LINEAR SERVOACTUATORS

CATALOGUE

SAM IL Series

SA IL Series

SAM PD Series

SA PD Series

SA Series

new ideas in linear motion

Linearmech linear servoactuators are **high performances** electromechanical cylinders, ball screw drive, motorized with brushless servomotors. Specifically developed for applications with high dynamics, this range of electromechanical cylinders is produced with **totally innovative solutions** if compared to more traditional electromechanical cylinders. All internal components are designed and built for maximum performance: **high speed, low inertia, high accuracy and repeatability in positioning, reliability and lifetime.**

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.

In the design and construction of this range of linear servoactuators, **Servomech** can count on its know-how and expertise from **thirty years of experience** in the field of electromechanical actuators, ball screws and a steady application experience on field. The result is an innovative product, with distinctive features and performances.

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.

Five reasons to prefer Servomech electromechanical cylinders to traditional hydraulic and pneumatic cylinders.

More informations on **www.servomech.com**

1. GREATER ENERGY EFFICIENCY WITH REDUCED ENERGY CONSUMPTION
2. GREATER CONTROL: POSITION - SPEED - FORCE
3. POSITIONING ACCURACY AND REPEATABILITY
4. GREATER SAFETY AND RELIABILITY
5. EASIER INSTALLATION AND LOWER MAINTENANCE COSTS

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.

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.

/ Product overview

Linearmech servoactuators product range of is based upon **5 series**, differentiated by design, mounting position and input drive.

SA IL Series

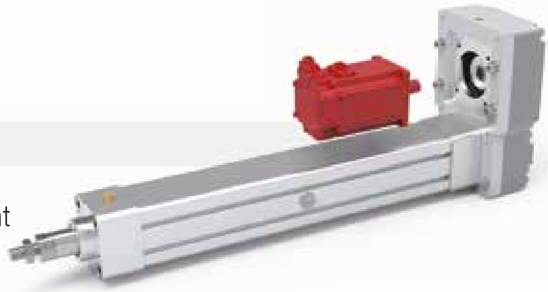
- Linear servoactuators with brushless motors
- In-line motor
- Transmission of motion by torsionally rigid coupling
- Linear unit to fit Linearmech brushless servomotor only, motor included
  Available for domestic market ONLY

SA PD Series

- Linear servoactuators with brushless motors
- Parallel motor
- Transmission of motion by high performance and accuracy timing belt
- Linear unit to fit Linearmech brushless servomotor only, motor included
  Available for domestic market ONLY

SAM IL Series

- Linear servoactuators with universal motor attachment for servomotors
- Prepared to easy-fit third party servomotors
- In-line motor
- Transmission of motion by torsionally rigid coupling



SAM PD Series

- Linear servoactuators with universal motor attachment for servomotors
- Prepared to easy-fit third party servomotors
- Parallel motor
- Transmission of motion by high performance and accuracy timing belt

SA 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_0 × Ph [mm]
SA • SAM 0	**Ø 32**	**Ø 20**	12 × 5
			12 × 10
SA • SAM 1	**Ø 40**	**Ø 22**	14 × 5
			14 × 10
SA • SAM 2	**Ø 50**	**Ø 25**	16 × 5
			16 × 10
			16 × 16
SA • SAM 3	**Ø 63**	**Ø 30**	20 × 5
			20 × 10
			20 × 20
SA • SAM 4	**Ø 80**	**Ø 35**	25 × 5
			25 × 10
			25 × 25
SA • SAM 5	**Ø 100**	**Ø 50**	32 × 5
			32 × 10
			32 × 20
			32 × 32
SA • SAM 6	**Ø 125**	**Ø 60**	40 × 5
			40 × 10
			40 × 20
			40 × 40

/ 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.

/ 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 mouting) and on the presence of the motor in the supply (motor included or linear unit prepared to fit third-party motor).

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***

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 $d_0 \times P_h$	[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 (1)		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^{-1}]	6000	6000	5000	5000	4500	4500	4500	3600	3600	3600
Max. acceleration a_{max}	[m/s^2]	10	10	10	10	10	10	10	10	10	10
Total actuator efficiency η		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_0 ref. to 0 mm stroke actuator	[kg×m^2]×10^{-4}	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^2]×10^{-4}	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^{-1}]	-		-		4500	4500	4500	3600	3600	3600
Max. acceleration a_{max}	[m/s^2]	-		-		10	10	10	10	10	10
Total actuator efficiency η		-		-		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_0 ref. to 0 mm stroke actuator	[kg×m^2]×10^{-4}	-		-		0.326	0.340	0.369	1.061	1.085	1.174
J_{100} each 100 mm extra-stroke	[kg×m^2]×10^{-4}	-		-		0.045	0.049	0.057	0.11	0.12	0.13

m_0 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		

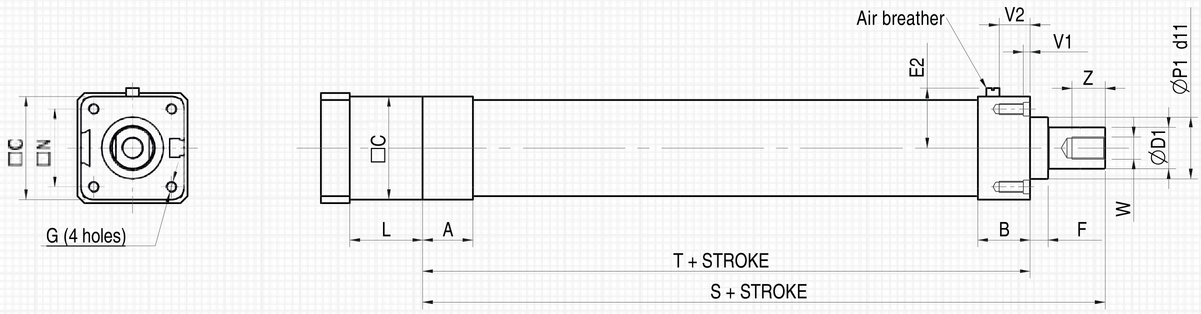
J_0 - *Moment of inertia of the actuator reduced to motor shaft referred to 0 mm stroke actuator*
J_{100} - *Moment of inertia of the actuator referred to each 100 mm extra-stroke*
m_0 - *Mass in linear motion referred to 0 mm stroke actuator*
m_{100} - *Mass in linear motion referred to each 100 mm extra-stroke*

SIZE		SAM 4 IL			SAM 5 IL				SAM 6 IL			
Profile ISO 15552	[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 $d_0 \times P_h$	[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
Ratio u		1			1				1			
Linear travel for 1 motor shaft revolution	[mm]	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)	[N]	6730	6870	3120	10680	15330	7820	4910	11740	19790	10220	5140
Max. input torque T_{max}	[Nm]	7.3	13.5	15	11.8	30	30	30	14.4	40	40	40
Max. linear speed v_{max}	[mm/s]	250	500	1250	230	470	930	1490	190	370	750	1500
Max. rotational speed n_{max}	[min^{-1}]	3000	3000	3000	2800	2800	2800	2800	2250	2250	2250	2250
Max. acceleration a_{max}	[m/s^2]	10	10	10	10	10	10	10	10	10	10	10
Total actuator efficiency η		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
J_0 ref. to 0 mm stroke actuator	[kg×m^2]×10^{-4}	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	[kg×m^2]×10^{-4}	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)	[N]	6730	6870	6313	10680	17170	10550	6635	11740	19870	15920	9980
Max. input torque T_{max}	[Nm]	7.3	13.5	29.5	11.8	33.5	40	40	14.4	40.1	60.8	75
Max. linear speed v_{max}	[mm/s]	250	500	1250	230	470	930	1490	190	370	750	1500
Max. rotational speed n_{max}	[min^{-1}]	3000	3000	3000	2800	2800	2800	2800	2250	2250	2250	2250
Max. acceleration a_{max}	[m/s^2]	10	10	10	10	10	10	10	10	10	10	10
Total actuator efficiency η		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
J_0 ref. to 0 mm stroke actuator	[kg×m^2]×10^{-4}	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	[kg×m^2]×10^{-4}	0.27	0.28	0.31	0.69	0.71	0.75	0.84	1.8	1.8	1.8	2.1
m_0 ref. to 0 mm stroke	[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			
Weight of 100 mm stroke actuator (3)	[kg]	10.4			20				36			
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*

2.2 / Dimensions SAM IL Series

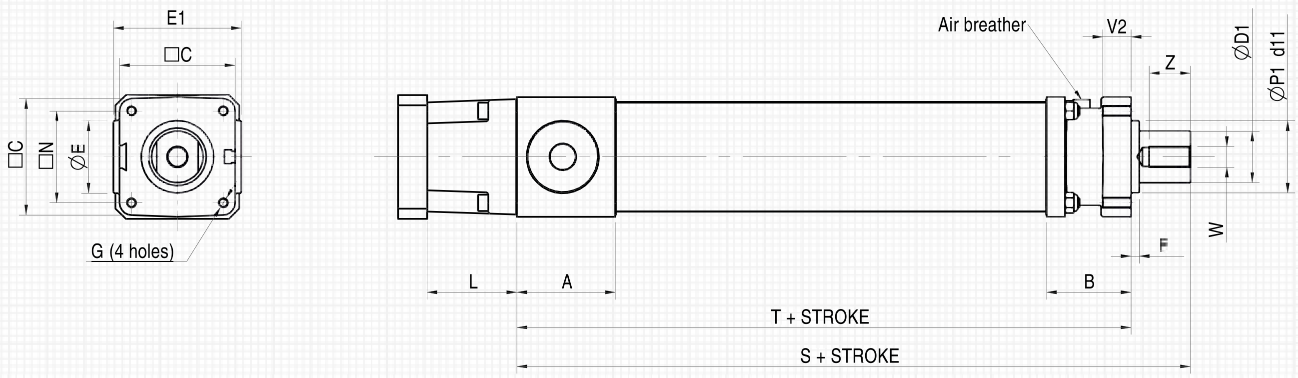
SAM 0 - 1 - 2 - 3 - 4 IL



Ordering code stroke:

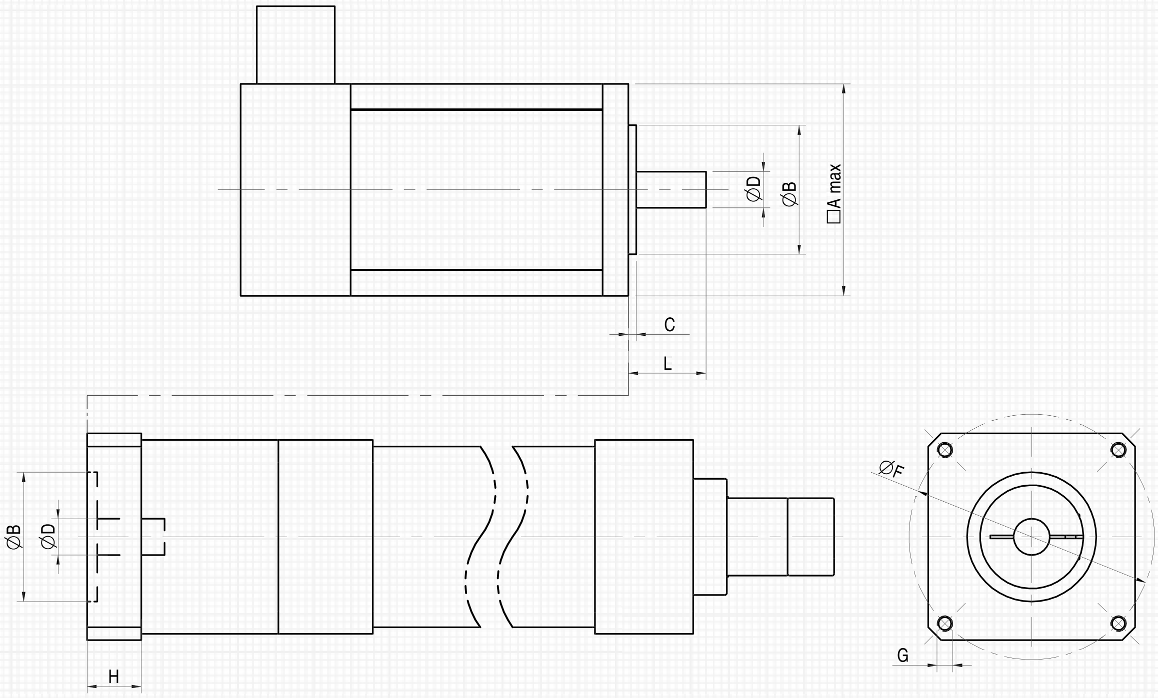
C	200
	Stroke in mm

SAM 5 - 6 IL



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	-	-	-	-	-	70	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:

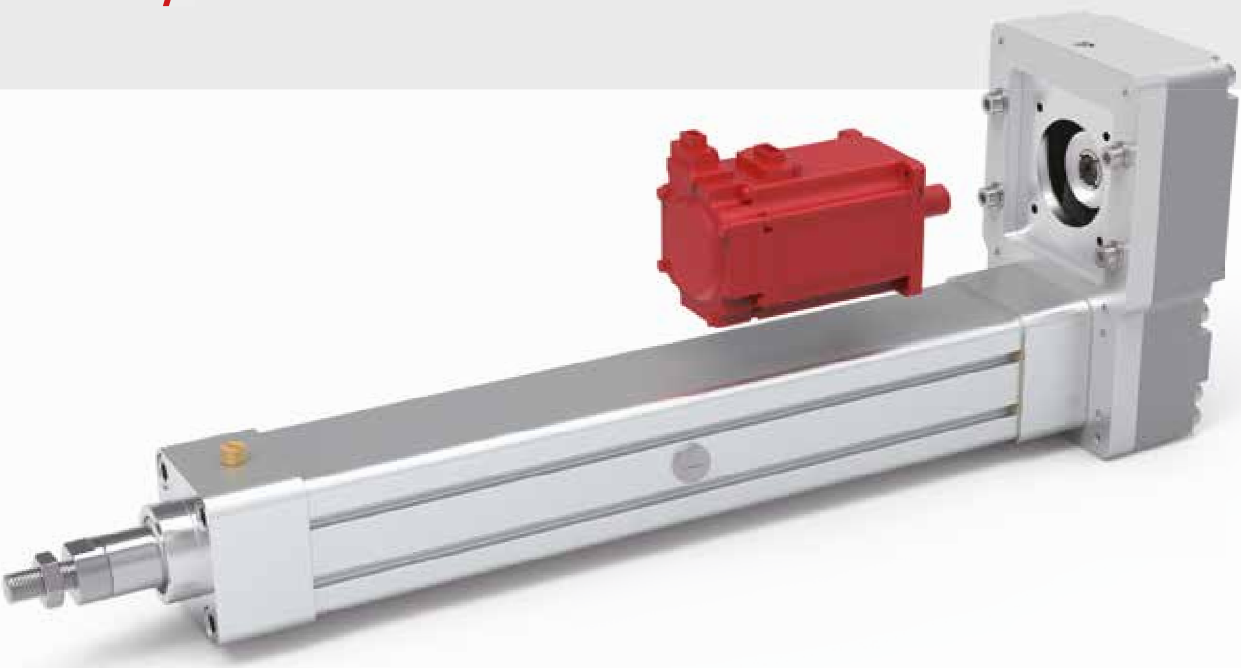
F2	24	-	50
1	2	-	3

1 - Flange code
2 - Shaft diameter 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 IL	F1	45	Ø30	2.5	Ø45 × M3	19	Ø8×20 - Ø8×25
	F2	45	Ø30	2.5	Ø46 × M4	19	Ø6×25 - Ø8×18- Ø8×25
SAM 1 IL	F1	65	Ø40	2.5	Ø63 × M5	23	Ø9×20 - Ø11×23 - Ø14×30
	F2	65	Ø50	3	Ø70 × M5	23	Ø8×25 - Ø11×30 - Ø14×30 - Ø14×31
SAM 2 IL	F1	65	Ø40	2.5	Ø63 × M5	18	Ø11×23 - Ø14×30
	F2	65	Ø50	3	Ø70 × M5	18	Ø8×25 - Ø11×30 - Ø14×30 - Ø14×31
	F3	75	Ø60	3	Ø75 × M5	22	Ø11×23 - Ø14×30
SAM 3 IL	F1	75	Ø60	3	Ø75 × M5	21	Ø14×30
	F2	80	Ø70	3	Ø90 × M6	26	Ø11×30 - Ø14×30 - Ø19×35
						33	Ø16×40 - Ø19×40
	F3	82	Ø50	3	Ø95 × M6	21	Ø14×30
	F4	96	Ø80	3	Ø100 × M6	26	Ø14×30 - Ø16×35 - Ø19×35
						33	Ø14×37 - Ø16×40 - Ø19×40
SAM 4 IL	F1	96	Ø80	3	Ø100 × M6	26	Ø16×35 - Ø16×40 - Ø19×35 - Ø19×40
	F2	105	Ø95	3	Ø115 × M8	30	Ø19×40 - Ø19×45 - Ø22×45 - Ø24×45
						37	Ø19×50 - Ø24×50
						42	Ø19×55
	F3	126	Ø95	3	Ø130 × M8	37	Ø24 × 50
	F4	126	Ø110	3.5	Ø130 × M8	37	Ø19×40 - Ø24×50
SAM 5 IL	F1	120	Ø95	3	Ø130 × M8	28	Ø24 × 50
	F2	126	Ø110	3.5	Ø130 × M8	28	Ø19×40 - Ø24×50
	F3	130	Ø110	3.5	Ø145 × M8	30	Ø16×40 - Ø19×40
						43	Ø19×58 - Ø22×55 - Ø22×58 - Ø24×58 Ø24×65 - Ø28×55 - Ø28×63
	F4	140	Ø110	3.5	Ø165 × M10	39	Ø24×50
	F5	155	Ø130	3.5	Ø165 × M10	39	Ø24×50 - Ø28×60 - Ø32×58
						59	Ø32×80
SAM 6 IL	F1	140	Ø110	3.5	Ø165 × M10	34	Ø24×50
	F2	155	Ø130	3.5	Ø165 × M10	34	Ø24×50 - Ø28×60 - Ø32×58
						54	Ø32×80
	F3	163	Ø155	4	Ø190 × M10	34	Ø32×60
	F4	180	Ø114.3	3.5	Ø200 × M12	52	Ø35×65 - Ø35×70 - Ø35×79 - Ø35×80
	F5	200	Ø180	4	Ø215 × M12	52	Ø28×60 - Ø32×58 - Ø38×80

3 / ACTUATORS SAM PD Series



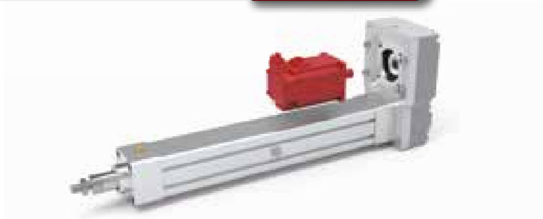
3.1 / Technical data **SAM PD** Series

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 $d_0 \times P_h$	[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 (1)		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⁻¹]	6000	6000	5000	5000	4500	4500	4500	3600	3600	3600
Max. acceleration a_{max}	[m/s²]	10	10	10	10	10	10	10	10	10	10
Total actuator efficiency η		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_0 ref. to 0 mm stroke actuator	[kg×m²]×10⁻⁴	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×m²]×10⁻⁴	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⁻¹]	6000	6000	6000	6000	6000	6000	6000	5540	5540	5540
Max. acceleration a_{max}	[m/s²]	10	10	10	10	10	10	10	10	10	10
Total actuator efficiency η		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_0 ref. to 0 mm stroke actuator	[kg×m²]×10⁻⁴	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×m²]×10⁻⁴	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⁻¹]	-		-		6000	6000	6000	6000	6000	6000
Max. acceleration a_{max}	[m/s²]	-		-		10	10	10	10	10	10
Total actuator efficiency η		-		-		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_0 ref. to 0 mm stroke actuator	[kg×m²]×10⁻⁴	-		-		0.317	0.320	0.328	1.314	1.321	1.346
J_{100} each 100 mm extra-stroke	[kg×m²]×10⁻⁴	-		-		0.012	0.013	0.015	0.032	0.033	0.038

m_0 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_0 *- 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_0 *- 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



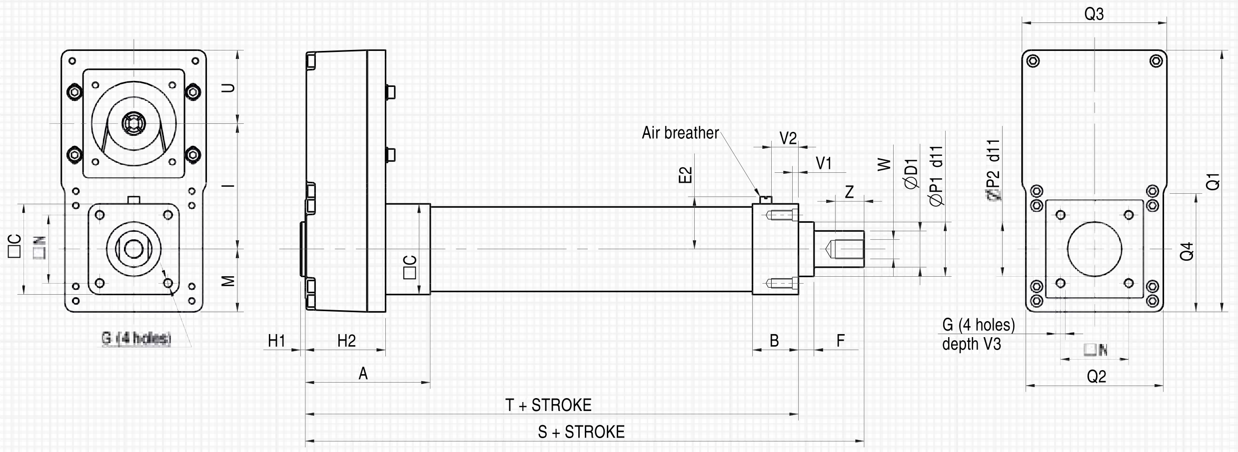
SIZE		SAM 4 PD			SAM 5 PD				SAM 6 PD				SAM 6 PD (*)			
Profile ISO 15552	[mm]	Ø80			Ø100				Ø125				Ø125			
Rod diameter	[mm]	Ø35			Ø50				Ø60				Ø60			
Ball screw BS		BS1	BS2	BS3	BS1	BS2	BS3	BS4	BS1	BS2	BS3	BS4	BS1	BS2	BS3	BS4
Diameter × Lead $d_0 \times P_h$	[mm]	25×5	25×10	25×25	32×5	32×10	32×20	32×32	40×5	40×10	40×20	40×40	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	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	[N]	14500	14800	13600	23000	37000	29800	35000	25300	42800	34300	40300	25300	42800	34300	40300
Static load C_{0a}	[N]	31500	28000	27300	60200	66800	53200	58100	76900	88900	70000	77100	76900	88900	70000	77100
Ratio u	RV	1 (40:40)			1 (32:32)				1 (36:36)				1 (36:36)			
Linear travel for 1 motor shaft rev	[mm]	5	10	25	5	10	20	32	5	10	20	40	5	10	20	40
Max. force F_{max} (2)	[N]	6730	6870	3080	10670	17170	9540	6000	11740	19860	12000	6120	11740	19860	15920	10920
Max. input torque T_{max}	[Nm]	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}	[mm/s]	250	500	1250	230	470	930	1490	190	370	750	1500	190	370	750	1500
Max. rotational speed n_{max}	[min^{-1}]	3000	3000	3000	2800	2800	2800	2800	2250	2250	2250	2250	2250	2250	2250	2250
Max. acceleration a_{max}	[m/s^2]	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Total actuator efficiency η		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	[Nm]	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_0 ref. to 0 mm stroke actuator	[kgxm^2]x10^{-4}	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	[kgxm^2]x10^{-4}	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)			1.5 (36:24)				1.467 (44:30)				1.467 (44:30)			
Linear travel for 1 motor shaft rev	[mm]	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)	[N]	6730	6870	2880	10670	17020	8680	5440	11740	19860	13560	6910	11740	19860	15920	12420
Max. input torque T_{max}	[Nm]	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}	[mm/s]	250	500	1250	230	470	930	1490	190	370	750	1500	190	370	750	1500
Max. rotational speed n_{max}	[min^{-1}]	4400	4400	4400	4200	4200	4200	4200	3300	3300	3300	3300	3300	3300	3300	3300
Max. acceleration a_{max}	[m/s^2]	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Total actuator efficiency η		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	[Nm]	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_0 ref. to 0 mm stroke actuator	[kgxm^2]x10^{-4}	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	[kgxm^2]x10^{-4}	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)			2 (48:24)				2 (60:30)				2 (60:30)			
Linear travel for 1 motor shaft rev	[mm]	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)	[N]	6730	6870	3927	10670	17170	11580	7260	11740	19860	15920	9420	11740	19860	15920	16940
Max. input torque T_{max}	[Nm]	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}	[mm/s]	250	500	1250	230	470	930	1490	190	370	750	1500	190	370	750	1500
Max. rotational speed n_{max}	[min^{-1}]	6000	6000	6000	5600	5600	5600	5600	4500	4500	4500	4500	4500	4500	4500	4500
Max. acceleration a_{max}	[m/s^2]	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Total actuator efficiency η		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	[Nm]	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_0 ref. to 0 mm stroke actuator	[kgxm^2]x10^{-4}	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	[kgxm^2]x10^{-4}	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_0 ref. to 0 mm stroke	[kg]	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	[kg]	0.24			0.49				0.62				0.62			
Weight of 100 mm stroke actuator (3)	[kg]	13.5			26				46				46			
Weight for each 100 mm extra-stroke	[kg]	1.1			1.9				2.7				2.7			

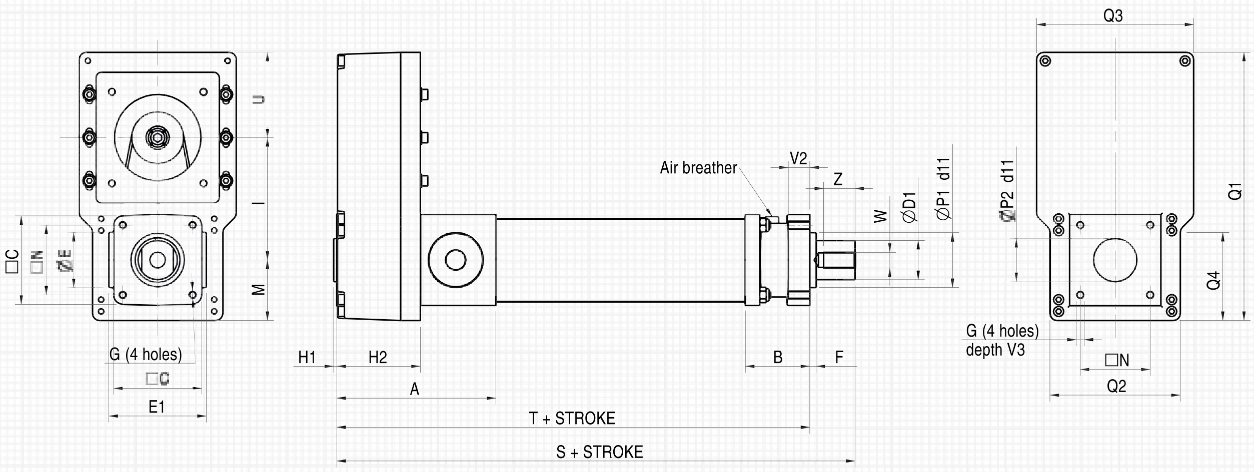
(1) - *Ball screws with accuracy grade IT 3 or IT 5 available on demand*
(2) - *Values highlighted in **orange**: force limit due to mechanical transmission*
*Values highlighted in **yellow**: force limit due to a ball screw life of 10 million revolutions*
(3) - *Weight of the actuator without fixing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

3.2 / Dimensions SAM PD Series

SAM 0 - 1 - 2 - 3 - 4 PD



SAM 5 - 6 PD

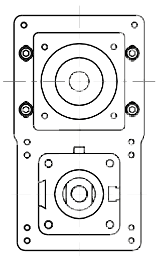


Ordering code stroke:

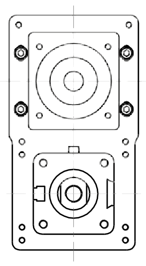
C	200
	Stroke in mm

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	-	-	-	-	-	70	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	246	256	277	308	F1,F2: 369 F3,F4: 374	502	601
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

Limit switches slot position

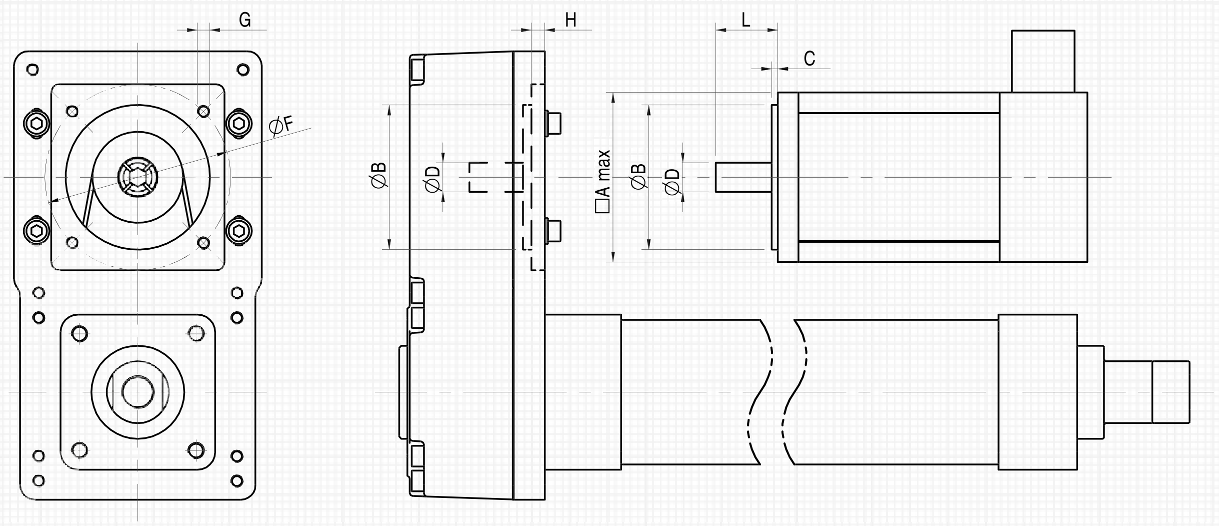


PW



PE

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

NOTA - *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
	F3	75	Ø60	3	Ø75 × M5	7.5	Ø11×23 - Ø14×30
SAM 3 PD	F1	82	Ø60	3	Ø75 × M5	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
						-0.5	Ø14×37 - Ø16×40 - Ø19×40
SAM 4 PD	F1	105	Ø80	3	Ø100 × M6	20.5	Ø16×35 - Ø19×35
						10.5	Ø16×40 - Ø19×40
	F2	105	Ø95	3	Ø115 × M8	10.5	Ø19×40 - Ø19×45 - Ø22×45 - Ø24×45
						3.5	Ø19×50 - Ø24×50
						-1.5	Ø19×55
	F3	126	Ø95	3	Ø130 × M8	10.5	Ø24 × 50
	F4	126	Ø110	3.5	Ø130 × M8	10.5	Ø19×40 - Ø24×50
SAM 5 PD	F1	155	Ø95	3	Ø130 × M8	14.5	Ø24 × 50
	F2	155	Ø110	3.5	Ø130 × M8	20.5	Ø19×40
						14.5	Ø24×50
	F3	155	Ø110	3.5	Ø145 × M8	20.5	Ø16×40 - Ø19×40
						14.5	Ø19×58 - Ø22×55 - Ø22×58 - Ø24×58 - Ø28×55 - Ø28×63
						1.5	Ø24×65
	F4	155	Ø110	3.5	Ø165 × M10	14.5	Ø24×50
	F5	155	Ø130	3.5	Ø165 × M10	14.5	Ø24×50 - Ø28×60 - Ø32×58
						-5.5	Ø32×80
SAM 6 PD	F1	196	Ø110	3.5	Ø165 × M10	15	Ø24×50
	F2	196	Ø130	3.5	Ø165 × M10	15	Ø24×50 - Ø28×60 - Ø32×58
						0	Ø32×80
	F3	196	Ø155	4	Ø190 × M10	15	Ø32×60
	F4	196	Ø114.3	3.5	Ø200 × M12	15	Ø35×65 - Ø35×70 - Ø35×79 - Ø35×80
	F5	196	Ø180	4	Ø215 × M12	15	Ø28×60 - Ø32×58 - Ø38×80

4 / ACTUATORS SA Series

4.1 / Technical data **SA** Series

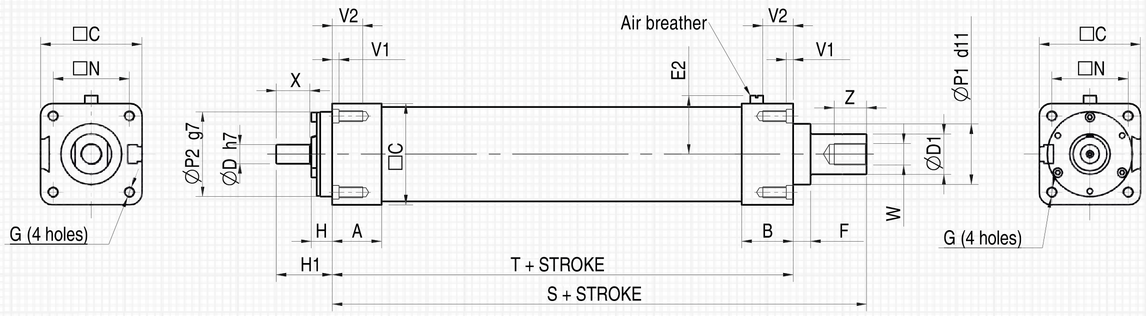
SIZE		SA 0		SA 1		SA 2			SA 3		
Profile ISO 15552	[mm]	Ø32		Ø40		Ø50			Ø63		
Rod diameter	[mm]	Ø20		Ø22		Ø25			Ø30		
Ball screw BS		BS1	BS2	BS1	BS2	BS1	BS2	BS3	BS1	BS2	BS3
Diameter × Lead $d_0 \times P_h$	[mm]	12×5	12×10	14×5	14×10	16×5	16×10	16×16	20×5	20×10	20×20
Ball diameter D_w	[mm]	Ø 2.381		Ø3.175		Ø3.175			Ø3.175		
Accuracy grade (1)		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^{-1}]	6000	6000	5000	5000	4500	4500	4500	3600	3600	3600
Max. acceleration a_{max}	[m/s^2]	10	10	10	10	10	10	10	10	10	10
Total actuator efficiency η		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_0 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_0 referred to 0 mm stroke actuator	[$kg \times m^2$]$\times 10^{-4}$	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	[$kg \times m^2$]$\times 10^{-4}$	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		SA 4			SA 5				SA 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 $d_0 \times P_h$	[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^{-1}]	3000	3000	3000	2800	2800	2800	2800	2250	2250	2250	2250
Max. acceleration a_{max}	[m/s^2]	10	10	10	10	10	10	10	10	10	10	10
Total actuator efficiency η		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^2]×10^{-4}	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^2]×10^{-4}	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 SA Series

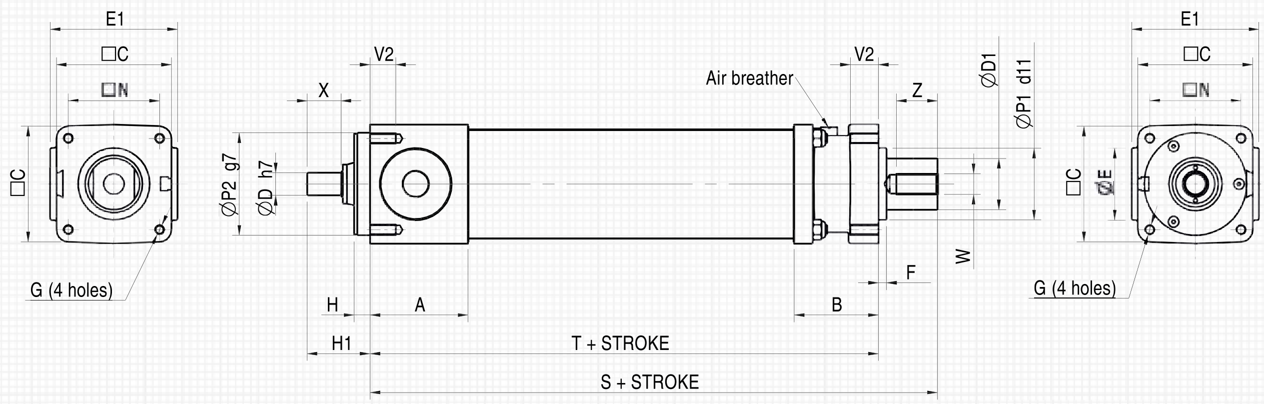
SA 0 - 1 - 2 - 3 - 4



Ordering code stroke:

C	200
	Stroke in mm

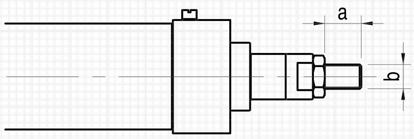
SA 5 - 6



SIZE	SA 0	SA 1	SA 2	SA 3	SA 4	SA 5	SA 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
ØE	-	-	-	-	-	70	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

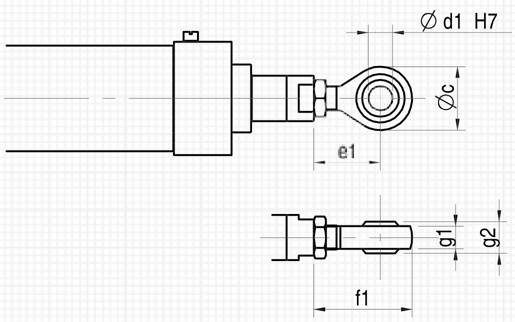
5.1 / Male threaded rod end **TM**



Ordering code: TM

SIZE	SA / SAM 0	SA / SAM 1	SA / SAM 2	SA / SAM 3	SA / SAM 4	SA / SAM 5	SA / 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

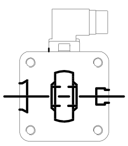
5.2 / Ball joint rod end **TS**



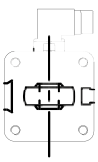
SIZE	SA / SAM 0	SA / SAM 1	SA / SAM 2	SA / SAM 3	SA / SAM 4	SA / SAM 5	SA / SAM 6
Ø c [mm]	28	32	32	42	50	50	70
Ø d1 [mm]	10	12	12	16	20	20	30
e1 [mm]	35	36	36	44	50	50	125
f1 [mm]	49	52	52	65	75	75	160
g1 [mm]	10.5	12	12	15	18	18	25
g2 [mm]	14	16	16	21	25	25	37

Ordering code: TS or TS90

SA IL Series • **SAM IL** Series

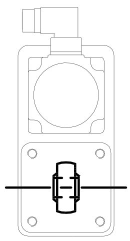


TS

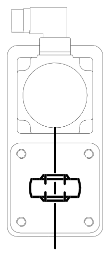


TS90

SA PD Series • **SAM PD** Series

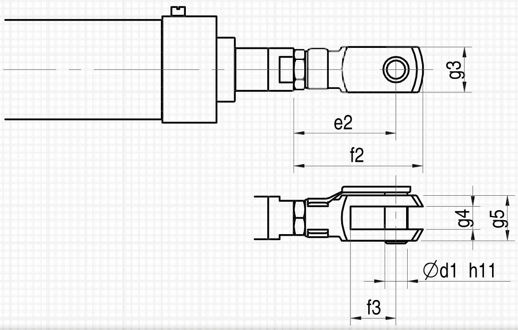


TS



TS90

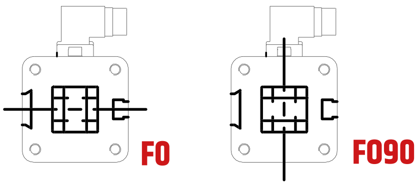
5.3 / Clevis rod end **FO**



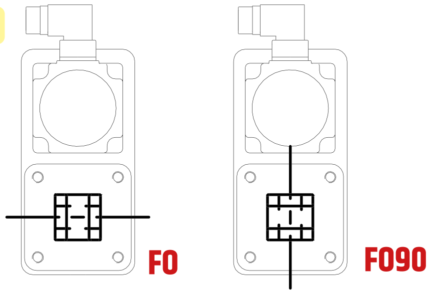
SIZE	SA / SAM 0	SA / SAM 1	SA / SAM 2	SA / SAM 3	SA / SAM 4	SA / SAM 5	SA / SAM 6
Ø d1 [mm]	10	12	12	16	20	20	30
e2 [mm]	46	55	55	72	89	89	122
f2 [mm]	58	69	69	91	114	114	160
f3 [mm]	20	24	24	32	40	40	54
g3 [mm]	20	24	24	32	40	40	55
g4 [mm]	10	12	12	16	20	20	30
g5 [mm]	20	24	24	32	40	40	55

Ordering code: FO or FO90

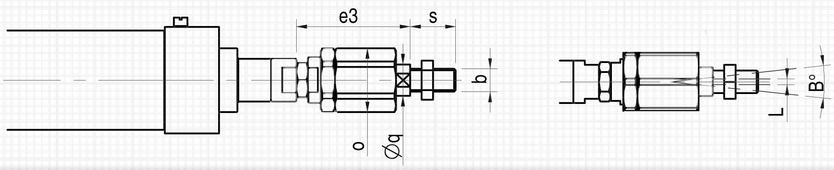
SA IL Series • SAM IL Series



SA PD Series • SAM PD Series



5.4 / Self-aligning joint **GA**

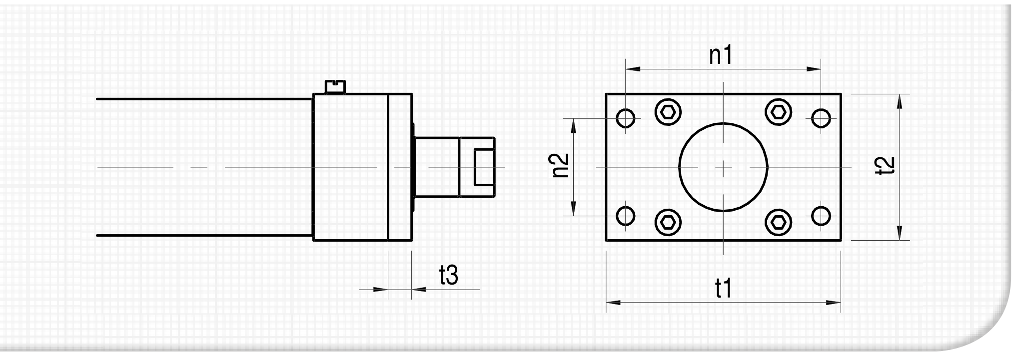


SIZE	SA / SAM 0	SA / SAM 1	SA / SAM 2	SA / SAM 3	SA / SAM 4	SA / SAM 5	SA / SAM 6
b [mm]	M10×1.25	M12×1.25	M12×1.25	M16×1.5	M20×1.5	M20×1.5	M27×2
e3 [mm]	57.5	58.5	58.5	80	88	88	105
o [mm]	32	32	32	45	45	45	70
Ø q [mm]	14	14	14	22	22	22	32
s [mm]	20	24	24	32	40	40	54
ß [°] (*)	8°	8°	8°	6°	6°	6°	8°
L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

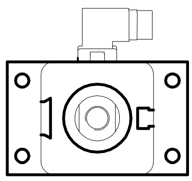
5.5 / Plate mount **FL**



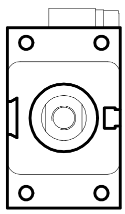
SIZE	SA / SAM 0	SA / SAM 1	SA / SAM 2	SA / SAM 3	SA / SAM 4	SA / SAM 5	SA / SAM 6
Ø n [mm]	7	9	9	9	12	14	16
n1 [mm]	64	72	90	100	126	150	180
n2 [mm]	32	36	45	50	63	75	90
t1 [mm]	80	90	110	120	150	170	205
t2 [mm]	45	52	65	75	95	115	140
t3 [mm]	10	10	12	12	16	16	20

Ordering code: FL or FL90

SA IL Series • **SAM IL** Series

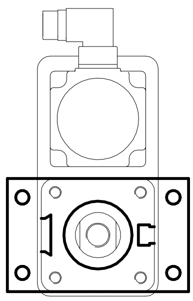


FL

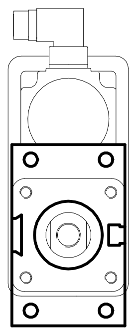


FL90

SA PD Series • **SAM PD** Series



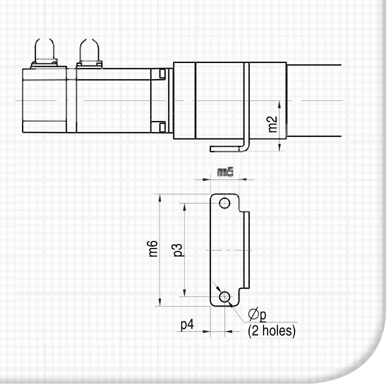
FL



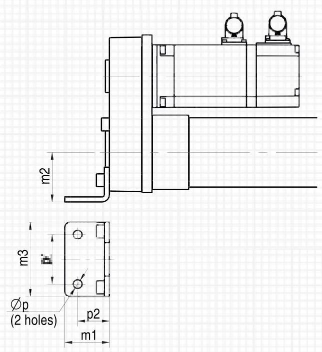
FL90

5.6 / Foot mount PB

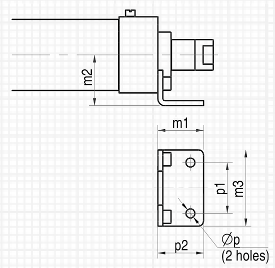
Actuators **IL** version
Rear fixing



Actuators **PD** version
Rear fixing



Actuators **IL** and **PD** version
Front fixing

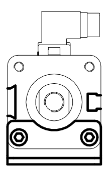


SIZE	SA / SAM 0	SA / SAM 1	SA / SAM 2	SA / SAM 3	SA / SAM 4	SA / SAM 5	SA / SAM 6
m1 [mm]	35	36	47	45	55	57	70
m2 [mm]	32	36	45	50 (55) *	63 (68) *	71 (81) *	90 (100) *
m3 [mm]	45	52	65	75	95	115	140
m4 [mm]	31	34	38	38	44	44	66
m5 [mm]	22	25	28	28	32	32	50
m6 [mm]	75	82	100	110	147	172	210
Ø p [mm]	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

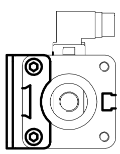
***(*)** Value in brackets valid for SAM actuator*

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

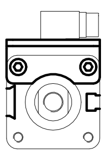
SA IL Series • SAM IL Series



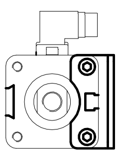
PBS



PBW

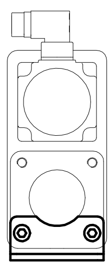


PBN

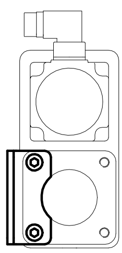


PBE

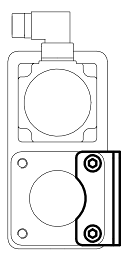
SA PD Series



PBS

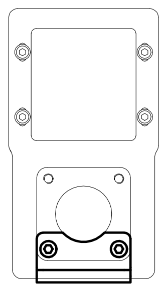


PBW



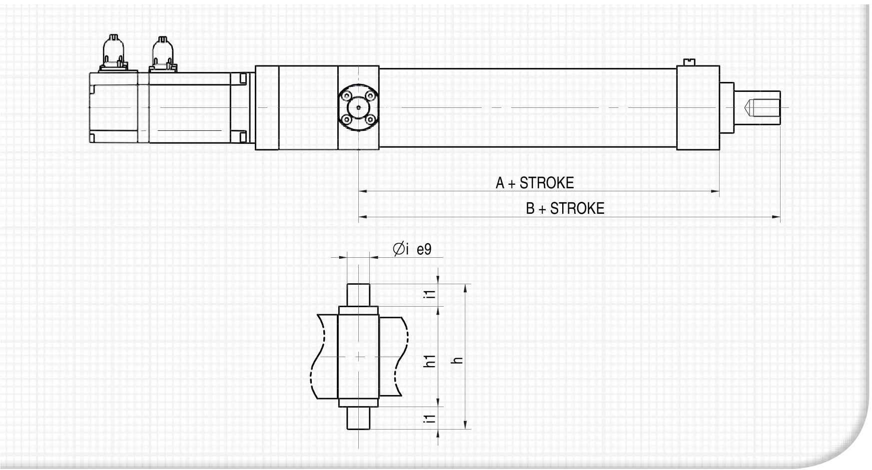
PBE

SAM PD Series



PB

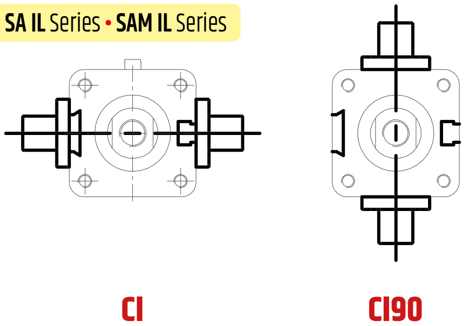
5.7 / Trunnion mount **CI**



Available only for **IL** version actuators

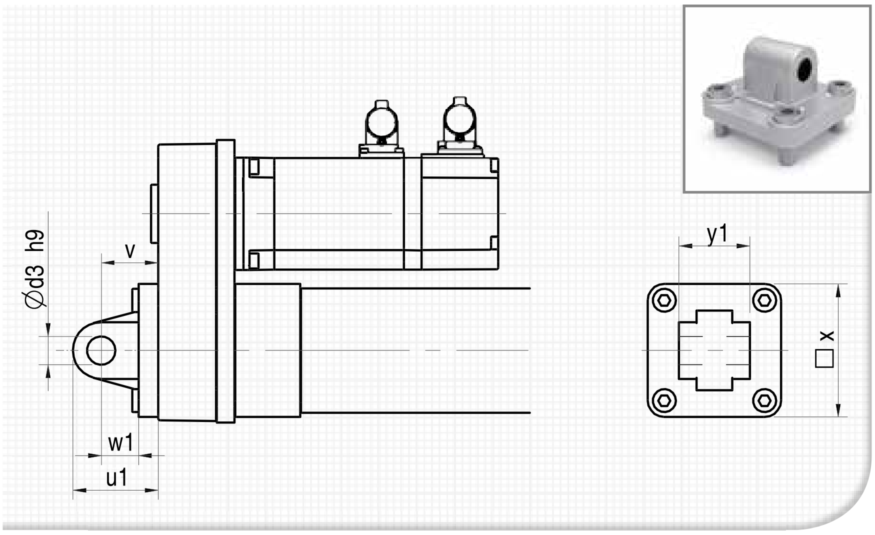
Ordering code: CI or CI90

SA IL Series • **SAM IL** Series



SIZE	SA / SAM 0	SA / SAM 1	SA / SAM 2	SA / SAM 3	SA / SAM 4	SA / SAM 5	SA / SAM 6
A [mm]	188	190	198	222	260	351	419
B [mm]	215	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	60	104	132	160

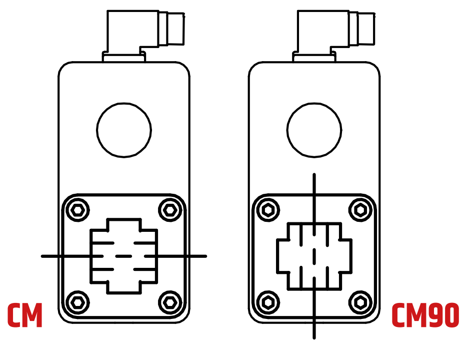
5.8 / Rear hinge **CM**



Available only for **PD** version actuators

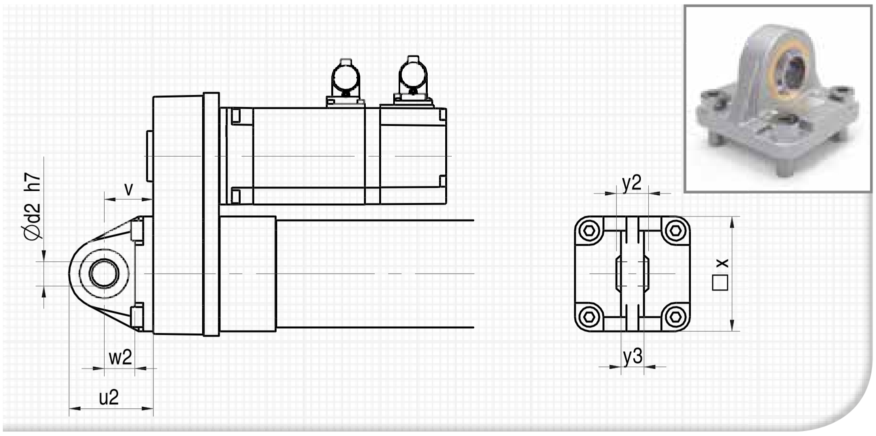
Ordering code: CM or CM90

SA PD Series • **SAM PD** Series



SIZE	SA / SAM 0	SA / SAM 1	SA / SAM 2	SA / SAM 3	SA / SAM 4	SA / SAM 5	SA / 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

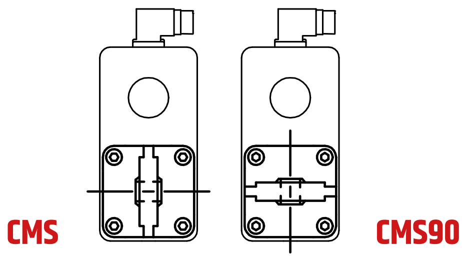
5.9 / Rear hinge with ball joint **CMS**



Available only for **PD** version actuators

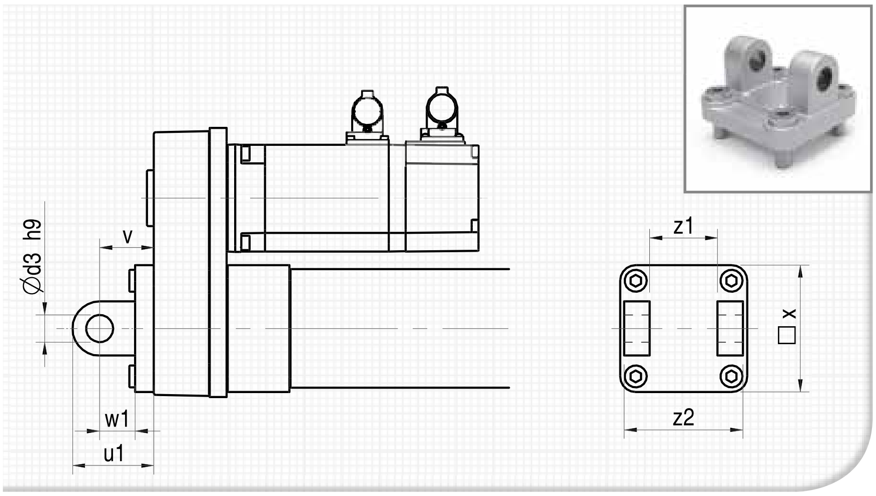
Ordering code: CMS or CMS90

SA PD Series • **SAM PD** Series



SIZE	SA / SAM 0	SA / SAM 1	SA / SAM 2	SA / SAM 3	SA / SAM 4	SA / SAM 5	SA / SAM 6
Ø 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
☐ 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

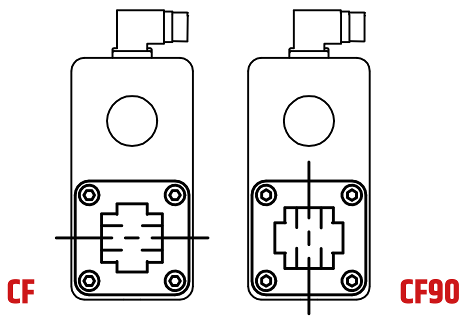
5.10 / Rear clevis **CF**



Available only for **PD** version actuators

Ordering code: CF or CF90

SA PD Series • **SAM PD** Series

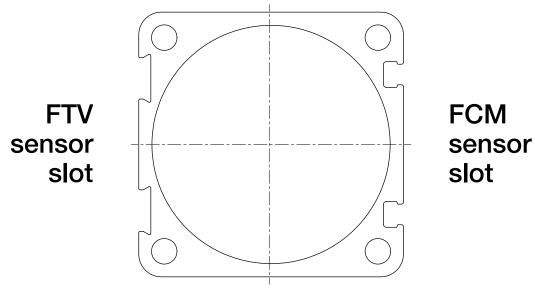


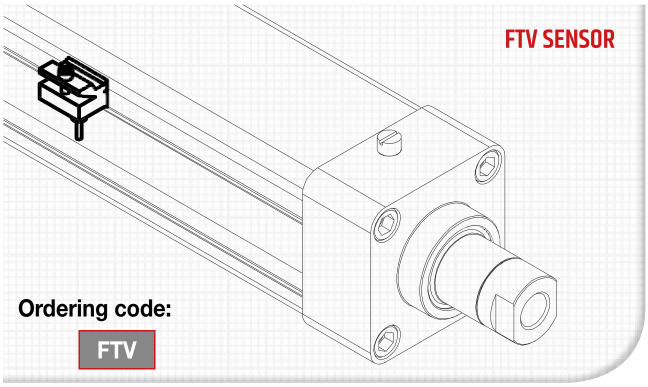
SIZE	SA / SAM 0	SA / SAM 1	SA / SAM 2	SA / SAM 3	SA / SAM 4	SA / SAM 5	SA / SAM 6
Ø d3 [mm]	10	12	12	16	16	20	25
u1 [mm]	32	37	39	48	52	61	75
v [mm]	22	25	27	32	36	41	50
w1 [mm]	13	16	16	21	22	27	30
☐ x [mm]	45	52	65	75	95	115	140
z1 [mm]	26	28	32	40	50	60	70
z2 [mm]	45	52	60	70	90	110	130

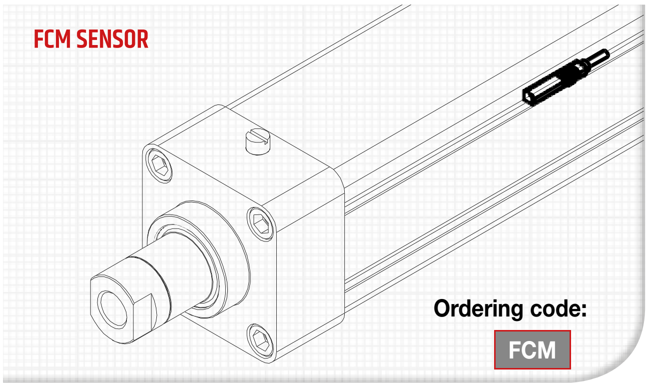
6 / Limit sensors

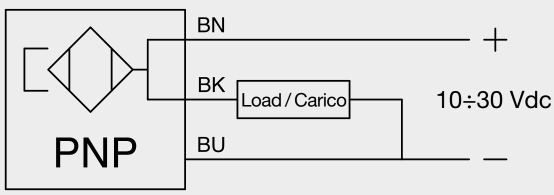
The Servomech servoactuators uses magnetic limit sensors which can be mounted in the longitudinal slots running along the external aluminum profile body. These sensors are activated by a magnet mounted on the translating nut inside the profile. The figures below show these predispositions.

There are two types of sensors, both of which can be mounted into their slots from above.



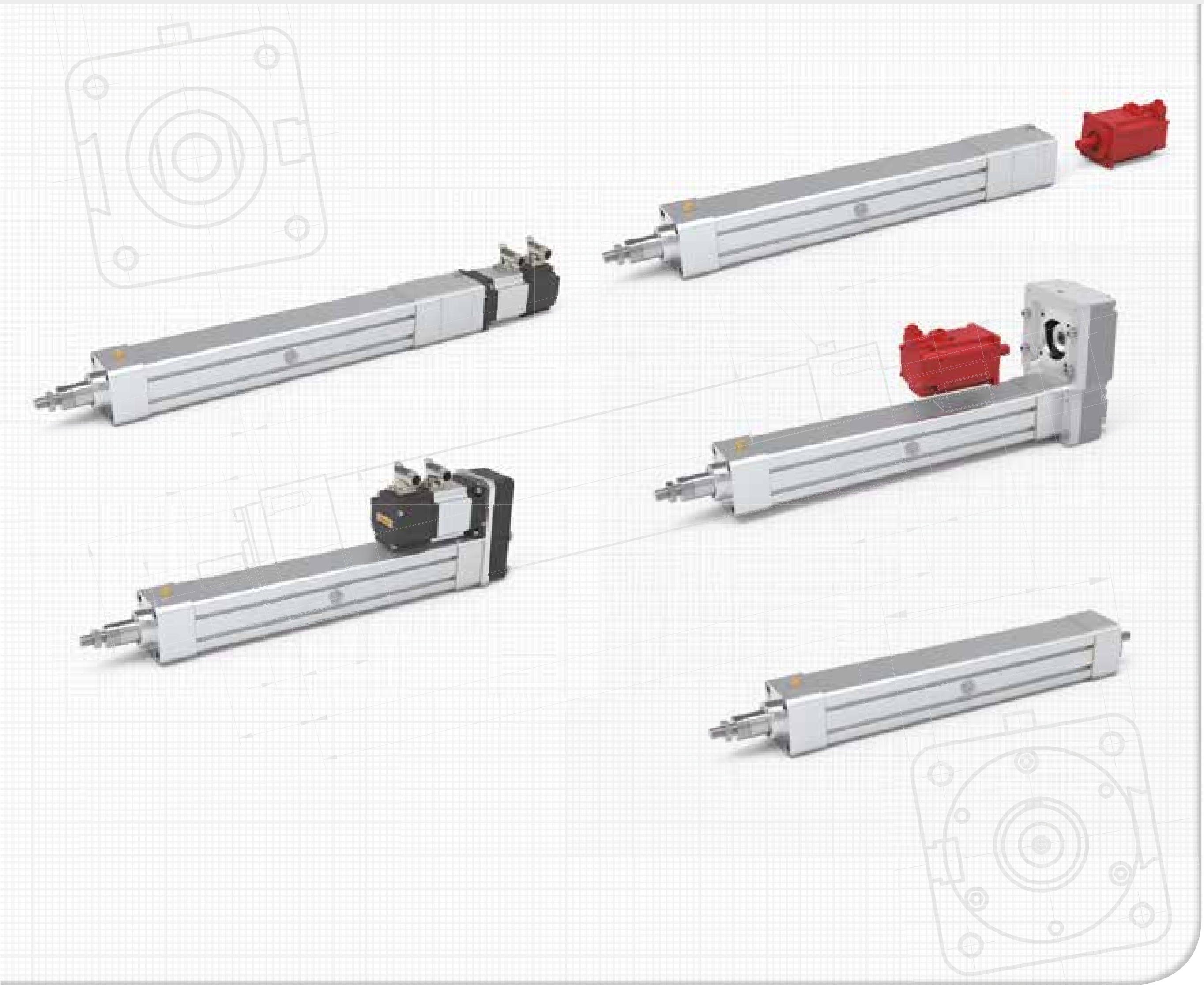




Limit sensor	FTV	FCM
Contact type	NO	NC
Output signal	PNP	
LED signal	YES	
Power supply	10÷30 Vdc	
Voltage drop @ 10 mA	0.8 V	≤ 2V
Max current	200 mA	100 mA
Switching delay OFF	20 ms (the switching delay is obtained electronically; it enables the signal readout at high speed conditions)	-
Power supply inverse polarity protection	YES	
Short circuit protection	YES	
Operating temperature	-20°C ÷ +70°C	-30°C ÷ +80°C
IP Protection rate	IP67	IP65
Material	ZA4	Plastico
Output cable	PVC, black, 3x0.25mm² - L = 3m	PUR, black 3x0.14mm² - L = 2m
Circuit	 **BN** Brown / Marrone, **BK** Black / Nero, **BU** Blue / Blu	

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}

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

J_0 [kg×m²] = moment of inertia of the actuator referred to the motor shaft for stroke 0 mm
J_{100} [kg×m²] = moment of intertia 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
η = total efficiency of the actuator

Inertia ratio *IR*

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

J_{mot} [kg×m²] = moment of inertia of motor rotor
J_{load} [kg×m²] = 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/s²] = acceleration suffered by the load

Total motor torque T_M

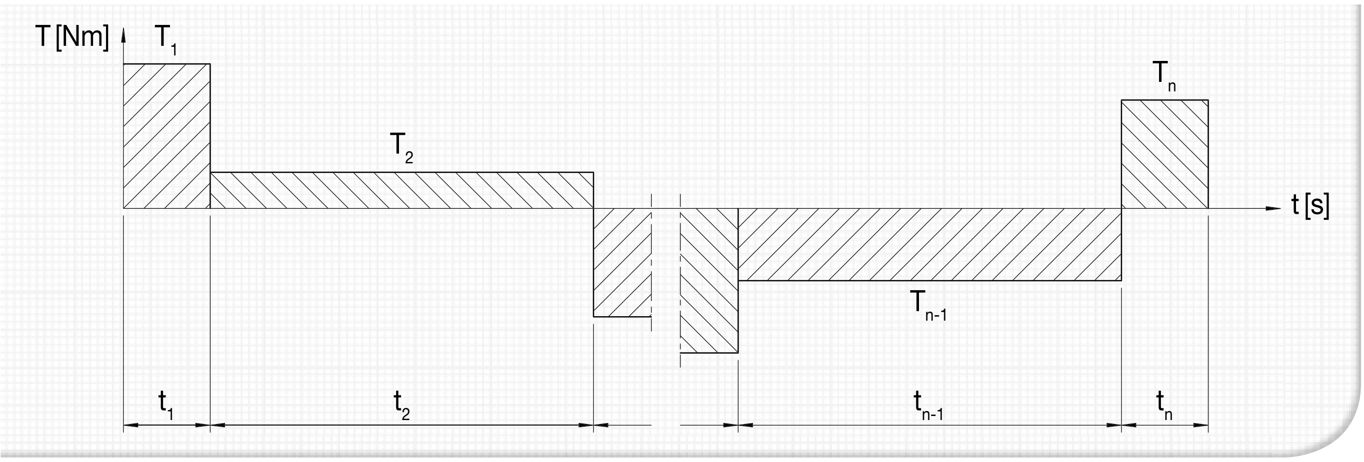
$$T_M = T_J + T_e + T_a \text{ [Nm]}$$

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:

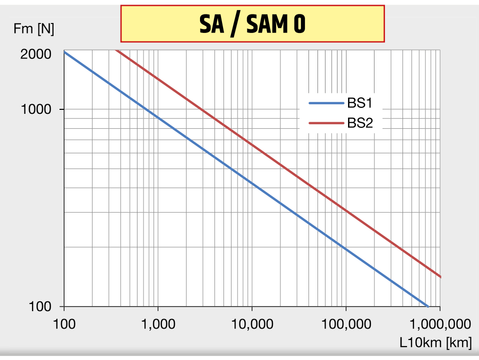
$$L_{10h} = \frac{L_{10} \cdot P_h}{3600 \cdot v_m} \text{ [hours]}$$

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

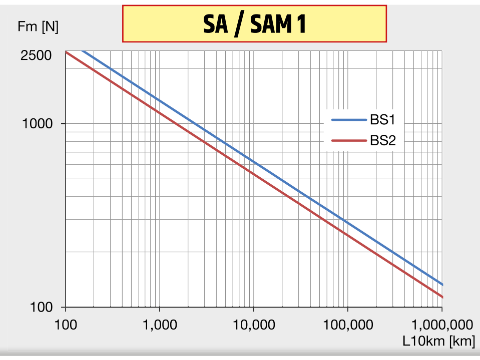
$$L_{10km} = \left(\frac{C_a}{F_m \cdot f_{sh}}\right)^3 \cdot P_h \text{ [km]}$$

P_h [mm] = thread helix lead

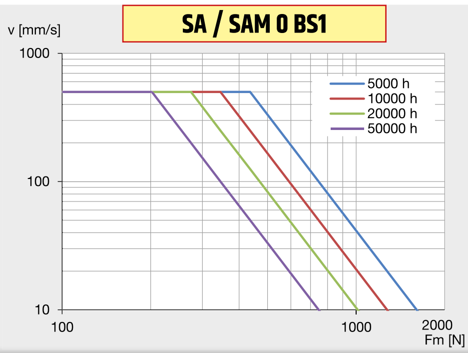
SA / SAM 0



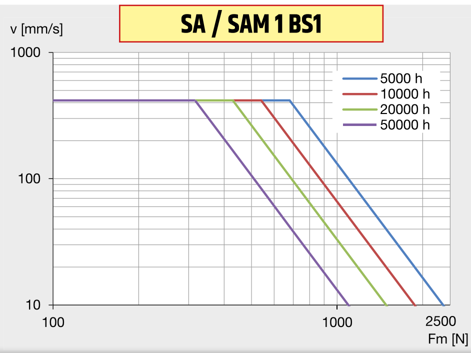
SA / SAM 1



SA / SAM 0 BS1

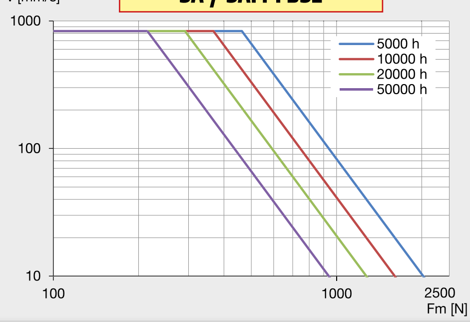


SA / SAM 1 BS1

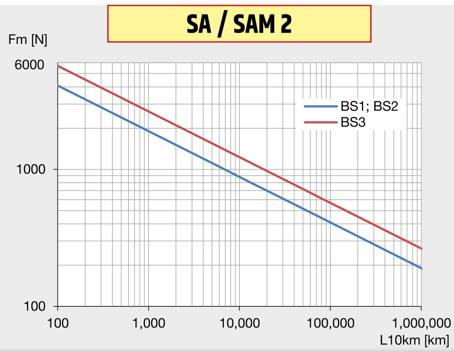


SA / SAM 0 BS2

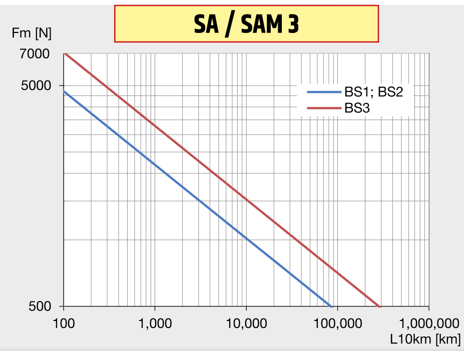
SA / SAM 1 BS2



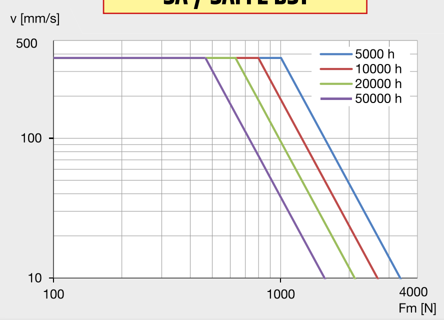
SA / SAM 2



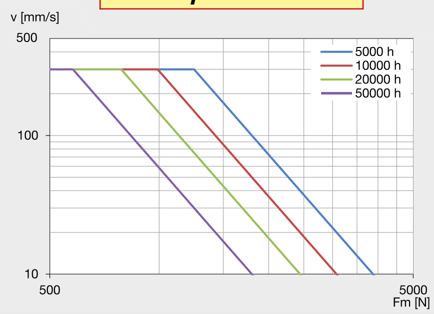
SA / SAM 3



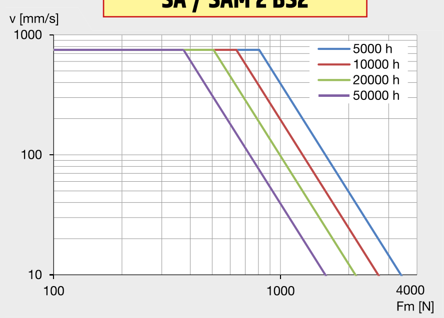
SA / SAM 2 BS1



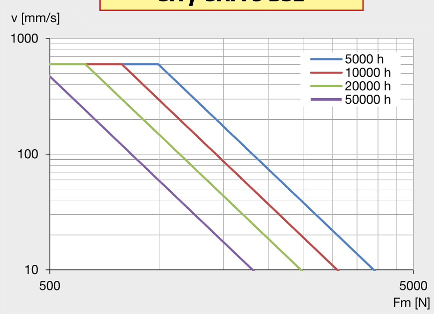
SA / SAM 3 BS1



SA / SAM 2 BS2

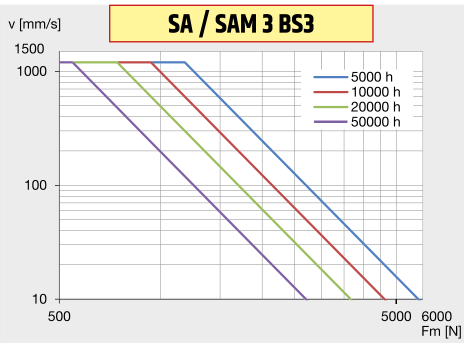


SA / SAM 3 BS2

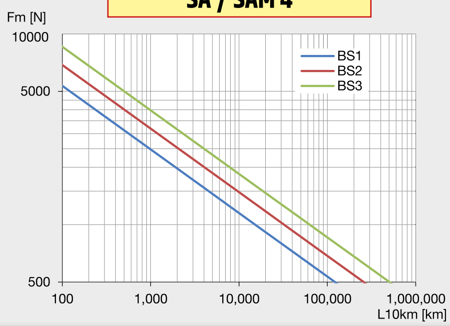


SA / SAM 2 BS3

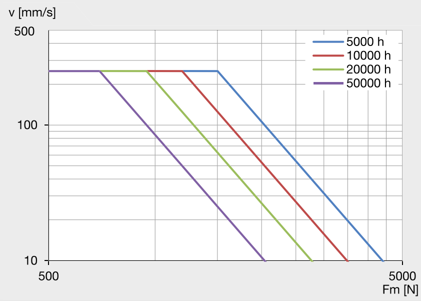
SA / SAM 3 BS3



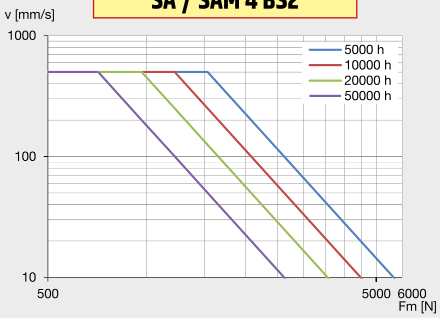
SA / SAM 4



SA / SAM 4 BS1

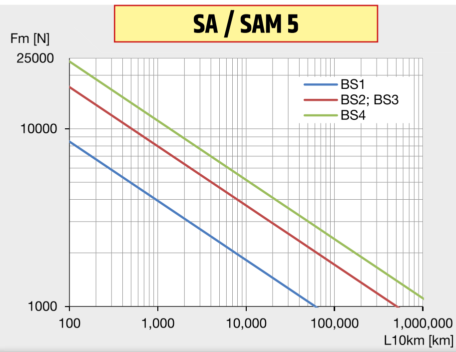


SA / SAM 4 BS2

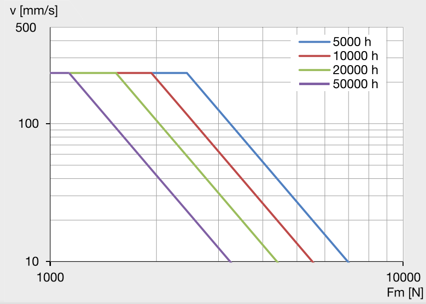


SA / SAM 4 BS3

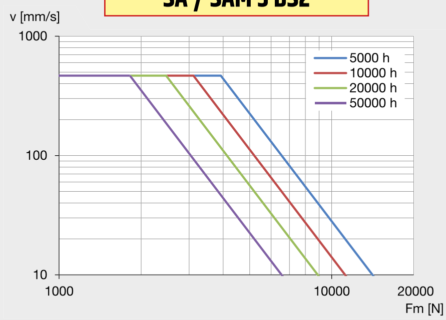
SA / SAM 5



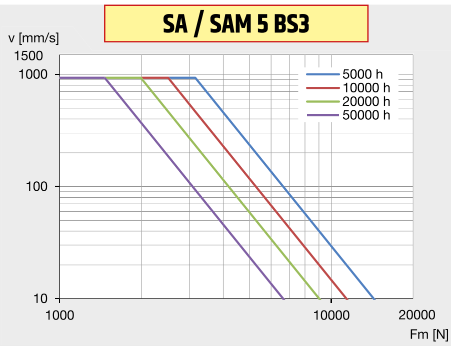
SA / SAM 5 BS1



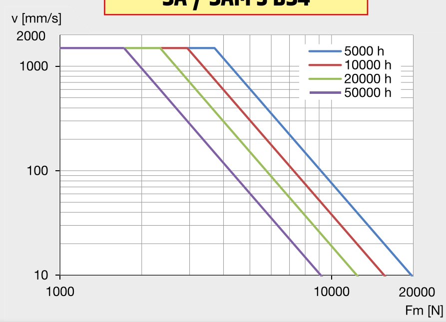
SA / SAM 5 BS2



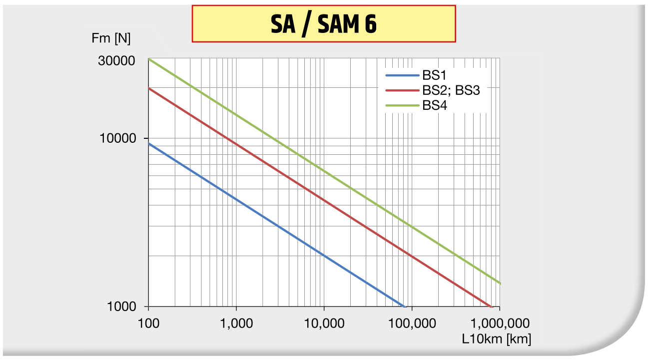
SA / SAM 5 BS3



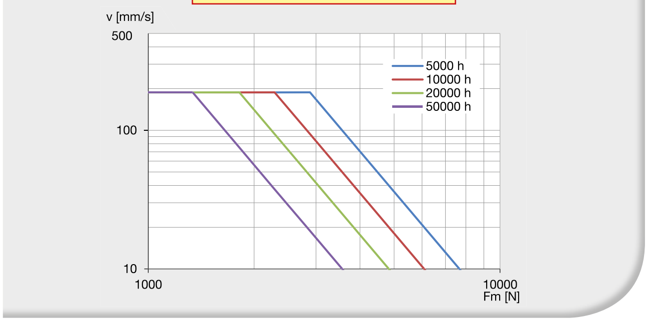
SA / SAM 5 BS4



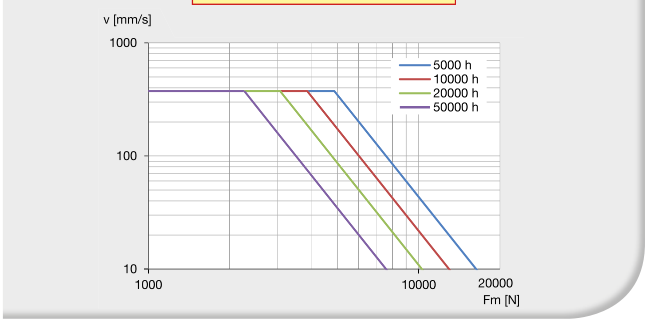
SA / SAM 6



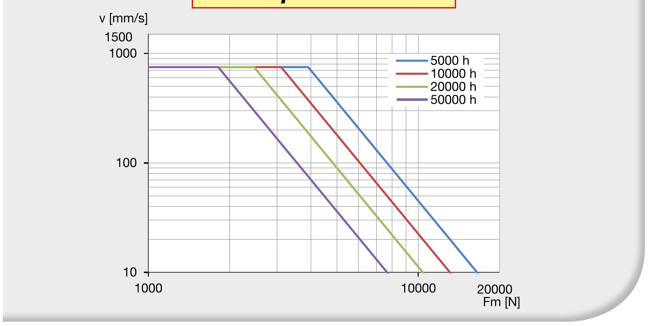
SA / SAM 6 BS1



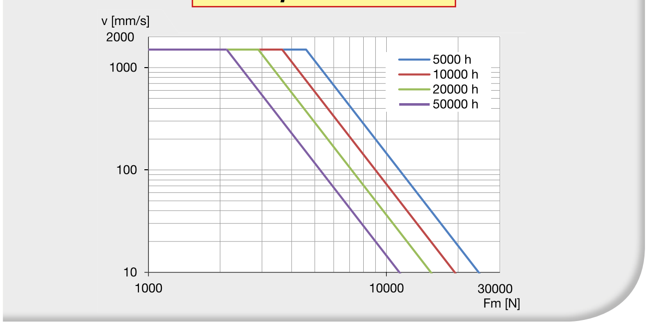
SA / SAM 6 BS2



SA / SAM 6 BS3



SA / SAM 6 BS4



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:

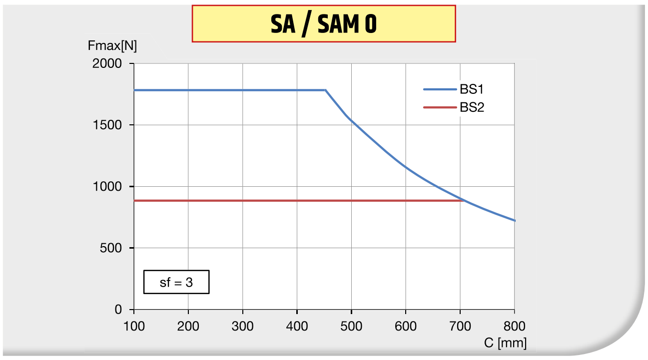
$$F_{max} = \frac{6437.5 \cdot \pi^3 \cdot (d_0 - D_W)^4}{(C + x)^2 \cdot sf} \ [N]$$

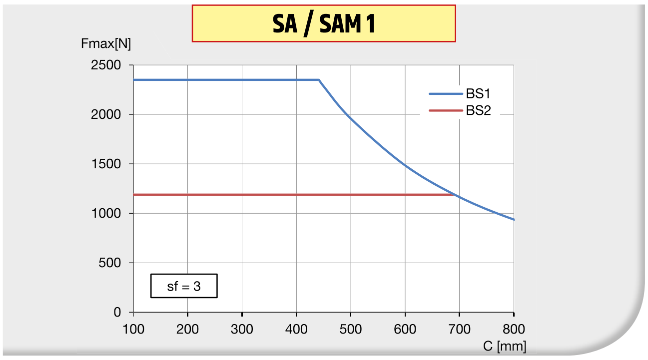
d_0 [mm] = ball screw nominal diameter
D_w [mm] = balls diameter
C [mm] = linear travel (stroke)

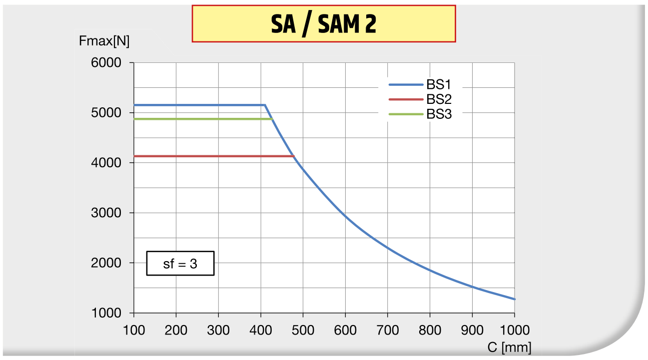
x = calculation coefficient (see below table)
sf = safety factor

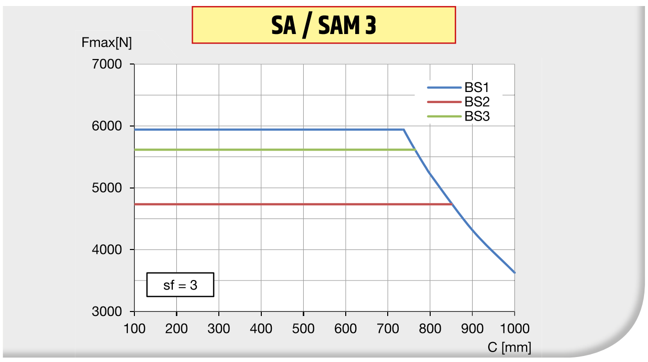
SIZE	SA / SAM 0	SA / SAM 1	SA / SAM 2	SA / SAM 3	SA / SAM 4	SA / SAM 5	SA / SAM 6
Coefficient *x*	158.5	173.5	174.5	201.5	210	270	310

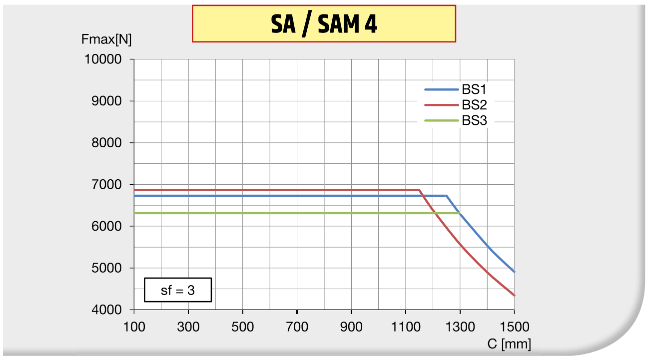
NOTE: value resulting from calculation must not exceed the max force value as for Technical Data (see chap. 2.1, 3.1, 4.1).

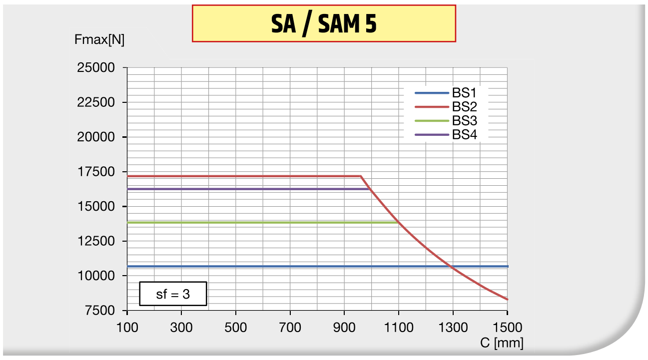


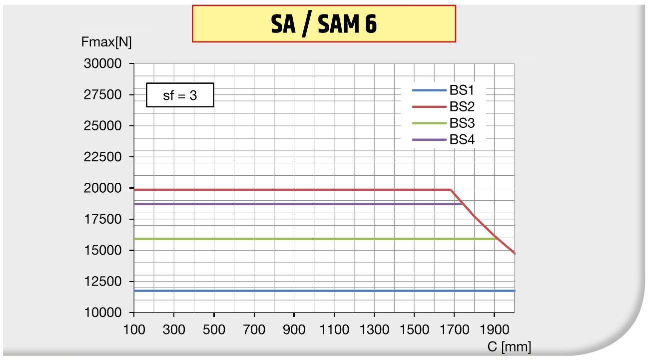












7.4 / Critical speed limit

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:

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

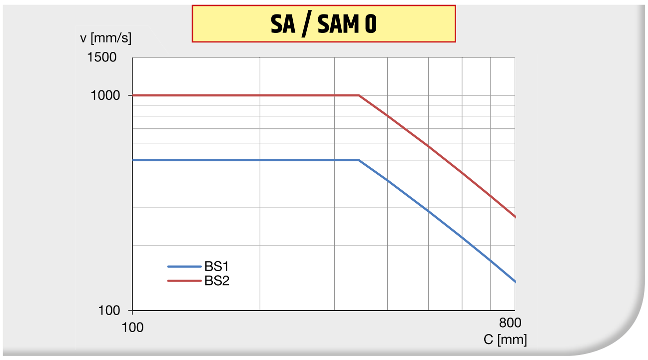
d_0 **[mm]** = ball screw nominal diameter
D_w **[mm]** = balls diameter
P_h **[mm]** = thread helix lead
***C* [mm]** = linear travel (stroke)
x = calculation coefficient (see below table)

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

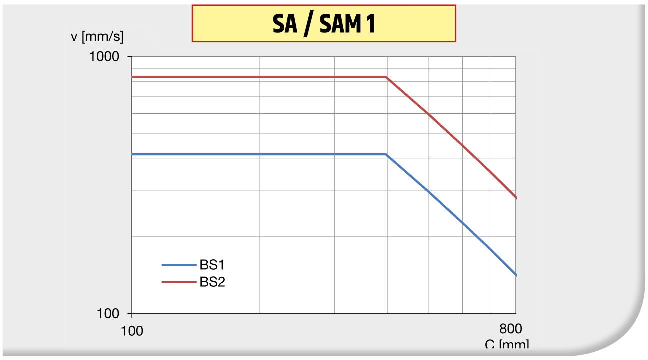
B - Limits due to internal factors
Depending on balls and screw material, geometry and material of all the recirculation elements and screw diameter, there is a specific limit of the maximum rotating speed. The values related to each actuator model and size are stated in the specific performance tables (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.

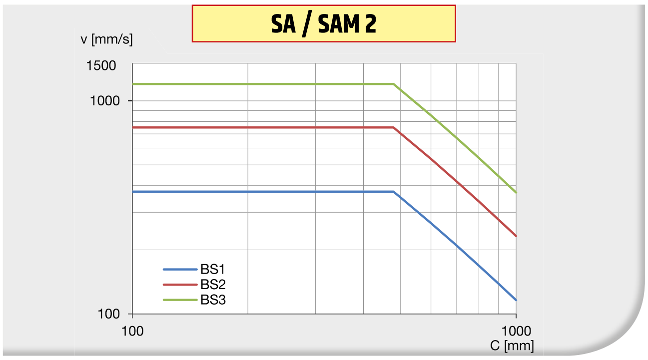
SA / SAM 0



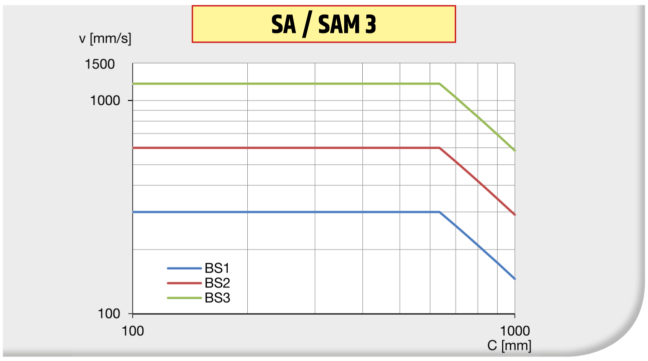
SA / SAM 1



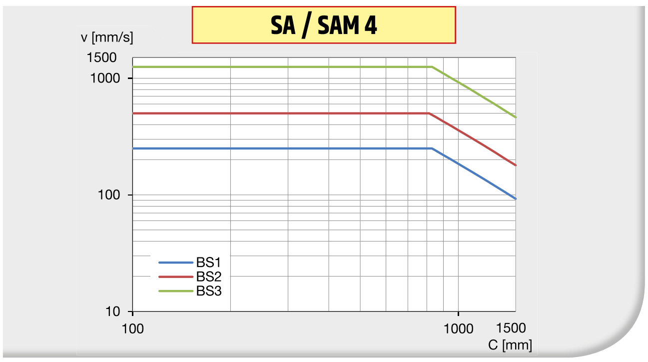
SA / SAM 2



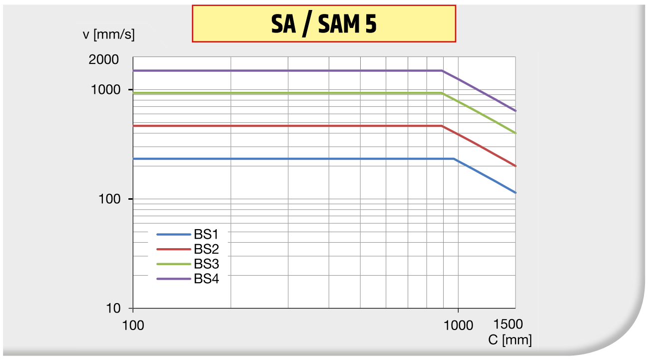
SA / SAM 3



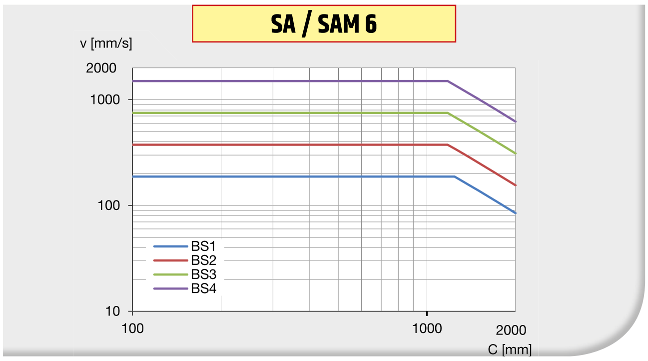
SA / SAM 4



SA / SAM 5

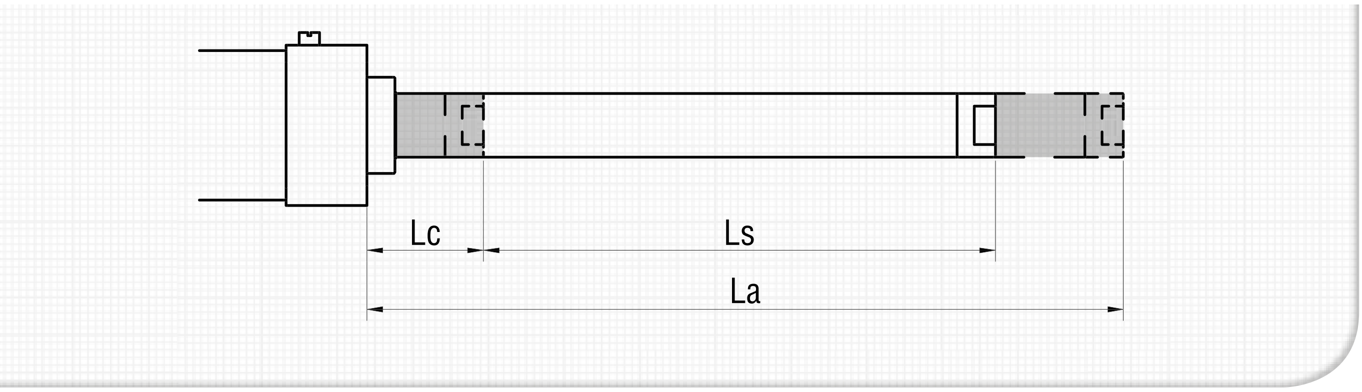


SA / SAM 6



7.5 / Side load limit

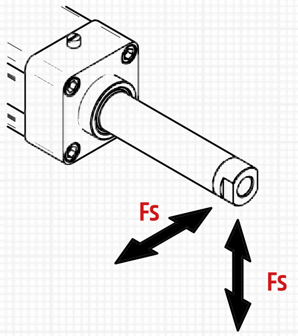
If lateral forces are applied on the linear actuator rod (static or dynamic condition), they must not exceed the limit shown in the graphs.



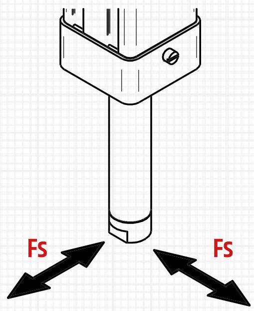
Lc = actuator retracted length
La = actuator extended length

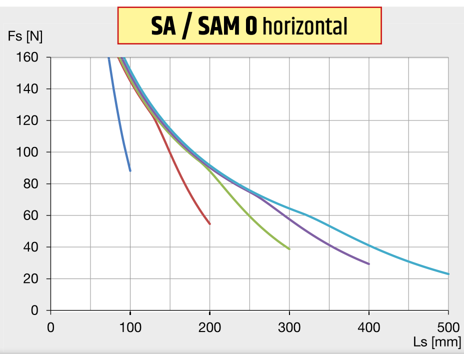
Ls = rod position (Lc ≤ Ls ≤ La)
Fs = side load applied on actuator rod

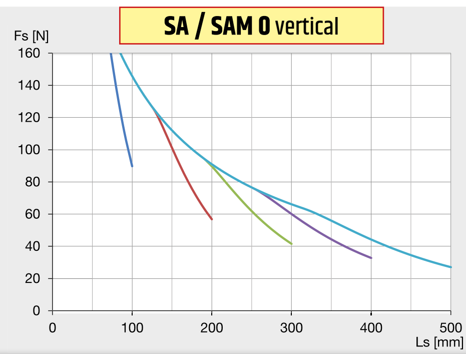
HORIZONTAL MOUNTING

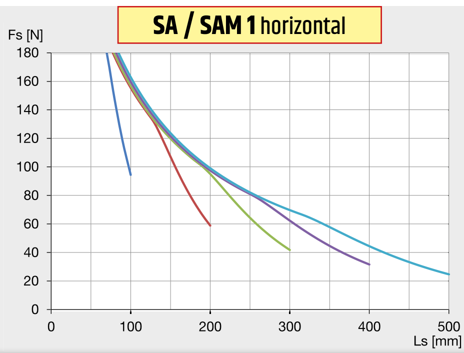


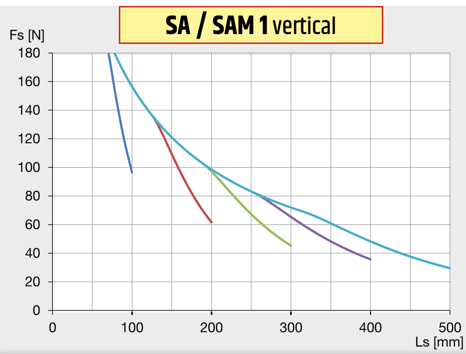
VERTICAL MOUNTING



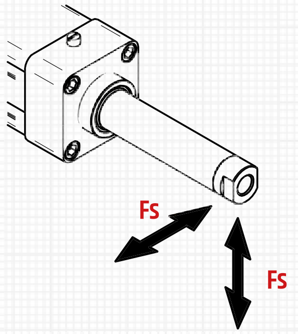




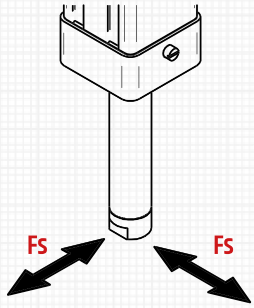




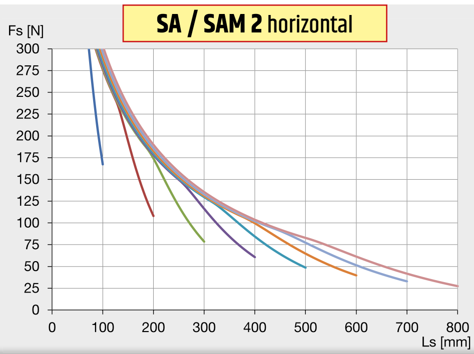
HORIZONTAL MOUNTING



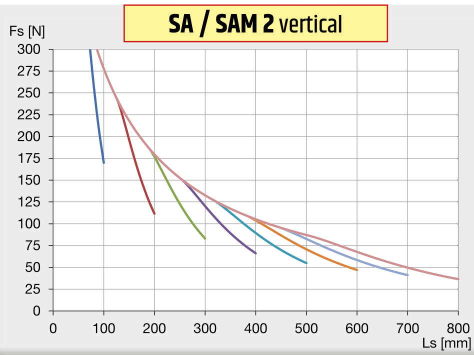
VERTICAL MOUNTING



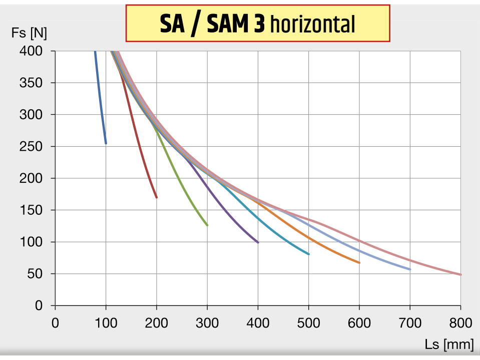
SA / SAM 2 horizontal



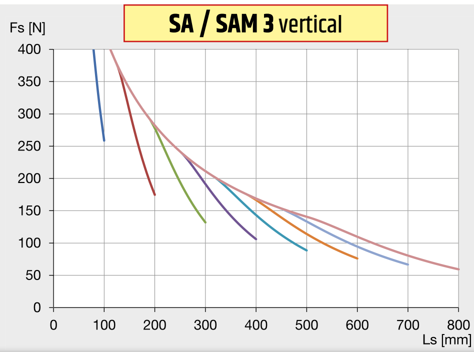
SA / SAM 2 vertical



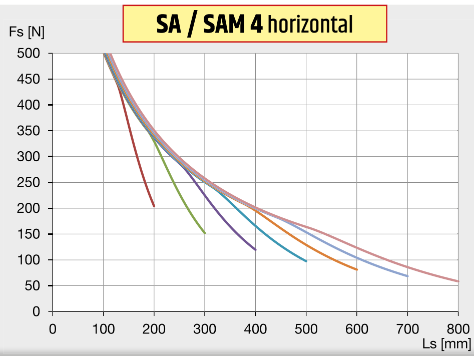
SA / SAM 3 horizontal



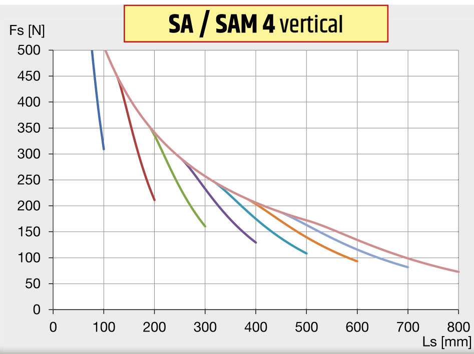
SA / SAM 3 vertical



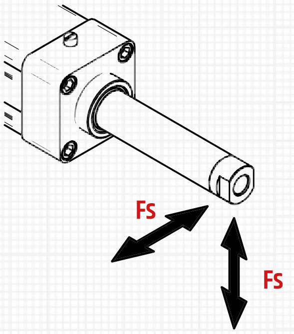
SA / SAM 4 horizontal



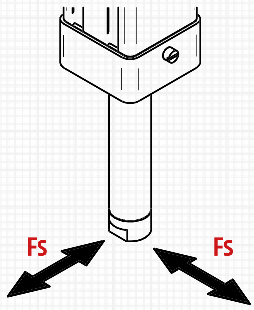
SA / SAM 4 vertical



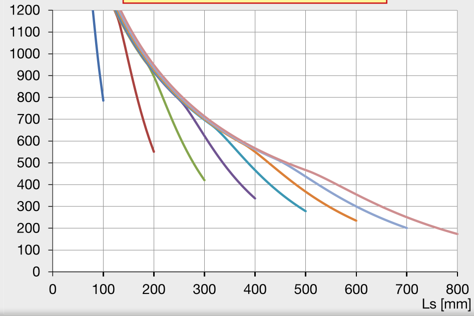
HORIZONTAL MOUNTING



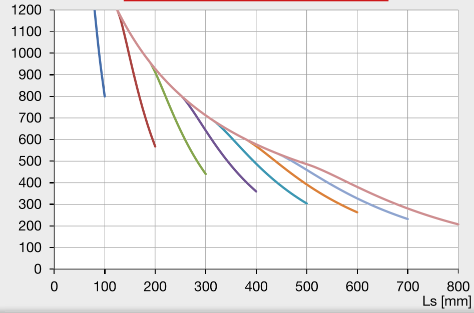
VERTICAL MOUNTING



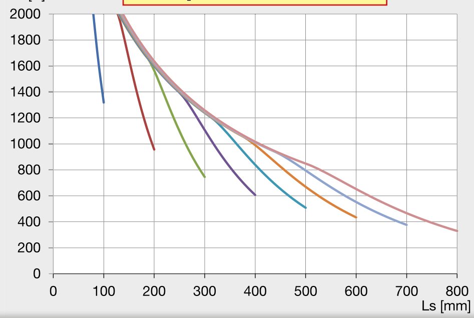
SA / SAM 5 horizontal



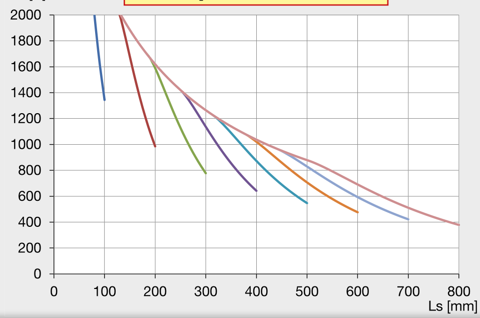
SA / SAM 5 vertical



SA / SAM 6 horizontal



SA / 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:

$$e_M = \pm T \, [\mu m]$$

The positioning error value does not include:
- Accuracy of the servomotor feedback system
- Axial play of the ball screw: standard axial play is **20 ÷ 40 µm**. 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* [µm] for ball screw with accuracy grade IT7 (standard)										
STROKE [mm]	**100**	**200**	**300**	**400**	**500**	**600**	**700**	**800**	**900**	**1000**
SA/SAM 0	43	61	76	86	93	-	-	-	-	-
SA/SAM 1	43	61	76	86	93	-	-	-	-	-
SA/SAM 2	43	61	76	86	93	100	105	115	-	-
SA/SAM 3	43	61	76	86	93	100	105	115	-	-
SA/SAM 4	43	61	76	86	93	100	105	115	120	129
SA/SAM 5	43	61	76	86	93	100	105	115	120	129
SA/SAM 6	43	61	76	86	93	100	105	115	120	129

Value *T* [µm] for ball screw with accuracy grade IT5 (option)										
STROKE [mm]	**100**	**200**	**300**	**400**	**500**	**600**	**700**	**800**	**900**	**1000**
SA/SAM 0	20	27	35	38	40	-	-	-	-	-
SA/SAM 1	20	27	35	38	40	-	-	-	-	-
SA/SAM 2	20	27	35	38	40	47	52	52	-	-
SA/SAM 3	20	27	35	38	40	47	52	52	-	-
SA/SAM 4	20	27	35	38	40	47	52	52	57	57
SA/SAM 5	20	27	35	38	40	47	52	52	57	57
SA/SAM 6	20	27	35	38	40	47	52	52	57	57

Linear Servoactuators Application Worksheet

Date: ____ / ____ / ____

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

Static load - PULL: ____________ [N] Side loads: □ YES □ NO

Static load - PUSH: ____________ [N] Shock loads: □ YES □ NO

Dynamic load - PULL: ____________ [N] Frequency: ____________

Dynamic load - PUSH: ____________ [N] Vibrations: □ YES □ NO

Moving mass: ____________ [kg]

ORIENTATION

□ Vertical □ Horizontal □ Inclined

Angle from horizontal plane:: ____________

Load guided: □ YES □ NO

Hold position:
□ UNDER LOAD
□ POWER OFF
□ NO

TRAVEL

Stroke length required: ____________ mm

MAX dim. in closed position: ____________ mm

LINEAR SPEED

MAX speed ____________ mm/s

MIN speed ____________ mm/s

Time to complete the stroke (ext/retr): ________ s

PRECISION

Repeatability: ____________ [mm]

Accuracy: ____________ [mm]

MAX backlash: ____________ [mm]

DUTY CYCLE

Total cycle time: ____________

Extend/retract cycles per day: ____________

Working hours per day: ____________

No. of cycles per hour: ____________

REQUIRED LIFE TIME

Units: □ Cycles □ km □ Working hours □ Days □ Months □ Years

Minimum life time required:

____

ENVIRONMENT

Operating temperature
□ Normal (0 - 40°C)
□ High temp. ____________
□ Low temp. ____________

Conditions
□ Outdoor
□ Washdown
□ Cleanroom
□ Other ____________
□ IP rate required: ____________

CONTAMINANTS

Solids: ____________

□ abrasive
□ non-abrasive
□ fine dust
□ coarse chips

Liquids: ____________
□ corrosive
□ non-corrosive
□ dips
□ mist / spray
□ splashing

SERVOMECH S.p.a. - Via M. Calari, 1 - 40011 Anzola dell'Emilia (Bologna) - ITALY - Tel. + 39 051 6501711 - E-mail: sales@linearmech.com

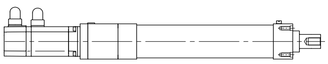
Servomech Linear-Mech

Linear Servoactuators Application Worksheet

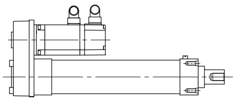
Date: ____ / ____ / ________

VERSION

□ In Line "IL"



□ Parallel "PD"



LIMIT SWITCHES

Magnetic limit switches   No. of switch positions ______

□ Normally closed contact (NC)

□ Normally open contact (NO)

FRONT FIXING

□ Threaded bore

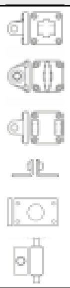
□ Male threaded rod end

□ Ball joint rod end

□ Clevis rod end

□ Self-aligning joint

REAR / BODY FIXING



□ Rear hinge (only for "PD" Version)

□ Rear hinge with ball joint (only for "PD" Version)

□ Rear clevis (only for "PD" Version)

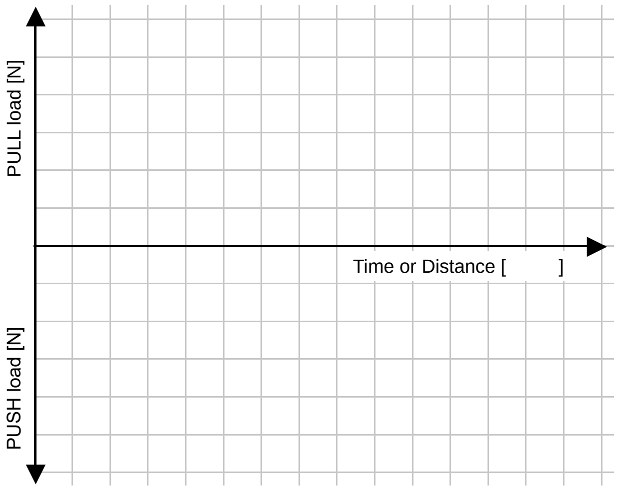
□ Foot mount (couple)

□ Plate mount

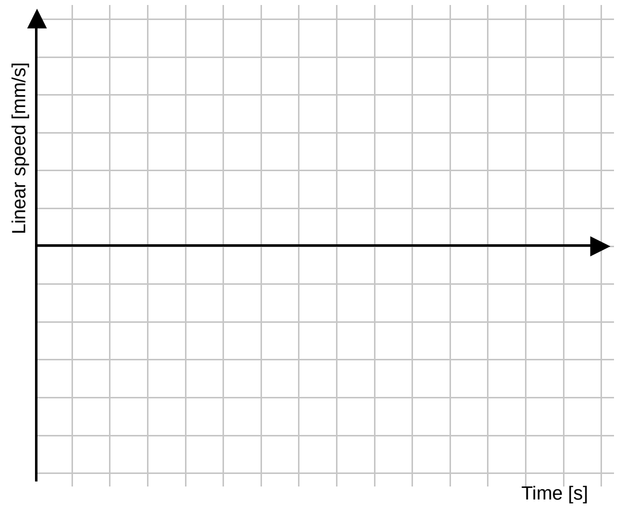
□ Trunnion mount (only for "IL" Version)

MOVE PROFILE

LOAD



SPEED



APPLICATION SKETCH *(Please show fixing method)*

SERVOMECH S.p.a. - Via M. Calari, 1 - 40011 Anzola dell'Emilia (Bologna) - ITALY - Tel. + 39 051 6501711 - E-mail: sales@linearmech.com

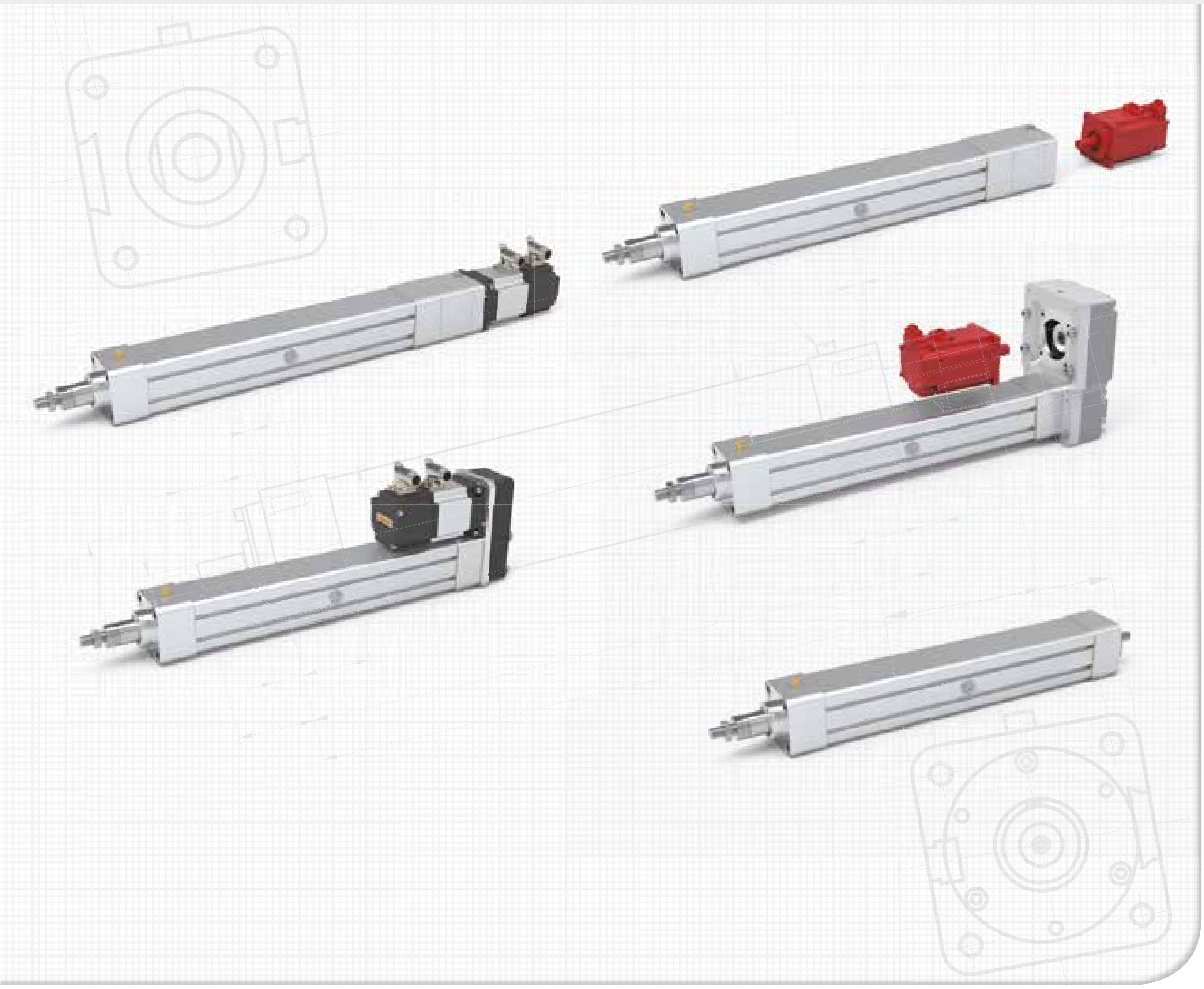
	Linear Servoactuators Application Worksheet	Date: _____ / _____ / ________

X **PACKAGE ACTUATOR ONLY** *(Motor + Drive NOT included in the supply)*	Please specify following information about the motor: □ Motor type: ____________ □ Brand: ____________ □ Model type: ____________

PACKAGE ACTUATOR + MOTOR + DRIVE *(NOT AVAILABLE - For domestic market only)*

SERVOMECH S.p.a. - Via M. Calari, 1 - 40011 Anzola dell'Emilia (Bologna) - ITALY - Tel. + 39 051 6501711 - E-mail: sales@linearmech.com

8 / Additional information



8.1 / Operating conditions

The normal operating conditions of the servoactuators are:

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

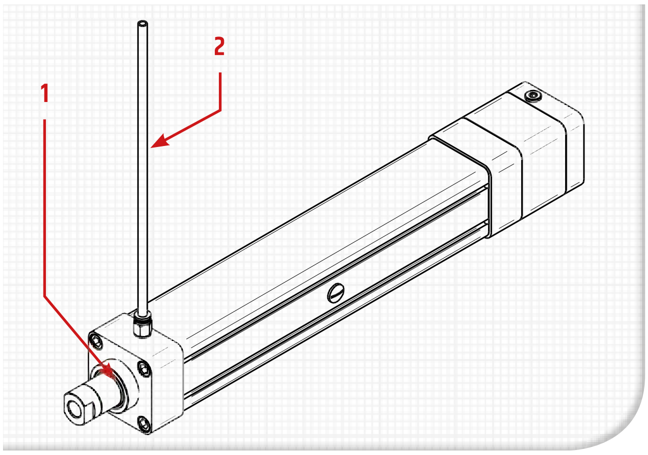
/ Actuator body IP rating

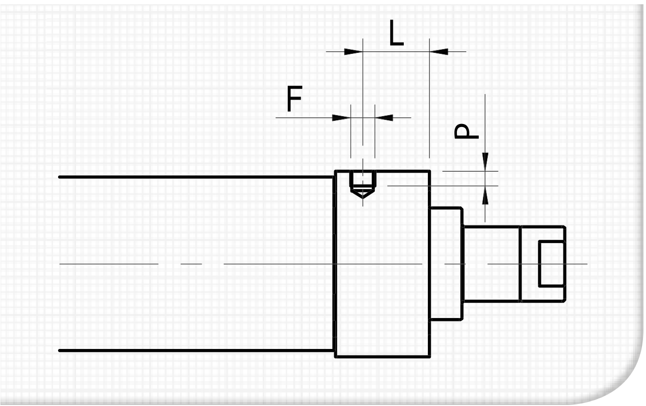
The sealing gaskets on all planar couplings and the sealing scraper on the push rod guarantee effective protection against inlet of contaminants in most of the applications.

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 (not included in the supply) 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.





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

Installation, use and maintenance manual available on:
www.servomech.com/download

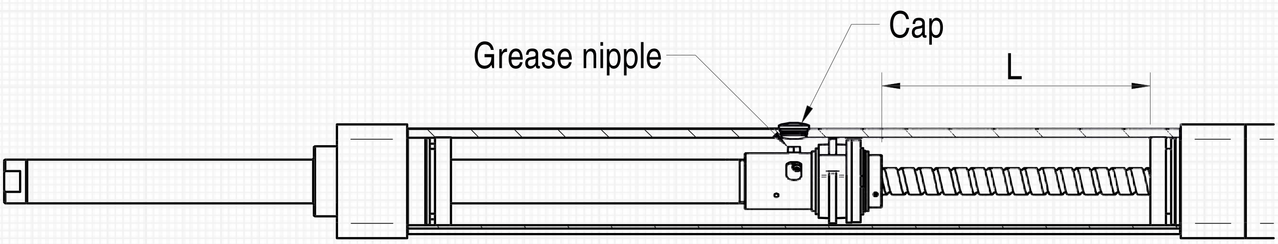
SIZE	SA / SAM 0	SA / SAM 1	SA / SAM 2	SA / SAM 3	SA / SAM 4	SA / SAM 5	SA / SAM 6
F	G1/8	G1/8	G1/8	G1/8	G1/8	G3/8	G3/8
P [mm]	4	5	6	6	6	7.5	8
L [mm]	28	19	22	27	42	48	60

NOTE: in case of actuator **SA 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.

8.2 / 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.



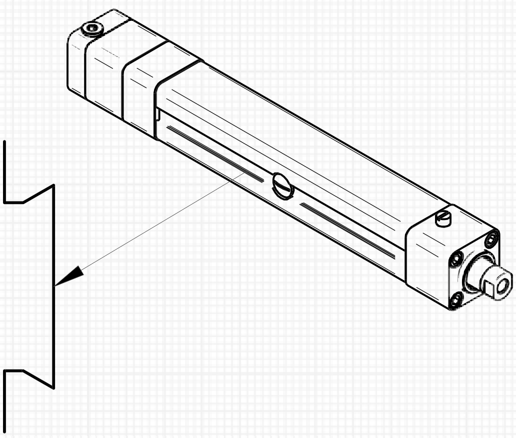
The opening stroke length ***L*** for relubrication operations is:

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

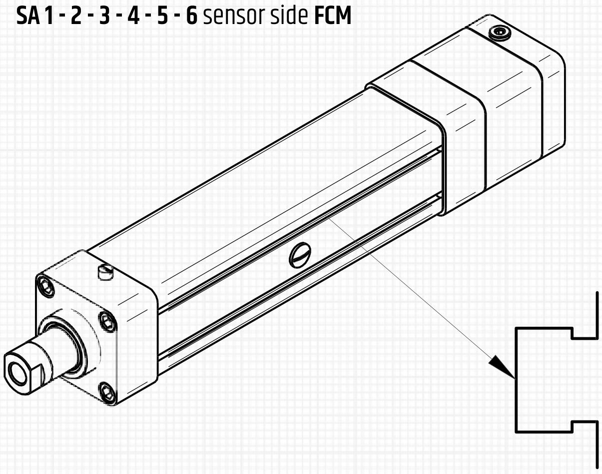
Where:
L [mm] = linear distance for the lubrication.
C [mm] = linear travel (stroke) of the servoactuator.
A = constant value specific for each size *(see following table)*.

SIZE	SA 0	SA 1	SA 2	SA 3	SA 4	SA 5	SA 6
A	4.5	2.5	3	7	6	-3.5	-5.5

POSITION OF THE LUBRICATING PLUG
SA 0 sensor side **FTV**



POSITION OF THE LUBRICATING PLUG
SA 1 - 2 - 3 - 4 - 5 - 6 sensor side **FCM**

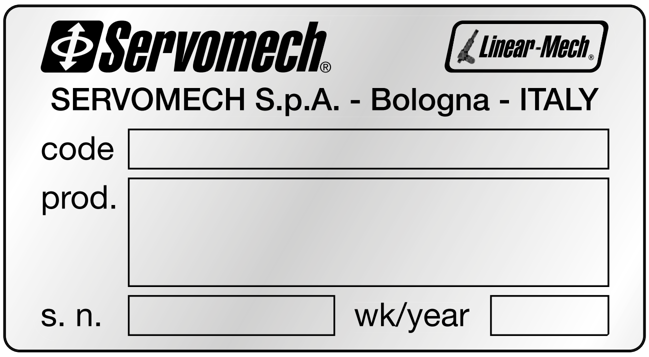


8.3 / Product identification

/ Actuators nameplate

Each servoactuators produced is identified by a nameplate with following elements:

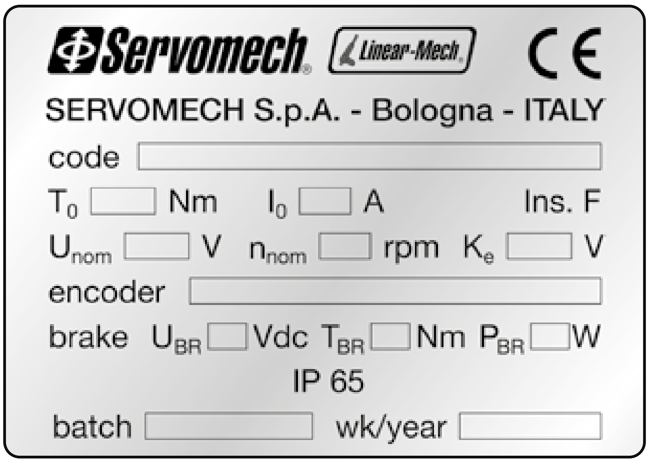
- **CODE -** Item code.
- **PROD -** Commercial code.
  (See Ordering code at chap. 9)
- **S. N. -** Product serial number, guarantees the complete product traceability.
- **WK / YEAR -** Week and year of production of the actuator.



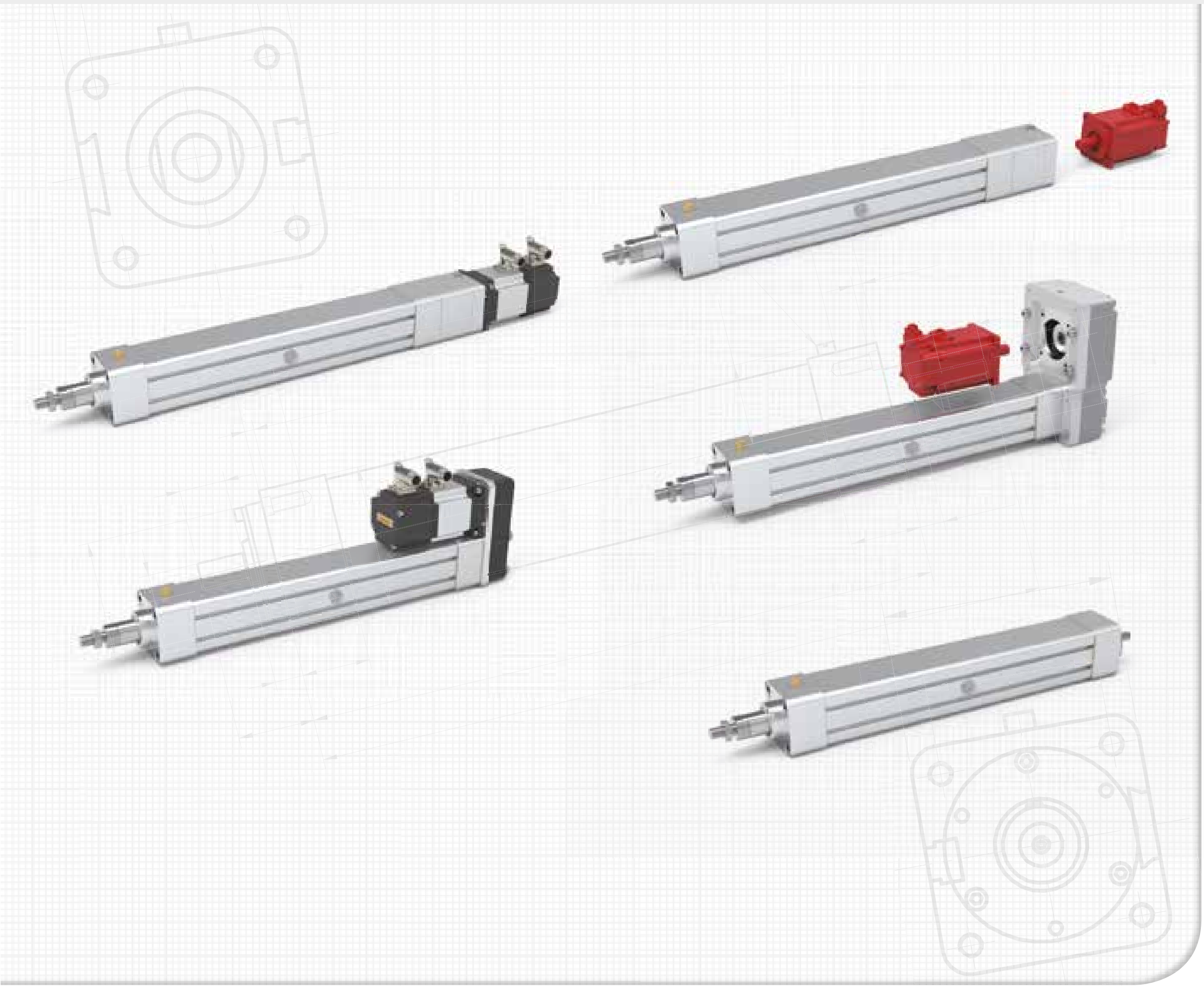
/ Servomotors nameplate

Each servomotors produced is identified by a nameplate with following elements:

- **CODE -** Item code.
  (See Ordering code at chap. 9).
- **T_0 -** Stall torque [Nm].
- **I_0 -** Stall current [A].
- **Ins. F. -** Insulation class of the motor (F).
- **U_{nom} -** Rated voltage [V].
- **n_{nom} -** Rated speed [rpm].
- **K_e -** Voltage constant [V/1000rpm].
- **ENCODER -** Motor feedback resolution [ppr].
- **U_{BR} -** Brake power supply voltage [Vdc].
- **T_{BR} -** Rated braking torque [Nm].
- **P_{BR} -** Brake power [W].
- **IP65 -** Motor body IP rating.
- **BATCH -** Production batch serial number, guarantees the product traceability.
- **WK / YEAR -** Week and year of production of the motor.



9 / Ordering code



9.1 / Actuators SAM IL Series

SAM 3 IL	BS 2	C 200	F3 14-30	TS CI	FCM	S
1	2	3	4	5	6	7

1	Actuator size	0, 1, 2, 3, 4, 5, 6
2	Ball screw	BS1, BS2, BS3, BS4
3	Stroke	C____
4	Motor attachment	
5	Fixing accessories: - Fixing end - Main body	 TM, TS, TS90, FO, FO90, GA PBS, PBE, PBN, PBW, FL, FL90, CI, CI90
6	Limit sensors	FCM, FTV
7	IP rating	S (standard), X (IP65)

9.2 / Actuators SAM PD Series

SAM 3 PD	RL	BS 2	C 200	F3 14-30	PW	TS CM	FCM	S
1	2	3	4	5	6	7	8	9

1	Actuator size	0, 1, 2, 3, 4, 5, 6
2	Ratio	RV, RN, RL
3	Ball screw	BS1, BS2, BS3, BS4
4	Stroke	C____
5	Motor attachment	
6	Limit sensors slot position	PW, PE
7	Fixing accessories and mounting position: - Fixing end - Main body	 TM, TS, TS90, FO, FO90, GA PB, FL, FL90, CM, CM90, CMS, CMS90, CF, CF90
8	Limit sensors	FCM, FTV
9	IP rating	S (standard)

9.3 / Actuators SA Series

SA 3	BS 2	C 200	TS CI	FCM	S
1	2	3	4	5	6

1	Actuator size	0, 1, 2, 3, 4, 5, 6
2	Ball screw	BS1, BS2, BS3, BS4
3	Stroke	C____
4	Fixing accessories and mounting position: - Fixing end - Main body	 TM, TS, TS90, FO, FO90, GA PBS, PBE, PBN, PBW, FL, FL90, CI, CI90
5	Limit sensors	FCM, FTV
6	IP rating	S (standard), X (IP65)

Edition: PRT.01.008.ENG.01.2023-01

SERVOMECH SpA
Via Calari, 1 • 40011 Anzola dell'Emilia (Bologna) • Italy • T. +39.051.6501711 • sales@linearmech.com
www.servomech.com • www.linearmech.com