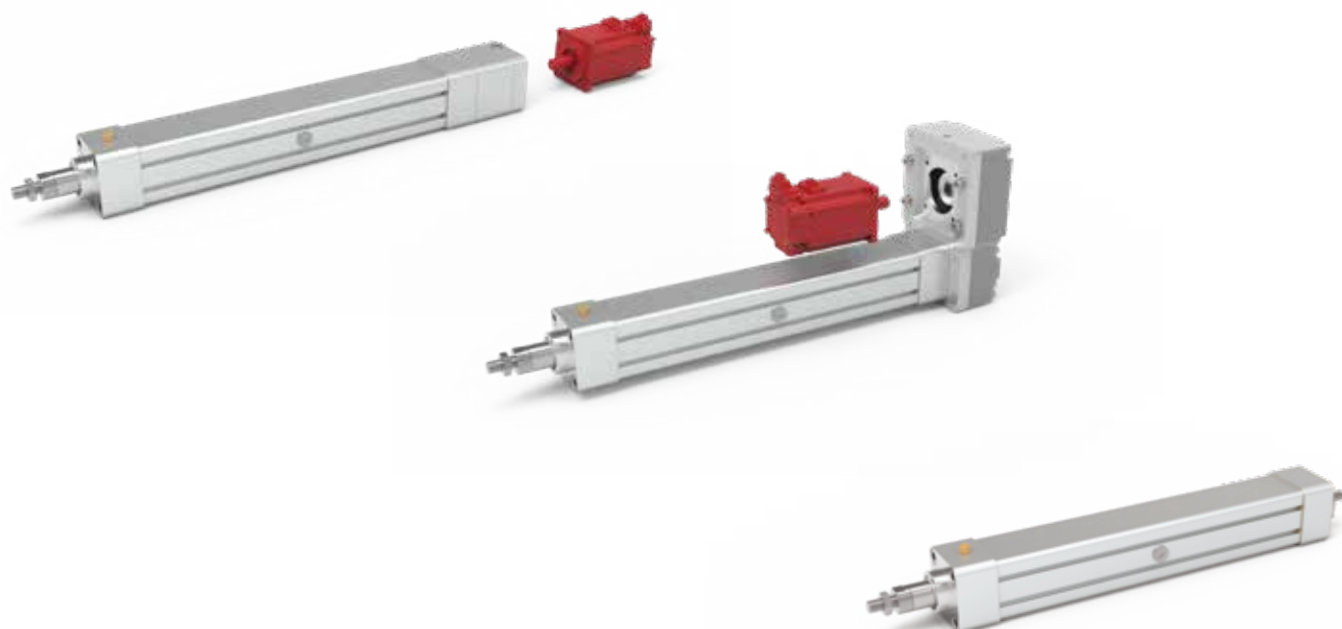




# LINEAR SERVOACTUATORS

CATALOGUE



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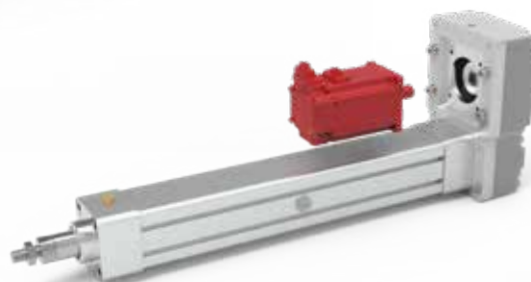


# LINEAR SERVOACTUATORS

CATALOGUE



SAM IL Series



SAM PD Series



SAM Series



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# Linear servoactuators

**MORE  
PRODUCTIVITY,  
LESS ENERGY  
CONSUMPTION**

**Linearmech linear servoactuators** are **high performances** electromechanical cylinders, with high precision ball screw drive, also produced in-house by Servomech, to be motorized mainly with brushless servomotors.

**Linearmech linear servoactuators** have been designed and built by Servomech to overcome the performance limits of pneumatic cylinders. Ideal for **high dynamics applications**, high precision and positioning accuracy, reliability over the time. Linearmech servoactuators grant excellent **speed control**, from speed close to zero up to the max permissible speed, excellent **positioning control** in any stroke position, intermediate or extreme, excellent **load control**, within a wide range of values.

Linearmech linear servoactuators best combine the demands for ever higher performance and **higher productivity** with competitive industrial costs.

Also ideal for **replacing pneumatic cylinders** in applications requiring high position, speed and force control.

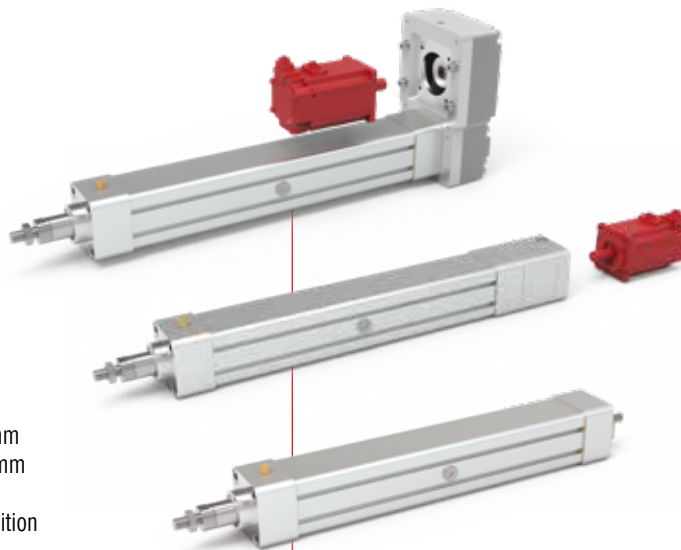
The **mechanical construction** of these servoactuators, in compliance with **ISO 15552 standard** for cylinders, allows the mounting of different standard types of fixing elements. This simplify the use and the assembly in systems where movements of controlled axis are required. Also the replacement of the traditional pneumatic cylinders with electromechanical servoactuators is easier, maintaining exactly the same type and size of the fixing.

There are many different **application fields for the servoactuators products**, but most of all they are suggested in case of applications with high levels of automation, productivity, efficiency and reliability.

**Linearmech** is a brand of the Servomech Group that brings together products focused on automation and mechatronics.

## SAM SERIES

- High precision ball screw drive
- Low inertia and zero backlash
- Extreme positioning control
- Excellent for high dynamics and high speed conditions
- Parallel or in-line motor
- Prepared for brushless servomotors mounting
- Linear speed up to 1,5 m/s
- 7 sizes, ball screw from Ø 12 mm to Ø 40 mm
- ISO 15552 profile from Ø 32 mm to Ø 125 mm
- ISO 15552 standard accessories
- Nut relubrication system with "homing" position
- Electric limit switches



SERVOMECH products are **designed and manufactured inside the production factory in Anzola dell'Emilia (Bologna) - ITALY** using high technology and CNC machine tools.

Check tests are carried out in-line during all manufacturing processes to monitor and adjust possible errors, obtaining a constant quality of the production with target zero scraps. Final control and functional checks are carried out to ensure high quality and reliability of the final product.

Each finished product is uniquely identified by the serial

number on the product identification nameplate. For each finished product, SERVOMECH fills a specific final test sheet which is supplied to the customer within the shipment together with the product and certifies its conformity. The final test sheet also contains important information for the correct functioning of the product. All working processes inside SERVOMECH comply to its **Quality Management System**, developed according to **ISO 9001:2015** and certified by TÜV Italia.



**/ Main features**

- Modular structure, robust and compact.
- **7 standard sizes** available at catalogue.
- **In-line or parallel motor.**
- **High precision ball screw drive**, made in Servomech. Standard execution with rolled ball screw ISO IT7 accuracy grade. Available upon request ball screw ISO IT3 and IT5 accuracy grade, ball nuts zero backlash or preloaded.
- **Integrated lubrication system for the ball nut** with sealing for lubricant. The lubricant is only where needed, no leakage even in case of high dynamic conditions.
- **Transmission of motion with zero backlash and low inertia**, to get maximum performances with high dynamics and speed conditions.
- Wide range of fixing elements according to the **ISO 15552 standards**.
- Compensation of air flows and the relative pressure through breathers both outwards and inwards. No seals failure, no energy waste, no lubricant leakage thanks to the special design of the ball nut.
- Non-sliding contact lubricant seals to prevent wear, overheating and frictional losses.
- Elastic cushioning elements at stroke-end position protect the mechanics in case of accidental impacts.
- **Anti-turn device** of the push rod included as standard.
- **Stroke end limit sensors** integrated into the profile.
- On demand: IP65 protection. For more informations, please contact our technical support.

**/ Product overview**

Linearmech servoactuators product range of is based upon **3 series**, differentiated by design, mounting position and input drive.

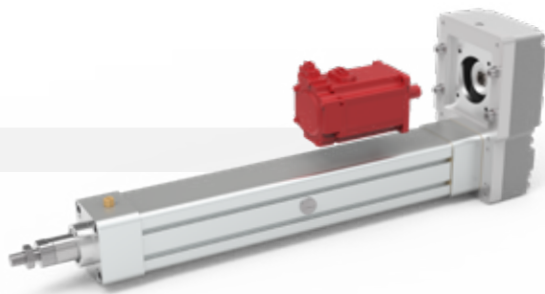
**SAM IL Series**

- In-line motor
- Prepared to easy-fit third party servomotors
- Transmission of motion by torsionally rigid coupling



**SAM PD Series**

- Parallel motor
- Prepared to easy-fit third party servomotors
- Transmission of motion by high performance and accuracy timing belt



**SAM Series**

- Mechanical linear unit with cylindrical input shaft
- Simple and flexible, to adapt to any type assembly with motor or gearmotor



## / Size overview

Thanks to the completely modular construction system, each family is available in **7 standard sizes**, to cover a wide range of performances.

SIZE	ISO 15552 profile [mm]	Push rod diameter [mm]	Ball screw $d_o \times Ph$ [mm]
SAM 0	Ø 32	Ø 20	12 × 5
			12 × 10
SAM 1	Ø 40	Ø 22	14 × 5
			14 × 10
SAM 2	Ø 50	Ø 25	16 × 5
			16 × 10
			16 × 16
SAM 3	Ø 63	Ø 30	20 × 5
			20 × 10
			20 × 20
SAM 4	Ø 80	Ø 35	25 × 5
			25 × 10
			25 × 25
SAM 5	Ø 100	Ø 50	32 × 5
			32 × 10
			32 × 20
			32 × 32
SAM 6	Ø 125	Ø 60	40 × 5
			40 × 10
			40 × 20
			40 × 40

## / 5 reasons to go electric

**Linear servoactuators SAM Series** are included inside the **5 Reasons To Go Electric** campaign, to prefer the Servomech electromechanical solution to hydraulic and pneumatic cylinders.

**1. Greater efficiency and lower energy consumption** of Servomech linear actuators when compared to traditional hydraulic or pneumatic cylinders.

**2. Greater control of position, speed, and force**, Servomech linear actuators offer significantly superior control options compared to hydraulic or pneumatic alternatives.

**3. Exact position repeatability**, essential for applications requiring high positioning accuracy, even when synchronizing multiple actuators.

**4. Greater safety and reliability**, thanks to the absence of pressurized fluids, there is no risk of explosion or environmental contamination. Furthermore, the ability to hold the load even in emergency situations further increases operational safety.

**5. Lower maintenance costs and increased productivity**, thanks to superior performance and flexibility in format changeovers, increases the quality and quantity of work performed.



## / Sizing and selection

Linearmech electromechanical servoactuators have been specially developed for applications with **high dynamics**, and in general where the precise and **accurate control of position, speed and force** is a crucial factor. Sizing your electromechanical cylinder correctly means finding the most cost-effective solution that meets the application requirements.

### 1 Identify the performances and technical specifications required by the application.

- **Load** (static and dynamic load, pull and push load, moving mass, side loads, shock loads, vibrations).
- **Working position** (horizontal, vertical, inclined, load guided, holding the position).
- **Stroke** (stroke length required, max. dimension in closed position).
- **Linear speed** (max. speed, min. speed).
- **Precision** (accuracy, max. backlash).
- **Duty cycle** (total cycle time, required lifetime, accurate description of the working cycle with load and speed diagram referred to time).
- **Environmental condition** (operating temperature, outdoor, washdown, IP grade required).
- Presence of **contaminants** (powders, liquids).
- **Motor and driver** required.

### 2 Select the product series.

Depending on the mounting position of the motor (in line or parallel mounting).

### 3 Select the size of the servoactuator.

Using the summary tables in the Technical data section of each series.

### 4 Mechanical checks.

- Lifetime check.  
According to the duty cycle, check the life of the ball screw. Refer to the information in chapter **7.2 / Ball screw sizing and service life** (page 42).

- Buckling resistance.  
In case of push load (static or dynamic) applied on the servoactuator, the buckling resistance of the screw must be checked. Refer to the information and diagrams in chapter **7.3 / Push load limit** (page 47).
- Critical speed / Max rotating speed of the screw.  
Refer to the information and diagrams in the chapter **7.4 / Critical speed limit** (page 48).
- Permissible side load. In case of side load applied on the push rod, this must be lower than max permissible side load. Refer to the information and diagrams in chapter **7.5 / Side load limit** (page 50).

### 5 Motor sizing.

See chapter **7.1 / Motor sizing** (page 40).

### 6 Options and accessories.

Mounting options and rod end options see chapter **5 / Mounting options** (page 30).

Stroke end limit switches sensors see chapter **6 / Limit sensors** (page 37).

### 7 Check actuator dimensions and fixing options.

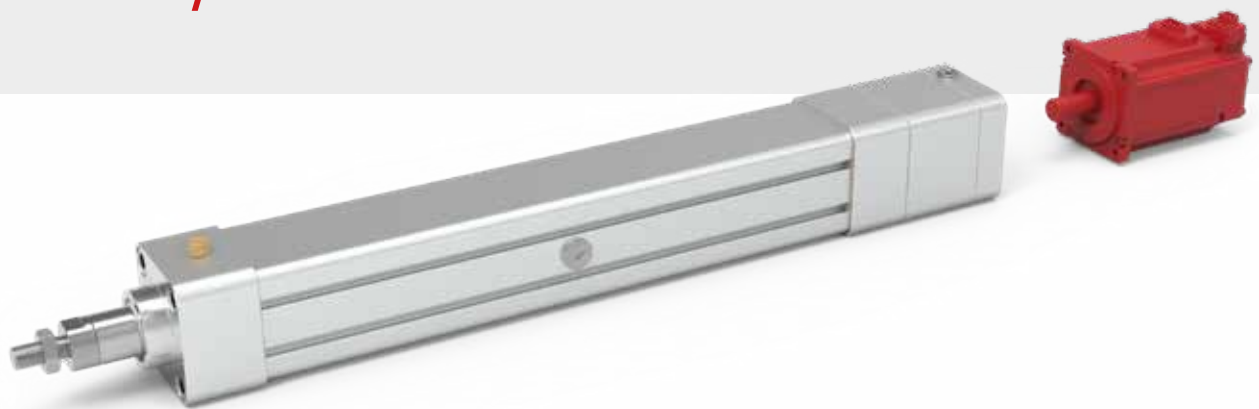
Refer to the tables to know the overall dimensions of the actuator and accessories and verify that they are compatible with the application. By visiting our website **www.servomech.com** you can download the 3D models of our products for free.

### 8 Fill the ordering code.

See chapter **9 / Ordering code** (page 61).

Our team of application engineers are at your disposal for more information and to support you in the correct product selection. We ask you to fill in the **application worksheet form** available on page 54 of this catalog and send it by e-mail to: [sales@linearmech.com](mailto:sales@linearmech.com)

## 2 / ACTUATORS SAM IL Series



**2.1 / Technical data SAM IL Series**

SIZE	SAM 0 IL		SAM 1 IL		SAM 2 IL			SAM 3 IL				
Profile ISO 15552	[mm]		Ø32		Ø40		Ø50			Ø63		
Rod diameter	[mm]		Ø20		Ø22		Ø25			Ø30		
Ball screw BS	BS1	BS2	BS1	BS2	BS1	BS2	BS3	BS1	BS2	BS3		
Diameter × Lead $d_o \times P_h$	[mm]		12×5	12×10	14×5	14×10	16×5	16×10	16×16	20×5	20×10	20×20
Ball diameter $D_w$	[mm]		Ø 2.381		Ø3.175		Ø3.175			Ø3.175		
Accuracy grade (°)			IT 7		IT 7		IT 7			IT 7		
N° of circuits	3	2	3	2	4	3	2	4	3	2		
N° of starts	1	2	1	1	1	1	2	1	1	2		
Dynamic load $C_a$	[N]		5300	6600	7800	5300	11100	8900	10500	12800	10200	12100
Static load $C_{0a}$	[N]		8000	9500	11100	6900	18100	14400	15700	24400	18900	20900
Ratio $u$			1		1		1			1		
Linear travel for 1 motor shaft revolution	[mm]		5	10	5	10	5	10	16	5	10	20
Motor attachment			F1 ; F2		F1; F2		F1; F2			F1; F2; F3		
Max. force $F_{max} (²)$	[N]		920	440	2130	1080	2080	1040	640	4750	2430	1220
Max. input torque $T_{max}$	[Nm]		1	1	2.2	2.2	2.2	2.2	2.2	5	5	5
Max. linear speed $v_{max}$	[mm/s]		500	1000	417	833	375	750	1200	300	600	1200
Max. rotational speed $n_{max}$	[min <sup>-1</sup> ]		6000	6000	5000	5000	4500	4500	4500	3600	3600	3600
Max. acceleration $a_{max}$	[m/s <sup>2</sup> ]		10	10	10	10	10	10	10	10	10	10
Total actuator efficiency $\eta$			0.86	0.88	0.85	0.88	0.85	0.87	0.88	0.84	0.87	0.88
Friction torque $T_a$	[Nm]		0.15	0.20	0.20	0.25	0.25	0.30	0.35	0.50	0.55	0.60
$J_o$ ref. to 0 mm stroke actuator	[kg×m <sup>2</sup> ]×10 <sup>-4</sup>		0.070	0.077	0.165	0.175	0.263	0.277	0.306	0.545	0.569	0.659
$J_{100}$ each 100 mm extra-stroke	[kg×m <sup>2</sup> ]×10 <sup>-4</sup>		0.018	0.020	0.026	0.029	0.045	0.049	0.057	0.11	0.12	0.13
Motor attachment			-		-		F3			F4		
Max. force $F_{max} (²)$	[N]		-		-		5070	2570	1610	5941	3800	1910
Max. input torque $T_{max}$	[Nm]		-		-		5	5	5	6.1	7.5	7.5
Max. linear speed $v_{max}$	[mm/s]		-		-		375	750	1200	300	600	1200
Max. rotational speed $n_{max}$	[min <sup>-1</sup> ]		-		-		4500	4500	4500	3600	3600	3600
Max. acceleration $a_{max}$	[m/s <sup>2</sup> ]		-		-		10	10	10	10	10	10
Total actuator efficiency $\eta$			-		-		0.85	0.87	0.88	0.84	0.87	0.88
Friction torque $T_a$	[Nm]		-		-		0.25	0.30	0.35	0.50	0.55	0.60
$J_o$ ref. to 0 mm stroke actuator	[kg×m <sup>2</sup> ]×10 <sup>-4</sup>		-		-		0.326	0.340	0.369	1.061	1.085	1.174
$J_{100}$ each 100 mm extra-stroke	[kg×m <sup>2</sup> ]×10 <sup>-4</sup>		-		-		0.045	0.049	0.057	0.11	0.12	0.13
$m_o$ ref. to 0 mm stroke	[kg]		0.32	0.32	0.47	0.48	0.64	0.65	0.65	1.06	1.07	1.05
$m_{100}$ each 100 mm extra-stroke	[kg]		0.13		0.14		0.19			0.20		
Weight of 100 mm stroke actuator (³)	[kg]		2.0		2.6		4.1			5.8		
Weight for each 100 mm extra-stroke	[kg]		0.44		0.51		0.67			0.79		

$J_o$  - Moment of inertia of the actuator reduced to motor shaft referred to 0 mm stroke actuator

$J_{100}$  - Moment of inertia of the actuator referred to each 100 mm extra-stroke

$m_o$  - Mass in linear motion referred to 0 mm stroke actuator

$m_{100}$  - Mass in linear motion referred to each 100 mm extra-stroke

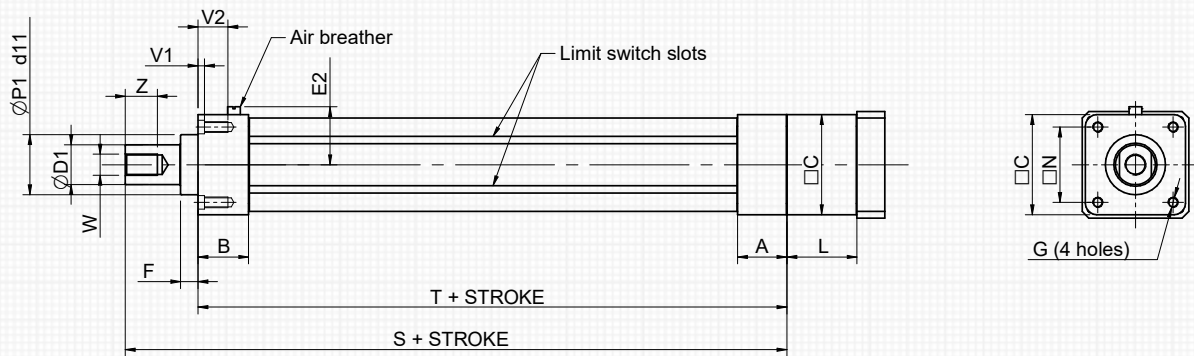


SIZE	SAM 4 IL			SAM 5 IL				SAM 6 IL			
Profile ISO 15552	Ø80			Ø100				Ø125			
Rod diameter	Ø35			Ø50				Ø60			
Ball screw BS	BS1	BS2	BS3	BS1	BS2	BS3	BS4	BS1	BS2	BS3	BS4
Diameter × Lead $d_o \times P_h$	25×5	25×10	25×25	32×5	32×10	32×20	32×32	40×5	40×10	40×20	40×40
Ball diameter $D_w$	Ø3.175	Ø3.969	Ø3.175	Ø3.175	Ø6.350	Ø6.350	Ø6.350	Ø3.175	Ø6.350	Ø6.350	Ø6.350
Accuracy grade (1)	IT 7			IT 7				IT 7			
N° of circuits	4	3	2	6	4	3	2	6	4	3	2
N° of starts	1	1	2	1	1	1	2	1	1	1	2
Dynamic load $C_a$	14500	14800	13600	23000	37000	29800	35000	25300	42800	34300	40300
Static load $C_{0a}$	31500	28000	27300	60200	66800	53200	58100	76900	88900	70000	77100
Ratio $u$	1			1				1			
Linear travel for 1 motor shaft revolution	5	10	25	5	10	20	32	5	10	20	40
Motor attachment	F1; F2			F1; F2; F3				F1; F2			
Max. force $F_{max} (2)$	6730	6870	3120	10680	15330	7820	4910	11740	19790	10220	5140
Max. input torque $T_{max}$	7.3	13.5	15	11.8	30	30	30	14.4	40	40	40
Max. linear speed $v_{max}$	250	500	1250	230	470	930	1490	190	370	750	1500
Max. rotational speed $n_{max}$	3000	3000	3000	2800	2800	2800	2800	2250	2250	2250	2250
Max. acceleration $a_{max}$	10	10	10	10	10	10	10	10	10	10	10
Total actuator efficiency $\eta$	0.82	0.86	0.88	0.80	0.85	0.87	0.88	0.78	0.84	0.87	0.88
Friction torque $T_a$	0.75	0.80	0.90	1.2	1.3	1.4	1.6	2.4	2.5	2.6	2.8
$J_o$ ref. to 0 mm stroke actuator	2.26	2.30	1.28	6.65	6.73	7.04	7.66	16.57	16.69	17.19	19.13
$J_{100}$ each 100 mm extra-stroke	0.27	0.28	0.31	0.69	0.71	0.75	0.84	1.8	1.8	1.8	2.1
Motor attachment	F3; F4			F4; F5				F3; F4; F5			
Max. force $F_{max} (2)$	6730	6870	6313	10680	17170	10550	6635	11740	19870	15920	9980
Max. input torque $T_{max}$	7.3	13.5	29.5	11.8	33.5	40	40	14.4	40.1	60.8	75
Max. linear speed $v_{max}$	250	500	1250	230	470	930	1490	190	370	750	1500
Max. rotational speed $n_{max}$	3000	3000	3000	2800	2800	2800	2800	2250	2250	2250	2250
Max. acceleration $a_{max}$	10	10	10	10	10	10	10	10	10	10	10
Total actuator efficiency $\eta$	0.82	0.86	0.88	0.80	0.85	0.87	0.88	0.78	0.84	0.87	0.88
Friction torque $T_a$	0.75	0.80	0.90	1.2	1.3	1.4	1.6	2.4	2.5	2.6	2.8
$J_o$ ref. to 0 mm stroke actuator	4.16	4.19	4.44	11.39	11.47	11.78	12.40	27.62	27.75	28.25	30.18
$J_{100}$ each 100 mm extra-stroke	0.27	0.28	0.31	0.69	0.71	0.75	0.84	1.8	1.8	1.8	2.1
$m_o$ ref. to 0 mm stroke	1.61	1.60	1.62	3.69	3.55	3.60	3.53	5.82	5.70	5.77	5.68
$m_{100}$ each 100 mm extra-stroke		0.24			0.49				0.62		
Weight of 100 mm stroke actuator (3)		10.4			20				36		
Weight for each 100 mm extra-stroke		1.1			1.9				2.7		

(1) - Ball screws with accuracy grade IT 3 or IT 5 available on demand  
 (2) - Values highlighted in orange: force limit due to mechanical transmission  
 Values highlighted in yellow: force limit due to a ball screw life of 10 million revolutions  
 (3) - Weight of the actuator without fixing accessories

2.2 / Dimensions SAM IL Series

**SAM 0 - 1 - 2 - 3 - 4 IL**

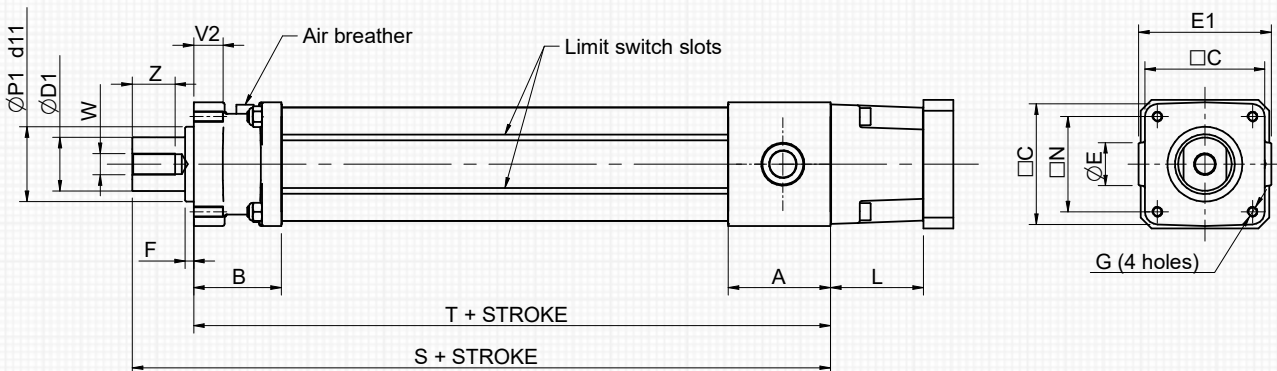


Ordering code  
stroke:

<b>C</b>	<b>200</b>
	Stroke in mm

**NOTE** - Standard slot positions for limit switches are as shown above.  
If you require a different position, please contact our technical support.

**SAM 5 - 6 IL**



Ordering code  
stroke:

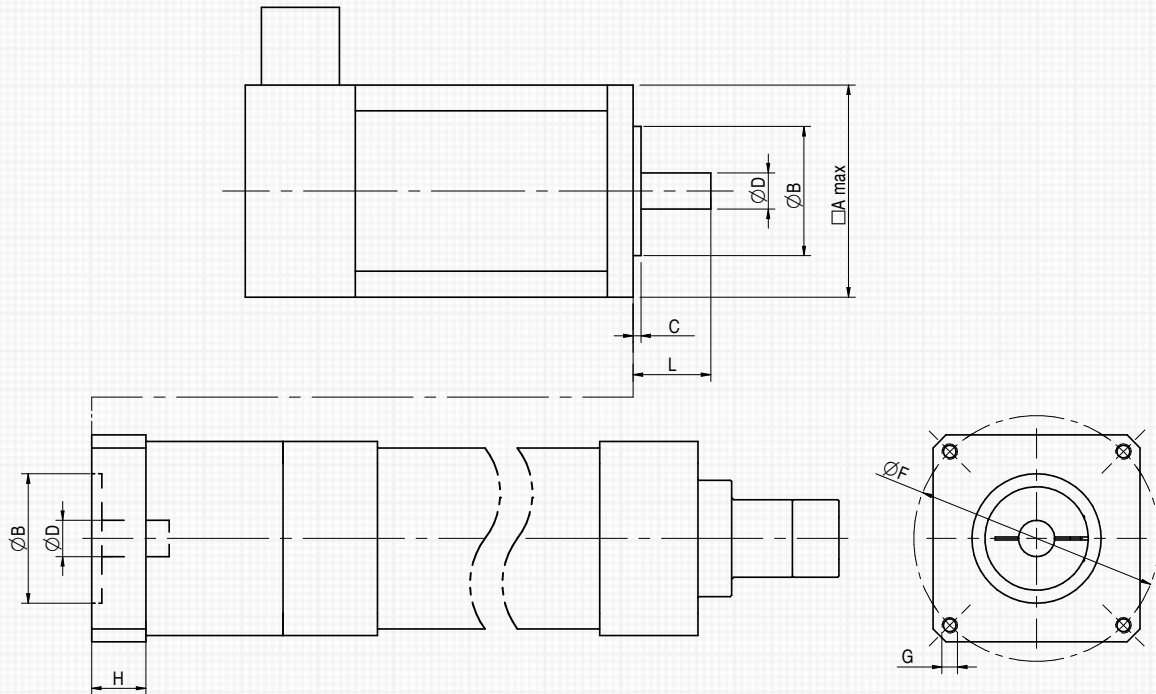
<b>C</b>	<b>200</b>
	Stroke in mm

**NOTE** - Standard slot positions for limit switches are as shown above.  
If you require a different position, please contact our technical support.



SIZE	SAM 0 IL	SAM 1 IL	SAM 2 IL	SAM 3 IL	SAM 4 IL	SAM 5 IL	SAM 6 IL
A	30	30	37	37	48	96	116
B	40	34	40	38	52	82	108
□ C	46	52	65	75	95	112	138
Ø D1	20	22	25	30	35	50	60
Ø E	-	-	-	-	-	40	70
E1	-	-	-	-	-	124	152
E2	30	32	39	44	54	-	-
F	5	10	13	13	5	8	8
G	M6	M6	M8	M8	M10	M10	M12
L	34	40	49	53	67	86	93
□ N	32.5	38	46.5	56.5	72	89	110
Ø P1	30	35	40	45	45	70	80
S	229	246	264	296	330	453	538
T	203	205	217	241	284	396	474
V1	4.5	4.5	5.5	5.5	5.5	-	-
V2	17	17	22	22	27	25	30
W	M10×1.25	M12×1.25	M12×1.25	M16×1.5	M20×1.5	M20×1.5	M27×2
Z	15	20	20	24	30	40	54

2.3 / Motor attachment **SAM IL Series**



**Ordering code  
motor attachment:**

F2	24	-	50
1	2	-	3

- 1 - Flange code
- 2 - Shaft diameter  $\varnothing D$
- 3 - Shaft length L

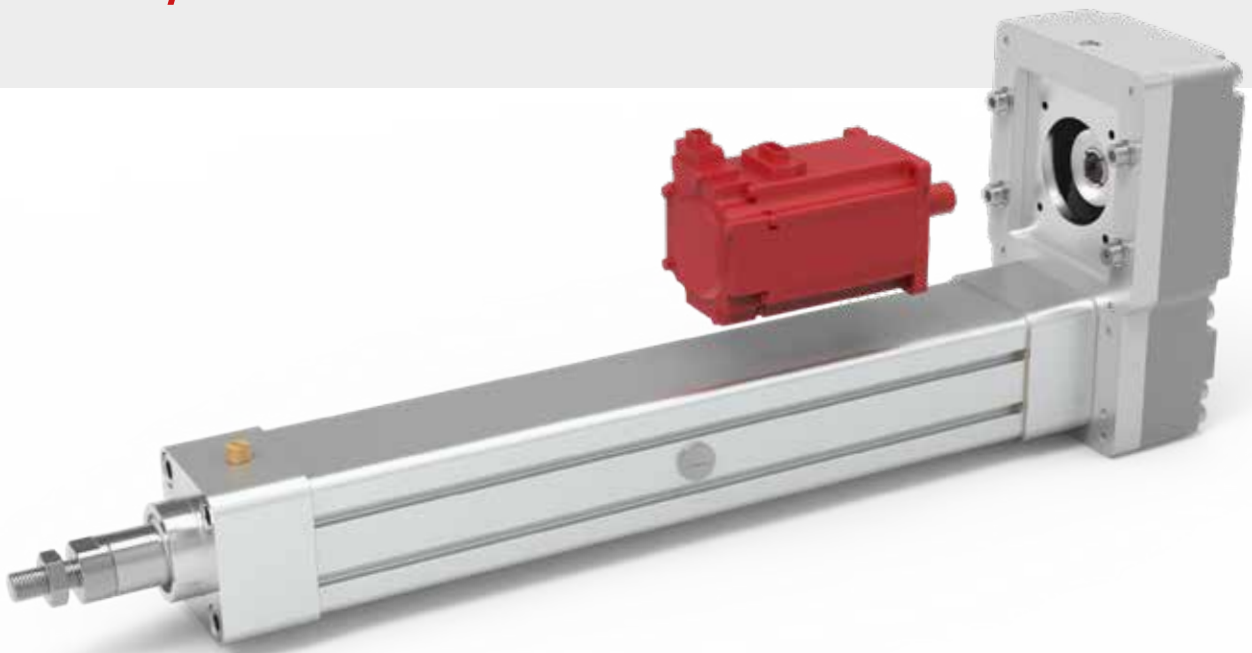
**NOTE** - In case of different motor attachment not included in the table, contact our technical support.



SIZE	Flange code	□ A [mm]	∅ B [mm]	C [mm]	∅ F × G [mm]	H [mm]	∅ D × L [mm]
SAM 0 IL	F1	45	∅30	2.5	∅45 × M3	19	∅8×20 - ∅8×25
	F2	45	∅30	2.5	∅46 × M4	19	∅6×25 - ∅8×18 - ∅8×25
SAM 1 IL	F1	65	∅40	2.5	∅63 × M5	23	∅9×20 - ∅11×23 - ∅14×30
	F2	65	∅50	3	∅70 × M5	23	∅8×25 - ∅11×30 - ∅14×30 - ∅14×31
SAM 2 IL	F1	65	∅40	2.5	∅63 × M5	18	∅11×23 - ∅14×30
	F2	65	∅50	3	∅70 × M5	18	∅8×25 - ∅11×30 - ∅14×30 - ∅14×31
	F3	75	∅60	3	∅75 × M5	22	∅11×23 - ∅14×30
SAM 3 IL	F1	75	∅60	3	∅75 × M5	21	∅14×30
	F2	80	∅70	3	∅90 × M6	26	∅11×30 - ∅14×30 - ∅19×35
						33	∅16×40 - ∅19×40
	F3	82	∅50	3	∅95 × M6	21	∅14×30
F4	96	∅80	3	∅100 × M6	26	∅14×30 - ∅16×35 - ∅19×35	
					33	∅14×37 - ∅16×40 - ∅19×40	
SAM 4 IL	F1	96	∅80	3	∅100 × M6	26	∅16×35 - ∅16×40 - ∅19×35 - ∅19×40
						30	∅19×40 - ∅19×45 - ∅22×45 - ∅24×45
	F2	105	∅95	3	∅115 × M8	37	∅19×50 - ∅24×50
						42	∅19×55
F3	126	∅95	3	∅130 × M8	37	∅24 × 50	
F4	126	∅110	3.5	∅130 × M8	37	∅19×40 - ∅24×50	
SAM 5 IL	F1	120	∅95	3	∅130 × M8	28	∅24 × 50
	F2	126	∅110	3.5	∅130 × M8	28	∅19×40 - ∅24×50
						30	∅16×40 - ∅19×40
	F3	130	∅110	3.5	∅145 × M8	43	∅19×58 - ∅22×55 - ∅22×58 - ∅24×58 ∅24×65 - ∅28×55 - ∅28×63
						F4	140
F5	155	∅130	3.5	∅165 × M10	39	∅24×50 - ∅28×60 - ∅32×58	
					59	∅32×80	
SAM 6 IL	F1	140	∅110	3.5	∅165 × M10	34	∅24×50
	F2	155	∅130	3.5	∅165 × M10	34	∅24×50 - ∅28×60 - ∅32×58
						54	∅32×80
	F3	163	∅155	4	∅190 × M10	34	∅32×60
	F4	180	∅114.3	3.5	∅200 × M12	52	∅35×65 - ∅35×70 - ∅35×79 - ∅35×80
F5	200	∅180	4	∅215 × M12	52	∅28×60 - ∅32×58 - ∅38×80	



## **3 / ACTUATORS SAM PD Series**

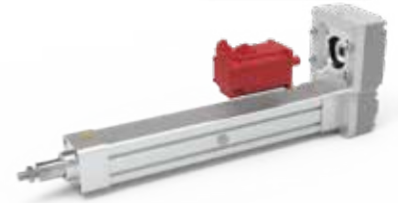


**3.1 / Technical data SAM PD Series**

SIZE		SAM 0 PD		SAM 1 PD		SAM 2 PD			SAM 3 PD		
Profile ISO 15552	[mm]	Ø32		Ø40		Ø50			Ø63		
Rod diameter	[mm]	Ø20		Ø22		Ø25			Ø30		
Ball screw BS		BS1	BS2	BS1	BS2	BS1	BS2	BS3	BS1	BS2	BS3
Diameter × Lead $d_o \times P_h$	[mm]	12×5	12×10	14×5	14×10	16×5	16×10	16×16	20×5	20×10	20×20
Ball diameter $D_w$	[mm]	Ø 2.381		Ø3.175		Ø3.175			Ø3.175		
Accuracy grade (I)		IT 7		IT 7		IT 7			IT 7		
N° of circuits		3	2	3	2	4	3	2	4	3	2
N° of starts		1	2	1	1	1	1	2	1	1	2
Dynamic load $C_a$	[N]	5300	6600	7800	5300	11100	8900	10500	12800	10200	12100
Static load $C_{0a}$	[N]	8000	9500	11100	6900	18100	14400	15700	24400	18900	20900
Ratio $u$	RV	1 (26:26)		1 (32:32)		1 (36:36)			1 (28:28)		
Linear travel for 1 motor shaft revolution	[mm]	5	10	5	10	5	10	16	5	10	20
Max. force $F_{max} (²)$	[N]	1080	520	1320	650	3310	1670	1040	4070	2090	1050
Max. input torque $T_{max}$	[Nm]	1.2	1.2	1.5	1.5	3.5	3.5	3.5	4.6	4.6	4.6
Max. linear speed $v_{max}$	[mm/s]	500	1000	417	833	375	750	1200	300	600	1200
Max. rotational speed $n_{max}$	[min <sup>-1</sup> ]	6000	6000	5000	5000	4500	4500	4500	3600	3600	3600
Max. acceleration $a_{max}$	[m/s <sup>2</sup> ]	10	10	10	10	10	10	10	10	10	10
Total actuator efficiency $\eta$		0.82	0.83	0.81	0.83	0.81	0.83	0.84	0.79	0.82	0.84
Friction torque $T_a$	[Nm]	0.15	0.20	0.20	0.25	0.25	0.30	0.35	0.50	0.55	0.60
$J_o$ ref. to 0 mm stroke actuator	[kg×m <sup>2</sup> ]×10 <sup>-4</sup>	0.082	0.090	0.151	0.161	0.353	0.367	0.398	1.335	1.359	1.454
$J_{100}$ each 100 mm extra-stroke	[kg×m <sup>2</sup> ]×10 <sup>-4</sup>	0.019	0.021	0.027	0.030	0.047	0.051	0.060	0.117	0.122	0.140
Ratio $u$	RN	1.5 (39:26)		1.5 (48:32)		1.5 (48:32)			1.538 (40:26)		
Linear travel for 1 motor shaft revolution	[mm]	3.333	6.667	3.333	6.667	3.333	6.667	10.667	3.25	6.5	13
Max. force $F_{max} (²)$	[N]	1620	780	2140	1050	4350	2190	1360	5340	2730	1380
Max. input torque $T_{max}$	[Nm]	1.2	1.2	1.6	1.6	3.1	3.1	3.1	4.0	4.0	4.0
Max. linear speed $v_{max}$	[mm/s]	333	667	333	667	333	667	1067	300	600	1200
Max. rotational speed $n_{max}$	[min <sup>-1</sup> ]	6000	6000	6000	6000	6000	6000	6000	5540	5540	5540
Max. acceleration $a_{max}$	[m/s <sup>2</sup> ]	10	10	10	10	10	10	10	10	10	10
Total actuator efficiency $\eta$		0.82	0.83	0.81	0.83	0.81	0.83	0.84	0.79	0.82	0.84
Friction torque $T_a$	[Nm]	0.15	0.20	0.20	0.25	0.25	0.30	0.35	0.50	0.55	0.60
$J_o$ ref. to 0 mm stroke actuator	[kg×m <sup>2</sup> ]×10 <sup>-4</sup>	0.071	0.074	0.152	0.157	0.260	0.266	0.280	1.124	1.134	1.174
$J_{100}$ each 100 mm extra-stroke	[kg×m <sup>2</sup> ]×10 <sup>-4</sup>	0.008	0.009	0.012	0.013	0.021	0.023	0.027	0.050	0.051	0.059
Ratio $u$	RL	-	-	-	-	2 (64:32)			1.923 (50:26)		
Linear travel for 1 motor shaft revolution	[mm]	-	-	-	-	2.5	5	8	2.6	5.2	10.4
Max. force $F_{max} (²)$	[N]	-	-	-	-	5150	2920	1810	5940	3420	1720
Max. input torque $T_{max}$	[Nm]	-	-	-	-	2.8	3.1	3.1	3.6	4.0	4.0
Max. linear speed $v_{max}$	[mm/s]	-	-	-	-	250	500	800	260	520	1040
Max. rotational speed $n_{max}$	[min <sup>-1</sup> ]	-	-	-	-	6000	6000	6000	6000	6000	6000
Max. acceleration $a_{max}$	[m/s <sup>2</sup> ]	-	-	-	-	10	10	10	10	10	10
Total actuator efficiency $\eta$		-	-	-	-	0.81	0.83	0.84	0.79	0.82	0.84
Friction torque $T_a$	[Nm]	-	-	-	-	0.25	0.30	0.35	0.50	0.55	0.60
$J_o$ ref. to 0 mm stroke actuator	[kg×m <sup>2</sup> ]×10 <sup>-4</sup>	-	-	-	-	0.317	0.320	0.328	1.314	1.321	1.346
$J_{100}$ each 100 mm extra-stroke	[kg×m <sup>2</sup> ]×10 <sup>-4</sup>	-	-	-	-	0.012	0.013	0.015	0.032	0.033	0.038
$m_o$ ref. to 0 mm stroke	[kg]	0.32	0.32	0.47	0.48	0.64	0.65	0.65	1.06	1.07	1.05
$m_{100}$ each 100 mm extra-stroke	[kg]	0.13		0.14		0.19			0.20		
Weight of 100 mm stroke actuator (³)	[kg]	2.5		3.2		5.0			7.6		
Weight for each 100 mm extra-stroke	[kg]	0.44		0.51		0.67			0.79		

$J_o$  - Moment of inertia of the actuator reduced to motor shaft ref. to 0 mm stroke  
 $J_{100}$  - Moment of inertia of the actuator referred to each 100 mm extra-stroke  
 $m_o$  - Mass in linear motion referred to 0 mm stroke actuator  
 $m_{100}$  - Mass in linear motion referred to each 100 mm extra-stroke

(\*) - The marked column is only valid for **SAM 6 PD** with motor adapter:  
 - F4 | 35 - 79  
 - F4 | 35 - 80  
 - F5 | 38 - 80

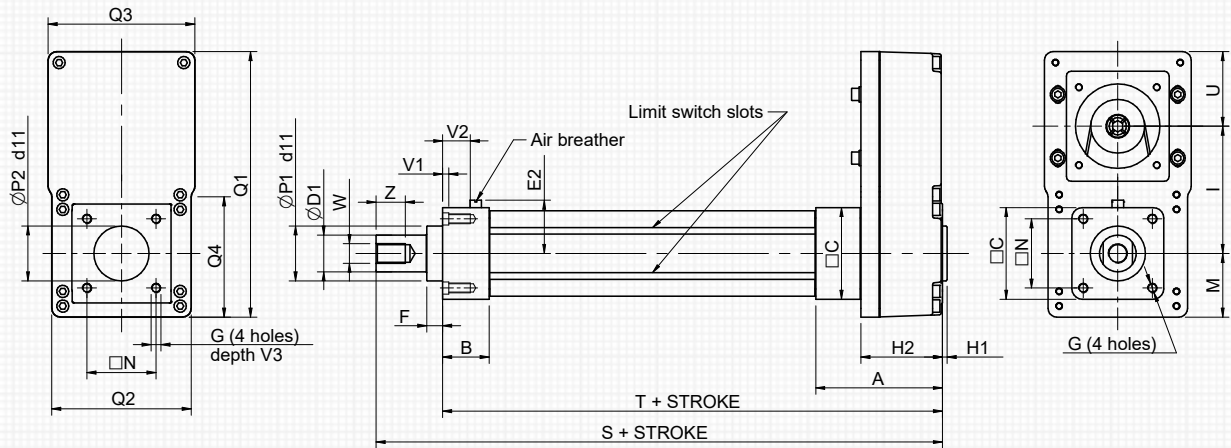


SIZE	SAM 4 PD			SAM 5 PD				SAM 6 PD				SAM 6 PD (*)			
Profile ISO 15552	Ø80			Ø100				Ø125				Ø125			
Rod diameter	Ø35			Ø50				Ø60				Ø60			
Ball screw BS	BS1	BS2	BS3	BS1	BS2	BS3	BS4	BS1	BS2	BS3	BS4	BS1	BS2	BS3	BS4
Diameter × Lead $d_o \times P_h$	25×5	25×10	25×25	32×5	32×10	32×20	32×32	40×5	40×10	40×20	40×40	40×5	40×10	40×20	40×40
Ball diameter $D_w$	Ø3.175	Ø3.969	Ø3.175	Ø3.175	Ø6.350	Ø6.350	Ø6.350	Ø3.175	Ø6.350	Ø6.350	Ø6.350	Ø3.175	Ø6.350	Ø6.350	Ø6.350
Accuracy grade (1)	IT 7			IT 7				IT 7				IT 7			
N° of circuits	4	3	2	6	4	3	2	6	4	3	2	6	4	3	2
N° of starts	1	1	2	1	1	1	2	1	1	1	2	1	1	1	2
Dynamic load $C_a$	14500	14800	13600	23000	37000	29800	35000	25300	42800	34300	40300	25300	42800	34300	40300
Static load $C_{0a}$	31500	28000	27300	60200	66800	53200	58100	76900	88900	70000	77100	76900	88900	70000	77100
Ratio $u$	RV 1 (40:40)			RV 1 (32:32)				RV 1 (36:36)				RV 1 (36:36)			
Linear travel for 1 motor shaft rev.	5	10	25	5	10	20	32	5	10	20	40	5	10	20	40
Max. force $F_{max}^{(2)}$	6730	6870	3080	10670	17170	9540	6000	11740	19860	12000	6120	11740	19860	15920	10920
Max. input torque $T_{max}$	7.6	14.1	15.5	12.4	35.0	38.0	38.0	15.0	42.5	49.2	49.2	15.0	42.5	64.4	85.6
Max. linear speed $v_{max}$	250	500	1250	230	470	930	1490	190	370	750	1500	190	370	750	1500
Max. rotational speed $n_{max}$	3000	3000	3000	2800	2800	2800	2800	2250	2250	2250	2250	2250	2250	2250	2250
Max. acceleration $a_{max}$	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Total actuator efficiency $\eta$	0.78	0.82	0.84	0.76	0.81	0.83	0.84	0.74	0.79	0.82	0.84	0.74	0.79	0.82	0.84
Friction torque $T_a$	0.75	0.80	0.90	1.2	1.3	1.4	1.6	2.4	2.5	2.6	2.8	2.4	2.5	2.6	2.8
$J_o$ ref. to 0 mm stroke actuator	6.79	6.83	7.09	22.51	22.59	22.92	23.57	60.21	60.34	60.87	62.91	70.77	70.90	71.43	73.47
$J_{100}$ each 100 mm extra-stroke	0.285	0.290	0.327	0.732	0.743	0.788	0.880	1.877	1.892	1.948	2.170	1.877	1.892	1.948	2.170
Ratio $u$	RN 1.467 (44:30)			RN 1.5 (36:24)				RN 1.467 (44:30)				RN 1.467 (44:30)			
Linear travel for 1 motor shaft rev.	3.409	6.818	17.045	3.333	6.667	13.333	21.333	3.409	6.818	13.636	27.273	3.409	6.818	13.636	27.273
Max. force $F_{max}^{(2)}$	6730	6870	2880	10670	17020	8680	5440	11740	19860	13560	6910	11740	19860	15920	12420
Max. input torque $T_{max}$	5.4	9.9	10.2	8.7	23.6	23.6	23.6	11.0	29.8	38.5	38.5	11.0	29.8	44.7	67.0
Max. linear speed $v_{max}$	250	500	1250	230	470	930	1490	190	370	750	1500	190	370	750	1500
Max. rotational speed $n_{max}$	4400	4400	4400	4200	4200	4200	4200	3300	3300	3300	3300	3300	3300	3300	3300
Max. acceleration $a_{max}$	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Total actuator efficiency $\eta$	0.78	0.82	0.84	0.76	0.81	0.83	0.84	0.74	0.79	0.82	0.84	0.74	0.79	0.82	0.84
Friction torque $T_a$	0.75	0.80	0.90	1.2	1.3	1.4	1.6	2.4	2.5	2.6	2.8	2.4	2.5	2.6	2.8
$J_o$ ref. to 0 mm stroke actuator	2.98	3.00	3.12	9.75	9.79	9.93	10.22	25.98	25.95	26.20	27.15	30.60	30.66	30.90	31.85
$J_{100}$ each 100 mm extra-stroke	0.132	0.135	0.152	0.325	0.330	0.350	0.391	0.873	0.879	0.906	1.009	0.873	0.879	0.906	1.009
Ratio $u$	RL 2 (60:30)			RL 2 (48:24)				RL 2 (60:30)				RL 2 (60:30)			
Linear travel for 1 motor shaft rev.	2.5	5	12.5	2.5	5	10	12.5	2.5	5	10	20	2.5	5	10	20
Max. force $F_{max}^{(2)}$	6730	6870	3927	10670	17170	11580	7260	11740	19860	15920	9420	11740	19860	15920	16940
Max. input torque $T_{max}$	4.2	7.5	10.2	6.8	18.2	23.6	23.6	8.7	22.5	33.5	38.5	8.7	22.5	33.5	67.0
Max. linear speed $v_{max}$	250	500	1250	230	470	930	1490	190	370	750	1500	190	370	750	1500
Max. rotational speed $n_{max}$	6000	6000	6000	5600	5600	5600	5600	4500	4500	4500	4500	4500	4500	4500	4500
Max. acceleration $a_{max}$	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Total actuator efficiency $\eta$	0.78	0.82	0.84	0.76	0.81	0.83	0.84	0.74	0.79	0.82	0.84	0.74	0.79	0.82	0.84
Friction torque $T_a$	0.75	0.80	0.90	1.2	1.3	1.4	1.6	2.4	2.5	2.6	2.8	2.4	2.5	2.6	2.8
$J_o$ ref. to 0 mm stroke actuator	3.73	3.74	3.81	11.68	11.70	11.78	11.94	34.74	34.78	34.91	35.42	39.45	39.48	39.62	40.12
$J_{100}$ each 100 mm extra-stroke	0.071	0.072	0.082	0.183	0.186	0.197	0.220	0.469	0.473	0.487	0.542	0.469	0.473	0.487	0.542
$m_o$ ref. to 0 mm stroke	1.61	1.60	1.62	3.69	3.55	3.60	3.53	5.82	5.70	5.77	5.68	5.82	5.70	5.77	5.68
$m_{100}$ each 100 mm extra-stroke	0.24			0.49				0.62				0.62			
Weight of 100 mm stroke actuator (3)	13.5			26				46				46			
Weight for each 100 mm extra-stroke	1.1			1.9				2.7				2.7			

- (1) - Ball screws with accuracy grade IT 3 or IT 5 available on demand
- (2) - Values highlighted in orange: force limit due to mechanical transmission  
Values highlighted in yellow: force limit due to a ball screw life of 10 million revolutions
- (3) - Weight of the actuator without fixing accessories

**3.2 / Dimensions SAM PD Series**

**SAM 0 - 1 - 2 - 3 - 4 PD**

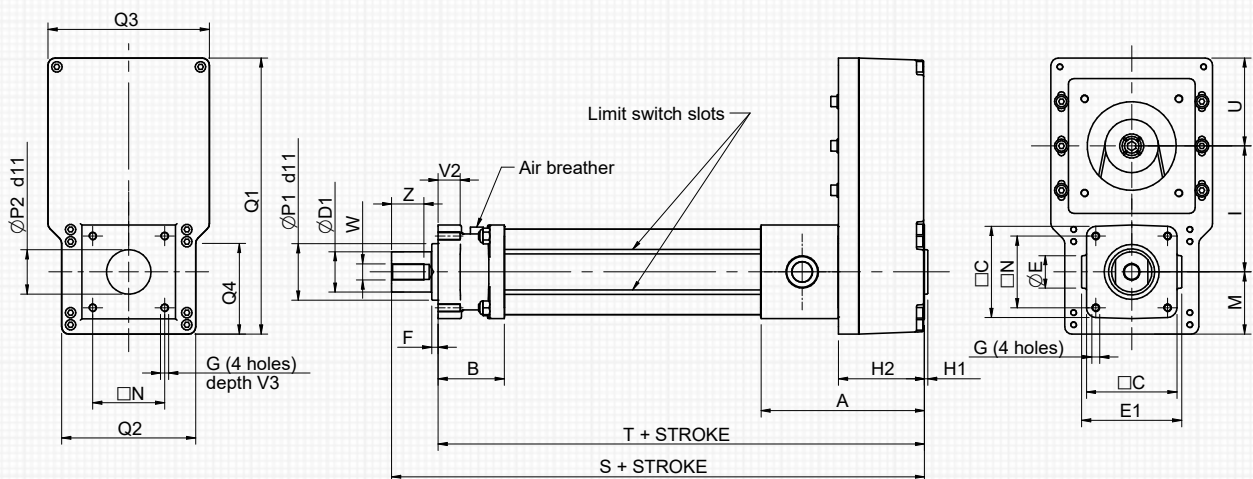


**Ordering code stroke:**

<b>C</b>	<b>200</b>
	Stroke in mm

**NOTE** - Standard slot positions for limit switches are as shown above. If you require a different position, please contact our technical support.

**SAM 5 - 6 PD**



**Ordering code stroke:**

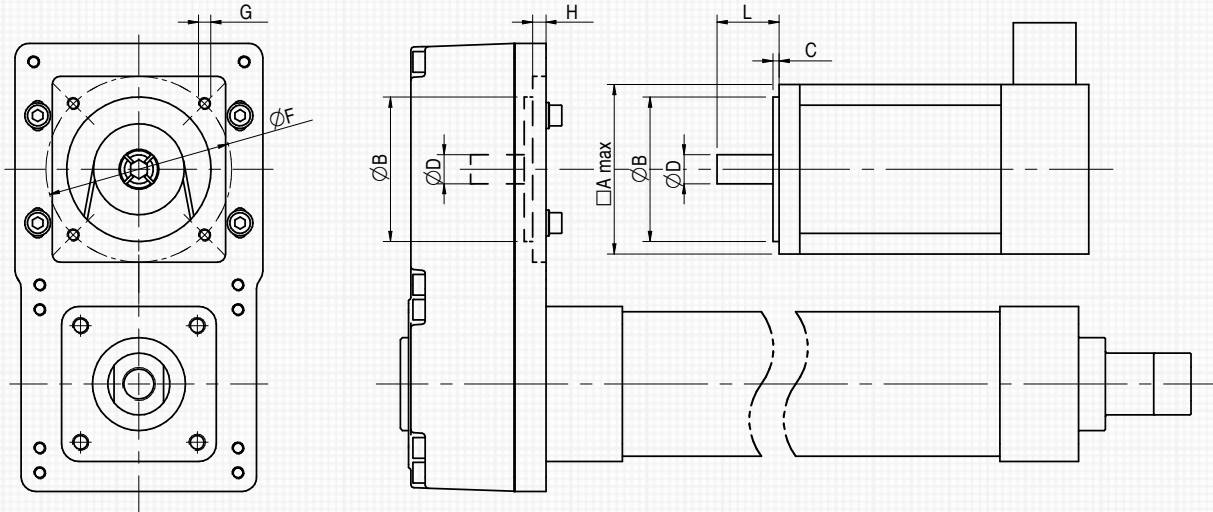
<b>C</b>	<b>200</b>
	Stroke in mm

**NOTE** - Standard slot positions for limit switches are as shown above. If you require a different position, please contact our technical support.



SIZE	SAM 0 PD	SAM 1 PD	SAM 2 PD	SAM 3 PD	SAM 4 PD	SAM 5 PD	SAM 6 PD
A	74	81	97	104	F1,F2: 133 F3,F4: 138	203	244
B	40	34	40	38	52	82	108
□ C	46	52	65	75	95	112	138
Ø D1	20	22	25	30	35	50	60
Ø E	-	-	-	-	-	40	70
E1	-	-	-	-	-	124	152
E2	30	32	39	44	54	-	-
F	5	10	13	13	5	8	8
G	M6	M6	M8	M8	M10	M10	M12
H1	4	4	4	4	4	4	5
H2	43	50	59	66	F1,F2: 84 F3,F4: 89	106	127
I	59	73	83	F1,F2,F3: 104 F4: 117	F1,F2: 130 F3,F4: 139	156	214
M	28	33	41	52	62	77	95
□ N	32.5	38	46.5	56.5	72	89	110
Ø P1	30	35	40	45	45	70	80
Ø P2	30	35	40	45	45	55	60
Q1	128	156	184	F1,F2,F3: 217 F4: 240	F1,F2: 272 F3,F4: 290	342	448
Q2	72	82	100	114	136	166	202
Q3	80	90	110	F1,F2,F3: 120 F4: 130	F1,F2: 150 F3,F4: 170	200	250
Q4	46	56	69	F1,F2,F3: 98 F4: 93	F1,F2: 114 F3,F4: 110	112	151
S	273	297	324	363	F1,F2: 415 F3,F4: 420	560	666
T	247	256	277	308	F1,F2: 369 F3,F4: 374	503	602
U	41	50	60	F1,F2,F3: 61 F4: 71	F1,F2: 80 F2,F4: 89	109	139
V1	4.5	4.5	5.5	5.5	5.5	-	-
V2	17	17	22	22	27	25	30
V3	12	12	14	15	19	19	23
W	M10×1.25	M12×1.25	M12×1.25	M16×1.5	M20×1.5	M20×1.5	M27×2
Z	15	20	20	24	30	40	54

**3.3 / Motor attachment SAM PD Series**



**Ordering code  
motor attachment:**

F2	19	-	40
1	2	-	3

- 1 - Flange code
- 2 - Shaft diameter Ø D
- 3 - Shaft length L

**NOTE** - In case of different motor attachment not included in the table, contact our technical support.



SIZE	Flange code	□ A [mm]	Ø B [mm]	C [mm]	Ø F × G [mm]	H [mm]	Ø D × L [mm]
SAM 0 PD	F1	45	Ø30	2.5	Ø45 × M3	4.5	Ø8×20
						-0.5	Ø8×25
	F2	45	Ø30	2.5	Ø46 × M4	4.5	Ø8×18
						-0.5	Ø6×25 - Ø8×25
SAM 1 PD	F1	63	Ø40	2.5	Ø63 × M5	5.5	Ø9×20 - Ø11×23
						-1.5	Ø14×30
	F2	63	Ø50	3	Ø70 × M5	5.5	Ø8×25
						-1.5	Ø11×30 - Ø14×30 - Ø14×31
SAM 2 PD	F1	75	Ø40	2.5	Ø63 × M5	11.5	Ø11×23
						7.5	Ø14×30
	F2	75	Ø50	3	Ø70 × M5	7.5	Ø8×25 - Ø11×30 - Ø14×30 - Ø14×31
SAM 3 PD	F1	82	Ø60	3	Ø75 × M5	7.5	Ø11×23 - Ø14×30
						6.5	Ø14×30
	F2	82	Ø70	3	Ø90 × M6	6.5	Ø11×30 - Ø14×30 - Ø19×35
						-0.5	Ø16×40 - Ø19×40
F3	82	Ø50	3	Ø95 × M6	6.5	Ø14×30	
F4	96	Ø80	3	Ø100 × M6	6.5	Ø14×30 - Ø16×35 - Ø19×35	
SAM 4 PD	F1	105	Ø80	3	Ø100 × M6	6.5	Ø14×30
						-0.5	Ø14×37 - Ø16×40 - Ø19×40
	F2	105	Ø95	3	Ø115 × M8	20.5	Ø16×35 - Ø19×35
						10.5	Ø16×40 - Ø19×40
						10.5	Ø19×40 - Ø19×45 - Ø22×45 - Ø24×45
F3	126	Ø95	3	Ø130 × M8	3.5	Ø19×50 - Ø24×50	
F4	126	Ø110	3.5	Ø130 × M8	-1.5	Ø19×55	
SAM 5 PD	F1	155	Ø95	3	Ø130 × M8	10.5	Ø24 × 50
						10.5	Ø19×40 - Ø24×50
	F2	155	Ø110	3.5	Ø130 × M8	14.5	Ø24 × 50
						20.5	Ø19×40
	F3	155	Ø110	3.5	Ø145 × M8	14.5	Ø16×40 - Ø19×40
						20.5	Ø19×58 - Ø22×55 - Ø22×58 - Ø24×58 - Ø28×55 - Ø28×63
F4	155	Ø110	3.5	Ø165 × M10	1.5	Ø24×65	
F5	155	Ø130	3.5	Ø165 × M10	14.5	Ø24×50	
SAM 6 PD	F1	196	Ø110	3.5	Ø165 × M10	14.5	Ø24×50 - Ø28×60 - Ø32×58
						-5.5	Ø32×80
	F2	196	Ø130	3.5	Ø165 × M10	15	Ø24×50
						15	Ø24×50 - Ø28×60 - Ø32×58
	F3	196	Ø155	4	Ø190 × M10	0	Ø32×80
F4	196	Ø114.3	3.5	Ø200 × M12	15	Ø32×60	
F5	196	Ø180	4	Ø215 × M12	15	Ø35×65 - Ø35×70 - Ø35×79 - Ø35×80	
							Ø28×60 - Ø32×58 - Ø38×80



## **4 / ACTUATORS SAM Series**



**4.1 / Technical data SAM Series**

SIZE	SAM 0		SAM 1		SAM 2			SAM 3		
Profile ISO 15552 [mm]	Ø32		Ø40		Ø50			Ø63		
Rod diameter [mm]	Ø20		Ø22		Ø25			Ø30		
Ball screw BS	BS1	BS2	BS1	BS2	BS1	BS2	BS3	BS1	BS2	BS3
Diameter × Lead $d_o \times P_h$ [mm]	12×5	12×10	14×5	14×10	16×5	16×10	16×16	20×5	20×10	20×20
Ball diameter $D_w$ [mm]	Ø 2.381		Ø3.175		Ø3.175			Ø3.175		
Accuracy grade (°)	IT 7		IT 7		IT 7			IT 7		
N° of circuits	3	2	3	2	4	3	2	4	3	2
N° of starts	1	2	1	1	1	1	2	1	1	2
Dynamic load $C_a$ [N]	5300	6600	7800	5300	11100	8900	10500	12800	10200	12100
Static load $C_{0a}$ [N]	8000	9500	11100	6900	18100	14400	15700	24400	18900	20900
Linear travel for 1 motor shaft revolution [mm]	5	10	5	10	5	10	16	5	10	20
Max. force $F_{max}$ (²) [N]	1780	885	2350	1190	5150	4130	4870	5940	4730	5610
Max. input torque $T_{max}$ [Nm]	1.8	1.8	2.4	2.4	5.1	7.9	14.5	6.1	9.2	20.9
Max. linear speed $v_{max}$ [mm/s]	500	1000	417	833	375	750	1200	300	600	1200
Max. rotational speed $n_{max}$ [min <sup>-1</sup> ]	6000	6000	5000	5000	4500	4500	4500	3600	3600	3600
Max. acceleration $a_{max}$ [m/s <sup>2</sup> ]	10	10	10	10	10	10	10	10	10	10
Total actuator efficiency $\eta$	0.86	0.88	0.85	0.88	0.85	0.87	0.88	0.84	0.87	0.88
Friction torque $T_a$ [Nm]	0.15	0.20	0.20	0.25	0.25	0.30	0.35	0.50	0.55	0.60
Mass in linear motion ( $m$ ) and moment of inertia ( $J$ ) reduced to motor shaft										
$m_o$ referred to 0 mm stroke actuator [kg]	0.32	0.32	0.47	0.48	0.64	0.65	0.65	1.06	1.07	1.05
$m_{100}$ each 100 mm extra-stroke [kg]	0.13		0.14		0.19			0.20		
$J_o$ referred to 0 mm stroke actuator [kg×m <sup>2</sup> ]×10 <sup>-4</sup>	0.039	0.046	0.055	0.065	0.139	0.153	0.182	0.347	0.370	0.460
$J_{100}$ each 100 mm extra-stroke [kg×m <sup>2</sup> ]×10 <sup>-4</sup>	0.018	0.020	0.026	0.029	0.045	0.049	0.057	0.11	0.12	0.13
Weight of 100 mm stroke actuator (³) [kg]	1.8		2.3		3.4			4.8		
Weight for each 100 mm extra-stroke [kg]	0.44		0.51		0.67			0.79		

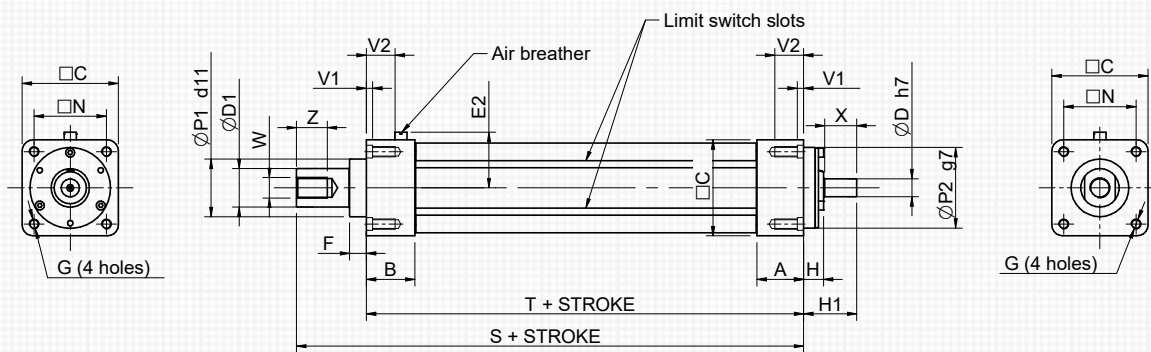


SIZE		SAM 4			SAM 5				SAM 6			
Profile ISO 15552	[mm]	Ø80			Ø100				Ø125			
Rod diameter	[mm]	Ø35			Ø50				Ø60			
Ball screw BS		BS1	BS2	BS3	BS1	BS2	BS3	BS4	BS1	BS2	BS3	BS4
Diameter × Lead $d_o \times P_h$	[mm]	25×5	25×10	25×25	32×5	32×10	32×20	32×32	40×5	40×10	40×20	40×40
Ball diameter $D_w$	[mm]	Ø3.175	Ø3.969	Ø3.175	Ø3.175	Ø6.350	Ø6.350	Ø6.350	Ø3.175	Ø6.350	Ø6.350	Ø6.350
Accuracy grade (1)		IT 7			IT 7				IT 7			
N° of circuits		4	3	2	6	4	3	2	6	4	3	2
N° of starts		1	1	2	1	1	1	2	1	1	1	2
Dynamic load $C_a$	[N]	14500	14800	13600	23000	37000	29800	35000	25300	42800	34300	40300
Static load $C_{0a}$	[N]	31500	28000	27300	60200	66800	53200	58100	76900	88900	70000	77100
Linear travel for 1 motor shaft revolution	[mm]	5	10	25	5	10	20	32	5	10	20	40
Max. force $F_{max}$ (2)	[N]	6730	6870	6310	10670	17170	13830	16240	11740	19860	15920	18700
Max. input torque $T_{max}$	[Nm]	7.3	13.5	29.4	11.8	33.5	52.0	95.6	14.4	40.1	60.8	138
Max. linear speed $v_{max}$	[mm/s]	250	500	1250	230	470	930	1490	190	370	750	1500
Max. rotational speed $n_{max}$	[min <sup>-1</sup> ]	3000	3000	3000	2800	2800	2800	2800	2250	2250	2250	2250
Max. acceleration $a_{max}$	[m/s <sup>2</sup> ]	10	10	10	10	10	10	10	10	10	10	10
Total actuator efficiency $\eta$		0.82	0.86	0.88	0.80	0.85	0.87	0.88	0.78	0.84	0.87	0.88
Friction torque $T_a$	[Nm]	0.75	0.80	0.90	1.2	1.3	1.4	1.6	2.4	2.5	2.6	2.8
Mass in linear motion ( $m$ ) and moment of inertia ( $J$ ) reduced to motor shaft												
$m_0$ referred to 0 mm stroke actuator	[kg]	1.61	1.60	1.62	3.69	3.55	3.60	3.53	5.82	5.70	5.77	5.68
$m_{100}$ each 100 mm extra-stroke	[kg]	0.24			0.49				0.62			
$J_0$ referred to 0 mm stroke actuator	[kg×m <sup>2</sup> ]×10 <sup>-4</sup>	0.93	0.96	1.21	3.28	3.36	3.67	4.29	8.27	8.39	8.89	10.83
$J_{100}$ each 100 mm extra-stroke	[kg×m <sup>2</sup> ]×10 <sup>-4</sup>	0.27	0.28	0.31	0.69	0.71	0.75	0.84	1.8	1.8	1.8	2.1
Weight of 100 mm stroke actuator (3)	[kg]	8.4			19				32			
Weight for each 100 mm extra-stroke	[kg]	1.1			1.9				2.7			

- (1) - Ball screws with accuracy grade IT 3 or IT 5 available on demand  
 (2) - Values highlighted in orange: force limit due to mechanical transmission  
 Values highlighted in yellow: force limit due to a ball screw life of 10 million revolutions  
 (3) - Weight of the actuator without fixing accessories

4.2 / Dimensions SAM Series

**SAM 0 - 1 - 2 - 3 - 4**

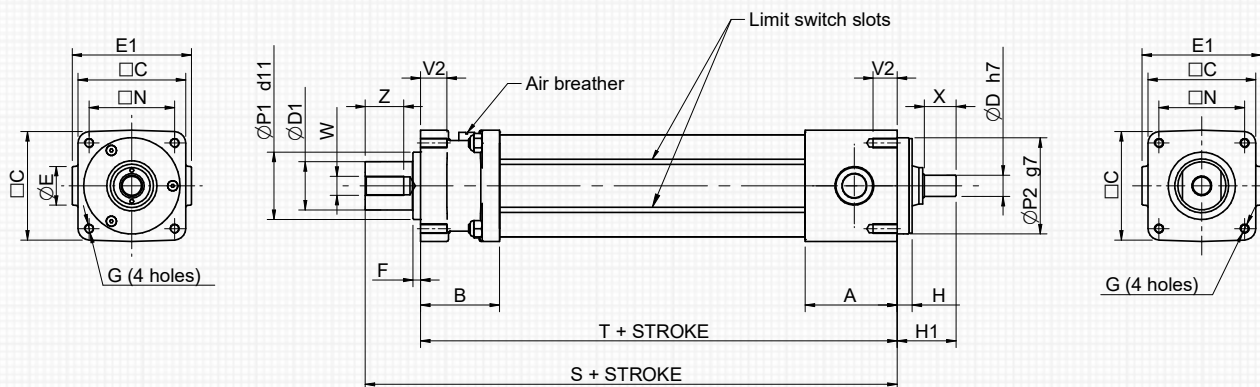


Ordering code  
stroke:

C	200
	Stroke in mm

**NOTE** - Standard slot positions for limit switches are as shown above.  
If you require a different position, please contact our technical support.

**SAM 5 - 6**



Ordering code  
stroke:

C	200
	Stroke in mm

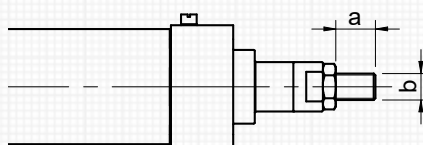
**NOTE** - Standard slot positions for limit switches are as shown above.  
If you require a different position, please contact our technical support.



SIZE	SAM 0	SAM 1	SAM 2	SAM 3	SAM 4	SAM 5	SAM 6
A	30	30	37	37	48	96	116
B	40	34	40	38	52	82	108
□ C	46	52	65	75	95	112	138
Ø D	8	9	11	14	19	22	28
Ø D1	20	22	25	30	35	50	60
Ø E	-	-	-	-	-	40	70
E1	-	-	-	-	-	124	152
E2	30	32	39	44	54	-	-
F	5	10	13	13	5	8	8
G	M6	M6	M8	M8	M10	M10	M12
H	11	11	14	15.5	16.5	15.5	17.5
H1	26	30	34	41	47	61	62
□ N	32.5	38	46.5	56.5	72	89	110
Ø P1	30	35	40	45	45	70	80
Ø P2	40	40	50	63	80	100	125
S	229	246	264	296	330	453	538
T	203	205	217	241	284	396	474
V1	4.5	4.5	5.5	5.5	5.5	-	-
V2	17	17	22	22	27	25	30
W	M10×1.25	M12×1.25	M12×1.25	M16×1.5	M20×1.5	M20×1.5	M27×2
X	14	18	18	25	28	33	33
Z	15	20	20	24	30	40	54

# 5 / Mounting options

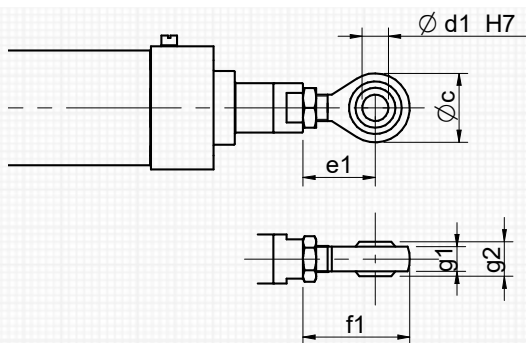
## 5.1 / Male threaded rod end TM



SIZE	SAM 0	SAM 1	SAM 2	SAM 3	SAM 4	SAM 5	SAM 6
a [mm]	15	20	20	24	30	40	54
b [mm]	M10×1.25	M12×1.25	M12×1.25	M16×1.5	M20×1.5	M20×1.5	M27×2

Ordering code: **TM**

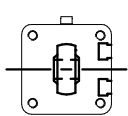
## 5.2 / Ball joint rod end TS



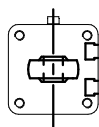
SIZE	SAM 0	SAM 1	SAM 2	SAM 3	SAM 4	SAM 5	SAM 6
Ø c [mm]	28	32	32	42	50	50	70
Ø d1 [mm]	10	12	12	16	20	20	30
e1 [mm]	35	36	36	44	50	50	125
f1 [mm]	49	52	52	65	75	75	160
g1 [mm]	10.5	12	12	15	18	18	25
g2 [mm]	14	16	16	21	25	25	37

Ordering code: **TS** or **TS90**

### SAM Series • SAM IL Series

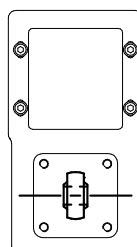


**TS**

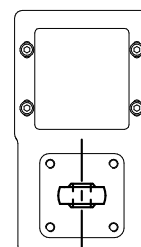


**TS90**

### SAM PD Series

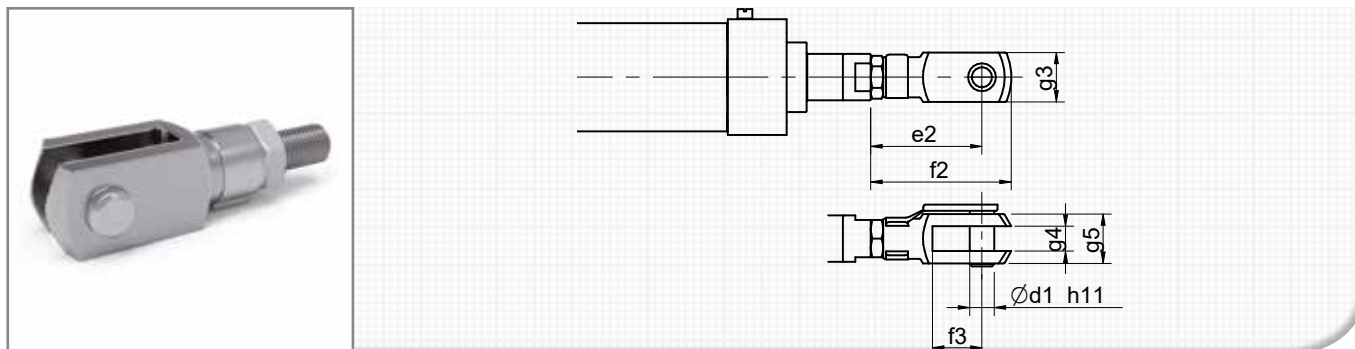


**TS**



**TS90**

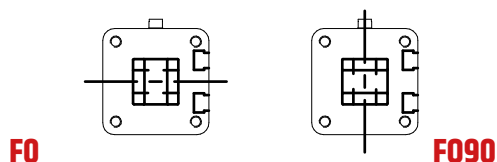
5.3 / Clevis rod end **FO**



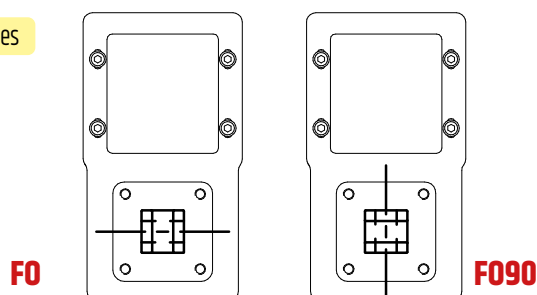
SIZE	SAM 0	SAM 1	SAM 2	SAM 3	SAM 4	SAM 5	SAM 6
Ø d1 [mm]	10	12	12	16	20	20	30
e2 [mm]	46	55	55	72	89	89	122
f2 [mm]	58	69	69	91	114	114	160
f3 [mm]	20	24	24	32	40	40	54
g3 [mm]	20	24	24	32	40	40	55
g4 [mm]	10	12	12	16	20	20	30
g5 [mm]	20	24	24	32	40	40	55

Ordering code: **FO** or **FO90**

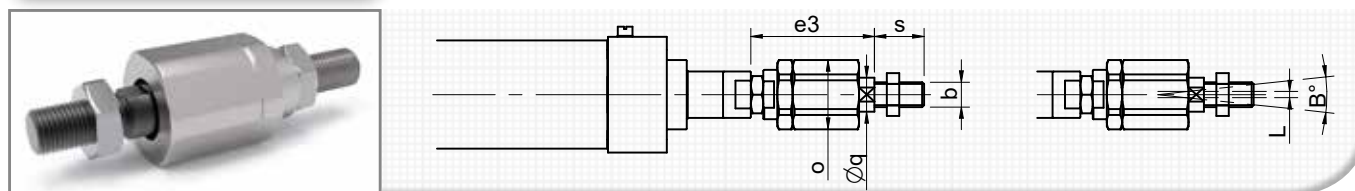
SAM Series • SAM IL Series



SAM PD Series



5.4 / Self-aligning joint **GA**

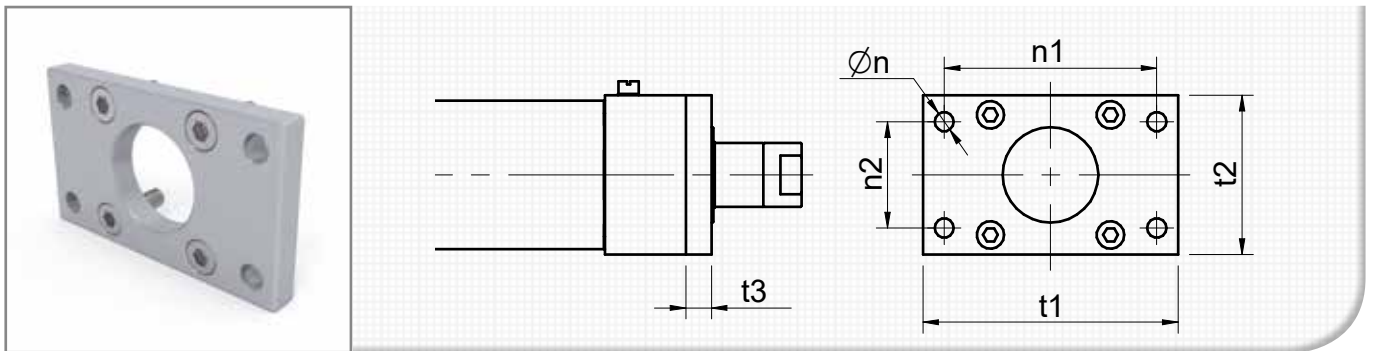


SIZE	SAM 0	SAM 1	SAM 2	SAM 3	SAM 4	SAM 5	SAM 6
b [mm]	M10×1.25	M12×1.25	M12×1.25	M16×1.5	M20×1.5	M20×1.5	M27×2
e3 [mm]	57.5	58.5	58.5	80	88	88	105
o [mm]	32	32	32	45	45	45	70
Ø q [mm]	14	14	14	22	22	22	32
s [mm]	20	24	24	32	40	40	54
β [°] (*)	8°	8°	8°	6°	6°	6°	8°
L [mm] (**)	2	2	2	2	2	2	2
Axial play [mm]	0.05 – 0.5	0.05 – 0.5	0.05 – 0.5	0.05 – 0.5	0.05 – 0.5	0.05 – 0.5	0.05 – 0.5

(\*) Max angular oscillation - (\*\*) Max axial oscillation

Ordering code: **GA**

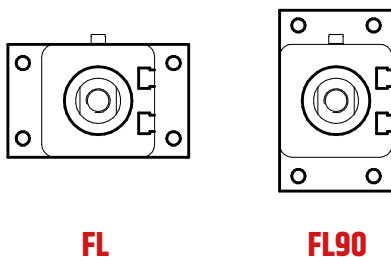
**5.5 / Plate mount FL**



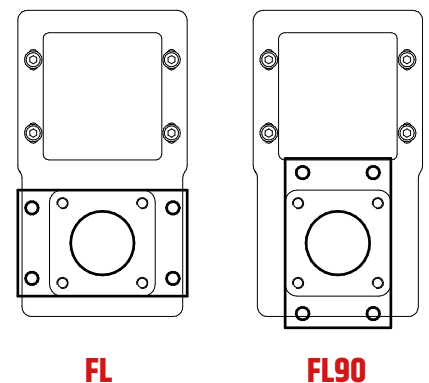
SIZE	SAM 0	SAM 1	SAM 2	SAM 3	SAM 4	SAM 5	SAM 6
$\varnothing n$ [mm]	7	9	9	9	12	14	16
$n1$ [mm]	64	72	90	100	126	150	180
$n2$ [mm]	32	36	45	50	63	75	90
$t1$ [mm]	80	90	110	120	150	170	205
$t2$ [mm]	45	52	65	75	95	115	140
$t3$ [mm]	10	10	12	12	16	16	20

Ordering code: **FL** or **FL90**

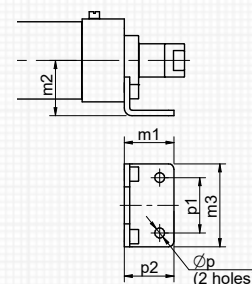
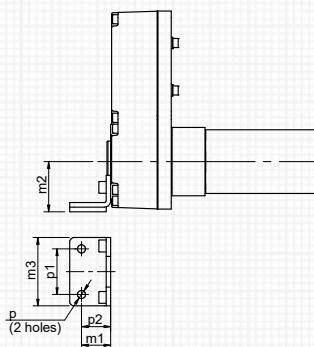
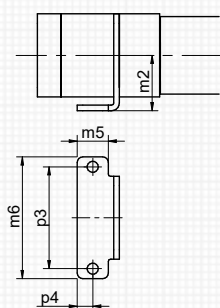
**SAM Series • SAM IL Series**



**SAM PD Series**



5.6 / Foot mount **PB**

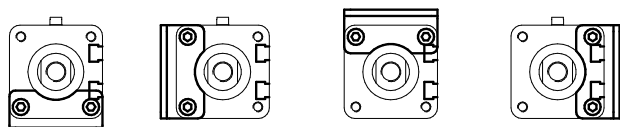


SIZE	SAM 0	SAM 1	SAM 2	SAM 3	SAM 4	SAM 5	SAM 6
m1 [mm]	35	36	47	45	55	57	70
m2 [mm]	32	36	45	50 (55) *	63 (68) *	71 (81) *	90 (100) *
m3 [mm]	45	52	65	75	95	115	140
m4 [mm]	31	34	38	38	44	44	66
m5 [mm]	22	25	28	28	32	32	50
m6 [mm]	75	82	100	110	147	172	210
Ø p [mm]	7	7	9	9	11	11	14
p1 [mm]	32	36	45	50	63	75	90
p2 [mm]	24	28	32	32	41	41	45
p3 [mm]	58	65	82	92	115	132	160
p4 [mm]	11	12.5	14	14	14	16	25

(\*) Value in brackets valid for SAM PD actuator

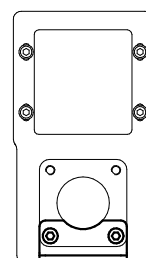
Ordering code: **PBS** or **PBW** or **PBN** or **PBE** or **PB**

**SAM Series • SAM IL Series**



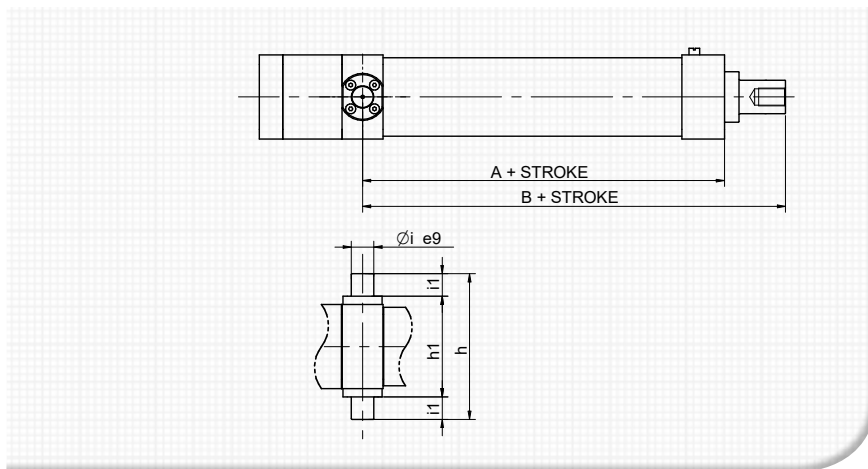
**PBS**      **PBW**      **PBN**      **PBE**

**SAM PD Series**



**PB**

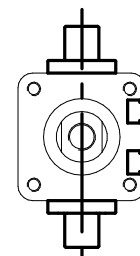
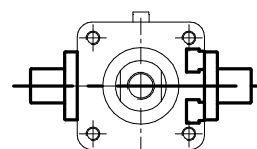
**5.7 / Trunnion mount CI**



Available only for **SAM** , **SAM IL** actuators

Ordering code: **CI** or **CI90**

**SAM Series • SAM IL Series**

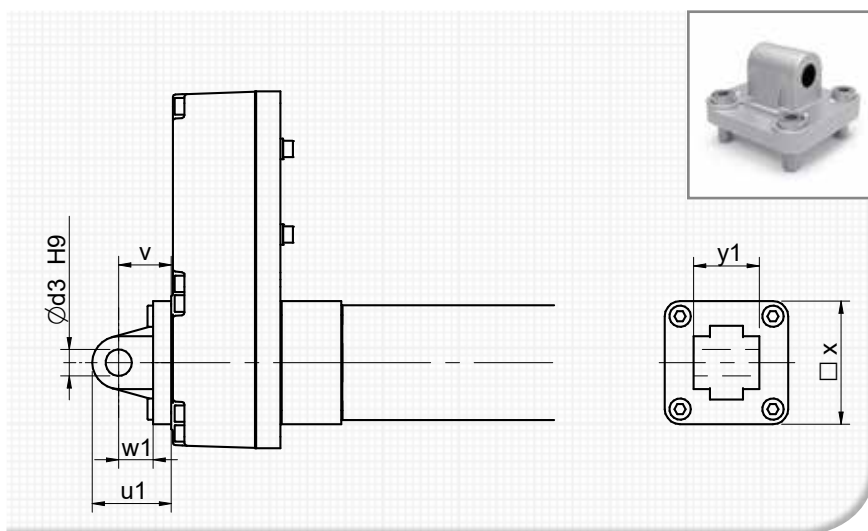


**CI**

**CI90**

SIZE	SAM 0	SAM 1	SAM 2	SAM 3	SAM 4	SAM 5	SAM 6
A [mm]	188	190	198	222	260	351	419
B [mm]	214	231	245	277	306	408	483
Ø i [mm]	12	16	16	20	20	25	25
i1 [mm]	12	16	16	20	20	25	25
h [mm]	83	100	112	130	144	182	210
h1 [mm]	59	68	80	90	114	132	160

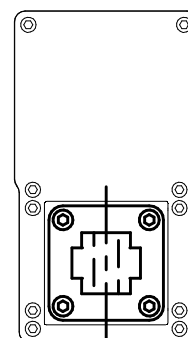
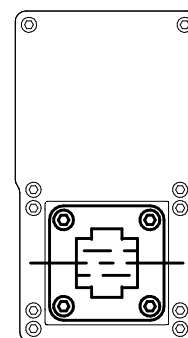
**5.8 / Rear hinge CM**



Available only for **SAM PD** actuators

Ordering code: **CM** or **CM90**

**SAM PD Series**

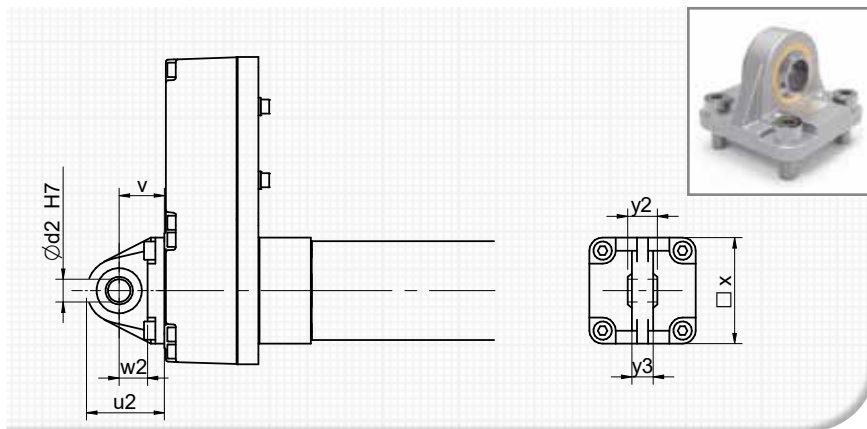


**CM**

**CM90**

SIZE	SAM 0	SAM 1	SAM 2	SAM 3	SAM 4	SAM 5	SAM 6
Ø d3 [mm]	10	12	12	16	16	20	25
u1 [mm]	32	37	39	48	52	61	75
v [mm]	22	25	27	32	36	41	50
w1 [mm]	13	16	16	21	22	27	30
□ x [mm]	45	52	65	75	95	115	140
y1 [mm]	26	28	32	40	50	60	70

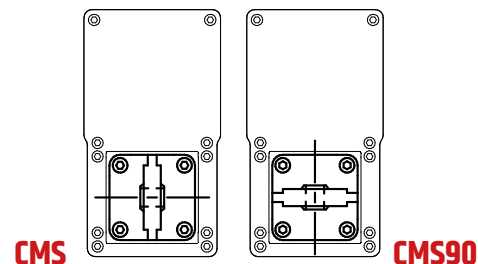
5.9 / Rear hinge with ball joint CMS



Available only for SAM PD actuators

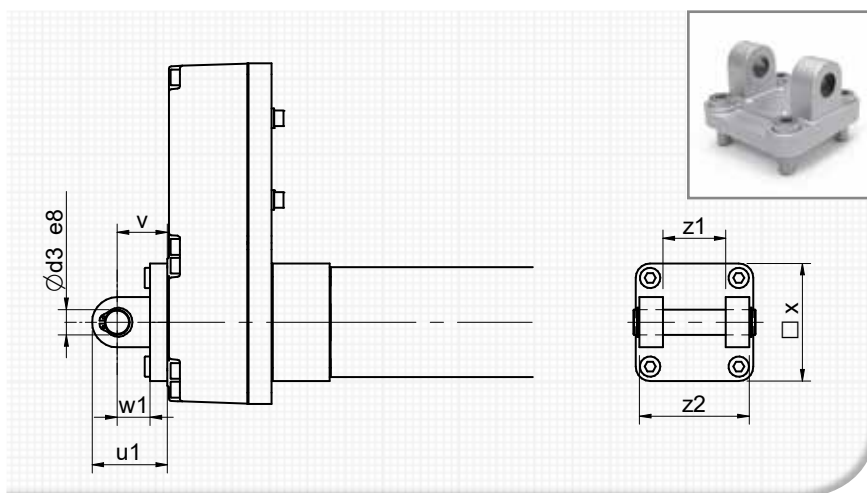
Ordering code: **CMS** or **CMS90**

SAM PD Series



SIZE	SAM 0	SAM 1	SAM 2	SAM 3	SAM 4	SAM 5	SAM 6
$\varnothing d2$ [mm]	10	12	16	16	20	20	30
$u2$ [mm]	38	43	48	55	64	71	90
$v$ [mm]	22	25	27	32	36	41	50
$w2$ [mm]	12	15	15	20	20	25	30
$\square x$ [mm]	45	52	65	75	95	115	140
$y2$ [mm]	14	16	21	21	25	25	37
$y3$ [mm]	10.5	12	15	15	18	18	25

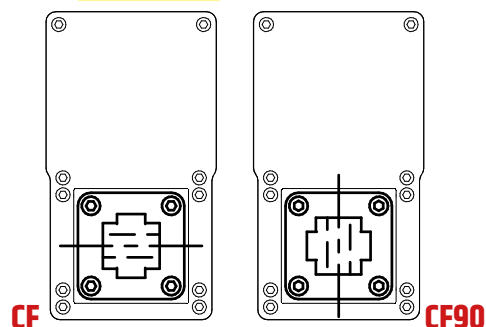
5.10 / Rear clevis CF



Available only for SAM PD actuators

Ordering code: **CF** or **CF90**

SAM PD Series



Note: zinc-plated steel pin and fixing rings included in the supply.

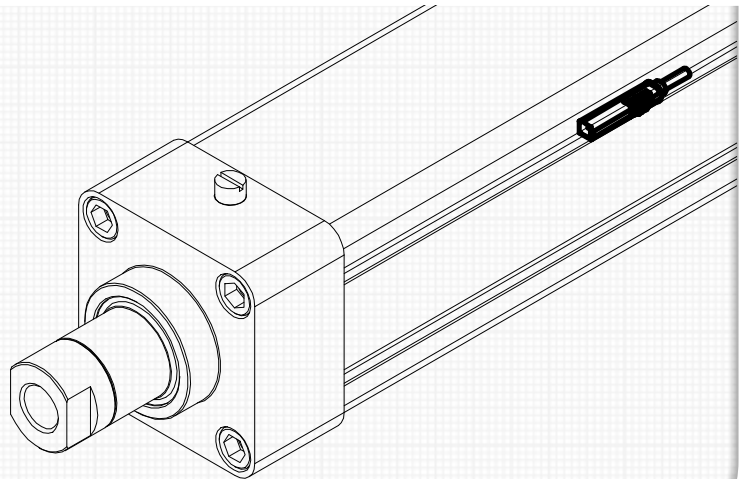
SIZE	SAM 0	SAM 1	SAM 2	SAM 3	SAM 4	SAM 5	SAM 6
$\varnothing d3$ [mm]	10	12	12	16	16	20	25
$u1$ [mm]	32	37	39	48	52	61	75
$v$ [mm]	22	25	27	32	36	41	50
$w1$ [mm]	13	16	16	21	22	27	30
$\square x$ [mm]	45	52	65	75	95	115	140
$z1$ [mm]	26	28	32	40	50	60	70
$z2$ [mm]	45	52	60	70	90	110	130



# 6 / Limit sensors

The linear servo actuators have two slots in the extruded aluminum profile, as shown in the image alongside, for the magnetic position sensors.

These sensors are activated by a magnet mounted on the translating nut inside the profile.



Ordering code:

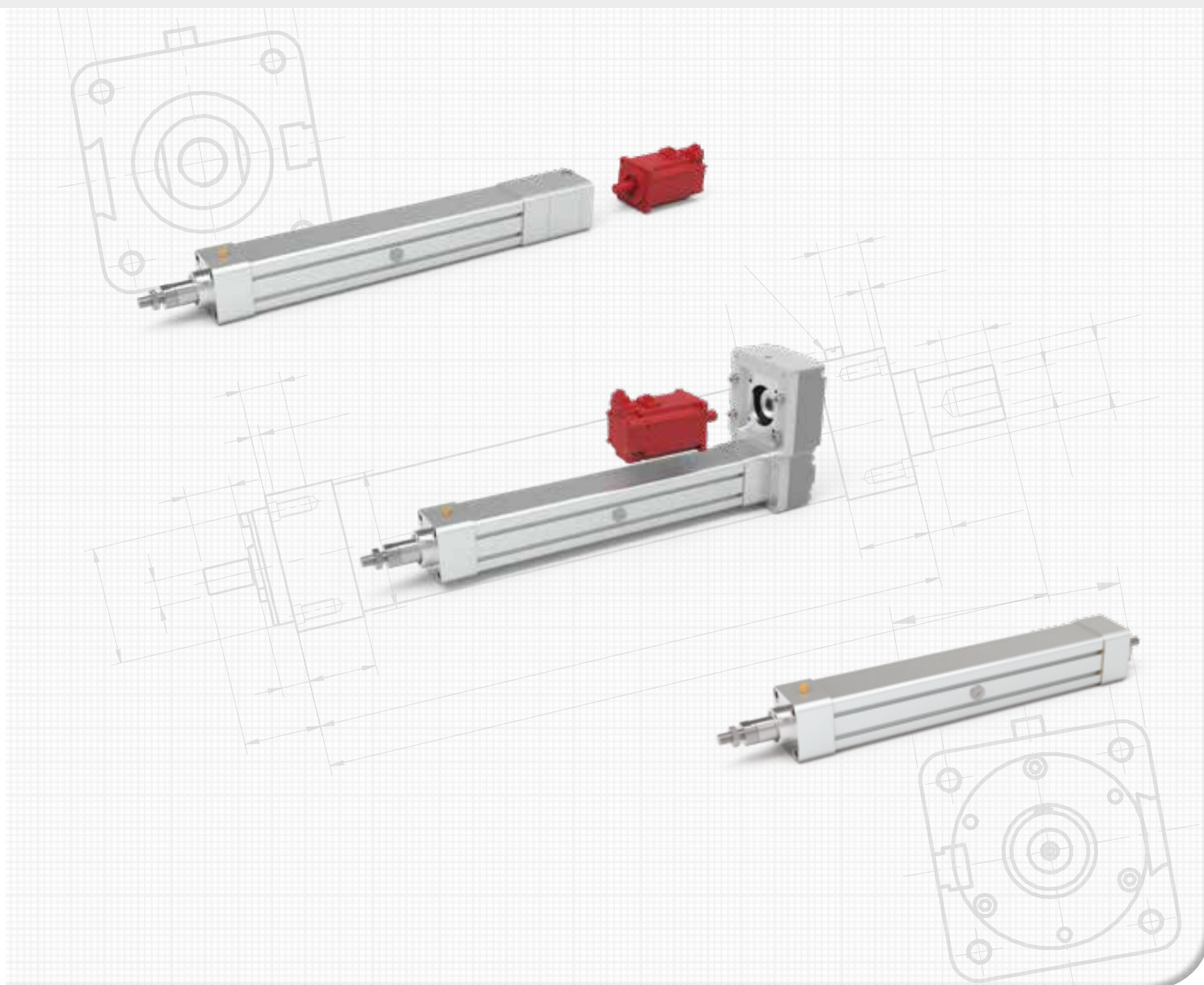
**FCM (NC)** or **FCM (NO)**

Limit sensor	FCM (NC)	FCM (NO)
Mounting position		T slot
Contact type	NC	NO
Switching output		PNP
LED signal		YES
Supply voltage		10÷30 Vdc
Voltage drop		≤ 2V
Max current		100 mA
Reverse polarity protection		SI
Short-circuit protection		SI
Ambient operating temperature		-30°C ÷ +80°C
IP Protection rate		IP65
Housing material		Plastica
Output cable		PUR black cable 3x0.14mm <sup>2</sup> - L = 2m
Circuit	<p><b>BN</b> Brown / Marrone <b>BK</b> Black / Nero <b>BU</b> Blue / Blu</p>	



# 7 / Sizing and selection

## LINEAR SERVOACTUATORS



**7.1 / Motor sizing**

This chapter provides the basics of servomotor sizing and selection.

**/ Inertia calculation**

**Moment of inertia of the actuator reduced to motor shaft  $J_{load}$**

$$J_{load} = J_0 + J_{100} \cdot \frac{C}{100} + \frac{M}{\eta} \cdot \left( \frac{P_h}{2000 \pi \cdot u} \right)^2 \text{ [kg}\cdot\text{m}^2\text{]}$$

- $J_0$  [kg·m<sup>2</sup>] = moment of inertia of the actuator referred to the motor shaft for stroke 0 mm
- $J_{100}$  [kg·m<sup>2</sup>] = moment of inertia of the actuator referred to the motor shaft for each 100 mm stroke
- $C$  [mm] = linear travel (stroke) of the actuator
- $M$  [kg] = external mass to be moved
- $P_h$  [mm] = thread helix lead of the ball screw
- $u$  = ratio of the actuator
- $\eta$  = total efficiency of the actuator

**Inertia ratio  $IR$**

$$IR = \frac{J_{load}}{J_{mot}}$$

- $J_{mot}$  [kg·m<sup>2</sup>] = moment of inertia of motor rotor
- $J_{load}$  [kg·m<sup>2</sup>] = moment of inertia of load

For correct load control and high quality regulation we recommend to use the following indicative values:

- Applications with high dynamics conditions:  $IR < 2$
- Applications with medium to low dynamics conditions:  $IR < 10$

**/ Motor torque calculation**

**Motor torque due to external forces  $T_e$**

$$T_e = \frac{(F_p + F_a + F_e) P_h}{2000 \pi \cdot u \cdot \eta} \text{ [Nm]}$$

- $F_p$  =  $9.81 \left( m_0 + m_{100} \cdot \frac{C}{100} + M \right)$  [N] = weight
- $m_0$  [kg] = mass in linear motion for actuator referred to 0 mm stroke
- $m_{100}$  [kg] = mass in linear motion for each 100 mm stroke
- $F_a$  [N] = friction force
- $F_e$  [N] = other external forces

**Acceleration motor torque  $T_j$**

$$T_j = (J_{load} + J_{mot}) \frac{a \cdot 2000 \pi \cdot u}{P_h} \text{ [Nm]}$$

- $a$  [m/s<sup>2</sup>] = acceleration suffered by the load

**Total motor torque  $T_M$**

$$T_M = T_j + T_e + T_a \text{ [Nm]}$$

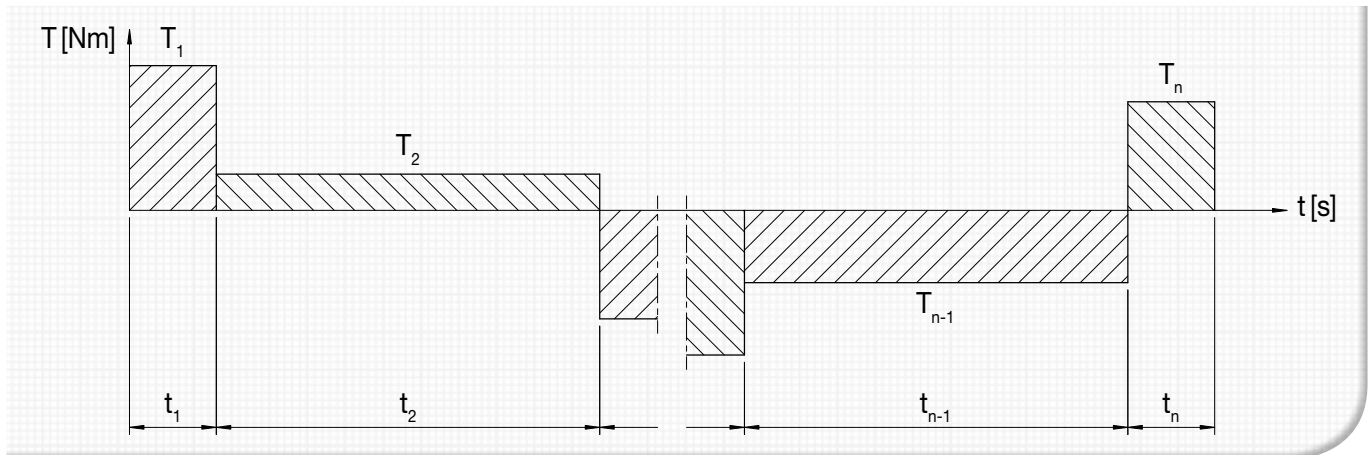
- $T_a$  [Nm] = friction torque of the actuator

**Thermal verification of the motor**

**RMS torque**

When the drive working cycle is defined, i.e. the motor torque trend in a variable period, you can calculate the RMS value of the motor torque: it is the torque which generates inside the servomotor so much

heat as during the effective working cycle. The simplest conditions, when the working cycle has constant acceleration or zero acceleration phases, provide a torque with constant intervals trend, as shown below.



In this case, the RMS value of the motor torque can be calculated as follows:

$$T_{RMS} = \sqrt{\sum_i \frac{T_{Mi}^2 \cdot t_i}{t_{tot}}} \text{ [Nm]}$$

$T_{Mi}$  [Nm] = motor torque of the i-th cycle phase  
 $t_i$  [s] = time of the i-th cycle phase

$t_{tot}$  =  $\sum_i t_i$  [s] = total cycle time

For the thermal check of the motor it is necessary to have:

$$T_{RMS} \leq T_{nom,100K}$$

$T_{nom,100K}$  [Nm] = constant rated torque of the servomotor

**MAX Torque**

For correct motor selection, the maximum torque required during the operating cycle must not exceed the peak torque that can be delivered by the motor:

$$(T_M)_{max} < T_p$$

$T_p$  [Nm] = peak torque of motor

**MAX Speed**

Check that the motor is able to reach the maximum linear speed required by the operating cycle:

$$n = \frac{60 \cdot v_{max} \cdot u}{P_h} \text{ [rpm]}$$

$v_{max}$  [mm/s] = max linear speed

$$n \leq n_{nom}$$

$n_{nom}$  [rpm] = motor rated speed

**7.2 / Ball screw sizing and service life**

Ball screws life corresponds to the number of revolutions that the screw can perform with regard to its nut before any sign of fatigue appears on the material

of screw, nut and rolling elements.

The **nominal ball screw life** ( $L_{10}$ ) is calculated with the following formula:

$$L_{10} = \left( \frac{C_a}{F_m \cdot f_{sh}} \right)^3 \cdot 10^6 \text{ [rev]}$$

- $C_a$  [N] = ball screw dynamic load
- $F_m$  [N] = equivalent dynamic load
- $f_{sh}$  = shock factor
  - $f_{sh} = 1$  load without shocks
  - $1 < f_{sh} \leq 1.3$  load with light shocks
  - $1.3 < f_{sh} \leq 1.8$  load with medium shocks
  - $1.8 < f_{sh} \leq 3$  load with heavy shocks

The result of the calculation corresponds to the number of revolutions of the screw with regard to the nut, reached by the

90 % of the ball screws, apparently identical, subject to the same load conditions, motion laws and environment conditions.

The **equivalent dynamic load** ( $F_m$ ) is defined as a hypothetical load concentric to the screw, axial only, with constant width and direction that, if applied, would have the same effects on the ball screw life as the real applied load.

To determine it, the working cycle is divided in distinct and separate phases, each of them characterized by its load level, the specific rotating speed and the relevant time of load application.

$$F_m = \sqrt[3]{\sum_i F_i^3 \cdot \frac{v_i}{v_m} \cdot \frac{t_i}{t_{tot}}} \text{ [N]}$$

- $t_i$  [s] = duration of the i-th phase of the cycle
- $F_i$  [N] = load applied during the i-th phase
- $v_i$  = linear speed during the i-th phase
- $v_m$  =  $\sum_i v_i \cdot \frac{t_i}{t_{tot}}$  [mm/s] = average speed
- $t_{tot}$  =  $\sum_i t_i$  [s] = total cycle time

The equivalent dynamic load  $F_m$  must be calculated as indicated above, where for each phase external loads,

mass loads (weight and inertial) and friction loads must be considered.

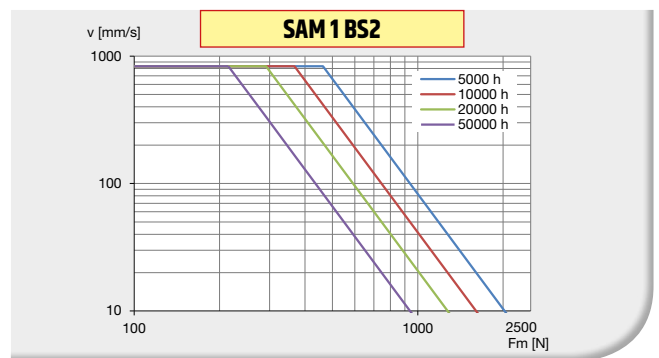
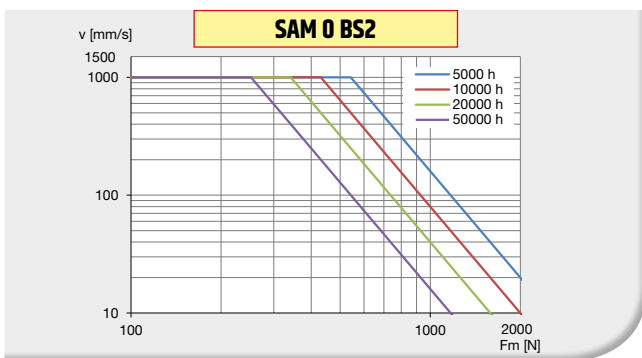
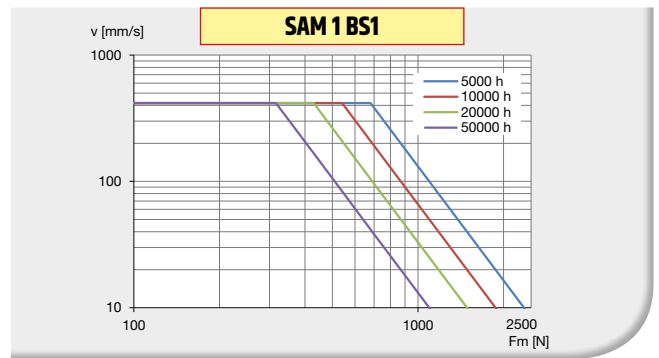
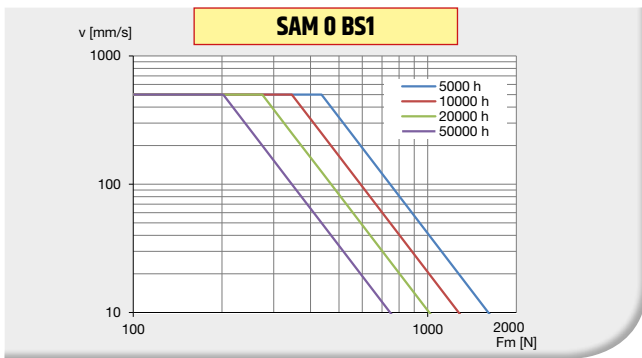
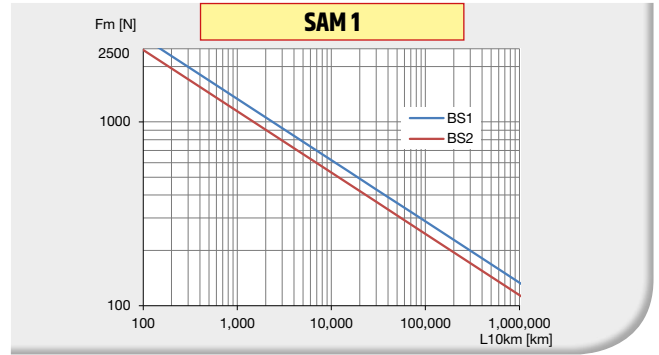
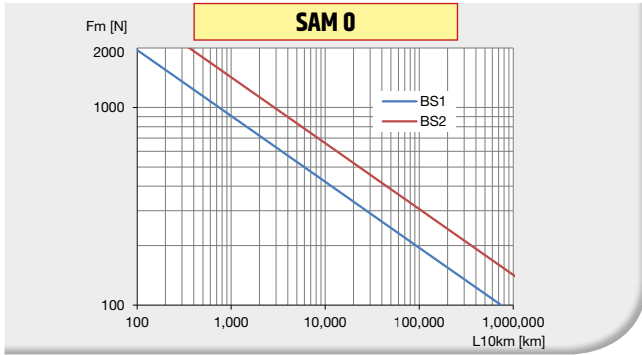
The **service life of ball screw expressed in hours** ( $L_{10h}$ ) is calculated as follows:

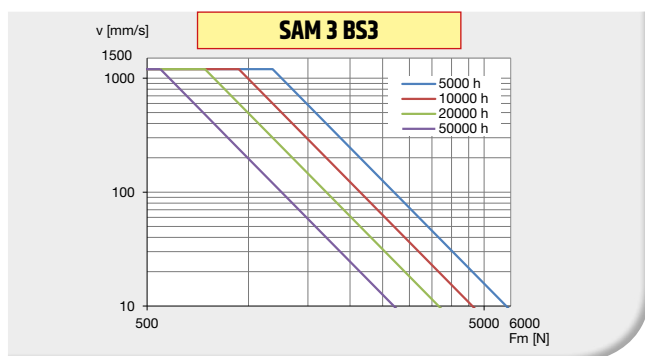
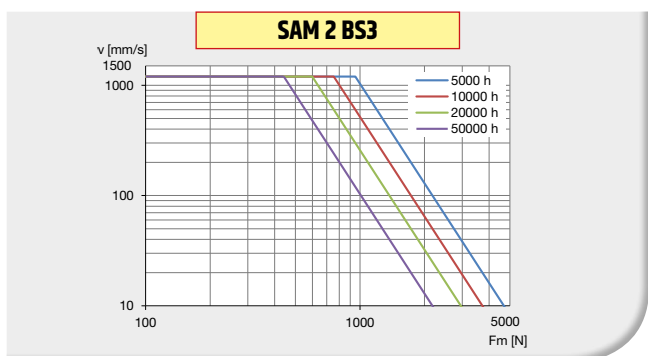
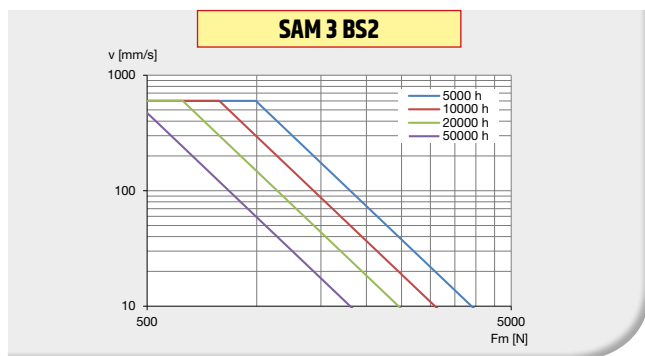
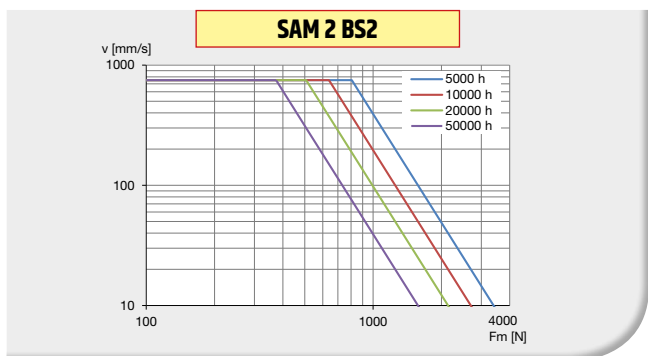
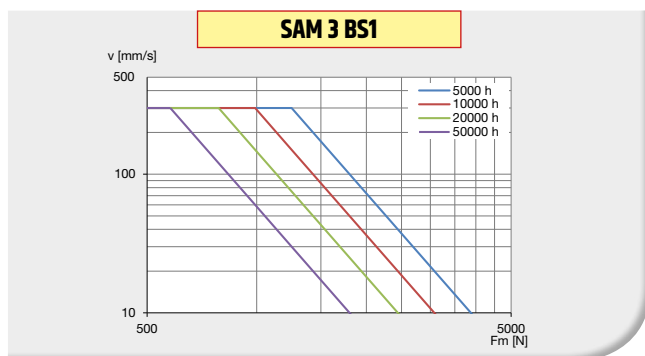
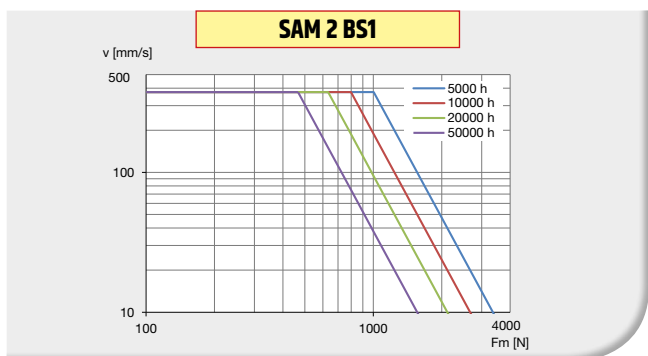
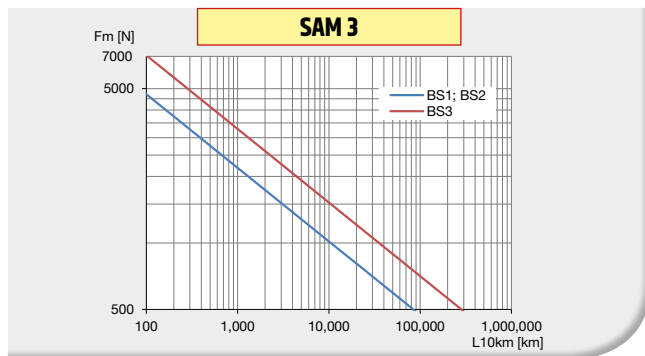
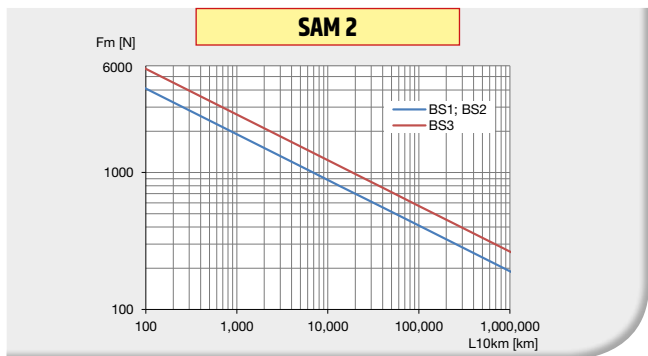
$$L_{10h} = \frac{L_{10} \cdot P_h}{3600 \cdot v_m} \text{ [hours]}$$

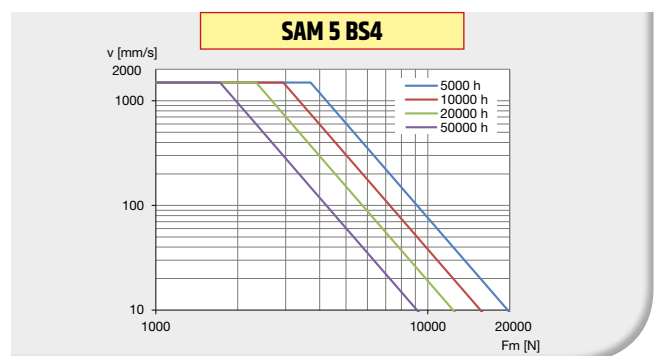
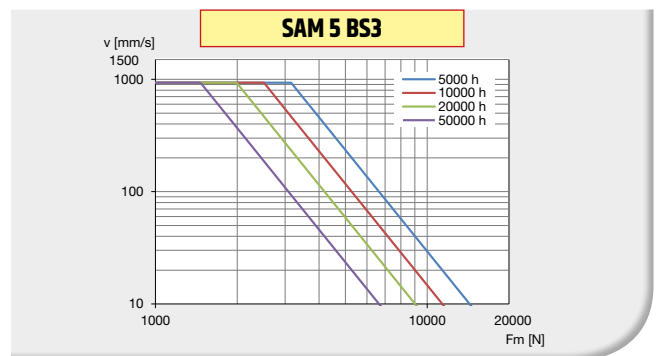
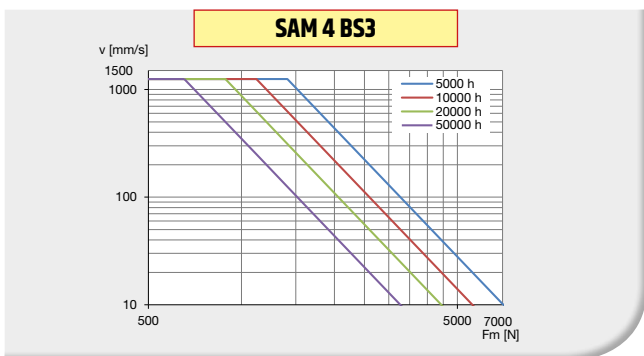
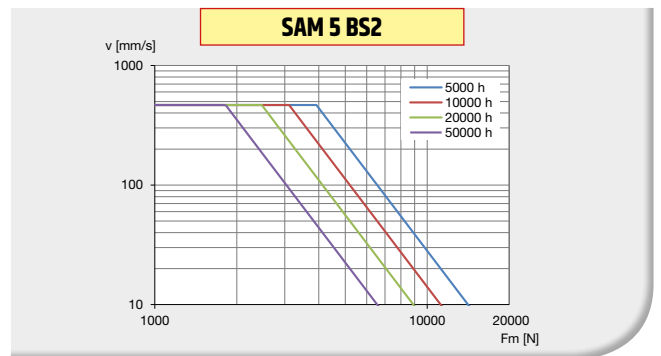
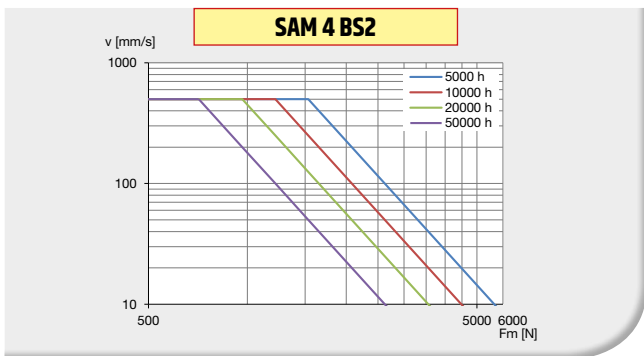
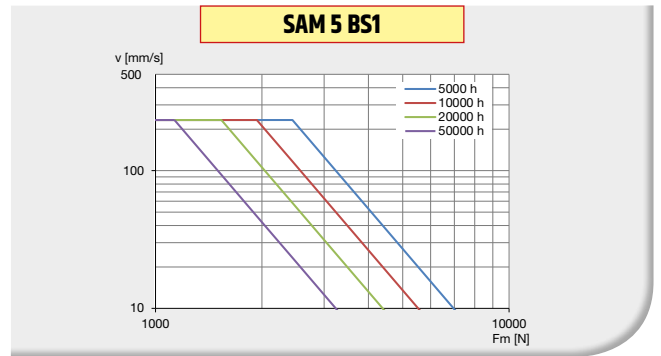
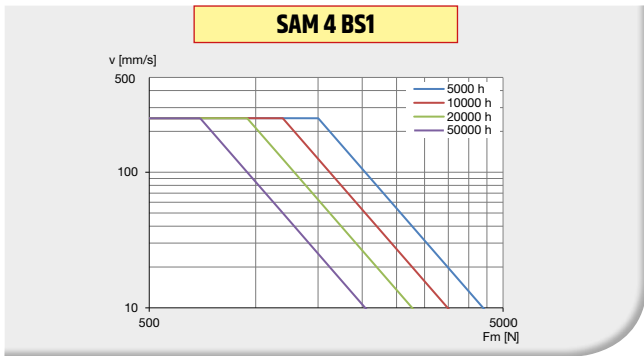
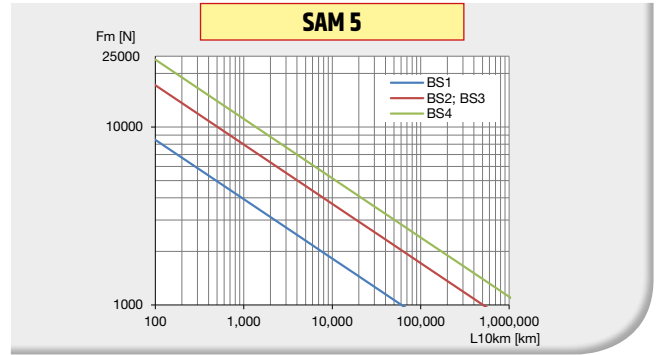
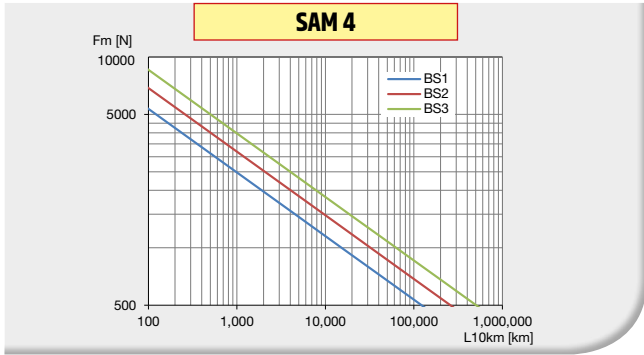
The **service life of ball screw expressed in km of travel** ( $L_{10km}$ ) is calculated as follows:

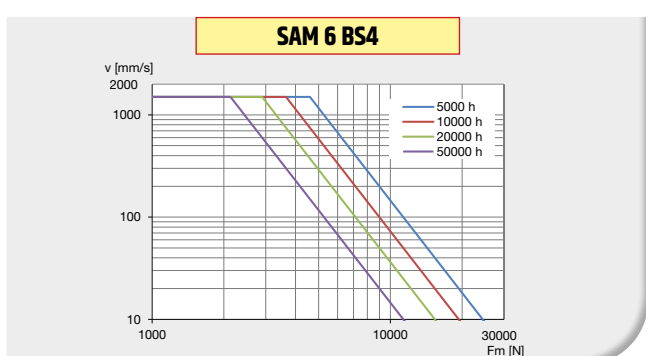
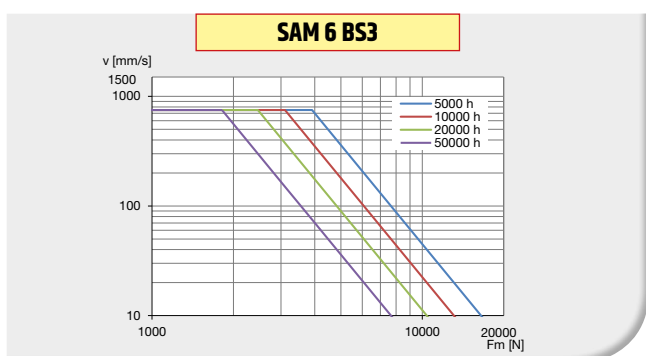
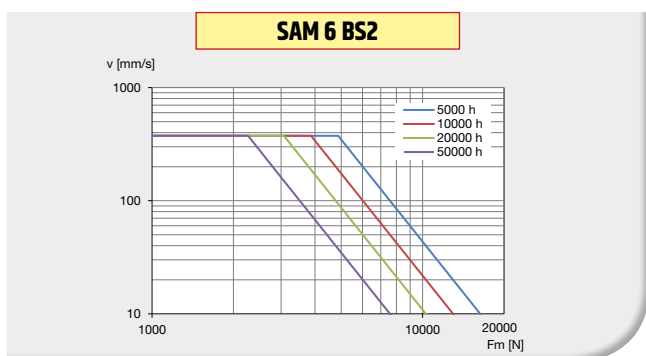
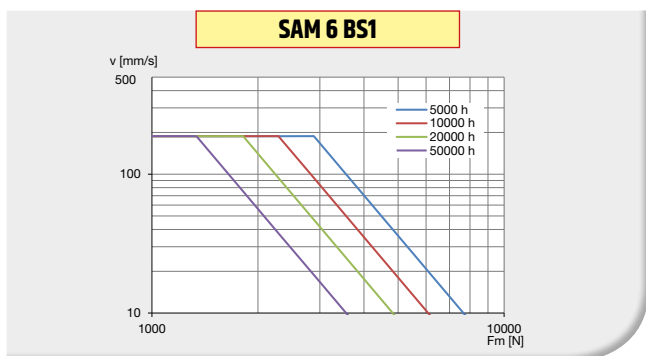
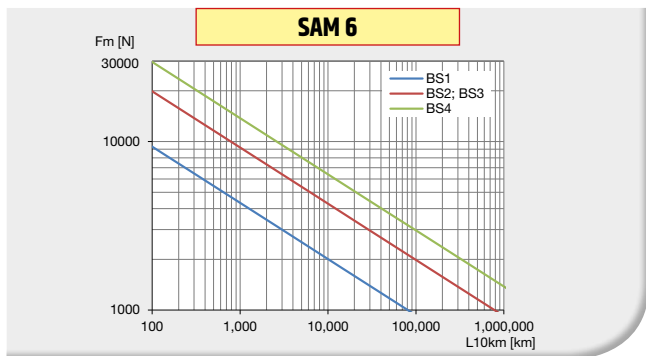
$$L_{10km} = \left( \frac{C_a}{F_m \cdot f_{sh}} \right)^3 \cdot P_h \text{ [km]}$$

- $P_h$  [mm] = thread helix lead









7.3 / Push load limit

In case of push load (static or dynamic) applied on the servoactuator, the buckling resistance of the screw must be checked. The maximum compression load allowed on the actuator is determined by:

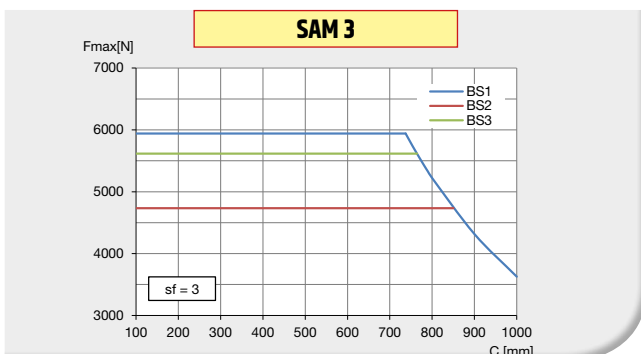
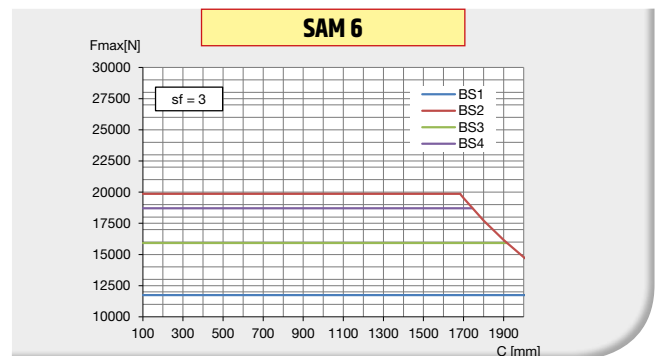
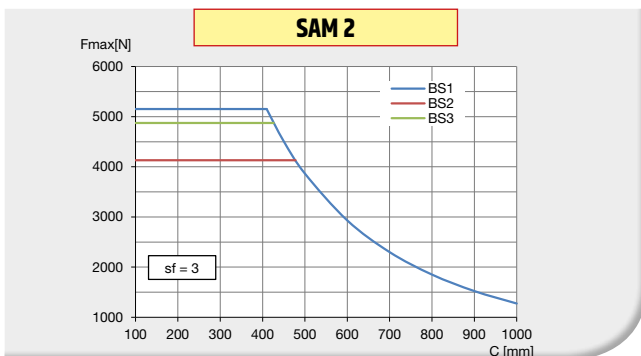
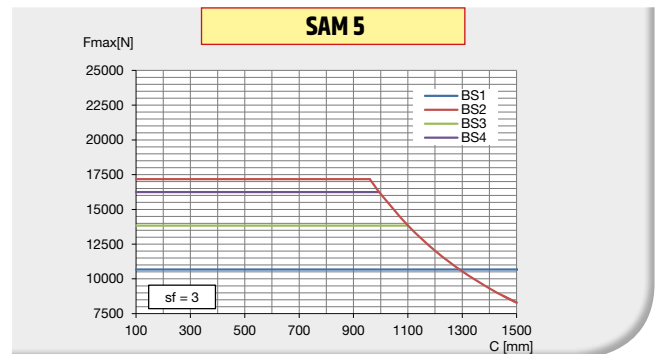
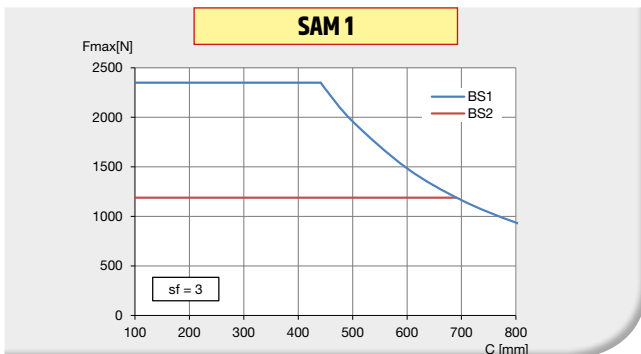
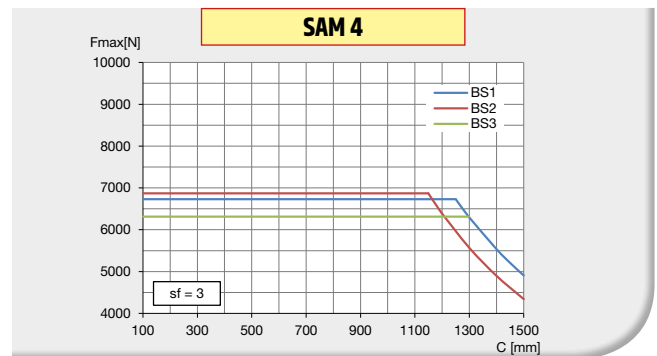
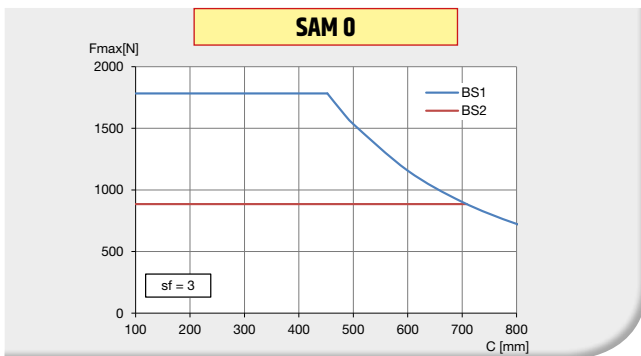
$$F_{max} = \frac{6437.5 \cdot \pi^3 \cdot (d_0 - D_w)^4}{(C + x)^2 \cdot sf} \text{ [N]}$$

$d_0$  [mm] = ball screw nominal diameter  
 $D_w$  [mm] = balls diameter  
 $C$  [mm] = linear travel (stroke)

$x$  = calculation coefficient (see below table)  
 $sf$  = safety factor

SIZE	SAM 0	SAM 1	SAM 2	SAM 3	SAM 4	SAM 5	SAM 6
Coefficient $x$	158.5	173.5	174.5	201.5	210	270	310

**NOTE:** value resulting from calculation must not exceed the max force value as for Technical Data (see chap. 2.1, 3.1, 4.1).



**7.4 / Critical speed limit**

The rotating speed of the screw generates the rod linear movement. Therefore, the linear speed of the servoactuator, is limited by the following factors:

- A - External factors** (length, diameter and type of screw end supports).
- B - Internal factors** (balls material, geometry and material of all the recirculation elements).

Once the respective values have been established according to these two criteria, the lower of the two values is adopted as the maximum speed of the system.

**A - Limits due to external factors**

In order to ensure a proper working of the system and to prevent imbalances which could damage the ball screw, the rotating speed must not reach the critical level. Therefore, also the linear speed must be limited to the critical value. The critical speed depends on the screw diameter, the type of screw end support and the length of the free ball screw. The maximum permissible linear speed is calculated according to the following formula, which limits the rotation speed to a value equal to 80% of the critical speed:

$$v_{max} = 251 \cdot 10^4 \cdot \frac{d_0 - D_w}{(C + x)^2} \cdot P_h \text{ [mm/s]}$$

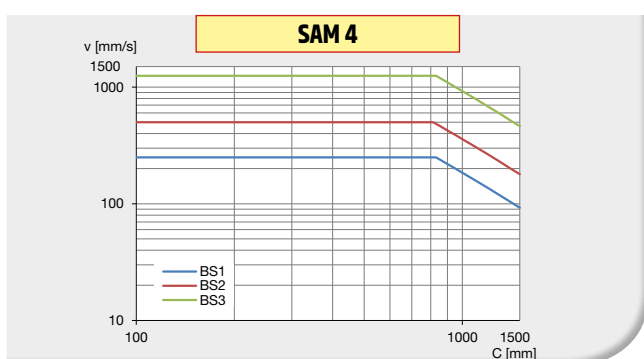
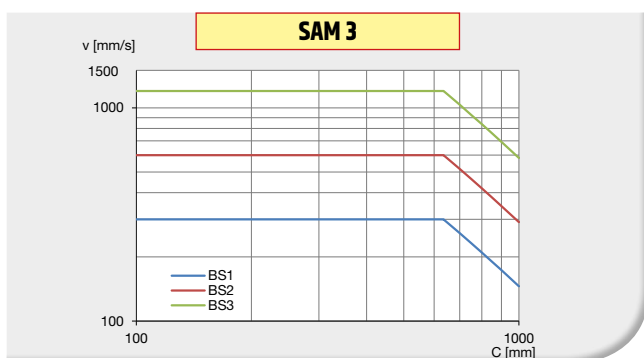
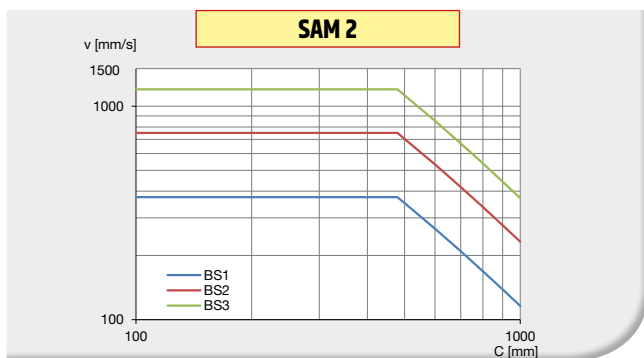
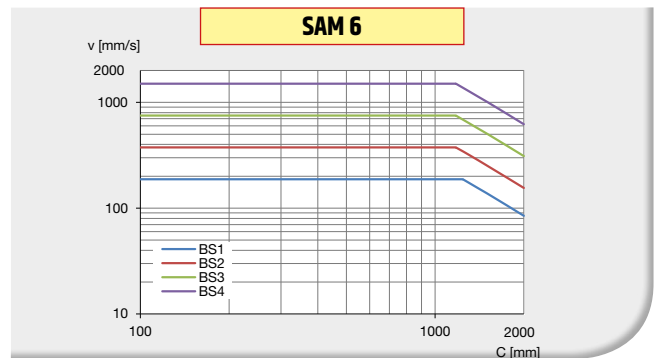
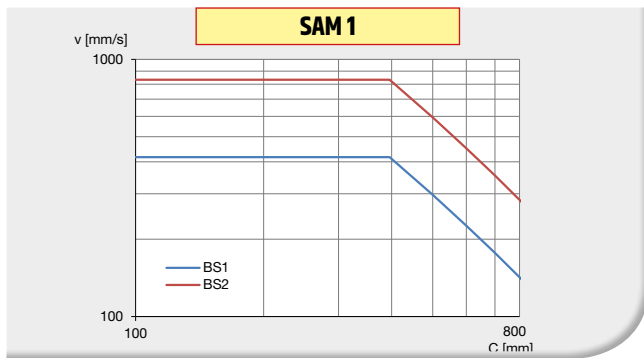
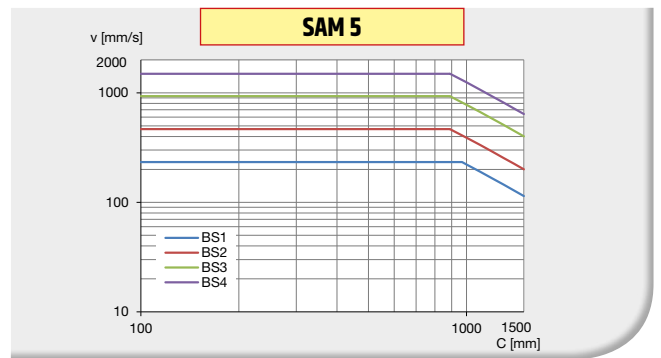
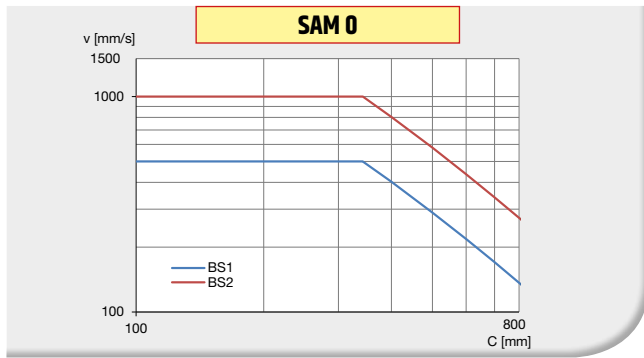
- $d_0$  [mm] = ball screw nominal diameter
- $D_w$  [mm] = balls diameter
- $P_h$  [mm] = thread helix lead
- $C$  [mm] = linear travel (stroke)
- $x$  = calculation coefficient (see below table)

SIZE	SAM 0	SAM 1	SAM 2	SAM 3	SAM 4	SAM 5	SAM 6
Coefficient $x$	158.5	173.5	174.5	201.5	210	270	310

**B - Limits due to internal factors**

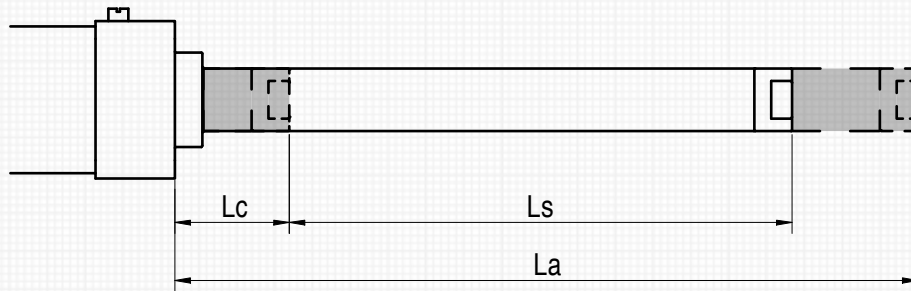
Depending on balls and screw material, geometry and material of all the recirculation elements and screw diameter, there is a specific limit of the maximum rotating speed. The values related to each actuator model and size are stated in the specific performance tables (see Technical Data chapters 2.1, 3.1, 4.1).

**NOTE:** for motorized servoactuators (SA IL Series or SA PD Series), the speed limit is determined considering also the nominal rotating speed of the motor.

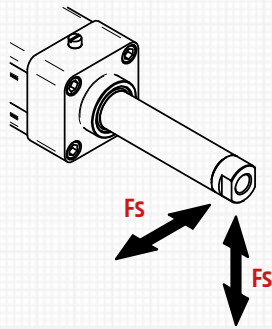


**7.5 / Side load limit**

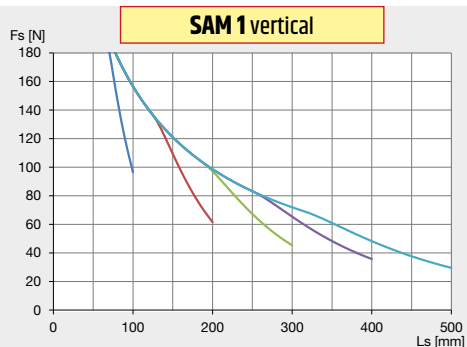
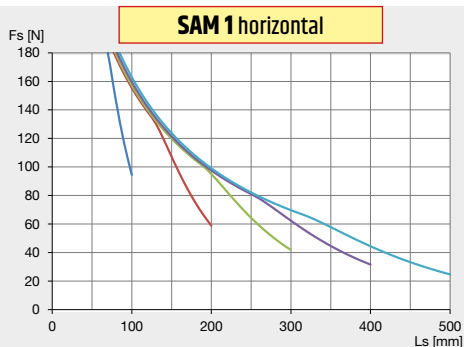
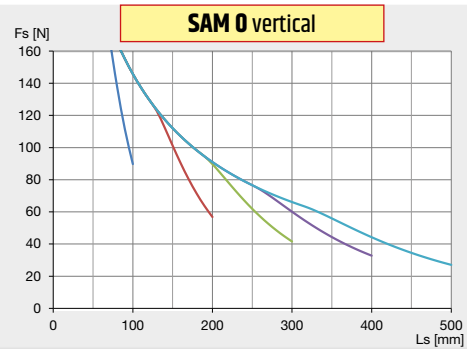
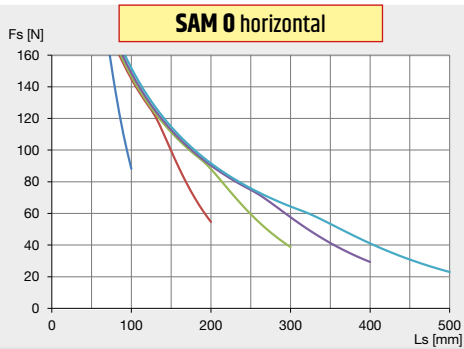
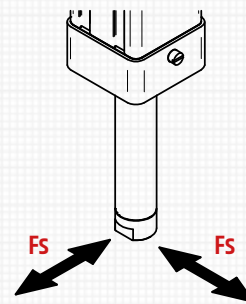
If lateral forces are applied on the linear actuator rod (static or dynamic condition), they must not exceed the limit shown in the graphs.



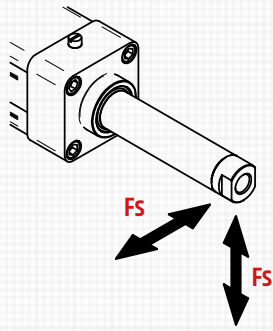
**HORIZONTAL MOUNTING**



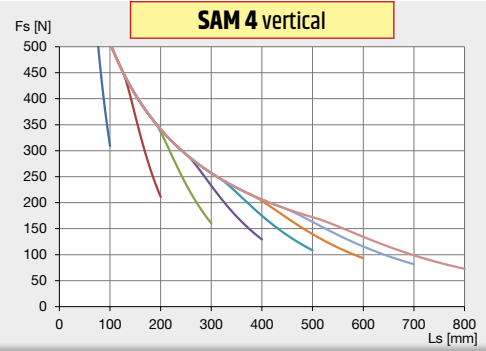
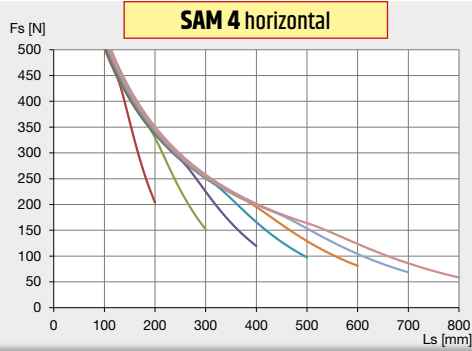
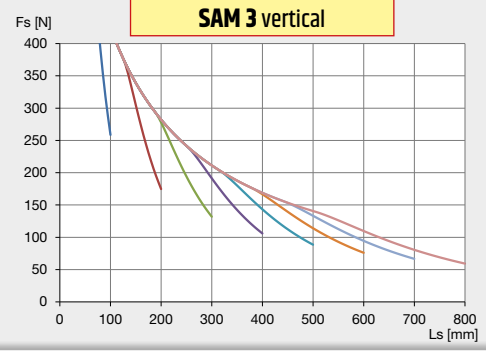
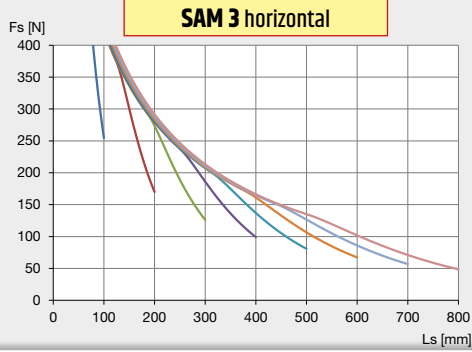
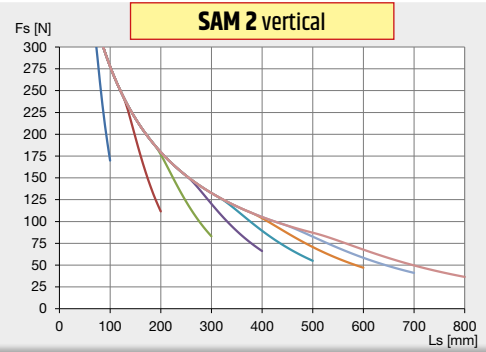
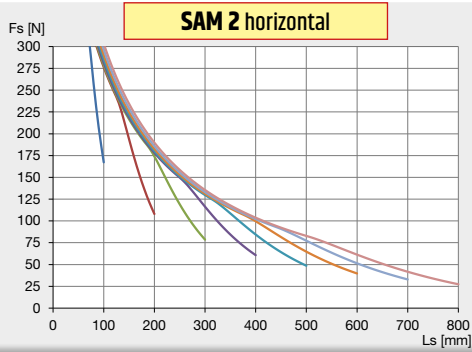
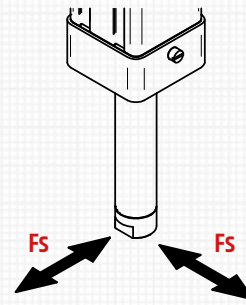
**VERTICAL MOUNTING**



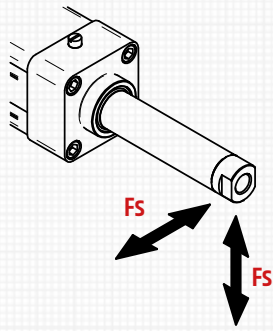
**HORIZONTAL MOUNTING**



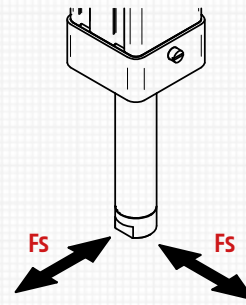
**VERTICAL MOUNTING**



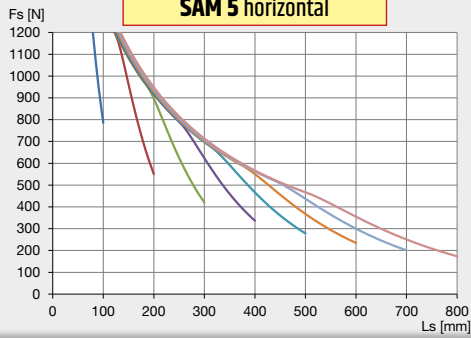
**HORIZONTAL MOUNTING**



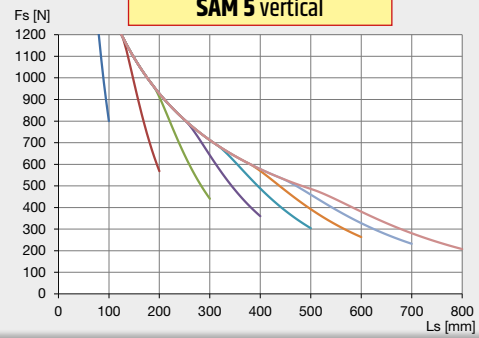
**VERTICAL MOUNTING**



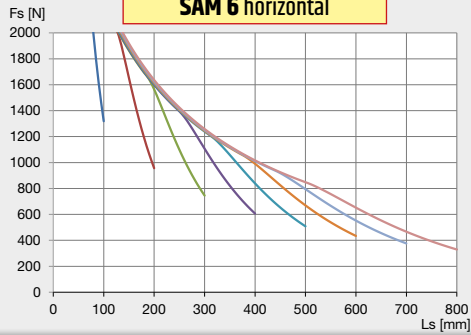
**SAM 5 horizontal**



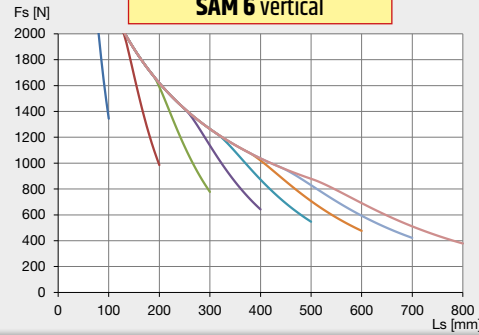
**SAM 5 vertical**



**SAM 6 horizontal**



**SAM 6 vertical**



## 7.6 / Positioning accuracy

The following tables show the tolerance value  $T$  related to the maximum positioning error  $e_M$  over the entire linear stroke of the ball screw,

according to ISO 3408 parameters.

The maximum positioning error for the entire stroke, as indicated in the table, is:

$$e_M = \pm T [\mu\text{m}]$$

The positioning error value does not include:

- Accuracy of the servomotor feedback system
- Axial play of the ball screw: standard axial play is  $20 \div 40 \mu\text{m}$ . Positioning accuracy may be affected by axial backlash of the ball screw in the case of applications with inversion of the axial load on the actuator. Servomech can supply **zero-backlash** nuts or preloaded nuts to avoid or limit this kind of problem.
- Elastic deformations of the mechanical components of the actuator or structure when subjected to axial load.

Value  $T$  [ $\mu\text{m}$ ] for ball screw with accuracy grade IT7 (standard)

STROKE [mm]	100	200	300	400	500	600	700	800	900	1000
<b>SAM 0</b>	43	61	76	86	93	-	-	-	-	-
<b>SAM 1</b>	43	61	76	86	93	-	-	-	-	-
<b>SAM 2</b>	43	61	76	86	93	100	105	115	-	-
<b>SAM 3</b>	43	61	76	86	93	100	105	115	-	-
<b>SAM 4</b>	43	61	76	86	93	100	105	115	120	129
<b>SAM 5</b>	43	61	76	86	93	100	105	115	120	129
<b>SAM 6</b>	43	61	76	86	93	100	105	115	120	129

Value  $T$  [ $\mu\text{m}$ ] for ball screw with accuracy grade IT5 (option)

STROKE [mm]	100	200	300	400	500	600	700	800	900	1000
<b>SAM 0</b>	20	27	35	38	40	-	-	-	-	-
<b>SAM 1</b>	20	27	35	38	40	-	-	-	-	-
<b>SAM 2</b>	20	27	35	38	40	47	52	52	-	-
<b>SAM 3</b>	20	27	35	38	40	47	52	52	-	-
<b>SAM 4</b>	20	27	35	38	40	47	52	52	57	57
<b>SAM 5</b>	20	27	35	38	40	47	52	52	57	57
<b>SAM 6</b>	20	27	35	38	40	47	52	52	57	57

	<b>Linear Servoactuators Application Worksheet</b>	<b>Date:</b> ____ / ____ / ____
---	--	------------------------------------

Company: \_\_\_\_\_

Address: \_\_\_\_\_

Name \_\_\_\_\_ Job title: \_\_\_\_\_

Phone: \_\_\_\_\_ E-mail: \_\_\_\_\_

www: \_\_\_\_\_ Company primary business: \_\_\_\_\_

**Action requires:**    Call me to discuss    Recommended product    Price quotation    Other \_\_\_\_\_

**Application / Description:** \_\_\_\_\_

**Volume requirements / Each application:** \_\_\_\_\_      **Volume requirements / Total:** \_\_\_\_\_

LOAD	ORIENTATION
Static load - PULL: _____ [N]    Side loads: <input type="checkbox"/> YES <input type="checkbox"/> NO	<input type="checkbox"/> Vertical <input type="checkbox"/> Horizontal <input type="checkbox"/> Inclined
Static load - PUSH: _____ [N]    Shock loads: <input type="checkbox"/> YES <input type="checkbox"/> NO	Angle from horizontal plane: _____
Dynamic load - PULL: _____ [N]    Frequency: _____	Load guided: <input type="checkbox"/> YES <input type="checkbox"/> NO
Dynamic load - PUSH: _____ [N]    Vibrations: <input type="checkbox"/> YES <input type="checkbox"/> NO	Hold position: <input type="checkbox"/> UNDER LOAD <input type="checkbox"/> POWER OFF <input type="checkbox"/> NO
Moving mass: _____ [kg]	

TRAVEL	LINEAR SPEED	PRECISION
Stroke length required: _____ mm	MAX speed _____ mm/s	Repeatability: _____ [mm]
MAX dim. in closed position: _____ mm	MIN speed _____ mm/s	Accuracy: _____ [mm]
	Time to complete the stroke (ext/retr): _____ s	MAX backlash: _____ [mm]

DUTY CYCLE	REQUIRED LIFE TIME
Total cycle time: _____	Units: <input type="checkbox"/> Cycles <input type="checkbox"/> km <input type="checkbox"/> Working hours <input type="checkbox"/> Days <input type="checkbox"/> Months <input type="checkbox"/> Years
Extend/retract cycles per day: _____	Minimum life time required: _____
Working hours per day: _____	
No. of cycles per hour: _____	

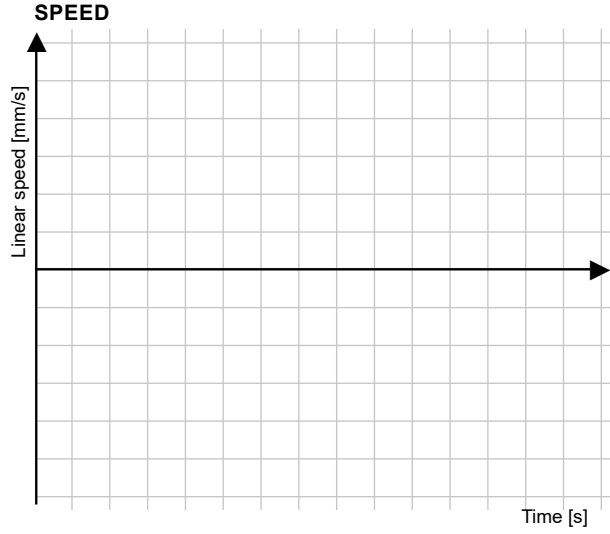
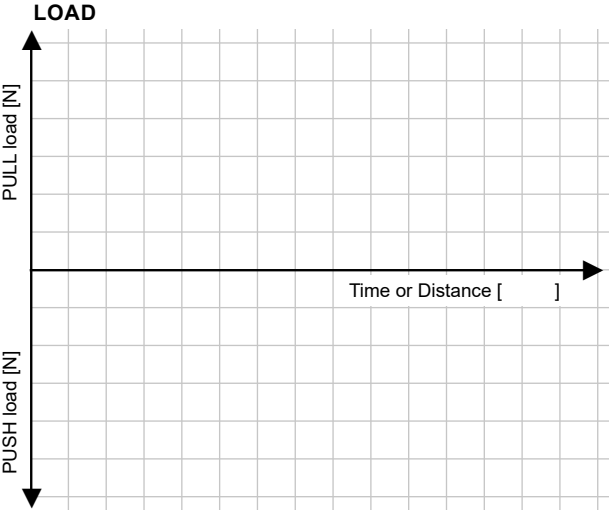
ENVIRONMENT	CONTAMINANTS				
Operating temperature <input type="checkbox"/> Normal (0 - 40°C) <input type="checkbox"/> High temp. _____ <input type="checkbox"/> Low temp. _____	<table style="width: 100%;"> <tr> <td style="width: 50%;">                     Conditions  <input type="checkbox"/> Outdoor  <input type="checkbox"/> Washdown  <input type="checkbox"/> Cleanroom  <input type="checkbox"/> Other _____  <input type="checkbox"/> IP rate required: _____                 </td> <td style="width: 50%;">                     Solids: _____   <input type="checkbox"/> abrasive  <input type="checkbox"/> non-abrasive  <input type="checkbox"/> fine dust  <input type="checkbox"/> coarse chips                 </td> </tr> <tr> <td></td> <td>                     Liquids: _____   <input type="checkbox"/> corrosive  <input type="checkbox"/> non-corrosive  <input type="checkbox"/> dips  <input type="checkbox"/> mist / spray  <input type="checkbox"/> splashing                 </td> </tr> </table>	Conditions <input type="checkbox"/> Outdoor <input type="checkbox"/> Washdown <input type="checkbox"/> Cleanroom <input type="checkbox"/> Other _____ <input type="checkbox"/> IP rate required: _____	Solids: _____  <input type="checkbox"/> abrasive <input type="checkbox"/> non-abrasive <input type="checkbox"/> fine dust <input type="checkbox"/> coarse chips		Liquids: _____  <input type="checkbox"/> corrosive <input type="checkbox"/> non-corrosive <input type="checkbox"/> dips <input type="checkbox"/> mist / spray <input type="checkbox"/> splashing
Conditions <input type="checkbox"/> Outdoor <input type="checkbox"/> Washdown <input type="checkbox"/> Cleanroom <input type="checkbox"/> Other _____ <input type="checkbox"/> IP rate required: _____	Solids: _____  <input type="checkbox"/> abrasive <input type="checkbox"/> non-abrasive <input type="checkbox"/> fine dust <input type="checkbox"/> coarse chips				
	Liquids: _____  <input type="checkbox"/> corrosive <input type="checkbox"/> non-corrosive <input type="checkbox"/> dips <input type="checkbox"/> mist / spray <input type="checkbox"/> splashing				

	<b>Linear Servoactuators Application Worksheet</b>	Date: _____ / _____ / _____
--	--	-----------------------------

VERSION	LIMIT SWITCHES
<input type="checkbox"/> In Line "IL" <span style="margin-left: 150px;"><input type="checkbox"/> Parallel "PD"</span>	Magnetic limit switches    No. of switch positions _____
<div style="display: flex; justify-content: space-around;"> </div>	<input type="checkbox"/> Normally closed contact (NC) <input type="checkbox"/> Normally open contact (NO)

FRONT FIXING	REAR / BODY FIXING
<input type="checkbox"/> Threaded bore <input type="checkbox"/> Male threaded rod end <input type="checkbox"/> Ball joint rod end <input type="checkbox"/> Clevis rod end <input type="checkbox"/> Self-aligning joint	<input type="checkbox"/> Rear hinge (only for "PD" Version) <input type="checkbox"/> Rear hinge with ball joint (only for "PD" Version) <input type="checkbox"/> Rear clevis (only for "PD" Version) <input type="checkbox"/> Foot mount (couple) <input type="checkbox"/> Plate mount <input type="checkbox"/> Trunnion mount (only for "IL" Version)

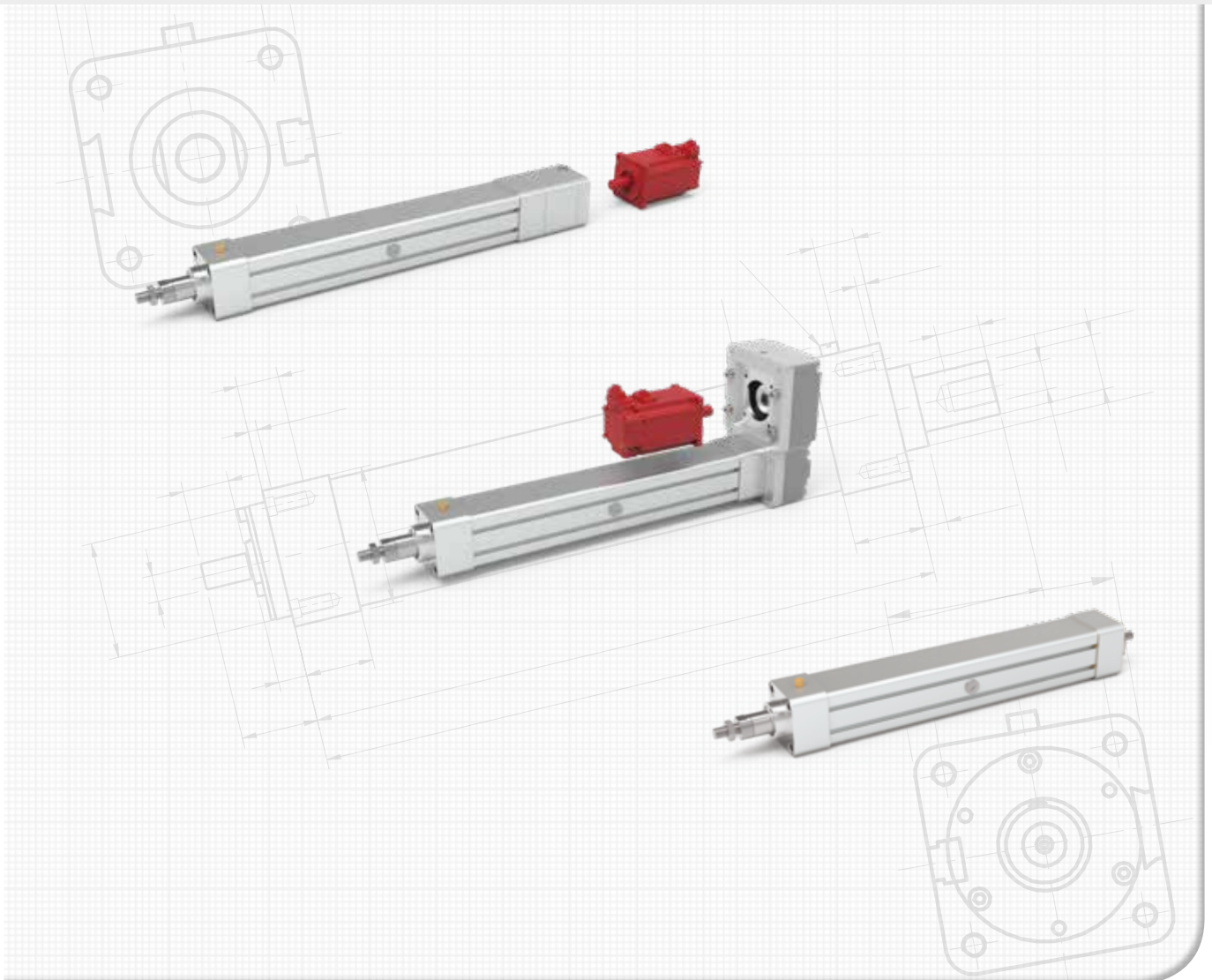
**MOVE PROFILE**



**APPLICATION SKETCH** *(Please show fixing method)*



## 8 / Additional information



**8.1 / Operating conditions**

The normal operating conditions of the servoactuators are:

- Environment temperature **+0°C ÷ +40°C**
- Relative air humidity **5% ÷ 85%**  
without condensation
- Duty cycle **100%**

**8.2 / Actuator body IP rating**

The sealing gaskets on all planar couplings and the sealing scraper on the push rod guarantee effective protection against inlet of contaminants in most of the applications.

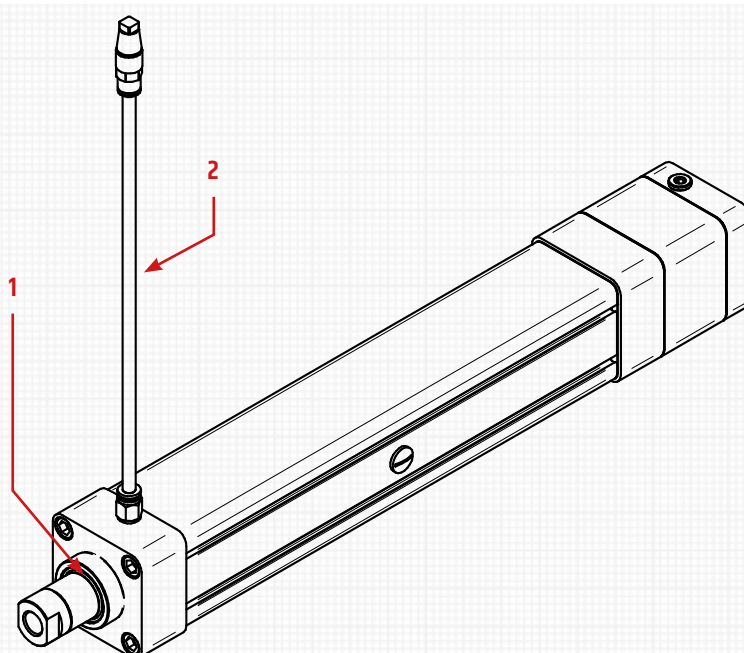
On request, the servoactuators can reach the IP65 protection rating thanks to a particular set-up, consisting of:

- 1** Reinforced actuator rod seal, able to ensure greater protection from inlet of dust and water.
- 2** Air breather threaded hole prepared for the attachment threaded joint and pipe that connect the actuator with a clean environment; in this way it is possible to ensure the compensation of air flows and pressure inside the actuator without the inlet of contaminants.

**NOTE** - joint included, tube NOT included into the supply.

**NOTE** - in case of actuator SAM series (linear unit with male input shaft) the IP rating is referred to actuator body, NOT for the rotating shaft sealing system.

**NOTE** - for SAM PD series actuators, please contact our technical support for more information.



IP Rating	Ordering code
IP40 (standard)	S
IP65 (optional)	X

Installation, use and  
maintenance manual available on:  
[www.servomech.com/download](http://www.servomech.com/download)

8.3 / Relubrication and maintenance

The servoactuators are grease lubricated and are supplied complete with lubricant.

The standard type of lubricant for bearings and ball screw for all servoactuator sizes is a grease of NLGI class 1 consistency according to DIN 51818: LUBCON Thermoplex ALN 1001. This lubricant is suitable for the entire possible speed range of servo actuators, with an ambient operating temperature of (0 ÷ 40) ° C. In case of operating temperature outside the indicated range, please contact Servomech S.p.a. to evaluate the use of different lubricant.

Ball bearings are life long lubricated.

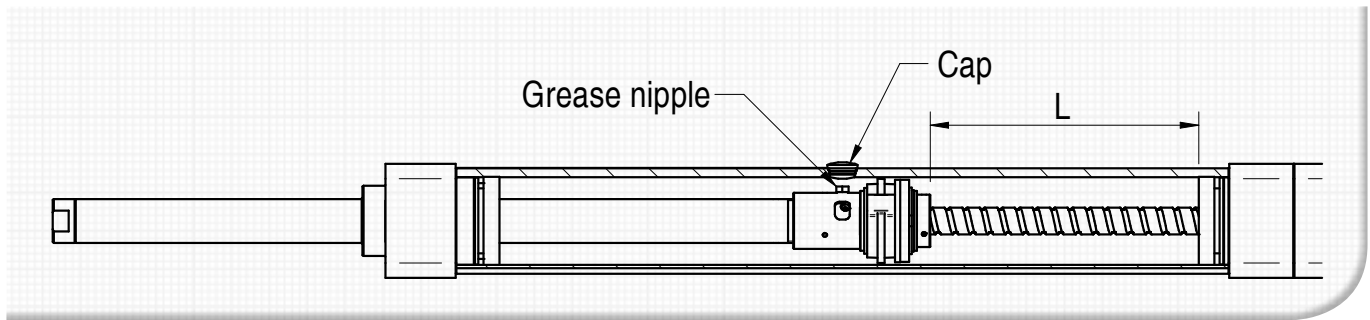
Ball nut must be periodically relubricated: for a proper lubrication, please refer to the **User and Maintenance**

**Manual** supplied with the actuator to define the right maintenance scheduling, lubricant type and quantity.

The servoactuators have a specific lubrication system for the ball screw nut: it is recommended to use LUB ferrule lubricators, specific for concave grease nipples.

To access to the grease nipple located on the nut, it is necessary to put the actuator in its completely retracted position until it stops against the bumper / shock absorber. Then open the actuator for a linear distance L, as shown on the image below, to align the nut grease nipple to the hole on the outer tube.

Now it is possible to remove the cap on the hole and put in the LUB ferrule lubricator to grease the nut.



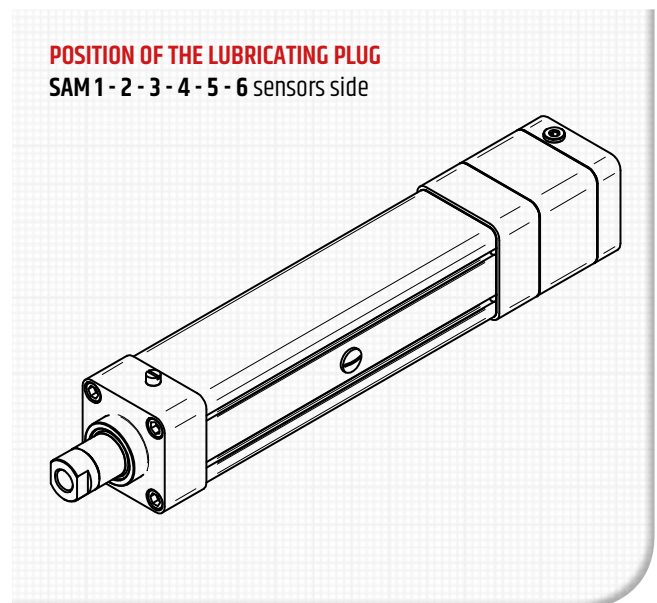
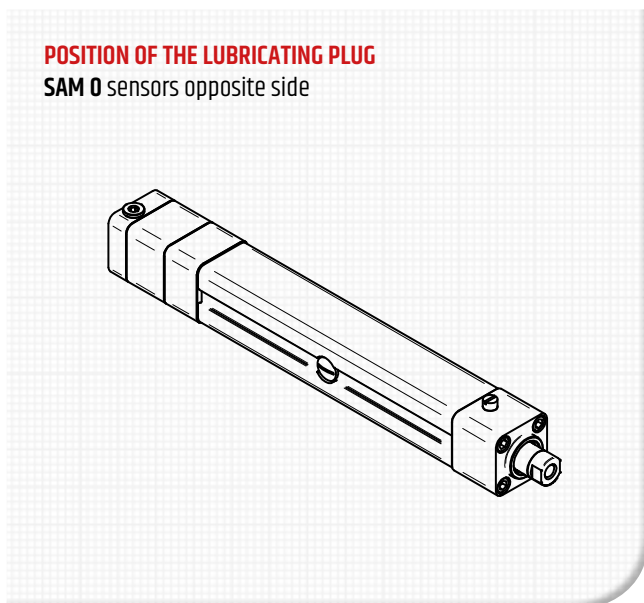
The opening stroke length **L** for relubrication operations is:

$$L = \frac{C}{2} + A$$

Where:

- L** [mm] = linear distance for the lubrication.
- C** [mm] = linear travel (stroke) of the servoactuator.
- A** = constant value specific for each size (see following table).

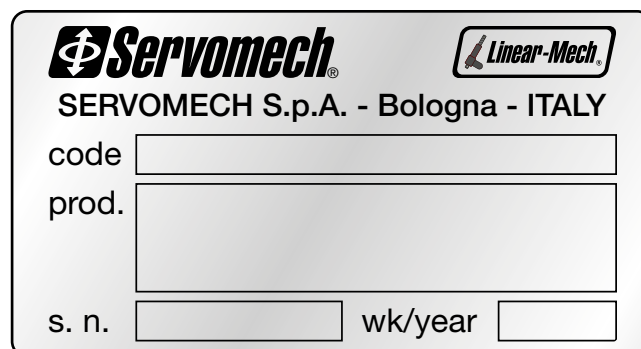
SIZE	SAM 0	SAM 1	SAM 2	SAM 3	SAM 4	SAM 5	SAM 6
<b>A</b>	4.5	2.5	3	7	6	-3.5	-5.5





## 8.4 / Product identification

Each SERVOMECH product is uniquely identified and supplied with an identification plate, shown in the figure below, which allows its identification and provides technical information on the product.

- **CODE** - Item code.
- **PROD** - Commercial code  
(See Ordering code at chap. 9).
- **S. N.** - Product serial number.  
It guarantees the complete product traceability even after long time. It must be given as reference when ordering spare parts for the unit.
- **WK / YEAR** - Assembly date, expressed in week/year (e.g.: 37/25 = week 37 / year 2025). It is commonly the same week of delivery week.



SERVOMECH S.p.A. - Bologna - ITALY

code

prod.

s. n.  wk/year

## 8.5 / Product supply information

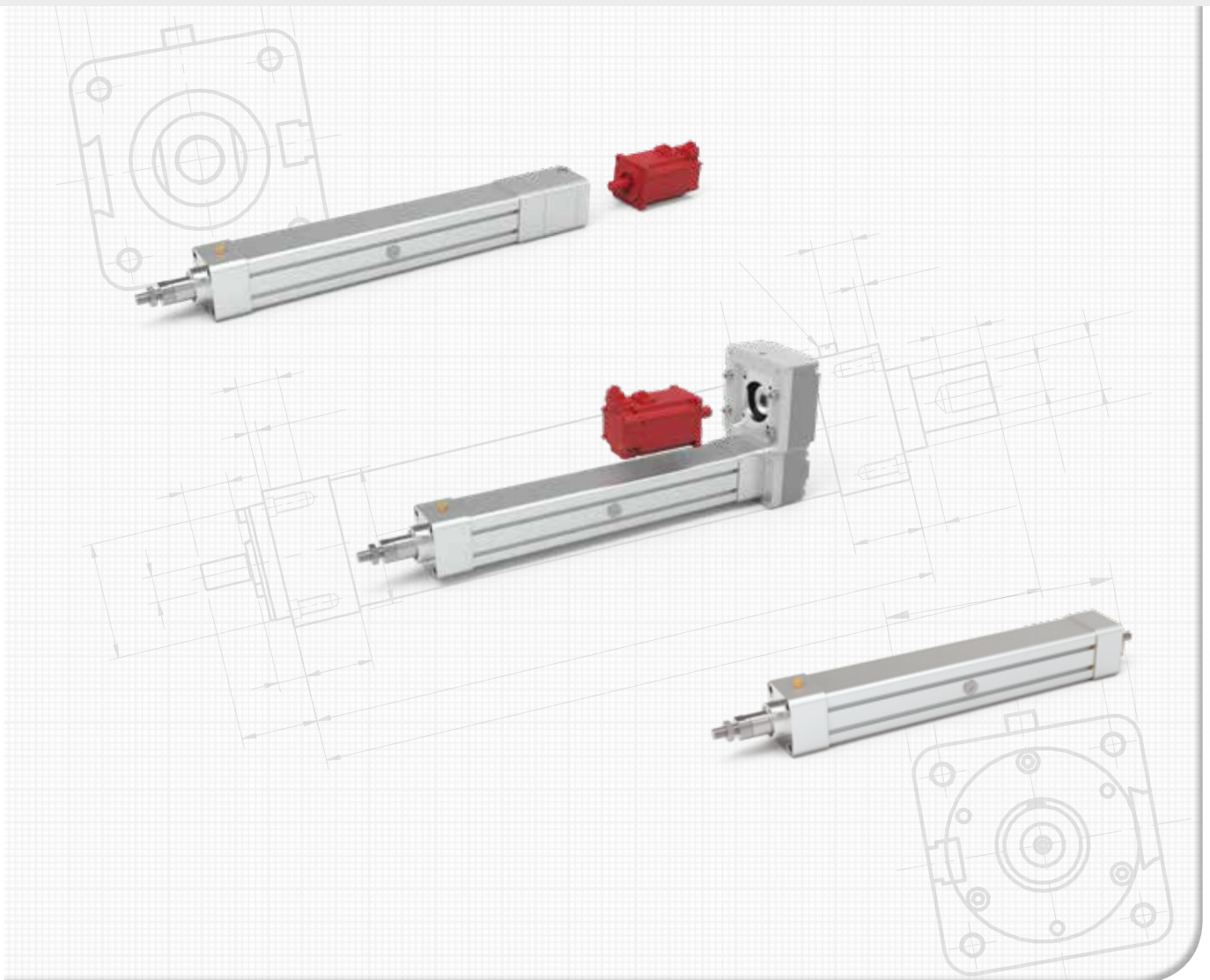
SERVOMECH linear actuators in standard execution are supplied in the set-up and finishing conditions shown below. For any special requests, please contact Servomech technical support.

- For each finished product, Servomech files a specific **test sheet** that is provided to the customer in the shipment together with the product and that certifies its conformity. The test sheet also contains important information for the correct functioning of the product itself.
- **Standard lubrication** according to the table (see Chap. 68.2 / Relubrication and maintenance). In case of special requirements (e.g. ambient temperature, food industry, environment with the presence of ionizing radiation, an environment that requires the use of biodegradable lubricants) the most suitable lubricant for the specific environment is evaluated. For more information and for any specific request, please contact SERVOMECH technical support.  
On request, specific lubricants agreed with the customer can be applied.
- **Shaft protection:** input shafts are protected with specific anti-rust products.
- **Packaging:** it is agreed with the customer and it is based on the size and quantity of the products, the final destination of the goods, and the type of transport. It is functional to preserve the goods until the destination with less possible impact on the product's value.

## 8.6 / Installation, operation and maintenance

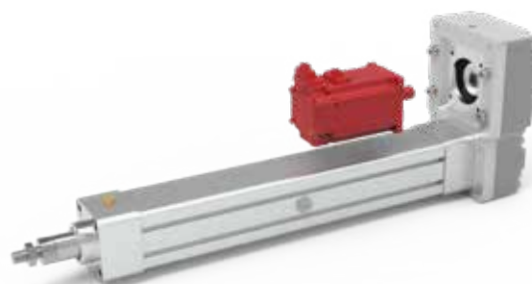
- We recommend carefully reading the product's **Installation, Operation and Maintenance Manual** before proceeding with any product-related operations. The manual is available on our website at [www.servomech.com/download](http://www.servomech.com/download) or by scanning the QR code directly on the product.
- It is recommended to exercise caution and care when **handling and transporting linear actuators** to avoid damaging mechanical parts and/or accessories and to prevent risks to personnel assigned to this activity. Refer to the product's Installation, Operation and Maintenance Manual.
- During **storage**, linear servoactuators must be protected from atmospheric agents and from the risk of dust or contaminants depositing on the stem, moving parts, and attachments. Please refer to the product's Installation, Operation and Maintenance Manual.
- In order to proceed correctly with the **installation and commissioning** of the product, we recommend that you follow the instructions given in the Installation, Operation and Maintenance Manual.
- Linear Servoactuators require **periodic maintenance**. For further details, please refer to the product's Installation, Operation and Maintenance Manual.

## 9 / Ordering code



**9.1 / Actuators SAM IL Series**


	<b>SAM 3 IL</b>	<b>BS 2</b>	<b>C 200</b>	<b>F3 14-30</b>	<b>TS CI</b>	<b>FCM</b>	<b>S</b>
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>1</b>	Actuator size			SAM IL 0, 1, 2, 3, 4, 5, 6			
<b>2</b>	Ball screw <i>(see Chap. 2.1 / Technical data SAM IL Series)</i>			BS1, BS2, BS3, BS4			
<b>3</b>	Stroke <i>(see Chap. 2.2 / Dimensions SAM IL Series)</i>			C____			
<b>4</b>	Motor attachment <i>(see Chap. 2.3 / Motor attachment SAM IL Series)</i>			F1____ , F2____ , F3____ , F4____			
<b>5</b>	Fixing accessories <i>(see Chap. 5 / Mounting options)</i> - Fixing end: - Main body:			TM, TS, TS90, FO, FO90, GA PBS, PBE, PBN, PBW, FL, FL90, CI, CI90			
<b>6</b>	Limit sensors <i>(see Chap. 6 / Limit sensors)</i>			FCM (NC), FCM (NO)			
<b>7</b>	IP rating <i>(see Chap. 8.2 / Actuator body IP rating)</i>			S (standard), X (IP65)			

**9.2 / Actuators SAM PD Series**


	<b>SAM 3 PD</b>	<b>RL</b>	<b>BS2</b>	<b>C 200</b>	<b>F3 14-30</b>	<b>TS CM</b>	<b>FCM</b>	<b>S</b>
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
<b>1</b>	Actuator size			SAM PD 0, 1, 2, 3, 4, 5, 6				
<b>2</b>	Ratio <i>(see Chap. 3.1 / Technical data SAM PD Series)</i>			RV, RN, RL				
<b>3</b>	Ball screw <i>(see Chap. 3.1 / Technical data SAM PD Series)</i>			BS1, BS2, BS3, BS4				
<b>4</b>	Stroke <i>(see Chap. 3.2 / Dimensions SAM PD Series)</i>			C____				
<b>5</b>	Motor attachment <i>(see Chap. 3.3 / Motor attachment SAM PD Series)</i>			F1____ , F2____ , F3____ , F4____				
<b>6</b>	Fixing accessories <i>(see Chap. 5 / Mounting options)</i> - Fixing end: - Main body:			TM, TS, TS90, FO, FO90, GA PB, FL, FL90, CM, CM90, CMS, CMS90, CF, CF90				
<b>7</b>	Limit sensors <i>(see Chap. 6 / Limit sensors)</i>			FCM, FTV				
<b>8</b>	IP rating <i>(see Chap. 8.2 / Actuator body IP rating)</i>			S (standard)				

## 9.3 / Actuators SAM Series



	SAM 3	BS 2	C 200	TS CI	FCM	S
	1	2	3	4	5	6
1	Actuator size			SAM 0, 1, 2, 3, 4, 5, 6		
2	Ball screw <i>(see Chap. 4.1 / Technical data SAM Series)</i>			BS1, BS2, BS3, BS4		
3	Stroke <i>(see Chap. 4.2 / Dimensions SAM Series)</i>			C____		
4	Fixing accessories <i>(see Chap. 5 / Mounting options)</i> - Fixing end: - Main body:			TM, TS, TS90, FO, FO90, GA PBS, PBE, PBN, PBW, FL, FL90, CI, CI90		
5	Limit sensors <i>(see Chap. 6 / Limit sensors)</i>			FCM, FTV		
6	IP rating <i>(see Chap. 8.2 / Actuator body IP rating)</i>			S (standard), X (IP65)		

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[www.servomech.com](http://www.servomech.com)





**35**  
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Illustrazione