to fit that specific application. These valves are designed to the same stringent codes, standards and testing criteria as our FHP product line. This process gives our customers the piece of mind that we are not trying to "fit" a standard valve into a non-standard application, and the assurance that they are not paying for features they don't need.

Automation

At EVS we offer quality actuation and control packages to fit any requirement. From a simple lever or gear operator to the most sophisticated automation systems; we can provide “one source” responsibility and ownership to our customers. At EVS you have a choice to select automation from our quality line of actuation products, or specify your own preferred automation manufacturer and let us mount it. Either way, we fully inspect and cycle test each valve/actuator assembly before it leaves our shop to give you piece of mind in the field.

Testing

Every valve going into Power Service is tested to API-598 with Body Hydro at 1.5 times MCWP. Seat tested in preferred direction at 1.1 times MCWP, then tested with 80 psi air and 1000 psi Nitrogen with “Zero” drops or bubbles allowed for a 2 minute observation period.

Quality

All valves comply to ASME B16.34. Socketweld valves are typically standard; however Buttweld options are per ANSI B16.25. Other standards and codes may be applicable based on valve design and application requirements.

A 105 Body

Working Pressures by Class, psig

| Temperature, °F | 150# | 300# | 600# | 900# | 1500# | 2500# | 4500# |
|-----------------|------|------|-------|-------|-------|-------|--------|
| -20 to 100 | 285 | 740 | 1,480 | 2,220 | 3,705 | 6,170 | 11,110 |
| 200 | 260 | 680 | 1,360 | 2,035 | 3,395 | 5,655 | 10,185 |
| 300 | 230 | 655 | 1,310 | 1,965 | 3,270 | 5,450 | 9,815 |
| 400 | 200 | 635 | 1,265 | 1,900 | 3,170 | 5,280 | 9,505 |
| 500 | 170 | 605 | 1,205 | 1,810 | 3,015 | 5,025 | 9,040 |
| 600 | 140 | 570 | 1,135 | 1,705 | 2,840 | 4,730 | 8,515 |
| 650 | 125 | 550 | 1,100 | 1,650 | 2,745 | 4,575 | 8,240 |
| 700 | 110 | 530 | 1,060 | 1,590 | 2,665 | 4,425 | 7,960 |
| 750 | 95 | 505 | 1,015 | 1,520 | 2,535 | 4,230 | 7,610 |
| 800 | 80 | 410 | 825 | 1,235 | 2,055 | 3,430 | 6,170 |

Standard Class Temperature and Pressure Ratings per ASME/ANSI B16.34 for Weld-End forged Materials

Note: A105 is not recommended for prolonged use above 800 °F.

F22 is not recommended for prolonged use over 1100 °F.

A182 Gr F 22 Class 3 Body

Working Pressures by Class, psig

| Temperature, °F | 150# | 300# | 600# | 900# | 1500# | 2500# | 4500# |
|-----------------|------|------|-------|-------|-------|-------|--------|
| -20 to 100 | 290 | 750 | 1,500 | 2,250 | 3,750 | 6,250 | 11,250 |
| 200 | 260 | 750 | 1,500 | 2,250 | 3,750 | 6,250 | 11,250 |
| 300 | 230 | 730 | 1,455 | 2,185 | 3,640 | 6,070 | 10,925 |
| 400 | 200 | 705 | 1,410 | 2,115 | 3,530 | 5,880 | 10,585 |
| 500 | 170 | 665 | 1,330 | 1,995 | 3,325 | 5,540 | 9,965 |
| 600 | 140 | 605 | 1,210 | 1,815 | 3,025 | 5,040 | 9,070 |
| 650 | 125 | 590 | 1,175 | 1,765 | 2,940 | 4,905 | 8,825 |
| 700 | 110 | 570 | 1,135 | 1,705 | 2,840 | 4,730 | 8,515 |
| 750 | 95 | 530 | 1,065 | 1,595 | 2,660 | 4,430 | 7,970 |
| 800 | 80 | 510 | 1,015 | 1,525 | 2,540 | 4,230 | 7,610 |
| 850 | 65 | 485 | 975 | 1,460 | 2,435 | 4,060 | 7,305 |
| 900 | 50 | 450 | 900 | 1,350 | 2,245 | 3,745 | 6,740 |
| 950 | 35 | 385 | 755 | 1,160 | 1,930 | 3,220 | 5,795 |
| 1000 | 20 | 265 | 535 | 800 | 1,335 | 2,230 | 4,010 |
| 1050 | 20 | 175 | 350 | 525 | 875 | 1,455 | 2,625 |
| 1100 | 20 | 110 | 220 | 330 | 550 | 915 | 1,645 |

A182 Gr F 91 Body

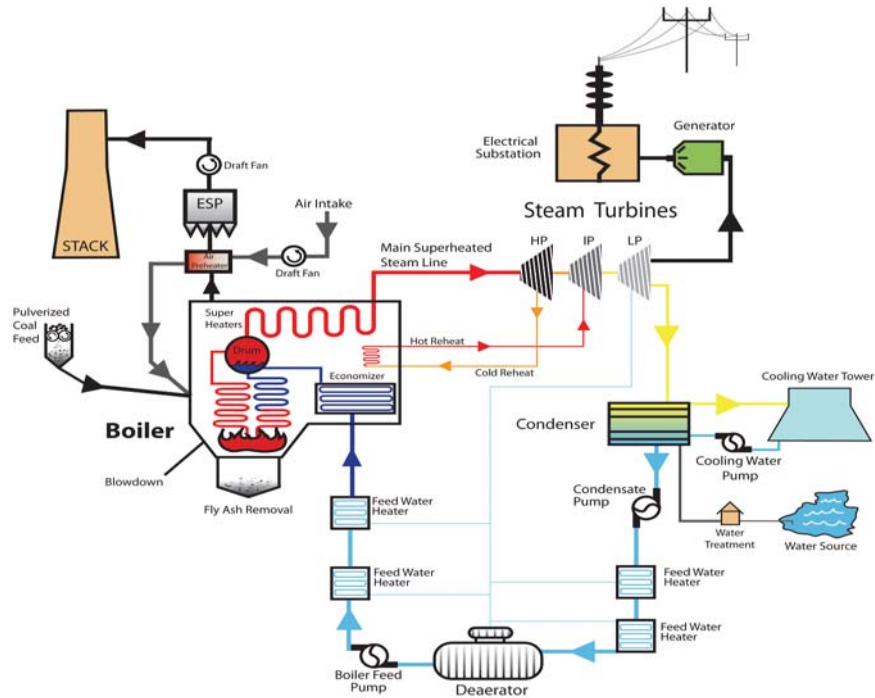
Working Pressures by Class, psig

| Temperature, °F | 150# | 300# | 600# | 900# | 1500# | 2500# | 4500# |
|-----------------|------|------|-------|-------|-------|-------|--------|
| -20 to 100 | 290 | 750 | 1,500 | 2,250 | 3,750 | 6,250 | 11,250 |
| 200 | 260 | 750 | 1,500 | 2,250 | 3,750 | 6,250 | 11,250 |
| 300 | 230 | 730 | 1,455 | 2,185 | 3,640 | 6,070 | 10,925 |
| 400 | 200 | 705 | 1,410 | 2,115 | 3,530 | 5,880 | 10,585 |
| 500 | 170 | 665 | 1,330 | 1,995 | 3,325 | 5,540 | 9,965 |
| 600 | 140 | 605 | 1,210 | 1,815 | 3,025 | 5,040 | 9,070 |
| 650 | 125 | 590 | 1,175 | 1,765 | 2,940 | 4,905 | 8,825 |
| 700 | 110 | 570 | 1,135 | 1,705 | 2,840 | 4,730 | 8,515 |
| 750 | 95 | 530 | 1,065 | 1,595 | 2,660 | 4,430 | 7,970 |
| 800 | 80 | 510 | 1,015 | 1,525 | 2,540 | 4,230 | 7,610 |
| 850 | 65 | 485 | 975 | 1,460 | 2,435 | 4,060 | 7,305 |
| 900 | 50 | 450 | 900 | 1,350 | 2,245 | 3,745 | 6,740 |
| 950 | 35 | 385 | 775 | 1,160 | 1,930 | 3,220 | 5,795 |
| 1000 | 20 | 365 | 725 | 1,090 | 1,820 | 3,030 | 5,450 |
| 1050 | 20 | 360 | 720 | 1,080 | 1,800 | 3,000 | 5,400 |
| 1100 | 20 | 300 | 605 | 905 | 1,510 | 2,515 | 4,525 |
| 1150 | 20 | 225 | 445 | 670 | 1,115 | 1,855 | 3,345 |
| 1200 | 20 | 145 | 290 | 430 | 720 | 1,200 | 2,160 |

Fossil Fueled Power Plant

How it Works

The largest majority of the world's power plants are fossil fuel design with coal as the primary feed. Other fossil feeds utilize natural gas and petroleum oil products. The coal is crushed, mixed with air and fed into a boiler where it ignites immediately. Treated water is heated and pumped through the system to the boiler, where it turns into super heated steam. The high pressure steam leaves the boiler and is routed through steam turbines that are connected to a generator. The generator creates the electric current and sends it to the sub-station. The exhaust from the boiler is vented through an ESP where the majority of the fly ash is removed. The remaining exhaust gases then go to the stack. These units are categorized as Sub-Critical, Super-Critical or Ultra-Critical, depending upon operating conditions.



Why use EVS Severe Service Metal Seated Ball Valves

EVS offers experience you can trust. Our team has over 80 years combined expertise in metal seated technology, offering you access to the latest technologically advanced products available. We know the Power market and appreciate your need to operate as efficiently as possible. Our goal is to decrease your down-time caused by valve failures. We win when you win!

Where to use EVS Severe Service Metal Seated Ball Valves

Listed are some typical EVS severe service ball valve applications in Power Plants. Service media includes high temperatures, high pressures, steam, water, condensate and fly ash that can be corrosive and erosive. Actual valve sizes are dependent upon individual plant size; however this table can be used as a basic guideline.

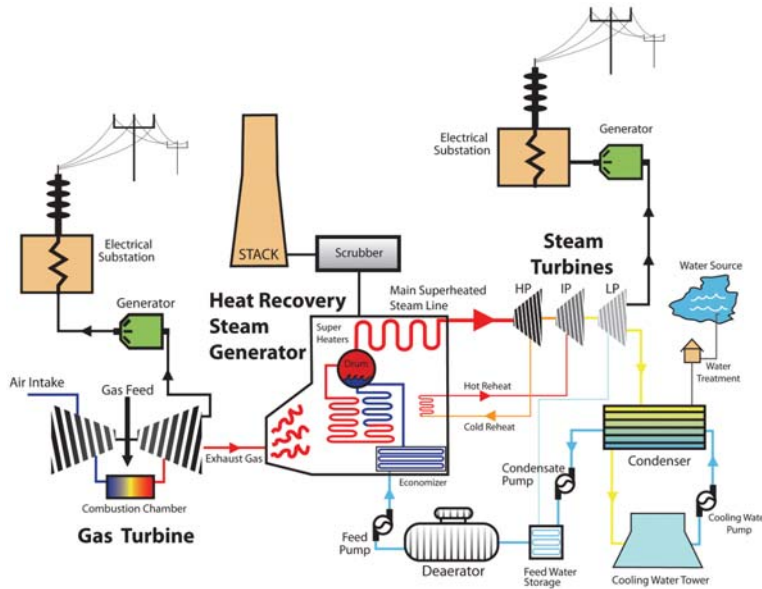
| Model | Valve Size & Class | Body Materials/Coatings | Applications |
|-------|--------------------------------|-----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FHP | 1/2" to 3" 1500#, 2500#, 4500# | A105, F22, F91, HVOF & Spray and Fused | Drains, Bottom Blowdown, Condensate Drain, Condenser Drain, Economizer Drain, Economizer Sampling, Gauge Glass/Instrument Isolation, Main Stream Drain and Vent, Mud Drum Drain, Preheat Drain, Reheat Drain, Steam Trap Isolation, Superheated Steam Drain, Turbine Drain, Steam Trap and Instrument Isolation and Fly Ash Handling |
| FS | 1/2" to 36" 150# to 2500# | Carbon Steel, Chrome Moly, Stainless Steel and Exotics with coating selected to meet specific application | Feedwater Heater Isolation, Main Steam Stop/Isolation, Pump Isolation, Turbine Isolation, Cooling Water and Recirculation Block, Bypass Lines, Attemperator Spray Isolation, Reheat Lines, Economizer Isolation, Soot Blower, Backwash and Fly Ash Handling |

Combined Cycle Power Plant



How it Works

A combined cycle power plant offers several advantages over a traditional coal powered fossil fueled plant. In a combined cycle plant, a gas turbine is added to generate power in addition to a steam turbine, thus creating two “combined” power sources. Another advantage is that the high pressure, high temperature gas turbine exhaust is captured and routed to a waste heat boiler to create the superheated steam for the steam turbine. The inherent design of this system improves overall plant efficiency, but more importantly reduces fugitive emissions. The typical feed for the gas turbine is natural gas, so the feed cost for a combined cycle is more expensive than a coal fed fossil unit. Temperature and pressures will vary based on specific design.



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| Model | Valve Size & Class | Body Materials/Coatings | Applications |
|-------|--------------------------------|-----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FHP | 1/2" to 3" 1500#, 2500#, 4500# | A105, F22, F91, HVOF & Spray and Fused | Drains, Bottom Blowdown, Condensate Drain, Condenser Drain, Economizer Drain, Economizer Sampling, Gauge Glass/Instrument Isolation, Main Stream Drain and Vent, Mud Drum Drain, Preheat Drain, Reheat Drain, Steam Trap Isolation, Superheated Steam Drain, Turbine Drain, Steam Trap and Instrument Isolation |
| FS | 1/2" to 36" 150# to 2500# | Carbon Steel, Chrome Moly, Stainless Steel and Exotics with coating selected to meet specific application | Feedwater Heater Isolation, Main Steam Stop/Isolation, Pump Isolation, Turbine Isolation, Cooling Water and Recirculation Block, Bypass Lines, Attenuator Spray Isolation, Reheat Lines, Economizer Isolation, Soot Blower, Backwash |

Introduction to EVS

As part of a growing International Valve Group, EVS brings forth a new era in Metal Seated Ball Valve technology. Evolving from a proven team with over 80 years combined expertise, EVS understands your Severe Service application challenges, and appreciates your need to increase efficiency and production.



The Engineering and Technology Department is directed by Marvin Beasley, P.E., a pioneer in the development of Severe Service valve technology and a respected expert in this field. Along with his experienced colleagues, this team is ready to work with you to address your harshest Severe Service application needs.

EVS Valves are manufactured in its large, state of the art manufacturing, automation, repair and service facility located in Stafford, Texas, USA. Our management team is committed to provide our customer's with a first class, top quality "One Stop" valve and automation center.



Metal seated ball valves have proven to be the valves of choice in Severe Service applications where critical shut-off or isolation of flow must be achieved due to safety, environmental or maintenance concerns. With the demand for energy increasing globally and investment in production capacities increasing, new challenges are being faced by users world-wide. We at EVS are fully prepared to meet the challenges of serving our customers.

EVS business strategy is based on trust and respect, ensuring our customer's needs always come ahead of commercial issues.

EVS evolves from deep Virgo roots

EVS is a wholly-owned subsidiary of the Virgo Engineers Group, a globally successful valve and automation company servicing over 70 countries world-wide. Virgo Engineers is one of the fastest growing valve companies in the world. Virgo product designs are the result of decades of experience and innovation in the Oil & Gas process industry. Our designs are proven performers in the most severe environments. Virgo brand signifies quality and reliability. To learn more about Virgo please visit the website at www.virgoengineers.com



EVS Mission Statement

We at EVS will strive to understand difficult flow isolation or control applications faced by our customers and will work with them to provide a reliable valve solution using sound engineering practices and our extensive industry experience. EVS team members will attain customer satisfaction without compromising good business ethics and our core values.

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