



*Flowserve – Anchor Darling
Tilting Disc Check Valves*

Tilting Disc Check Valves

Problem

Provide a check valve with quick response and no water hammer effect.

Solution

Tilting-Disc check (TDC) valves are designed for use in applications where rapid response (fast opening or closing) is required. The center of gravity of the Anchor/Darling TDC disc is very close to the axis of rotation thus, the disc can open or close very quickly without damage to the body, disc or seat. Since the valve closes quickly upon flow reversal, no significant fluid velocity is developed in the reverse direction, thereby minimizing the potential for severe waterhammer.

Abstract

TDC valves have additional advantages over swing and lift check valves, including stability at low and pulsating flow rates (where other check valves may “simmer” or “chatter”) and their potential for installation in both horizontal and vertical lines (Vertical installation requires a different disc design).

Anchor/Darling TDC Valve Design

TDC valves require a more exacting design and assembly technique than other types of check valves. The hinge pin is located near the disc center of gravity, minimizing sealing surface radius rotation and thus velocity. The reduced moment arm of the TDC disc makes it imperative that the hinge pin bushings be properly aligned and non-binding to permit smooth swinging, as well as to maintain the precise geometry required for leak tightness. Hinge pin body penetrations require special attention as well. The most effective seal design for hinge pin penetration is the studded, blind-flange hinge pin cover.

The counterweight’s hydrofoil profile maintains disc stability while being lifted by hydrodynamic forces at any flow, including pulsating.

Proper selection of materials, design of the disc and hinge pin assembly, and care in assembly of the valve are all important in achieving the desired result.

Alternate Designs

To avoid the exacting requirements of design and assembly, some TDC designs use shortcuts that can compromise the performance of the valve. Examples of shortcuts include:

a) Modifying a swing check valve by relocating the disc pivot point. (See Figure A.)

This approach may accelerate the response of the valve to a degree. However, the absence of a counterweight may retard closure and certainly would not provide the stability against low or pulsating flows for which a TDC valve is most favored. Because this is a modification of a swing check valve, the potential for waterhammer may also be greater. Finally, the pressure drop through this design may exceed that through an equivalent Anchor/Darling TDC valve because the body contours have not been adjusted to compensate for the additional resistance to flow imparted by the disc.

Figure A

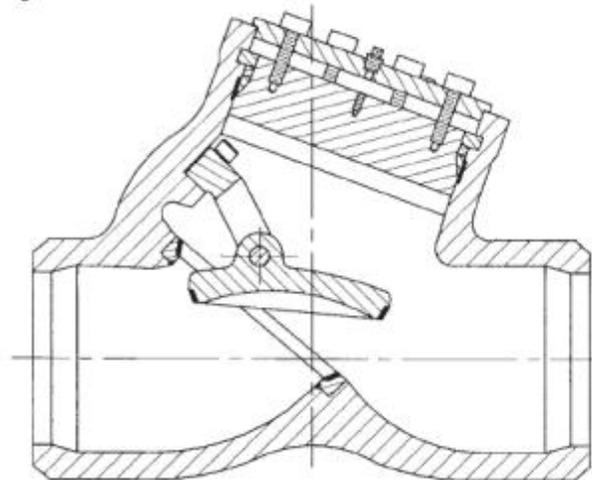
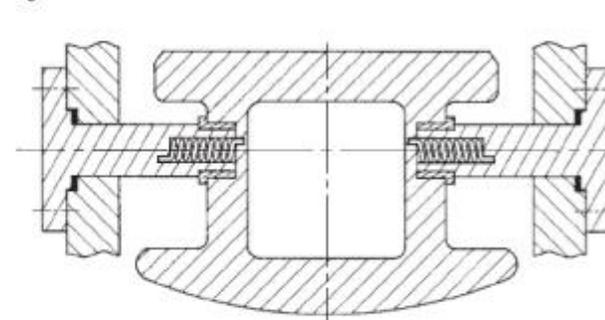


Figure B



Tilting Disc Check Valves

b) Use of torsion springs to assist closing. (See Figure B.)

This approach can negate one of the prime benefits gained from the TDC valve, namely rapid opening. The damping of the valve against pulsating flow may also be affected. If the valve is properly aligned in bushings of suitable material, closure assist springs should not be necessary. Springs introduce an additional component which is prone to corrosion and breakage.

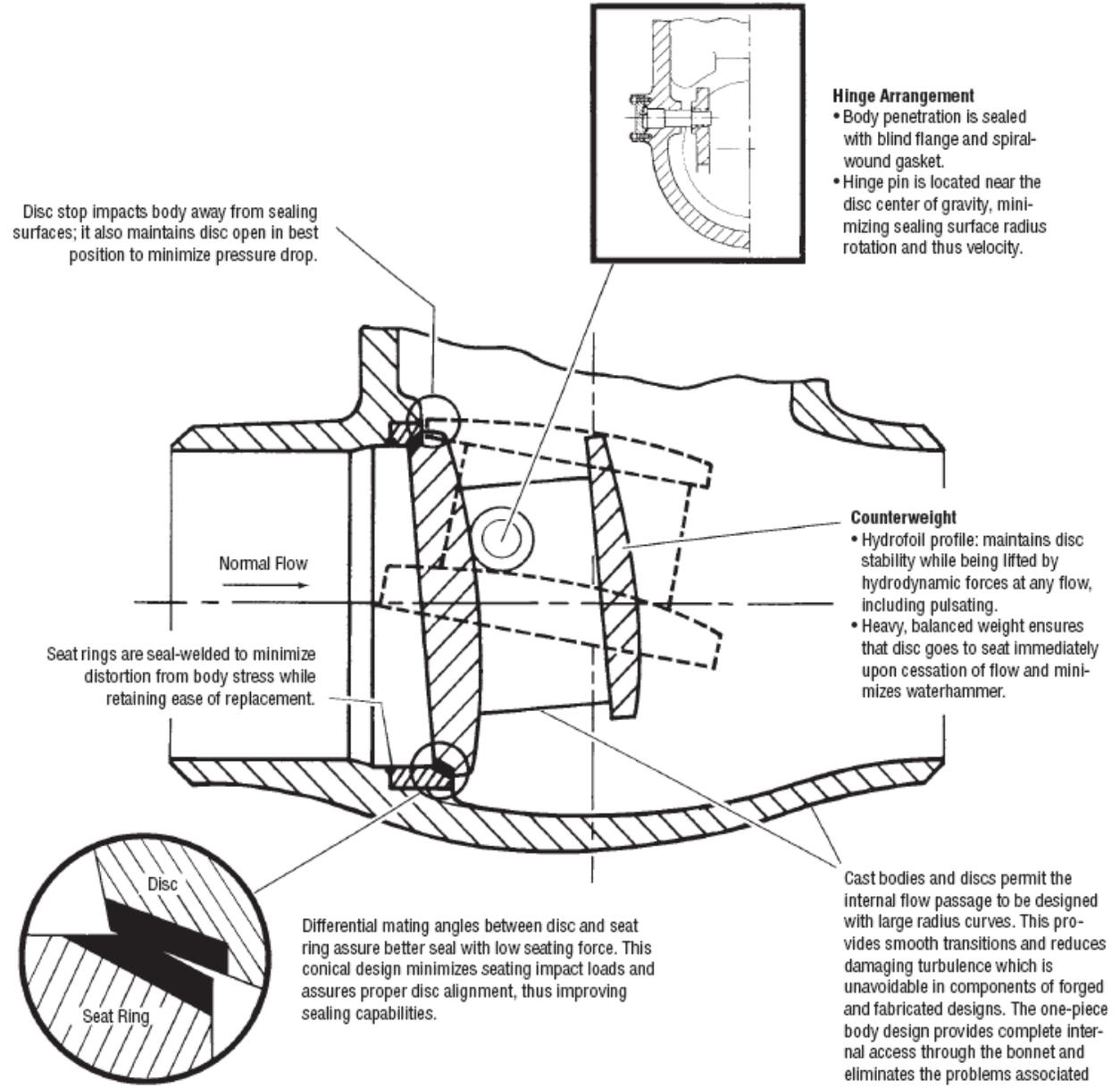
Summary

Properly designed and constructed tilting-disc check valves afford the system designer and operator a mechanism for achieving system performance not attainable with other types of check valves. Your Anchor/Darling regional representative can assist in selecting the right valve for the application.*

* See Flowserve-Anchor/Darling On-Line document titled, Check Valve Selection Guide.

Applications

- Protection from waterhammer.
- Stable at low and pulsating flows.
- Acceptable pressure drop.
- Designs available for installation in horizontal and vertical lines (with flow upward).





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