Compact weight-loaded hydraulic actuator
Type KFa
SAFETY IS PARAMOUNT!

Weight-loaded hydraulic actuators are used wherever valves have to be safely and reliably closed or opened at important places in pipe systems even if there is a loss of actuation power. This means that the requirements relating to functionality and operational readiness are extremely exacting. ERHARD KFa compact weight-loaded hydraulic actuators provide an economic, technically optimal solution thanks to their rugged construction and well thought-out design concept.

**Standard version KFa**
- two-stage, adjustable closing process (see graphic)
- compact design with built-in hydraulic power unit (motor and hand pump) as well as a thermostwitch and pressure relief valve,
- solenoid valve (working current / quiescent current principle),
- hand valve (3/3-way ball valve) for emergency opening/closing (manual) and/or hydraulic interlocking (manual)

**Modules:**
Other designs available within the actuator module include:
- KFaR weight-loaded hydraulic actuators without a power unit, i.e. version with only a lever, weight and cylinder module for connection to an on-site hydraulic unit
- one- or three-stage actuator systems, depending on the requirements and their specific use in the system
- mechanical actuation of the main valve (if no auxiliary power is available on site) – see the subject of pipe breakage safety devices under the Applications heading
- a version of the hydraulic unit with a hydraulic accumulator

Further options are available which cannot all be listed here.

So why not get in touch with us – we’ll be pleased to advise you!

*ERHARD tilting disc check valve with weight-loaded hydraulic actuator at a waterworks in the Bergisches Land region of Germany.*

*ERHARD tilting disc check valve DN 1600 with interlock unit and weight-loaded hydraulic actuator for a power station in Portugal.*
ERHARD Compact weight-loaded hydraulic actuator Type KFa

AN ACTUATOR CONCEPT FOR VARIOUS TYPES OF VALVE

ERHARD KFa compact weight-loaded hydraulic actuators are used for actuating valves with a drive shaft that needs to move through a maximum of 90°. The weight-loaded hydraulic actuator is fitted with an energy storage device. The actuation energy for a single closing or opening of the valves is provided by the falling weight.

Depending on the application and specific use, the ERHARD KFa compact weight-loaded hydraulic actuator can be fitted to ball valves, tilting disc check valves, or needle valves. Graded actuator sizes and standardised interfaces together with a fully perfected module concept mean that the ideal solution can be found for all sizes of valve and all pressure stages.
LAYOUT AND CONSTRUCTION OF THE KFA COMPACT WEIGHT-LOADED HYDRAULIC ACTUATOR

The KFa ERHARD compact weight-loaded hydraulic actuator is characterised by its compact design. The weight-loaded hydraulic actuator is directly connected to the valve and as well as the mechanical components such as the falling weight, lever, console and bearing plate (for suspending the cylinder) it also contains the hydraulic braking and opening cylinder with integrated hydraulic power unit. All the hydraulic components such as the electric pump, hand pump, balance tank and valve block with various combinations of valves are rigidly mounted on the cylinder without protruding pipework. The compact block design means that unbraked closing of the valve is impossible, even if there is a break in the control pipe.
OUTSTANDING ADVANTAGES

<table>
<thead>
<tr>
<th>ERHARD service</th>
<th>User benefit</th>
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<tbody>
<tr>
<td>Actuator is in a compact design and firmly attached to the valve, hydraulic</td>
<td>No power units or cylinders need to be provided by the customer. No laying</td>
</tr>
<tr>
<td>power unit is integrated in the actuator.</td>
<td>of costly hydraulic pipes required on site. The hydraulic moments are taken</td>
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<td></td>
<td>up and retained within the valve, and they are not transmitted to the</td>
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<td></td>
<td>structure.</td>
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<tr>
<td>Valve block and control valves in “block design” directly mounted on the</td>
<td>No unwanted, unbraked closing of the valve if there is a break in the control</td>
</tr>
<tr>
<td>cylinder.</td>
<td>pipe.</td>
</tr>
<tr>
<td>Closing process for each actuation stage is separately adjustable via top</td>
<td>Precise adjustment to equipment and operating conditions is possible, so</td>
</tr>
<tr>
<td>quality, pressure-independent flow control valves.</td>
<td>fluid hammer is minimised. Fully reproducible and adjustable closing and</td>
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<td></td>
<td>opening processes.</td>
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<td>Pilot valves with low electrical power rating, irrespective of the size of</td>
<td>Guaranteed economic and safe operation.</td>
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<tr>
<td>the actuator and valves.</td>
<td></td>
</tr>
<tr>
<td>Excellent corrosion protection for the complete actuator unit with ERHARD</td>
<td>Permanent protection, long service life.</td>
</tr>
<tr>
<td>EKB epoxy coating. Valves and accessories made of corrosion-resisting</td>
<td></td>
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<tr>
<td>materials.</td>
<td></td>
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<tr>
<td>Option of operating actuator with biodegradable hydraulic fluid.</td>
<td>Environmentally friendly operation is possible.</td>
</tr>
<tr>
<td>Safety equipment such as pressure relief and temperature monitoring systems</td>
<td>High level of functionality and safety.</td>
</tr>
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<td>are integrated as standard in the actuator.</td>
<td></td>
</tr>
<tr>
<td>Package solution: weight-loaded hydraulic actuator with measuring and</td>
<td>Unified service provision – with a single point of contact!</td>
</tr>
<tr>
<td>control systems including control cabinet and installation and</td>
<td>Coordination of the individual components, functionality and safety is</td>
</tr>
<tr>
<td>commissioning service. (ERHARD systems engineering)</td>
<td>guaranteed!</td>
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</tbody>
</table>

TECHNICAL DATA/SCOPE OF SUPPLY

| Torque range:                                                                 | 250 - 300,000 Nm |
| (dynamic/static)                                                             | (across a total of 9 different actuator sizes) |
| Main components:                                                             |
| Actuator console / lever hub:                                                  | ductile cast iron SGGI/EKB or welded steel/EKB |
| Actuator lever and cylinder:                                                  | ductile cast iron/steel/EKB |
| Weight:                                                                       | cast iron SGGI/EKB |
| Plunge rod/control pipes:                                                     | stainless steel |
| Pipe joints:                                                                  | galvanised steel |
| Valve block:                                                                  | aluminium, anodised with screw-on flow control, hand and solenoid valves |
| Balance tank:                                                                 | cast iron SGGI/EKB – plexiglas/steel/EKB with visual oil level display |
| Is used in combination with:                                                 | ERHARD tilting disc check valve DN150 - DN2600 PN10-40 |
|                                                                                | ERHARD ball valve DN100-DN1200 PN10-100 |
|                                                                                | ERHARD needle valve DN100-DN1800 PN10-100 |
| Protective devices:                                                           | supplied for the swivel range of the falling weight on request |
OPERATION AND ACTUATION DIAGRAM

Opening in working position:
The pumps (motor or hand pump) draw the oil out of the rod side of the cylinder chamber or out of the balance tank (5) and create pressure on the piston side of the cylinder, which raises the falling weight. In the open position, the oil must no longer escape from the cylinder (1), 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 loss of oil can be detected immediately through the sinking of the falling weight.

Any unwanted sinking from the open position is registered by an additional limit switch (90% open) which automatically switches on the motor pump (3) and resets the system to the 100% OPEN position.

Initiation of the closing movement:
The speed at which the weight sinks can be set for the initial braking range (roughly 70% of the cylinder stroke) on flow control valve S1, and for the second range on flow control valve S2. Flow control valves maintain a constant rate of flow regardless of the differential pressure. This concept means that graduated actuation stages can be generated for the falling weight lowering process. Graduated actuation stages for the closing of the valves are required in order to keep the pressure increase (fluid hammer) in the pipe within permitted limits while minimising closing times. The actuator is fitted with a small balance tank (5) with a visual oil level indicator for balancing out the difference in volume between the rod- and piston-side of the cylinder chamber and for storing a small oil reserve if there are leakage losses. The limit switches are mounted on the cover plate for recording and signalling the different positions of the actuator closure device. As well as their signalling function, these limit switches also control the actuator’s electrical components. If a weight-loaded hydraulic actuator is fitted with an electric pilot valve (solenoid valve (4.2)) and a motor pump (3), a control cabinet is necessary for the operation of the actuator.

In the case of electric pilot valves, the closing movement is initiated by the supplying of current to the solenoid valve (4.2.) (working current principle) or the switching off of the current to it (quiescent current principle). This triggers the sinking of the falling weight. The components (motor pump 3; thermostatic switch 2.5; pilot valve 4.2 and limit switch) must be electrically actuated. The electric control unit can be supplied by ERHARD on request.
Hydraulic diagram for the KFa standard version

Working current principle, solenoid valve de-energised.
When current is supplied to the solenoid valve, the weight falls.
TYPICAL APPLICATIONS

**Discharge prevention device for containers**
Protects against the unwanted emptying of containers in the event of a pipe breakage or if the inlet regulating valve fails. A combination of weight-loaded hydraulic actuator and inlet-outlet valve is possible.

**Controlled pump non-return device**
Combined operation (controlled start-up of pumps and backflow prevention) in one valve. Advantages compared to free-floating non-return valves:
- Automatic full opening when the pump is operating minimises loading of seals and bearings
- Full opening ensures optimal economical operation (energy consumption minimised) irrespective of the flow rate
- Actuator is able to start the pump up gently
- Disc slams avoided during closing owing to the 2-stage closing process

**Turbine inlet protection**
Safety valve in the turbine inlet itself. It acts as a protection device and ensures quick closing if the turbine is disconnected from the grid (avoids turbine over-speed, and consequently fluid hammer). In a very large number of systems weight-loaded actuators are also used as by-passes which have a quick-opening function that is synchronised with the closing of the inlet valve in order to maintain an even flow rate.

**Burst pipe safety device**
Safety valve for monitoring pipe systems in order to protect structures and transport routes. Fail-safe closing must be ensured in the event of a pipe breakage.

**Measuring methods for detecting a pipe breakage**
- triggered if a maximum flow rate is reached (excess flow)
- or
- triggered through continuous monitoring if a permissible flow rate difference is exceeded

**Measuring systems for activation when the maximum flow rate is reached (no external power supply)**
- Pitot tubes / probes (Prandtl tube, VDEh probe)
- Oscillating storage device
- Venturi tubes / standard orifice plates
Measuring systems for continuous monitoring of leaks
(using external power supply)

- Electromagnetic flowmeter
- Ultrasonic flowmeter

For each of these typical applications detailed functional specifications and documentation are available. However, a “weight-loaded actuator / valve” combination provides lots more benefits.

So why not get in touch with us to find out more!

Examples of uses of valves with a KFa weight-loaded actuator

![Diagram of water system with numbered components and labels for vessel, feed pump, feed pump motor, controlled pump non-return device, pump pressure line, vessel inlet protection, gravity tank, flow sensor, burst pipe safety device, down pipe, settlement, turbine inlet protection, turbine, generator, vessel, and consumer network.]
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**DESIGN AND DIMENSIONING**

ERHARD KFa weight-loaded hydraulic actuators are designed for the specific intended use and the hydraulic conditions. KFa weight-loaded hydraulic actuators have a modular design and are designed in a range of different sizes. The main information required for testing and dimensioning the actuators and assigning them to the valves is as follows:

- Maximum dynamic torque during opening / closing (depends on the specific use as well as the pressure and flow ratios).
- Maximum actuation torque from and in the seat when the valve is in the closed position, depending on the operating pressure.
- Specific application and use, as well as these specifications.

**ACTUATOR DESIGN PARAMETERS**

In order to draw up a quotation for the respective specific application, we need the following details:

- Valve type
- Nominal diameter DN
- Pressure stage PN
- Specific application
  - burst pipe safety device
  - pump non-return device,
  - turbine inlet protection,
  - fast-opening valve,
- Flow velocity or volumetric flow rate (min., norm., max.)
- Pressure ratios (primary and secondary pressure) static and dynamic incl. fluid hammer
- Trigger quantity (in the case of emergency closure)
- Actuation times for opening/closing
- Falling weight lowering process caused by:
  - mechanical/hydraulic impulse (without external power source)
  - electrical impulse (electrical data)
- Solenoid valve:
  - working current principle
  - quiescent current principle
- Falling weight raised by:
  - manual oil pump
  - electrohydraulic pump (electrical data)
ERHARD KFa compact weight-loaded hydraulic actuators provide reliable safety functions in a wide range of applications and fields, for example as a
- burst pipe safety device,
- controlled pump non-return device,
- overflow preventer (vessel inflow and outflow)
- turbine inlet protection (emergency closing device)
- fast-opening and/or fluid hammer relief valve.

As well as the design and manufacture of the corresponding safety valve with compact weight-loaded hydraulic actuator, ERHARD also supplies the complete systems technology as one package. In order to achieve the specified functionality of the “Intelligent Valve”, the interaction of the measuring and control systems with the actuator is of crucial importance.

The ERHARD compact weight-loaded hydraulic actuator package solution includes the following options:
- transducer, flowmeter systems – inductive, using ultrasound, or mechanical/hydraulic.
- Electrical control cabinet with all the components needed for controlling/ regulating the KFa compact weight-loaded hydraulic actuator in accordance with the user’s specifications and requirements.
- Assembly, installation and commissioning of all the components with corresponding after-sales service and customer support.

We can also provide pipe parts, (adapter and extension pieces / bypass pipes with corresponding fittings etc.).

Just give us a call – our experts will be happy to provide you with in-depth advice.
TALIS is the absolute leader when it comes to water transportation and control. TALIS has the best solutions in the field of water and energy management, and for industrial and municipal applications. We have a large and varied range of products offering comprehensive solutions for the whole water cycle – from hydrants, check valves and gate valves to flow control valves. Our experience, innovative technology and worldwide expertise as well as our personal advice process provide the basis for the development of sustainable solutions for the efficient use of the vital natural resource that is water.

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