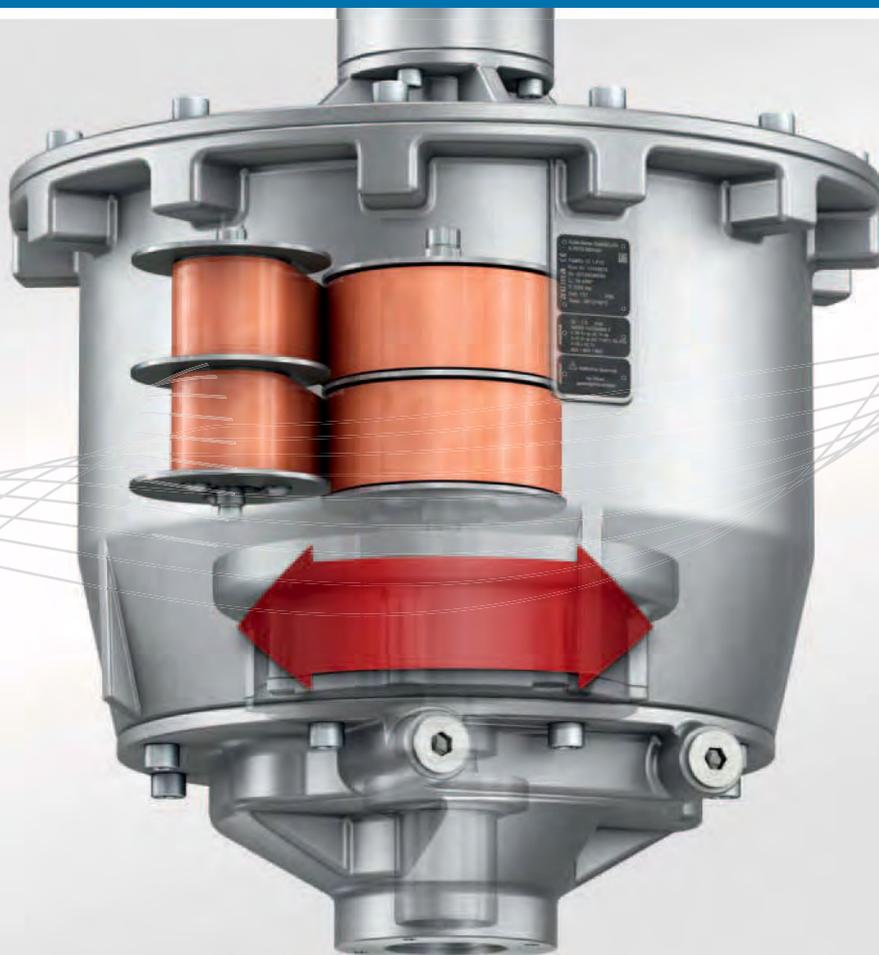




## ELECTRIC ACTUATORS WITH FAIL SAFE UNIT

For automatic opening or closing of a valve in the event of an emergency



In recent years, safety requirements in process plants have become increasingly demanding. Even in case of emergency, the system must be safe for persons and the environment. Actuators play a crucial role here, since it is their task to open or close a valve in case of emergency and to ensure that the plant remains in safe condition.

With their new FQM fail safe unit, AUMA offer innovative and safe actuator solutions for automatic operation of valves in case of emergencies making use of stored mechanical energy.

The FQM fail safe unit meets the requirements of safety-related applications up to SIL 2/SIL 3 and is basically maintenance-free. An explosion-proof version is also available.

## MECHANICAL SOLUTION FOR UTMOST SAFETY

When relying on safe opening or closing of a valve, mechanical actuator solutions provide top safety. In case of need, the new FQM fail safe unit generates the required torque by means of a constant force spring purely on a mechanical basis. No electrical power is required for fail safe operation.

## CONSTANT TORQUE

The constant force spring motor with patent pending provides a constant torque during fail safe operation and this across the complete travel. During standard operation, the constant force spring is disengaged and is not operated. As a consequence, actuator sizing can be relatively small.

## VARIABLE RUNNING SPEEDS

Running speeds for fail safe operations are adjustable. Furthermore, the actuator can operate the valve into the defined end position at reduced speed. This avoids pressure peaks within the pipeline and protects the valve.

## ELECTRIC PART-TURN ACTUATORS WITH FQM FAIL SAFE UNIT



## EASY INTEGRATION

Actuators with FQM fail safe unit are integrated into systems in the same way as standard AUMA actuators. The fail safe unit seamlessly adapts to the modular AUMA product design. It is combined with AUMA SQ part-turn actuators or AUMA SA multi-turn actuators paired with GS part-turn gearboxes.

Integration into the DCS is made as for the standard devices by means of AC integral controls. Operating concept, interfaces and communication remain homogeneous across all valves installed within the plant.

## EASY RETROFITTING

Thanks to their identical interfaces, the fail safe unit can be retrofitted within existing plants. For example, if the safety requirements for an application have intensified. And even better, the already installed actuator may often be retained.

## VERSATILE IMPLEMENTATION

AUMA actuators with FQM fail safe unit are particularly suited to automate butterfly valves as well as ball and plug valves at a swing angle of up to 90°. They are the perfect choice if part-turn actuators require safe opening or closing in case of emergencies.

### Industrial applications

Fail safe actuators are used in all markets and applications. In water reservoirs, they prevent drainage in case of burst pipes, for example. Steam generating boilers in power plants and fire protection measures in road and railway tunnels are further typical examples.

### Applications in the oil & gas industry

The oil & gas industry imposes highest quality standards not least due to the superior danger of potential explosions. The explosion-proof fail safe unit caters for the required safety level. Overfill protections in tank farms, drainage protection in tanks and pipelines or use in gas regulating and metering stations are merely a few of the versatile implementations in the oil & gas industry.



# FUNCTION

## FQM fail safe unit

AUMA part-turn actuators with fail safe unit ensure that the valve is operated to a safe position in the event of power failure or in case an emergency signal is issued. Selection can be made whether the valve is to be operated into position OPEN or CLOSED.

## Normal operation

All AUMA actuator functions are available as usual in normal operation. The torque is transmitted directly from the actuator through the fail safe unit to the valve.

## Fail safe operation

The fail safe operation is completely independent of the power supply and is exclusively supplied on a mechanical basis by means of the energy stored in the coiled up constant force spring.

A fail safe operation is initiated in case of power failure or if an emergency signal is issued. This is independent of AC actuator controls.

The constant force spring is activated during fail safe operation and transmits the generated torque to the valve by means of a planetary gearing. During the complete fail safe operation, the spring provides an almost constant torque.



SQ

FQM

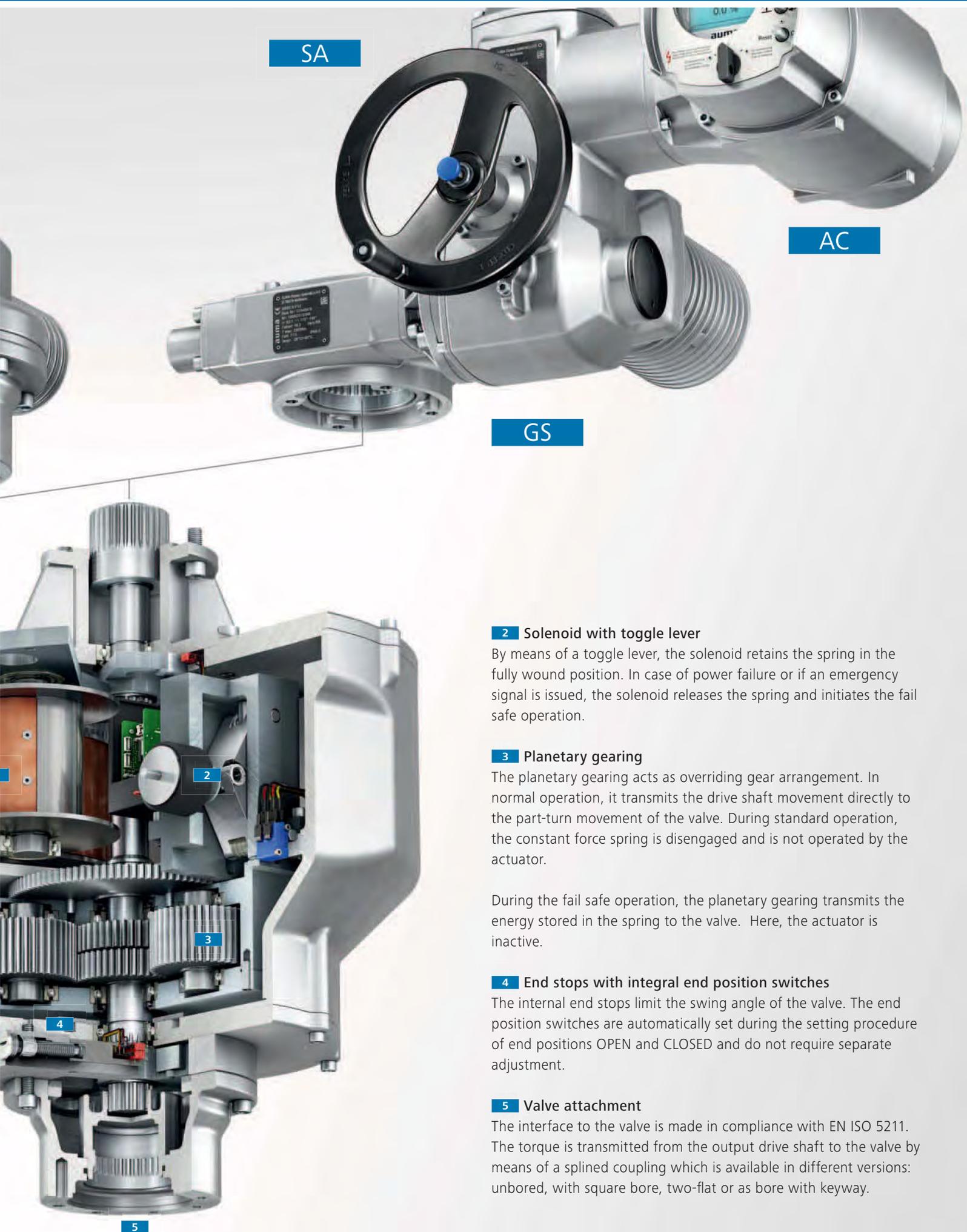


### 1 Constant force spring motor

The core of the fail safe unit is a mechanical constant force spring motor providing the required torque to open or close the valve in case of an emergency.

When connecting the actuator to the mains and after acknowledgement by the DCS, the fail safe unit is initialised and the constant force spring is fully wound by means of an integrated electric motor. For this, the spring is wrapped in inverted direction on a drum.

During fail safe operation, the integrated electric motor additionally acts as a brake, allowing setting of various running speeds during fail safe operation.



SA

AC

GS

**2 Solenoid with toggle lever**

By means of a toggle lever, the solenoid retains the spring in the fully wound position. In case of power failure or if an emergency signal is issued, the solenoid releases the spring and initiates the fail safe operation.

**3 Planetary gearing**

The planetary gearing acts as overriding gear arrangement. In normal operation, it transmits the drive shaft movement directly to the part-turn movement of the valve. During standard operation, the constant force spring is disengaged and is not operated by the actuator.

During the fail safe operation, the planetary gearing transmits the energy stored in the spring to the valve. Here, the actuator is inactive.

**4 End stops with integral end position switches**

The internal end stops limit the swing angle of the valve. The end position switches are automatically set during the setting procedure of end positions OPEN and CLOSED and do not require separate adjustment.

**5 Valve attachment**

The interface to the valve is made in compliance with EN ISO 5211. The torque is transmitted from the output drive shaft to the valve by means of a splined coupling which is available in different versions: unbores, with square bore, two-flat or as bore with keyway.

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### Electric part-turn actuator

FQM fail safe unit can be combined with both AUMA SQ part-turn actuators as well as with AUMA SA multi-turn actuators paired with GS part-turn gearboxes. The electric actuator can thus be individually and perfectly adjusted to the application requirements:

- > SQ part-turn actuators for open-close duty, SQR for modulating duty as well as SQEx and SQREx for potentially explosive atmospheres
- > SA multi-turn actuators paired with GS part-turn gearboxes for open-close operation, SAR for modulating operation, as well as SAEx and SAREx for potentially explosive atmospheres

### AC integral actuators controls

AC integral actuator controls assume communication control between DCS and actuator. Controls are available with various interfaces to the DCS – allowing both parallel signal transmission and fieldbus communication. Supported are, for example, Profibus DP, Modbus RTU, DeviceNet, Foundation Fieldbus as well as HART and Wireless HART.

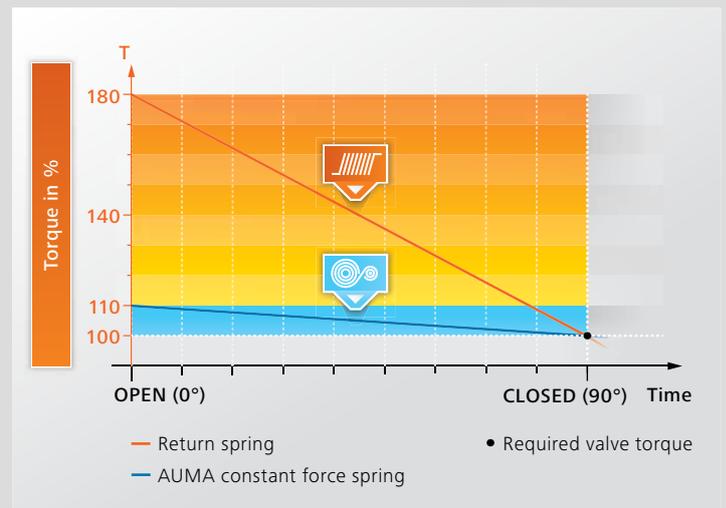
Advanced diagnostic functions enable preventive maintenance and integration of actuators into asset management systems. Integral local controls also allow for local actuator operation.

### Advantages of the AUMA constant force spring motor

The main drawbacks of conventional solutions using simple return springs are that the spring transmits the highest torque at the start of the travel. Towards the end of the travel, the applied torque is reduced when it is needed most to ensure safe valve seating. Hence, the springs have to be oversized to ensure that the required torque is still supplied towards the end of the travel.

With the constant force spring with patent pending by AUMA, the spring supplies an almost constant torque across full travel. Consequently, constant force spring motor sizing is lower than for conventional return springs.

Further advantage: Thanks to the overriding gear arrangement, the spring must not be operated during normal operation and remains completely wound. This allows selection of smaller actuators. Furthermore, premature spring fatigue can be prevented and the valve is protected against excessive torques.



# SERVICE CONDITIONS

AUMA actuators with FQM fail safe unit are designed to highest reliability and long product life and fulfil their automation tasks in most severe and harsh environments.

## IP68 ENCLOSURE PROTECTION

Like the actuators, the FQM fail safe unit is available with increased enclosure protection IP68 in compliance with IEC 60529. The permissible immersion height of 8 m head of water is specified for a max. duration of 96 hours.

## AMBIENT CONDITIONS

FQM fail safe unit in standard version is designed for temperatures between  $-30\text{ }^{\circ}\text{C}$  and  $+70\text{ }^{\circ}\text{C}$ , the low temperature version for temperatures between  $-40\text{ }^{\circ}\text{C}$  and  $+60\text{ }^{\circ}\text{C}$ . Further temperature ranges are available on request.

## CORROSION PROTECTION

The AUMA corrosion protection system with the two-layer powder coating is certified by the TÜV and provides top-quality mechanical and chemical resistance.

Actuators equipped with FQM fail safe units are suitable for environmental conditions C5-I and C5-M in compliance with EN ISO 12944-2. They comply with the requirements for use in areas with high salinity, almost permanent condensation, and high pollution.

## EXPLOSION PROTECTION

Both actuators and FQM fail safe units were tested and certified in close collaboration with national and international certification bodies. Approvals have been obtained from authorities worldwide for use in potentially explosive atmospheres, including ATEX (Europe), IECEx (international), FM (USA) and ROSTECHNADSOR/EAC (TR-CU) (Russia).

- > Explosion protection according to ATEX  
ATEX II2G Ex d,e IIC T4 or T3
- > Explosion protection according to FM:  
Class I, Div. 1, Groups B,C,D  
Class II, Div. 1, Groups E,F,G  
Class III

## FIREPROOF VERSION

AUMA actuators with FQM fail safe units are available in fireproof version to ensure safe closing and opening of valves even in the event of a fire. Devices fitted with K-MASS™ fire protection coating preserve functionality during 30 minutes at temperatures as high as  $1,100\text{ }^{\circ}\text{C}$ . Consequently, they fulfil the requirements in compliance with UL 1709.

## SIL

Fail safe requirements and functional safety are often closely linked. In particular, components with increased reliability and lower probability of failure are required if system requirements include safeguarding the safety for persons and environment in case of emergencies.

AUMA fail safe unit complies with the highest demands regarding functional safety according to IEC 61508 and is suitable for safety-related systems up to SIL 2/SIL 3.

## TECHNICAL DATA

Type	Output mounting flange	Max. output torque	Swing angle	Operating time	suitable part-turn actuator	
	EN ISO 5211	[Nm]		[s]	SQ	SA with GS
FQM 05.1	F05 F07	150	to $90^{\circ}$	5 – 30	SQ 05.2	–
FQM 07.1	F07 F10	300			SQ 07.2	SA 07.2 + GS 50.3 SA 10.2 + GS 50.3
FQM 10.1	F10 F12	600			SQ 10.2	SA 07.2/SA 10.2 + GS 50.3
FQM 12.1	F12 F14	1200		10 – 60	SQ 12.2	SA 07.2/SA 10.2 + GS 63.3 SA 10.2 + GS 80.3
Mains voltage	50 Hz: 220 V, 230 V, 240 V, 380 V, 400 V, 415 V 60 Hz: 440 V, 460 V, 480 V, 500 V					
Control voltage for EMERGENCY input	24 V DC/1 A 115 V AC					



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