

V-Port Ball Valves vs. Globe

In most process applications there are two different types of valves used: on/off and control. On/off valves are simply for allowing full flow or stopping flow completely. Control valves, in contrast have the ability to control the AMOUNT of flow, also known as throttling.

■ By Brian Booth – Assured Automation

When selecting a control valve for a particular application, there are two distinctly different valve styles to consider: V-Port ball valves, which use rotary motion; and Globe valves which use linear motion (figure 1).

No matter what type of valve is used for control applications the valve assembly requires three main components:

- 1) Valve
- 2) Actuator
- 3) Positioner

Control Valve Operation

The actuator, of course, operates the valve. The positioner controls the actuator. The control system monitors conditions such as flow rate, temperature, level, and pressure via sensors. The sensors send feedback signals to the controller which performs any logic, then sends a signal to the control valve positioner. The control signal can be a 0-10VDC or 4-20mA electrical signal, or a 3-15 psi pneumatic

signal. The positioner then controls the actuator accordingly (table 1).

Rotary valves such as ball, plug, and butterfly valves are the most common type of on/off valves and are typically NOT recommended for throttling applications for two reasons:

- 1) The seals will wear unevenly based on the partial exposure to the flowing media
- 2) The flow curve they produce is not ideal due to an uneven increase of flow when compared to the degree of rotation (Figure 3).

V-Port Ball Valves

V-Port ball valves are a specialized ball valve that are suitable for coarse control applications. At the same time, they can also provide reliable shutoff. These valves are constructed similar to full or standard port ball valves with one exception – the bore through the ball is “characterized” as opposed to a “circular bore.” As the name states, the bore is a “V,” or wedge shape. This character-

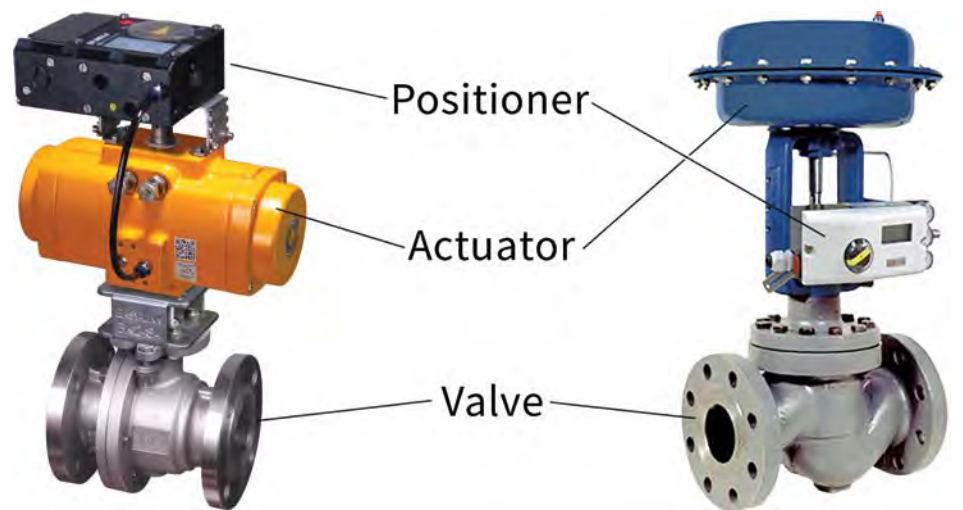


Figure 1: V-Port Ball Valve (rotary) vs. Globe Valve (linear)

Control Signal	Closed	50%	Open
0-10VDC	0	5	10
4-20mA	4	12	20
3-15 psi	3	9	15

Resulting Valve Position			
Linear (globe)	Down	Half way	Up
Rotary (V-Port ball)	0°	45°	90°

Table 1

ization evens out the flow curve, making them suitable for, and sometimes preferred for control applications.

There are many different V-Port balls available to accommodate different flow ranges with the same valve body. The most common are 60°, 30°, and 15° (Figure 2).

Globe Valves

Globe valves use linear actuation and have been the preferred type of control valve for decades. While they offer more precise control due to a more linear flow curve (Figure 3) and do not suffer the uneven wear in the mid positions, they do not typically provide a bubble tight shutoff.

Typically Globe valves have higher pressure drops than V-Port valves, since the pressure exerted is transferred to the valve stem. They also require greater force or a larger actuator to seat the valve.

Choosing Between V-Port or Globe

When selecting a control valve for any application there are many factors to consider:

What valve configuration is required?

Globe valves are available in 2-way flow control, 3-way mixing, or 3-way diverting. V-Port Ball Valves are available in 2-way flow control.

Is bubble-tight shutoff required?

Globe valves are not typically used for applications where a bubble-tight shutoff is required although they could be used in combination with a simple on/off ball, butterfly, or plug valve, or any other type of shutoff valve. This of course adds to the cost and space requirements.

V-Port Ball Valves use the “floating ball principle” which will provide a bubble tight shutoff in addition to the modulating flow control. When the valve is closed, the upstream pressure pushes the ball against the downstream seat, thus enhancing the seal.

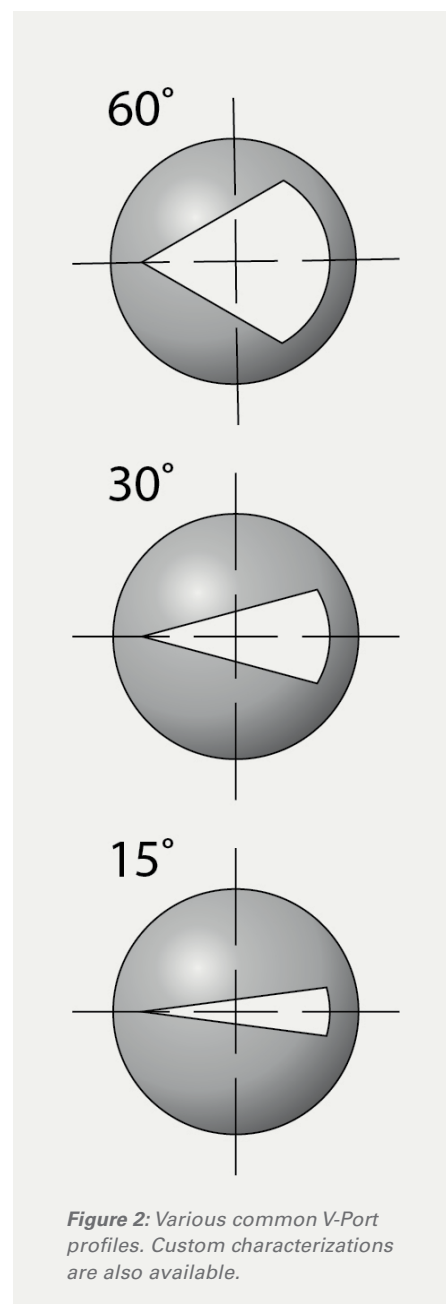



Figure 2: Various common V-Port profiles. Custom characterizations are also available.

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Valves shown are to scale.

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Valves for Control Applications

What degree of precision is required? (fine or coarse control)

Globe Valves offer finer degree of control capability than V-Port Ball Valves.

How often will the flow need to be adjusted?

Globe Valves are far better suited for high-cycle applications where the valve needs to be constantly adjusted

to maintain strict parameters. There is no contact between the plug and seat other than when in the completely closed position.

V-Port Ball Valves are geared more towards applications where infrequent adjustments are required. Frequent cycling of these will wear the seals more rapidly due to the constant contact of the ball with the seats.

What flow capacity is required?

For any given line size, a larger degree profile V-Port, i.e. 60° will provide a higher max. Cv than a globe valve of that same size (figure 4).

Is cavitation a cause for concern?

Cavitation is the occurrence of tiny explosions caused by the media changing pressure quickly and drastically causing the media to vaporize and form a bubble. This phenomenon is very noisy and can be extremely damaging to the valve, the line, and the entire system. In all cases, cavitation should be avoided.

If cavitation IS a concern, a globe valve is better solution. When media is passing through a valve, there is always a pressure drop or head loss. It is important to note that the resulting final pressure on the downstream side is NOT the lowest pressure within the flow path. There is point within the path that is the highest velocity and the lowest pressure. This is known as the Vena Contracta. The flow path in V-Port ball valves produce a much lower Vena Contracta, making the chances of cavitation much higher.

Will high temperature media be controlled?

Globe valves should usually be selected for use in higher temperature applica-

tions (above 350°F). Of course, there are other factors that vary greatly that also need to be taken into account. These include operating pressure, temperature, and seat/seal material. All of these must be checked against the valve's ratings.

Is ease of maintenance an important issue?

In many industries, particularly continuous processes, downtime can be extremely costly. Batch processes by nature have designated start and stopping times. This makes the ease of maintenance and downtime less costly.

Globe valves will most likely need less frequent seat replacements due to the lack of constant contact with the plug. Soft seats like TFE or PEEK will wear sooner than metal seats, such as stainless steel. When leakage rates exceed what is acceptable, the valve must be repaired. Fortunately, most globe valves have a bolt on bonnet, that can be removed for easy access to the plug and "drop-in" trim.

V-Port ball valves, on the other hand will have their seats wear sooner due to the constant contact of the ball and the seat. When a V-Port valve requires repair, it is the same procedure as that of a regular ball valve.

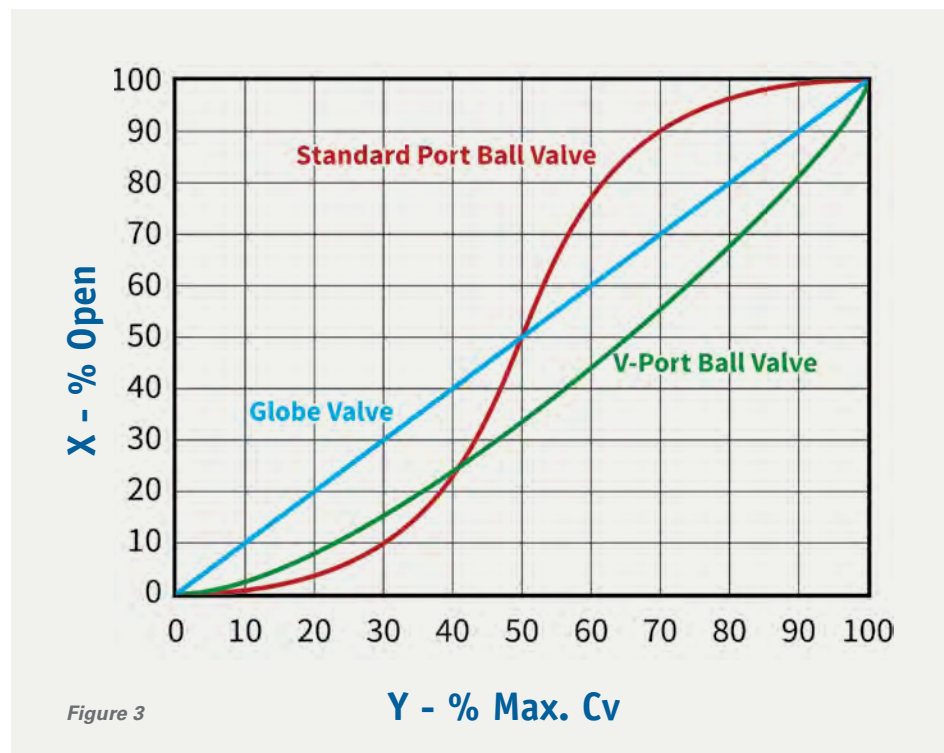


Figure 3

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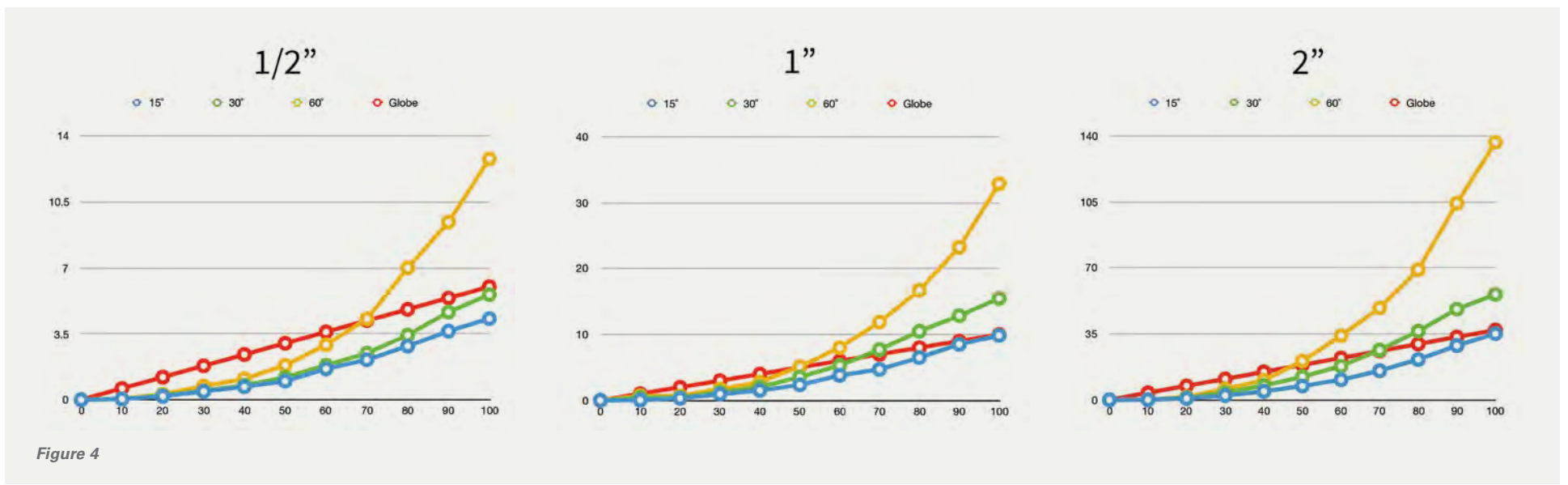


Figure 4

How much does it cost?

If there are no specific reasons listed previously to choose one vs. the other, then you should consider cost. V-Port ball valves are by far a more economical

solution. Typically, a V-Port Ball Valve will be 35% to 50% less than a Globe Valve. While considerably more expensive, Globe valves do still offer the many advantages listed (table 2).

	Globe	V-Port
Function	2-way flow control, 3-way mixing, 3-way diverting	2-way flow control
Positive Shutoff	Not leak free	YES
Control Capability	Fine	Coarse
High Duty Cycle	YES (constant)	NO
Flow Capacity	Lower	Higher
Cavitation Prevention	Preferred	—
High Temperature	Preferred	—
Ease of Maintenance	Preferred	—
Cost	—	More economical

Table 2

ABOUT THE AUTHOR



Brian Booth is Vice President of Sales and Product Manager for all thermal and remote shutoffs, including the FireChek® and FM Fire-Safe Emergency Isolation Valves at Assured Automation. The company is a leading provider of Automated Valves, Flow Components, and Fire Safety Products for industrial process control applications. Assured Automation provides state of the art automation ranging from small equipment manufacturers to the Fortune 500 manufacturing, chemical and pharmaceutical companies. The Assured Automation product line consists of a complete offering of standardized automated valve assemblies with a variety of commonly used accessory items. The company's complete valve automation services supply special automated valve assemblies designed around any specified products or particular applications. Full design capabilities are offered including AutoCAD, Solidworks or other commonly used design and drawing programs. In addition to standard products, Assured Automation develops customized solutions for specific customer requirements.

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