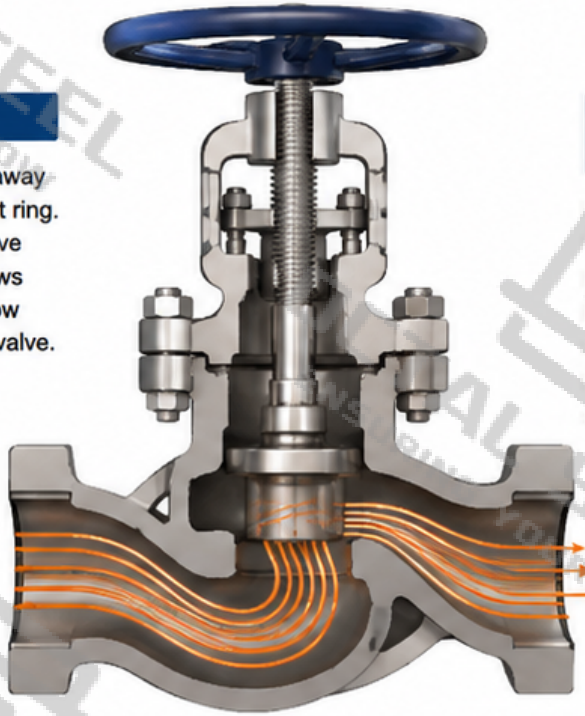
Globe Valve Working Principle and Throttling Flow Path

A globe valve controls or shuts off flow through a stem-driven disc that moves perpendicularly to the seat ring. The indirect internal passage causes the fluid to change direction through the body and across the disc-seat region.

OPEN

Disc raised away from the seat ring. Large effective opening allows maximum flow through the valve.

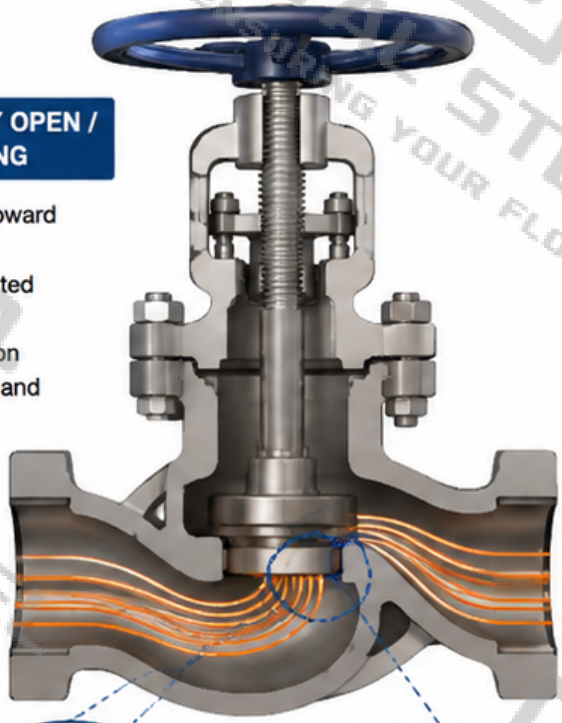


Stem Fully Raised

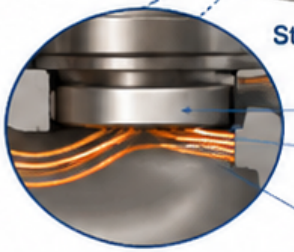
PARTIALLY OPEN / THROTTLING

Disc moves toward the seat ring.

Flow is restricted in the annular throttling region between disc and seat.



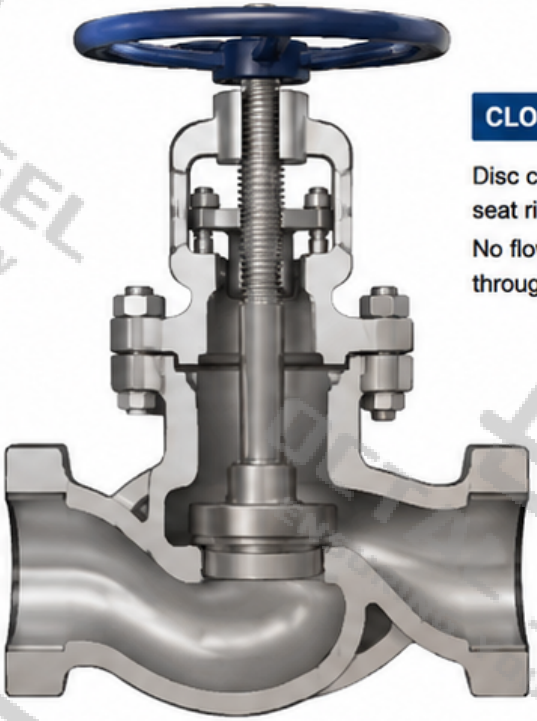
Stem Mid Travel



CLOSED

Disc contacts the seat ring.

No flow can pass through the valve.



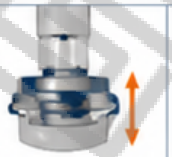
Stem Fully Lowered

OPERATING CHAIN

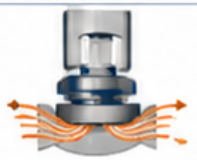
Handwheel / Actuator Input → Stem Linear Travel → Disc Position → Effective Flow Area

ENGINEERING NOTES

1. Disc travel changes effective opening.



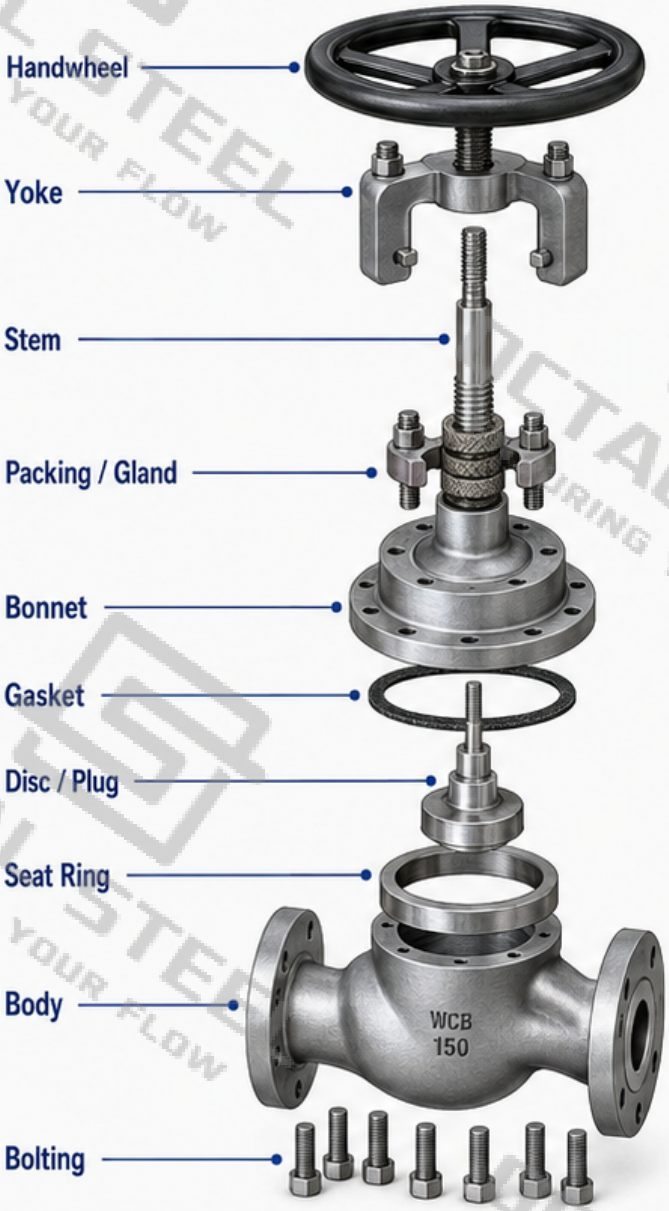
2. Partial opening creates the main throttling restriction.

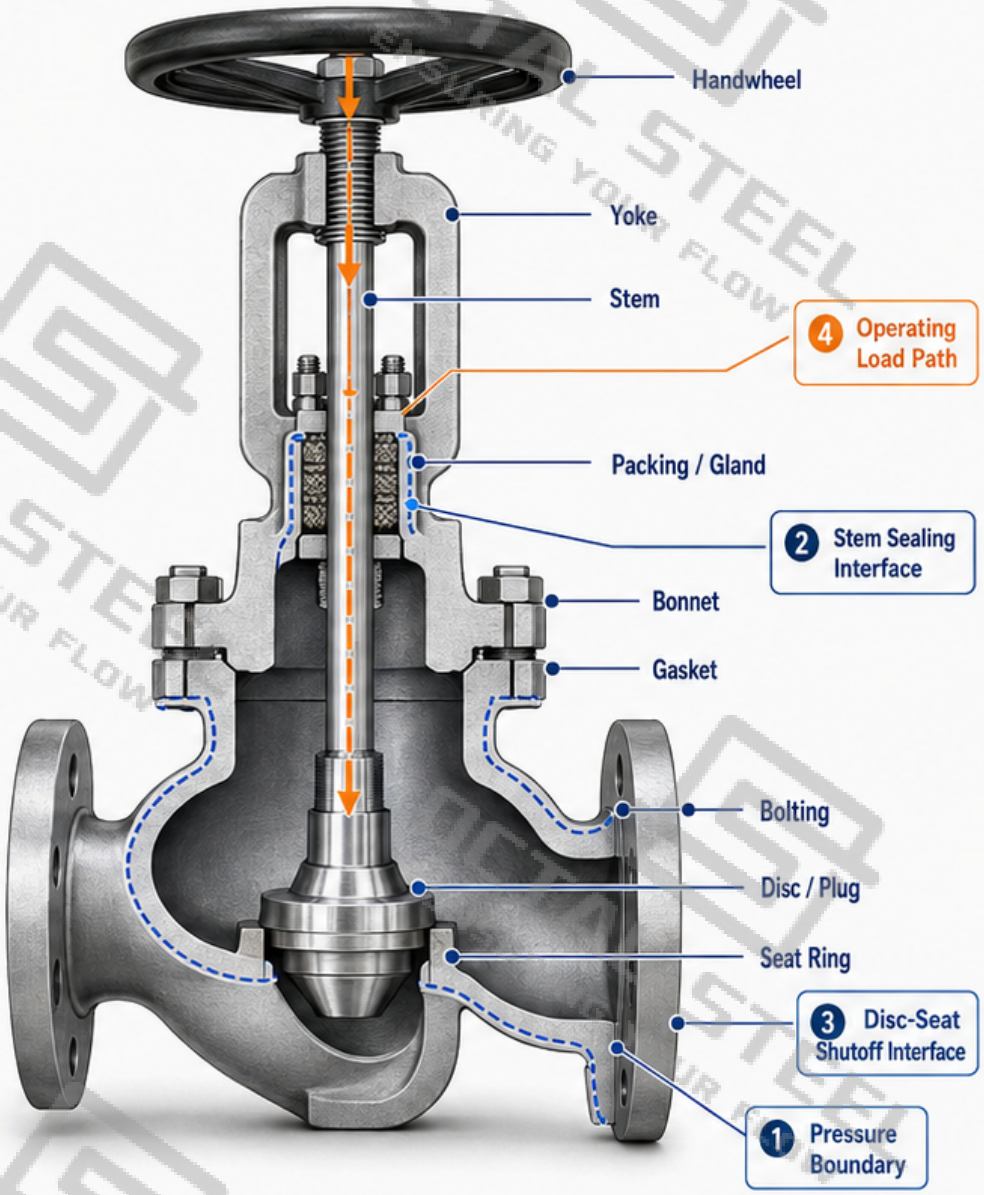


3. Final seat contact establishes shutoff.

Globe Valve Main Components and Funcctional Interfaces

Technical Reference Sheet





Functional Interfaces

1 Pressure Boundary
Encloses and contains the process pressure within the valve.

2 Stem Sealing Interface
Prevents process fluid from leaking to the atmosphere along the stem.

3 Disc-Seat Shutoff Interface
Provides isolation by sealing the disc against the stationary seat ring.

4 Operating Load Path
Mechanical load transmitted from the handwheel through the stem to the disc.

1. Pressure boundary is formed by the body, bonnet, gasket and bolting.

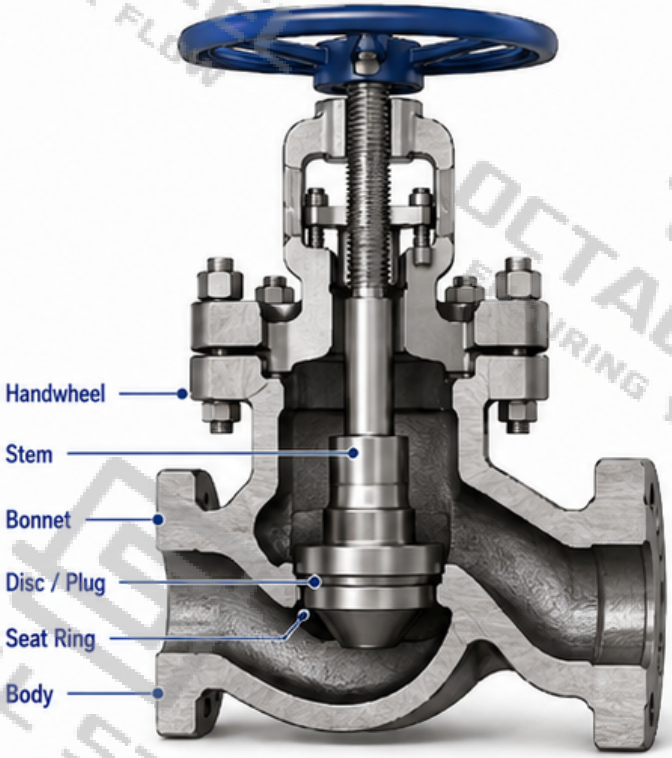
2. Stem load is transferred through the operating assembly to the disc.

3. Disc-seat alignment determines shutoff integrity.

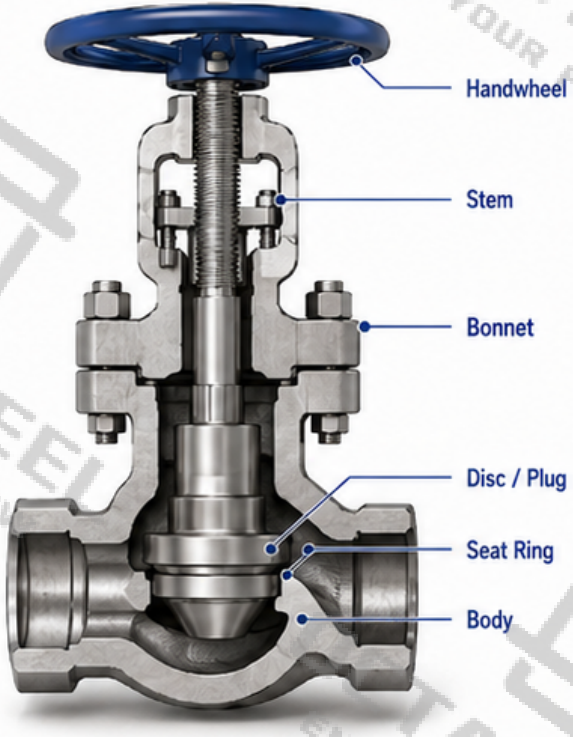
Cast, Forged and Pressure Seal Globe Valve Construction

Globe valves are manufactured using different body construction routes to match application pressure, temperature and service requirements. The choice of construction influences strength, weight, maintainability and suitability for high-pressure and severe-service duties.

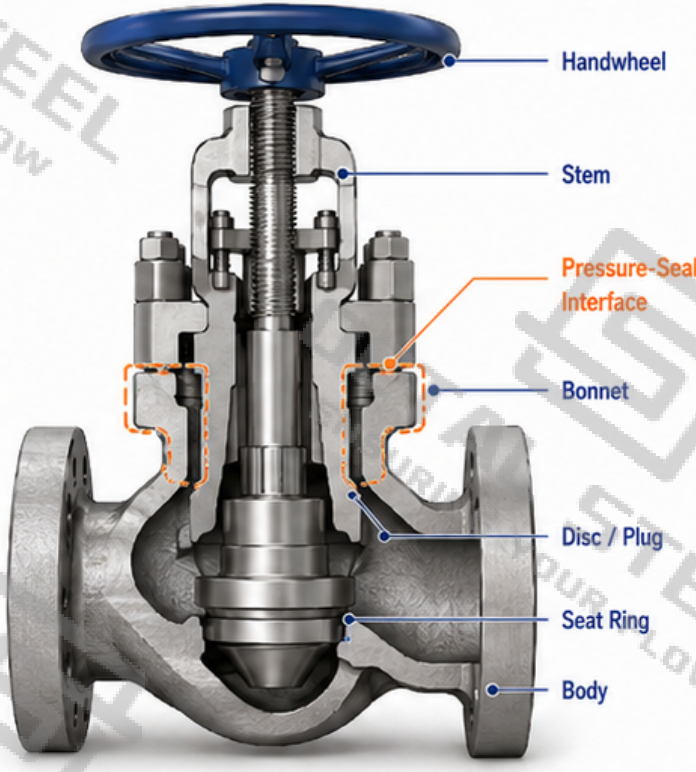
CAST STEEL



FORGED STEEL



PRESSURE SEAL



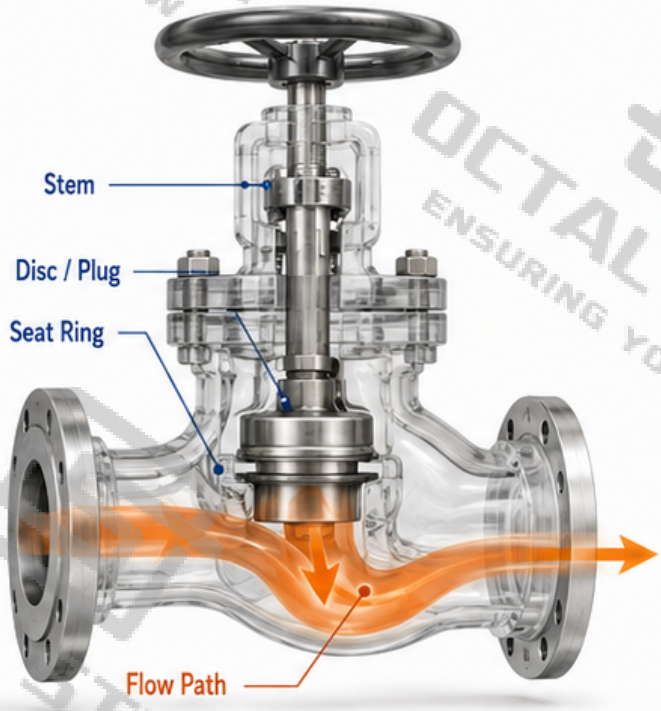
	Cast Steel	Forged Steel	Pressure Seal
Body Manufacturing Route	Sand casting	Closed-die forging	Forged body with pressure-seal bonnet
Construction Scale	Larger, heavier	Compact, lighter	Robust for very high-pressure service
Bonnet Arrangement	Bolted bonnet	Bolted bonnet	Pressure-seal bonnet joint
End Connection Options	Flanged, butt-weld	Threaded, socket-weld, butt-weld, flanged	Flanged, butt-weld
Project Selection Driver	General purpose, wide availability, cost-effective	Space and weight savings, moderate to high-pressure service	Very high pressure, severe service, leak-tight integrity

T-Pattern, Y-Pattern and Angle Globe Valve Flow Geometry

Globe valve body pattern determines the internal flow direction, pressure-loss behavior, and piping layout while using the same basic disc-seat throttling principle.

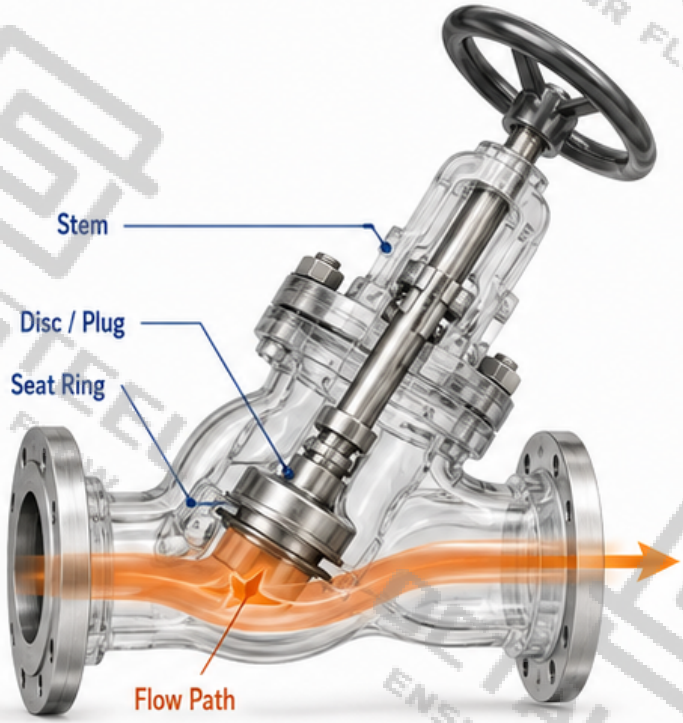
T-Pattern

Conventional indirect path with greater directional change



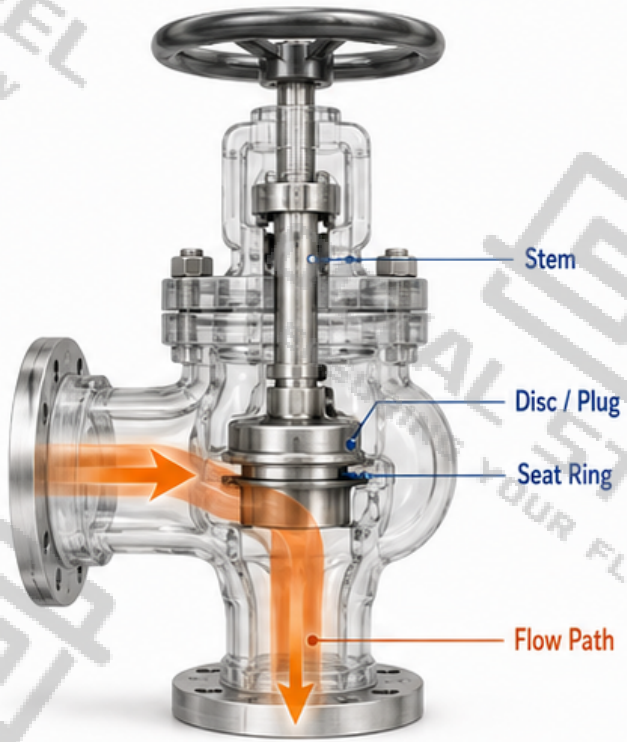
Y-Pattern

Inclined stem and seat for smoother internal flow path



Angle Pattern

Inlet and outlet at 90° with regulation at the seat



	T-Pattern	Y-Pattern	Angle Pattern
Flow Direction Change	Greater change in direction	Less change in direction	Change through 90 degrees
Throttling Capability	Good for general service	Good to very good	Good for on/off and throttling
Pressure-Loss Consideration	Higher pressure loss	Lower pressure loss	Higher pressure loss
Piping Arrangement	Straight-through layout	Matches line direction well	For inlet-to-outlet at right angle

Globe Valve Manufacturing, Inspection and Pressure Testing

Technical Reference Sheet

1 Material Identification

Incoming material verified to approved specification and positively identified.

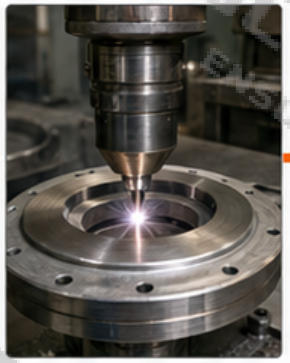
2 Body / Bonnet Machining

Body and bonnet CNC machined including sealing faces, flange faces and bolting features.

3 Stem / Disc / Seat Machining

Stem, disc and seat precision machined to tight tolerances and surface finish.

4 Seat Finishing / Hardfacing Where Required



Seating surfaces lapped or hardfaced (where required) and finished to ensure reliability.

5 Assembly

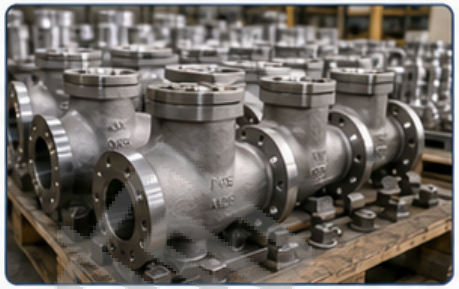
Components cleaned, inspected and assembled using controlled procedures and lubricants.

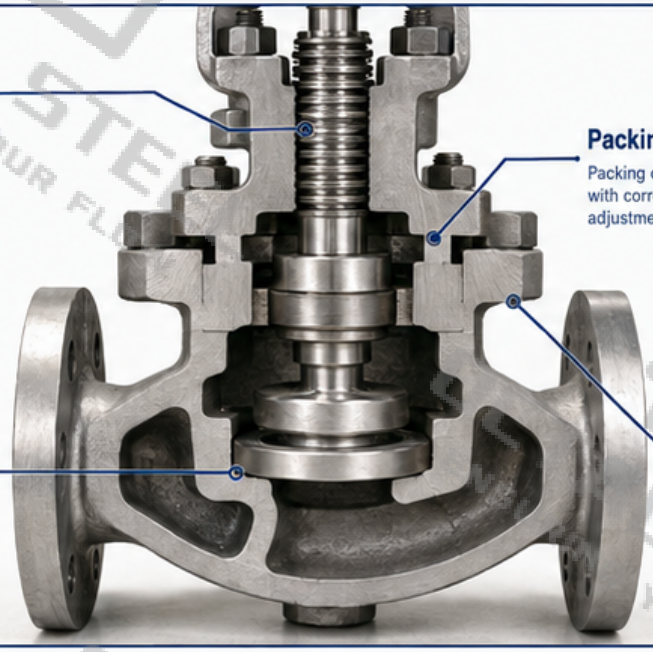
6 Dimensional / Functional Inspection

Dimensional checks and functional verification of operation and travel.

7 Shell / Seat Pressure Testing

Shell and seat tested hydrostatically to verify integrity and tightness.





Stem Travel

Smooth, free movement through full stroke range without binding.

Packing Installation

Packing compressed evenly with correct gland adjustment.

Disc-Seat Alignment

Disc centered on seat for uniform contact and positive shut-off.

Body-Bonnet Joint

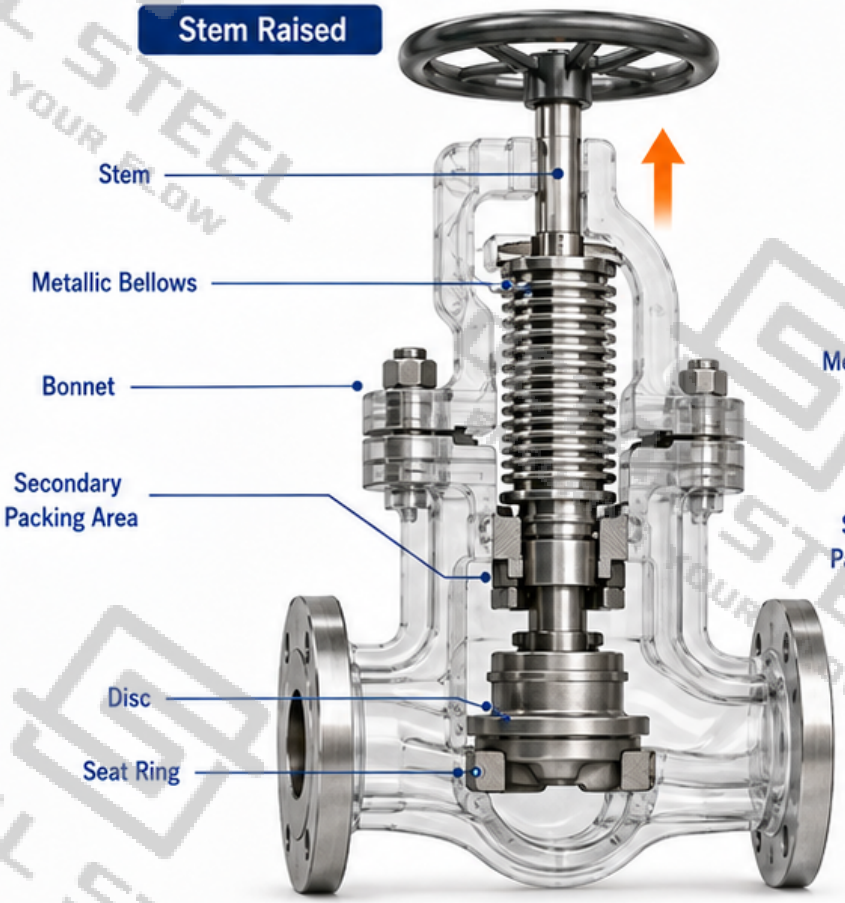
Joint faces clean and properly mated with correct bolt torquing.

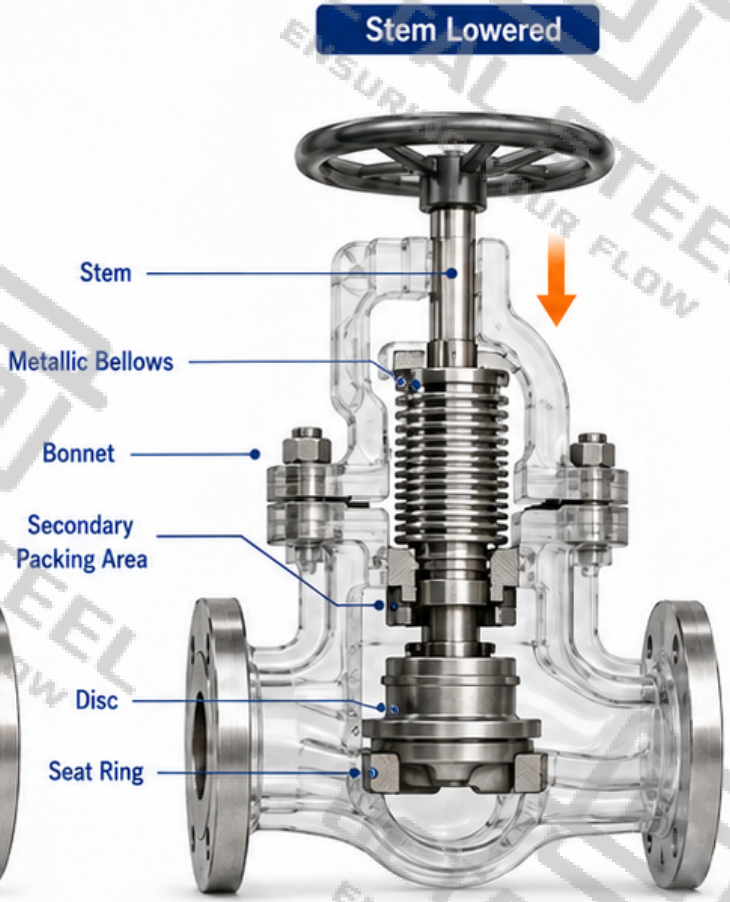
Traceability Through Process

Material Identity → Inspection Record → Pressure-Test Record → Marking / Packing

Note: API 598 may be used as an applicable inspection and testing reference.

Bellows Seal Globe Valve Construction



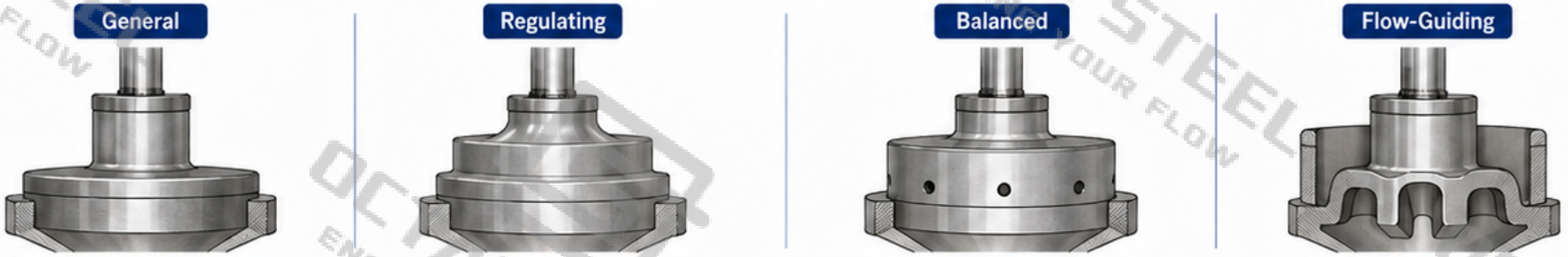


Reference Configuration

(Values shown are reference configuration, not universal Globe Valve limits)

- EN 13709 Design
- MSS SP-117 Bellows
- DN15–DN400
- PN16 / PN25 / PN40
- Flanged / Butt-Welded
- Reference Temperature Range: -10°C to 400°C

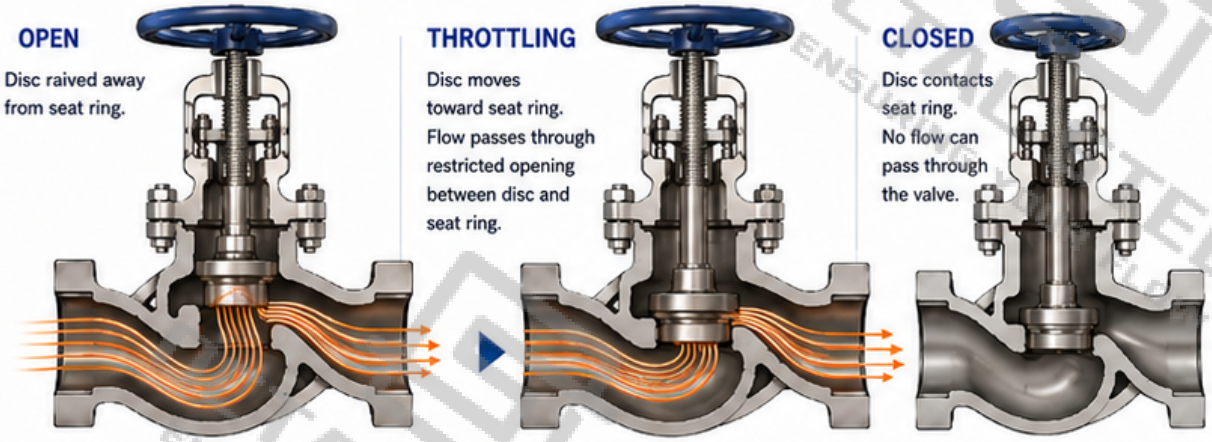
Bellows Seal Globe Valve Disc Types



Globe Valve, Gate Valve and Ball Valve Operating Comparison

GLOBE VALVE

Stem-driven disc moves linearly toward the seat ring.
Designed for regulation and positive shutoff.



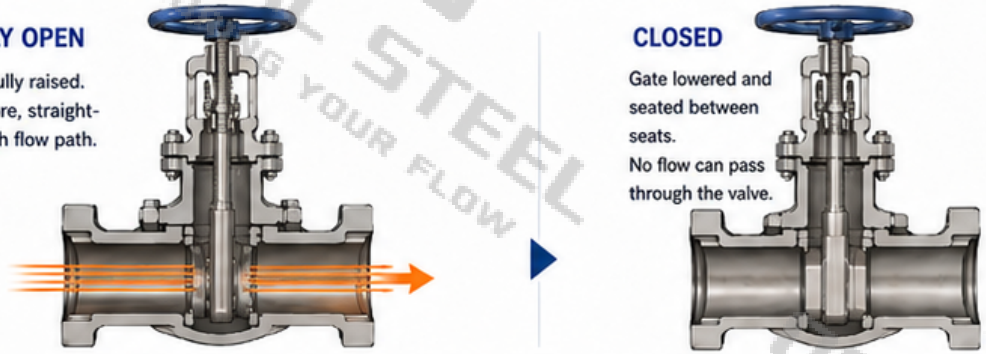
OPEN
Disc raived away from seat ring.

THROTTLING
Disc moves toward seat ring.
Flow passes through restricted opening between disc and seat ring.

CLOSED
Disc contacts seat ring.
No flow can pass through the valve.

GATE VALVE

Linear gate movement provides straight-through flow when fully open.
Designed for on/off isolation.

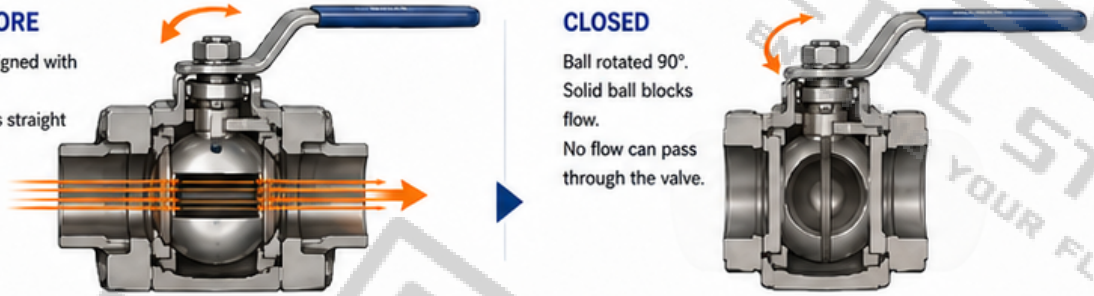


FULLY OPEN
Gate fully raised.
Full bore, straight-through flow path.

CLOSED
Gate lowered and seated between seats.
No flow can pass through the valve.

BALL VALVE

Quarter-turn rotary ball provides straight-through flow when open.
Designed for rapid isolation.



OPEN BORE
Ball bore aligned with pipeline.
Flow passes straight through.

CLOSED
Ball rotated 90°.
Solid ball blocks flow.
No flow can pass through the valve.

COMPARISON FACTOR	GLOBE VALVE	GATE VALVE	BALL VALVE
Closure Movement	Linear (disc to seat)	Linear (gate to seat)	Rotary 90° (quarter-turn)
Partial-Open Function	Yes Designed for throttling and regulation	No Not intended for throttling	No Not intended for throttling
Fully Open Flow Path	Indirect (S-shaped path)	Straight-through (full bore)	Straight-through (full bore)
Operating Speed	Moderate (multiturn)	Slow (multiturn)	Fast (quarter-turn)
Main Selection Logic	Control + shutoff where throttling/ regulation is needed	Full-line isolation with low pressure drop when open	Rapid isolation where quick on/off is required

Globe — regulation + shutoff

Gate — full-line isolation

Ball — rapid quarter-turn isolation

Specialized V-port / control-ball configurations are evaluated separately.