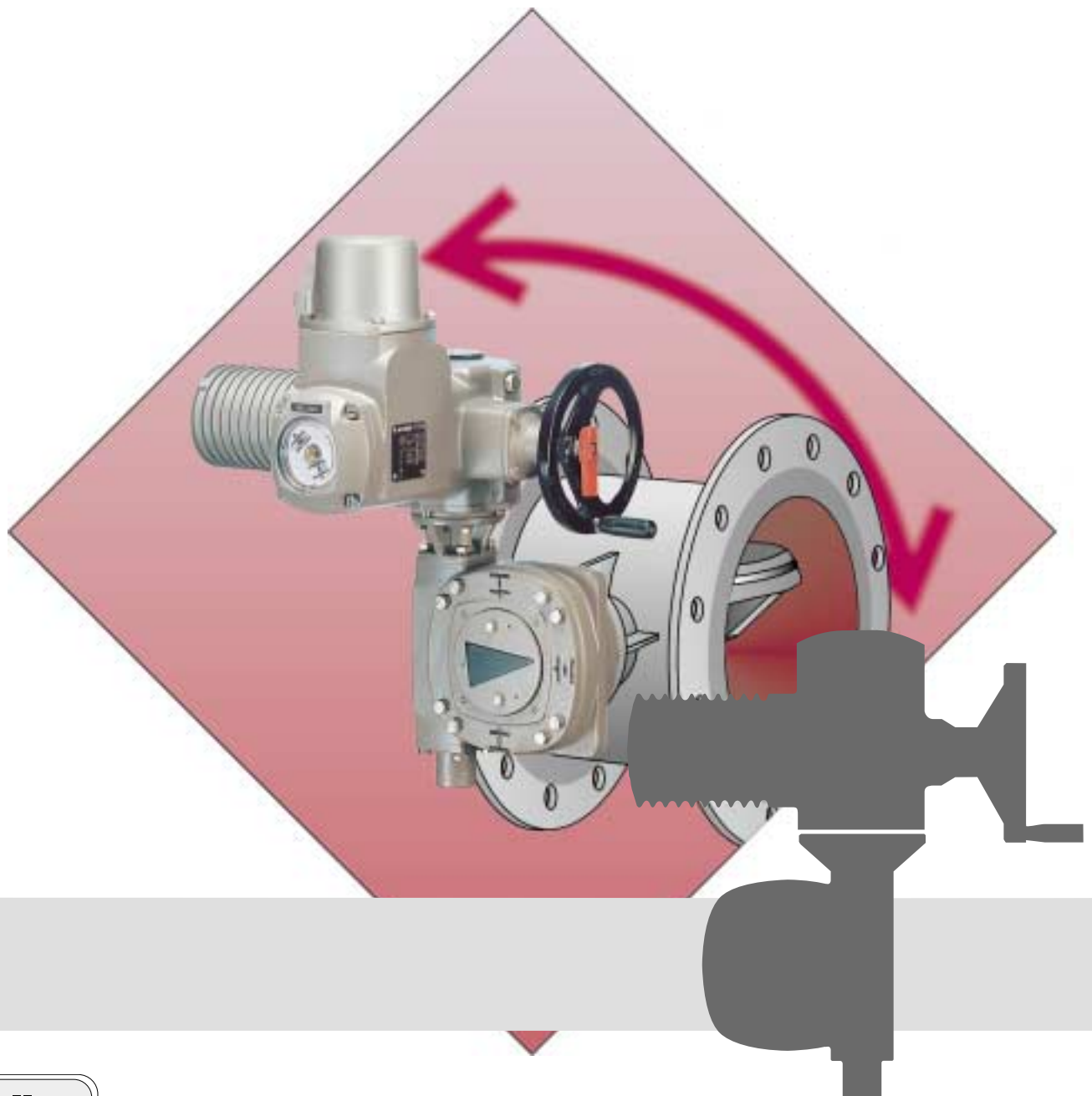


auma[®]

Electric part-turn actuators

**Combinations Multi-turn actuators SA/SAR
Part-turn gearboxes GS**



Certificate Registration No.
12 100 4269

Information

Introduction

AUMA, a leading manufacturer of electric actuators, offers multi-turn, part-turn and linear actuator type ranges with a wide torque and thrust spectrum.

The AUMA product range furthermore includes valve gearboxes which form, together with the actuators, a modular system. For almost every problem in valve automation there is a solution on account of the different modules.

By combining multi-turn actuators SA/ SAR with worm gearboxes GS an electric part-turn actuator can be realised for higher torque requirements. These combinations complement the part-turn actuator type ranges AS and SG, with torque ranges up to 500 Nm or 1 200 Nm respectively.

This brochure describes the features which result in the combination of the multi-turn actuators SA/SAR with the worm gearboxes GS. Detailed information can also be found in the brochures 'Product description, Electric multi-turn actuators SA/SAR' and 'Product description, Part-turn gearboxes GS'.

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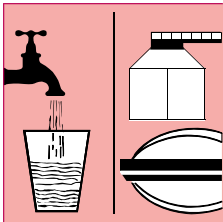
We reserve the right to alter data according to improvements made.
Figures and diagrams are not binding.

AUMA part-turn actuators are employed wherever a swivel movement of 90° driven by an electric motor is required. Examples are the operation of valves, such as butterfly valves and ball valves.

Multiple applications, under the most varied conditions

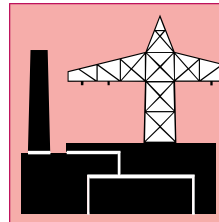
Open-close and modulating duty, high enclosure protection, corrosion protection classes for various ambient conditions, high and low temperature versions, explosion protection - the list of options is long. AUMA is therefore in a position to always offer

the best solution, optimally adapted to the specific conditions.



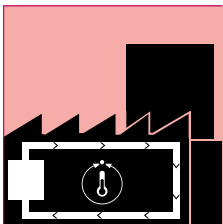
Water industry

- Water works
- Water pipelines
- Sewage treatment plants
- Pump stations
- Locks



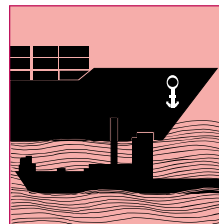
Energy

- Power plants
- Desulphurization units
- District heating
- Pipelines



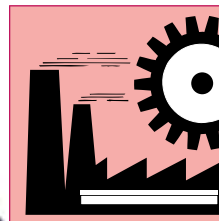
Air conditioning

- Air conditioning
- Ventilation
- Environment technology



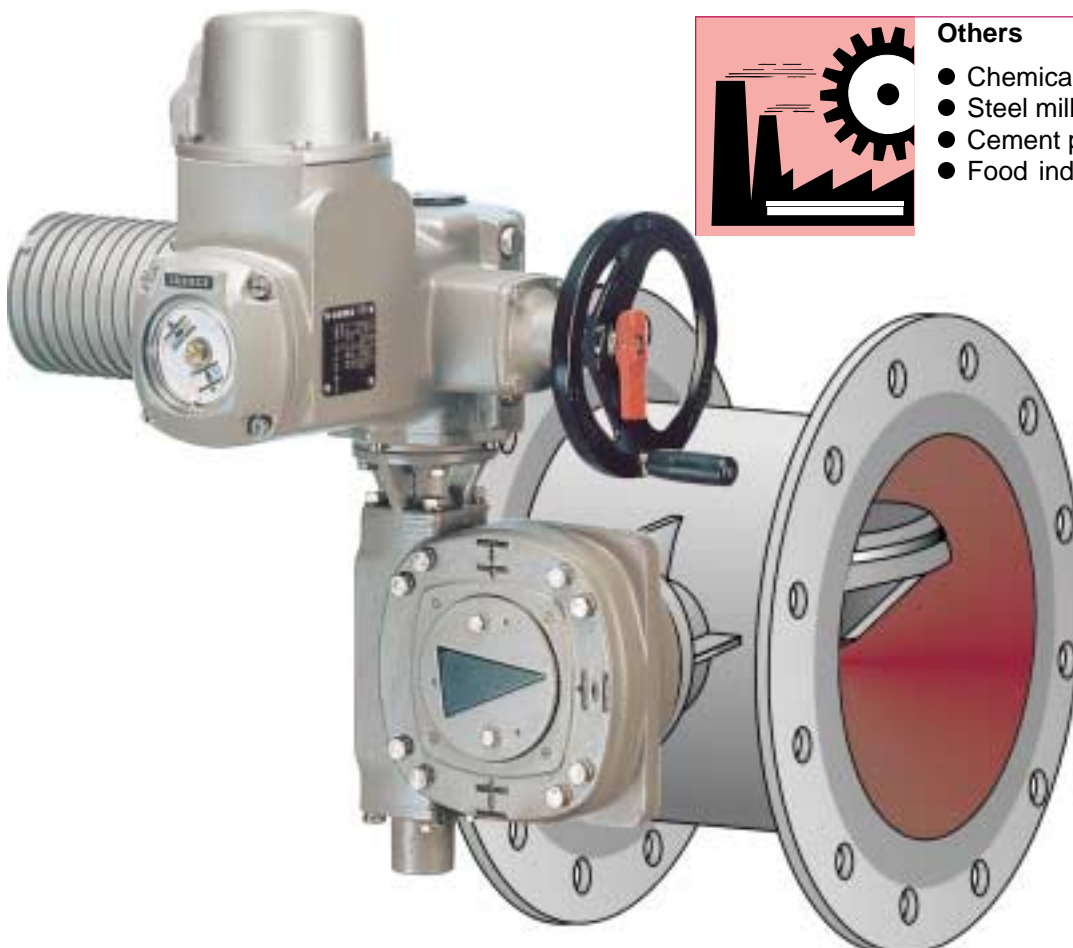
Ship building industry

- Fire extinguish systems and sprinklers
- Bilge pumps and leakage water systems
- Fuel systems
- other systems for supply and disposal
- Ballast systems



Others

- Chemical industry
- Steel mills
- Cement plants
- Food industry



Part-turn actuators SA(R)/GS

Combination of multi-turn actuator SA / SAR and worm gearbox GS for max. output torques up to 360 000 Nm

The worm gearboxes GS are suitable for **open-close duty** and **modulating duty**. Combining a gearbox with an open-close actuator SA makes a part-turn actuator for open-close duty. With modulating actuators SAR a part-turn actuator for modulating duty is made.

Multi-turn actuators for open-close duty SA 07.1 – SA 40.1 and for modulating duty SAR 07.1 – SAR 30.1

The selected output speed of the actuator determines the operating time of the combination. Multi-turn actuators SA and SAR are available in explosion-proof version.

The limit switching and the tripping torque is set at the multi-turn actuator.

The actuators can be equipped with integral controls AUMA MATIC. These process the actuator signals directly and contain all required switch gears and local controls.

Detailed information is available in the brochures 'Product description, Electric multi-turn actuators SA' and 'Product overview, Actuator controls AUMA MATIC / VARIOMATIC'.



Worm gearboxes GS 40.3 – GS 250.3 and worm gearboxes GS 315 – GS 500

The simple and robust principle of the worm gearbox fulfils, an account of its design, the self-locking feature which is required for many applications. The AUMA specific end stop technology guarantees a high strength of the end stop. A further advantage is the easy setting of the end stops. Only for one valve end position the adjustment is necessary after mounting the gearbox to the valve. The swing angle set in the factory remains unchanged.

The gearboxes can also be supplied without end stops for multi-turn applications.

Detailed information can be found in the brochure 'Product description, Part-turn gearboxes GS'.

1 Electrical connection

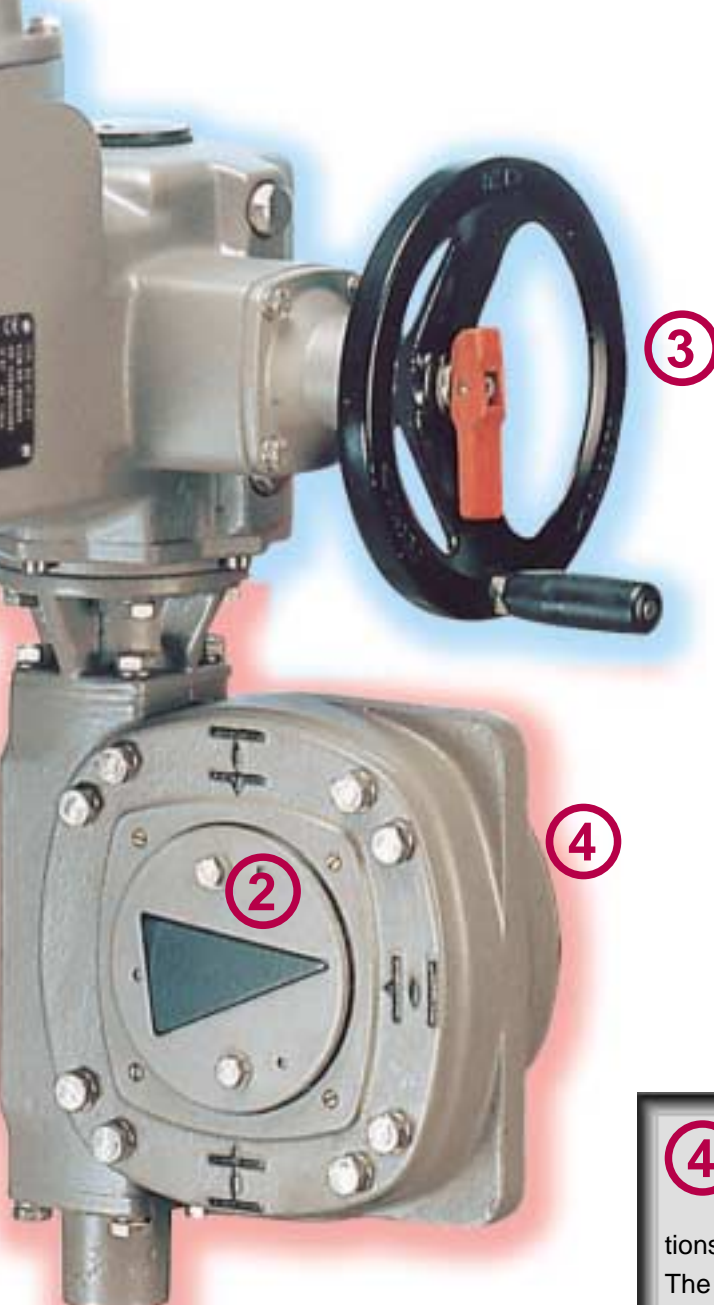
The connections for motor and controls are made on a 50-pole AUMA plug/ socket connector.

In case the plug/ socket is disconnected for maintenance work, the wiring remains undisturbed.

For explosion-proof types SAEx and SAREx plug/ socket connectors are not permitted. In these cases terminals are used for the electrical connection.

Further equipment features

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■ Primary reduction gearing		Page 6
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■ Integral controls		Page 6
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2 Mechanical position indicator

In the basic version the gearbox contains a mechanical position indicator. The pointer cover is replaced by a protection cover for gearboxes with increased enclosure protection IP 68. As an option the multi-turn actuator SA/SAR can be equipped with a mechanical position indicator.

3 Manual operation

For commissioning or in an emergency the actuator can be operated with the handwheel. By operating the red change-over lever the motor drive is disconnected and the manual drive engaged.

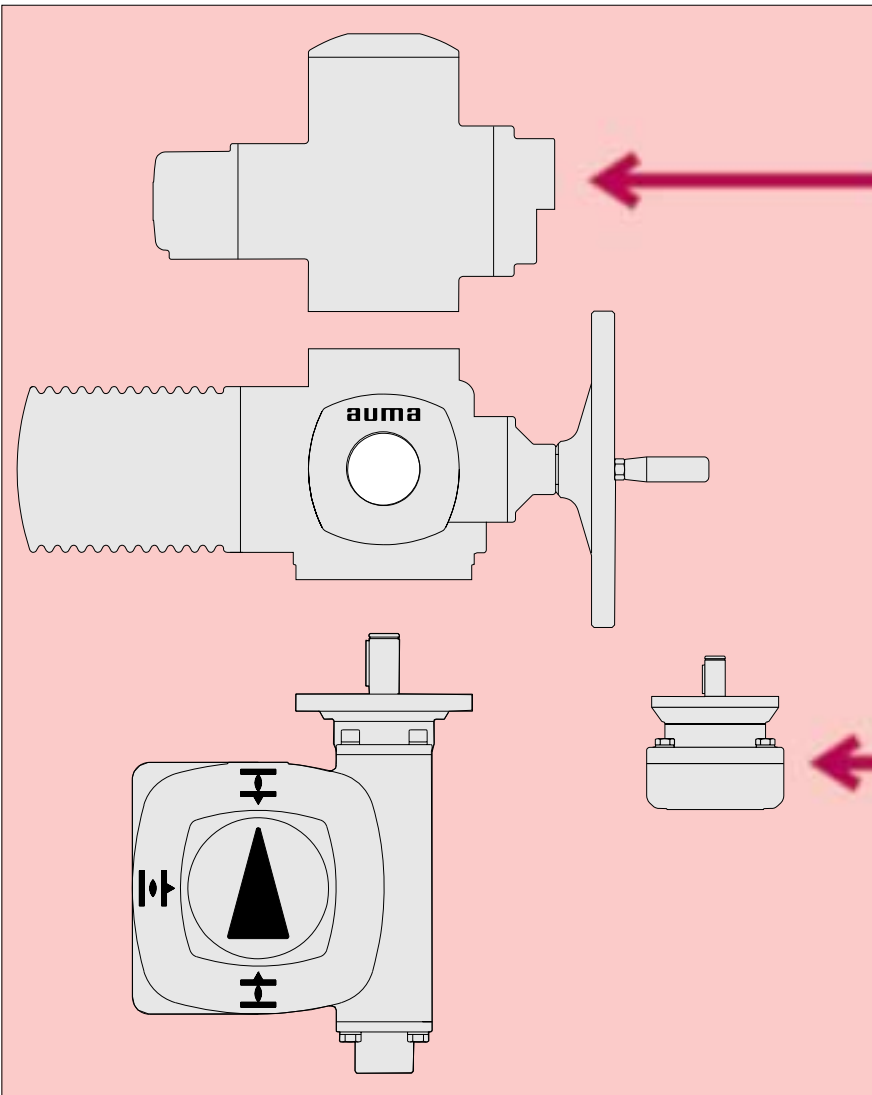
When starting the motor the manual drive is automatically disengaged. During electric operation the handwheel does not rotate.

4 Valve attachment

The valve attachment is according to EN ISO 5211. On request connections with special dimensions are available. The connection between valve shaft and output drive is by a separate coupling (refer to page 10)

Equipment / Versions

Combination possibilities



The diagram illustrates the combination possibilities for actuators. It shows a central 'auma' actuator with a hand crank, and several other components: a multi-turn actuator, a primary reduction gearing unit, and a smaller multi-turn actuator. Red arrows point from the text boxes to the corresponding components.

Integral controls (option)

The multi-turn actuators can be equipped with integral controls which contain the following components:

- Switch gears
- Logic to process actuator signals
- Interface to the higher level controls.

Using integral controls offers many advantages:

- reduced planning costs
- reduced labour intensive installation due to less components
- easy commissioning

The controls are available with a variety of fieldbus interfaces. Detailed information can be found in the brochure 'Product overview, Actuator controls'.

Primary reduction gearing (option)

With a primary reduction gearing the required torque can be reduced at the gearbox input side. Therefore a smaller multi-turn actuator can be applied, usually the less expensive solution. It must be considered that the operating time is extended according to the reduction ratio.

Versions

The worm gearboxes are available with the worm shaft either on the right or left side. Furthermore a distinction is made between clockwise and counter-clockwise rotation of the out-

put shaft at clockwise rotation of the input shaft. This results in four variants.

The first letter in the designation stands for the position of the worm shaft, the second one stands for the direction of rotation at the output



Mounting positions

The multi-turn actuators can be positioned on the gearbox at every 90°. Therefore a good solution can be achieved even for installation in restricted areas. In combination with four possible gearbox versions this results in 16 different variations.

Since variations RR and RL or LR and LL do not differ in their outside appearance, this results in the 8 below illustrated mounting positions.

The gearboxes of the sizes GS 160.3 – GS 250.3 and GS 315 – GS 500 are not mounted together with the multi-turn actuators in the factory for packing reasons. Required fasteners are supplied.

		Mounting positions			
		A	B	C	D
Worm shaft on the right side	R				
		Gearbox versions RR ¹⁾ and RL ²⁾	RR and RL	RR and RL	RR and RL
Worm shaft on the left side	L				
		Gearbox versions LR and LL	LR and LL	LR and LL	LR and LL

1) clockwise rotation of the output shaft at clockwise rotation of the input shaft
2) counter clockwise rotation of the output shaft at clockwise rotation of the input shaft

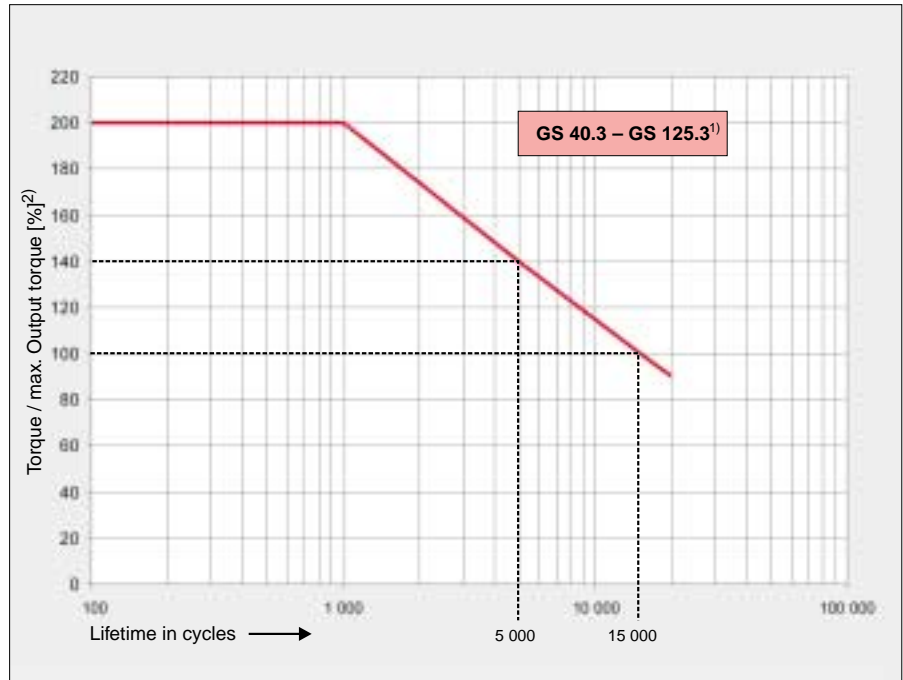
Torques / Equipment

Torques / Service life

Torque and lifetime are directly linked to each other. The higher the load, the shorter the lifetime. The opposite statement is also true: The lesser the gearbox is operated, the larger the load can be.

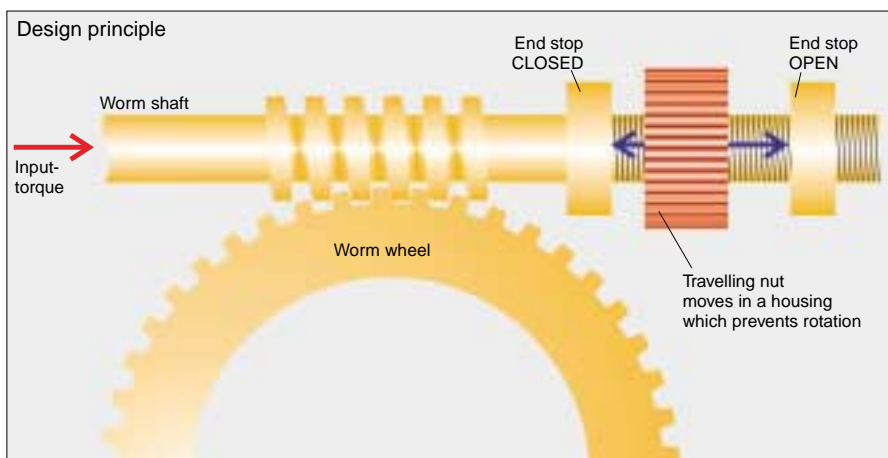
The permissible load depending on the required lifetime can be found in the lifetime characteristic curve¹⁾.

The lifetime is indicated in cycles. One cycle is an operation from CLOSE to OPEN and reverse for swing angle of 90°.



- 1) The curve is applicable to gearboxes up to size 125.3 with worm wheels made of spheroidal cast iron.
- 2) The 200 % torque corresponds to the max. output torque shown in the tables on page 9.

Mechanical end stops



The gearbox contains positive stops for both end positions. They are placed on the worm shaft. During operation a travelling nut moves from one end stop to the other. The linear

travel is according to the required swing angle.

The AUMA end stop technology distinguishes itself by the following significant advantages:

- The end stops must only withstand the comparatively low input torques. There is merely a low load on the gearbox housing – all common specifications regarding the strength of end stop are fulfilled.
- Only the adjustment for one valve end position is necessary after mounting the gearbox to the valve. After loosening 4 bolts the travelling nut can be brought into the end position by turning the end stop housing. The swing angle set in the factory remains unchanged.

Combinations for open-close duty (selection)

With the suggested combinations the max. permissible output torque (200 % torque) of the gearbox is reached. If the torque requirement is lower, smaller and therefore less expensive actuators can be combined with the gearbox.

If the application requires a higher service life than the one mentioned, then the combination must be sized larger (refer to separate selection tables).

Max. Output torque [Nm]	Operating time s	Service life Cycles min	Combination		
			Actuator SA	Gearbox GS	Primary reduction gearing
250	9 - 73	1 000	07.1	40.3	–
500	9 - 96	1 000	07.1	50.3	–
1 000	9 - 96	1 000	07.5	63.3	–
2 000	9 - 100	1 000	10.1	80.3	–
4 000	9 - 98	1 000	14.1	100.3	–
	13 - 300		10.1	100.3	VZ 3.3
8 000	9 - 98	1 000	14.5	125.3	–
	13 - 300		10.1	125.3	VZ 3.3
14 000	18 - 204	1 000	14.1	160.3	GZ 160.3-4:1
	37 - 301		10.1	160.3	GZ 160.3-8:1
28 000	18 - 201	1 000	14.5	200.3	GZ 200.3-4:1
	36 - 296		14.1	200.3	GZ 200.3-8:1
56 000	36 - 290	750	14.5	250.3	GZ 250.3-8:1
90 000	25 - 50	2 000	30.1	315	–
	72 - 288		14.5	315	GZ 30-16:1
180 000	37 - 51	2 000	35.1	400	–
	144 - 288		14.5	400	GZ 35-32:1
360 000	35 - 49	2 000	40.1	500	–
	280 - 392		14.5	500	GZ 40-64:1

Combinations for modulating duty (selection)

With the suggested combinations the max. permissible output torque (140 % torque) of the gearbox is reached. If the torque requirement is lower, smaller and therefore less expensive actuators can be combined with the gearbox.

Worm gearboxes for modulating duty contain a worm wheel made of bronze instead of a worm wheel made of spheroidal cast iron.

Max. Output torque [Nm]	Torque for modulating [Nm]	Operating time s	Service life ¹⁾ Operations min	Number of starts ²⁾ [c/h]	Combinations		
					Actuator SAR	Gearbox GS	Primary reduction gearing
175	60	13 - 73	5 Mio.	1 200	07.1	40.3	–
350	125	17 - 96	5 Mio.	1 200	07.1	50.3	–
700	250	17 - 96	5 Mio.	1 200	07.5	63.3	–
1 400	500	18 - 100	5 Mio.	1 200	10.1	80.3	–
		17 - 98	3,5 Mio.	1 200 ³⁾	14.1	100.3	–
2 800	1 000	69 - 390	5 Mio.	1 200	07.5	100.3	VZ 4.3
		17 - 98	3,5 Mio.	1 200 ³⁾	14.5	125.3	–
5 600	2 000	69 - 390	5 Mio.	1 200	10.1	125.3	VZ 4.3
		18 - 51	3,5 Mio.	1 200 ³⁾	14.5	160.3	–
8 000	4 000	73 - 204	3,5 Mio.	1 200	10.1	160.3	GZ 160.3-4:1
		147 - 301	5 Mio.	1 200	07.5	160.3	GZ 160.3-8:1
16 000	8 000	18 - 51	3,5 Mio.	900 ³⁾	16.1	200.3	–
		71 - 201	3,5 Mio.	1 200 ³⁾	14.1	200.3	GZ 200.3-4:1
32 000	16 000	145 - 296	5 Mio.	1 200	10.1	200.3	GZ 200.3-8:1
		24 - 49	2,5 Mio.	300	25.1	250.3	–
32 000	16 000	70 - 197	3,5 Mio.	1 200 ³⁾	14.5	250.3	GZ 250.3-4:1
		142 - 290	3,5 Mio.	1 200 ³⁾	14.1	250.3	GZ 250.3-8:1

1) The duration of each operation is 0,75 s

2) For nominal voltage, with 25 % on time

3) max. values, refer to separate data sheet 'Multi-turn actuators for modulating duty SAR' or 'Explosion-proof multi-turn actuators for modulating duty SAREx'

Equipment / Valve attachment / Enclosure protection

Swing angle

For gearboxes GS 40.3 – GS 125.3 in the basic version the swing angle is set between 0° and 100°. The required swing angle must be mentioned on the purchase order. A subsequent change is not possible for these gearboxes. As an option these gearboxes can be supplied with an adjustable end stop.

For the larger gearboxes in the basic version the adjustable end stop is standard.

For larger swing angles and multi-turn applications the gearboxes are supplied without end stops.

Detailed information can be found in the 'Product description, Part-turn gearboxes GS'

Remote position transmitter

For remote indication of the valve position, e.g. in a control room, the multi-turn actuator or the gearbox can be equipped with a remote position indicator. Output signals 0 - 5 V, 0 - 20 mA or 4 - 20 mA are available.

Further information can be found in the following brochures:

- **Product description**
Electric multi-turn actuators SA
- **Product description**
Part-turn gearboxes GS

Valve attachment

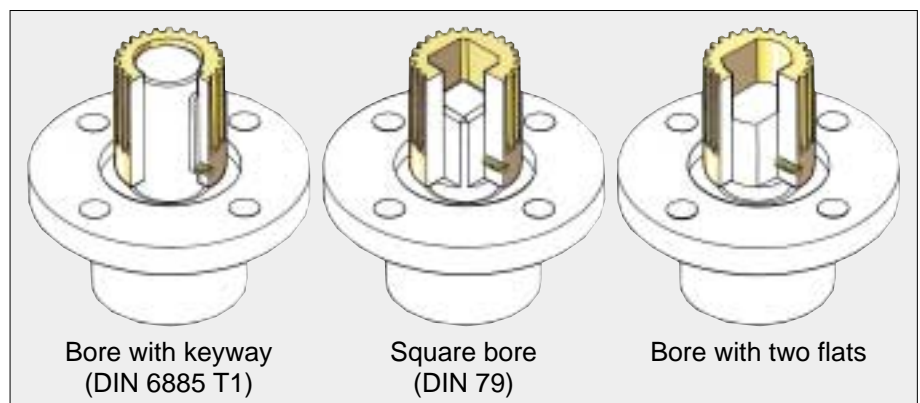
Following flange sizes according to EN ISO 5211 are available:

Type GS	40.3	50.3	63.3	80.3	100.3	125.3	160.3	200.3	250.3	315	400	500
Flange sizes	F05 / F07	F07 / F10	F10 / F12	F12 / F14	F14 / F16	F16 / F25	F25 / F30	F30 / F35	F35 / F40	F40	F48	F60

Coupling

The separate coupling (refer to page 5) can be supplied as follows:

- unbored
- extended length
- finish machined as shown



Types of enclosure protection

Enclosure protection IP 67

The part-turn actuators in basic version have enclosure protection IP 67 according to EN 60 529. IP 67 means protection against immersion in water up to max. 1 m head of water for max. 30 minutes.

Enclosure protection IP 68 (option)

The part-turn actuators are available with increased enclosure protection IP 68 according to EN 60 529. IP 68 means protection against submersion up to max. 6 m head of water for max. 72 hours. Up to 10 operations are permissible during submersion.

For gearboxes in version IP 68, the pointer cover is replaced by a protection cover.

Ambient conditions / Functional testing / Index

Corrosion protection

KN (standard)

The standard AUMA corrosion protection KN is a high quality coating. This is also suitable for outdoor installations and in moderately aggressive atmospheres.

The outside bolts of the plug cover and switch compartment cover are of stainless steel.

KS

AUMA recommends this corrosion protection class for installing part-turn actuators in aggressive atmospheres, e.g. maritime climate or aggressive chemical substances (e.g. in sewage works, chemical plants).

KX

AUMA recommends this corrosion protection class for installing

part-turn actuators in extremely aggressive atmospheres, e.g. in cooling towers.

Painting

The standard colour of the finish coating is silver-grey (DB 701, similar to RAL 9007). The gearboxes size 160.3 and larger are supplied with a primer coat.

Ambient temperatures

	Open-close duty	Modulating duty
Standard	- 25 °C up to + 80 °C	- 25 °C up to + 60 °C
Low temperature version	- 40 °C up to + 60 °C	
Extreme low temperature version	- 60 °C up to + 60 °C	-
High temperature version	0 °C up to + 120 °C	-

Functional test

After assembly all part-turn actuators are tested according to AUMA's inspection specification. On request a final inspection record can be supplied.

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