Modularity in valve technology re-defined:

How innovative new valve body concepts can simplify the design of complex valve interfaces

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Modularity in valve technology re-defined

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Fluid connections for valves and sensors in the process industry challenge system planners, pipe constructors and installers to implement a piping system that is as simple as possible, quick to install and free of leaks. In addition, the solution should be cost-effective and should require minimal installation space. An innovative valve body concept that partially eliminates the need for conventional piping can help to meet these requirements in practice.

The combining, distribution or mixing of fluid flows by means of valves is one of the essential basic processes in production systems for just about every industrial sector. The piping or fluid connections of the various valves and sensors generally involves extensive planning and installation. This increases with the number of valves used in the system. The complex tasks performed by such systems include mixing of different fluids, as in food and beverage production, or cooling of systems by means of several cooling circuits.

In the classic scenario, valves and sensors are joined by means of piping components that are connected using conventional connecting technology, such as threaded, flanged, adhesive or welded connections. The disadvantages of such connections include high installation expense and extensive space requirements for the piping (Fig. 1). During installation, all pipes must be cut to length, bent and screwed together using 90° elbow or T joints. Each single threaded connection has to be sealed and presents a potential weak spot for leaks in the completed system. Besides the high time and material requirements for the installation, the conventional design is always prone to

the risk of leaking connections, especially in the case of alternating temperatures.

Valve systems used in the past for conventional piping are designed so that the inlet to the valve and the outlet from the valve are at one level. Inside the valve, the fluid flow is conducted through a seat. This method technically requires redirecting the fluid three times: In the inlet to the seat by 90°, in the seat itself 180° and finally in the outlet by another 90° (Fig. 2). This construction inevitably causes flow losses in the valve, which negatively affect the kv value – a factor that must be taken into account when selecting and dimensioning a valve.

Fig. 1: Conventional piping of valves based on the example of alternate tempering of injection moulding tools

In the new, modular basic body the inlet level and the outlet level are separate (Fig. 2). Since the fluid flow now only has to be redirected by 180°, this increases the flow coefficient. Separating the two levels also improves the design in other ways: The inlet and outlet level can now be connected directly with other valve bodies, without additional piping. The connections of the basic bodies can be designed according to user-specific requirements. A pipe connection between the single valves is no longer necessary, since the fluid connection is established simply by joining the valve bodies. Depending on the required flow rate and the application, different solutions are possible, two of which are described below.

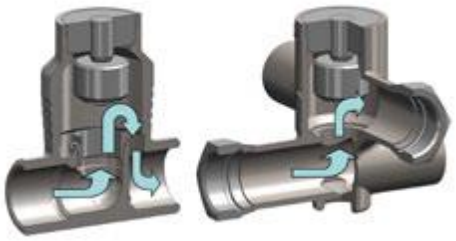

Fig. 2: Internal media flows in the case of a standard valve body (left) and modular body

Modular valve bodies connected by a connecting rod

In this solution, the modular valve bodies are connected with each other by means of connecting rods (Fig. 3). At the inlet and outlet level, up to four connections are possible, which can be designed differently based on the requirements of the application. The actual fluid connection is achieved by join-

ing several valve bodies. Heat-resistant graphite rings are used for the seals between the bodies.

This solutions offers several advantages in comparison with conventional pipe connections. The elimination of piping between the valves reduces the fluid path and therefore minimizes flow losses with a minimal enclosed fluid volume. This also minimizes the required installation space. In order to construct a highly effective and extremely compact system, the bodies can also be combined with stainless steel actuators with an On/Off plug or a control plug. Sensors for measuring flow rate, temperature or pressure, as well as filters or check valves, can also be integrated.

Directly welded modular valve bodies

In this solution, several valve bodies are joined to form a block using orbital welding (TIG) technology (Fig. 3). The dimensions of the valve bodies are adapted so that conventional orbital electrode holders can be used during assembly. For each inlet and outlet level, two connections are possible, which can be designed differently based on the requirements of the application. All connections (G, NPT, RC threads) are established by welding.

Fig. 3: Modular basic valve body DN20/25 (left) and DN10 (right)

The welded valve body makes this valve solution extremely robust and compact. The bodies can be combined with all standard Bürkert drives, which in turn can be used together with a position indicator or positioner. In addition, it is possible to integrate sensors for measuring flow rate, temperature or pressure. This solution is extremely variable with respect to the connecting threads and connecting technology, so that it can be adapted flexibly to the requirements of the respective application.

Increased functional reliability combined with reduced space requirements

The target groups for the new valve body concept are OEMs and plant engineers and integrators, who have only limited installation space available for fluid function solutions. The significantly reduced piping requirements save not only space, but also costs for extensive planning and installation, as well as material. Fewer pipe connections also mean fewer potential weak points and increased functional reliability due to a lower risk of leaks.

But industrial end users can also benefit directly from the advantages of the innovative solution. The concept was developed under the premises of “mass customization” so that it also allows the cost-effective production of customized solutions in small batches. One example of such an application would be

a solution for alternate tempering of injection moulding tools (Fig. 4). The injection moulding tool is connected to connections A1 and P1, while connections A2 and P2 are connected to the tempering unit for cooling. Connections A3 and P3 are available for another tempering unit for heating. The advantages of this solution:

- The extremely compact design requires only minimal installation space. (See also comparison of Fig. 1 with Fig. 4)
- Only a very small volume is enclosed between the valve block and the injection moulding tool.
- The exchange of tempering fluid between the two tempering units is very low.

Fig. 4: 6x block for alternate tempering of injection moulding tools In the Graphic: Internal channel routing

The innovative, modular valve body eliminates the need for conventional pipeline connections between single valves. The fluid connections are established by direct joining of the valve bodies, which can be achieved in different ways. Plant engineers therefore have the capability of easy and fast implementation of extremely compact and robust valve systems with high functional reliability. The modular design of the valve bodies also enables the cost-effective production of small quantities. The separation of the inlet and outlet levels in the new valve bodies makes it possible to optimize the kv value due to reduced redirection of the fluid flow in comparison with conventional valves.

Contact

Can we help you to simplify the design of complex valve interfaces in your systems with our innovative new valve body concepts or do you have further questions? Just contact us:

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