*Keywords:* Control valves • Fugitive emissions • Leakage • Life cycle



# DBB vs. DIB

**Double-Block and Bleed functionality has been available in ball valves essentially since the development of the trunnion-mounted ball valve commonly used today. The phrase "double-block and bleed" has been in use to describe that basic function for ball valves and gate valves for quite a long time. Double-block and bleed has historically referred to the capability of a valve to isolate pressure at each inlet and to vent the cavity between the seats. Venting the cavity between the seats allows the user to detect any leakage past the seats without removing the valve from the piping.**

*By Jeffrey M. Partridge, Eii Valve Company*

In recent years some have incorrectly used the phrase "double-block and bleed" in reference to double isolation and bleed. Double isolation and bleed provides double isolation barriers from the pressure source with a bleed cavity between the barriers. This misuse of the phrase has led to confusion. API 6D / ISO 14313 includes definitions of "double-block and bleed valves" as well as "double-isolation and bleed valves" making the difference between the two types very distinct. End users and manufacturers must be accurate when describing valve functionality in order for the resulting system to perform as expected. Use of the terms only as defined above will clarify the understanding of requirements and valve capabilities. While double-block and bleed valves (DBB) are well suited for most ball valve applications, there are many applications where double-isolation and bleed valves (DIB) would be a better fit. The industries using ball valves for isolation have many applications that require a second pressure barrier that seals independently of the primary pressure barrier. The need is usually either due to operational safety requirements, or the nature of the service (i.e. gas service, low tolerance for leakage, cleanliness of the produced fluid, etc.). DIB valves are particularly suited for these applications. DIB can be achieved in a single direction or in both directions by selecting the appropriate seat design.

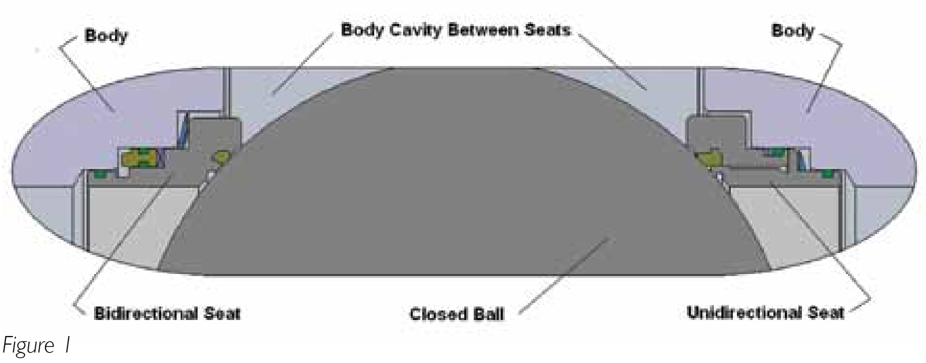


*Figure 1*

## DBB and DIB

DBB valves typically contain two unidirectional seats. The unidirectional seats, when energized, isolate the pressure in the piping from the body cavity between the seats. If pressure is reversed, the seats are urged away from the ball and allow pressure to relieve from the body cavity to the piping. This is a desirable function, particularly in liquid service. In the case where the valve body cavity is filled with liquid and heated due to process flow or external sources, pressure can build due to thermal expansion of the liquid in the body cavity. Without the self-relieving unidirectional seats, this could lead to over-pressure in the valve body resulting in leakage or rupture.

DIB valves include one or two bidirectional seats. When two bidirectional seats are used, the valve provides double isolation from pressure at either end of the valve. This configuration has one operational drawback. It cannot relieve body cavity pressure past the seats. An external relief piping system must be used to allow any pressure build-up in the body cavity to relieve to the upstream piping. When one bidirectional seat and one unidirectional seat are used together the valve provides double isolation in one direction only. This configuration retains the capability to relieve body cavity pressure without any external apparatus. Figure 1 shows a ball valve with one bidirectional seat and one unidirectional seat. The bidirectional

### API 6D / ISO 14313 term definitions

- Double-Block and Bleed Valve (DBB) – A single valve with two seating surfaces that, in the closed position, provides a seal against pressure from both ends of the valve with a means of venting/bleeding the cavity between the seating surfaces. NOTE: This valve does not provide positive double isolation when only one side is under pressure.
- Double-Isolation and Bleed Valve (DIB) – A single valve with two seating surfaces, each of which, in the closed position, provides a seal against pressure from a single source, with a means of venting/bleeding the cavity between the seating surfaces.

*NOTE: This feature can be provided in one direction or both directions.*

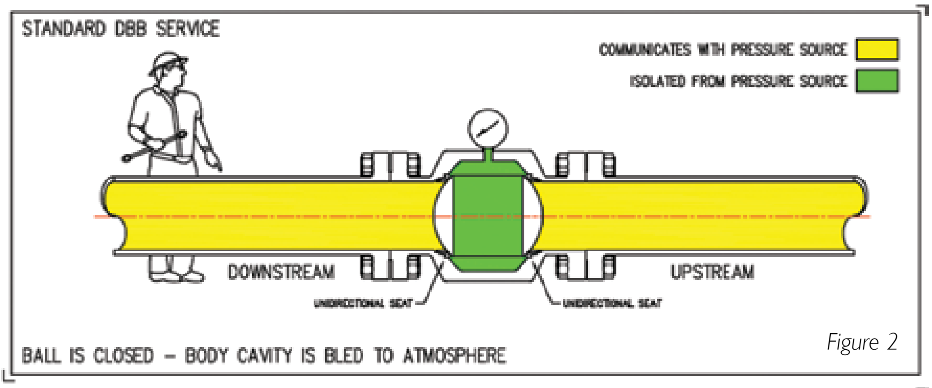

*Figure 2*

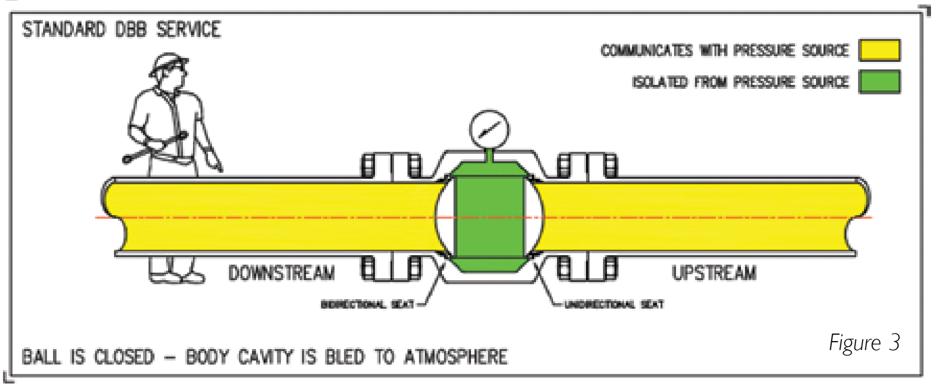

*Figure 3*

seat is at the left side of the valve.
This seat configuration provides double isolation and bleed capability for pressure applied at the right end of the valve.
The action of the seats is determined by the pressure differentials that act on the seats. For the unidirectional seat (on the right), upstream pressure urges the seat against the ball and creates a seal between the seat and the ball. The seat is urged this direction by pressure acting across the differential area between the ball seal contact diameter and the body seal contact diameter. Pressure in the body cavity urges the valve away from the ball and breaks the seal between the ball and seat, thereby relieving body pressure. The bidirectional seat is urged against the ball by pressure regardless of the location of the pressure source (upstream or in the body cavity). This is achieved by moving the effective diameter of the body seal in or out with the reversing ring on the bidirectional seat. This DIB configuration is suitable for most DIB applications because the location of the pressure source is usually known. It retains the capability to relieve body cavity pressure and retains basic DBB function as well.
Applications for DIB are numerous with the most common being for metering, process isolation of different fluids, and for block valves where line service is expected or common. The DIB feature provides the second barrier such that while piping is removed downstream (as in a repair situation) the body cavity can be monitored for upstream seat leakage. The downstream seat provides the second barrier in the event the upstream seat begins leaking during the maintenance or repair. Metering service and isolation of different process fluids have a different reason for DIB. Both applications have a very low tolerance for leakage. A closed valve that is leaking slightly can create errors in metering. The DIB provides a similar result as having two valves in series in each of these applications.

## DBB/DIB applied

In a piping system the use of DBB and DIB valves create different levels of flow control, particularly when line maintenance is foreseen. The following graphics describe the differences in how the valves perform. Figure 2 shows a standard DBB valve closed and in the double-block and bleed condition. Figure 3 shows a DIB valve in the double-block and bleed condition.
The valves perform identically in this situation. Monitoring of the body cavity would indicate whether both seats are sealing properly. In each of the figures that follow yellow indicates areas in direct communication with the pressure source and green indicates areas that are isolated from the pressure source by the valve seats.
When the valve is closed and the upstream seat is sealing properly both

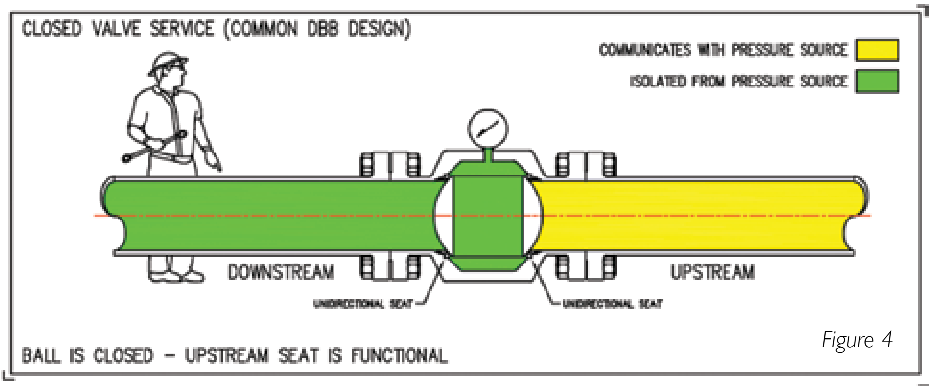

*Figure 4*

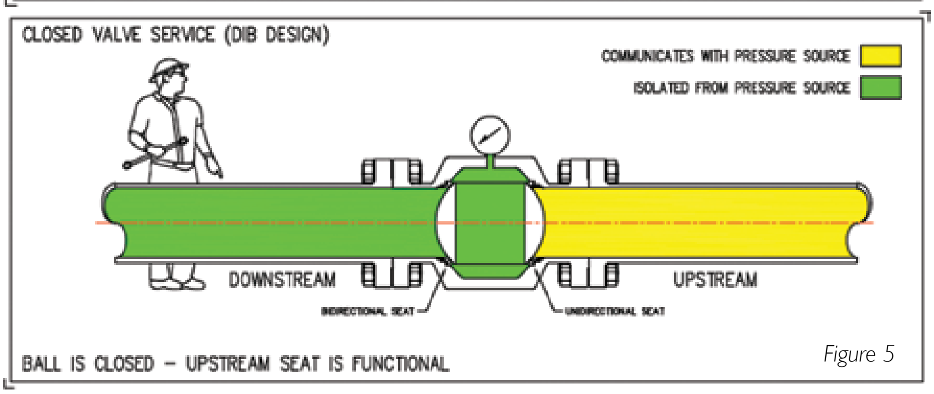

*Figure 5*

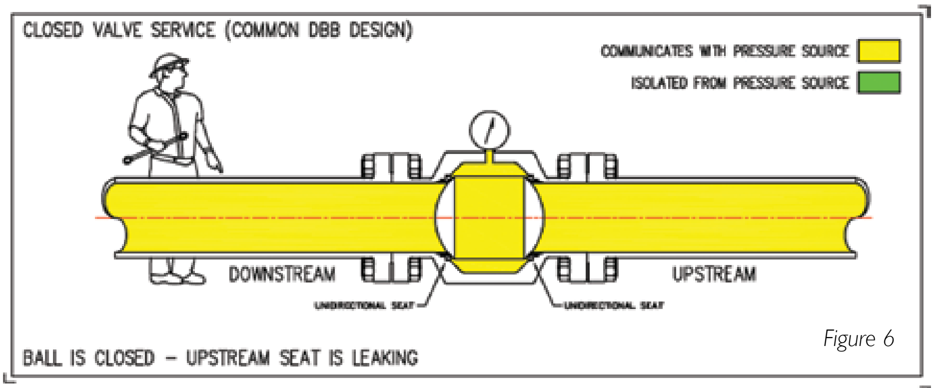

*Figure 6*

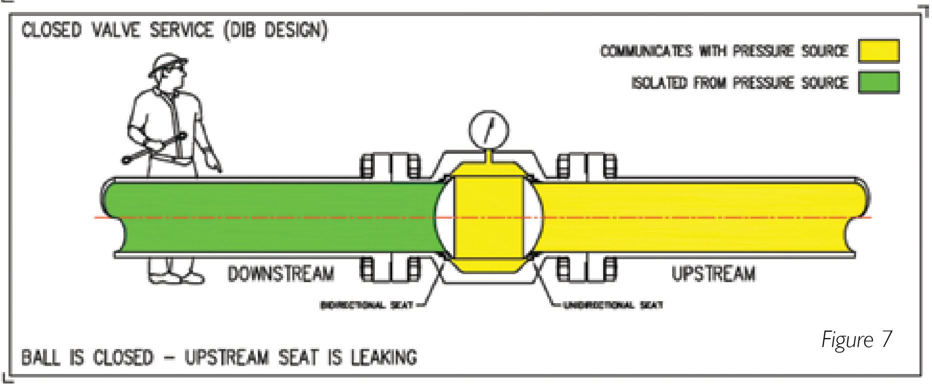

*Figure 7*

types of valve perform identically. Figure 4 shows a standard DBB valve. Figure 5 shows a DIB valve. Upstream pressure is stopped at the upstream seat and is prevented from reaching the body cavity or the downstream piping.

The performance of DBB and DIB valves start to deviate when a seat becomes compromised. Figure 6 shows a DBB valve when the upstream seat has been damaged. Figure 7 shows a DIB valve when the upstream seat has been damaged. In the DBB valve, the downstream seat pushes away from the valve once the body cavity pressure is higher than the downstream pressure, allowing fluid to flow downstream past the closed valve. In the DIB valve the downstream seat seals and prevents the upstream pressure from reaching the downstream piping.

When piping modification or maintenance is considered the performance of a DIB valve provides significant operating options that a DBB valve does not. If maintenance is to be performed downstream of the DIB valve, the body cavity is monitored to ensure the upstream seat is functioning properly. Maintenance can begin once it is established that the seats are functioning. In the unlikely event that the upstream seat develops a leak while the maintenance is taking place the downstream seat stops the leakage and prevents uncontrolled loss of fluid. Figure 8 shows the DIB valve preventing leakage past the upstream seat from reaching the downstream piping.

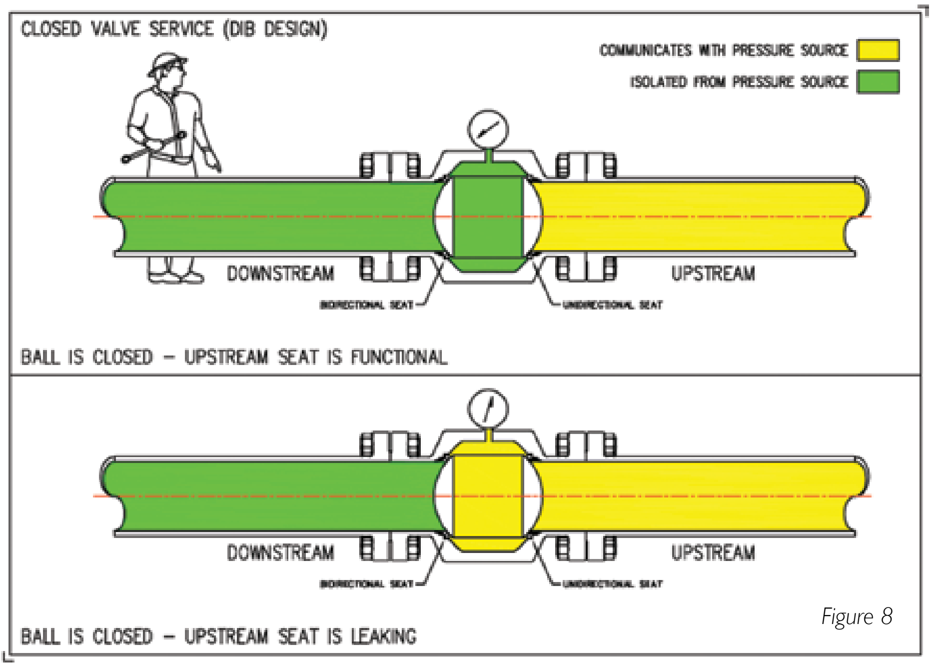

*Figure 8*

## Conclusion

A clear understanding of the similarities and differences of DBB and DIB valves is necessary when designing piping systems and ordering valves. The basic information presented has described the mechanics behind how each of the valves functions. It has also addressed how the functional differences between the valves can impact their effectiveness in particular applications. The purpose for this article is to enlighten users and sellers of ball valves and to prevent the common misuse of "double-block and bleed". When double isolation is required, specify double-isolation and bleed valves. Not double-block and bleed valves.

## About the author

Mr Jeff Partridge directs engineering and product development for Eii Valve in Houston, Texas. He has worked as an engineer in the oil and gas industry since 1992 in roles ranging from product design and development, project engineering, product evaluation, engineering consulting, and business management. Mr Partirdge has developed multiple ball valve products, other valves, and specialized equipment. He is a registered professional engineer in the state of Texas and has a Bachelor of Science in Mechanical Engineering from Texas A&M University.