

# Industrial Valves

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## Butterfly valves in municipal water management

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*Butterfly valves of various types have been manufactured for more than 50 years. They have stood the test of time in a wide variety of operating conditions throughout the world. Without butterfly valves modern water management would be inconceivable. Butterfly valves play an important role wherever water is stored, transported, treated and distributed. What counts most are durability and decades of functional reliability. Valves used in water management have to withstand enormous loads, high water pressures, critical flow velocities as well as extreme temperatures and weather conditions, whether in tropical climates or in the desert. Therefore the materials of construction have to be just right. That's because modernizing valves, which can often weigh tonnes, is very costly, particularly in major supply lines. VAG valves help to precisely control the complex processing systems required for this and to make them even more efficient through automation.*

## Design

Butterfly valves are isolating valves in which the closure device – the valve disk – rotates on its own axis parallel or perpendicular to the flow. Depending on the type of construction and installation the valve disk is positioned either horizontally or vertically in the pipeline with the medium flowing around it.

According to DIN EN 593 (formerly DIN 3354) designs are differentiated by the type of connection and the shaft bearing of the valve disk. The type of connection is called a double flange butterfly valve (**Figure 1**) or a wafer type butterfly valve (**Figure 2**).

With respect to shaft bearings a difference is made among

- butterfly valve with centric shaft bearing
- butterfly valve with eccentric shaft bearing
- butterfly valve with double eccentric shaft bearing

Tightness of the seal is one of the most important criteria of butterfly valves. That is why both the sealing system and

sealing kinematics (geometry of motion) are of great significance for a 100 % tight seal. For butterfly valves with centric shaft bearing no sealing force component results from the rotational movement. For soft seated butterfly valves sealing takes place when there is enough surface pressure between the elastomer of the closure device (disk) and the sealing seat in the housing.

The advantage of a double eccentric bearing is that the disk's point of rota-

tion lies both horizontally and vertically outside of the sealing plane. In open position the disk is located either above or below the pipe axis. In open position the sealing ring, also referred to as a profile ring, for the most part arranged directly on the disk is unstressed over the entire circumference. In this way no deformations of the profile ring will take place even when in prolonged open position. Another advantage of double eccentric butterfly valves is shown by sizes above DN 1000. The profile ring



**Fig. 1:** VAG EKN® Butterfly Valve with flanges



**Fig. 2:** VAG CEREX® 300 Butterfly Valve wafer type

can then be replaced in installed state without having to disassemble the disk or remove the valve from the pipeline.

Soft seated butterfly valves are usually manufactured in a nominal size range of up to several meters in diameter and at pressure ratings of more than 40 bar.

In addition, a difference is made between medium-contacting and medium non-contacting body designs. Butterfly valves with centric bearing are predominantly not made with medium-contacting housings. An elastomer is used here as a body lining which at the same time provides the body corrosion protection. butterfly valves with double eccentric bearing are almost always medium-contacting. However, for use in municipal water supply the inner surfaces are usually given an epoxy-based coating for corrosion protection.

### Highest demands on valve technology

The protection of our environment requires sophisticated systems and processing technology. Thus, the demands of consultants and operators of water technology plants on functional safety and reliability are also greater. In addition, in the selection of valves from an



**Fig. 3:** Coating thickness test on a VAG EKN® Butterfly Valve

economic viewpoint, consultants, planners, plant manufacturers and operators are increasingly focusing on all-purpose products with installation advantages and a high degree of operational reliability. The highest demands of quality and user-friendliness are being made on valves. All components must enable the absolute trouble-free and fully automated operation of water treatment and supply facilities.

The type of coating and associated certification is of the utmost importance in the selection of valves. Valves with the RAL quality mark meet the requirements for "heavy-duty corrosion protection". This guarantees the user a perfect and

tested epoxy-based coating quality and thus safe and reliable coating suitable for use in drinking water systems (**Figure 3**). In the present state of the art, epoxy technology is the most advanced coating process. This entails spraying the sandblasted and heated valve housing with coating powder which then melts. An all-round coating with an average layer thickness of 250 microns guarantees maximum adhesion and long-term protection from external influences. The RAL quality mark is only awarded to manufacturers who satisfy the high demands of comprehensive quality assurance (**Figure 4**). Drinking water must be free from pathogens, fit for human consumption



**Fig. 4:** Porosity testing the coating on a VAG EKN® Butterfly Valve



**Fig. 5:** VAG EKN® Butterfly Valve DN 4000

and pure. Consumer confidence in the drinking water supply is high and a DVGW (German Technical and Scientific Association for Gas and Water) certificate shows that the acknowledged high standards of performance are fulfilled for German water supply systems. Among other things, each valve must be fit for purpose, tested with 2500 load cycles. Moreover, certification of the elastomers used (for the profile sealing ring made of EPDM) assures no negative micro-bacteriological growth in accordance with DVGW worksheet W 270. VAG Butterfly Valves meet all of these requirements to the fullest extent.

### Range of use of VAG EKN® Butterfly Valves

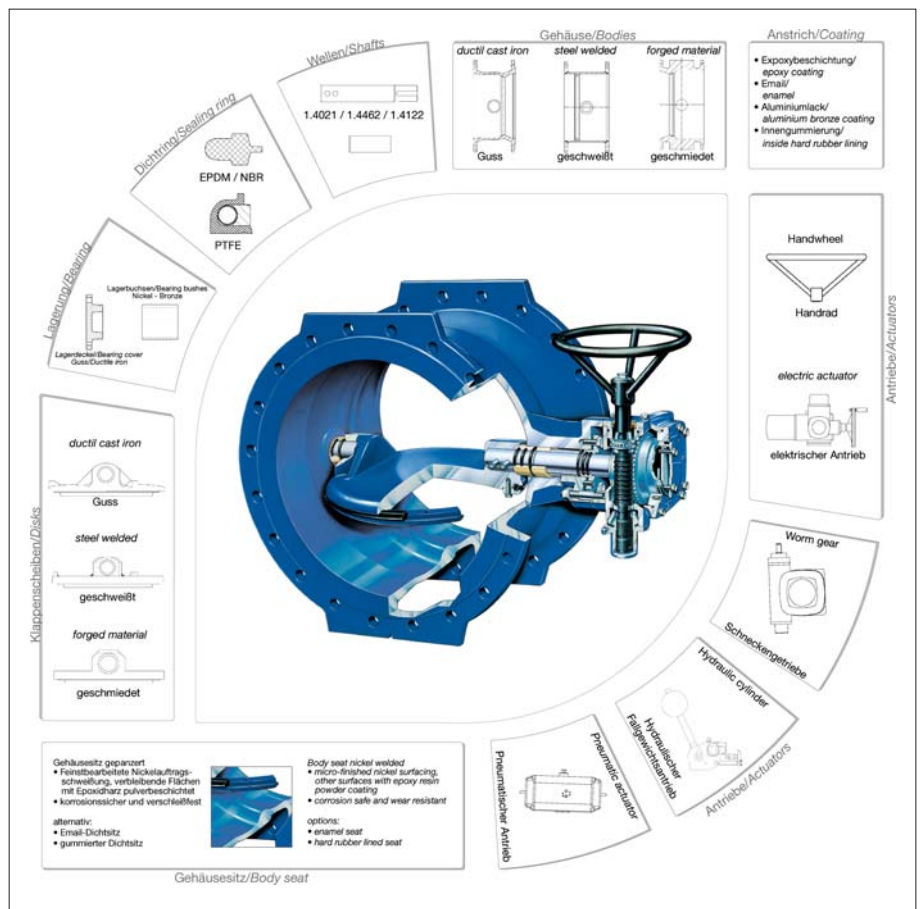
VAG-Armaturen is expanding its range of butterfly valves to include diameters of up to DN 4000. The long established and proven VAG EKN® Butterfly Valve is available in all nominal diameters from DN 100 to DN 4000 (**Figure 5**). In addition to the tried and tested F4 series, a "short pattern" series (in accordance with EN 558-1, basic series 13, formerly DIN 3202, F16) up to DN 1500 is now available. The new double flange butterfly valve design now provides an all-purpose installation op-

tion of the valve, even at full differential pressure. The 100 % tightness of both flow directions is assured by means of

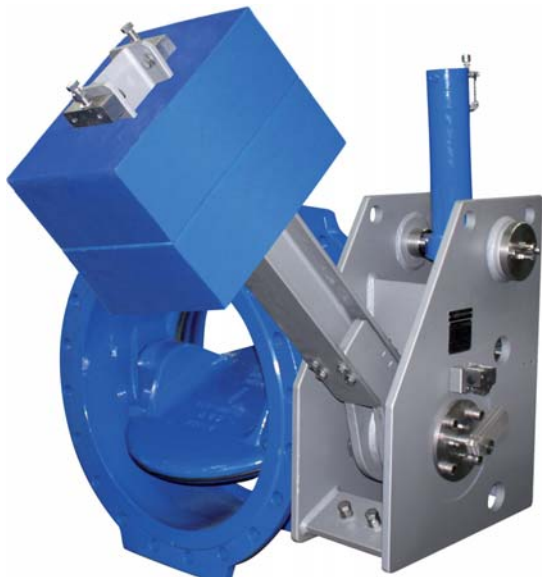
a pressure-assisted profile sealing ring. Depending on the nominal diameter, the VAG EKN® Butterfly Valve can now be used at operating pressures of more than 50 bar. When the valve is closed the pipeline can be dismantled on one side even under operating pressure. All of these advantages result in the reduction of potential installation errors during on-site assembly and thus greatly increase safety during assembly: The EKN® Butterfly Valve is the universal standard valve and provides the user significant advantages compared to other commonly available butterfly valves.

A high degree of operational reliability is assured from unrestricted tightness in both flow directions. The double O-ring sealing in the shaft bearing, the closed bearing eyes in the area of the axle bearing and a housing seat seal as nickel plating enable reliable long-term operation, even over de-cades.

**Figure 6** shows the universal combinations of materials that can be achieved with the VAG EKN® Butterfly Valve.



**Fig. 6:** Large variety of VAG EKN® Butterfly Valve models



**Fig. 7:** VAG EKN® Butterfly Valve with VAG HYsec hydraulic brake and lift unit

dirt particles from lodging in the lower bearing bracket of the disk. Like all isolating valves, the flanges of butterfly valves should be tightened evenly and plane parallel to one another in order to avoid warping of the valve body. The bases mounted to valve bodies are not suitable for the transmission of longitudinal forces on foundations. Moreover, butterfly valves should also not be used as fixed points for absorbing piping forces. For larger butterfly valves with diameters of DN 1200 or greater it is recommended to use concrete foundations to absorb the weight of the valves, thus preventing the weight of the valves and water loads from being transferred to the pipeline.

The main field of application of the VAG EKN® Butterfly Valve is in municipal water supply. Beginning with water delivery, transport lines, in use in water treatment plants to drinking water supply networks, where the VAG EKN® Butterfly Valve has stood the test of time over decades in many projects throughout the world.

### Actuators for butterfly valves

By means of actuators external forces are transmitted to the disk in order to safely and reliably move it in any operating situation. butterfly valves are equipped with mechanical, electric, pneumatic or hydraulic actuators. butterfly valves with mechanical actuators (predominantly with manual worm gears) are employed in plants as well as underground. Valves with electric or pneumatic actuators are used to automate plants. If performance and safety of the water supply system is essential then t, valves with hydraulic actuators are predominantly used. For the most part as a hydraulic brake and lift cylinder, e. g., in pumping stations as a "controlled" non-return valve with controlled closing movement. You can efficiently and safely move the valve using the electro-hydraulic control. The modular design of the VAG HYsec brake and lift cylinder permits use in a variety of applications. Additional features can be implemented quickly and easily by adding various modules. For check valves, for example, that must be acti-

vated as quick opening valves without auxiliary power. Or as combined quick closing and control devices.

In combination with a switch or signalling unit, brake and lift cylinders always deliver high performance even for this application. Wherever brake and lift cylinders from VAG are used the highest level of safety must be assured (**Figure 7**). VAG HYsec brake and lift units integrate all drive, actuator and control units in a compact assembly. The ready to operate unit is available for delivery in your option of mounted terminal or control box. The unit only needs to be connected to the power supply to be put into operation. The valve and actuator are ready for operation in just a few steps. The actuators are also well prepared for individual use. Actuating times can be easily and individually set on site and the adjustable flow controller assists in this.

### Installation guidelines for butterfly valves

To ensure the best possible flow conditions, butterfly valves should never be installed directly after pumps or elbows. A straight section of stilling pipe of at least 3 to 5 x DN must first be installed. While butterfly valves can be installed in horizontally positioned pipelines with both horizontal and vertical disks, the general recommendation for contaminated water is to install the disk in horizontal position. This largely prevents

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### The Company

VAG's valves and solutions cover the entire process of collecting, transporting and storing drinking and industrial water. Moreover the company is a solution partner for leading power station operators and industrial enterprises: chemical or steel manufacturers, conventional or nuclear power plants. Many types of valves guarantee operational safety for example in cooling water circuits, district heating networks or water treatment plants.

**VAG Group** is a global company with 130 sales representatives taking care of customers on every continent. Since its founding in 1872, the company has been known for its international character and quality "Made in Germany". The head office is in Mannheim (Germany) from where it delivers products all over the world.

VAG is a company with German roots with lots of experience in the design and manufacturing of heavy-duty valves for all kinds of water applications. With more than 1,000 employees worldwide the valve manufacturer is a globally active company and is setting new standards as a solution and system provider in water and wastewater technology. With 17 subsidiaries and 4 production facilities VAG is at home around the world.



## Water – we help it flow

For more than 130 years, VAG-Armaturen is everywhere water is exploited, processed, stored, and distributed. Our name is closely tied to modern water management. We make high-quality valves and system solutions that enable water to be managed efficiently. Our development and manufacturing headquarters in Mannheim are supported by manufacturing sites around the world, and our worldwide distribution network guarantees our customers receive expert help where they need it.

Talk to your VAG representative or meet him or her at

[www.vag-group.com](http://www.vag-group.com)