



We introduce ourselves...
Pneumatic
Part Turn Actuators



AIR TORQUE

PNEUMATISCHE STELLANTRIEBE

Air Torque GmbH - 4th Generation pneumatic part turn actuators

Innovations for the future with new and intelligent highlights!

The company AIR TORQUE GmbH, located in Ettlingen, near to the Black Forest, is your technical partner for pneumatic and electric actuators.

The development and production of the pneumatic actuators is done in accordance with the practicable standards, for example the ISO 5211, DIN 3337, VDI/VDE 3845 or the NF E29-409 considering the ISO 9001.



Our team in the sales department, the project planning and in the assemblage assures to you a perfect support and a high quality standard. To guarantee the daily deliveries we maintain the world-wide biggest stock with Air Torque part turn actuators.

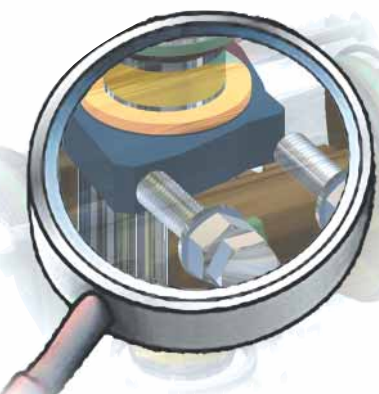


Additional we are to meet online at www.airtorque.de anytime. Here we provide beside the technical informations a large download area with documentation.

AIR TORQUE part turn actuators of the 4. Generation:

Interesting news and a lot of technical developments combine best practice now with the requirements of the future and fulfil the newest demands of the ISO 5211 yet!

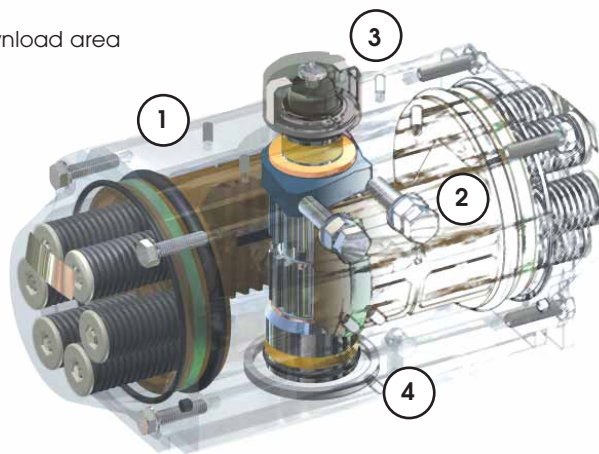
- ① **Body** - The Aluminium body with the appealing 'New Edge Design' is inside and outside complete coated with ALODUR.



Advantages

of the ALODUR coating:
extremely abrasion resistant,
low surface roughness, optimal resistance

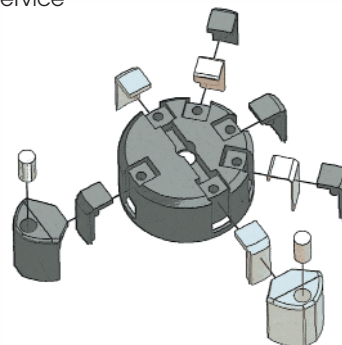
- ② **External stroke adjustment** - a great saving of time is achieved, when mounting the actuator on the valve, through the service friendly adjustment of both end positions with the precise cam system. The rotation angle is easily changeable with a special cam, f.e. for 0°-15° and 75°-90°. Safety for emergency cases is possible through blocking of the actuator. This new feature can be used by simply changing the screw into a longer one. All adjustments of the end positions are possible service friendly without disassembling.



- ③ **Multifunction indicator** - the position of the multifunction indicator is quick adapted for a parallel or 45° position of the square as well as for along or across to the pipe mounted actuator positions.

The direct mounting - through exchange of the yellow inserts the multifunction indicator is suitable as cam for the direct mounting (mechanic, inductive).

- ④ **The connections** - ISO 5211, DIN 3337 (F03-F25), VDI/VDE 3845 (Size 0 to 4) ISO 1 (CNOMO) and NAMUR for flexible usability and exchangeability.





The principle of the double acting actuator

If the port '2' is under pressure and port '4' evacuated, the both pistons are moving into the endpositions and a turning of the drive shaft is the result (a turning of the drive shaft in its opposite is possible through a turned mounting of the pistons -> type DL).

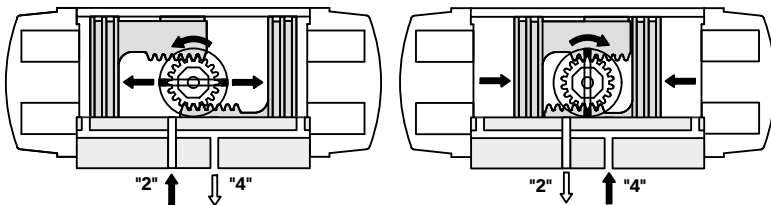


Fig. DR02: Top view and principle of a double acting actuator under pressure

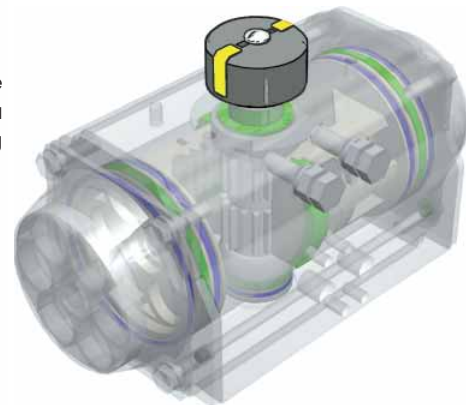


Fig. DR01:
Principle of a double acting actuator

If the port '4' is under pressure and the port '2' de-aerated, the pistons are moving into the middle position. This also has as result a turning of the drive shaft (a turning of the drive shaft in its opposite is possible through a turned mounting of the pistons).

With rack and pinion construction the output torque of an actuator is obtained by multiplying the piston force (given by air supply pressure) by the pitch shaft radius (lever arm) as shown in fig. DR03 less the force lost for friction (efficiency). Because of this concept, the output torque is linear as shown in the diagram DR04 in both clockwise and counterclockwise rotation.

The suggested safety factor for double acting actuators in normal working conditions is 15-20%.

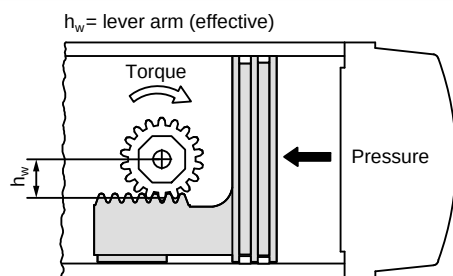


Fig. DR03: Top view of a double acting actuator under pressure

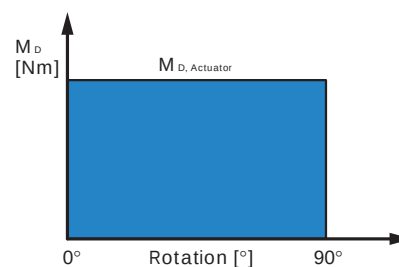


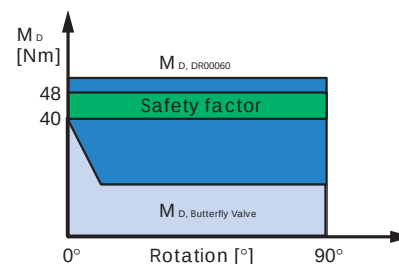
Fig. DR04: Principle of the torque (double acting)

Sizing example for double acting actuator (data see datasheet):

Published butterfly valve torque	= 40 Nm
Safety factor	= 40 Nm + 20 % = 48 Nm
Air supply pressure available	= 5 bar

The double acting AT actuator that produces a minimum of 48 Nm at 5 bar is the DR60.

Fig. DR05:
Principle of the sizing a double-acting actuator





Principle of Single Acting Actuators (Spring Return)

If the port '2' is under pressure and port '4' evacuated, the both pistons are moving into the endpositions and compress the springs - result is a turning of the drive shaft (a turning of the drive shaft in its opposite is possible through a turned mounting of the pistons -> type SO).

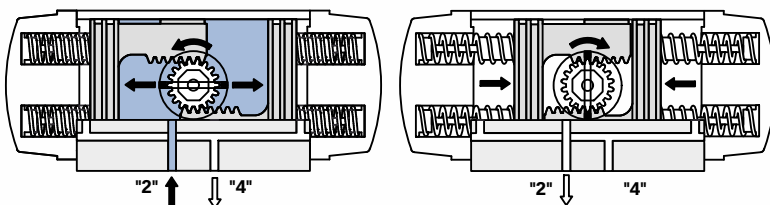


Fig. SC02: Top view and principle of a single acting actuator under spring pressure

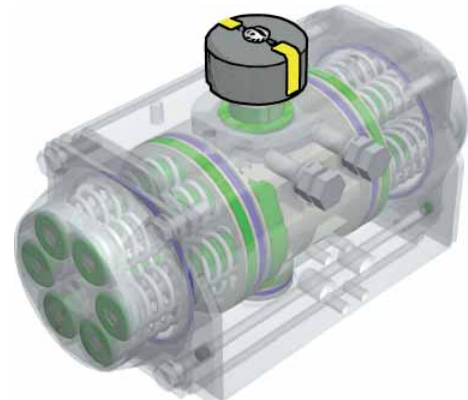


Fig. SC01:
Principle of a single acting actuator

By the spring force a fail-safe position by air or electricity loss is guaranteed.

In spring return applications the output torque is obtained in two different operations. Each operation produces two different values in relation to the stroke position (0° or 90°). For spring return actuators the output torque is produced by multiplying the force (air or springs acting on the pistons) by the lever arm.

First case:

The output torque is generated by air supply pressure at port '2' after compressing the springs, called 'output torque air stroke'. In this case air forces the pistons from the 0° to the 90° position and consequently the torque starts from a high value and during the stroke it constantly decreases until 90° due to the natural force that springs generate (oppose) when they are compressed (see diagram SC04).

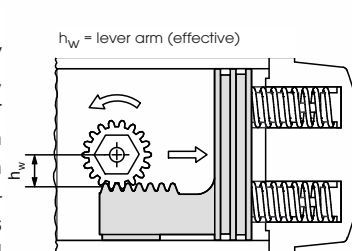


Fig. SC03:
Top view of a single-acting actuator

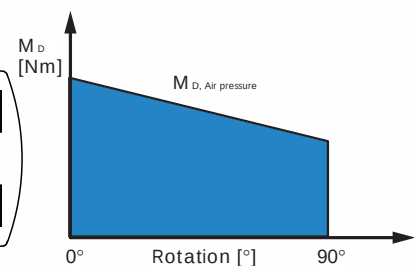


Diagram SC04:
Principle of the air torque

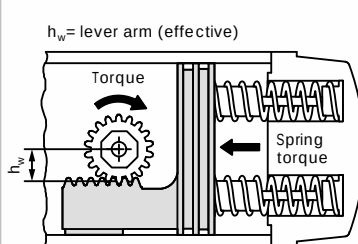


Fig. SC05:
Top view of a single acting actuator

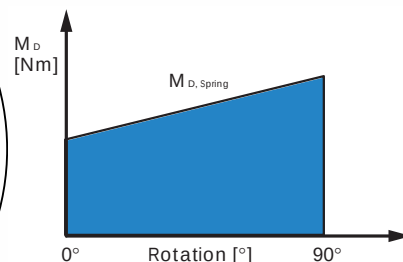


Diagram SC06:
Principle of the spring torque

Second case:

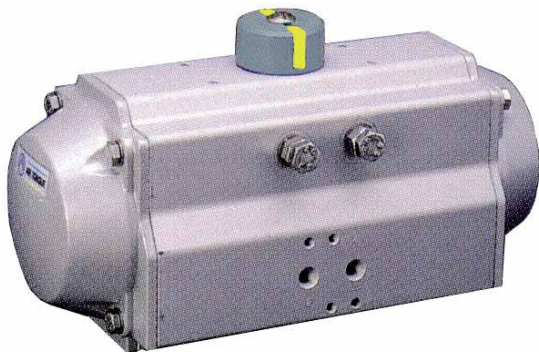
The output torque is generated by the force that springs release onto the pistons when air fails, called 'output torque spring stroke'. In this case the torque, starting from the 90° position, constantly decreases until 0° because of springs extending (see diagram SC06).

AT spring return actuators are designed to produce a balanced torque in the two conditions explained above when the number of springs per side is equal to the air pressure supply (4 bar - 4 springs each side) as shown in the diagram SC07. For certain applications it is possible to achieve (where desired), the unbalanced torque, as shown in diagram SC08, by changing the relation between the number of springs per side and air pressure supply in bar (for example 6 springs and 5,5 bar or vice versa).

In spring return applications two conditions can be achieved: air failure to close or failure to open. The suggested safety factor for spring return actuators in normal working conditions is 20-25%.



Rack and pinion actuator with constant torque version 'A' throughout the entire output rotation with convincing advantages



The body is ALODUR coated, inside as well as outside. The end caps are chromitized and coated with light-grey polyester. The coating is abrasion-free and is used for standard industrial purposes. The ALODUR-coating has compared with the common hard anodizing the advantage of a better surface roughness with nearly the same strength, by a better stability.

External serviceable travel stops for open and close position allow a fine adjustment of $\pm 4^\circ$. This special feature eliminates alignment problems due to a clearance of connections between the stem of the valve adaptor and the shaft of the actuator.

Due to a triple bearing of the piston all actuators have a constant torque, even under high load. Beside the guides on the outside of the piston there is an additional guide inside which absorbs the cross load through the integrated support at the drive shaft.

The drive shaft is held in position by two bearings, one at the top of the pinion, one at the bottom. These guarantee less friction and abrasion-free operation. Due to the special design of the bearings at the shoulders of the piston, the drive shaft is blowout proof and fulfills the hard US-standards for product liability.

The drive shaft has a 25-30 μm electroless nickel coating.

The bearings are temperature resistant to 155°C. Because of an internal retaining shoulder the bearings are blowout safe.

The maintenance free springs allow a safe and simple assembly and disassembly. The adaptation of the AT - actuators to your working conditions with the recommended pneumatic pressure can so be arranged. The conversion of a double acting to a spring return actuator can be easily managed. Only the necessary springs have to be mounted. This advantage of AT - actuators reduces stocking costs significantly.

Silicon free:

All actuators are silicon free according to the automobile industry recommendations.

Exception: High and low temperature actuators

Serial inspection:

Each actuator has to pass a comprehensive serial inspection with e.g. a tightness / density check and a torque check. After passing the inspection the actuator is given a serial number according to ISO 9001.

Test Certificate:

Salt spray test: no. SAC/655/98
Kesternich test: no. SAC/299/98

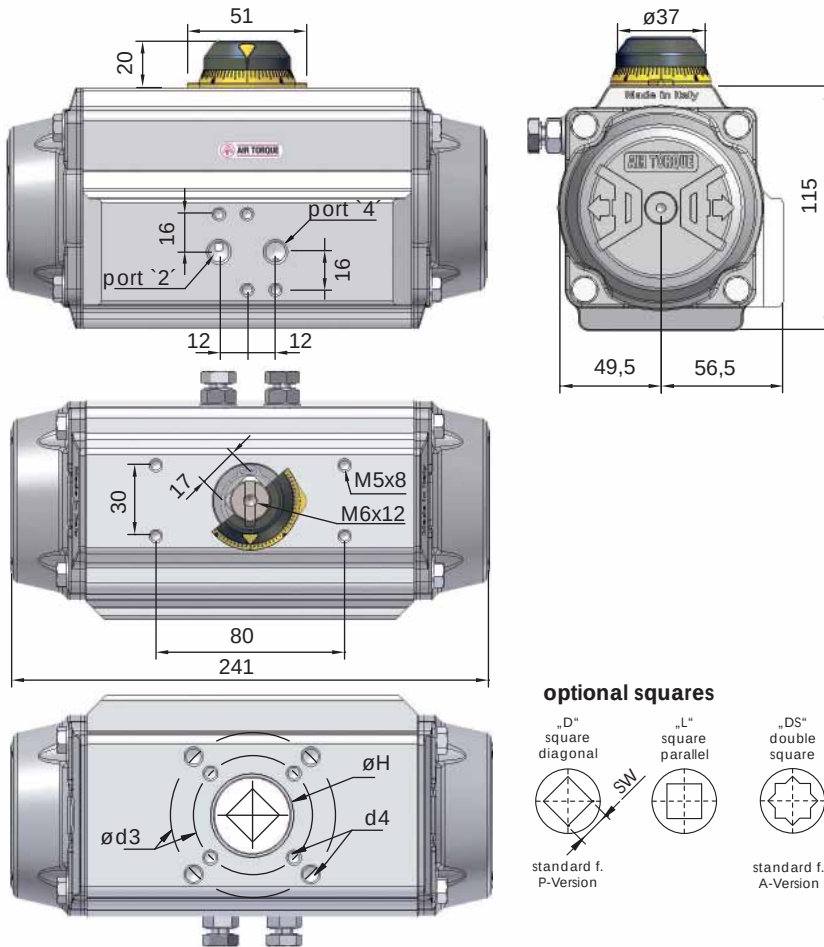
Approval:

Classification of ships: DET NORSKE Nr. P-12465
GOST: no. 7435773, PPC 00-26447

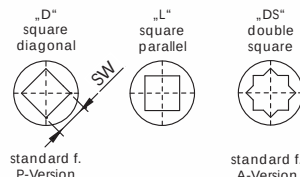
Protection	Parts and Protection				suitable for	not recommended for
	Body	End-Caps	Drive Shaft	Pistons		
Material	EN AW 6063	GD- AlSi8.5Cu3.5Fe	C22	GD- AlSi8.5Cu3.5Fe	general service	caustic soda, all strong acids or basic solutions
Description	ALODUR	chromitized + Polyester coated	Carbon steel ENP	anodized, black		
Coating	30 - 35 μm	80 - 90 μm	25 - 30 μm	15 - 20 μm		
Colour	light grey	light grey, Ral 9007		black		
Process	This coating is achieved through a special method, which uses a special surface treatment with brushing and sandblasting followed by an electrochemical oxidation of the aluminium surface.					
Advantages	Good corrosion resistance, very high surface hardness for good abrasion resistance in connection with the standard hard anodation the inside surface roughness was reduced about 40%. The outcome of this is lower friction in combination with a higher sealing lifetime.					



Dimensions in mm



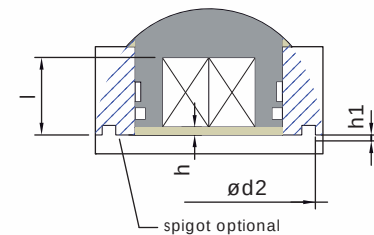
optional squares



ISO 5211 - available flanges

	Standard		optional
ISO 5211	F05* + F07		F07
Ø d2	40	-	55
Ø d3	50	70	70
d4	M6x9	M8x12	M8 x 12
Ø H	40		55
SW x l min.	D	-	11x19 - 14x18 - 17x19
	DS	17 x 19	17 x 19
h min.	1,5	1,5	1,5
h1	1,5	-	2

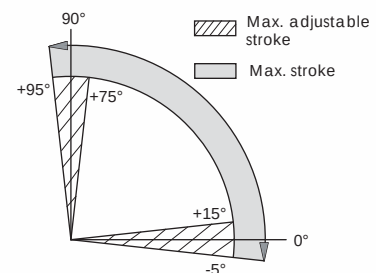
*before selecting the flange connection please consider the indications of standard n° 5211 on page 0911 of our manual for op. and maintenance



Connection / Attachment

Pressure connection Port 2 and 4	G1/8"
Ancillaries attachment	AA 1

Rotation and stroke adjustment



Pressure	Output torque for double acting and spring return in Nm												Spring torque	approx. weight
	2,5 bar	3 bar	3,5 bar	4 bar	4,2 bar	4,5 bar	5 bar	5,5 bar	6 bar	7 bar	8 bar			
	0° 90°	0° 90°	0° 90°	0° 90°	0° 90°	0° 90°	0° 90°	0° 90°	0° 90°	0° 90°	0° 90°	90° 0°		
DR	45,8	54,9	64,1	73,2	76,9	82,4	91,5	101	110	128	146	-	3,82	

SC 2/3	27,4 16,9	36,6 26	45,7 35,2	54,9 44,3	58,5 48	64 53,5	73,2 62,6					28,9 18,3	4,07
SC 3	23,8 11,1	32,9 20,3	42,1 29,4	51,2 38,6	54,9 42,2	60,4 47,7	69,5 56,9	78,7 66				34,7 22	4,12
SC 3/4		29,2 14,5	38,4 23,6	47,5 32,8	51,2 36,4	56,7 41,9	65,8 51,1	75 60,2	84,2 69,4			40,4 25,7	4,17
SC 4			34,7 17,9	43,9 27	47,5 30,7	53 36,2	62,2 45,3	71,3 54,5	80,5 63,6	98,8 81,9		46,2 29,3	4,22
SC 4/5				40,2 21,2	43,9 24,9	49,4 30,4	58,5 39,5	67,7 48,7	76,8 57,8	95,1 76,1	113 94,5	52 33	4,27
SC 5						45,7 24,6	54,8 33,8	64 42,9	73,1 52,1	91,5 70,4	110 88,7	57,8 36,7	4,32
SC 5/6							51,2 28	60,3 37,1	69,5 46,3	87,8 64,6	106 82,9	63,5 40,3	4,37
SC 6								56,7 31,4	65,8 40,5	84,1 58,8	102 77,1	69,3 44	4,42

Pressure max.	Rotation (STD) (C)	Screw stroke adjustment	Chamber (Ø mm)	Air volume (L)		Moving time (sec.) (A)	
				OPEN	CLOSE	OPEN	CLOSE
8 bar	0° - 90°	for 1° 1/5 rotation	88	0,51	0,78	D 0,40 S 0,50	D 0,50 S 0,60

Operating temperature (°C) (B)		
ST (Standard)	HT (High temperature)	LLT (Extreme low temperature)
- 40 to + 80	- 15 to + 150	- 55 to + 80

(A) the above indicated moving time of the actuator is obtained under the following test conditions: (1) room temperature, (2) actuator stroke 90°, (3) solenoid valve with Ø 4 mm and flow capacity Q₉₀ 400 L/min., (4) inside pipe Ø 8 mm, (5) medium clean air, (6) air supply pressure 5,5 bar (79,75 Psi), (7) actuator without external resistance load. **Caution:** It has to be expected, e.g. for field applications, when one or more of the above parameters are different, the moving time will be different.

Operating Medium:

The operating medium must be free of dust and oil. The maximum particle size must not exceed 30µ. (ISO 8573 Part1, Class5). In order to prevent water condensation and/or solidification (ice when actuator works below 0°C), the operating medium must have a dew point equal to -20°C or at least 10°C below the ambient temperature (ISO 8573 Part1, Class3)

(B) Every temperature range option requires proper components and lubricant. Please contact Air Torque GmbH.



Actuator Sizes German

Valve attachment

Actuator Sizes international

Type	Flange ISO 5211	Double Square	Square	Type Marking
DR/SC 00010U	F03 / F04	9 / 11	-	AT 045
DR/SC 00015U	F03F05 / F04	11	9 / 11	AT 051U
DR/SC 00030U	F03F05 / F04F07 / F05F07 / F05	11 / 14	9 / 14	AT 101U
DR/SC 00060U	F04F07 / F05F07 / F05	14 / 17	11 / 14 / 17	AT 201U
DR/SC 00100U	F05F07 / F07	17	11 / 14 / 17	AT 251U
DR/SC 00150U	F05F07 / F07F10 / F07	17 / 22	14 / 17 / 22	AT 301U
DR/SC 00220U	F07F10 / F10	17 / 22	14 / 22	AT 351U
DR/SC 00300U	F07F10 / F10	22 / 27	17 / 22	AT 401U
DR/SC 00450U	F10F12 / F12	27	22 / 27	AT 451U
DR/SC 00600U	F10F12 / F12	27	22 / 27	AT 501U
DR/SC 00900U	F10F12 / F14	27 / 36	22 / 36	AT 551U
DR/SC 01200U	F10F12 / F14	27 / 36	22 / 36	AT 601U
DR/SC 02000U	F12 / F14 / F16	36 / 46	27 / 46	AT 651U
DR/SC 03000U	F12 / F14 / F16	36 / 46	27 / 46	AT 701U
DR/SC 04000U	F14 / F16 / F16F25	46 / 55	55	AT 751U
DR/SC 05000U	F16F25 / F25	46 / 55	55	AT 801U
DR/SC 10000U	F16F25F30 / F30	55 / 75	75	AT 1004U

- Standard bold printet

- all types except P version with double flange in some sizes + double square
- Version P P only available with single flange and square
- EC Version only available with stainless steel drive shaft and double square

How to order:

Pos.1: Actuator type - Feature 1

- D - double acting
- S - single acting

Pos.2: Actuator type - Feature 2

- R - Clockwise (CW) > for double acting actuators
- L - CounterCW >
- C - Spring close > for single acting actuators
- O - Spring open >

Pos.3: Size

- last digit = 0 -> turning range 90°
- last digit = 2 -> turning range 120°
- last digit = 3 -> turning range 135°
- last digit = 5 -> turning range 145°
- last digit = 8 -> turning range 180°

Pos.4: Number of springs per side

- only for single acting actuators

Pos.5: Actuator type - Feature 3

- U (Upgrade) = Edition 2010
- without attribute = Edition 2000

Pos.6: Flange Connection

- possible combinations -> s. top table

Pos.7: Key Size

- possible combinations -> s. top table

Pos.8: Protection Levels

- Versions: A/B/D/E/P/EC/S*

Pos.9: Cam

- without attribute = conical cam with graduated ring
- Z (cylindric) = multifunktional indicator

Pos.10: Special Attributes

- 3 - 3 position
- B - 100% or 50% stroke adjustment
- D - hydraulic damper
- F - special colour
- FM - Fail Mid
- H - high temperature
- N - internal character
- Q - for assembly across the line
- S - fast acting
- T - extreme low temperature
- W - control medium clean water
- Y - centerring*
- G - automatic safety device**

Ordering Example:

Position	1	2	3	4	5	6	7	8	9	10
Example	S	C	00100	-4	U	F05F07	17	A	Z	H

Single acting actuator, spring close, size 00100, 4 springs per side (symmetric sizing for control pressure = 4bar),
Edition 2010, double flange F05F07, double square 17, version A, multifunction indicator, high temperature

*Details for S = stainless steel see
data sheet 0306 / 0524

**not for P-Version, included in standard version

***on request for some sizes