

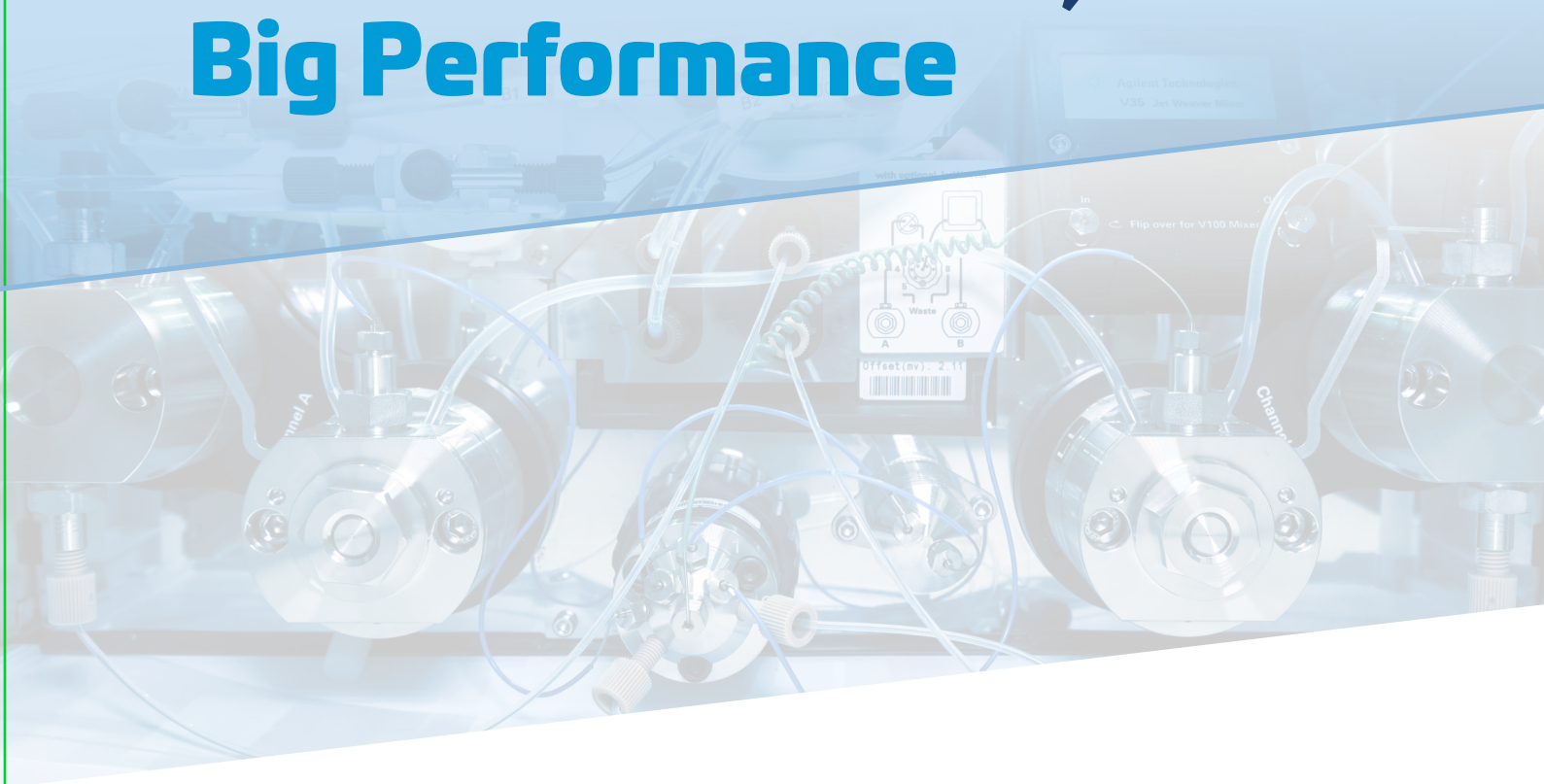
Small Check Valves, Big Performance



O'Keefe Controls Co.

If it's about precision, it's O'Keefe.

Small Check Valves, Big Performance



Widely used in industry, Check Valves are designed to allow “free” flow in one direction and prohibit flow in the reverse direction. This function is necessary for proper operation of the system in a very broad range of applications. For example, in sewer lines, large check valves are employed to keep waste flowing in only one direction. In aircraft hydraulic systems, smaller check valves are used to control the actuators in landing gear, among other uses. These two examples highlight the SIZE difference needed in check valves for industrial applications.

Larger-sized check valves have been developed for use in gas and liquid pipelines, water and steam systems, cooling towers, water treatment, and tank farms, to name a few. Smaller sized check valves play a vital role in applications such as multi-line dispensing operations, in preventing reverse flow in solenoid valves, and in preventing backflow in small reciprocating proportioning pumps. Industrial innovation has also demanded the development of MINIATURE check valves. These are ideal for use in manifolds, speed controls and pneumatic controls. In this article, we will be focusing on the advantages these small and miniature check valves bring to a wide array of industrial operations.

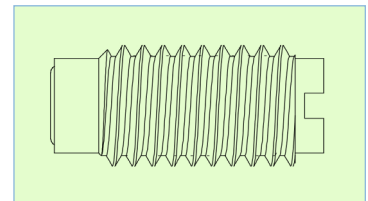
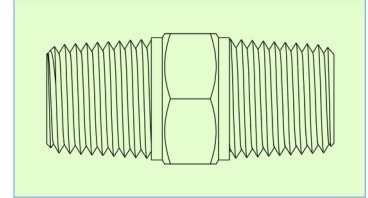
Two Design Classes Allow Control Where Needed

Although small and miniature check valves come in many shapes and sizes, they can be separated into two primary designs, *in-line* and *integral*.

In-line check valves have connections on the inlet and outlet. This allows the user to install the check valve directly into the pipe, tubing or hose that carries the fluid being controlled. There is a large selection of connections available, including NPT, 10-32 UNF, and compression tube.

Integral check valves are designed to be incorporated into a valve, manifold, or some other component in a fluid system. Again, there is a large selection of configurations available, making it easy to install an integral check valve in a system. A wide range of bodies designed to thread into a straight threaded cavity is available in US or Metric straight threads. Several sealing methods are also available.

Let's review the configurations, characteristics, and some examples of each.



In-Line Check Valves

As previously stated, In-Line Check Valves come in many different connections, including NPT, 10-32 UNF and Compression Tube, making it easy to incorporate them into a variety of systems. Checking mechanisms can include **disk type**, **spring loaded ball type** or **free-floating ball type**. Each type offers unique advantages in operation; each provides appropriate service for specific application conditions and parameters. Let's take a look at how these different types operate and the benefits of each.

Check valves are useful in preventing nozzle drips when spray painting automotive parts.



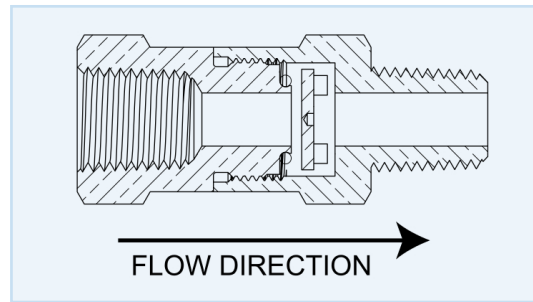
Disk Type Check Valves

Industry's Workhorse for High-Cycle Applications

Disk Type Check Valves are comprised of a floating disk and an elastomeric seat. The disk position is determined by differential pressure. In the free flow direction differential pressure pushes the disk away from the elastomeric seat and fluid flows around the disk and through the outlet port. A reverse differential pressure forces the disk against the elastomeric seal and reverse flow is prevented.



Disk Type Check Valves prevent reverse flow through rapid cycle solenoid valves used to maintain close temperatures in an environmental testing chamber.



The differential pressure needed to open or close Disk Type Check Valves is generally low, and the design is capable of many cycles. These features make them ideal for use with rapid-cycling solenoid valves, as in an environmental testing chamber application. The check valves can open and close very quickly to keep up with the solenoid valve cycling, and their construction ensures lasting reliable service.

As noted, the pressure differential needed to open the valve is low, which is advantageous for various leak testing applications. For example, Disk Type Check Valves have been used in conjunction with solenoid valves for leak testing high-altitude pressure suits used by pilots.

Another useful feature of Disk Type Check Valves is their high flow capability. Due to their construction, they can flow 4-5 times as much as a ball type check valve through a 1/4" NPT pipe, for example.

For applications across numerous varied industries requiring the unique features offered by these check valves, O'Keefe Controls Co. offers small Disk Type Check Valves, available in 1/8", 1/4", and 3/8" NPT or in 10-32 UNF threads, in female by female or male by female configurations. The durable construction of Brass or 303SS bodies, with disk materials of brass, 303SS or Delrin, ensures reliable, long-life service.



Disk Type Check Valves can play a role in leak testing high altitude pressure suits.

Ball Type Check Valves

High Performance Across a Wide Variety of Applications

Ball Type Check Valves are available with or without springs. The operation of the free-floating, or springless, version is similar to the Disk Type Check Valve in that the ball position is determined by differential pressure. However, unlike the disk type elastomeric seat, the ball type uses a metal-to-metal seat, thus expanding the pressure rating substantially.

A common use of Ball Type Check Valves is in protecting small reciprocating pumps and other equipment from damage caused by backflow, when pressure changes in the piping cause flow reversal. Ball Type Check Valves are also used to prevent reverse flow through solenoid valves, especially in higher pressure applications.



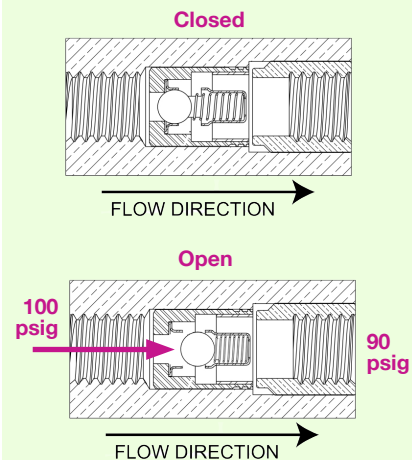
Check Valves are useful in bioreactors to help control the pressure and gas mixing operations.

In addition to the above applications, Ball Type Check Valves can be incorporated into fill operations and multi-line dispensing systems and industrial spray nozzle applications, to minimize dripping.

Incorporating a return spring into the assembly ensures the ball returns to its seat with or without a differential pressure. A return spring also introduces a **cracking pressure** (See sidebar). These inline spring-loaded ball type check valves can be used with expansion valves for pressure relief applications. The ball moves away from the valve seat when the force of the upstream pressure exerts a greater force than that of the spring, allowing the media to pass through the outlet port.

What is Cracking Pressure?

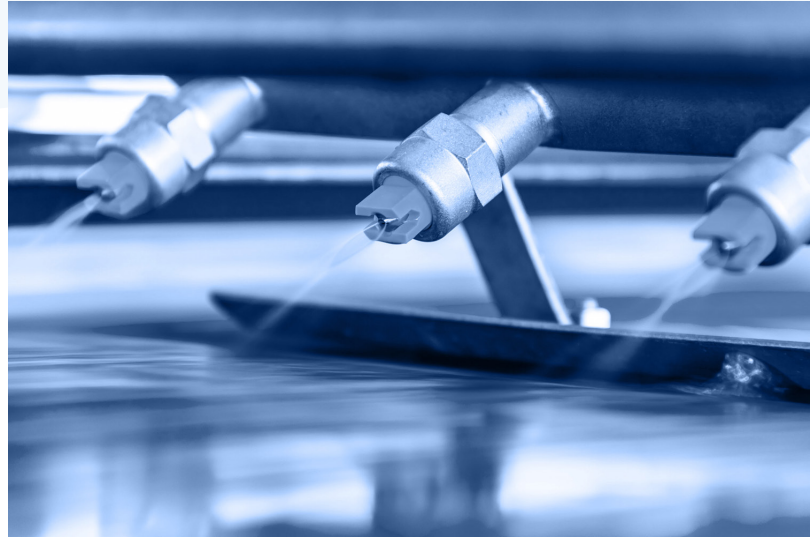
A **cracking pressure** is the minimum differential needed to open the valve and allow free flow. As an example, a check valve with a 10 psi cracking pressure requires a minimum differential pressure of 10 psi between the inlet and outlet ports. The valve will open and free flow with 10 psig on the inlet discharging to atmosphere, or at 100 psig discharging to 90 psig.



Check valves control dripping in filling and dispensing operations in Food and Beverage production.

For the myriad smaller-sized, in-line industrial applications that require a fluid checking function, O’Keefe Controls Co. offers a variety of rugged, long-life Ball Type Check Valves, in brass or 303SS with Stainless steel interiors. To ease finding the right fitting for integration into a system, they are available in 1/8” and 1/4” NPT, or 10-32 UNF threads, with the choice of male by male, male by female or female by female configurations.

The free-floating ball style (no return spring) is also available in a compression tube fitting, used to attach both the inlet and the outlet of the check valve. For this version, 1/8”, 1/4” and 3/8” OD tube connection sizes are offered. Balls are available in stainless steel or elastomeric materials. The extensive variety of configurations, sizes, and cracking pressure options enables engineers across industries to find the perfect fit for many diverse applications.

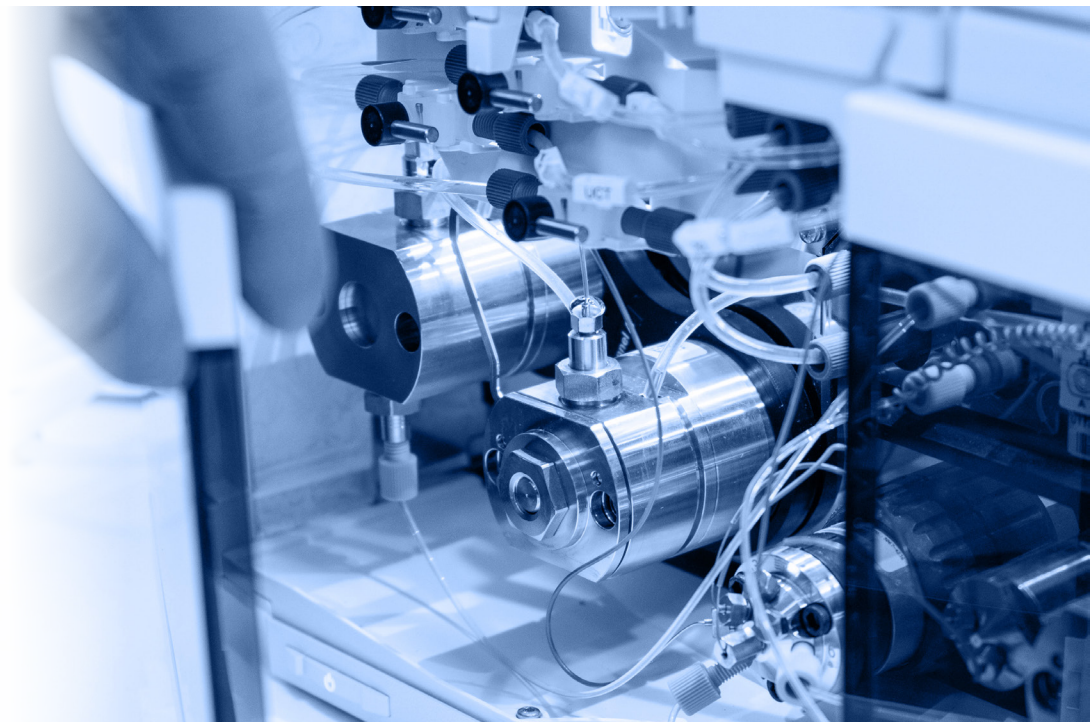


Minimizing spray nozzle dripping is aided by check valves in industrial paint and lacquering operations.

Integral Check Valves

In applications where size and weight are a concern, an *integral check valve* can often be a convenient option. Integral check valves are designed to fit into some other existing device like a valve, manifold, vessel wall or perhaps another fitting. The most common integral check valve consists of a threaded body that is intended to be threaded into the other device using a screw slot or hex drive.

Due to their size, integral threaded insert check valves are useful in highly miniature environments, as in some medical research applications.

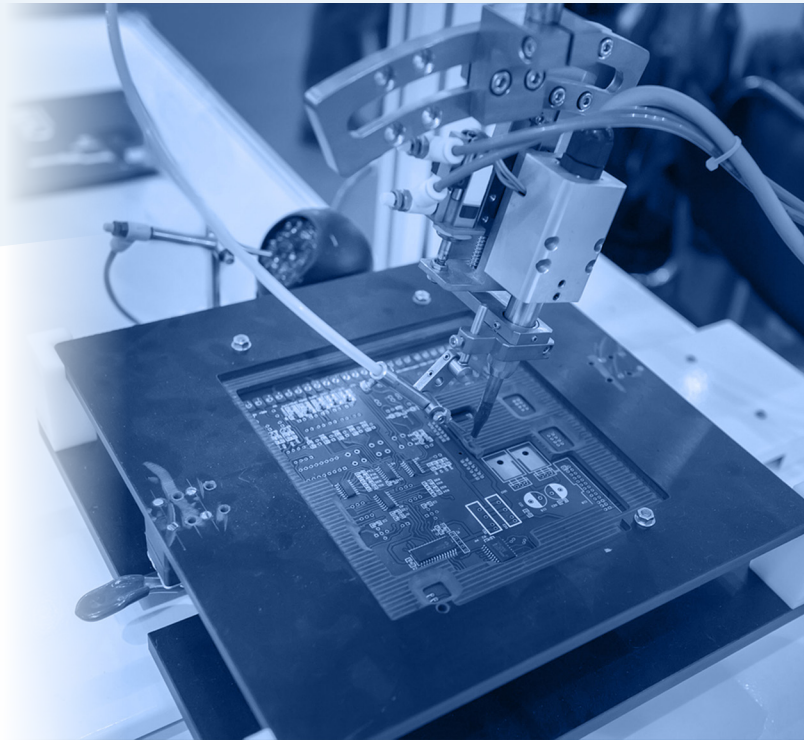


O'Keefe Controls Co. specializes in manufacturing these miniature check valves, offering a number of configurations which answer the needs of a broad range of industrial applications. For example, they can be useful in miniature pneumatic control and speed control applications.

Available as either a spring-loaded ball type or a free-floating ball type, they feature durable brass or stainless steel bodies, with a ball of stainless steel or elastomeric material such as Viton or Buna N. Additionally, a large range of threads are available. In instances where miniaturization is paramount, threads as small as 6-32 UNC or M3.5 can be used.

It should be noted that threaded check valves generally require a thread sealant to prevent spiral leakage around the threads. A unique alternate sealing option, offered by O'Keefe Controls Co., is the use of a **nose seal**

construction. A nose seal is an O-ring seal on the leading end of the check valve that can seal against a flat surface. This option can save time and expense in installation.



Integral Check Valves can be utilized in miniature pneumatic control manufacturing operations, such as in controlling a robotic hand.

Summary

Check Valves are used extensively throughout industry, simply to prevent unwanted reverse flow. There are many common applications for very large check valves, which are designed specifically to satisfy those requirements. Not to be dismissed are the countless industrial applications where small, and even miniature, check valves play a vital role. Incorporated into a system, these check valves help ensure the success of a process, the protection of the equipment, or even the safety of the operating environment and its workers.

Understanding the needs and answering the call of this "smaller-sized application" industrial sector, O'Keefe Controls Co. has remained a leader in providing small and miniature Check Valves. Precisely engineered to provide reliable, long-life performance, they are offered in numerous configurations to address the broad range of small and miniature applications that currently exist, and have yet to be developed.