



Application guide

Piggy-back applications with Belimo actuators

Edition 2026-05/A

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Piggy-back operation

General

"Piggy-back" is a designation used by Belimo to describe a specific application of its actuators. It refers to the operation of mechanically coupled and electrically connected actuators, resulting in a correspondingly higher torque. For this reason, piggy-back operation is typically only available within a product range for actuators with the highest torque.

Actuator types

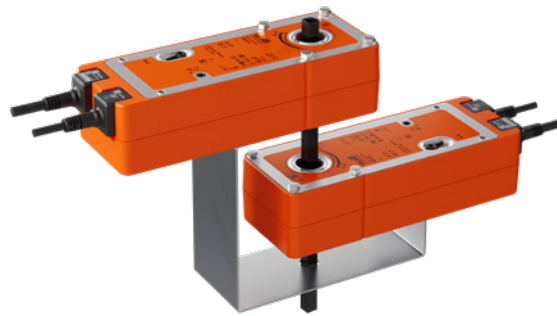
BFA24 and BFA230 (note: not -T types)

Coupling types (mechanical)

Two actuators on one shaft

The shaft is the mechanical element that firmly connects the two actuators.

Piggy-back operation: permissible



Two actuators on two shafts with a stable mechanical connection

There is an additional mechanical element that firmly connects the two shafts. The used damper crank arms, which are connected with a connecting rod, should form a parallelogram.

Piggy-back operation: permissible



Two actuators on two shafts without a mechanical connection

There is no mechanical connecting element between the shafts. This application corresponds to two electrically parallel actuators on two separate dampers that are not mechanically connected. Although this operating mode is permissible, it does not carry the designation of a piggy-back operating mode.

Piggy-back operation: no (no piggy-back operating mode)



Mounting methods

In piggy-back operation, the actuators are controlled in parallel. This requires a rigid mechanical connection between the actuators. The best results are achieved when the actuators are mounted close together on the same shaft.



It is possible to mount two actuators on different mechanically coupled shafts. The mechanical coupling can be achieved using high-quality damper crank arms, ball joints, and linkages. As a rigid connection is important, the general rule is that the damper crank arms must always be arranged so that they form a parallelogram.



Increasing the distance between the actuators and adding connecting elements increases the elasticity of the overall system. This can result in an uneven load distribution across the actuators.



Technical data

Intended use

Fire damper actuator BFA

The BFA actuator range for fire dampers is suitable for piggy-back operation with open/close control. This involves mechanically coupling two actuators and connecting them electrically in order to increase the total torque. This allows large dampers to be motorised where the torque of a single actuator is insufficient.



Control	Open/close
Number of actuators	2
Torque motor piggy-back operation	30 Nm @ 20°C (20 Nm x 1.5 = 30 Nm)
Torque fail-safe piggy-back operation	30 Nm @ 20°C (20 Nm x 1.5 = 30 Nm)
Running time motor piggy-back operation	<60 s / 90°C @ 20°C
Running time fail-safe piggy-back operation	20 s @ 20°C
Ambient temperature normal operation	20°C
Service life piggy-back operation	30,000 safety positions @ 20°C
Manual override and locking switch	Use not permitted
BAT thermoelectric tripping device	Only BFA actuator types without BAT (-T) may be used (see page 9)

Factors influencing function and system behaviour

The piggy-back application is a complete solution. This means that the function, performance, and system behaviour are not solely determined by the actuator and its individual specifications, but also by other factors and ambient conditions. These include, in particular:

- Model, type, and construction of the damper
- Mounting method of the actuators in piggy-back operation
- Mechanical connections between the damper and the actuators, as well as between the two actuators themselves
- Application- and project-specific operating conditions

The technical data specified in this application guide applies to piggy-back applications. This may differ from the specifications in the technical data sheet for an actuator used in a standalone application (see www.belimo.com).

The technical data specified in this application guide takes precedence for piggy-back operation. For any technical data not listed in this document, please refer to the technical data sheet for the respective actuator.

The design, validation/verification, and release of the complete solution are the responsibility of the user, i.e. the manufacturer of the damper. This includes, in particular:

- Verification of mechanical interfaces and connections
- Application-specific operational checks
- If necessary, in-house test series, tests, or verifications to ensure the required function and service life
- Application- and project-specific operating conditions

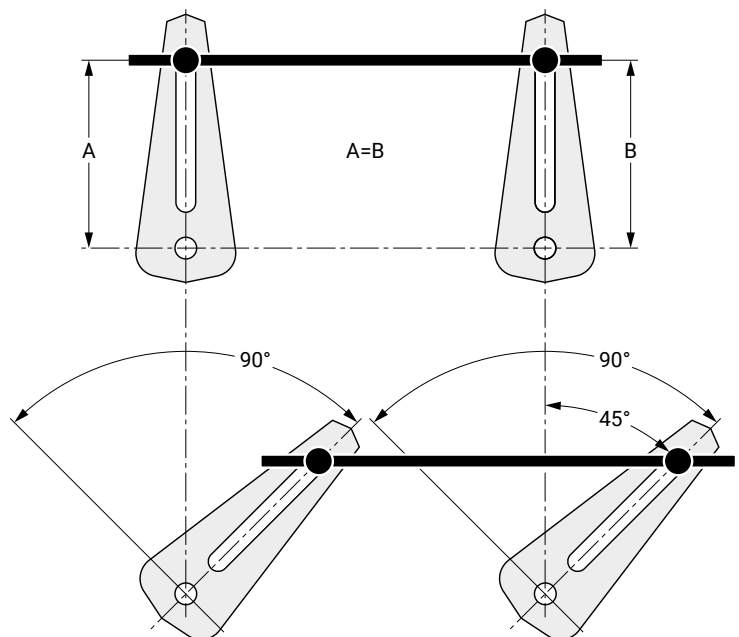
Belimo cannot guarantee a reliable actuator function for applications outside the technical data and application requirements set out in this guide.

Belimo is happy to support you with the design and application of the piggy-back solution. Please contact us if you have any questions or would like project-specific advice.

Application requirements

Mechanical installation

- The actuators must operate synchronously and in the same direction of rotation, both in motor operation and in fail-safe operation.
- The actuators must be rigidly coupled to each other. Mechanical play and the stiffness of the coupling between the actuators can impair performance. The best results are achieved when both actuators are mounted together on the same shaft and have a stiff, play-free connection.
- When coupled via damper crank arms and linkages, the damper crank arms must maintain a parallelogram configuration to ensure an even load distribution between the actuators. It should be noted that the torque transmission from one shaft to the other decreases as soon as the damper crank arms and linkages are not perpendicular to each other.

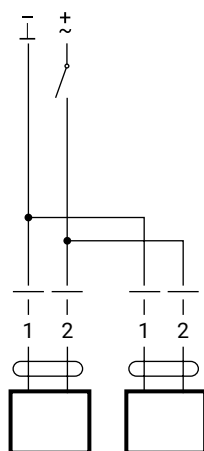


- The mechanical coupling must not be statically overdetermined.
- The angles of rotation of both actuators must be coordinated, especially in the open position. Misalignment can lead to uneven load distribution and impair performance.
- The angle of rotation must be limited by sturdy end stops on the damper in both the open and closed positions. It is not permissible to limit the angle of rotation using the internal mechanical end stop of only one actuator.

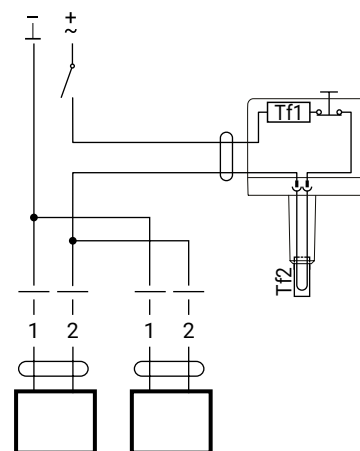
Electrical installation

- The actuators must use the same supply voltage (24 V or 230 V) and the same voltage type (AC or DC).
- The actuators must be connected in parallel and powered by the same power supply.

Wiring diagram without BAT thermoelectric tripping device



Wiring diagram with separate BAT thermoelectric tripping device, permissible only for BFA24



Restrictions

BAT thermoelectric tripping device

- The thermoelectric tripping device must cut off the power supply to both actuators simultaneously. The use of -T type actuators with integrated BAT is not permitted.

In the case of fire, it is essential that the power supply to both actuators is cut off so that the fail-safe function for both actuators is triggered simultaneously.

Manual override and locking switch

- Neither the manual override nor the locking switch may be used. Manual operation of the coupled actuators is not permissible during piggy-back operation.
- The position lock must be released before the actuators are permanently mounted to ensure that the angles of rotation of both actuators are aligned.

Replacement procedure

- If a replacement is required, both actuators must be replaced.

Accessories

Please get in touch with your Belimo contact person before using any accessories in accordance with the technical data sheet for the individual actuator.

All inclusive.

Belimo is the global market leader in the development, production, and sales of field devices for the energy-efficient control of heating, ventilation and air-conditioning systems. The focus of our core business is on damper actuators, control valves, sensors and meters.

Always focusing on customer value, we deliver more than only products. We offer you the complete product range for the regulation and control of HVAC systems from a single source. At the same time, we rely on tested Swiss quality with a five-year warranty. Our worldwide representatives in over 80 countries guarantee short delivery times and comprehensive support through the entire product life. Belimo does indeed include everything.

The "small" Belimo devices have a big impact on comfort, energy efficiency, safety, installation and maintenance.

In short: Small devices, big impact.



5-year warranty



On site around the globe



Complete product range



Tested quality



Short delivery times



Comprehensive support



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