ERHARD

Double eccentric

Ball Valve

quality as tradition.

ERHARD

Water treatment

Water transport

Water distribution network

Sewage network and treatment

Dams and hydropower

Industrial water aplications

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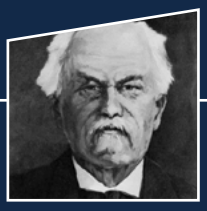


1871

Foundation of ERHARD by Johannes Erhard

1962

Start of the production at the new site in Oettingen (Bayern)

1998

Management buy-in from Deutsche Armaturen AG

2002

Investment of 4,5 Mio. Euro in the plant in Heidenheim: new manufacturing halls to optimize the processes

2008

Project Fujairah II in the UAE: inauguration of the new FBE and liquidcoating plant as well as the new vitreous enamel coating plant with integrated shotblasting plant

1904

Management buyout by the nephew Josef Waldenmaier

1986

ERHARD buys the plant in Daun (from Mark Controls)

2001

Management buy-in from Tyco Waterworks EMEA

2007

Water Supply Project Ankara: second largest order in the history of the company

2010

Acquisition by Triton and creation of TALIS

ERHARD – Valves for large-scale installations

ERHARD is one of the most important manufacturers of water valves in the world with experience dating back over 140 years. Its success story began in 1871 when Johannes Erhard founded a small workshop in Heidenheim, Germany, for producing brass water taps.

Today ERHARD supplies valves for all sectors of the water supply industry in all size ranges, from domestic service lines valves to valves for power plants with nominal widths from DN 40 to DN 3600. ERHARD also has a broad product portfolio in the sewage sector as well as of valves for large-scale industrial installations. ERHARD offers complete solutions to problems in field of valves, including the corresponding technical calculation of the pipelines, combined with great specialist competence and many years of experience in valve construction. Customised valves and all-in solutions also belong to the product range.

2010

ERHARD delivered a butterfly valve DN 3600 for a new coalfired power station

2017

Inauguration of the new ERHARD logistic center in the immediate vicinity of the company headquarters

2020

Merder of SCHMIEDING Armaturen GmbH in to ERHARD and take over of the UNIJOINT Range product portfolio within the TALIS Group

2023

Further investments in machinery, buildings and digitalisation at the Heidenheim plant in 2022/2023 amounting to ~€8 million

2013

Opening of the Valve Academy in Heidenheim

2018

IInvestments in the plant in Heidenheim: new production machines to optimize the production flow of ROCO Wave butterfly valves

2021

150 years anniversary of ERHARD

2023

Acquisition by Hawle Austria Group

Experience with a big variety of applications

Dams & Hydropower

Madeira, Portugal

Pumped storage plant
2018
3 valves
- DN 500 PN 100
- DN 600 PN 16

Ball valves in hydropower and pumped storage applications ensure best hydraulic efficiency with no headloss, as well as optimum protection of turbines and pumps.
In Madeira's pumped-storage plant, Calheta III ERHARD ball valves are installed in the pumping station for an operating pressure of 70 bar.

Norway

Oksebotn hydro power plant
2020
1 valve
- DN 1200, PN 16

Ball valves for turbine inlet protection with by-pass are installed in Oksebotn for pressure compensation. The valve is installed as the main shut-off valve, closing the pressure pipe towards the turbine.

Liechtenstein

Samina pumped-storage plant
2014
- 2 valves DN 300 PN 100
- 2 valves DN 400 PN 100
- Refurbishment of 3 valves DN 300 PN 100

In Samina, there are 7 ball valves installed for 83 bar operating pressure in the turbine inlet and the pump start-up positions.

Water transmission

China

- Beijing infrastructure for winter sport games
- 2019
- 44 valves
- DN 100-800, PN 40-63

Ball valves in water transmission pipelines minimize pressure losses and result in significant energy savings, as they realise a full flow cross-section in the open position.

Water distribution network

Deutschland

- Raw water intake Lake Constance
- 2009
- 3 valves
- DN 700 PN 40

Robust ball valve design that can withstand high dynamic loads. Here at the inlet of raw water for drinking water treatment.

Sewage

Deutschland

- Berlin sewage network
- 2002
- 100 valves
- DN 300-600, PN 10

In sewage applications, the outstanding features of the ball valve are its insensitivity to dirt and its piggability.

Ball valve

Double eccentric ball valves

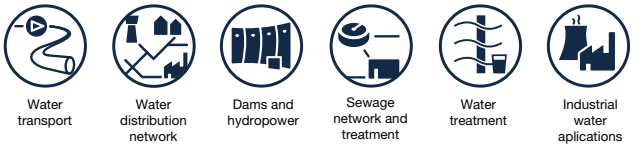
For more than 50 years, the ERHARD ball valve has shown its unique strengths especially where other valves reach their limits.

With high flow velocities up to 20 m/s and pressure ratings up to PN 160, the ERHARD ball valve offers the ideal solution for manifold applications in the water and sewage sector.

Its very low resistance coefficient, compared to other valve types, has a strong impact on the energy inputs of pumps in closed pipe systems.

In direct comparison with other isolation valves, it becomes evident that the purchase costs will mostly amortize already in the first years of usage.

Application



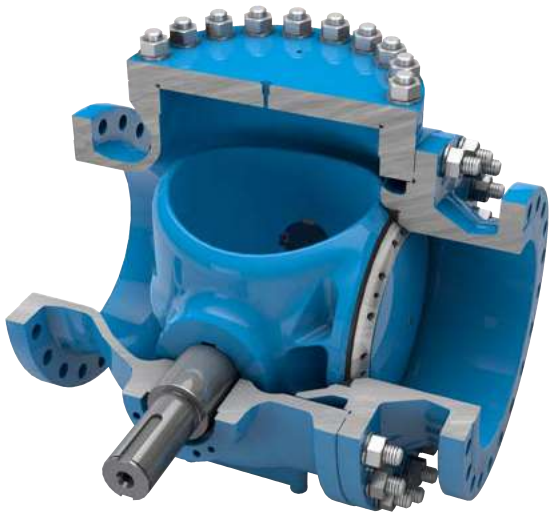
- **Dams and hydropower:**
  With the full bore and literally no head loss, the ERHARD ball valve is the perfect match for hydropower plants, when there must be zero energy loss in the environment of pumps and turbines. The ball valve is used as a turbine main inlet valve, by-pass valve and pump start-up valve.
  As safety valves for emergency shut-off for pipe burst proetction, they are suitable for up to 30 m/s flow velocity.
- **Water transmission and distribution:**
  The ideal solution for long pipelines with high pressure, surge-free closure with the slider crank mechanism and lowest head loss of all isolation valve types.
  For transmission lines under pressure, the ball valve allows safe and fast drainage.
- **Sewage network and treatment**
  The ERHARD ball valve is piggable with a full bore and is insensitive to dirt and robust against deposits. Additionally, the inspection cover allows an easy check of the valve status in installed position and a removal of obstructing elements.

Adventages

- **Double eccentric design:** Seal ring lifts off the seat immediately when the valve is opened Minimum wear due to double offset Plug being flushed and self-cleaned
- **Literally no headloss:** Energy-efficient use of pumps Insensitive to dirt, suitable for sewage Piggable
- **Maximum safety:** Force-locked connection of shaft and plug with friction-fit wedges, backlash free, even under high pressure or mechanical load
- **Easy maintenance:** Optional inspection cover for maintenance and dirt removal Simple exchange of seal ring in installed position

Characteristics

- Low construction height and full straight-through bore,- minimum head loss in open position.
- Ball plug of simple and solid cast design.
- Minimum gasket wear: seal ring releases after opening 3° due to the double eccentric design.
- Stable dynamic behavior and dimensional stability: The medium flows around the eccentrically mounted ball plug.
- Even after long periods without operating, the valve works smoothly and is tight in both directions.
- At the end of the line, the flow goes into atmosphere and very high flow velocities can be reached. 20-25 m/s are mastered by the ball valve.
- 100% tested according to DIN EN 12266, type tests according to DIN EN 1074.
- Made in Germany.



Technical Data

- **Face-to-face dimension**
  DIN EN 588 series 26
- **Sizes**
  DN 80 - DN 1200
  PN 10 - PN 160
- **Flange Drilling**
  PN10 bis PN 160
  acc. to EN 1092-2
- **Medium Temperature**
  -10 °C to 60 °C
- **Coating:**
  Epoxy 250 µm GSK

Options / Variants

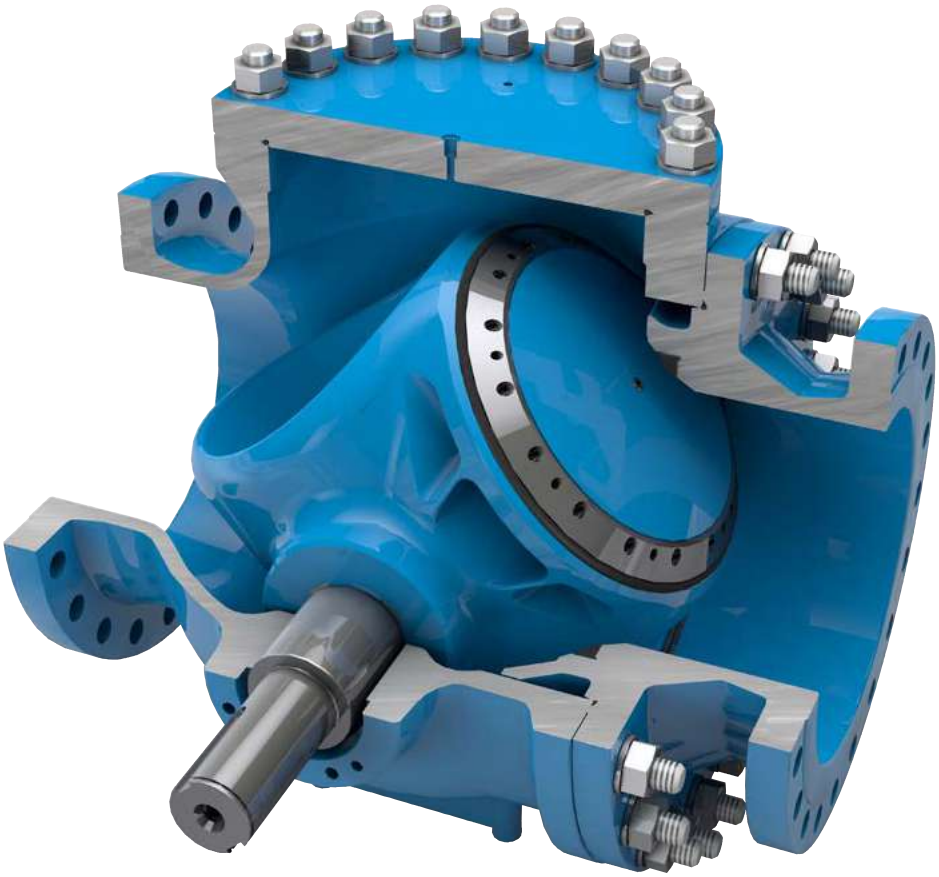
- **Coating:**
  EPC coating for abrasive media or sea water Special coatings for industrial applications Thickness of epoxy coating up to 500 µm Individual color coatings using PU lacquers
- **Connection and flanges**
  ANSI, special flanges
- **Gearbox options**
  Inductive or mechanical position indicator
- **Limit switches**
- **Inspection cover**
  For easy maintenance of sealing elements.
- **Weight loaded actuator**
  For safety valve applications such as turbine inlet protection, pump start-up and burst pipe protection.
- **Upstream by-pass**
  For better pressure balance when filling or emptying the pipeline.
- **Spindle extensions**

Design-Highlights

Efficient

Safe and reliable

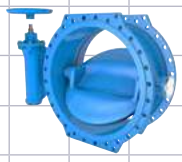
Robust



Flow velocity

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	m/s
PN 6																
PN 10																
PN 16																
PN 25																
PN 40																
PN 63																
PN 100																
PN 160																


Gate valve

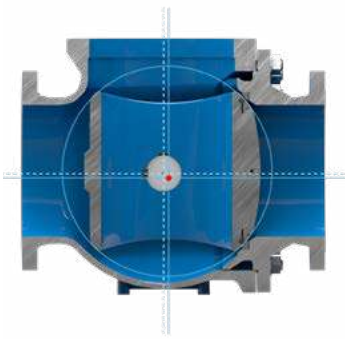

Butterfly valve


Ball valve

GOOD TO KNOW

The ERHARD ball valve goes beyond the limits of other isolation valves in terms of pressure and flow velocity.

Technical advantages



Double eccentric design

- Seal ring releases after only 3° opening
- **Minimum gasket wear** due to double offset
- Plug is flushed and self-cleaned

Optional inspection cover

- Easy maintenance
- Simple exchange of seal ring in installed position
- Remove dirt and deposits of the valve in-line

Optional weight-loaded actuator

- **Safety applications**, such as pipe burst protection
- For hydropower plants, pumping stations, supply lines
- Compact incorporated hydraulic unit independent of an external oil supply

Free passage

- **Literally no headloss**
- Energy-efficient use of pumps
- Insensitive to dirt, suitable for sewage
- Piggable

Force-locked connection

- Friction-fit wedge connection of shaft and plug
- Backlash free for **maximum safety**, even under high pressure or mechanical load
- Reliable torque transfer

SKG slider crank gearbox

- Two step closing action **prevents damage from water hammer**
- Self-locking mechanism
- Adjustable end stop on the spindle

Powerful connection

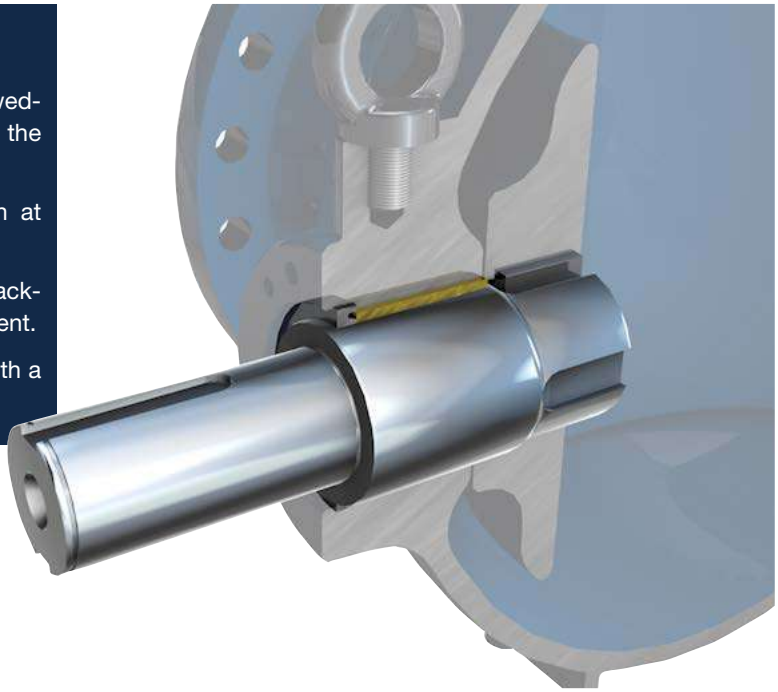
Robust wedge key connection

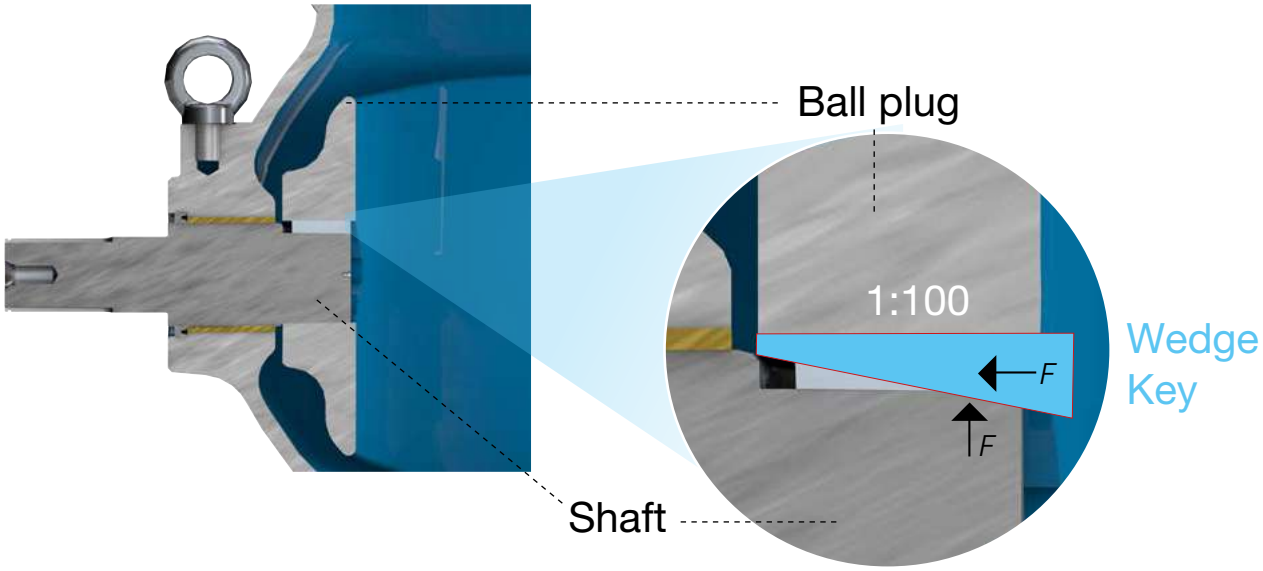
For decades, ERHARD has relied on the robust wedge connection, proven in many installations all over the world.

It also ensures clearance-free power transmission at highest dynamic loads.

The wedge connection is adapted precisely and backlash-free as a form-fit and force-fit connection element.

Two wedge keys are inserted and secured safely with a key securing device on the shaft front side.





According to the norm DIN 6886 (Stressed-type fastenings with taper action), the surface facing the shaft has a gradient of 1:100 (schematically represented in the illustration above).

The wedge is inserted into the groove in the shaft and force-locked.

After exceeding the slip limit, there is a force and form closure

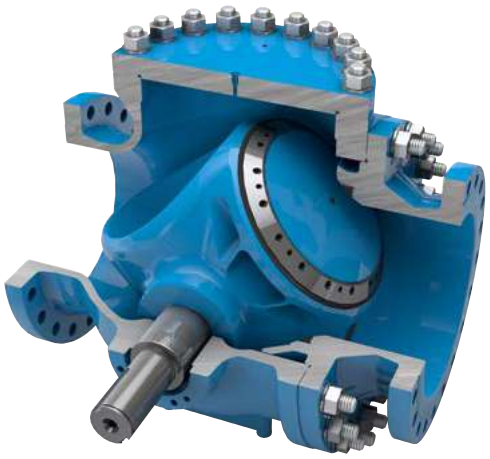
Options for the longer service-life

Optional inspection cover

ERHARD ball valves are optionally equipped with an inspection cover.

This opening can be used to quickly inspect, readjust or replace the ball seal ring, after depressurizing the pipeline.

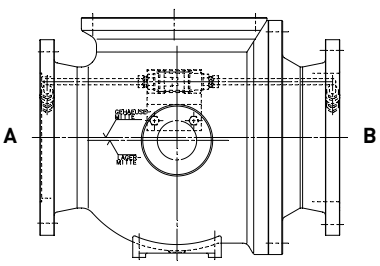
Additionally, dirt, deposits or obstacles can easily be removed this way. This makes the ball valve highly suitable for sewage applications.

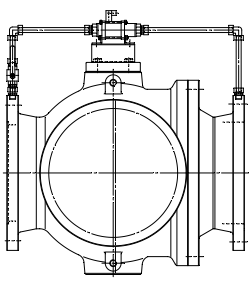


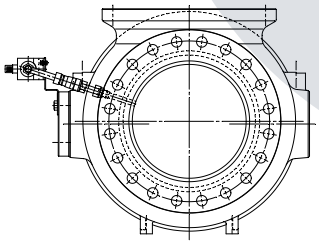
Optional by-pass

An upstream bypass connection can be provided on the body for easy filling and draining of the pipeline, balancing the pressure.

For space reasons, it may be necessary to attach the downstream connection to the pipe.







SKG slider crank gearbox

Perfectly adapted to the valve dynamics

ROCO Wave is equipped with a unique slider crank gearbox (SKG), which is the ideal solution for reliable opening and closing, as its movement kinematics are optimally adjusted to the needs of the ROCO Wave butterfly valve. The high precision SKG gearbox is developed and manufactured at ERHARD.

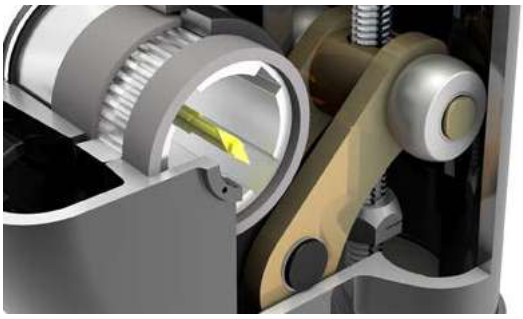
System safety

Energy efficiency

Suitability for underground installation

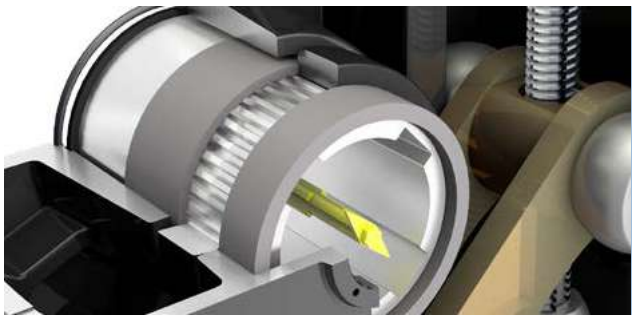
Standardized ISO Connections

The SKG gearbox input and output flange connections are standardized according to DIN ISO 5210/5211 allowing full flexbility for all actuation methods.



Adustable end stop on the spindle

The robust, adjustable end stop on the spindle ensures that no forces are being exerted on the housing parts during operation. The inner parts are made of bronze and stainless steel, ensuring a long life time.



Mechanical position indicator with sight glass

The mechanical position indicator with a pointer directly connected to the valve shaft is visible through a sight glass in the gear box. The sight glass is made of impact resistant polycarbonate (PC) and thus suitable for chamber or underground installations.

Mechanical position indicator with sight glass

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System safety by two step closing action

The ERHARD SKG gearbox closes in two steps: the first 70% closes fast, the last 30% closes slowly to avoid water hammer.

Due to the lower closing speed near the “CLOSED” position, the gearbox with slider-crank mechanism ensures extremely soft closing, minimizing the danger of water hammer - a plus for safety and durability of all plant components.

There is a risk of water hammer whenever a valve is closed too fast, since the pressure increase is inversely proportional to the decrease of the flow velocity and can seriously damage the pipe system.

Closing of the valve

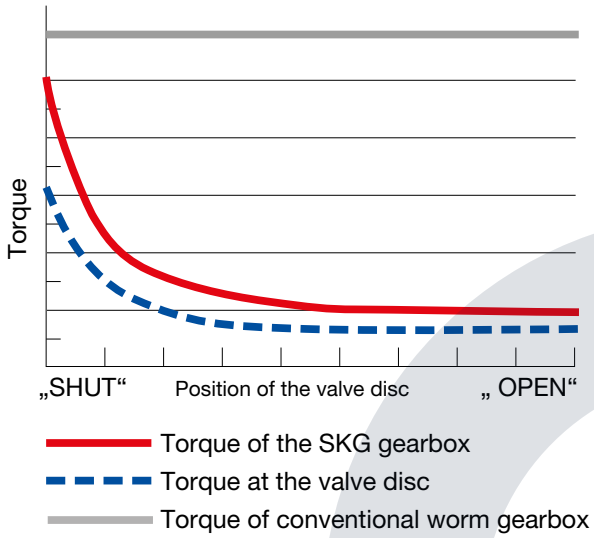
First 70 % of closing

- Non-critical area for possible water hammer
- Fast closing

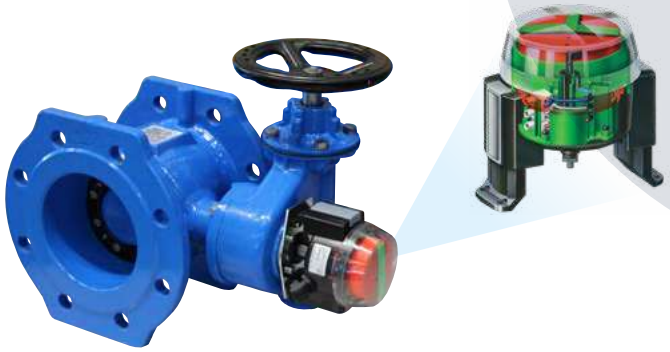
Last 30 % of closing

- Critical area for possible water hammer
- Slow closing

- **System safety by optimized torque curve**
  In contrast to a standard worm gear box, the ERHARD SKG gearbox does not have a constant torque curve for operating the disc. Instead, the torque rises disproportionately near the closing point pushing the main sealing reliably but still softly into its seat.
- **Energy efficient**
  The actuating torques are constantly low throughout the complete closing process, thus allowing the use of small and cost-effective electric and pneumatic actuators.



- **Optional: Switchmaster**
  The patented Switchmaster position indicator can be installed either with electro-mechanical micro-switches or inductive switches – switching directly or according to Namur.



Coating

Perfect protection for every field of application

Corrosion protection for long lasting valves and clean water is a key technology of ERHARD valves.

We distinguish between two standard coating systems:

- EKB fusion bonded epoxy coating
- Pro-Enamel

Additionally, customized solutions adapted to the application are available upon request.

Epoxy coating represents the classic coating solution, being a proven technology suitable for the most common requirements. EKB is physiologically non-hazardous and has confirmed test certificates for drinking water, among others, from the DVGW Research Centre TZW Karlsruhe, from the Hygiene Institute of Gelsenkrichen and the WRAS (WRc) in Great Britain.

Epoxy coating at the ERHARD plant in Heidenheim/Germany

EKB fusion bonded epoxy coating

ERHARD works using the latest technologies and complies with the test conditions of the Quality Association for “Heavy Duty Corrosion Protection of Powder Coated Valves and Fittings” (GSK). The standard thickness is at least 250 µm, layer thicknesses up to 500 µm are possible.

ERHARD covers two coating processes for fusion bonded epoxy coating:

- Electrostatic powder coating in accordance with the GSK Quality Association (RAL-GZ 662).

The epoxy resin coating provided in the powder coating process is one of the most often used corrosion protection processes. During this process, the coating is applied in a precisely defined thickness and melted on at exactly 210 °C.

- Wet electrostatic coating, applying the liquid epoxy resin material directly onto the valve.

With large valves, EKB is applied in a wet process in a two-layer structure:

A cathodic basic protection is followed by an electrostatic wet coating using a low-solvent two component epoxy resin. In the heat channel, the final bonding to the heavy corrosion protection takes place according to DIN 30677-2.

Economic and cost-effective due to excellent flow values

Designed for best hydraulic performance

Ball valves are the best type of isolation valve when it comes to head loss.

This way, ERHARD double eccentric ball valves contribute to an overall optimized system for lowest consumption of energy.

Key figures are Kv and ζ (zeta) values:

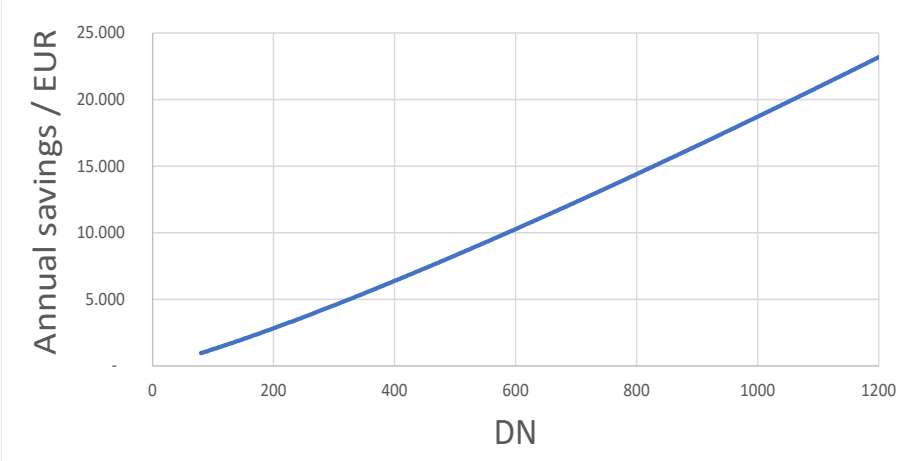
- The Kv-factor of a valve indicates the water flow in m³/h at a pressure drop across the valve of 1 bar at 5-30°C when the valve is 100% open.
- The head loss coefficient ζ (zeta), also referred to as pressure loss coefficient or resistance coefficient, is a dimensionless measure in fluid mechanics reflecting the resistance in a certain hydraulic element. This resistance depends on the geometry of the system.

DN	Kv (m³/h)	ζ (zeta)
80	853	0,09
100	1,380	0,08
125	2,209	0,08
150	3,353	0,07
200	6,226	0,07
250	9,957	0,06
300	14,693	0,06
350	20,340	0,06
400	26,799	0,06
450	34,219	0,06
500	42,628	0,06
600	61,950	0,05
700	85,112	0,05
800	112,231	0,05
900	142,043	0,05
1000	175,361	0,05
1200	262,831	0,05

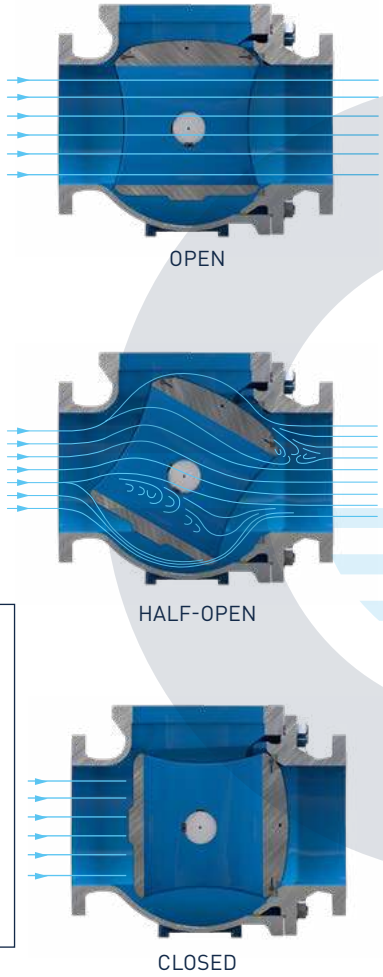
Savings using a ball valve

In terms of head loss, a ball valve is superior to a butterfly valve, which is displayed in the following chart:

$$\Delta K = \frac{\pi \cdot DN^2 \cdot v^3 \cdot \rho \cdot (\zeta_2 - \zeta_1)}{8000 \cdot \eta_g} \cdot B \cdot K_E$$



Symbol	Description	Unit	Basis for calculation
DK	Cost reduction per year	[EUR/a]	
DN	Nominal pipe / valve size	[m]	
v	Flow velocity of the medium	[m/s]	5
ζ_1	Head loss coefficient of ball valve	[-]	
ζ_2	Head loss coefficient of comparative valve	[-]	
ηg	Overall efficiency (Pump and motor)	[-]	0.75
B	Operating time of the pumping station	[h/a]	8760
KE	Energy costs	[EUR/kWh]	0,25
r	Density of the flow medium	[kg/m³]	1000



Weight-loaded actuator KFa

When safety is priorty

ERHARD weight-loaded hydraulic actuators KFa are used wherever valves have to be safely and reliably closed or opened at crucial points of the pipe network, even on failure of external operating energy.

Thus, they have to meet the most stringent requirements in terms of functional safety.

System safety

Compact design

Independent of external energy souces

Characteristics

- **Range of torques** 250-300.000 Nm
  (9 actuator sizes)
- **Valve types:**
  Double eccentric butterfly valves DN 150-3000
  Ball valve DN 100-1200
  Needle valve DN 100-1800
- **Coating:**
  Epoxy 250 µm GSK

Standard design:

- Two-phase closing action, each adjustable, avoiding water hammer.
- Compact design with incorporated hydraulic unit (motor pump and manual pump)
- Thermal switch and pressure limiting valve included
- Control by means of solenoid valve (open-circuit/closed-circuit concept)
- Manual valve (3/3-way ball valve) for emergency tripping (manual) or for hydraulic blocking (manual)

Options / Variants

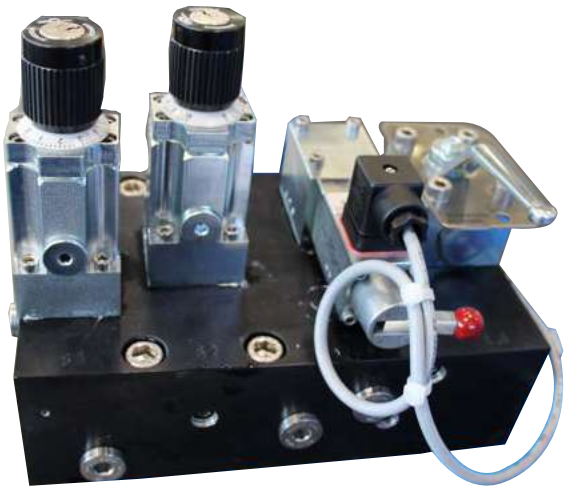
- Weight-loaded hydraulic actuators KFaR without hydraulic unit, i.e. for connecting to an on-site hydraulic unit supplied by the customer (external oil supply).
- One or three-phase closing action, depending on the requirement and application of the plant.
- Mechanical operation of the main valve (if there is no external energy available on site).
- Hydraulic unit equipped with accumulator.
- Accumulator (with 2 pressure switches)
- Position transmitter (4 – 20 mA signal)
- Measuring systems for exceeding of max. flow rate (overspeed detection)
- Blocking device to avoid the movement of the actuator
- Electrical control cabinet for control/regulation

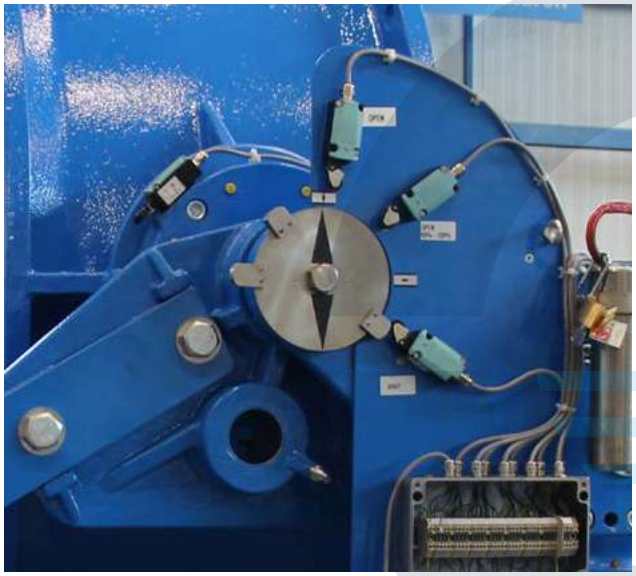
Package solution with compact design

- Hydraulic power unit with integrated oil tank and electric pump incorporated in the actuator
- Hydraulic forces are absorbed and supported within the valve, no transmission onto the structure

Self-sufficient control unit

- Control unit is directly mounted on the cylinder in “block design” with little tubing
- No uncontrolled valve closing in case of pipe breakage
- Pilot valve with small electrical output, irrespective of the actuator size





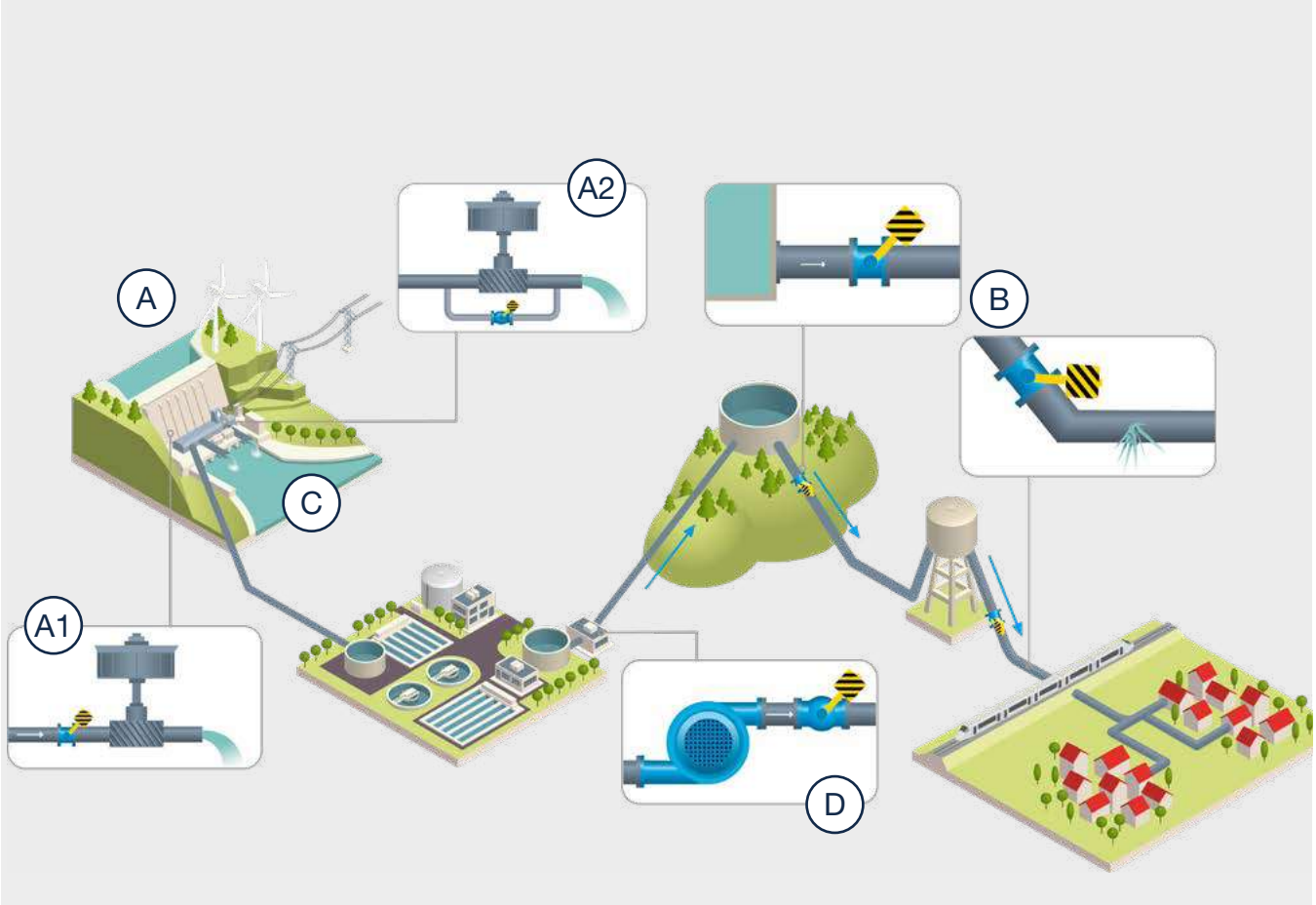
Adjustable closing phases

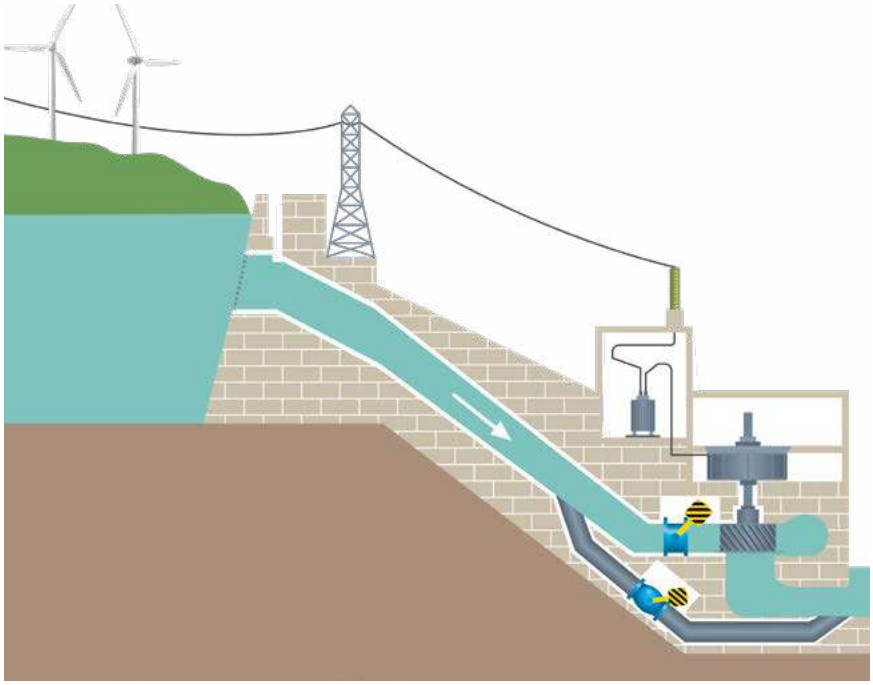
- Each of the 2 closing phases (0-70% and 70-100%) can be adjusted separately
- High-quality flow control valves operating independently of the pressure
- Precise adaptation to the operating conditions

Limit switches

- 3 limit swtiches: OPEN, CLOSED, 90% OPEN
- Unintentional sinking of the weight is registered by the additional limit switch (90% open)
- Automatically switches on the motor pump and resets the system to the "open" position. This way, an internal leakage can be compensated.

Applications of the weight-loaded actuators KFa





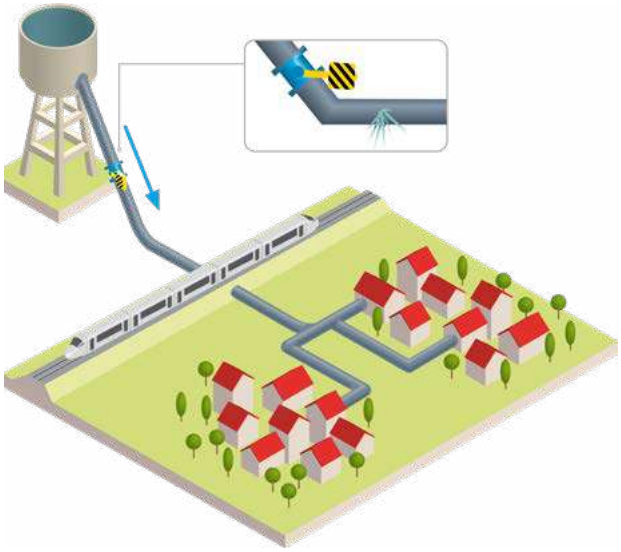
A Turbine safety valves

A1 Turbine inlet valve

Main inlet valve isolating the turbine and completely cutting-off the water flow. It serves as a safety device protecting the turbine. The challenge is to close quickly at the maximum water discharge (emergency shut-off), thus preventing unacceptably high flow velocities at the turbine, whilst avoiding water hammer damage.

A2 Turbine by-pass valve

In the by-pass, the safety valve acts as a quick-opening device in order to open synchronously to the closing of the inlet valve, adjusting the overall flow through the plant.



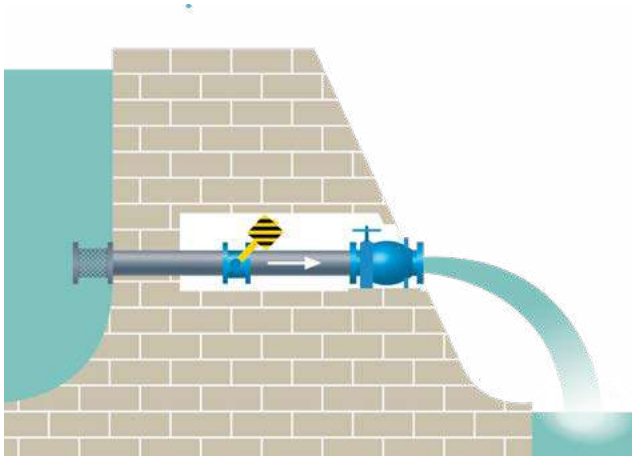
B Burst pipe protection valve

In the outlets of dams or reservoirs, safety valves with weight loaded actuators are installed to protect buildings, traffic routes, power plants etc. from flooding in the case of a pipe burst downstream of the valve. At the same time, they prevent the dam or reservoir from being emptied.

Upstream of the valve, an overspeed detection device triggers the drop of the weight.

Downstream, a vacuum breaker allows the inlet of air, preventing the pipe from collapsing.

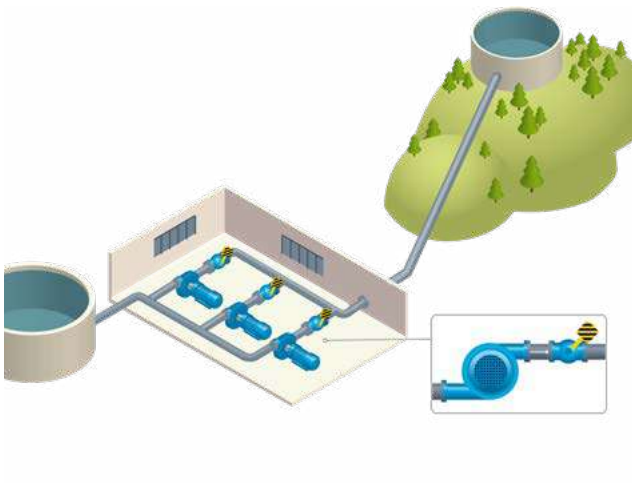
An important feature of this specific application is the independency of external energy sources. The closing process takes place without external energy.



C Drainage protection valve

In the outlets of dams or reservoirs, we always find a control valve, such as a needle valve or a cone outlet valve to control the outlet flow.

As a safety measure, in case this control valve fails, an emergency isolation valve is placed just upstream of the control outlet valve. This avoids emptying of the reservoir, which is especially requested when dams are built for water storage purposes.



C Pump start-up and backflow prevention valve

In this application two functions are combined in one valve: a controlled discharge of the pump and a non-return function.

Pumps without a frequency converter require a controlled discharge in relation to the built-up pressure.

The control unit at the weight loaded actuator allows a smooth, synchronous start-up of the valve.

Compared to a swinging check valve, the opening and closing behaviour of the controlled valves can be adjusted to the pump characteristic curve.

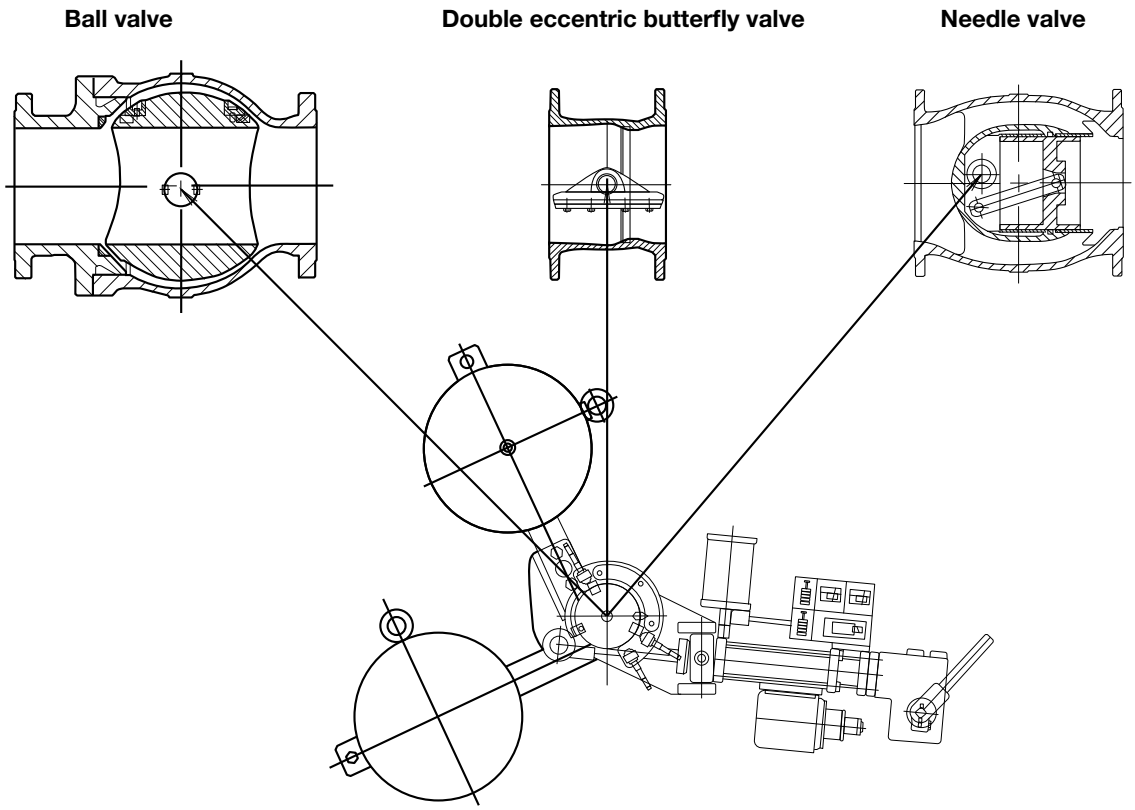
KFa: An actuator concept for quarter-turn valves

ERHARD KFa compact weight-loaded hydraulic actuators are used for quarter-turn valves with a movement of 90°. Depending on the application and specific use, the ERHARD KFa compact weight-loaded hydraulic actuator can be fitted to ball valves, double eccentric butterfly valves, or needle valves.

Recommendations:

- Ball valves: Turbine inlet and pump start-up valves, exploiting the energy advantages of minimum headloss.
- Butterfly valves: Pipe burst protection, drainage protection.
- Needle valves: Turbine station by-pass valve with a quick opening function providing cavitation control.

Fitting options for weight-loaded hydraulic actuators

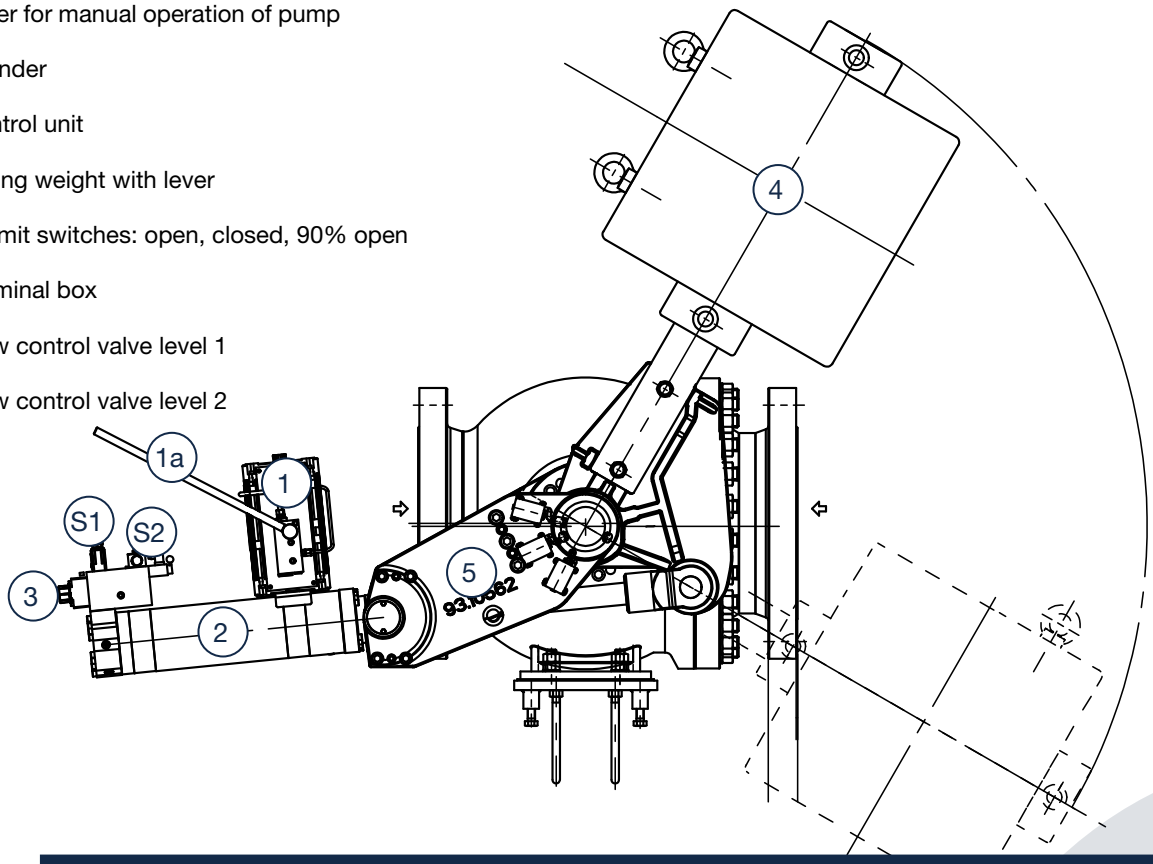


Main components of the KFa compact weight-loaded hydraulic actuator

The ERHARD weight-loaded hydraulic actuator KFa is characterised by its compact design.

The compact block design prevents an unbraked closing of the valve, even if there is a break in the control pipe.

1. Hydraulic power unit (HPU)
1a. Lever for manual operation of pump
2. Cylinder
3. Control unit
4. Falling weight with lever
5. 3 Limit switches: open, closed, 90% open
6. Terminal box
S1. Flow control valve level 1
S2. Flow control valve level 2



GOOD TO KNOW

Fail-safe elements:

- Leakage monitoring by third limit switch
- Manual pump in case of power failure
- Pressure relief valve in the HPU
- Oil level indicator
- Manual switch for triggering the actuator
- 3-way ball valve for manual operation
- Locking keys on flow control valves
- Temperature monitoring
- Optional blocking device to avoid accidental movement of the actuator

ERHARD

Going beyond the limits

Double eccentric

Ball Valve

DN80 up to 1200, PN10-160

For more than 50 years, ERHARD has been delivering customized ball valves worldwide for the most challenging operating conditions. The ERHARD Ball Valve just gets started, when other isolation valves find their limits.

Robustness and simplicity are combined to meet highest demands in terms of pressure and flow velocity – quality made in Germany.

Tailor-made

Most of ERHARD ball valves are tailor made for the specific need. Materials, sealing elements, flanges, pressure rating and actuation are highly customizable and match perfectly to the operating conditions of the respective installation.

Reliabile

ERHARD ball valves have a service life of decades. The low-maintenance design, high-quality components and the optional inspection cover make this product a long-lasting, reliable core-element within your network.

Well-proven

When it comes to customized solutions, trust the engineering expertise of ERHARD for safety valve applications and high pressure solutions. With installations in more than 50 countries, ERHARD ball valves are designed for challenging applications and operating pressures up to 160 bar.

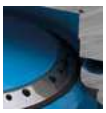
quality as tradition.

www.erhard.de

ERHARD

Ball Valve

Double eccentric



Double eccentric design

Low gasket wear

- Seal ring releases immediately when opening the ball plug
- Minimum wear due to double offset
- Plug is flushed and self-cleaned

Optional inspection cover

Easy maintenance

- Simple exchange of sealing ring in installed position
- Easily remove dirt and deposits

Optional weight loaded actuator

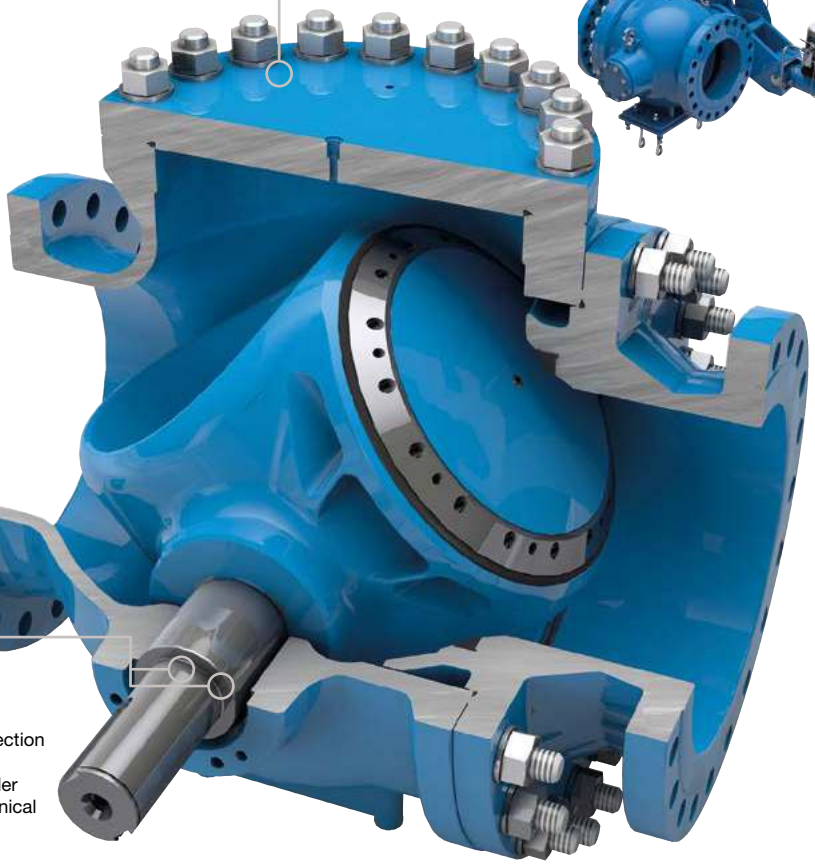
Reliable and autonomous

- For safety applications, hydropower and main burst protection
- Compact incorporated hydraulic unit independent of plant electricity

Free passage

Literally no headloss

- Energy-efficient use of pumps, lowering operating costs
- Insensitive to dirt, suitable for sewage
- Piggable



Force-locked connection

Maximum safety

- Friction-fit wedge connection of shaft and plug
- Backlash free, even under high pressure or mechanical load
- Reliable torque transfer

Scan the QR Code & discover the product in AR

SKG slider crank gearbox

Prevents damage from water hammer

- Two step closing behavior
- Self-locking mechanism
- Adjustable end stop on the spindle

quality as tradition.

www.erhard.de

Hydraulic power unit with cylinder, motor pump and control unit

The hydraulic power unit HPU (1) and the control unit (3) are mounted on the cylinder (2) .

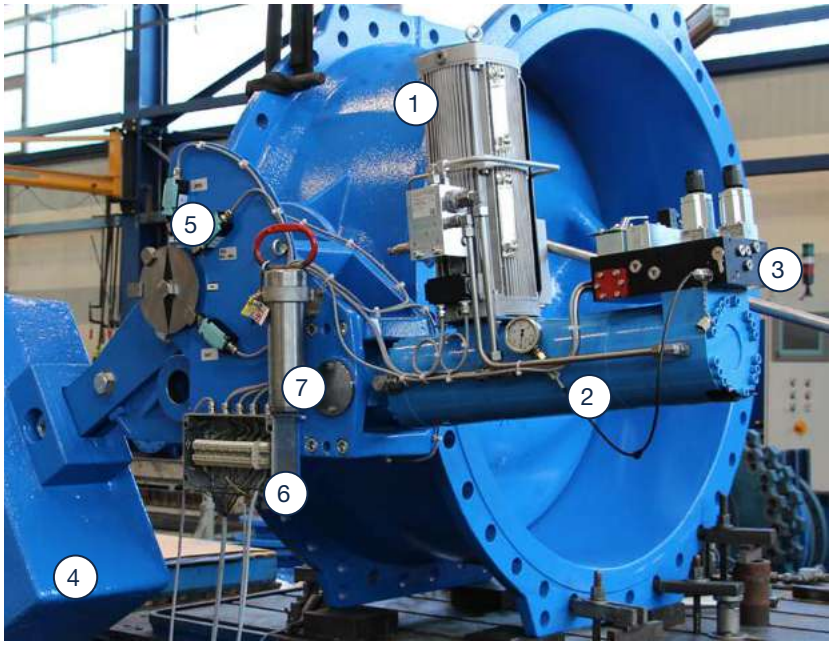
The hydraulic power unit HPU (1) includes the motor pump and an additional manual operation (1.1) .

The intelligence of the weight loaded actuator KFa is in the control unit (3) which regulates the movement of the weight (4).

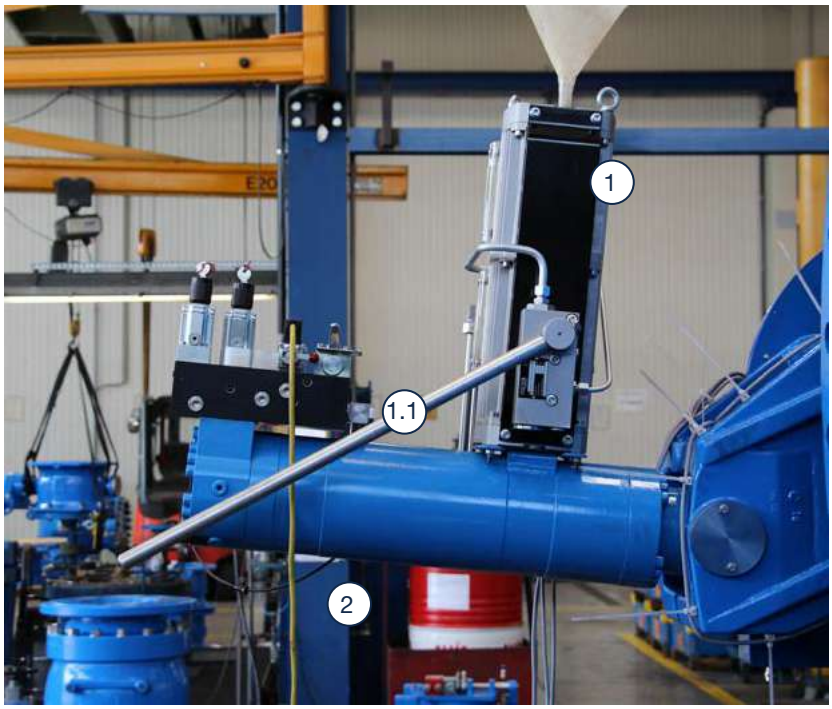
The terminal box (6) can either be connected to the plant distributed control system or to a local control cabinet. The local control cabinet can optionally be supplied by ERHARD.

For compensating the difference in flow rate between the cylinder chamber on the rod side and that on the piston side and for keeping a small oil reserve for losses due to leakage, the actuator is equipped with an oil tank with visual control (1.5) of the oil level. The electric motor pump is integrated in the oil tank.

If a weight-loaded hydraulic actuator is fitted with an electric pilot valve (3.2) and a motor pump (1.4), a control cabinet is necessary for the operation of the actuator.

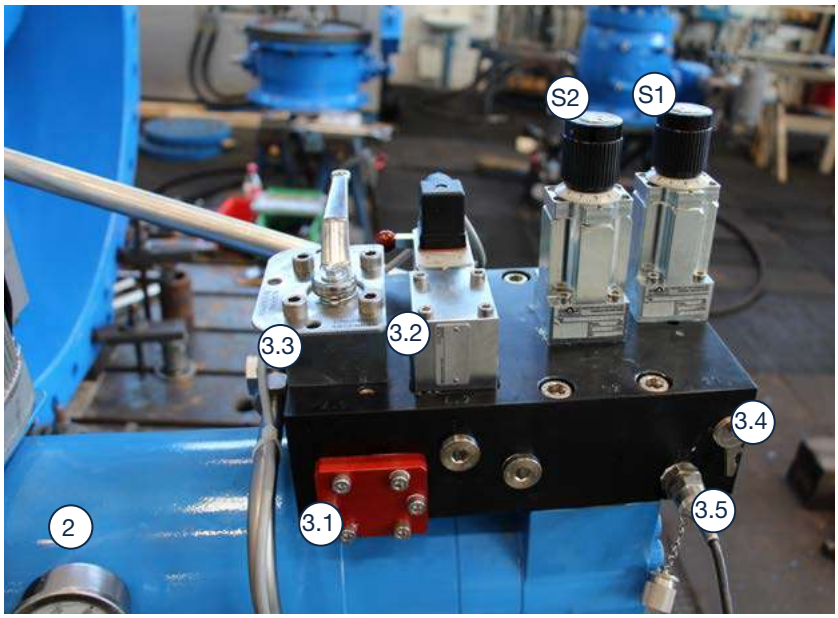


- (1) Hydraulic power unit (HPU)
- (1.1) Lever for manual pump operation
- (1.2) Electrical outlet
- (1.3) Pressure relief valve
- (1.4) Motor pump
- (1.5) Sight glass for oil level
- (2) Cylinder
- (3) Control unit
- (4) Weight
- (5) Limit switches
- (6) Terminal box
- (7) Optional safety blocking device



Components for control and operation of the KFa weight loaded actuator

Control unit with flow control valves



(2) Cylinder
(3.1) Cartridge valve (main valve)
(3.2) Solenoid valve (pilot valve)
(3.3) Ball valve 3/3-way
(3.4) Locking keys for S1 and S2
(3.5) Connection for pressure gauge
(S1) Flow control valve level 1
(S2) Flow control valve level 2

Control unit with flow control valves mounted on cylinder

The weight loaded actuator KFa has a two step closing action, avoiding damage caused to the infrastructure by water hammer.

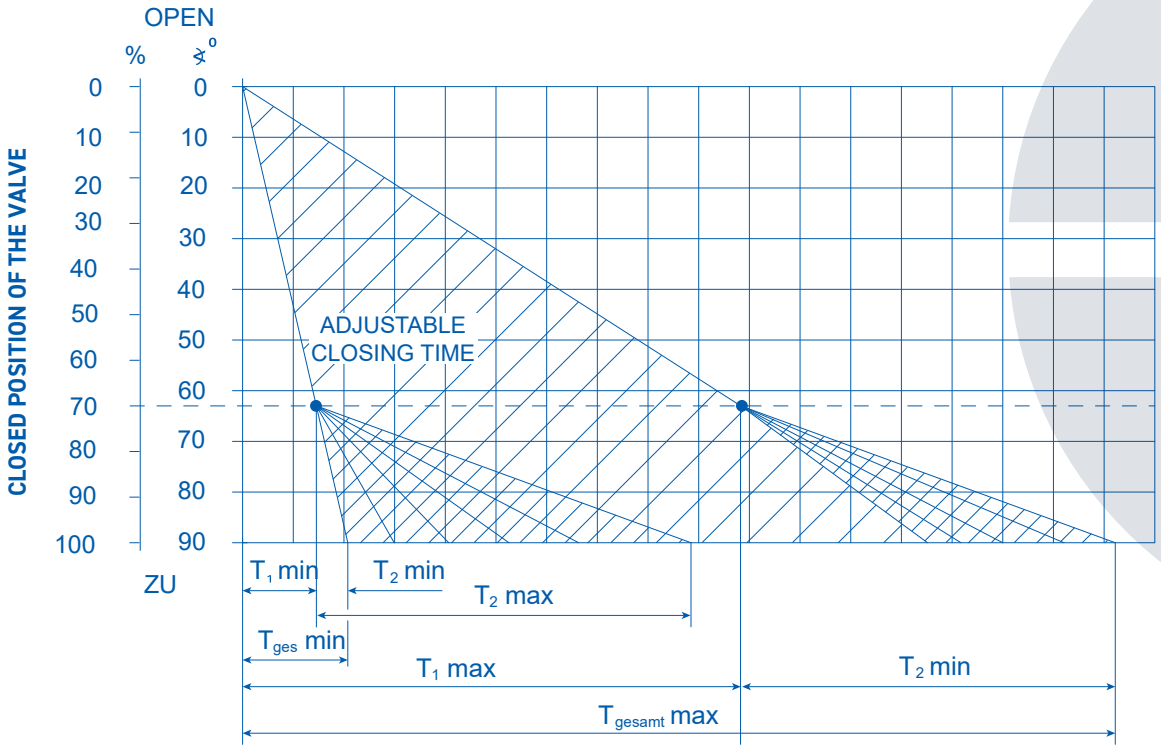
Each of the closing phases can be adjusted independently from each other by means of high-quality flow control valves.

The flow control valves operate independently of the medium pressure.

The lowering velocity of the first phase (70% valve opening degree) can be adjusted at flow control valve (S1), the velocity of the second phase (30% valve opening degree) at the flow control valve (S2).

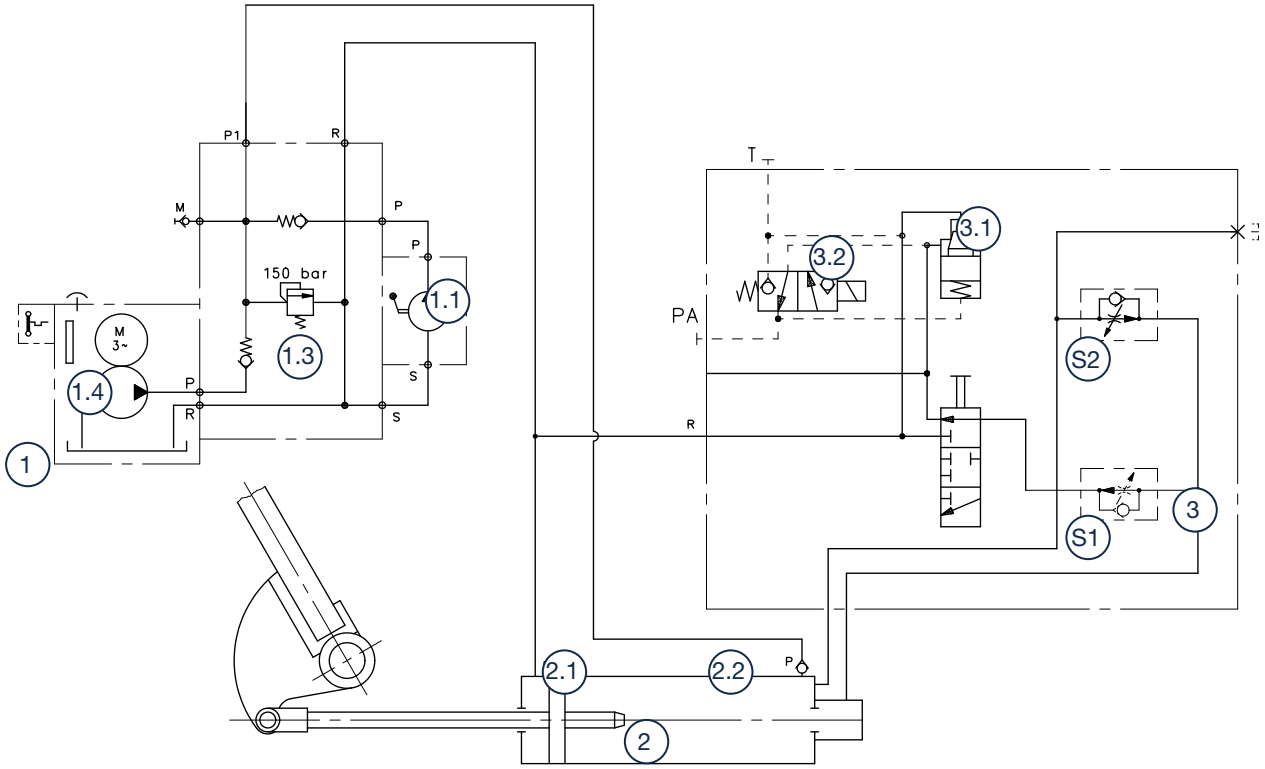
These phases are necessary in order to keep the pressure increase (water hammer) in the pipeline within an admissible range.

If desired, the phases can be adapted to suit the specific installation.



Two step closing time characterstic – steps and timing are adjusted to the application

Hydraulic power unit with cylinder, motor pump and control unit



Kfa hydraulic scheme with load current principle – weight drops when solenoid valve is de-energized

1 Hydraulic power unit (HPU)
1.1 Manual pump
1.2 Electrical outlet
1.3 Pressure relief valve
1.4 Motor pump
2 Cylinder
2.1 Damping pin
2.2 Non-return valve
3 Control unit
3.1 Cartridge valve (main valve)
3.2 Solenoid valve (pilot valve)
3.3 Ball valve 3/3-way
S1 Flow control valve level 1
S2 Flow control valve level 2

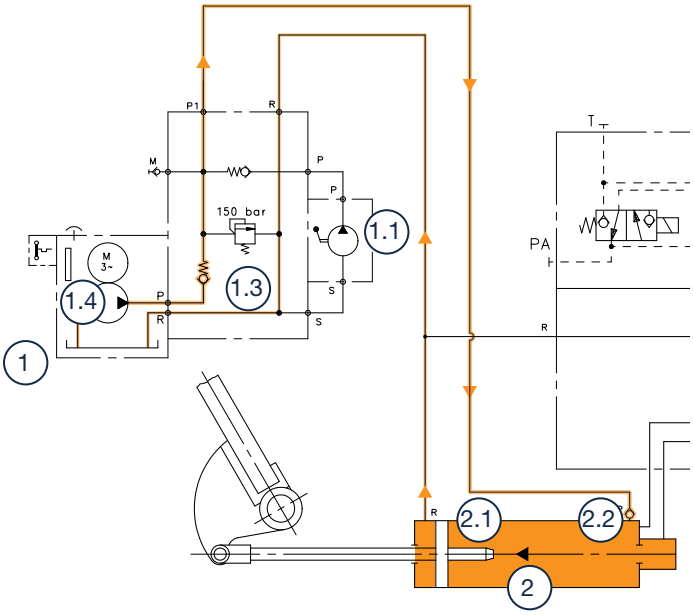
Rebuilt pumped-storage plant samina in liechtenstein

Lifting the weight to working position:

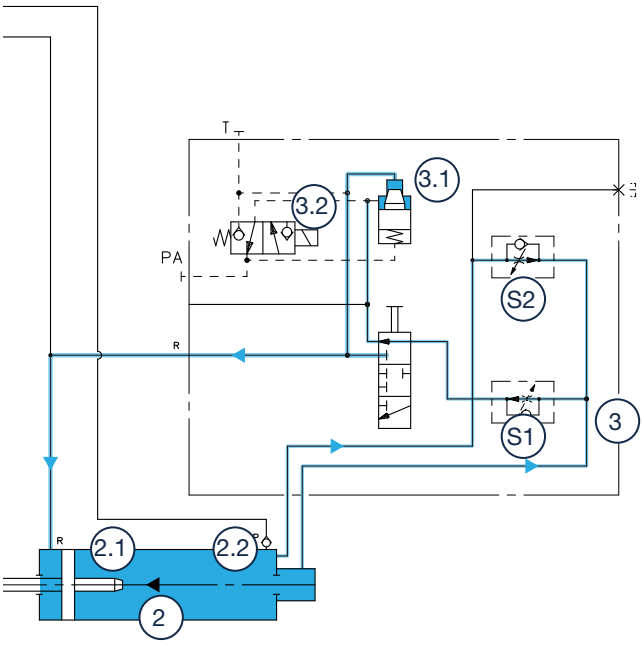
The motor pump (1.4) draws the oil out of the rod side of the cylinder chamber through the balancing tank inside the HPU and creates pressure on the piston side of the cylinder, which lifts up the weight.

In the open position, the oil must no longer escape from the cylinder (2), and this is ensured by the valve block (4) with its combination of valves. Mechanically, electrically or hydraulically activated pilot valves (4.2) control a main valve (4.1) which shuts off or opens up the flow of oil from the cylinder.

The actuator is hydraulically kept in the "working position" (falling weight raised). An advantage of this is that any internal oil leakage can be detected immediately through the sinking of the weight.



KFa hydraulic scheme: load current principle



KFa hydraulic scheme: load current principle

Dropping the weight:

The lowering velocity for the first damping phase (70%) can be adjusted at flow control valve (S1), the velocity for the second damping zone at the flow control valve (S2). Flow control valves keep the flow rate constant irrespective of the differential pressure.

The sinking movement is triggered in the standard by energizing (open-circuit concept) the solenoid valve (3.2). If required by the application, it can also be triggered by de-energizing (closed-circuit concept).

The solenoid valve (3.2) opens the circuit by opening the cartridge valve (3.1) allowing the oil to flow through the flow control valves into the piston side of the cylinder.

The flow valve (S1) control level one of the sinking phase, having the higher flow volume. Once the damping pin (2.1) reaches its final position, the oil will first flow through (S2), which has the lower volume flow, triggering the second sinking phase.

The 3/3-way ball valve enables manual operation, alloweing the valve to be closed manually. In the blocking position of the ball valve, the lowering of the weight is blocked.

Leakage control and monitoring the position of the weight

For signalling the different positions of the valve, several limit switches are mounted on the cover plate of the actuator. In the standard configuration, three limit switches (5) indicate the positions “OPEN”, “CLOSED”, and “90% OPEN”. Apart from signalling, the limit switches are also used for electrical control of the actuator. The electrical control can be carried out by the distributed control system of the plant or can be realised by a local on-site control cabinet. The local control cabinet can optionally be supplied and isntalled by ERHARD.

When the weight is lifted, internal leakage in the oil circuit can cause the drop weight to drop.

There are two possible solutions to switch on the motor pump in case of leakage:

- Triggered by a limit switch (standard)
- Triggered by pressure sensor (optional)

Motor pump is triggered by a limit switch (standard)

Inadmissible lowering of the weight, will be detected by a limit switch in 90% open position which switches on the motor pump. The pump is switched off, as soon as the limit switch reaches the 100% open position.

The type, number and position of the limit switches can be adapted to the individual needs.

Standard: 3 limit switches for ”open”, “closed” and “90% open”

Customized example

GOOD TO KNOW

Fail-safe elements:

- Leakage monitoring and control
- Manual pump in case of power failure
- Pressure relief valve in the HPU
- Oil level indicator
- Manual switch on the solenoid valve for triggering the actuator
- 3-way ball valve for manual operation
- Locking keys on flow control valves
- Temperature monitoring
- Optional blocking device to lock mechanically the movement of the actuator

Motor pump is triggered by a pressure sensor (optional)

Optionally, pressure sensors and a pressure accumulator can be mounted on the hydraulic power unit (HPU) in order to detect and compensate for oil leakage.

The oil leakage is compensated by the pressure accumulator. The motor pump is controlled via pressure sensors and the emptied pressure accumulator is filled again.

Pressure accumulator and pressure sensor”

Paddle-trip mechanism for overspeed protection

In principle, the burst pipe is detected by an excessive flow rate.

The signal of the excessive flow rate is then used to trigger the drop of the weight, closing the valve and stopping the flow in emergency mode.

The trigger to drop the weight and close the valve can be linked to:

- Exceeding a maximum flow rate or flow rate difference in the pipeline. This is either done by continuous monitoring with a flowmeter (using an external power supply) or by the ERHARD designed paddle trip mechanism (without external power supply)

OR

- Exceeding a maximum pressure difference or falling below a minimum pressure level in a pipeline or tank, depending on the installation.

Any type of flowmeter, pressure sensor or level indicator can be integrated into the control unit of the KFa actuator. The signal - mechanical, hydraulic or electrical - is used to trigger the drop of the weight.

When it comes to uncompromising safety and reliability in case of a burst pipe, the ERHARD paddle-trip mechanism is a reliable detection and trigger method.

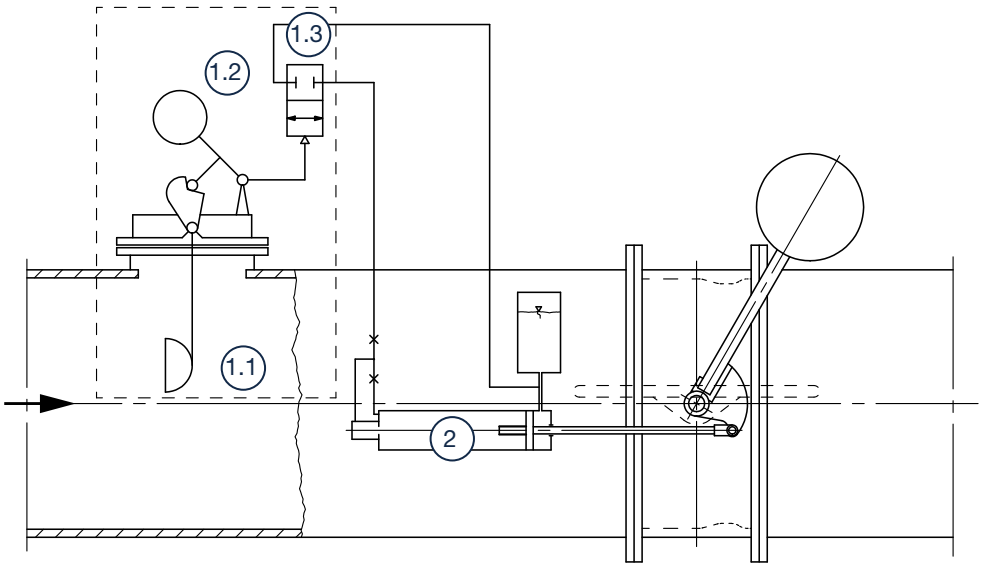
It consists of a paddle with a lever (1), which sticks out into the water and a tripping device.

When the flow velocity within the pipeline reaches the tripping point (defined individually per installation), the paddle (1) is pushed in the flow direction and triggers the tripping lever (2). The tripping lever is in the active position when it is lifted, it falls when triggered. This opens the hydraulic valve (3), which initiates the hydraulic circuit within the cylinder (1) of the weight loaded actuator.

The tripping lever must be lifted manually in order to reposition.

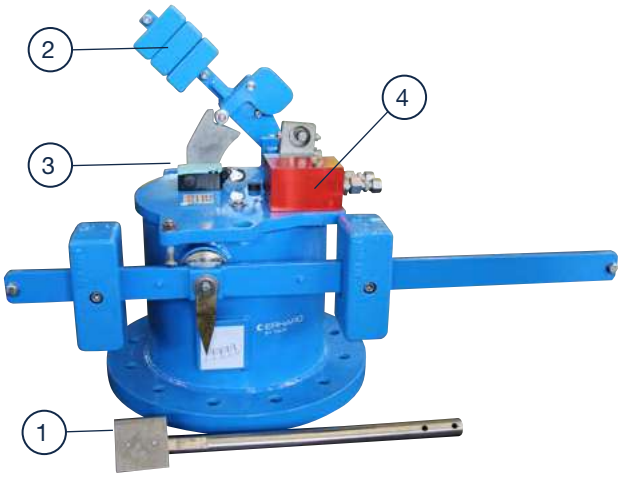
Safety valve with weight loaded actuator and paddLe-trip mechanism

Mechanical paddle trip system (overspeed detector) for DN >300

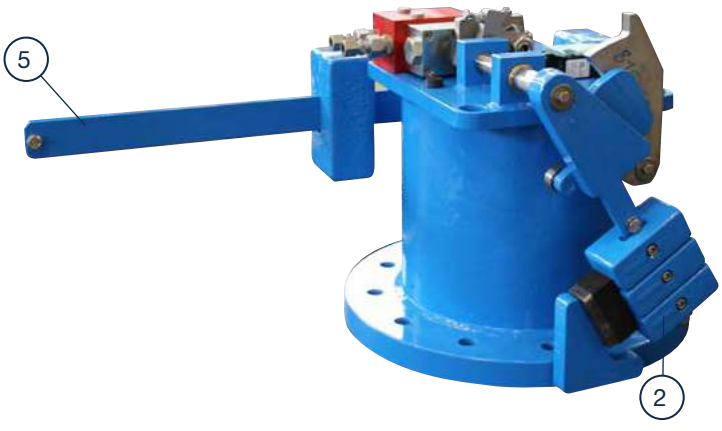


1 Paddle with lever
1.1 Tripping lever
1.2 Hydralic valve
1.3 Pressure relief valve
1.4 KFa Cylinder

Principle of paddletrip mechanism



1 Paddle
2 Tripping lever (active position)
3 Limit switch
4 Hydraulic valve



2 Tripping lever (inactive position)
5 Balance lever (adjustment of tripping velocity)

Main components of the paddle-trip mechanism

Request for quotation
for weight loaded actuator type KFa

Send form toanfragen-vertrieb-inland@erhard.de

Please attach drawings with dimensions and surrounding elements.

Header data

Request date

Project

Customer

Country of installation

Application & use

- Main burst control valve
- Combined pump discharge and non-return valve
- Turbine inlet safety valve (emergency closing device)
- Quick-opening valve
- Overflow prevention (tank inlet and outlet)
- Other

Valve data

Valve type

- Double eccentric butterfly valve
- Ball valve
- Needle valve

DN

PN

Flange drilling

Operating data

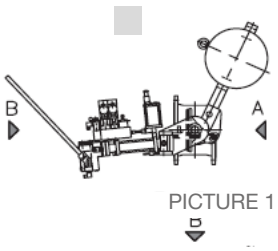
Operating pressure — Normal — Min. — Max.

Operating flow rate — Normal — Min. — Max.

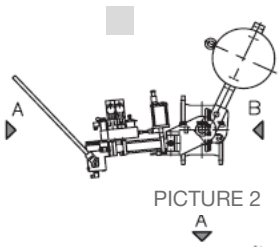
Tripping flow rate (triggers the actuator)

Functional details

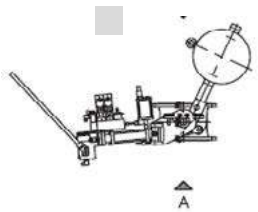
Arrangement of actuator



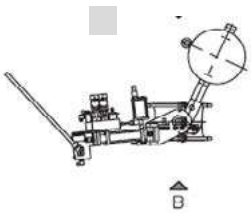
PICTURE 1



PICTURE 2



PICTURE 3



PICTURE 4

Main function of weight

- Falling weight closes (Standard)
- Falling weight opens

How shall the solenoid valve be triggered?

- Weight drops when solenoid is de-energyzed
- Weight drops when solenoid is energyzed

Hydraulic system - Hydraulic power unit (HPU) included?

- KFa: HPU included (Standard)
- KFaR: HPU not included in scope of supply, hydraulic network at installation

  Available pressure:
- KFaR: separate HPU:
  - HPU for 1 valve each
  - HPU with one hydraulic unit for several valves

Closing steps

- 70% / 30% (Standard)
- Other

Closing time

Step 1 in seconds

Step 2 in seconds

Lowering process of the weight is triggered:

- mechanically (e.g. paddle trip)
- electrically (solenoid valve)

Voltage
Frequency
Output

Raising of weight-loaded lever by means of:

- Manual oil pump
- Electrohydraulic pump

Voltage
Frequency
Output

Trigger, when the maximum flow rate is reached:

- Paddle trip mechanism

Options

- Accumulator
- Control cubicle
- 3- or 4-point blocking of the valve
- Blocking of the actuator
- Pressure switch
- Float switch
- Further limit switches
- Stabilizing flange feet
- Special coating or color
  (standard coating is epoxy 250 microns)

Comments

Overview of actuation methods

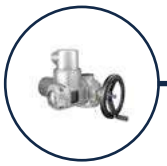
The actuation design is always adapted to the application and specific need.

Without Flanges - For Actuation with square cap, handwheel or extensions

Flanged Connection acc. to DIN ISO 5210-Prepared for actuator

Weight loaded actuator

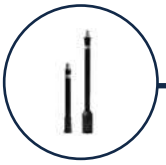
Handwheel



Electric actuator (multiturn)

Square cap for T-keys

Pneumatic actuator



Variety of extensions, also for underground use and according to GW336

Hydraulic actuator

Without flanges - For actuation with captop, handwheel or extensions

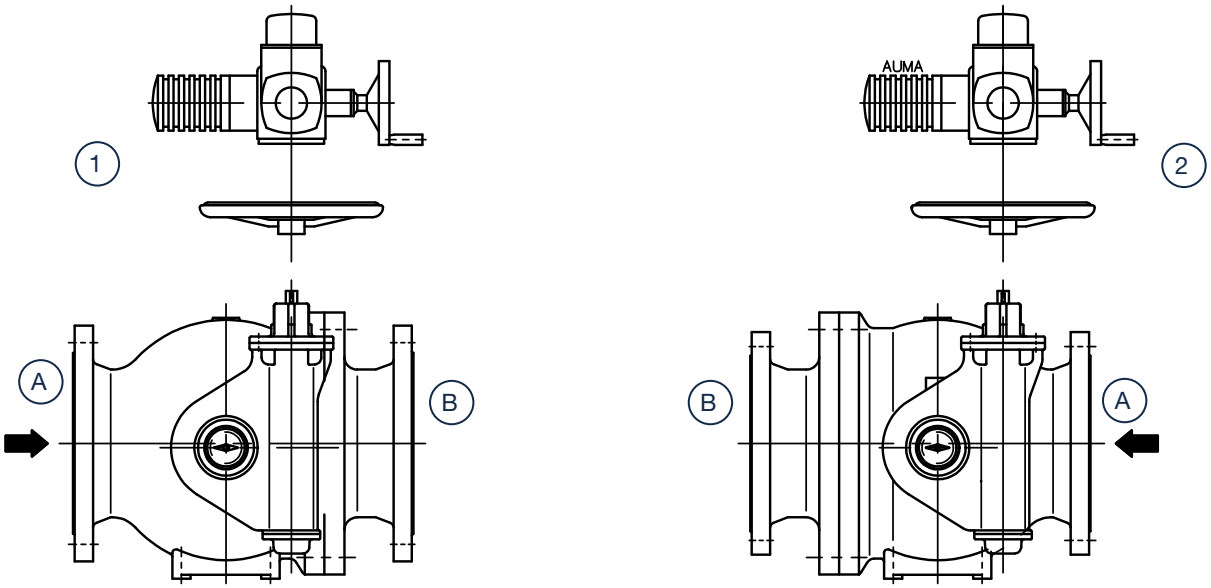
Modular actuation concept - gearbox management

ERHARD double eccentric ball valves are tight in both directions and can be installed according to ERHARD drawing no. 4D156721.

Both patterns are also suitable for installation in vertical pipes. If the flow against the valve is always from one side, then side A is to be preferred, the pressure supports the sealing function.

Flow from “B” to “A”. This corresponds to the standard flow if used as a pump start-up valve. The back pressure against the pump is on the “A” side.

Flow from “A” to “B” is chosen for turbine, bypass and flushing valves.



Quality and testing

- Without exception, 100% of ERHARD valves are tested according to DIN EN 12266, or as per customer requirements. Additionally, ERHARD conducts tests above industry standards.
- Type tests are conducted according to DIN EN 1074 (2500 cycles endurance resistance).

Testing pressures

Pressure values of testing / body test			
	PN 6	PN 10	PN 16
acc. EN 12266	9 bar	15 bar	24 bar
acc. EN 1074	12 bar	17 bar	25 bar

Testing durations

Duration values of testing / body test		
DN of valves	EN 12266	ERHARD
≤ DN 150	60 s	300 s
DN 150 - DN 300	120 s	300 s
DN 350 - DN 500	300 s	300 s
> DN 500	300 s	600 s

Approvals

A cutting-edge traceability system, applied from the reception of raw materials to product supply, together with an exhaustive control of processes, guarantees the top quality of our products.

ERHARD valves are suitable for potable water and they are approved by the most prestigious organisations all over the world.

Certified processes

In addition, the TÜV certification according to DIN EN ISO 9001 and industry-specific certifications guarantee the highest quality and efficiency of all ERHARD processes and thus also of our valves.

(DIN ISO 9001:2015; DGRL 2014/68/EU Modul H; KTA 1401; AD-WO/2014/68/EU)

KTA 1401

Prequalifications and audits

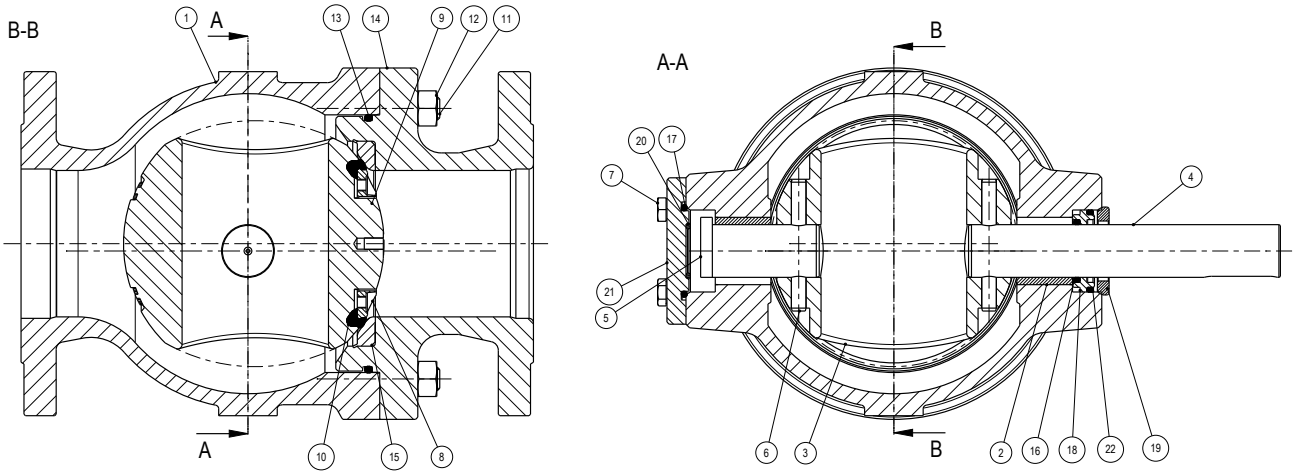
- ERHARD is prequalified at renowned utility companies such as Thüga, Innogy, Berliner Wasserbetriebe and Bodensee-Wasserversorgung.
- Country registration procedures such as SPAN (Malaysia) and yearly audits such as for IGH (Croatia) and BULGARKONTROLA (Bulgaria) are part of our Quality Management routine.
- Regular audits according to customer specifications demonstrate suitability in terms of quality, know-how and performance.

Own research institute

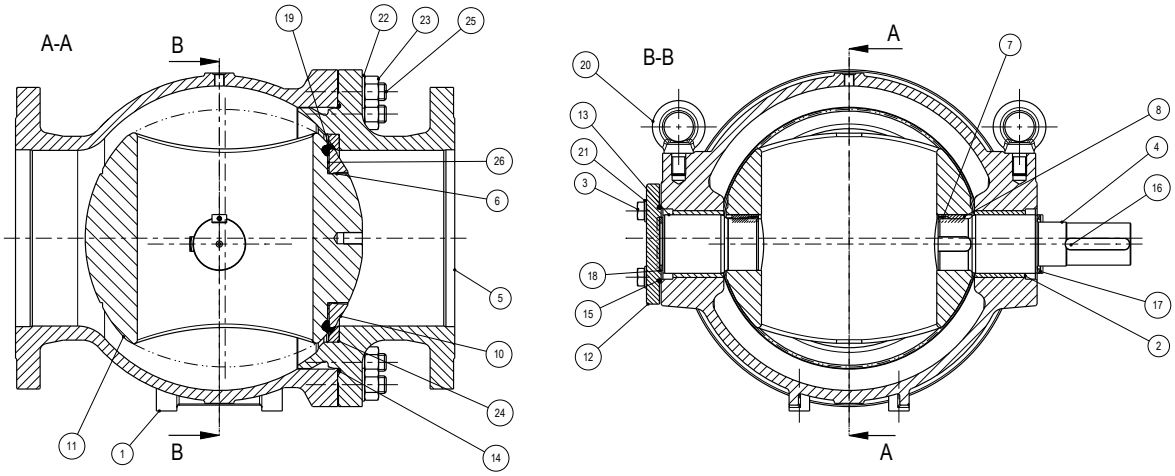
ERHARD has the infrastructure to test the quality of its products and validate the results directly. Testing grounds, laboratories and immediate testing results for our product engineering processes on site, enable us to provide the highest quality of our products. In our own research institute at ERHARD, we can test valves up to DN 1200. E.g. we can measure and carry out flow characteristics, endurance tests, corrosion tests, torque detection and much more.

Main components

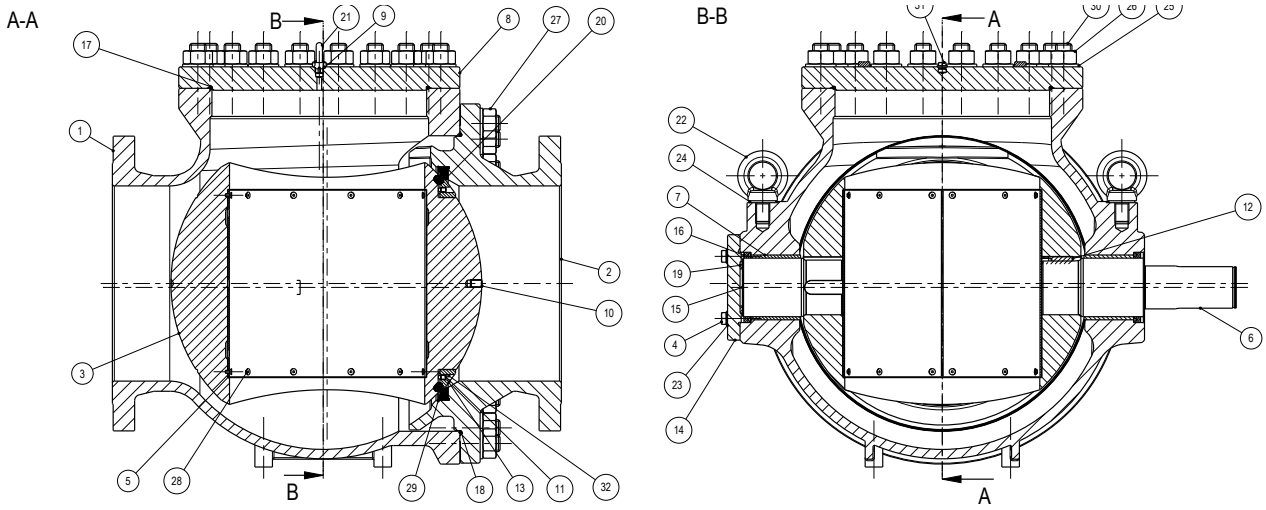
Design range DN 80-125



Design range DN 150-350



Design range DN 400-1200*



*DN 1200 has a 3 part body, which is not reflected in this drawing

Pos.	Description	Material - Standard	Optional	Spare Part
1	Body inlet	EN-GJS-500-7		
2	Body outlet	EN-GJS-500-7	G24Mn6+QT1*, GP240GH	
3	Ball plug	EN-GJS-500-7	G24Mn6+QT1*, GP240GH	
4	Cover plate	1.4301		
5	Countersunk screw	A4		
6	Seat ring	1.4301		
7	Drive shaft	1.4057.05	1.4571	
8	Cylindrical pin	1.4021.05		
9	Wedge key	1.4057.05		x
10	Trunnion	1.4057.05	1.4462	
11	Sliding bush	P1/1.4301-PTFE	A4	
12	Bearing cover	RST 37-2 epoxy coated	A4	
13	Hexagon screw	A2	n.a.	
14	Washer	A2	A4	
15	Profile ring	NBR	A4	
16	Clamping ring	EN-GJS-500-7 epoxy coated	EPDM, PUR	x
17	Hexagon socket head cap screw	A4	1.4301, 1.4571	
18	Threaded pin	A4		
19	Centering ring	9SMN28K		x
20	Gauge ring	Copper alloy		
21	Stud bolt	A2		
22	Hexagon nut	A2	A4	
23	Washer	A2	A4	
24	Threaded pin	A4	A4	x
25	O-Ring	NBR		
26	O-Ring	NBR	EPDM	x
27	O-Ring	NBR	EPDM	x
28	Cage	Copper alloy	EPDM	x
29	O-Ring	NBR		
30	Threaded pin	A2	EPDM	x
31	Eye bolt	Galvanized steel	A4	
32	Washer	A2		
33	Parallel Key	C45+C		
Optional				
34	Inspection cover*	EN-GJS-500-7	G24Mn6+QT1*, GP240GH	
35	O-Ring	NBR	EPDM	
36	Seal ring	Copper		x
37	Eye bolt	Galvanized steel	A4	
38	Screw plug	A4	A4	

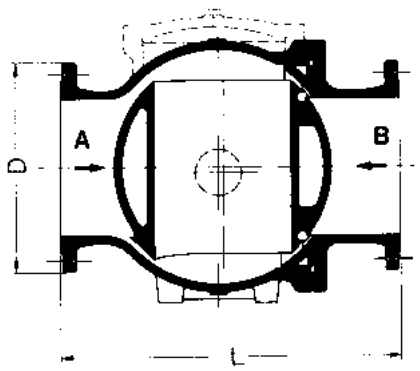
*Standard for PN ³63

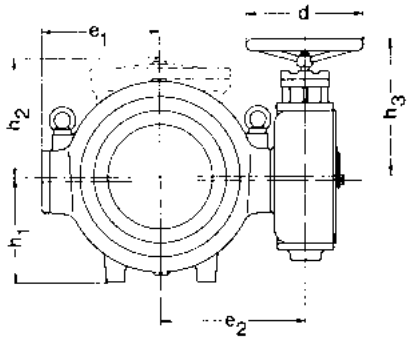
Dimensions and weights

Double eccentric ball valve with handwheel

DN	PN	L	D	h1	h2	h3	e1	e2	Weight
80	16	310	200			238	150	246	56
80	25	310	200			238	150	246	56
80	40	310	200			238	150	246	61
80	63	310	215			238	150	246	63
100	10	350	220			237	165	260	70
100	16	350	220			237	165	260	70
100	25	350	235			237	165	260	70
100	40	350	235			237	165	260	76
100	63	350	250			237	165	260	80
125	10	400	250			237	180	276	95
125	16	400	250			237	180	276	95
125	25	400	270			237	180	276	95
125	40	400	270			237	180	276	104
125	63	400	295			314	180	345	116
150	10	450	285			236	220	338	160
150	16	450	285			236	220	338	160
150	25	450	300		220	236	220	338	160
150	40	450	300		220	313	220	360	175
150	63	450	395		220	313	220	360	185
200	10	550	340	215		311	265	400	240
200	16	550	340	215		311	265	400	240
200	25	550	360	215	290	311	265	400	240
200	40	550	375	215	290	311	265	400	270
200	63	550	415	215	290	336	270	430	335
250	10	650	395	258		336	305	471	380
250	16	650	405	258		336	305	471	380
250	25	650	425	258	330	336	305	471	387
250	40	650	450	258	330	336	310	471	427
250	63	650	470	258	330	425	330	455	480
300	10	750	445	295		334	335	500	530
300	16	750	460	295		334	335	500	530
300	25	750	485	295	360	334	335	500	560
300	40	750	515	295	385	423	365	476	635
300	63	750	530	295	385	510	380	520	780
350	10	850	505	350	435	334	405	564	750
350	16	850	520	350	435	334	405	564	790
350	25	850	555	350	440	425	405	517	960
350	40	850	580	350	445	510	440	520	1270
350	63	850	600	350	448	660	460	620	1300
400	10	950	565	380	490	425	440	555	970
400	16	950	580	380	490	425	440	555	1000
400	25	950	620	380	490	510	460	550	1050
400	40	950	660	380	500	510	460	550	1500
400	63	950	670	380	500	660	500	650	1570
450	10	1050	615	420	515	510	490	580	1300
450	16	1050	640	420	515	510	490	580	1300
450	25	1050	670	420	515	510	500	560	1300

DN	PN	L	D	h1	h2	h3	e1	e2	Weight
450	40	1050	685	420	540	660	530	620	2000
450	63	1050	715	420	560	760	550	720	2100
500	10	1150	670	470	575	510	535	625	1670
500	16	1150	715	470	575	510	535	625	1670
500	25	1150	730	470	575	510	535	630	1600
500	40	1150	755	470	610	660	575	670	2500
500	63	1150	880	470	620	760	620	790	2600
600	10	1350	780	550	645	510	605	695	2600
600	16	1350	840	550	645	660	630	733	2720
600	25	1350	845	550	645	690	630	735	2750
600	40	1350	890	550	670	765	690	783	3700
600	63	1350	930	550	670	900	720	930	4600
700	10	1550	895	635	740	510	675	765	3500
700	16	1550	910	635	740	660	700	805	3520
700	25	1550	960	635	740	690	700	805	3400
700	40	1550	995	635	770	765	730	850	4300
700	63	1550	1075	635	790	900	760	980	5200
800	10	1750	1015	710	830	660	765	870	4800
800	16	1750	1025	710	830	760	810	920	5000
800	25	1750	1085	710	830	760	810	920	5100
800	40	1750	1140	710	860	765	810	920	6300
800	63	1750	1165	710	890	940	900	1120	7000
900	10	1950	1115	780	870	760	850	960	6300
900	16	1950	1125	780	870	760	850	960	6300
900	25	1950	1185	780	870	760	870	960	6000
900	40	1950	1250	780	910	900	900	1080	7700
900	63	1950	1285	780	850	940	950	1160	8000
1000	10	2150	1230	865	1015	760	935	1045	7600
1000	16	2150	1255	865	1015	760	935	1045	7600
1000	25	2150	1320	865	1015	760	935	1045	8600
1000	40	2150	1360	865	1050	900	950	1120	9100
1000	63	2150	1415	865	1100	940	1000	1250	9500
1200	10	2400	1455	1100	1250	760	1250	1360	17000
1200	16	2400	1485	1100	1250	900	1250	1360	17000
1200	25	2400	1530	1100		900	1250	1360	15000





Dimensions used:

D [mm] flange diameter

L [mm] face-to-face dimension to EN-558 Basic line 26

e [mm] projection

h [mm] height

d [mm] handwheel diameter

Gearbox and actuator sizing

DN	PN	Operation with handwheel				
		Gearbox size	Torque at gearbox Nm	Strokes OPEN-CLOSE	Handwheel Ø mm	Manual force N
80	16	SKG1	18	25	200	180
80	25	SKG1	22	25	200	220
80	40	SKG1	24	25	200	240
80	63	SKG1	26	25	200	260
100	16	SKG1	18	25	200	180
100	25	SKG1	22	25	200	220
100	40	SKG1	24	25	200	240
100	63	SKG1	26	25	200	260
125	16	SKG1	18	25	200	180
125	25	SKG1	22	25	200	220
125	40	SKG1	24	25	200	240
125	63	SKG2	26	29	250	208
125	100	SKG2	34		250	272
150	16	SKG1	20	25	200	200
150	25	SKG1	25	25	200	250
150	40	SKG2	34	29	250	272
150	63	SKG2	40	29	250	320
150	100	SKG4	60		350	343
200	10	SKG2	20	29	250	160
200	16	SKG2	25	29	250	200
200	25	SKG2	34	29	250	272
200	40	SKG2	58	29	250	464
200	63	SKG4	72	36	350	411
200	100	SKG8	90		350	514
250	10	SKG4	33	36	350	189
250	16	SKG4	42	36	350	240
250	25	SKG4	53	36	350	303
250	40	SKG4	76	36	350	434
250	63	SKG8	95	149	350	543
300	10	SKG4	42	36	350	240
300	16	SKG4	52	36	350	297
300	25	SKG4	74	36	350	423
300	40	SKG8	105	149	350	600
300	63	SK70	100	51	500	400
300	100	SK70	120		500	480
350	10	SKG4	51	36	350	291
350	16	SKG4	78	36	350	446
350	25	SKG8	100	149	350	571
350	40	SK70	150	51	500	600
350	63	SK70		51	500	
400	10	SKG8	120	149	350	686
400	16	SKG8	120	149	350	686
400	25	SK70	120	51	500	480
350	63	SK70			500	
350	100					

DN	PN	Operation with handwheel				
		Gearbox size	Torque at gearbox Nm	Strokes OPEN-CLOSE	Handwheel Ø mm	Manual force N
400	10	SKG8	120		350	686
400	16	SKG8	120		350	686
400	25	SK70	120	51	500	480
400	40	SK70	180	51	500	720
400	63	SK110/4:1	45	228	350	257
450	10	SK70		51	500	
450	16	SK70		51	500	
450	25	SK70		51	500	
450	40	SK110/4:1	60	228	350	343
450	63	SK110/4:1	80	228	350	457
500	10	SK70	100	51	500	400
500	16	SK70	130	51	500	520
500	25	SK70	150	51	500	600
500	40	SK110/4:1	80	228	350	457
500	63	SK250/4:1	110	284	350	629
600	10	SK70	105	51	500	420
600	16	SK70	135	51	500	540
600	25	SK110/4:1	70	228	350	400
600	40	SK250/4:1	80	284	350	457
600	63	SK250/4:1		284	350	
700	10	SK70	125	51	500	500
700	16	SK110/4:1	80	228	350	457
700	25	SK110/4:1	100	228	350	571
700	40	SK250/4:1		284	350	
700	63	SK400/5,6:1		438	400	
800	10	SK110/4:1	80	284	350	457
800	16	SK250/4:1	80	284	350	457
800	25	SK250/4:1	75	284	350	429
800	40	SK250/4:1		284	350	
800	63	SK400/5,6:1		438	400	
900	10	SK250/4:1		284	350	
900	16	SK250/4:1		284	350	
900	25	SK250/4:1		438	350	
900	40	SK400/5,6:1			400	
1000	10	SK250/4:1	100	284	350	571
1000	16	SK250/4:1	125	287	350	714
1000	25	SK400/5,6:1		438	400	
1000	40	SK400/5,6:1		438	400	
1200	10	SK250/4:1		284	350	
1200	16	SK400/5,6:1		438	400	
1200	25	SK400/5,6:1		438	400	
1200	40	SK700/5,6:1		438	400	
1200	16	SK400/5,6:1			400	
1200	25	SK400/5,6:1			400	
1200	40	SK700/5,6:1			400	

Gearbox and actuator sizing

DN	PN	Operation with AUMA electric actuator				
		Gearbox size	Strokes OPEN-CLOSE	Actuator size - AUMA"	Max. Torque CLOSE [Nm]	Max. Torque OPEN [Nm]
80	16	SKG1	25	SA 07.2	20	30
80	25	SKG1	25	SA 07.6	25	35
80	40	SKG1	25	SA 07.6	25	35
80	63	SKG1	25	SA 07.6	30	40
100	16	SKG1	25	SA 07.2	20	30
100	25	SKG1	25	SA 07.6	25	35
100	40	SKG1	25	SA 07.6	25	35
100	63	SKG1	25	SA 07.6	30	40
125	16	SKG1	25	SA 07.2	20	30
125	25	SKG1	25	SA 07.6	25	35
125	40	SKG1	25	SA 07.6	25	35
125	63	SKG2	29	SA 07.6	30	40
125	100	SKG2	29	SA 07.6	35	50
150	16	SKG1	25	SA 07.6	20	30
150	25	SKG1	25	SA 07.6	25	40
150	40	SKG2	29	SA 07.6	35	50
150	63	SKG2	29	SA 10.2	40	60
150	100	SKG4	36	SA 10.2	60	90
200	10	SKG2	29	SA 07.6	20	30
200	16	SKG2	29	SA 07.6	25	40
200	25	SKG2	29	SA 07.6	35	50
200	40	SKG2	29	SA 10.2	60	90
200	63	SKG4	36	SA 10.2	75	110
200	100	SKG8/4:1	149	SA 07.6	40	55
250	10	SKG4	36	SA 07.6	35	50
250	16	SKG4	36	SA 10.2	45	65
250	25	SKG4	36	SA 10.2	55	80
250	40	SKG4	36	SA 10.2	80	110
250	63	SKG8/4:1	149	SA 07.6	40	60
250	100	SK70/4:1		SA 07.6	40	55
300	10	SKG4	36	SA 10.2	45	65
300	16	SKG4	36	SA 10.2	55	80
300	25	SKG4	36	SA 10.2	75	110
300	40	SKG8/4:1	149	SA 10.2	45	65
300	63	SK70/4:1	204	SA 07.6	35	50
300	100	SK70/4:1	204	SA 07.6	35	50
350	10	SKG4	36	SA 10.2	50	75
350	16	SKG4	36	SA 10.2	80	110
350	25	SKG8/4:1	149	SA 10.2	40	60
350	40	SK70/4:1	204	SA 07.6	35	50
350	63	SK70/4:1	204	SA 07.6	40	55
400	10	SKG8/4:1	149	SA 07.6	30	40
400	16	SKG8/4:1	149	SA 07.6	40	55
400	25	SK70/4:1	204	SA 07.6	35	50
400	40	SK70/4:1	204	SA 07.6	35	55
400	63	SK110/4:1	228	SA 10.2	55	80
400	100	SK110/4:1		SA 07.6	75	110
450	10	SK70/4:1	204	SA 07.6		
450	16	SK70/4:1	204	SA 07.6		

DN	PN	Operation with AUMA electric actuator				
		Gearbox size	Strokes OPEN-CLOSE	Actuator size - AUMA"	Max. Torque CLOSE Nm	Max. Torque OPEN Nm
450	25	SK70/4:1	204	SA 07.6		
450	40	SK110/4:1	228	SA 10.2	60	90
450	63	SK110/4:1	228	SA 10.2	75	100
500	10	SK70/4:1	204	SA 07.6	30	45
500	16	SK70/4:1	204	SA 07.6	40	55
500	25	SK70/4:1	204	SA 10.2	50	75
500	40	SK110/4:1	228	SA 10.2	50	75
500	63	SK250/4:1	284	SA 10.2		
600	10	SK70/4:1	204	SA 07.6	35	50
600	16	SK70/4:1	204	SA 10.2	45	65
600	25	SK110/4:1	228	SA 10.2	65	90
600	40	SK250/4:1	284	SA 10.2	75	100
600	63	SK250/4:1	284	SA 10.2	90	115
700	10	SK70/4:1	204	SA 10.2	45	65
700	16	SK110/4:1	228	SA 10.2	65	90
700	25	SK110/4:1	228	SA 10.2	90	110
700	40	SK250/5:1	355	SA 14.2	95	130
800	10	SK110/4:1	228	SA 10.2	60	90
800	16	SK250/4:1	284	SA 10.2	60	90
800	25	SK250/4:1	284	SA 10.2	80	105
800	40	SK250/5:1	355	SA 14.2	100	140
900	10	SK250/4:1	284	SA 10.2		
900	16	SK250/5:1	355	SA 14.2		
900	25	SK250/5:1	355	SA 14.2	100	140
1000	10	SK250/5:1	355	SA 14.2		
1000	16	SK250/5:1	355	SA 14.2	100	140
1200	10	SK250/5:1	355	SA 14.2		

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