VALVE SOLUTIONS

FET | Accuseal®

ACCUSEAL®

HYDROCARBON PROCESSING VALVES

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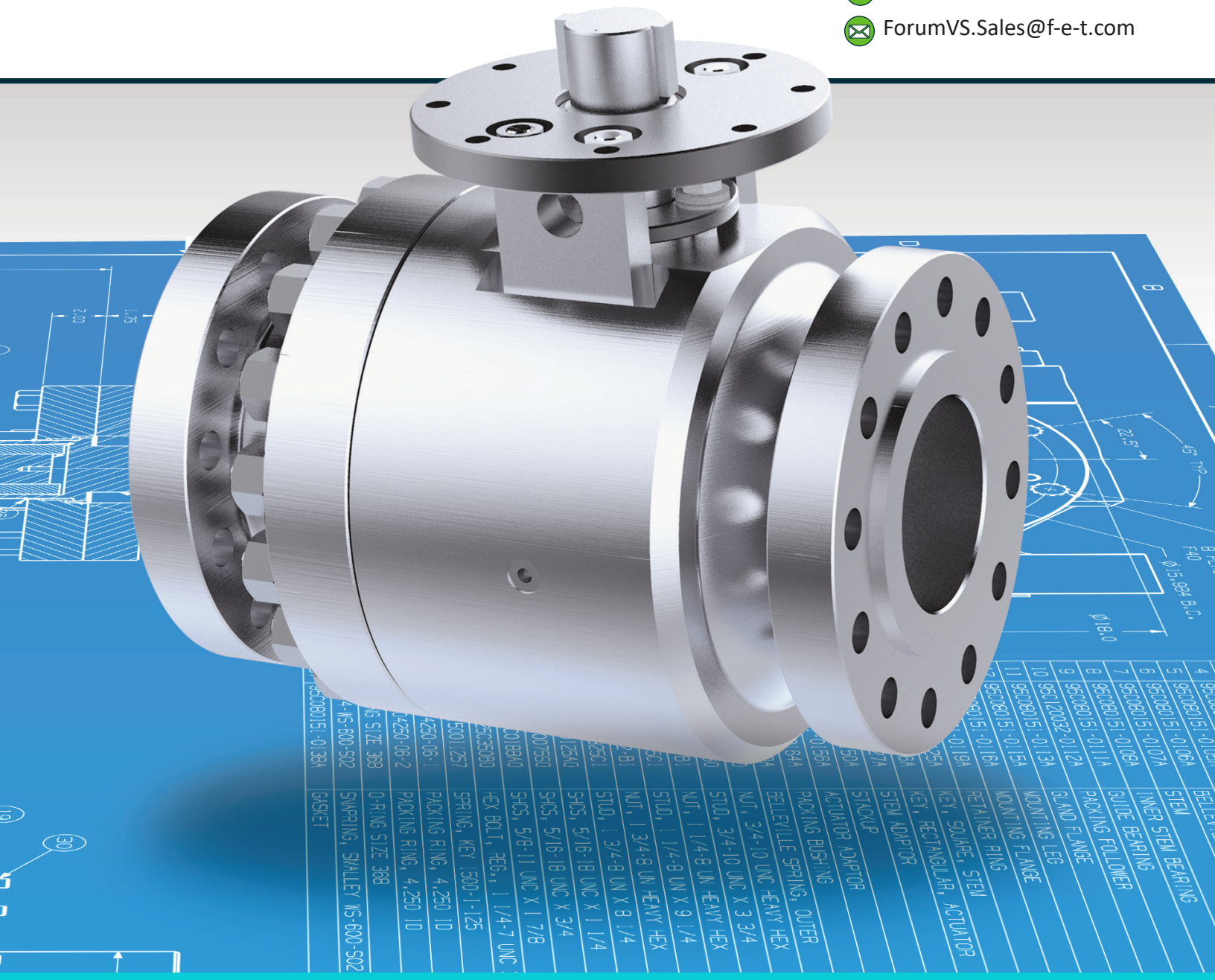
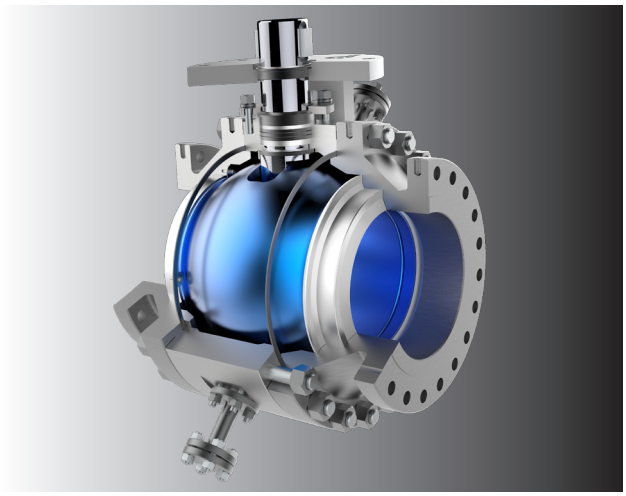
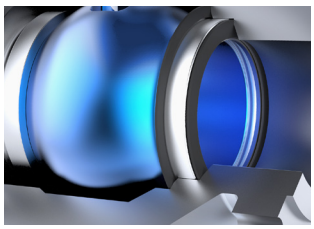


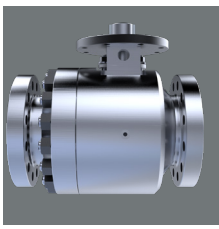
EXPERIENCE, DEDICATION AND VISION

Forum Energy Technologies (FET) is a global provider of manufactured technologies and applied products and services. FET brings together some of the most well-known brands in our industry with an extensive range of mission critical products and services. We offer innovative solutions to customers around the world. Forum is well positioned to supply our clients with the equipment and related services that improve safety and performance, and lower operating costs.

Forum's products and services range from the underground reservoir to the refinery, from the sea floor to the above ground transportation line, to power plants, mines, and heavy industry. We take pride in our comprehensive offering of solutions to maximize operations and improve end results. We partner with our customers to solve challenges.







HYDROCARBON PROCESSING

FORUM provides a broad range of isolation valves, to meet most applications from basic manual operated to fully automated systems. As the industry continues to increase technology demands, operators select FORUM to obtain best-in-class service, performance and value. We are ISO-9001 certified, thus assuring design and manufacturing of the highest quality products available in the market.

Why Accuseal MSBV's?

Our Products & Services

Refinery Overview

Accuseal CSV

Accuseal CSV Overview

Accuseal CR2 Overview

WHY ACCUSEAL MSBVS?

Why Make Accuseal Your Severe Service Metal-Seated Ball Valve Of Choice?

Demands on hydrocarbon processing plants are unprecedented. In refineries, chemical plants, and specialty chemical plants, virtually every unit is required to perform under higher demands at higher temperatures and higher pressures. Mechanical equipment, including valves, must meet the frequent challenges relating to cycling and thermal transience. Reliable, repeatable isolation has never been more critical.

There Is A Difference!

Many claim to be the best. All have a ball, seat and stem. But which valve most consistently provides tight shutoff under the most challenging of conditions?

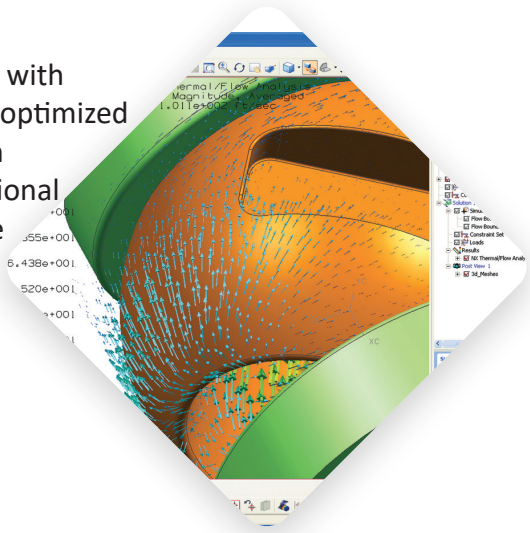
You choose severe service valves with care because the consequences of failure are severe. Accuseal Valves provides many advantages in power generation applications.

Accuseal Valves Deliver Predictable Reliability And Performance

- **Optimized Ball Valve Design and Engineering Software.**
  Proprietary software fast tracks optimal valve engineering.
- **Superior Valve Coatings.**
  Accuseal's state-of-the-art HP-HVOF (high pressure - high velocity oxygen fuel) coatings provide maximum protection for longer valve life.
- **Omni-Lap 360°™**
  The proprietary Accuseal mate-lapping process laps the entire spherical surface of the ball and seat surface, not just the sealing band areas.
- **Vacuum Seal Test**
  Accuseal ball and seat sealing is tested prior to valve assembly, ensuring seal integrity.

Optimized Ball Valve Design And Engineering Software

Extensive severe service ball valve engineering experience is combined with proprietary valve optimization CAD/CAM/CAE software and fast-tracks optimized valve design. Service conditions are simulated, providing feedback with engineering analysis, FEA (Finite Element Analysis) and CFD (Computational Fluid Dynamics). Beginning to end, the most current Product Life-Cycle Management (PLM) software is used.



Computational Fluid Dynamics
Fast-tracks optimized designs

Advantages Include:

- Optimized ball/seat sealing engagement
- Line of sight bore for totally unobstructed media flow
- Optimized ball/stem tang interface
- Thermally stabilized seat geometry allows for rapid sealing

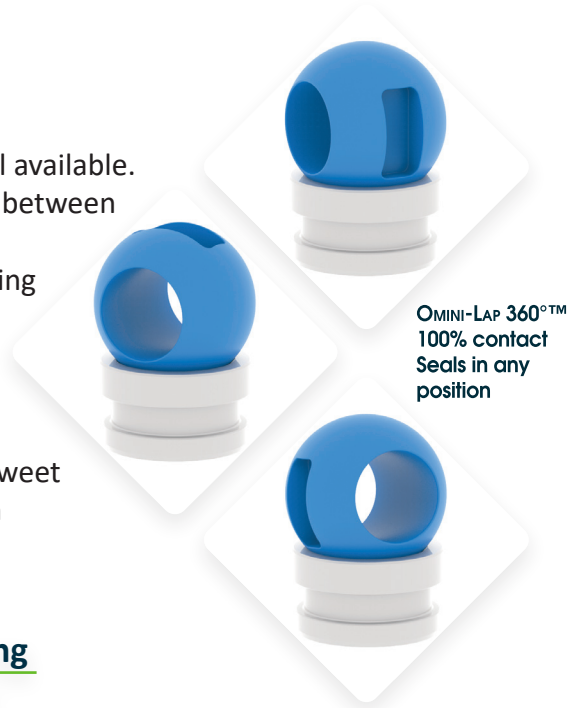
Superior Valve Coatings

Not all HVOF coatings are equal.

- Accuseal's HVOF coating formulas are the most consistent and least porous available, matched to the ball/seat material. State of the art technology applies the coating at the highest velocity for greatest density coverage, superior bond strength and surface hardness. Ongoing research ensures the most reliable coating is matched to service conditions.
- Accuseal's Fused carbide coating are thermally stabilized to handle high cycle and high thermal cycle applications.
- Superior coating performance under thermal stress and media bombardment.
- Longer valve life with smooth surface integrity.
- No place for leak paths to develop.
- Reduced torque values to operate the valve.

Omni-Lap 360°™

Proprietary mate-lapping produces the tightest, most reliable seal available. All metal seated ball valves rely on continuous, unbroken contact between the metal ball and seat to create an isolating seal. Omni-Lap 360° mate-laps the entire ball and seat for optimal roundness, producing 100% ball to seat contact, regardless of positioning.



Omni-Lap 360°™ 100% contact Seals in any position

Traditional cup-lapping methods mate only the sealing band of the ball to seat surfaces creating ridges that distort the ball's roundness and compromise the coating thickness. The sealing "sweet spot" originates a leak path if even slightly misaligned resulting in reduced valve life, more maintenance and higher actuation costs.

Omni-Lap 360°

- Automated lapping of the entire spherical surface
- Consistent 100% roundness
- Uniform coating thickness
- Seals in any position
- 100% ball to seat contact
- Smooth surfaces reduce friction for lower torques

Traditional Lapping

- Laps only a sealing band
- Distorts roundness
- Compromises coating thickness
- Creates ridges around "sweet spot"
- Surface irregularities cause higher torques

Traditional mate-lapping selectively laps the seat to only one side of the ball, resulting in imperfect spherical geometry and non-uniform coating thickness.

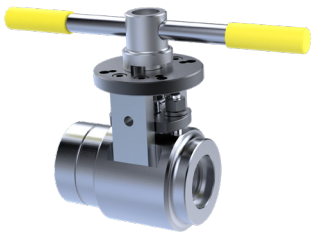
Vacuum Seal Testing

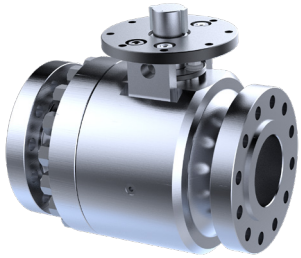
Accuseal Valves vacuum testing of every ball and seat prior to assembly verifies 100% ball-to-seat seal to Class VI shut-off.

- Seal reliability is ensured
- Greater manufacturing efficiency means lower cost
- Easier valve assembly — in the factory and in the field

OUR PRODUCTS & SERVICES

Valve Type	Shape Process	Size	Pressure Class	End Connections	Materials
Accuseal Steam Power Valve (SPV)	Forged	0.50” - 2.50”	150# - 4500# LTD	SW, BW, Hub	Accuseal also available in F91, A105, and F22.
Accuseal Critical Service Valve (CSV)	Forged	0.50” - 36.0”	150# - 1500#	SW, BW, RFF, RTJ, Hub	





Testing

- Radiography Testing
- Dye Penetrant Testing
- Ferrite Content Testing
- Hardness Testing
- Corrosion Evaluation Testing
- Chlorine Cleaning
- Oxygen Cleaning
- Phosgene Cleaning

Accuseal Features

- Largest Offering of Nickel Alloy Materials
- Wide Range of Severe Service Applications
- Material Test Reports
- Traceability / Serial Numbers
- RFID Enabled with IDS TraceIt+
- API-591 Tested
- API-598 Tested
- Major End-User Approvals
- Extensive Engineering Capabilities
- Excellent Customer Service
- Extended Warranty Program
- Quick Deliveries & Stock
- Recognized Highest Industry Quality
- Extensive NDE Availability
- Tested for Low Fugitive Emissions
- International Organization for Standardization (ISO 9001)

Valve Automation

- Electric, Hydraulic, and Pneumatic Automation
- Multi-turn, Quarter-turn, and Linear
- New Applications

Valve Modification

- By Passes
- Bore Changes
- Mounting Brackets
- Stem Extensions
- Limit Switches
- Trim Changes and More!

REFINERY OVERVIEW

Distillation Unit

The purpose of atmospheric distillation is primary separation of various “cuts” of hydrocarbons. The heaviest hydrocarbon residue taken out from partial reboiler is sent to the vacuum distillation column for further separation under reduced pressure. The different cuts of hydrocarbons taken out at this stage are the result of primary separation and undergo further processing before being transformed to end products.

Coker Unit

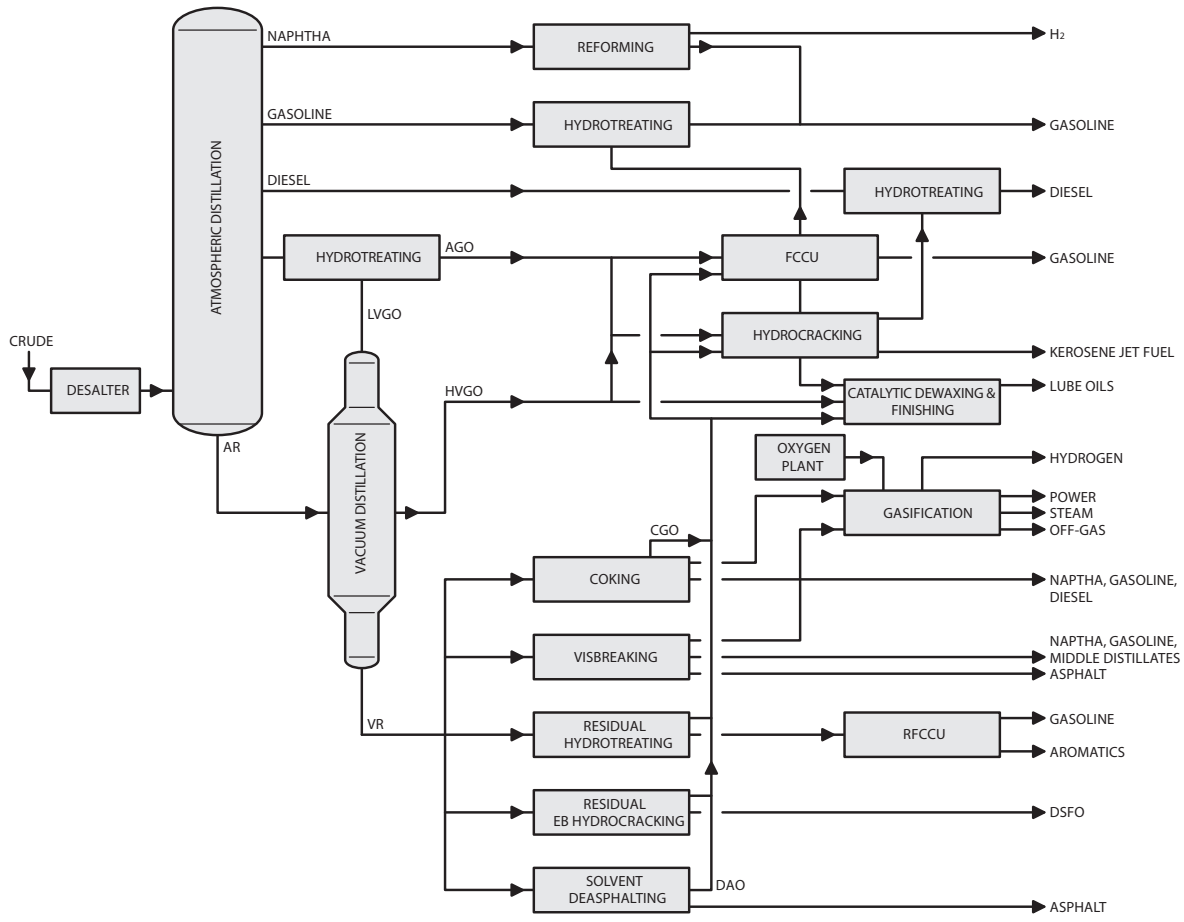
Processes vacuum residuals, which is heated to over 900° F and put into the coke drums, where it undergoes thermal cracking as the oil decomposes under the extreme heat.

Reformer Unit

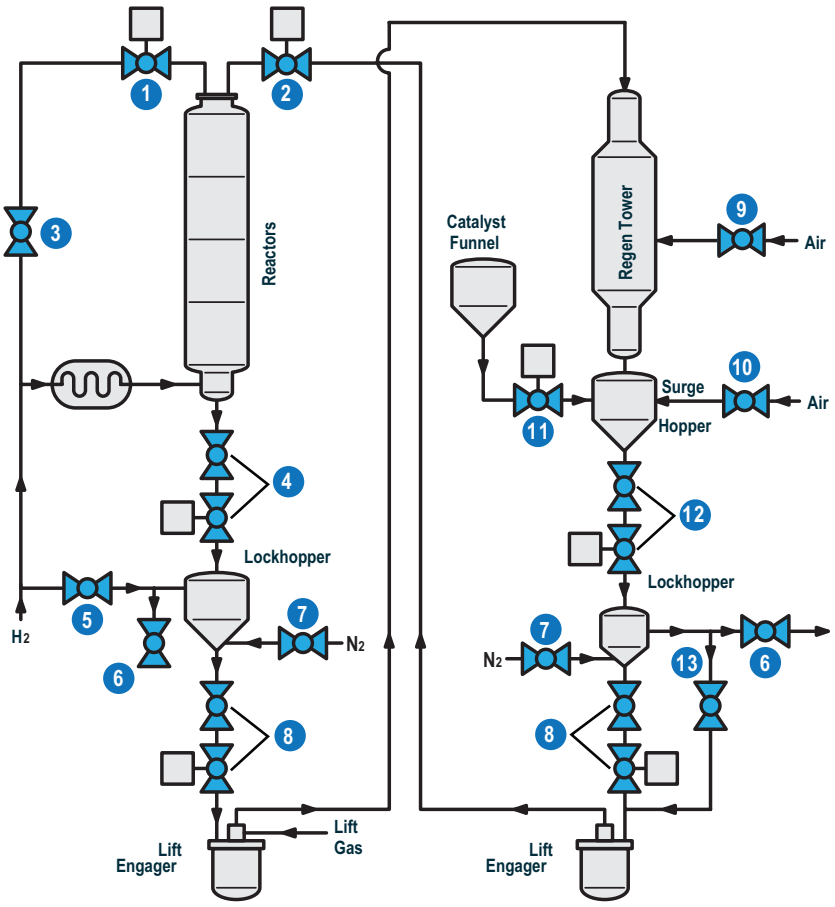
Using heat, catalyst and moderate pressure, the reformer changes the molecular structure of crude and coker naphthas to produce a high octane primary gasoline blend stock called reformate.

Alkylation Unit

Uses acid catalyst to combine small molecules into larger ones collectively called alkylate, which has high octane and is the cleanest burning of the gasoline blendstocks.



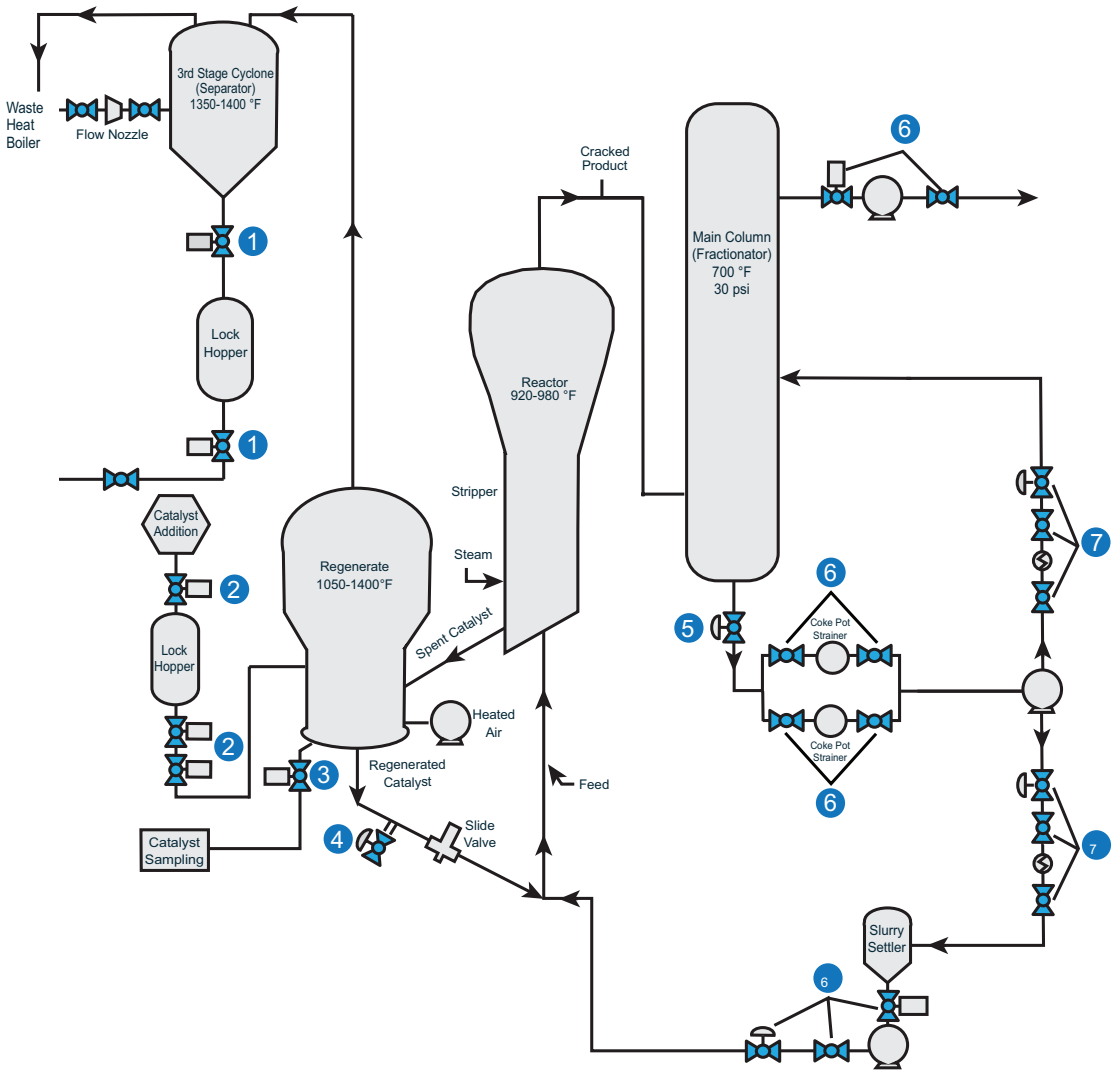
CONTINUOUS CATALYTIC REFORMER



Valve Specification

Number	Valve Description	Temperature	Pressure	Pipe Size
1	Reactor Overhead Purge	400 - 1000 °F	300 - 800 psi	1 - 8 inches
2	Reactor Overhead Regeneration	400 - 1000 °F	300 - 800 psi	1 - 8 inches
3	Standby Reduction Zone Purge	400 - 1000 °F	300 - 800 psi	1 - 8 inches
4	Reactor Bottoms Unloading Valve	400 - 1000 °F	300 - 800 psi	1 - 8 inches
5	Hydrogen Loading to Lockhopper	400 - 700 °F	300 - 700 psi	1 - 8 inches
6	Hydrogen Vent for Lockhopper	400 - 700 °F	300 - 700 psi	1 - 8 inches
7	Nitrogen Purge for Lockhopper	400 - 700 °F	300 - 700 psi	1 - 8 inches
8	Catalyst to Lift Engager	400 - 700 °F	300 - 700 psi	1 - 8 inches
9	Air Valve to Regeneration Cooler	400 - 700 °F	300 - 700 psi	6 inches
10	Air Valve to Surge Hopper	400 - 700 °F	300 - 700 psi	6 inches
11	Fresh Catalyst Addition	200 - 300 °F	300 - 500 psi	2 - 8 inches
12	Regen Catalyst Unloading from Surge Hopper	400 - 700 °F	300 - 700 psi	6 inches
13	Pressure Balancing for Lockhopper / Lift Engager	400 - 700 °F	300 - 700 psi	6 inches

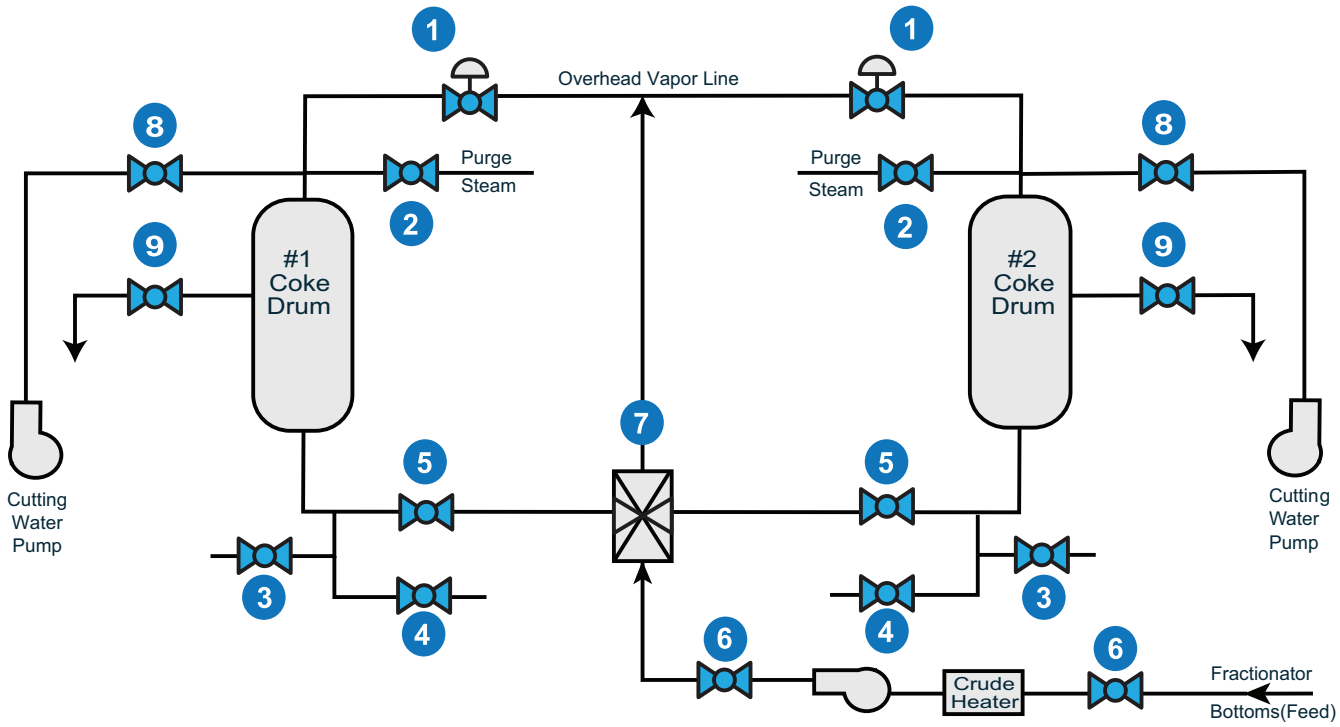
FLUIDIZED CATALYTIC CRACKING



Valve Specification

Number	Valve Description	Temperature	Pressure	Pipe Size
1	Catalyst Block	500 - 1400 °F	35 psi	6 - 8 inches
2	Catalyst Addition	500 - 1400 °F	35 psi	2 - 4 inches
3	Catalyst Withdrawal	800 - 1400 °F	35 psi	4 - 8 inches
4	Catalyst Sampling	800 - 1400 °F	20 psi	2 - 3 inches
5	Emergency Shut Down	500 - 850 °F	30 psi	10 - 14 inches
6	Pump/Strainer Isolation	500 - 850 °F	30 psi	8 - 14 inches
7	Catalyst Slurry	500 - 850 °F	35 psi	6 - 8 inches

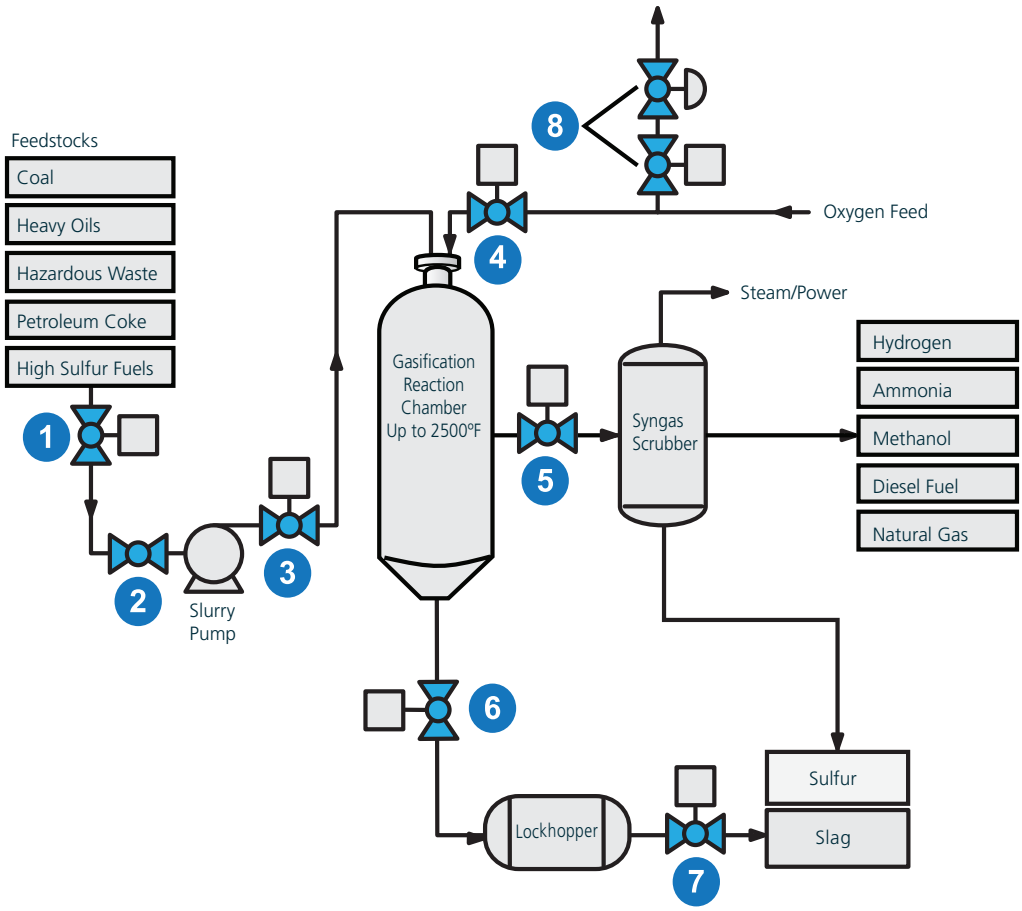
DELAYED COKING



Valve Specification

Number	Valve Description	Temperature	Pressure	Pipe Size
1	Overhead Vapor	400 - 950 °F	50 - 100 psi	6 - 8 inches
2	Steam Blowdown Control	400 - 950 °F	50 - 100 psi	2 - 4 inches
3	Steam Warm-up	400 - 750 °F	50 - 200 psi	4 - 8 inches
4	Quench Water	400 - 950 °F	50 - 200 psi	2 - 3 inches
5	Inlet Feed	400 - 950 °F	50 - 100 psi	10 -14 inches
6	Furnace Isolation	400 - 950 °F	50 - 100 psi	8 -14 inches
7	Switching	400 - 950 °F	50 - 100 psi	6 - 8 inches
8	Cutting Water	Ambient	2000 psi	2 - 6 inches

GASIFICATION



Valve Specification

Number	Valve Description	Temperature	Pressure	Pipe Size
1	Slurry Tank EBU	500 - 900 °F	100 - 200 psi	6 - 10 inches
2	Feed Slurry Pump Isolation	100 - 300 °F	100 - 200 psi	6 - 10 inches
3	Gasifier Isolation	100 - 300 °F	900 - 1200 psi	6 - 10 inches
4	Oxygen Feed Isolation	100 - 200 °F	900 - 1200 psi	4 - 8 inches
5	Course Slag Lockhopper Isolation	150 - 650 °F	900 - 1200 psi	6 - 12 inches
6	Lockhopper Drum Inlet	400 - 600 °F	900 - 1200 psi	12 - 24 inches
7	Lockhopper Drum Outlet	400 - 600 °F	900 - 1200 psi	12 - 24 inches
8	Pressure Relief Valve	100 - 200 °F	900 - 1200 psi	4 - 8 inches

ACCUSEAL CSV

1. Body / End Connection
- Machined from forgings for highest material integrity
- End Connections: RFF- raised face flange - Standard
- Options available on request: BW-Butt Weld, SW-Socket Weld, RTJ, Hub Connectors, Threaded, Lens Joint, Wafer, etc
- Weld overlay of wetted surfaces to protect from corrosion and erosion - available upon request

2 & 3. Ball + Seats = the sealing assembly
- Omni-Lap 360° optimizes the matched roundness of the ball and seat for 100% seal, regardless of positioning. The wide sealing surface provides a low stress metal to metal seal. The seal is consistently reliable
- Corrosion resistant materials with matched rates of thermal expansion are used on the sealing components to maintain seal integrity and reliability
- Coatings are robotically applied with HP-HVOF (high velocity oxygen fueled) or Spray and Fuse processes for uniform surface thickness, coating density and maximum metallurgical bond to withstand extreme service conditions
- Self-cleaning - the seats remove all debris from the ball with every on/off cycle, extending valve life
- Field repair is simpler and faster, when required. The ball and seat assembly is vacuum seal verified at the factory and easily replaced on site

4. Dual Belleville Springs
- Provides resilient loading of ball to seat
- Provides effective particulate exclusion

5. Stem
- Surface modification eliminates galling with rotation
- Blow-out proof per ASME B16.34

6. Inner Stem Seal
- Provides primary metal-to-metal stem seal

7. Packing Bushing
- Prevents stem packing intrusion into body
- Works with stem bearing to prevent lateral stem motion

8. Packing Rings
- Reinforced graphite

9. Anti-extrusion Rings
- Prevents packing extrusion

10. Packing Follower
- Thermally matched to stem material
- Prevents galling and contains upper packing

11. Articulating Gland Flange
- Spherically engages the packing follower to prevent stem binding and galling during adjustments.

12. Belleville Springs
- Live load on the bolted joint eliminates routine gland adjustments.
- Reduces maintenance.

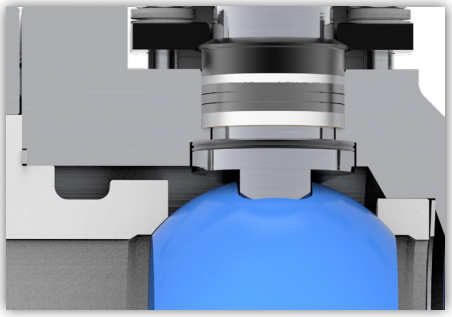
13. Stem Retaining Ring
- Prevents stem misalignment during actuator installation.
- Stem cannot be forced into ball stem slot.

14. Mounting Flange
- Precision machined to ISO 5211.
- External mounting flange provides rigid mounting for ease of adjustment.
- Direct mounting option reduces hysteresis and stem deflection.

15. Body Gasket
Spiral Wound Gaskets
- Grafoil filled
- 500 pressure class and below

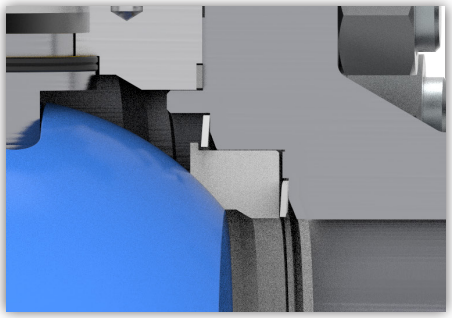
Engineered Body Seal
- 2500 pressure class and above
- Gold-plated Inconel 718
- Pressure assisted seal

VARIOUS SEATING OPTIONS AVAILABLE PER APPLICATION



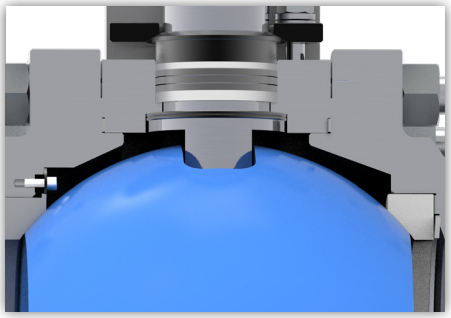
Unidirectional flow

- Flanged seat design
- Sharp leading edges of the seat scrape the ball clean each time the valve is opened
- Fully field service-able.
- Vacuum tested to Class VI shutoff.



Dual Spring

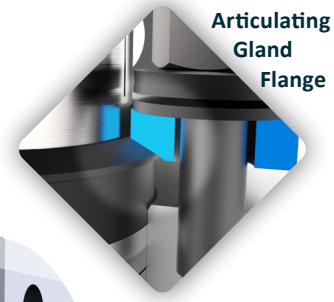
- Upstream Seat Landing is mate lapped to upstream landing for bi-directional seat.
- Line contact at the O.D. and I.D. provides a particulate barrier protecting the landing.

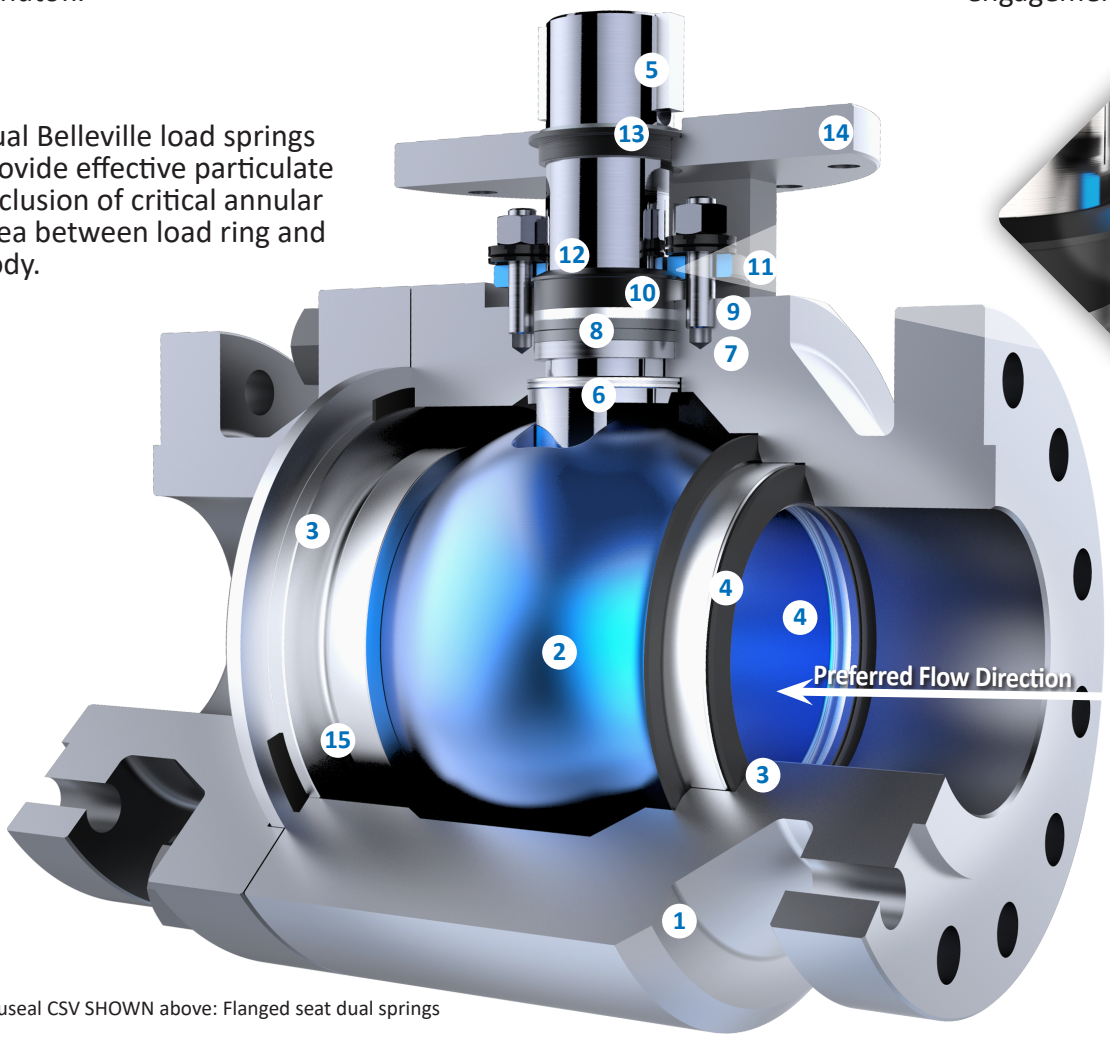


Bidirectional

- Locked-in downstream seat.
- Fully bidirectional - completely independent of flow direction.
- Redundant isolating seats - both upstream and downstream seat are in continuous sealing engagement with ball.

Dual Belleville load springs provide effective particulate exclusion of critical annular area between load ring and body.





Accuseal CSV SHOWN above: Flanged seat dual springs

ACCUSEAL CSV

Applications

- Critical isolation of Slurry, Liquids, Solids, and Gases
- Custom designs to solve problematic applications.
  Any application with service conditions too hot and/or abrasive/erosive for commodity valves

Bidirectional with Preferred Flow

- Size: ½”- 36”
- Full and reduced port valves
- Bore to match pipe ID - available
- ASME Pressure Class: 150 thru 4500

Materials of Construction

- A105, Stainless Steel, Exotic Alloys and other materials by request.

End Connections

- RFF Standard or to customer specifications (Butt Weld, Socket Weld, RTJ, Hub Connectors, Threaded)

Actuator Options

- Factory installation of actuator of your choice
- Mounting kits provided to mount to existing actuators

Features and Benefits

- Flow Isolation Options
  - Unidirectional - Standard
  - Bidirectional - Shuts off flow in either direction
- Positive mechanical stops prevent over-travel
- Operator - Per application requirements
- Easily automated with ISO 5211 standard mounting pads
- Self-cleaning ball and seats
- Positive positioning feature prevents misalignment during actuation.
- Stem cannot force ball out of correct position
- Field repairable with Omni-Lap 360o TM ball and seat assemblies, vacuum seal pretested at the factory

1 year warranty standard (contact FORUM - Accuseal Valves for details)

First Class Solutions to Meet Any Challenge

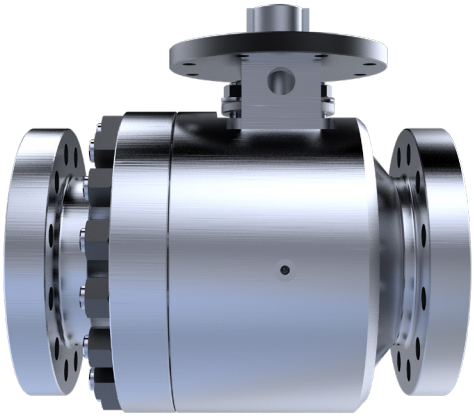
Custom Design Examples

Coker Drum Isolation

- 12” - 300# RFF - A182 F317
- 14” - 300# RFF - A182 F9

Double Block and Bleed

- 3” - 2500# GR25 : 2 Balls 1 Body - Dual Linkage

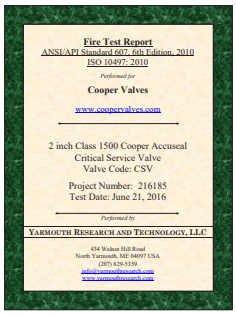


Accuseal Valves manufactures to ASME B16.34

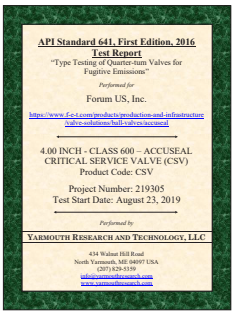
Certifications

- API-607
- API-641
- ISO 9001: 2015
- PED/CE
- CRN
- IBR
- SIL-3

API-607



API-641



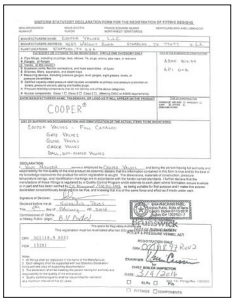
ISO 9001: 2015

Dimensions

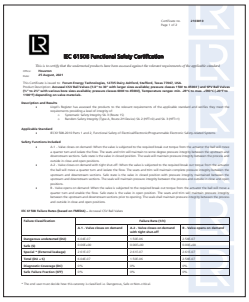
- End to End dimensions per ASME B16.10
- Bore to match pipe ID available
- Special Face-to-Face available upon request.

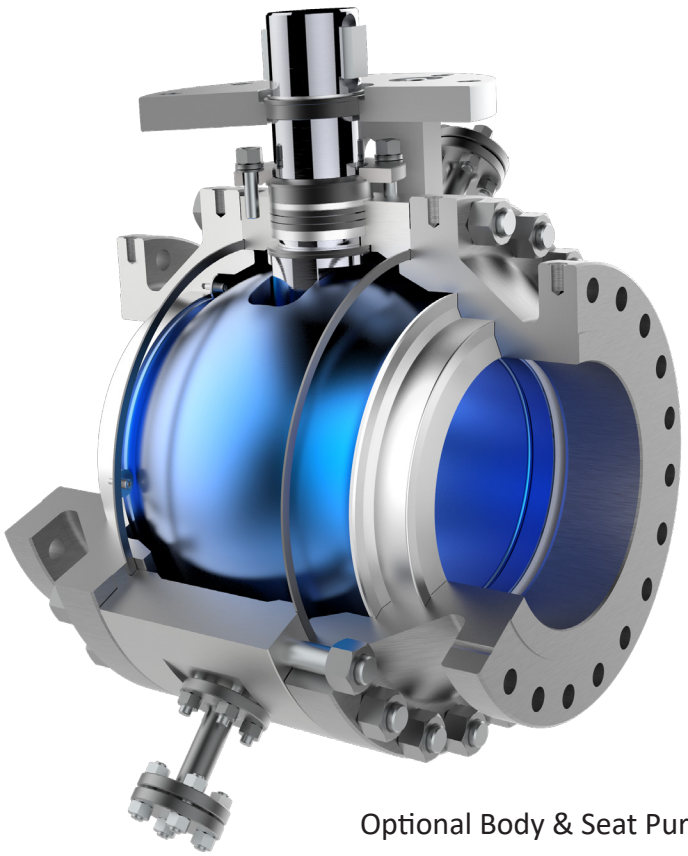
PED/CE

CRN



SIL-3





Accuseal Valves Testing Procedures

- Standard valve testing to meet or exceed MSS SP-61 and FCI 70-2 Class VI
- Exclusive vacuum testing of ball and seat to verify seal prior to valve assembly

Contact FET - Accuseal for warranty information.

Optional Body & Seat Purge Ports available upon request.

ACCUSEAL CSV

Applications

- Critical Isolation
- Custom designed to solve problem applications

Size

½" – 30" (larger sizes available)

ASME Pressure Class

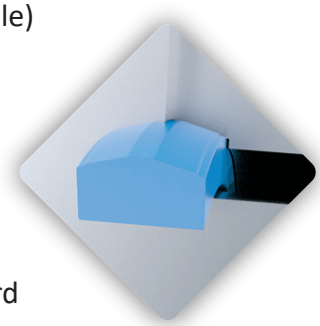
150 - 4500 Standard, limited and special classes

Sealing Options

- Uni-directional - Standard
- Bi-directional - Optional

End Connections

Per customer specifications



Engineered Body Seal 2500 pressure class and above

Features and Benefits

- Omni-Lap 360° ball and seat
- Application specific coatings
- Coating matched to ball and seat materials to withstand thermal shocks
- Articulating gland flange prevents stem binding and galling during adjustments
- External and internal guide bearings ensure proper alignment preventing lateral motion of the stem, even during side loading
- Replaceable ball and seats provide field repairability

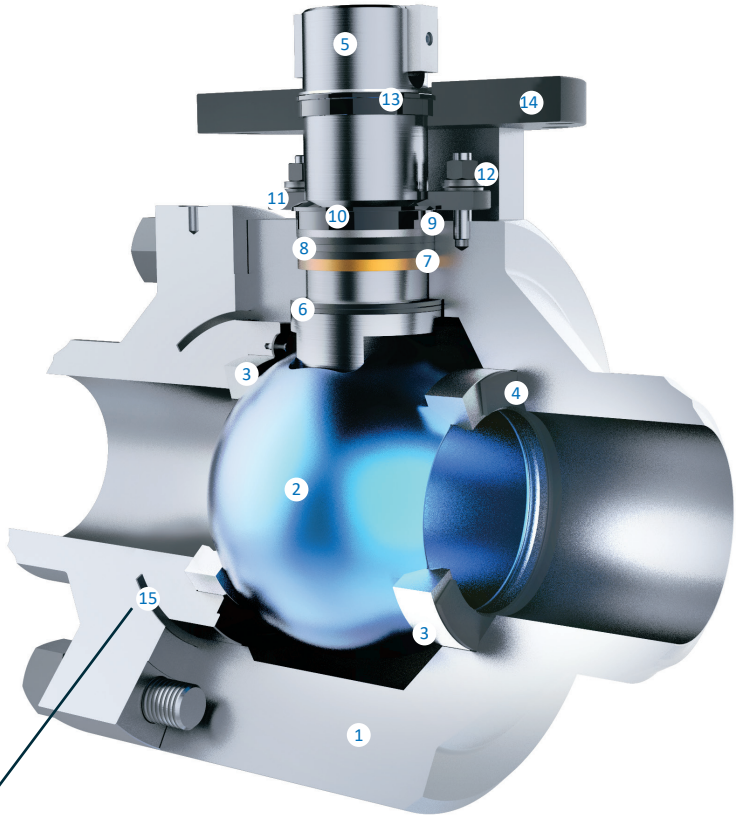
1 year warranty on standard service (contact FORUM – Accuseal for details)

Bill of Materials - Accuseal CSV

Item	Description	Material
1	Body	A105 A182 F22 Cl.3 A182 F91
2	Ball	410 SS / CC Coating Inconel 718 / Spray & Fuse
3	Seats	410 SS / CC Coating Inconel 718 / Spray & Fuse
4	Belleville Spring	Inconel 718
5	Stem	A-286 Hardfaced
6	Inner Stem Seal	410 SS / CC Coating Hardfaced
7	Packing Bushing	316 SS Hardfaced
8	Packing Rings	Grafoil
9	Anti-Extrusion Ring	Inconel® Wire Reinforced Grafoil®
10	Packing Follower	316 SS Hardfaced
11	Articulating Gland Flange	410 SS Hardfaced
12	Live Loading Belleville Springs	Stainless Steel
13	Stem Retaining Ring	Stainless Steel
14	Mounting Flange	Carbon Steel
15	Body Gasket	Spiral Wound Grafoil Filled/ Inconnel 718 Gold Plated

Special alloys & coatings available upon request

CC= Chrome Carbide coating



Buttweld ends per ASME B16.25

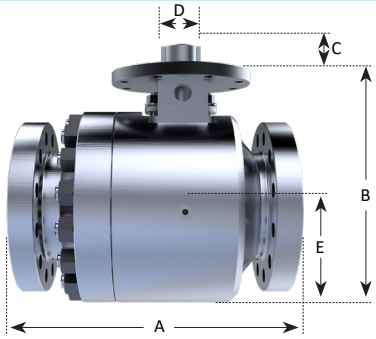
Body Gaskets

Spiral Wound Gaskets

- Grafoil® filled
- 1500 pressure class & below

Engineered Body Seal

- 2500 pressure class and above
- Gold plated Inconel® 718
- Pressure assisted seal



Accuseal® CSV – Bore

NPS (inches)	150	300	600	900	1500	2500	4500
0.5	0.55	0.55	0.55	0.55	0.55	0.55	Note 1
0.75	0.72	0.72	0.72	0.72	0.72	0.72	Note 1
1	1.06	1.06	1.06	1.06	1.06	1.06	Note 1
1.5	1.50	1.50	1.50	1.50	1.50	1.06	Note 1
2	2.00	2.00	2.00	2.00	2.00	1.50	Note 1
2.5	2.50	2.50	2.50	2.13	2.13	1.77	Note 1
3	3.00	3.00	3.00	3.00	2.62	2.30	Note 1
4	4.00	4.00	4.00	3.62	3.44	3.15	Note 1
6	6.00	6.00	6.00	5.50	5.19	4.90	Note 1
8	8.00	8.00	7.87	7.19	6.81	6.81	Note 1
10	10.00	10.00	9.75	9.06	8.50	8.50	Note 1
12	12.00	12.00	11.75	10.75	10.13	10.13	Note 1

Accuseal® CSV Cv – Full Bore

Valve Size (inches)	150	300	600	900	1500	2500	4500
0.5	25	22	21	18	18	16	Note 1
0.75	54	48	43	39	39	36	Note 1
1	144	126	110	102	102	92	Note 1
1.5	270	251	223	198	198	83	Note 1
2	549	498	429	382	382	163	Note 1
2.5	948	842	720	421	421	236	Note 1
3	1474	1250	1114	1076	682	438	Note 1
4	2932	2539	2134	1600	1283	919	Note 1
6	6393	6316	5366	4101	3281	2482	Note 1
8	12497	11931	9966	7468	6106	5508	Note 1
10	20612	19966	15889	12737	9933	8772	Note 1
12	30897	29974	24953	18475	14641	13051	Note 1

Accuseal® CSV 0.5” - 12” Dimensions

	Size (inches)	Bore	A	C	D	E	F
ASME150	0.5	0.55	4.25	4.17	1.10	0.50	1.88
	0.75	0.72	4.62	4.87	1.10	0.50	2.09
	1	1.06	5.00	5.24	1.31	0.75	2.44
	1.5	1.50	6.50	5.64	1.63	0.88	2.75
	2	2.00	7.00	5.87	1.31	0.75	3.00
	2.5	2.50	7.50	6.12	1.66	1.19	3.50
	3	3.00	8.00	5.56	1.18	0.88	3.75
	4	4.00	9.00	7.29	2.02	1.38	5.00
	6	6.00	15.50	9.92	2.59	2.25	7.00
	8	8.00	18.00	11.51	2.03	2.50	8.13
	10	10.00	21.00	13.86	2.68	2.75	10.50
	12	12.00	24.00	15.68	2.50	3.00	12.00
ASME 300	0.5	0.55	5.50	4.36	1.10	0.50	1. 88
	0.75	0.72	6.00	4.87	1.10	0.50	2.09
	1	1.06	6.50	5.24	1.31	0.75	2.44
	1.5	1.50	7.50	5.98	1.63	0.88	2.75
	2	2.00	8.50	5.97	1.66	1.06	3.25
	2.5	2.50	9.50	6.12	1.66	1.19	3.50
	3	3.00	8.00	5.56	1.18	0.88	3.75
	4	4.00	9.00	7.29	2.02	1.38	5.00
	6	6.00	15.50	9.92	2.59	2.25	7.00
	8	8.00	18.00	11.51	2.03	2.50	8.13
	10	10.00	21.00	13.86	2.68	2.75	10.50
	12	12.00	24.00	15.68	2.50	3.00	12.00
ASME 600	0.5	0.55	6.50	4.36	1.10	0.50	1.88
	0.75	0.72	7.50	5.13	1.10	0.50	2.09
	1	1.06	8.50	5.24	1.31	0.75	2.44
	1.5	1.50	9.50	5.98	1.63	0.88	2.75
	2	2.00	11.50	6.25	1.66	1.06	3.25
	2.5	2.50	13.00	6.25	1.87	1.50	3.75
	3	3.00	14.00	7.31	1.27	1.38	4.13
	4	4.00	17.00	7.83	3.00	2.06	5.75
	6	6.00	22.00	10.66	2.38	2.50	7.25
	8	7.87	26.00	13.92	2.72	3.25	8.44
	10	9.75	31.00	17.32	4.50	4.00	11.63
	12	11.75	33.00	20.40	4.00	5.00	12.75

Accuseal® CSV 0.5” - 12” Dimensions

	Size (inches)	Bore	A	C	D	E	F
ASME 900	0.5	0.55	8.50	4.17	0.50	1.10	2.25
	0.75	0.72	9.00	4.89	0.50	1.10	2.25
	1	1.06	10.00	5.62	0.75	1.31	2.94
	1.5	1.50	12.00	7.22	1.06	1.66	3.50
	2	2.00	14.50	6.38	1.19	1.66	3.50
	2.5	2.13	16.50	6.53	1.50	1.87	3.75
	3	3.00	15.00	8.32	2.50	1.50	4.25
	4	3.62	18.00	10.46	3.00	2.06	5.75
	6	5.50	24.00	11.13	2.25	3.00	7.50
	8	7.19	29.00	12.96	2.94	3.63	9.25
	10	9.06	33.00	14.56	4.50	4.50	10.75
	12	10.75	38.00	16.44	4.50	5.50	12.00
ASME 1500	0.5	0.55	8.50	4.17	0.50	1.10	2.25
	0.75	0.72	9.00	4.89	0.50	1.10	2.25
	1	1.06	10.00	5.62	0.75	1.31	2.94
	1.5	1.50	12.00	7.22	1.06	1.66	3.50
	2	2.00	14.50	6.38	1.19	1.66	3.50
	2.5	2.13	16.50	6.53	1.50	1.87	3.75
	3	2.62	18.50	9.28	2.50	1.75	4.50
	4	3.44	21.50	9.10	2.84	2.50	6.12
	6	5.19	27.75	13.04	3.00	3.38	7.75
	8	6.81	32.75	16.49	5.00	4.00	9.50
	10	8.50	39.00	17.40	4.50	5.50	11.50
	12	10.13	44.50	18.20	4.50	6.75	13.25
ASME 2500	0.5	0.55	10.38	5.25	1.10	0.50	2.50
	0.75	0.72	10.75	6.13	1.31	0.69	2.75
	1	1.06	12.12	6.67	1.63	0.88	3.00
	1.5	1.06	15.12	6.67	1.66	1.19	3.00
	2	1.50	17.75	6.49	2.63	1.75	3.50
	2.5	1.77	20.00	9.24	2.82	1.63	4.25
	3	2.30	22.75	10.42	1.81	1.75	4.50
	4	3.15	26.50	11.44	2.84	2.50	6.50
	6	4.90	36.00	13.21	6.80	3.38	8.50
	8	6.81	40.25	16.80	5.00	5.25	9.75
	10	8.50	50.00	17.66	6.50	7.50	11.75
	12	10.13	56.00	18.88	6.50	8.00	13.50

1. ASME 4500 pressure class bore / Cv varies according to application (values determined based on customer needs).
Contact FORUM – Accuseal for sizes and pressure classes not listed.

ACCUSEAL CR2

Applications

- Boiler Drains and Vents
- Turbine Drains and Vents
- Control Valve Isolation
- Equipment Isolation
- Longer lasting alternative to gate and globe valves

Size

- 1”- 3“ (various bore sizes available)

ASME Pressure Class

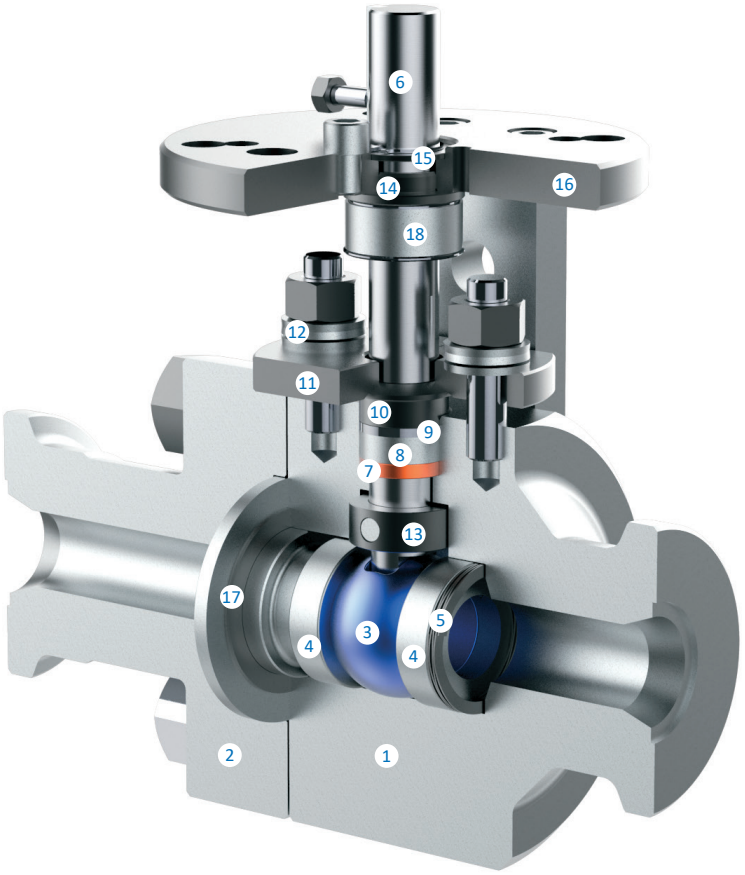
- 600 - 4500 Limited Class

Socket weld, Buttweld & Hub Connections

- Complies with the ASME Section VIII Div. 1, 2 and 3
- Boiler and Pressure Vessel codes.
- ASME Certificates of Authorization for ASME Section VIII Div. 1 (“U”), 2 (“U2”) and 3 (“U3”) are currently maintained.

Features and Benefits

- Provides reduced total cost of ownership for operator
- Hub eliminates welding and PWHT requirements after installation
- Designed for extended lifespan with easy disassembly, maintenance, and complete repairability in the field
- Omni-Lap 360° optimized roundness and matched ball and seat assemblies ensure 100% seal
- Tight shut-off to API 598/MSS SP-61
- Withstands severe thermal shocks
- Field repairable

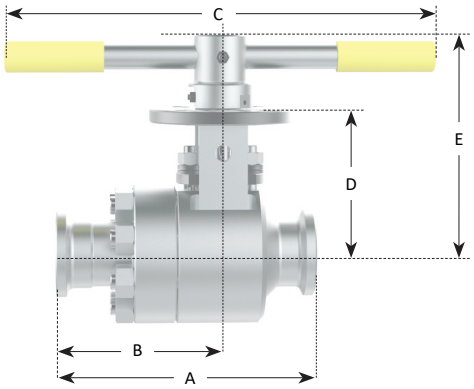


Bi-directional designs available.
Special alloys and coatings available upon request.

The Accuseal Hub-End CR2 allows repair or replacement with no welding or hot work permit. A field repair kit and 2 new hub gaskets are all that is required.

Bill of Materials - Accuseal CR2

ITEM	DESCRIPTION	MATERIAL
1	Body	A105 A182 F22 Cl.3 A182 F91
2	End Connect	A105 A182 F22 Cl.3 A182 F91
3	Ball	Inconel 718 / Spray & Fuse
4	Seat	Inconel 718 / Spray & Fuse
5	Wave Spring	A-286
6	Stem	Inconel 718 / A-286 Hardfaced
7	Packing Bushing	316 SS Hardfaced
8	Packing Rings	Grafoil®
9	Anti-Extrusion Ring	Inconel Wire Reinforced Grafoil®
10	Packing Follower	316 SS Hardfaced
11	Articulating Gland Flange	4130 Hardfaced
12	Live Loading Belleville Springs	Stainless Steel
13	Retaining Pins	Inconel 718
14	Guide Bearing	Ni-Al-Brz
15	Stem Retaining Ring	Stainless Steel
16	Mounting Flange	Carbon Steel
17	Gasket	Graphite
18	Retaining Sleeve	304 SS



Cv – ASME 600, 900, 1500 Limited Class

Bore (inches)	Pipe Size (inches) / Schedule									
	0.75 SCH 80	0.75 SCH 160	1.00 SCH 80	1.00 SCH 160	1.50 SCH 80	1.50 SCH 160	2.00 SCH 80	2.00 SCH 160	2.50 SCH 80	2.50 SCH 160
0.72	47	40	24	23	21	22	-	-	-	-
1.06	-	-	104	73	51	69	45	56	-	-
1.34	-	-	-	-	137	212	100	121	82	91
1.69	-	-	-	-	-	-	175	347	119	139

Dimension – ASME 1500, 3100, 4500 Limited Class

			A		B		C		D		E		Weight	
Model	Bore	Class	in	mm	in	mm	in	mm	in	mm	in	mm	lb	kg
Accuseal CR2072	0.72	1500	8.50	215.90	5.52	140.21	15.00	381.00	4.54	115.31	7.24	183.89	26	11.79
	0.72	3100	9.50	241.30	6.15	156.21	15.00	381.00	5.13	130.30	7.83	198.88	32	14.51
Accuseal CR2106	1.06	1500	9.00	228.60	5.71	145.03	18.00	457.20	5.56	141.22	8.56	217.42	42	19.05
	1.06	3100	11.00	279.40	6.99	177.54	18.00	457.20	5.86	148.84	8.56	217.42	62	28.12
Accuseal CR2134	1.34	1500	10.50	266.70	6.81	172.97	18.00	457.20	6.25	158.75	9.25	234.95	66	29.93
	1.34	3100	12.50	317.50	7.66	194.56	18.00	457.20	6.82	173.99	9.82	249.42	92	41.73
Accuseal CR2169	1.69	1500	11.75	298.45	7.22	183.38	-	-	7.73	196.34	-	-	107	48.53
	1.69	3100	14.00	355.60	8.70	220.98	-	-	8.40	213.36	-	-	147	66.67
Accuseal CR2066	0.66	4500	11.75	298.45	7.68	195.07	18.00	457.20	5.46	138.68	8.16	207.26	61	27.66
Accuseal CR2100	1.00	4500	13.75	349.25	8.81	223.77	18.00	457.20	6.93	176.02	9.93	252.22	115	52.16

Maximum Operating Pressure Rating vs. Temperature

	Temp (°F)	-20° to 100°	200°	300°	400°	500°	600°	650°	700°	750°	800°	850°	900°	950°	1000°	1050°	1100°
	Temp (°C)	-29° to 38°	93°	149°	204°	260°	316°	343°	371°	399°	427°	454°	482°	510°	538°	566°	593°
ASME 1500 LTD	A 105 (1)	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	-	-	-	-	-	-
	A 182 Gr. F22 Cl.3 (2)	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2411	1784	1170	732
	A 182 Gr. F91	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2500	2411	2249	2249	2014
ASME 3100 LTD	A 105 (1)	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	-	-	-	-	-	-
	A 182 Gr. F22 Cl.3 (2)	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4131	2703	1693
	A 182 Gr. F91	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4500	4495
ASME 4500 LTD	A 105 (1)	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	-	-	-	-	-	-
	A 182 Gr. F22 Cl.3 (2)	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	4063	2546
	A 182 Gr. F91	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000

(1) Not recommended for prolonged use above 800°F / 427°C (2) Not recommended for prolonged use above 1100°F / 593°C

NOTE: MAXIMUM differential pressure across valve = 6000 psig

Reduced ratings shown above are limited by material design considerations.

The valve body is designed in accordance with ASME B16.34 Limited Class pressure rating requirements for the designated pressure class.

Weld end valves are rated to ASME Limited Class.

Hub end valves are rated to ASME Standard Class.

OUR CORE VALUES

No One Gets Hurt

The safety of our employees and customers is our first priority coupled with a healthy respect for the environment.

Integrity

In everything we do, in every interaction, both internally and externally, we strive to operate with the utmost integrity and mutual respect.

Customer Focused

Our products enhance our customer's performance and we listen to their needs and work with them to solve their challenges.

Good Place To Work

We are committed to creating a workplace that fosters innovation, teamwork and pride. Every team member is integral to our success and is treated equally and fairly.

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