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Flange valves: one modular system for all applications

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The extremely wide application spectrum for flange valves ranges from MEMS and fluid technology to multiple aspects of processing technology and power engineering. This article describes a modular system, which was developed by GSR – a leading manufacturer of flange valves – in order to enable an optimal adjustment of the valves to the individual application.

Standard product or individual design? Mechanical engineers are often confronted with this question, when they need components for demanding machinery and plants. When they choose a standard product, they know for sure that the cost outline will be favourable, but on the other hand, they have to accept that the component does not accurately meet the requirements. If they prefer using an individually designed product, they will have to accept that the engineering costs will be high – as will be the costs – and no statements or claims can be made as availability and process safety are regarded, since they cannot revert to previous experiences with this component.

The best of both worlds

Both methods have their advantages and disadvantages. GSR Ventiltechnik has developed a product concept (Figure 1), which offers the user the "best of both worlds": a modular system for flange valves enabling the configuration of valves for demanding applications.

As the system has grown through the years, this modular design from GSR meanwhile also covers rather "exotic" applications. The spectrum originally was limited to rather small nominal widths and applications for the conventional fluid technology, but nowadays versions for special fields, e.g. high-temperature and high-pressure applica-

tions as well as saltwater-resistant versions are included as well.

Arbitrary control type

The basics of the modular system are valve series with piston, diaphragm and poppet seals which are available for different pressure ranges. Hereby, nominal sizes from DN 15 to DN 300 and maximum pressures from 16 to 160 bar are achieved. These designs can be combined with different control types; the modular programme includes direct acting valves, pilot operated valves and force pilot operated valves with manual, electrical and pneumatic

operation. The casings are made of brass, stainless steel or GG-25 or GS-C25 and of course, different sealing materials such as NBR, EPDM, FKM and PTFE are offered as well.

High safety level

As the valves are increasingly used in demanding and sometimes even critical fields of application, they offer a high degree of safety. The force pilot operated solenoid valves as from nominal size DN 32 for instance are as a standard equipped with an adjustable close dampening, in order to avoid water hammer effects when the valve is clos-



Fig. 1: Overview of flange valves, different control types

ing. For higher pressures (25 to 150 bar), the diaphragm of the pilot operated valves is replaced with a robust piston as sealing element. These constructive details create the perfect conditions for a reliable operation of the valve during an extremely long time.

Large options programme

This programme, by means of which some 40 different series can be generated, covers the needs of many fields of applications, from filling systems, brewing equipment and chemical plants to refineries, power plant technology, water treatment and drinking-water supply. The application possibilities can be further extended by means of the numerous available options.

These options include, for instance, position indicators with different detection principles (capacitive, inductive or Reed contacts) for monitoring the valve position. If one position indicator is used, the "off" position will be displayed; if two position indicators are used, both the "on" and "off" position will be displayed.

As the electrical connection is regarded, variants for all common AC and DC circuits from 12 to 240 V with cable connection or terminal box wiring are available. And if the user cannot

find anything in the line of his application, a connection for special voltages can be supplied. Further options include, amongst other things, NPT threads, casings free of oil and grease as well as in nonferrous heavy metal and versions with a special surface treatment for open-air assembly.

Option for burner control systems: the hydraulic brake

Some of these options are intended for very specific applications, for instance the so-called hydraulic or oil brake (**Figure 2**). This additional module is especially used for valves regulating the gas supply on large gas furnaces, which are usually installed on the continuous hardening furnaces in the steel industry. Here, the hydraulic brake ensures that the flame is not smothered or extinguished by the inflow of gas. The hydraulic brake thus enables a failure-free operation of the furnace and simultaneously serves as safety equipment.

The essential component of the hydraulic brake is a pneumatically controlled pilot valve, which is connected to the control system of the plant. The valve opens slowly and interrupts the flow within 0.5 seconds in case of danger. This simple yet efficient option is certified for this kind of applications and can be used for valves with nominal sizes of up to DN 150.

Integration in automatic control systems

The options programme of the modular flange valve system also includes a regulator. This module enables the integration of the valve in automatic control systems, where it can be used for the flow rate regulation, e.g. in mixing and dosing processes. The regulator has a control system equipped with an actual value generator, which queries the spindle position, and a monitoring module to synchronise the actual and the target value. The connection to the control system of the plant is realised through standard interfaces and the module has an accuracy of approximately 5%. In case of a failure of the control system, the valve autonomously closes and remains in zero position, thus contributing to the process safety as well.

Series for high-temperature applications

High-quality valves are often used to transport hot media or need to operate in high ambient temperatures, for instance in power plant technology, steel processing, surface hardening technology or steam generators. For such applications, GSR has extended the flange valve system with multiple force pilot operated, direct acting and direct pressure controlled versions, which can be used for temperatures of up to 250, 300, 350 and 400 °C.

Comprehensive programme for explosion protection

Explosion risks are not a "monopoly" of the chemical industry. In power generators for instance, inflammable gases are used as well. For handling this kind of media, the valve system includes a comprehensive programme of flange valves for the gas-Ex zones 1 and 2. GSR has a thorough know how in this safety-critical field, which is permanently extended. GSR also manufactures saltwater-resistant Ex valves for offshore plants.

Gas and hydrogen handling: a growing market

Ex supply valves for CNG filling stations are an important and growing



Fig. 2: Flange valve with oil brake



Fig. 3: Valve for CNG filling stations



Fig. 4: Multiport valve for CNG stations

market. GSR valves are used in natural gas distribution networks as well (Figure 3 and 4). These applications require valves equipped with large valve seats and a robust design, which are suitable for pressures up to 350 bar and feature a long life even under rough ambient conditions. For this demanding business, GSR supplies the valve technology for the entire process chain from compressor to gas pump.

Development project: hydrogen valves for fuel cells

The GSR engineers are currently dealing with the energy source of the future: when hydrogen is used to drive fuel cells or direct injection engines, special valves are needed, resisting to pressures up to 900 bar (Figure 5). These valves however cannot be assembled with the standard components of the modular valve system, as such high

pressures require a special casing. Some of the options however still can be used.

Also suitable for niche applications

This overview and the quoted application examples prove that the flange valve system from GSR covers a very large field of applications. Even for niche applications, "custom-made" valves can be configured at reasonable engineering costs. To this end, competent application-specific technical advice as well as a highly flexible production process is required in addition to the modular valve system.

High degree of vertical integration, flexible production

The manufacturer of a comprehensive product range with many options must

have a flexible production process. GSR meets this requirement: even for batch size 1, an economic production is guaranteed and due to the high degree of vertical integration, the delivery times are short. The single-part production however is not often deployed, as the individual valve is configured on the basis of the modular system. In such case, the individual work often is limited to "just" the assembly. This also offers the advantage that spare parts are quickly at hand, even after long uptimes. GSR frequently supplies spare and wear parts from stock for valves, which have been manufactured some 15 years ago and which are still operational today without noteworthy failures.

The prerequisites: advice and consultancy

The GSR technicians provide their customers with detailed information and advice, so that they can select the optimal valve from the modular system. For the media to be transported, the applied processes and the boundary conditions as well as the applicable safety prescriptions and certifications play an important part in making the right choice. GSR provides its customers worldwide with competent consultancy. The Chinese market for instance is an important export market to GSR notwithstanding the fierce competition of local companies. Here, the customers are advised by engineers, who have been trained in Germany. GSR furthermore is only active in the upper quality segment, which is an additional advantage compared to the competition: many international machinery and plant builders, who consider safety, long lifetime, long maintenance intervals and high availability of spare parts of paramount importance, frequently use the valve technology from GSR.



Fig. 5: RRV® Rapid Reaction Valve resisting to pressures up to 900 bar



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