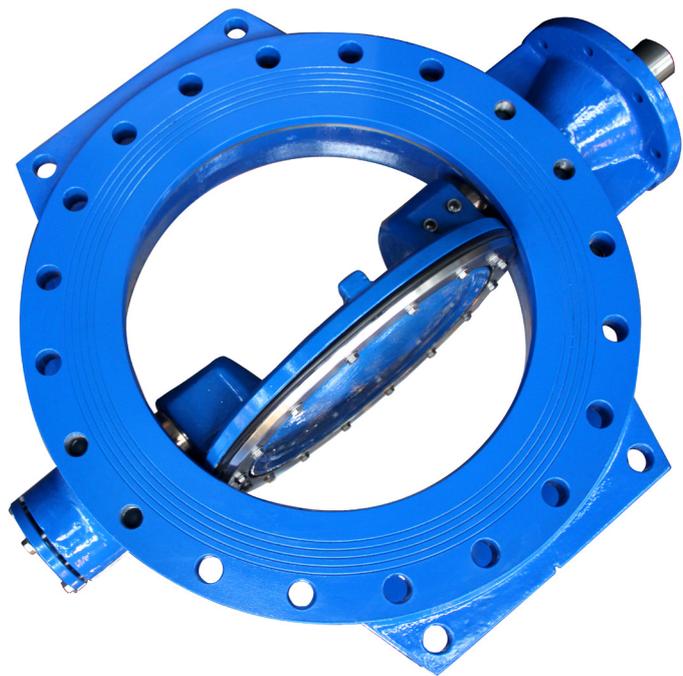


VAG Butterfly Valves

VAG EKN[®] double eccentric - VAG TEKN triple eccentric





A Century of Experience

VAG valves are known for long term reliability in the most demanding water and wastewater applications. Whether a simple check valve or a complex automatic control valve, each VAG valve is built on over 100 years of design, manufacturing and application experience to ensure its dependability and superior performance.

Outstanding Technical Support

From the factory to the field, VAG provides responsive and knowledgeable technical assistance and support. VAG application engineers, and our team of trained and experienced sales representatives, work closely with designers to select the right valve from our broad product range to ensure the valve meets the system requirements. VAG is committed to serving our customers in all phases of the project.

Superior Quality

VAG valves are designed in accordance with applicable AWWA and other industry standards and precision manufactured from the highest grade materials. Every valve is tested to ensure it meets our high standards and the latest industry requirements so you can be sure it will operate as expected from the minute it is put in service.

Comprehensive Product Range

We are continuously expanding and improving our product line to meet the ever-changing needs of the waterworks industry. From off-the-shelf standard butterfly and plug valves to sophisticated, highly engineered pump control, check and surge control valves, VAG offers one of the broadest ranges of valves specifically suited to the demanding needs of municipal waterworks.



EKN® AWWA Butterfly Valve

VAG butterfly valves have been manufactured for over 50 years in different versions. They are renowned all over the world for their reliability in a wide variety of operating conditions while performing under strict functional requirements.

The VAG EKN® AWWA Butterfly Valve has been designed based on this experience. VAG EKN® AWWA Butterfly Valves are commonly found in cooling systems for power plants and industrial facilities - as well as transmission pipelines, hydro power plants and water systems around the world.

Product characteristics

- Pressure rating:
 - 6" up to 168": class 150 A/B, 250 B, 300
 - large sizes available
- Standard version with worm gear
- Operating options:
 - manual actuator
 - electric actuator
 - pneumatic actuator
 - hydraulic actuator
 - Actuator with counter weight
- Special design on demand
 - steel welded
 - forged steel
 - with welding ends
 - for operational temperatures from -40°F up to 392°F (200°C)
 - rubber lined version
 - different kinds of elastomer for various applications: EPDM, NBR, Viton, PU, PTFE

Surface coating

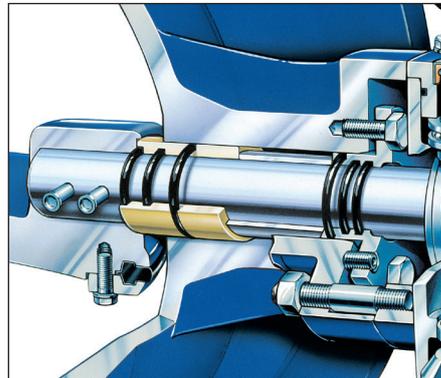
- NSF61 approved coating systems
- Fusion Bonded Epoxy ($\leq 48''$); Epoxy coating $> 48''$
- VAG epoxy coating system:
 - GSK quality specification (heavy corrosion protection)
- Optional: Rilsan, Patig, Halar, Hard Rubber Lining

Gear

- Self locking
- Fully enclosed (water proof, NEMA 4 or 6)
- ISO flange and shaft connection to the gear
- Adjustable limit stops made of solid material
- Gear box position can be turned by 90°

Butterfly disk bearing

- Shafts are made of stainless steel and are completely enclosed by a redundant double O-ring sealing and covered disk-shaft bearings. This guarantees optimum corrosion protection for all parts.
- Bearing bushings are made of seawater resistant bronze and guaranty a long and reliable life due to self-lubricating capability.
- Safe operation even at changing pipeline conditions
- Dry shaft operation

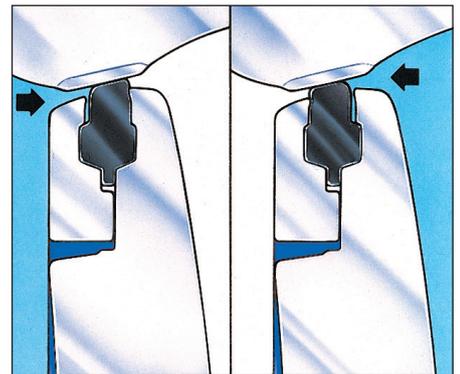


Double offset disk

- Optimized closing of the sealing ring into the body seat
- Important reduction of the shearing strains on the sealing ring
- Long life due to low wear of the sealing ring
- Relief of the sealing ring in full, open position
- Sealing ring can be replaced easily while valve is in-line
- Shape optimized by use of computer analysis minimizing head loss
- Sealing ring is not interrupted by shaft bearings

Shut-off by profiled elastomer seat ring

- Automatic sealing system in the sealing ring. Operational pressure supports sealing force in both flowing directions.
- Due to its profile, the sealing ring is retained firmly between disk and retaining ring. No seal failure even at extreme flow velocities.

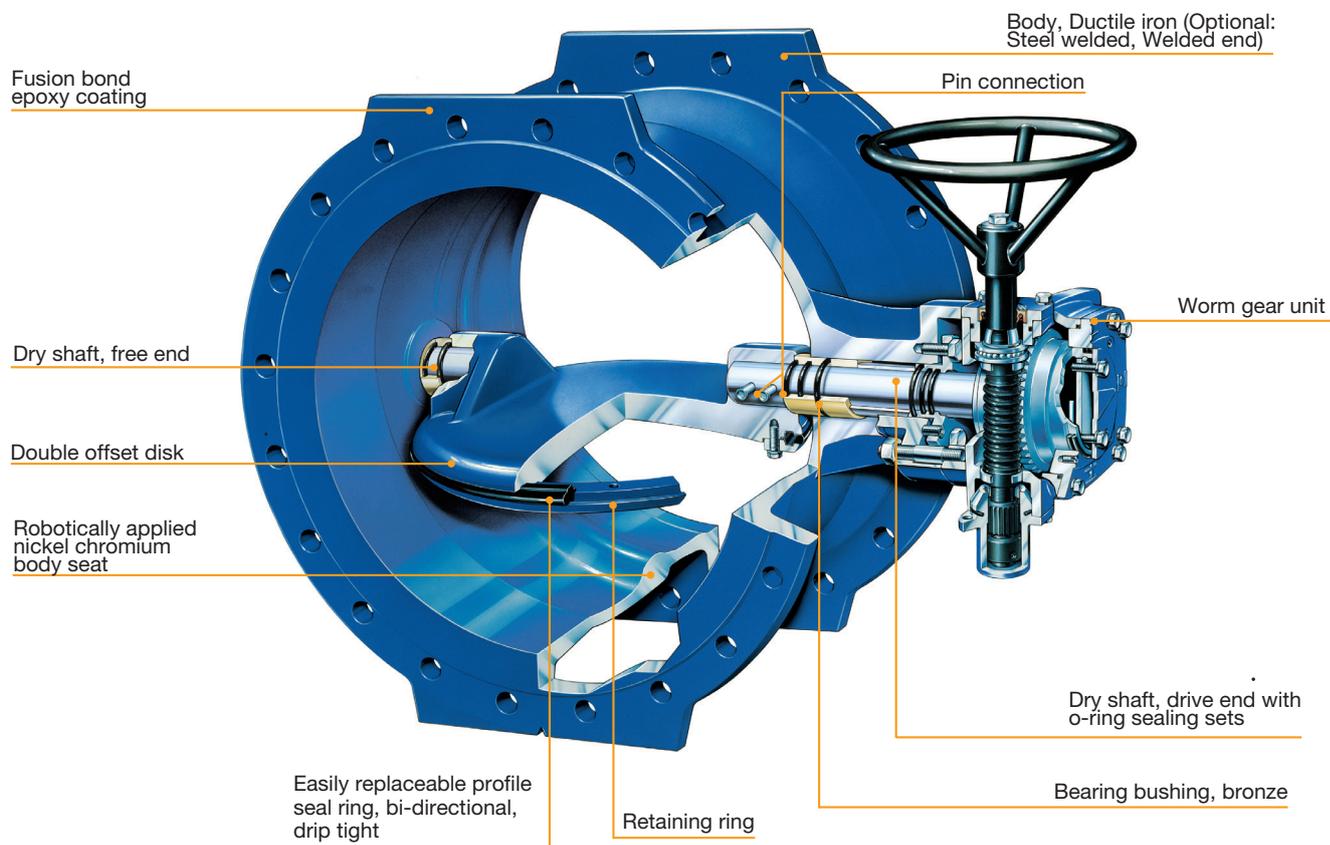


Body seat with excellent gliding characteristics

- Micro-finished hard faced seat. Other surfaces with epoxy resin coating
- Direct welded onto the body to avoid corrosion between seat and body



EKN® AWWA Butterfly Valve - Resilient Seated Double Offset



Low cost life cycle

Double Offset Design

The centerline of the disc rotation is horizontally and vertically offset from the body seat. This modern design provides 360 degree sealing and eliminates the potential for “compression set” of the rubber seat in the fully open position. Expect decades of bi-directional sealing from vacuum to rated pressure.

Rugged and Corrosion Resistant

High strength ductile iron body coated with NSF-61 certified fusion bonded epoxy creates long-term corrosion resistance.

Weld Overlaid Body Seat

The body seat is nickel chromium alloy, weld overlaid onto the ductile iron body and micro-finished. The weld overlay process forms a permanent metallurgical bond preventing corrosion between the seat and body.

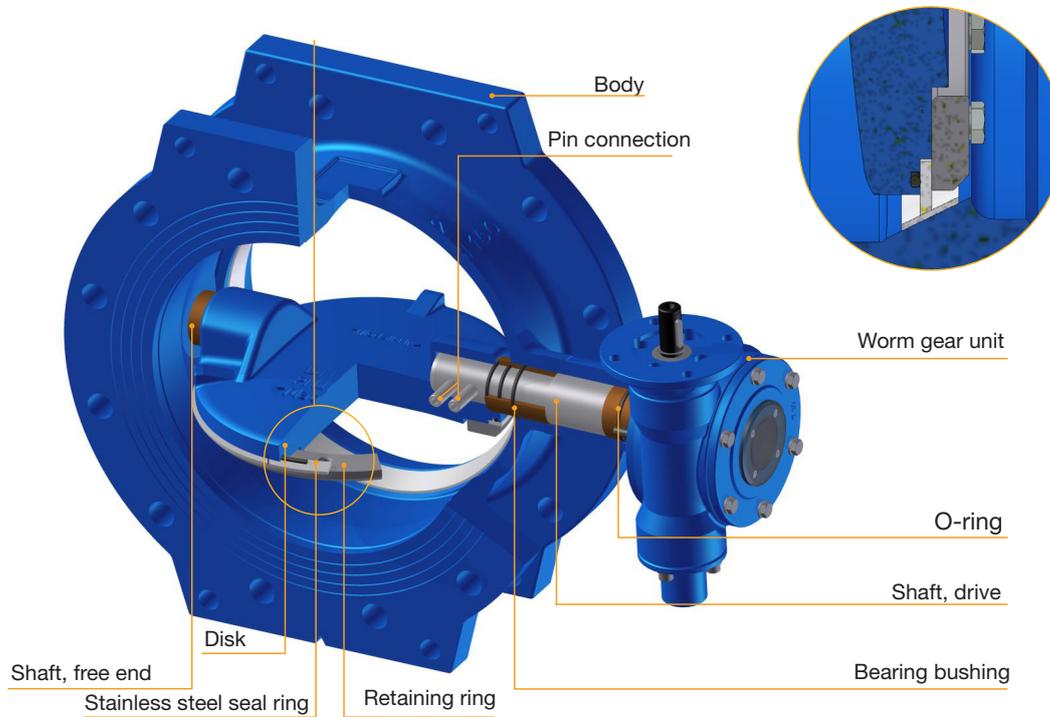
Dry Shaft

The innovative dry shaft design protects the body and disc hub shaft bores by sealing the shafts from line media, while the backup replaceable cartridge seals prevent groundwater entry. The shaft is supported at both ends by heavy duty, self-lubricating, lead-free bronze bushings.

Field Replaceable Rubber Seat

High quality body and disc castings allow for minimal exposure of the elastomeric seal to the flow stream and are designed to withstand extreme localized fluid velocities across the seat without pullout, cold flow, or scalloping. In the unlikely event seat replacement becomes necessary, the seat retention method permits replacement using common tools with minimal down time.

TEKN AWWA Butterfly Valve - Metallic Seated Triple Offset



Technical Details

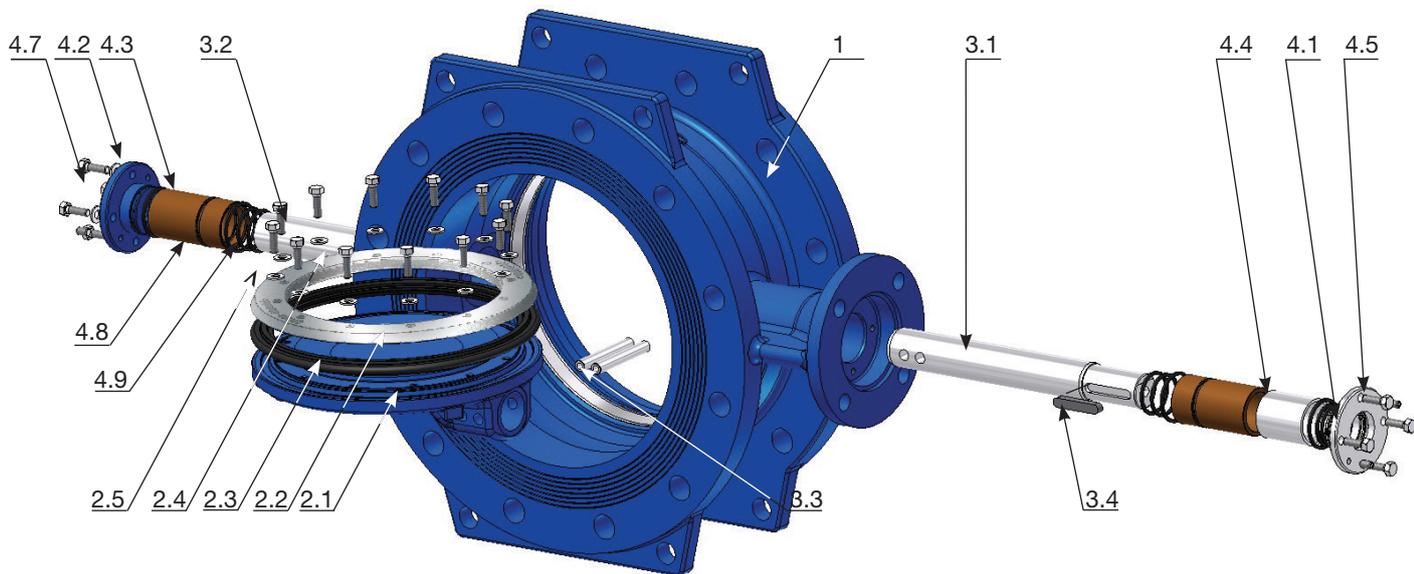
- Pressure range class 150 A/B, class 250 B/300
- Nominal dimensions 6" - 48"
- Field of application: Water, sea water, hot water
- Sealing system: triple eccentric seat design
solid stainless steel seat and stainless steel sealing ring
- Face to Face dimensions ISO 5752 Table4, short (13)
- Standard version: With worm gear unit
- Actuator types:
 - handwheel
 - electric
 - hydraulic
 - pneumatic
- With brake and lift unit as safety device
- Standard version: Body and disk of A536 60-40-18 ductile cast iron EN-JS 1030 (GGG-40) with epoxy coating
- Special versions:
 - Sealing system laminated stainless steel with graphite laminate
 - Steel welded
 - With welded-ends
- Epoxy coating min 250µm

Product Characteristics

- The stainless steel shafts are completely enclosed by an O-ring seal and closed bearing lugs. This protects the whole bearing optimally from corrosion.
- The self-lubricating properties of the bronze bearing bushing guarantee a long and safe service life.
- Wear-resistant, hardfaced stainless steel seat.
- Metal sealing valve. The friction forces are minimized by triple eccentric design.
- To predict reliability, the VAG Valve design is verified by a stress analyses and functional testing under critical conditions. The VAG Triple Eccentric Butterfly Valve provides a tight shut-off. The design ensures that the disc seal contacts the body seat only at the final close position.
- The metal to metal sealed TEKN Butterfly Valve provides extra safety compared to the operation of rubber seal Butterfly Valves. Contamination with limescale or mussels do not harm the sealing system.
- OFFSET 1:
The shaft is offset from shaft to seal allows the complete sealing contact around the entire seat.
- OFFSET 2:
The shaft centerline is offset from the pipe centerline which provides interference free opening and closing of the valve.
- OFFSET 3:
The seat cone axis is offset from the shaft centerline to eliminate friction during closing and opening. The disc seal closes into the cone to achieve uniform sealing around the entire seat.

EKN® AWWA Butterfly Valve

Material specification

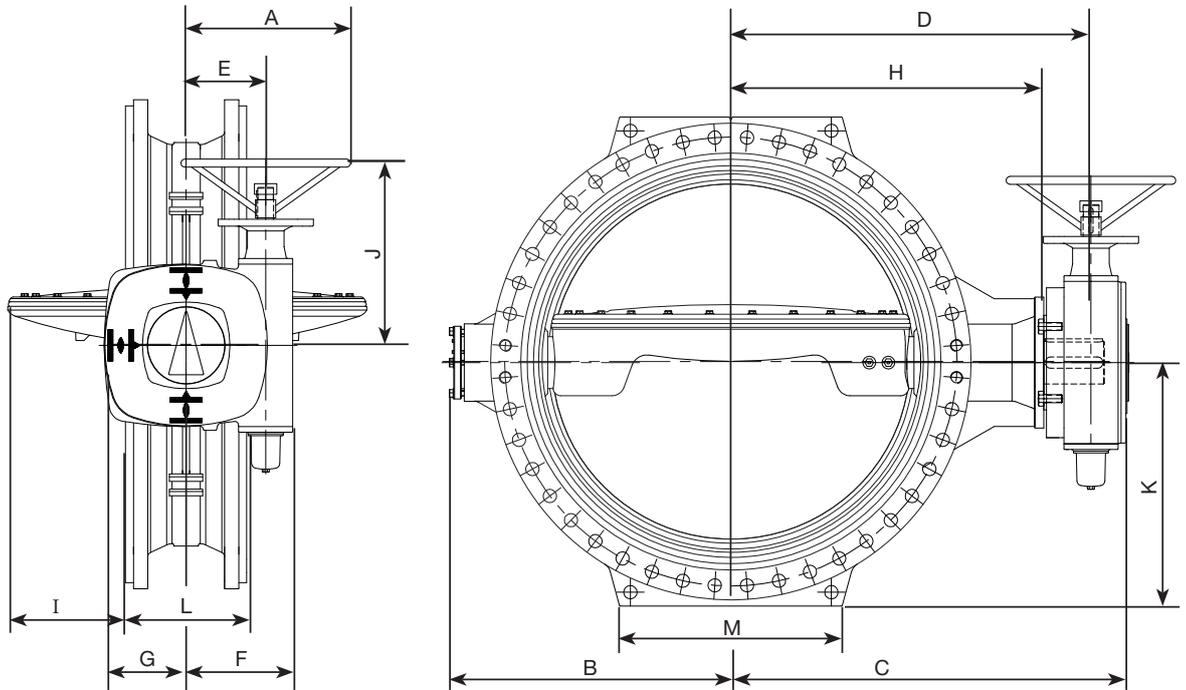


Standard Materials

1	Body	Ductile Iron, ASTM A536 Grade 65-45-12 or 60-40-18
2.1	Disc	Ductile Iron, ASTM A536 Grade 65-45-12 or 60-40-18
2.2	Retaining Ring	Stainless Steel, Type 304 (Standard) Stainless Steel, Type 316 (Optional)
2.3	Seat Ring	EPDM (Standard) Buna-N or Viton (Optional)
2.4	Hex Head Screw	Stainless Steel, Type 316
2.5	Washer	Stainless Steel, Type 316
3.1	Shaft, Driven End	Stainless Steel, Type 304 (Standard) Stainless Steel, Type 316 (Optional)
3.2	Shaft, Free End	Stainless Steel, Type 304 (Standard) Stainless Steel, Type 316 (Optional)
3.3	Shaft Pin	Stainless Steel, Type 431, Mechanically Retained
3.4	Key	Carbon steel, A576
4.1	Bearing Flange	Steel, ASTM A36, Zinc Plated
4.2	Bearing Cover	Steel, ASTM A36, Zinc Plated
4.3	Bearing Bushing	Bronze, Alloy C90800
4.4	Spacer Bushing	Stainless Steel, Type 304
4.5	Hex Head Screw	Stainless Steel, Type 316
4.7	Set Screw	Stainless Steel, Type 316
4.8	O-Ring	EPDM (Standard) Buna-N or Viton (Optional)
4.9	O-Ring	EPDM (Standard) Buna-N or Viton (Optional)

Contact factory for other options, materials, configurations and lining/coatings.

EKN® AWWA Butterfly Valve



Dimensions (inches)

Valve Size	6"	8"	10"	12"	14"	16"	18"	20"	24"	30"	36"	42"	48"	54"	60"	66"	72"
A	9 13/16	9 13/16	9 13/16	9 13/16	9 13/16	13 3/4	13 3/4	15 3/4	15 3/4	15 3/4	15 3/4	19 11/16	19 11/16	24 13/16	24 13/16	24 13/16	24 13/16
B	7 1/8	8 1/2	7 13/16	10 1/2	11 15/16	14 1/16	14 13/16	16 1/2	19 15/16	21 15/16	27 1/2	31 1/16	34 5/8	36 3/8	36 7/8	42 11/16	45 1/2
C	11 7/8	13 3/8	13 7/16	17 1/16	18 5/16	21 5/8	22 1/16	24 5/8	27 1/2	31 11/16	38	40 7/8	48 1/2	49 9/16	51 1/8	57 1/4	66 7/16
D	9 15/16	11 3/16	11 5/8	15 1/16	16 5/16	19	19 3/8	21 3/4	24 11/16	28 3/8	34 3/16	37	43 7/8	44 1/2	46 7/16	50 15/16	58 3/4
E	2 1/2	2 1/2	2 1/2	3 1/8	3 1/8	3 15/16	3 15/16	4 15/16	4 15/16	6 5/16	7 7/8	7 7/8	9 13/16	9 13/16	9 13/16	12 3/8	15 3/4
F	3 13/16	3 13/16	3 13/16	4 1/8	4 1/8	5 5/8	5 5/8	6 7/8	6 7/8	8 9/16	10 3/4	10 3/4	13 3/16	13 3/16	13 3/16	19 5/16	24
G	2 15/16	2 15/16	2 15/16	3 7/16	3 7/16	4 1/8	4 1/8	4 15/16	4 15/16	6 7/8	8 3/16	8 3/16	10 3/16	10 3/16	10 3/16	13 3/8	16 15/16
H	8 5/16	9 1/2	10 13/16	12	14	16	16 7/16	18 13/16	21 3/4	24 13/16	29 11/16	32 9/16	38 13/16	39 3/8	40 15/16	45 1/4	51 7/8
I	3/8	13/16	13/16	1 11/16	2 11/16	3 5/8	4 3/16	5 1/16	6 11/16	8 1/2	10 3/8	14 7/16	14 3/4	18 1/16	21	22 13/16	25 9/16
J	9 13/16	9 13/16	9 13/16	10	10	14 5/16	16 5/16	17 13/16	17 13/16	22 3/8	25 7/8	26 3/4	29 11/16	29 11/16	29 11/16	35 1/4	39 13/16
K	6 1/8	7 1/8	8 5/8	9 15/16	11 3/16	12 3/16	13 3/4	14 3/16	17 1/2	20 11/16	23 5/8	27 9/16	30 1/2	33 7/16	37 5/8	40 3/4	44 1/8
L	5	6	8	8	8	8	8	8	8	12	12	12	15	15	15	18	18
M	6 5/16	7 7/8	9 7/16	11	11 3/16	12 5/8	11	11 13/16	15 3/4	17 11/16	2 15/8	25 9/16	27 9/16	31 1/2	33 7/8	36 1/4	47 1/4
Weight	79	125	174	267	306	408	590	780	1015	1616	2701	2381	4863	6614	8377	10141	12125

- NOTE:
1. Dimensions apply to Pressure Class 150B, ANSI Class 125 flanged valves, dimensions for larger sizes and higher pressure ratings available upon request.
 2. Weight includes standard gear actuator.
 3. Dimensions based on standard gear actuator and may vary if a different actuator is supplied. Request certified drawings if dimensions are critical.
 4. Larger sizes and higher pressure ratings available upon request.

EKN® AWWA Butterfly Valve Accident Prevention Device (APD)

EKN® APD is a reliable mechanical safety device comprising of 3 to 6 locking pins that when engaged, prevent the butterfly valve from opening. While the upstream side is fully pressurized – the disc remains drop tight – in the ‘locked’ and closed position.

Why APD?

- Safety - Considered ‘Best Practice’ protocol when workers enter a pipeline for system/component maintenance.
- Disk is ‘locked’ in closed position – even if the valve shaft and gearbox are removed – ensuring truest form of isolation in a pipeline.
- Reduces liability – manufactured and proven safety solution
- Reduces plant downtime, improves profitability
- Reduces investment cost by replacing two conventional isolation valves respectively - double block and bleed system

Why VAG APD?

- 30+ years experience
- Hundreds of installations, references
- German engineered quality, zero failure
- Approved by international safety authorities and power plant operators



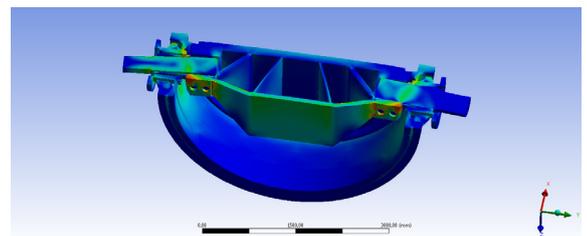
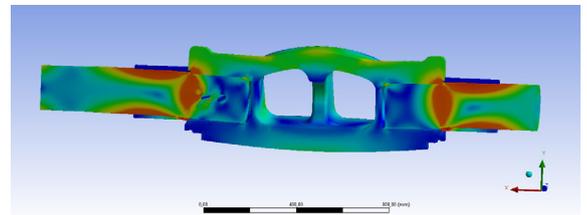
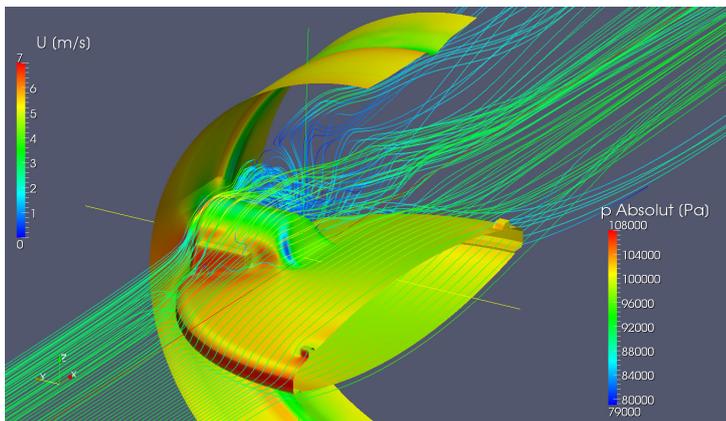
VAG EKN® Butterfly Valve 84" with APD.

Finite Element Analysis

The VAG design team provides conceptual design, traditional and computational stress analysis, flow dynamics analysis and technical drawings. Computational Fluid Dynamics (CFD) analysis is also employed to minimize cavitation, headloss, and turbulence.

VAG engineers have effectively integrated FEA into the design process, enabling rapid optimization before expensive hardware is made. The valve is subject to different load cases in order to predict the behavior under all postulated operating conditions. For each load case, the valve is assessed to the requirement of PED 97/23/EC or ASME VIII code, ensuring safety and quality of construction through a series of hydrostatic tests.

VAG Butterfly Valve undergoing FEA.



VAG Butterfly Valves

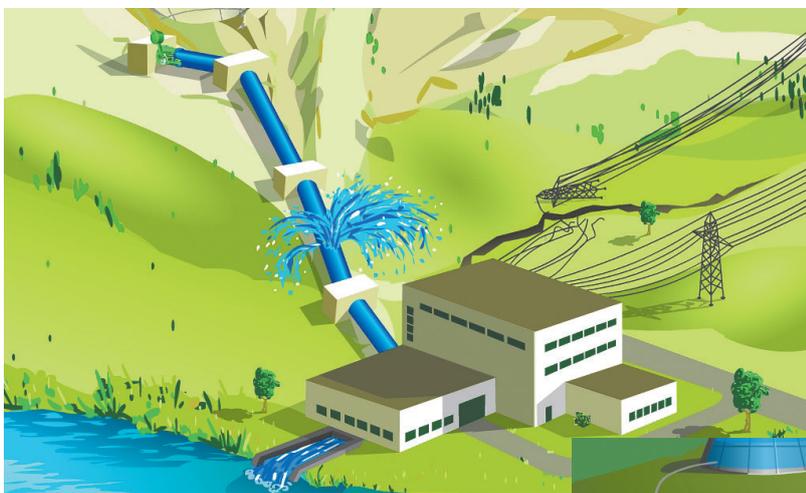
With HYsec Hydraulic Actuator by VAG

When performance and safety is of utmost importance, VAG Hydraulic Actuated Valves are an excellent selection. EKN® AWWA Butterfly Valves can be equipped with a weight loaded hydraulic actuator (VAG HYsec Brake-and-Lift Cylinder).

This electro hydraulic unit actuates the valve efficiently and safely. Due to the lever and drop weight, the valve can be operated in the event of power failures.

The modular design enables VAG Brake-and-Lift Cylinder to be used in a variety of applications. Typical modes of operation are pipe burst safety device, pump check valve, quick opening valve and turbine inlet/bypass valve. Additional functions are easily added by attaching a new module.

Safety is guaranteed wherever VAG Brake-and-Lift Cylinder are used:

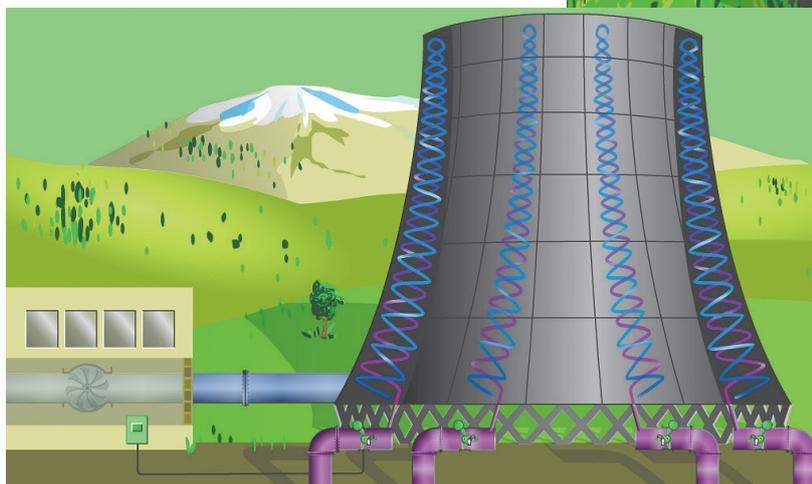
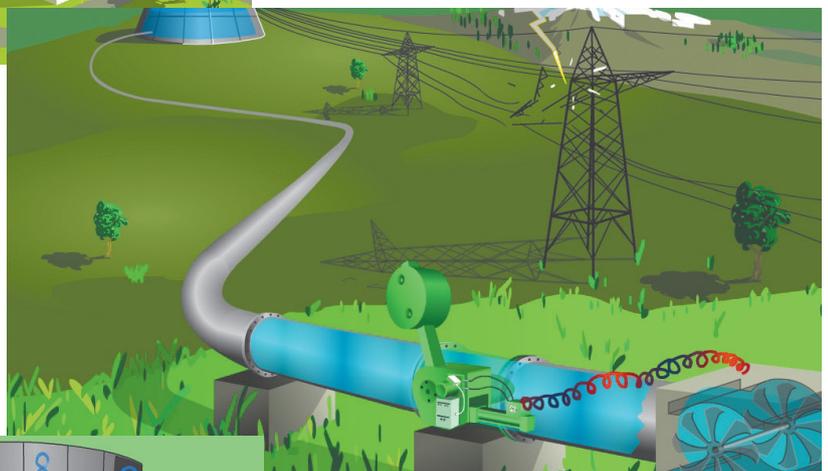


Pipe burst safety device

VAG Hydraulic Actuated Valves, in combination with VAG Anti Vacuum Valves, are able to isolate broken pipe sections to protect the environment from overflowing or other serious injury; without auxiliary power.

Pump check valve / quick closing valve

By using VAG Hydraulic Actuated Valves as a pump protecting valve, you can control your pump system as well as prevent your pumps from back flow in the event of power failure. Furthermore, the same valve can be used as a pump start valve to achieve defined control behaviors within the pipe system.



Quick opening valve

VAG Hydraulic Actuated Valves can be used in special applications as quick opening valves for emergency supply in cooling circuits in power stations, fire fighting systems, or as a turbine bypass valve.

HYsec Hydraulic Actuators by VAG

The possibilities are yours!

Application examples



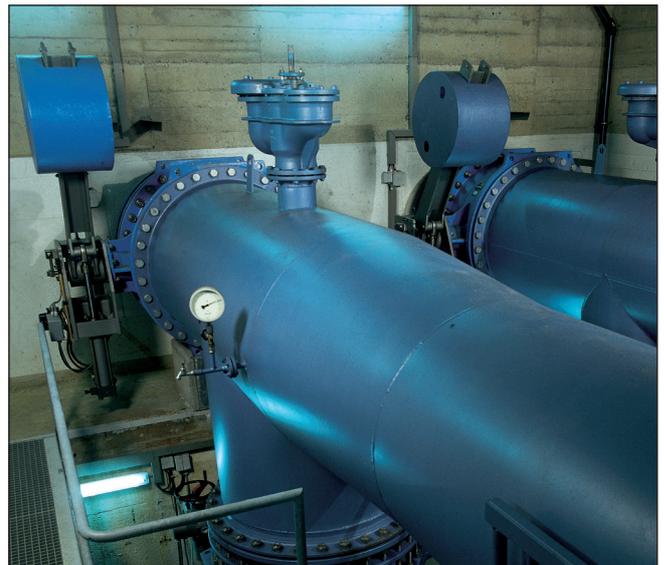
VAG EKN® 78" Butterfly Valve with HYsec Hydraulic Brake-and-Lift Cylinder during customer acceptance the pressure test in 2009 at a power plant in Boxberg, Germany.



VAG EKN® 54" Butterfly Valve with HYsec for water supply at a plant in Poland.



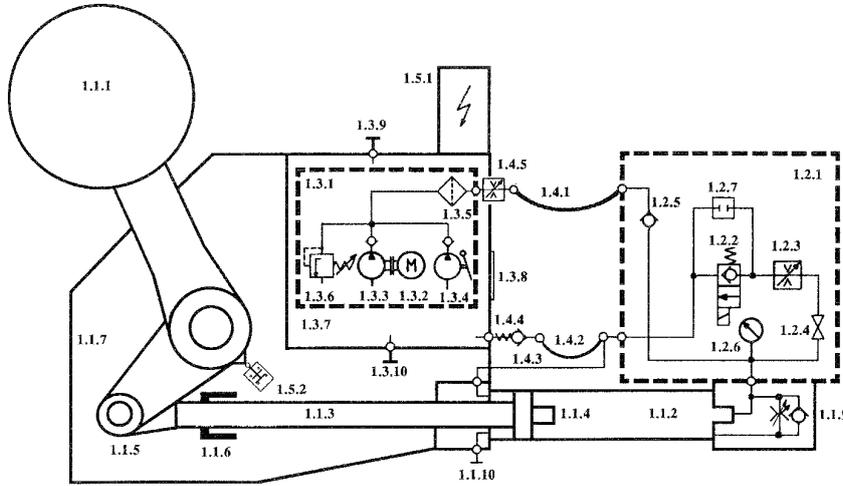
Vertical cylinder, anti clockwise closing
VAG EKN® 48" Butterfly Valve with brake and lift cylinder, installed in the Leibis-Lichte dam in Germany.



Vertical cylinder downward, clockwise closing
VAG EKN® 48" Butterfly Valve with HYsec Hydraulic Brake-and-Lift Cylinder, installed in the Eibenstock dam in Germany.

Technical details

Hydraulic scheme



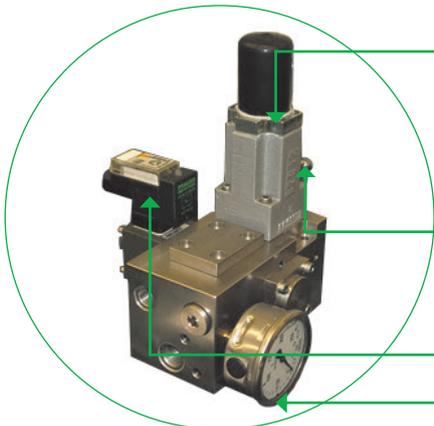
- 1.1 Working unit**
 1.1.1 Lever with drop weight
 1.1.2 Cylinder body
 1.1.3 Piston rod
 1.1.4 Cushioning plunger
 1.1.5 Hinge joint
 1.1.6 Stop in closed position
 1.1.7 Connecting console
 1.1.9 Flow control non-return valve-closing, second stage

- 1.1.10 Oil drain plug
1.2 Control unit
 1.2.1 Valve block
 1.2.2 Solenoid seat valve
 1.2.3 Flow control valve
 - closing, first stage
 1.2.4 Stop cock
 - closing stop
 - for opening with hand pump

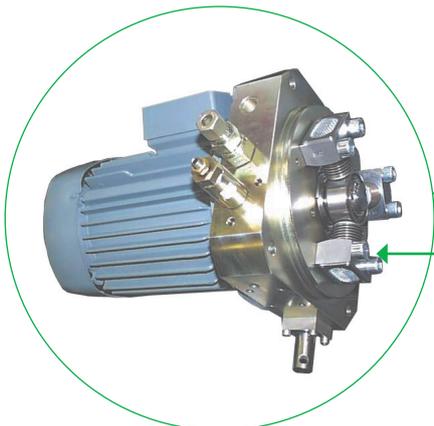
- 1.2.5 Check valve
 1.2.6 Pressure gauge
 1.2.7 Cover plate
1.3 Pump unit
 1.3.1 Drive block
 1.3.2 Pump motor
 1.3.3 Radial plunger pump
 1.3.4 Hand pump
 1.3.5 Oil filter
 1.3.6 Pressure limiting valve
 1.3.7 Oil tank
 1.3.8 Oil lever indicator
 1.3.9 Oil filling plug
 1.3.10 Oil drain plug
 1.4 Control piping
 1.4.1 Pipe pressure side
 1.4.2 Pipe recirculation
 1.4.3 Pipe recirculation
 1.4.4 Check valve
 1.4.5 Lifting control valve

- 1.5 Electric accessories**
 1.5.1 Terminal box
 1.5.2 Control box
 1.5.3 Limit switch
 „Open“
 „Closed“
 „Open on automatic“

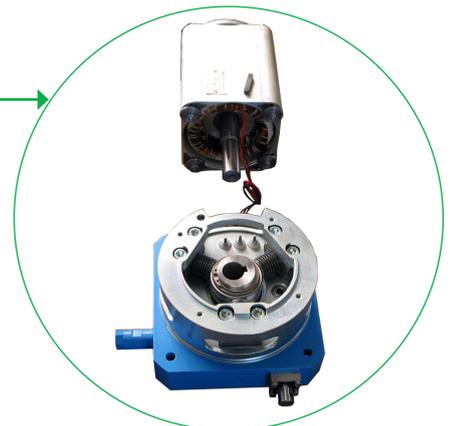
Additional accessories

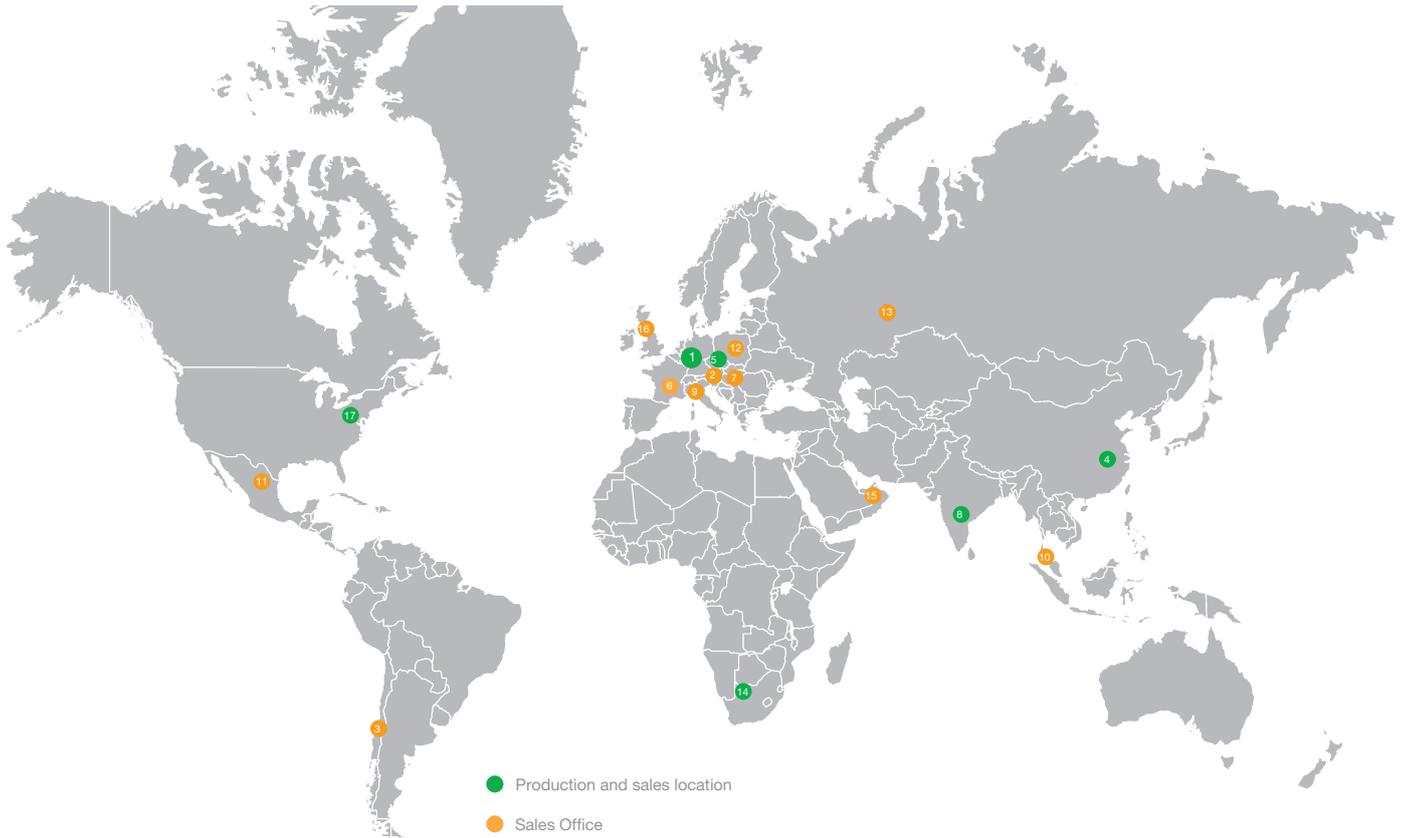


- Flow control valve**
 Closing speed not influenced by hydraulic pressure
2nd Flow control valve
 • 2 separate adjustable closing times
 • Control function for plunger valves
Shut-off ball valve
Bypass valve
 • Bypass of solenoid seat valve
 • Manual tripping
Solenoid seat valve
Pressure gauge



- Hydraulic pump with oil submerge motor protection NEMA 6**
Hydraulic pump with electric motor protection class NEMA 4
3 plunger pumps





Locations

- | | | | |
|------------------------|-------------------|--------------------------------|-------------------|
| 1 GERMANY | MANNHEIM | 11 MEXICO | MONTERREY |
| 2 AUSTRIA | VIENNA | 12 POLAND | WARSAW |
| 3 CHILE | SANTIAGO DE CHILE | 13 RUSSIA | SAMARA |
| 4 CHINA | TAICANG | 14 SOUTH AFRICA (VAG/KLAMFLEX) | KRUGERSDORP |
| 5 CZECH REPUBLIC (JMA) | HODONIN | 15 UAE | DUBAI |
| 6 FRANCE | CHASSIEU | 16 UK | BIRMINGHAM |
| 7 HUNGARY | BUDAPEST | 17 VAG USA, LLC | CRANBERRY TWP, PA |
| 8 INDIA | HYDERABAD | | |
| 9 ITALY | SAN GIULIANO | | |
| 10 MALAYSIA | PETALING JAYA | | |

The VAG USA, LLC is part of a global network with our partner company, VAG-Armaturen GmbH, headquartered in Mannheim, Germany. Together, we have a highly qualified team of service specialists around the world. Our capabilities include:

- Engineering & technical design
- Sales & distribution
- Production
- Installation & start-up
- Fabrication
- Aftermarket service



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