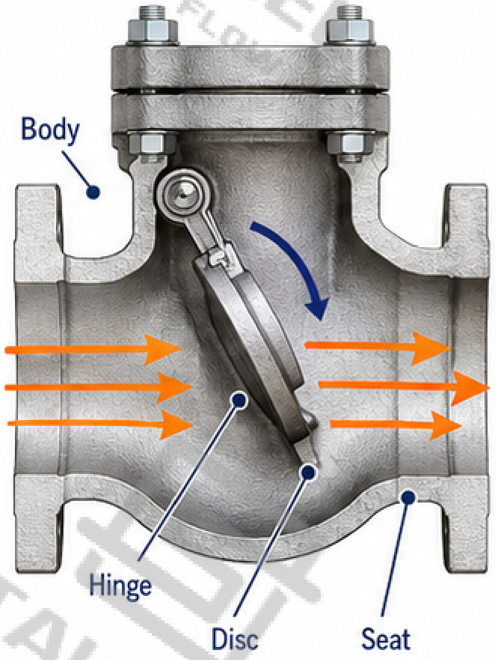
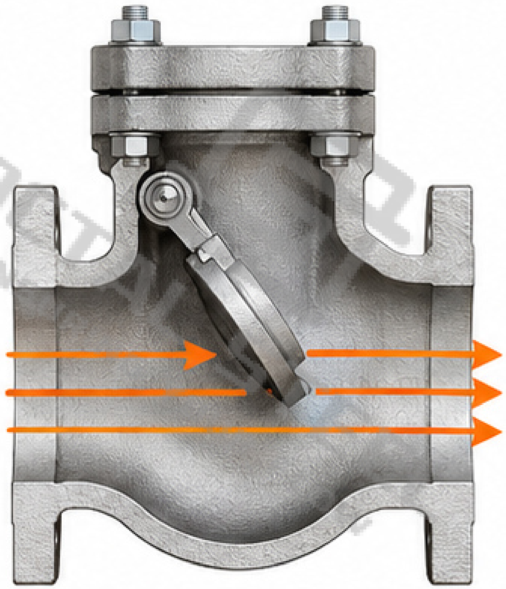
Check Valve Working Principle and Flow-Reversal Sequence

1 FORWARD FLOW



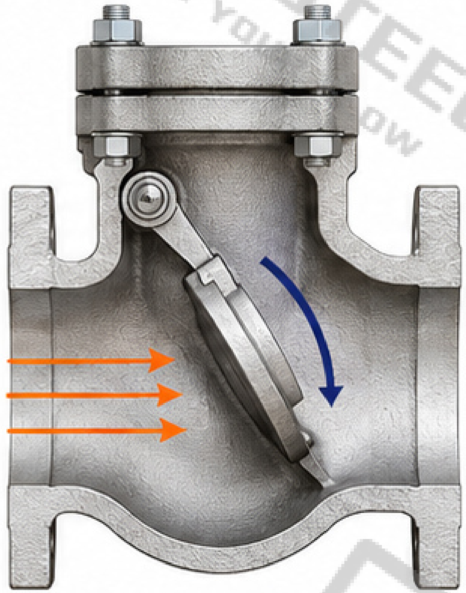
Forward differential pressure rotates disc away from seat.

2 STABLE OPEN



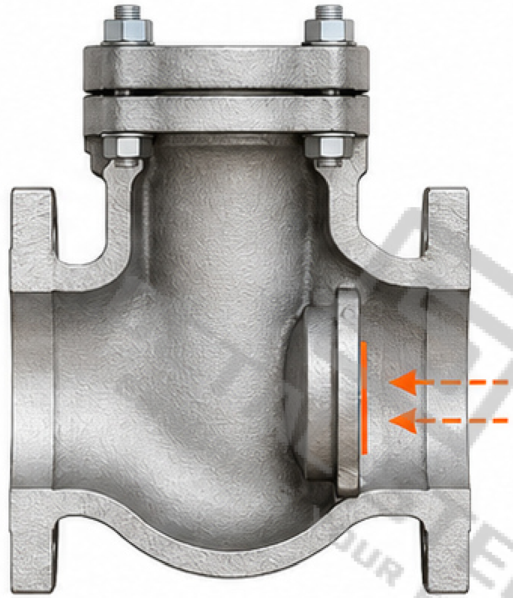
Forward flow holds disc in a stable open position.

3 FLOW DECELERATION



Reduced forward flow and differential pressure allow disc to return toward seat under gravity.

4 CLOSED / REVERSE BLOCKED



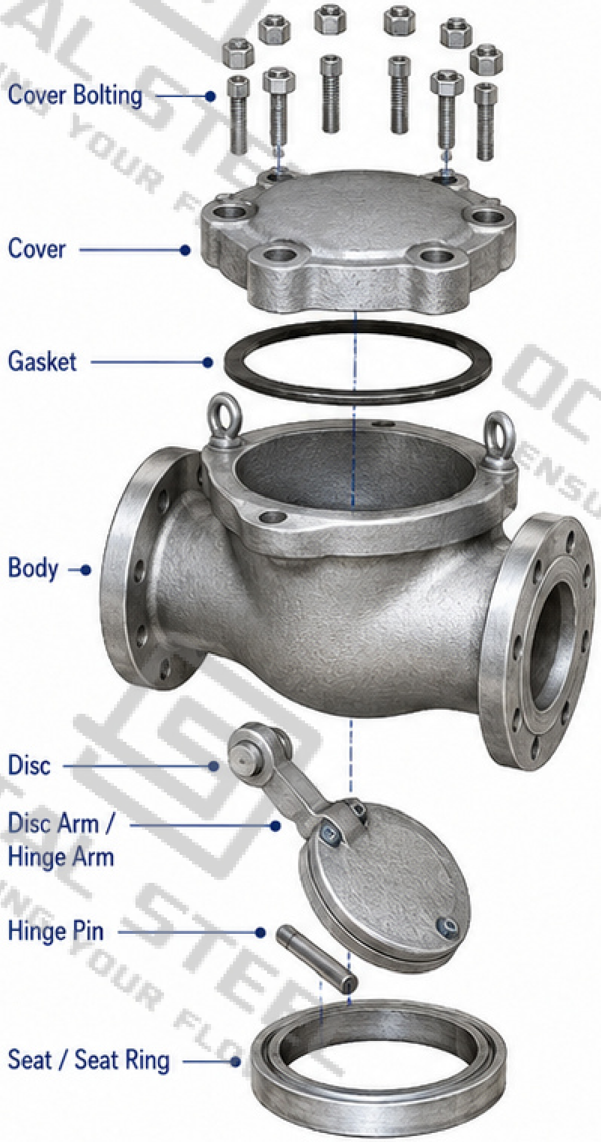
Disc contacts seat to prevent reverse flow. Reverse flow is blocked.

Forward Differential → Disc Opens → Stable Flow → Flow Decelerates → Disc Returns → Seat Contact

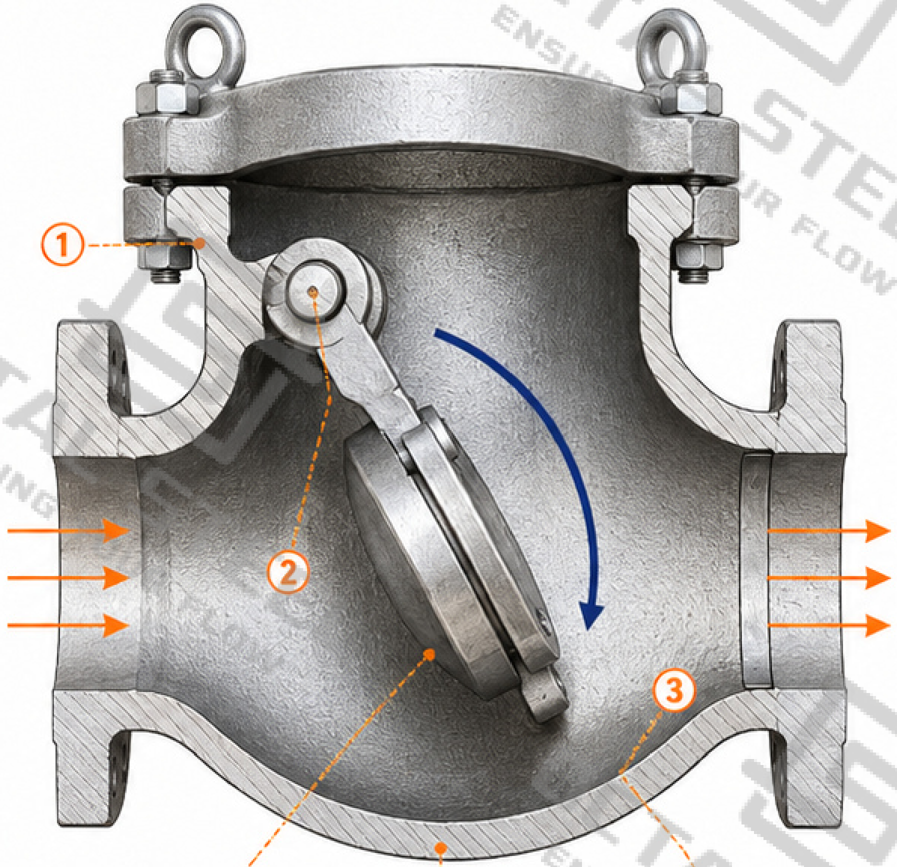
ⓘ Opening and closing behavior depends on valve configuration, flow condition and closure forces.

Swing Check Valve Construction and Disc-Hinge Movement

EXPLODED VIEW (Assembly Order)



ASSEMBLED HALF-SECTION (Interior Shown)



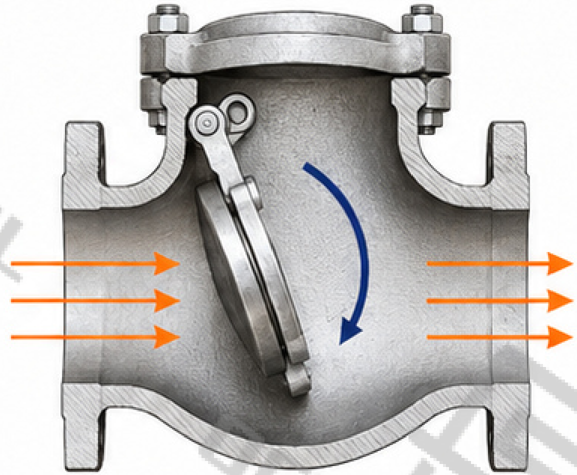
① Pressure Boundary
Seals between body, cover, and seat ring contain the pressure.

② Disc-Hinge Movement
Disc pivots about hinge pin through a long arc to open and close.

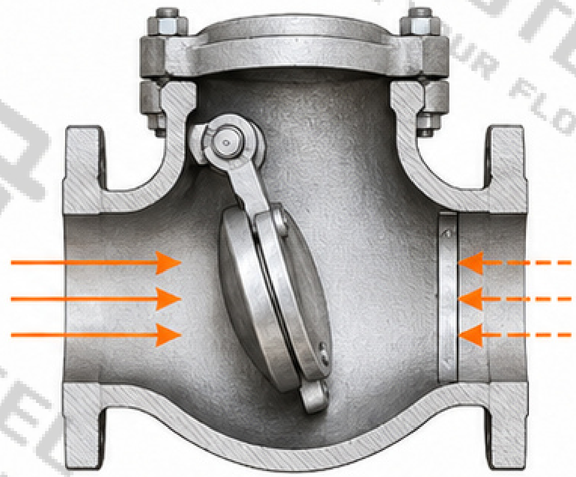
③ Disc-Seat Closure
Disc swings to contact the seat ring, creating a tight shutoff.

VALVE STATES

OPEN

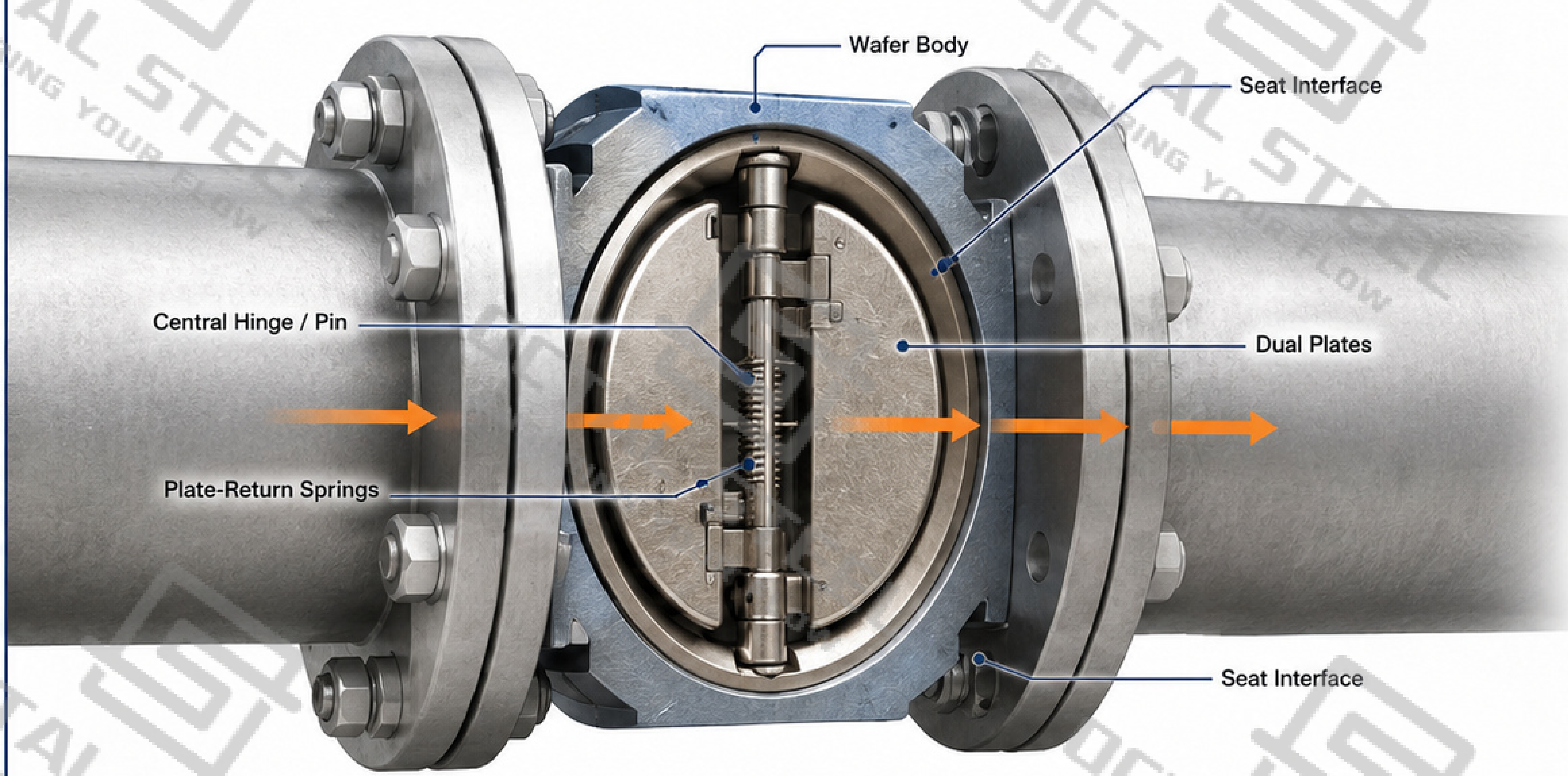


CLOSED

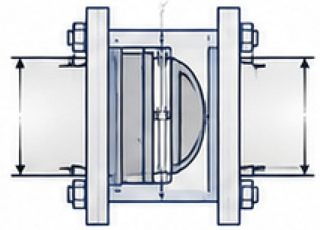


ⓘ Swing check valves use a hinged disc with comparatively long rotational travel toward the seat.

Dual Plate and Wafer Check Valve Construction



CONFIGURATION PANEL



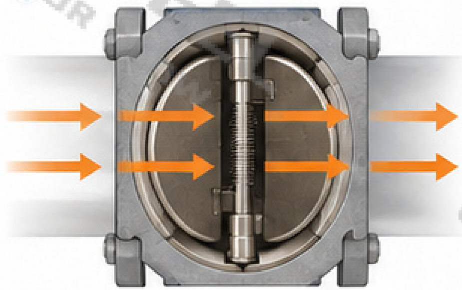
Wafer body describes installation form; internal closure mechanisms may differ.

Typical Features

- Compact wafer design
- Two semicircular plates
- Central hinge / pin
- Spring-assisted closure
- Seat interfaces on body

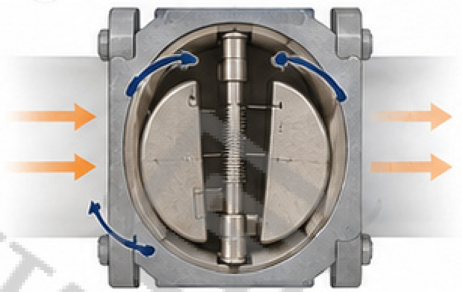
OPERATING SEQUENCE

1 OPEN



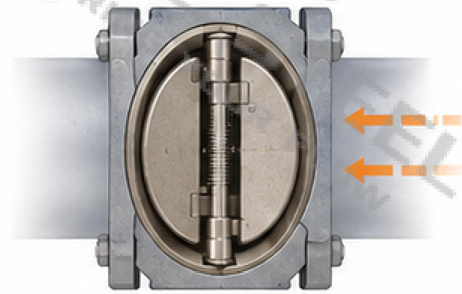
Forward flow opens both plates.
Flow passes through with low resistance.

2 DECELERATING



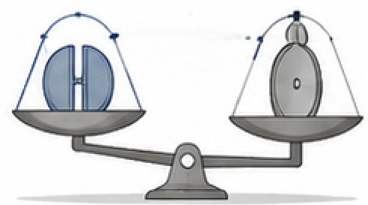
As flow decreases, spring force and reverse differential begin to rotate plates toward the seat.

3 CLOSED



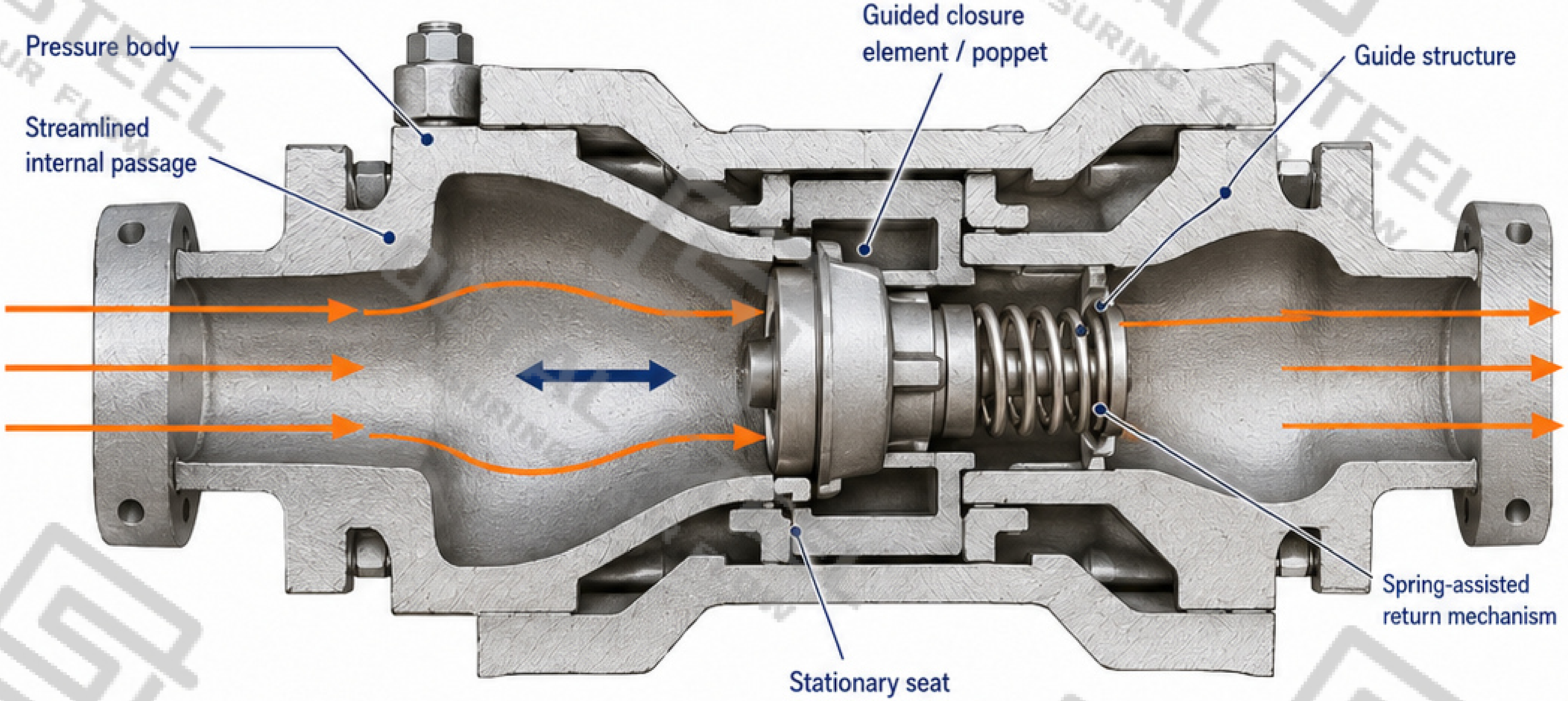
Plates close against the seat.
Reverse flow is prevented.

COMPARISON NOTE



Two smaller plates reduce individual moving mass and closure travel compared with a large single swing disc.

Axial Flow Check Valve Construction and Guided Closure



GUIDED AXIAL TRAVEL

Poppet moves axially along an internal guide, keeping alignment with the seat throughout travel.

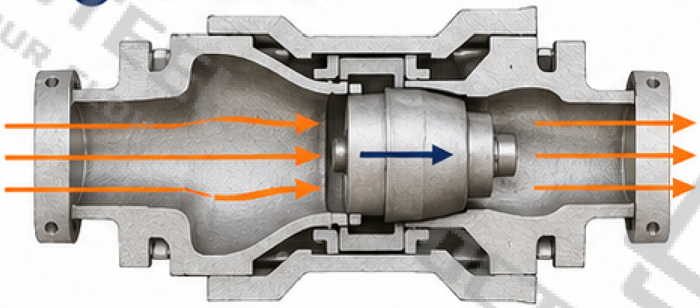
SHORTER CLOSURE PATH

Axial design provides a short, straight-line closure path to the stationary seat.

SPRING ASSISTANCE MAY INITIATE CLOSURE

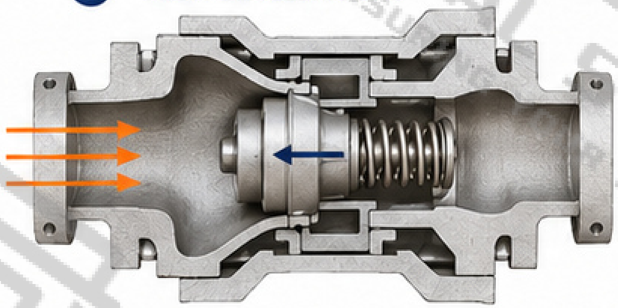
Spring helps return the poppet toward the seat as differential pressure decreases.

1 FORWARD FLOW



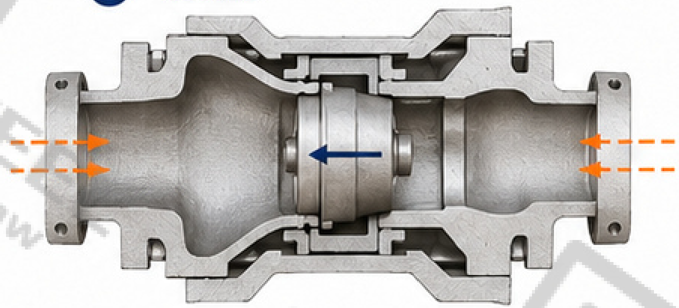
Forward flow holds poppet open against spring force. Flow passes axially through streamlined passage.

2 FLOW DECELERATION



As differential pressure decreases, spring force and reduced flow allow poppet to begin axial movement toward the seat.

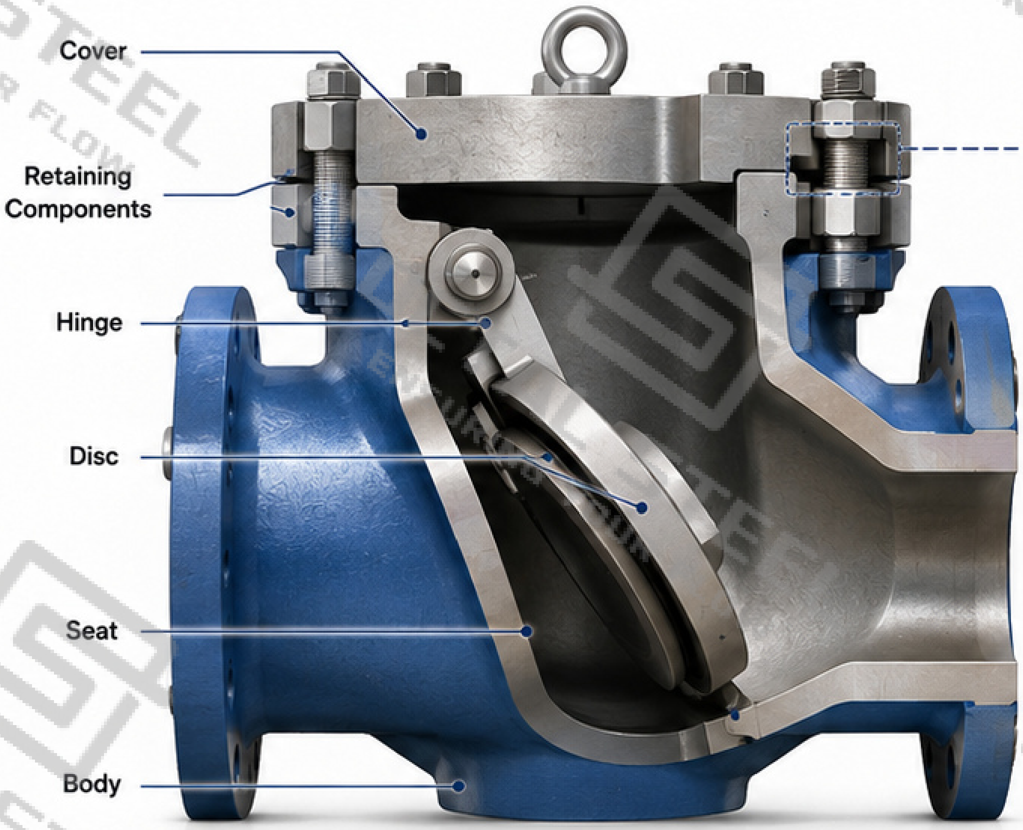
3 CLOSED



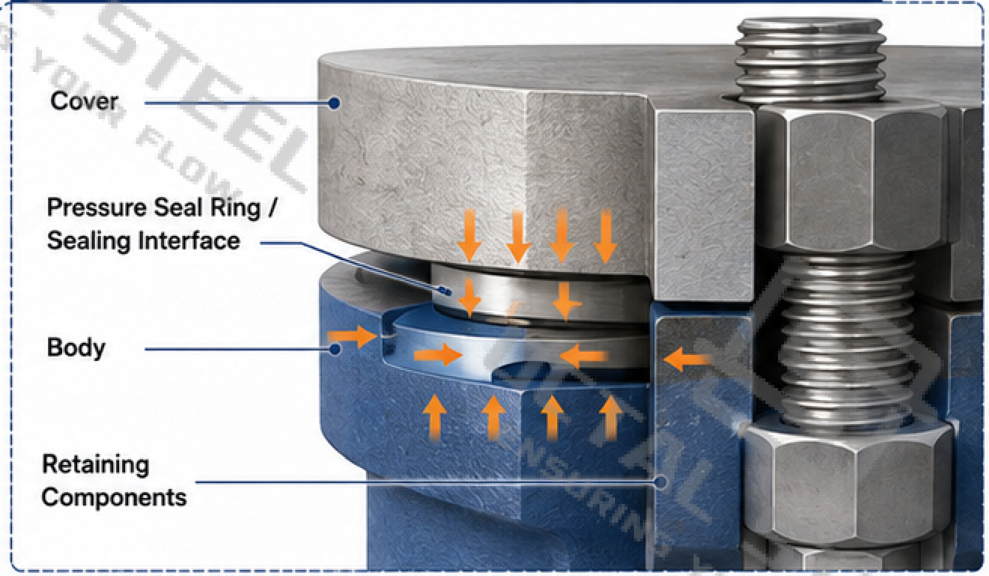
Poppet contacts stationary seat to stop reverse flow. Axial guidance maintains alignment during closure.

ⓘ Axial-flow construction does not by itself guarantee elimination of pressure transients; system behavior and sizing remain important.

Pressure Seal Check Valve Construction



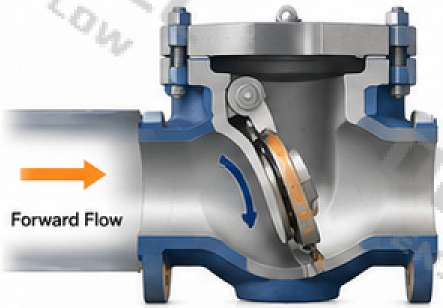
PRESSURE-SEAL INTERFACE (ENLARGED)



PRESSURE ACTION

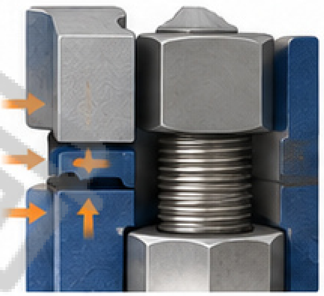
Internal pressure acts on the pressure seal ring and sealing interface, driving the cover tightly against the body sealing surface.

CLOSURE FUNCTION



Disc closes against seat to prevent reverse flow.

PRESSURE-SEAL FUNCTION



Internal pressure assists the body-cover pressure seal to maintain a tight pressure boundary.

KEY POINTS

- The disc and hinge assembly provide the non-return (closure) function.
- The pressure seal ring and retaining components provide the pressure-boundary sealing between body and cover.
- Internal pressure enhances the body-cover seal by intensifying contact across the sealing interface.

Pressure seal describes the pressure-boundary joint; it does not define the basic check-valve closure motion.

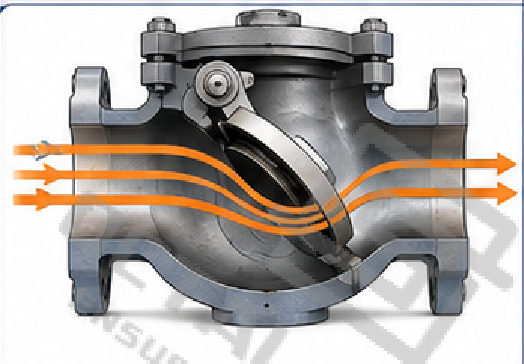
Check Valve Operating Characteristics

Technical Reference Sheet

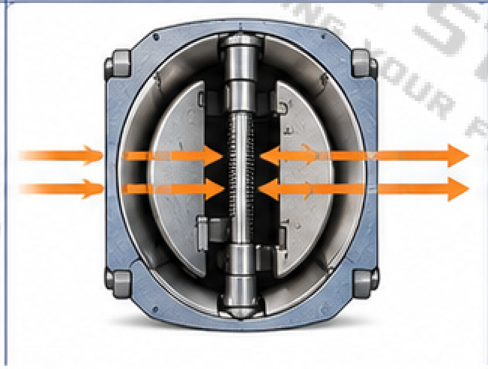
1 Forward Flow and Pressure Loss

Forward flow creates pressure loss across the valve due to internal geometry, friction and flow path changes.

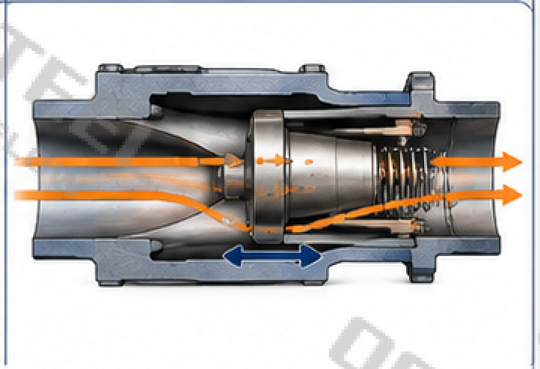
SWING CHECK VALVE



DUAL PLATE CHECK VALVE



AXIAL FLOW CHECK VALVE

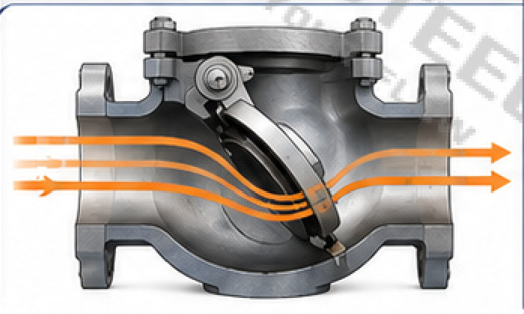


- Flow follows the internal passage geometry.
- Pressure loss results from friction, flow direction changes and component design.
- Minimize pressure loss by matching valve type and configuration to service.

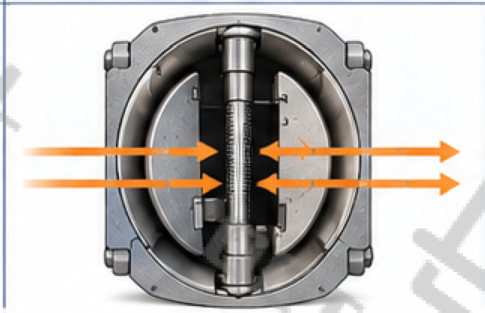
2 Stable Opening

With sufficient forward differential pressure and flow condition, the closure element remains in a stable open position.

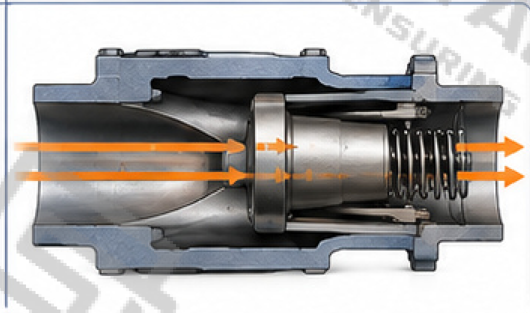
SWING CHECK VALVE



DUAL PLATE CHECK VALVE



AXIAL FLOW CHECK VALVE

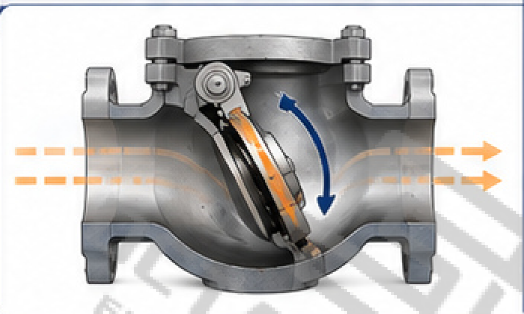


- Actual flow condition must be sufficient to maintain stable opening.

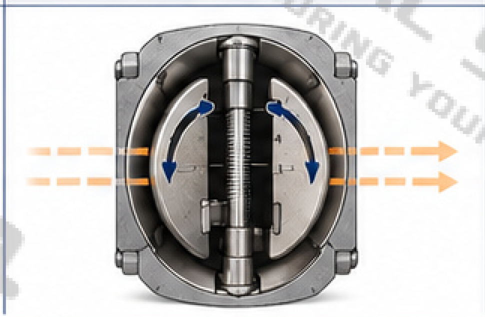
3 Closing Response

As forward flow decreases, differential pressure reduces and the closure element moves toward the seat under gravity, spring force and/or reverse pressure.

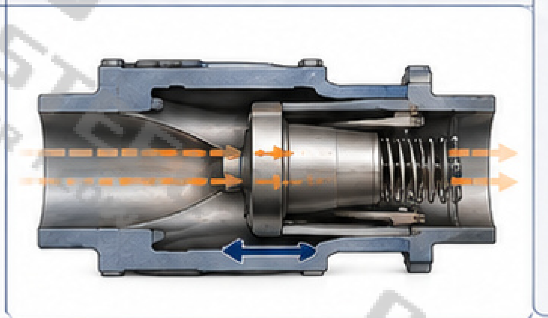
SWING CHECK VALVE



DUAL PLATE CHECK VALVE



AXIAL FLOW CHECK VALVE



- Flow deceleration reduces differential pressure.
- Closure element travels toward the seat.
- Reverse flow is prevented once the seat is closed.

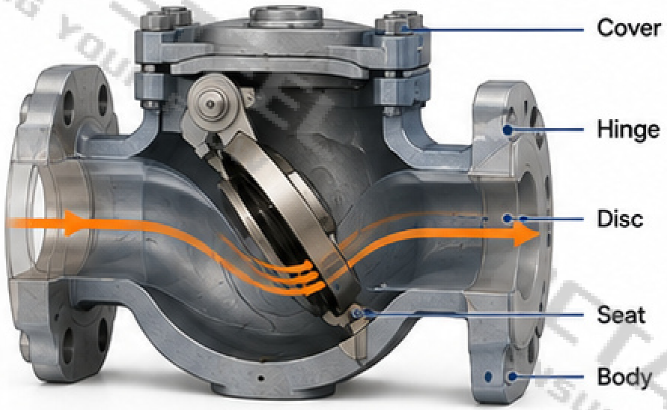
OPERATING LOGIC

Flow Path – Forward flow enters the valve and follows the internal passage.
→ **Stable Opening** – Sufficient flow and differential pressure hold the element open.
→ **Flow Deceleration** – Forward flow decreases and differential pressure begins to drop.
→ **Closure Travel** – The element moves toward the seat under gravity/spring/reverse pressure.
→ **Seat Contact** – The element contacts the seat and blocks reverse flow.

SELECTION NOTE Selection balances allowable pressure loss, stable opening and required closing response for the service condition.

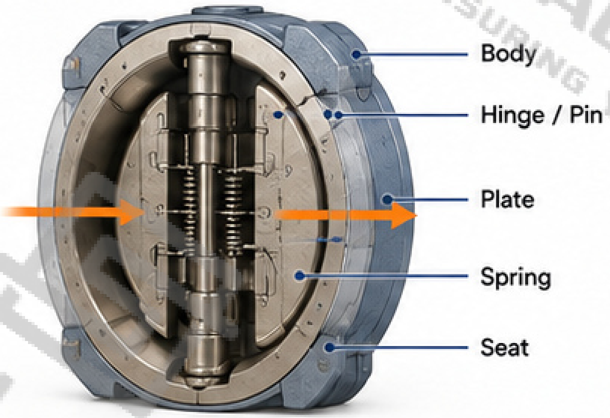
Swing, Dual Plate and Axial Flow Check Valve Comparison

SWING CHECK VALVE



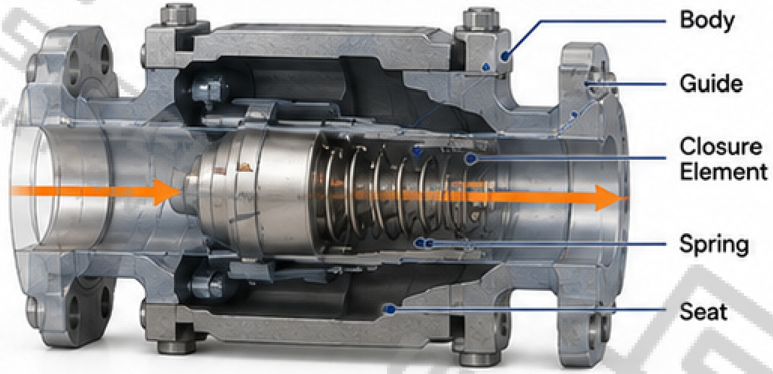
Single hinged disc swings away from the seat to allow forward flow and returns under gravity and reverse differential.

DUAL PLATE CHECK VALVE



Two spring-assisted plates rotate on a central hinge to open with flow and close toward the seat when flow decreases or reverses.

AXIAL FLOW CHECK VALVE



Guided closure element moves axially along the flow path. Spring and differential pressure assist return to the seat.

Comparison Item	Swing Check Valve	Dual Plate Check Valve	Axial Flow Check Valve
Closure Element	Single hinged disc	Two semicircular plates	Guided poppet or disc
Movement	Rotational about hinge	Rotational about central hinge	Linear along flow axis
Closure Travel	Relatively long rotational travel	Short rotational travel	Short linear travel
Flow-Path Interaction	Disc projects into flow path when open	Plates split the flow area; compact internal profile	Streamlined flow path around guided element
Installation Form	Flanged or wafer	Wafer (standard) or flanged	Flanged
Stable-Open Requirement	Higher forward differential needed for stable open	Moderate forward differential maintains stable open	Lower forward differential can maintain stable open
Closing Response	Gravity and reverse flow act on larger mass and longer travel	Springs assist; shorter travel and lower moving mass	Spring and differential pressure assist; short axial travel
Main Selection Logic	General service; simple structure	Compact installation; limited space; shorter travel requirement	Low pressure loss; axial pipeline; short travel preference

Final selection depends on system flow condition, allowable pressure loss, shutdown behavior, orientation and project requirements.

Note: The above comparison is qualitative. Actual performance varies with size, pressure rating, material, design details and operating condition.