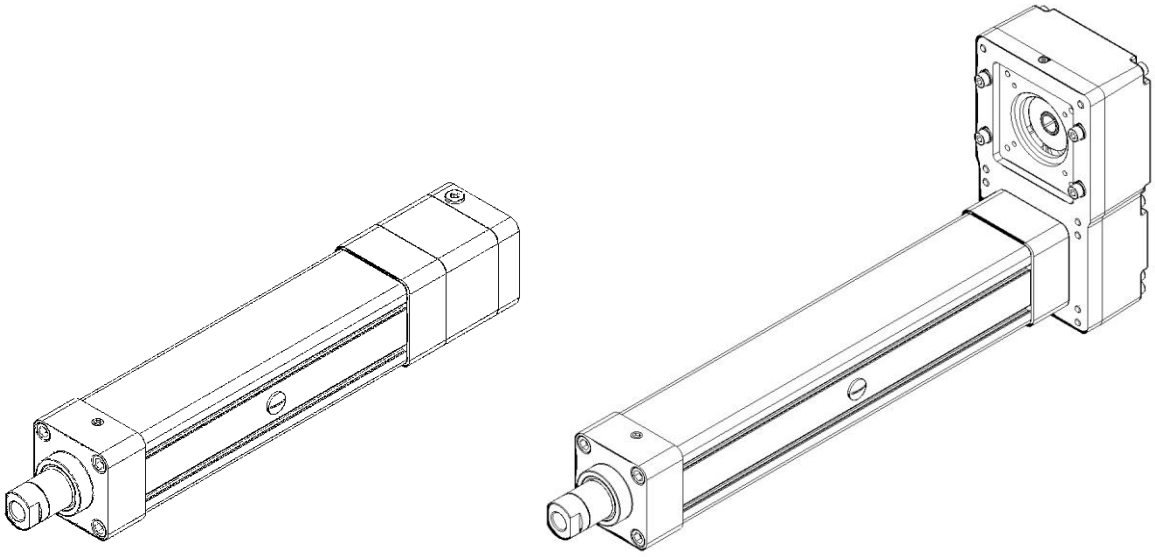
LINEAR SERVOACTUATORS

SAM (SAM IL, SAM PD versions)

Installation, Use and Maintenance Manual



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⚠ WARNINGS

This manual should be considered as product element; it includes information for a proper actuator installation, set and maintenance.

Servomech S.p.A. does not assume responsibility for actuator misuse, not complying performances and limits indicated on our catalogue.

Any operation for actuator installation, use and maintenance done not fulfilling all prescription mentioned on this manual, voids warranty conditions and Servomech S.p.A. cannot be held liable for injuries and damages.

What follows affect product safety, leading to risks for goods damages and people injuries:

- Any product modifications;
- Any part integration on our product, not previously studied and agreed with Servomech S.p.A.;
- Non-original spare parts use.

This voids warranty conditions and responsibility of Servomech S.p.A. immediately decays.

Servomech S.p.A. and its authorized distributors are at customer's disposal to provide, during design process, the technical support for proper actuator selection and application.

Servomech S.p.A. reserves the right to make changes and/or improvements in products, catalogs and manuals without notice.

SAM LINEAR SERVOACTUATORS (SAM IL, SAM PD versions)
Installation, Use and Maintenance Manual

Contents

1. MODELLI COPERTI DAL PRESENTE DOCUMENTO

This manual covers following products:

- Servo-actuators SAM IL series: SAM 0 IL, SAM 1 IL, SAM 2 IL, SAM 3 IL, SAM 4 IL, SAM 5 IL, SAM 6 IL
- Servo-actuators SAM PD series: SAM 0 PD, SAM 1 PD, SAM 2 PD, SAM 3 PD, SAM 4 PD, SAM 5 PD, SAM 6 PD

2. MANUFACTURER AND PRODUCT IDENTIFICATION

2.1. *Manufacturer identification*

SERVOMECH S.p.A. S.U.

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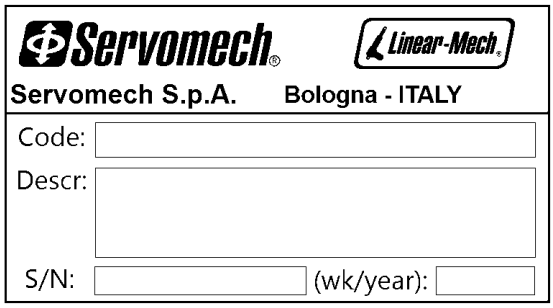
e-mail: sales@linearmech.com

2.2. *Product identification*

All servo actuators are identified by a label as follows.



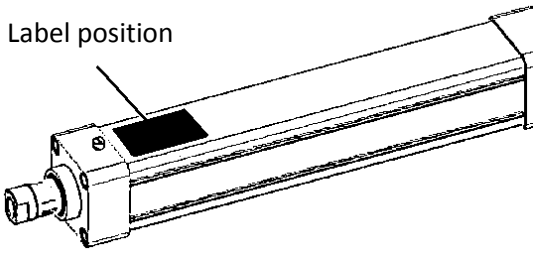


Figure 2.1 – Identification label

On servo-actuator label following data are printed:

- CODE: article code;
- DESCR: product description (the mining of symbols and their sequence are indicated on the catalogue);
- S/N: production serial number (gives the full traceability of products);
- WK/YEAR: week and year of manufacturing of the product.

3. TRANSPORT AND HANDLING

⚠ It is recommended to pay attention and care during the handling and transport of linear actuators not to damage mechanical parts and / or accessories and to prevent risks for the personnel in charge of this activity.

- The packaging must be lifted and moved with care and in a safe way.
- For lifting and transporting the linear actuator, the push rod must be in retracted position.
- Lift the actuator from the housing and outer tube, supporting the motor during transport.
- DO NOT lift the actuator from the push rod and / or the motor.

⚠ The ball screw inside the actuator is NOT self-locking. Never lift the linear actuator upright from the push rod as the actuators could be back driven by its own weight.

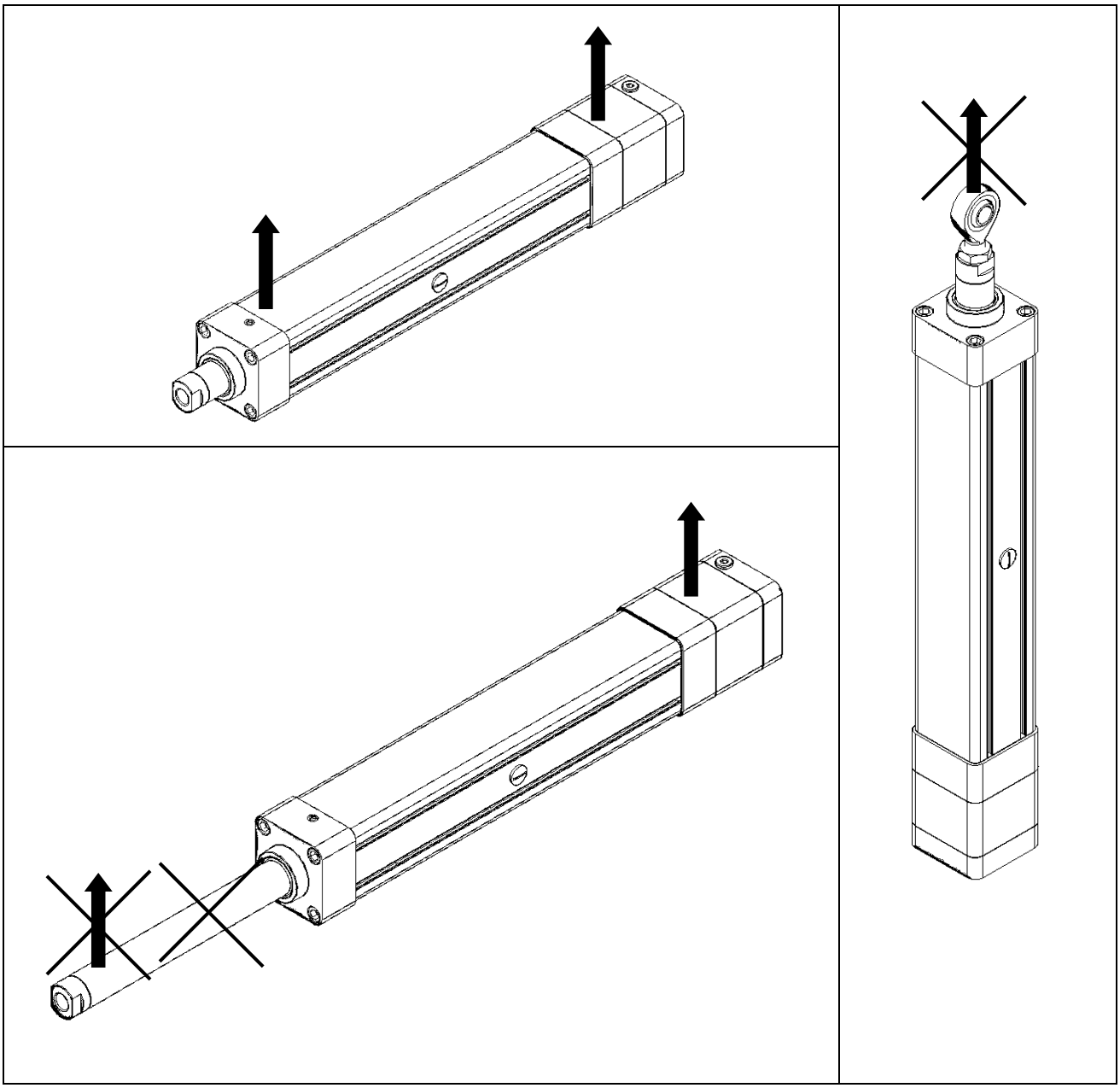


Figure 3.1 – Transport and handling

4. PRODUCT USE LIMITS

Here important prescriptions are provided to operate safely along all the product life phases.
Not complying with these prescriptions leads to operate in risky conditions that may cause operators injuries or machine damages.

4.1. *Intended use*

Servo-actuators can perform very different functions in machinery. It is responsibility of machinery manufacturer the machine design in accordance with laws in force in their specific field and in accordance with specific machinery safety laws, following the guidelines provided in our catalog and in this manual.

4.1.1. Servo actuator use

Servo actuators are designed and built to drive moving parts of various types, form and construction, as described and within the limits set out in the descriptions and tables of technical data shown in our catalog and in this manual.
A purely axial load (push and pull) must be applied on servo-actuators.
Servo-actuators must be subjected to loads, speed and duty limits provided in our catalog.
In loads assessment:

- all the external loads,
- all inertial loads generated by the servo-actuator moving masses,
- all inertial loads generated by external masses connected to the servo-actuator must be considered, as indicated on the product catalog.

The accelerations and consequent inertial loads, in addition to external loads, strongly affect the product selection and its lifetime.
Modifications of servo-actuator parts or replacements with non-original spares are not admitted. Original spares replacement must be done by Servomech S.p.A. only.
Any other use is improper and therefore potentially dangerous for operators safety, as well as it voids the warranty.
In event of special needs, please consult our sales office.
Any modifications of servo-actuators must be authorized by Servomech S.p.A. by written documents.

⚠ ANY OTHER DIFFERENT USE IS NOT ADMITTED BY MANUFACTURER.

4.1.2. Use restrictions

Servo-actuators can not be used for unforeseen applications.
Any utilization of this device beyond its intended purpose may lead to potentially hazardous situations.
Therefore is strictly forbidden:

- the servo-actuator use in a constructive configuration different than the one provided by Servomech S.p.A.;
- the servo-actuator outdoor use;
- the servo-actuator use in places with explosions and/or fire risks (servo-actuator is not CE ATEX directive compliant);
- the servo-actuator use in locations with chemically aggressive atmospheres;
- the servo-actuator use in locations where particular electrical protections are required;
- the servo-actuator use in locations where particular protection enclosures are required;
- integrate systems and/or equipments not considered by Servomech S.p.A. in servo-actuator design;
- the servo-actuator use with partially removed part, tampered parts or differently wired;
- connect the servo-actuator with energy sources different than the ones provided by Servomech S.p.A.

⚠ THE USE OF THE SERVO ACTUATOR IN ABOVE CONDITIONS MUST BE PREVIOUSLY DECLARED AND AGREED WITH SERVOMECH, SINCE A SPECIAL EQUIPMENT OF THE PRODUCT MUST BE PROVIDED.

4.1.3. Environmental conditions

The servo-actuator must be used with the environmental conditions prescribed by Servomech S.p.A.
All works necessary to obtain and maintain such environmental conditions are in charge by the machinery manufacturer and, if occur, by the end user.
The servo-actuator must be installed and used indoor only, in dry area with following environmental conditions:

- Air temperature +0°C ÷ +40°C
- Relative atmospheric humidity 5% ÷ 85%
- No build up of condensation

Servo-actuator must be installed and used in a room with a constant illumination of 500lux at least, complaining the norm UNI EN 1837:2009, or complaining specific norms related to specific application fields.

⚠ THE USE OF THE SERVO ACTUATOR IN DIFFERENT CONDITIONS THAN JUST DESCRIBED MUST BE PREVIOUSLY DECLARED AND AGREED WITH SERVOMECH, SINCE A SPECIAL EQUIPMENT OF THE PRODUCT MUST BE PROVIDED.

4.2. *Operators qualifications*

This manual must be provided to different operators assigned to installation, use and maintenance.

It is responsibility of the machine manufacturer:

- to assign the servo-actuator installation and commissioning to qualified operators;
- to verify assigned operators qualifications periodically;
- to verify that assigned operators are aware about the contents of this manual.

5. STORAGE

- Do not store outside.
- Storage should be dry and dust-free.
- Keep away from any aggressive media.
- Protect from UV radiation.
- Avoid mechanical vibrations.
- Storage temperature: 0 to +50 °C.
- Relative atmospheric humidity: max. 95% (no build up of condensation).

6. INSTALLATION, WIRING AND COMMISSIONING

The operations here described provide both mechanical and electrical connections, as well as servo actuator movement test at reduced speed and force.

So, obligations listed in following paragraph must be complied.

6.1. *Safety warnings*

- ⚠ BEFORE PROCEED WITH ELECTRICAL WIRING OF ELECTRIC MOTOR AND ITS DRIVE, BE SURE THAT POWER SUPPLY IS TURNED OFF.
- ⚠ BEFORE POWER ON THE ELECTRIC MOTOR, CHECK ITS CONNECTORS: THEY MUST BE PROPERLY INSERTED AND TIGHTEN.
- ⚠ DO NOT DAMAGE MOTOR CABLES WHILE ASSEMBLING; CABLES MUST BE PLACED FAR FROM HEAT SOURCES AND MOVING PARTS.
- ⚠ WHILE RUNNING, ELECTRIC MOTOR GENERATES ELECTRIC, MAGNETIC AND ELECTROMAGNETIC FIELDS. PEOPLE WITH "PACEMAKER" MUST KEEP LONG DISTANCE FROM RUNNING MOTORS, TO AVOID DANGEROUS INTERFERENCES.
- ⚠ DO NOT DISCONNECT CONNECTORS WHILE ACTUATOR IS RUNNING OR BEFORE SWITCHING OFF MAIN POWER SUPPLY.
- ⚠ BEFORE RUN THE ELECTRIC MOTOR, CHECK ALL MECHANICAL COUPLINGS. COUPLINGS MUST BE STABLE AND UNDAMAGED.
- ⚠ WHILE COMMISSIONING UNATTENDED MOVEMENTS COULD HAPPEN, DUE TO:
    - WIRING MISTAKES;
    - ASSEMBLY ERRORS;
    - DAMAGES ON CONNECTION CABLES;
    - HW OR SW ERRORS
    - DRIVE PARAMETER SET ERRORS
    - OPERATING CONDITIONS OUT FROM SPECIFICATIONS HEREIN PROVIDED OR OUT FROM CHARACTERISTICS ON CATALOG

- ⚠ ALL SECURITY GUARDS AND ALL ELECTRICAL PROTECTIONS MUST BE ASSEMBLED AND ACTIVE TO PREVENT DAMAGES AND/OR INJURIES DUE TO UNATTENDED MOVEMENT AS ABOVE MENTIONED.
- ⚠ ELECTRIC MOTOR OUTER SURFACES CAN REACH HIGH TEMPERATURES WHILE RUNNING (UP TO 100°C OR MORE).
- ⚠ DO NOT FASTEN OR PLACE NEAR THE MOTOR THERMO SENSITIVE COMPONENTS: DAMAGES MAY OCCUR.
- ⚠ DO NOT TOUCH THE ELECTRIC MOTOR UNTIL ITS TEMPERATURE IS LOWER THAN 40°C.

6.2.*In line motor assembly (SAM IL)*

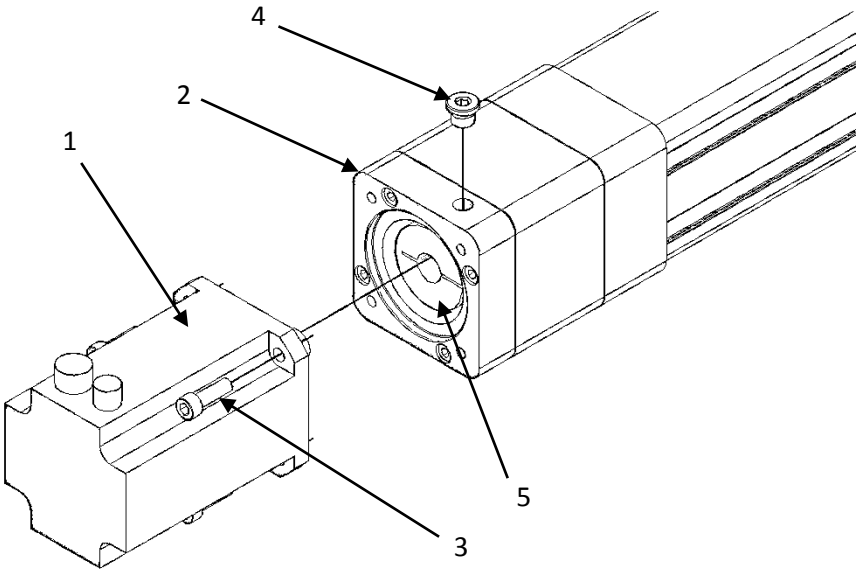


Figure 6.1 – SAM IL motor assembly

- Remove the plug (4) and check the correct alignment between the locking screw of the coupling (5) and the bore.
- Install the motor (1) on the flange (2) with the screws (3).
- NOTE: the screws are not included with the actuator.
- Clamp the coupling on the motor shaft with the screw. Apply tightening torque indicated in Tab. 6.2.
- Fix again the plug (4) on the flange.

Actuator size	SAM 0	SAM 1	SAM 2		SAM 3		SAM 4		SAM 5		SAM 6	
Motor interface	F1 F2	F1 F2	F1 F2	F3	F1 F2 F3	F4	F1 F2	F3 F4	F1 F2 F3	F4 F5	F1 F2	F3 F4 F5
Clamping screw	M3	M4	M4	M4	M4	M5	M6	M8	M8	M10	M10	M10
Tightening torque [Nm]	2,3	4	4	4,5	4,5	8	15	40	40	70	70	85

Table 6.2 – Coupling tightening torque

6.3.*Parallel motor assembly (SAM PD)*

6.3.1. Assembling the motor and pulley

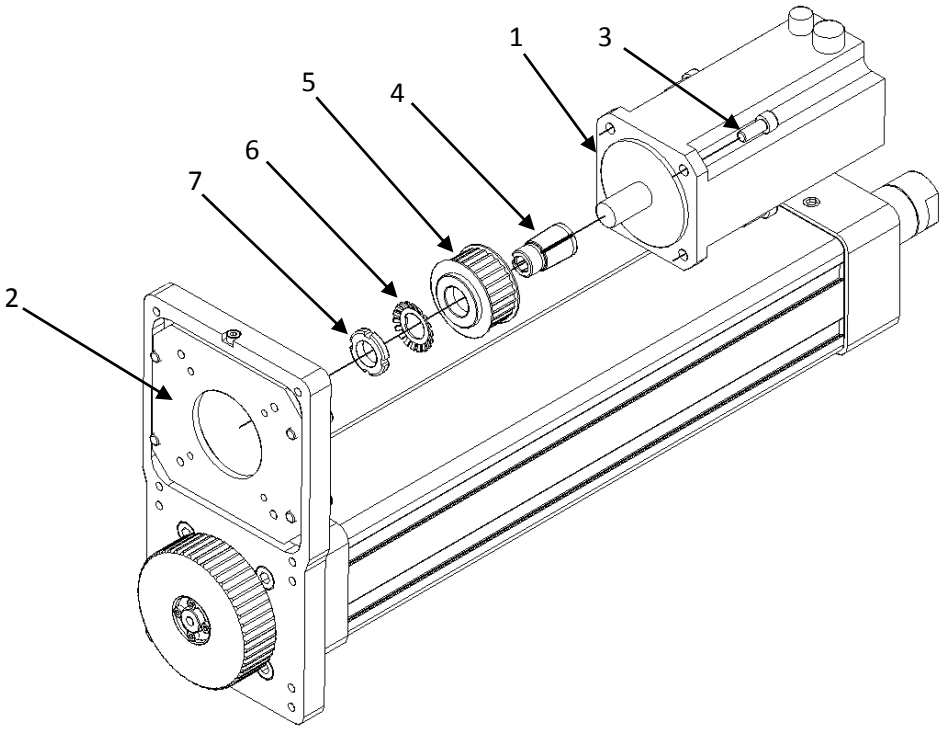


Figure 6.3 – SAM PD motor assembly

- Install the clamp (4) on the motor shaft. The clamp must be completely inserted on the shaft.
- Lighlty oil the internal surface of the pulley (5) and insert it on the clamp (4).
- Fix the pulley on the clamp with MB washer (6) and KM nut (7). Screw-fasten the nut with specified tightening torque (see Tab. 6.4), countering the torque with the hexagonal wrench on the clamp.
- Bend the MB washer on the KM nut to lock it.
- Fix the motor (1) on the plate (2) with the screws (3).
- NOTE: the screws are not included with the actuator.

Actuator	SAM 0		SAM 1				SAM 2			SAM 3			
Shaft diameter [mm]	Ø 6	Ø8	Ø8	Ø9	Ø11	Ø14	Ø8	Ø11	Ø14	Ø11	Ø14	Ø16	Ø19
KM nut tightening torque [Nm]	4	4	4	5	8	8	4	12	12	12	12	30	30

Actuator	SAM 4				SAM 5						SAM 6				
Shaft diameter [mm]	Ø16	Ø19	Ø22	Ø24	Ø16	Ø19	Ø22	Ø24	Ø28	Ø32	Ø24	Ø28	Ø32	Ø35	Ø38
KM nut tightening torque [Nm]	30	30	40	40	30	30	50	50	50	50	50	50	50	75	75

Table 6.4 – Clamp tightening torque

6.3.2. Belt assembly

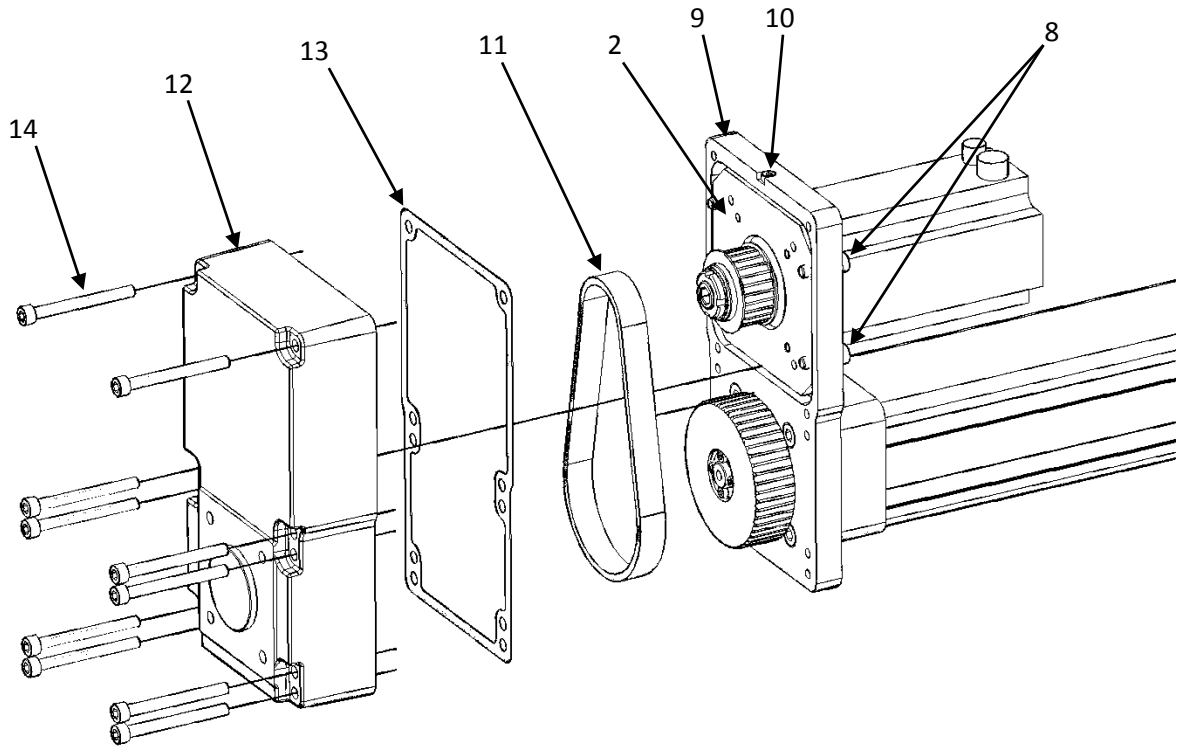


Figure 6.5 – Belt assembly

- Loosen the screws (8) of the motor plate, in order that the motor plate (2) is free to shift on the support plate (9).

⚠ WARNING: during belt tensioning the motor plate (2) must be in contact with the support plate (9); excessive loosening of screws (8) can lead to a wrong measurement of belt tension.

- Completely unscrew the adjusting screw (10) until the motor plate reaches the mechanical stop inside the support plate (minimum center distance).
- Mount the belt (11) on pulleys.
- Screw the adjusting screw (10) to increase the belt tension.
- Adjust the belt tension as specified in Tab. 8.6, using the adjusting screw (turn the screw clockwise to increase the belt tension, turn it anticlockwise to decrease the belt tension).
- The correct tension of the timing belt can be measured using a suitable frequency measurement device. The device measures the natural frequency **fr** of the belt and must be applied at half of the straight line of the belt. As alternative, the tension of the timing belt can be detected by applying a force **F** at half of the straight line of the belt, then measuring at the point of force application, the resulting deflection **f**.

⚠ Excessive belt preloads can lead to increased wear in belt, bearing of the linear unit or motor due to radial loading

- Tighten the screws of the motor plate (8).
- Check the belt tension and adjust it again if necessary.
- Fix the cover (12) with sealing (13) on the support plate (9) with the fixing screws (14).

Actuator	SAM 0		SAM 1		SAM 2			SAM 3					
Motor interface	F1; F2		F1; F2		F1; F2; F3			F1; F2; F3			F4		
Transmission ratio	RV	RN	RV	RN	RV	RN	RL	RV	RN	RL	RV	RN	RL
Natural frequency **fr** of the belt [Hz]	366	365	352	356	323	345	354	203	213	218	181	190	193
Belt tension checking force **F** [N]	3.8	3.8	5.6	5.6	10	11.3	11.3	10.7	11.5	11.5	10.7	11.5	11.5
Belt deflection **f** [mm]	1.2	1.2	1.5	1.5	1.7	1.7	1.6	2.1	2.1	2.0	2.3	2.3	2.3

Actuator	SAM 4						SAM 5			SAM 6					
Motor interface	F1; F2			F3; F4			F1; F2; F3; F4; F5			F1; F2; F3; F4; F5			F1; F2; F3; F4; F5 (*)		
Transmission ratio	RV	RN	RL	RV	RN	RL	RV	RN	RL	RV	RN	RL	RV	RN	RL
Natural frequency **fr** of the belt [Hz]	165	188	193	156	181	179	144	160	169	125	141	139	125	140	139
Belt tension checking force **F** [N]	18	24	24	18	24	24	32.8	43.8	43.8	50	60	60	83.3	100	100
Belt deflection **f** [mm]	2.6	2.6	2.6	2.8	2.7	2.8	3.0	3.2	3.0	4.3	4.2	4.3	4.3	4.2	4.3

(*) – only for 80mm length shaft

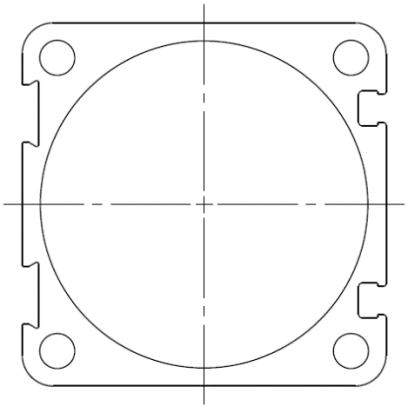
Tolerance for belt frequency	
Frequency [Hz]	Tolerance
≤ 100	± 3
> 100 ≤ 200	± 5
> 200 ≤ 300	± 7
> 300	± 10

Table 6.6 – Belt tensioning

6.4. *Servo actuator limit switches: mounting and positioning*

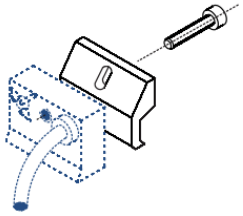
Servo actuators have two or more slots on the aluminium profile to fit the stroke limit switches. The profile shape is in compliance with ISO 15552 standard. Following drawings show these arrangements.

FTV sensor slot



FCM sensor slot

Both type of sensors can be fitted inside their slot from the top.

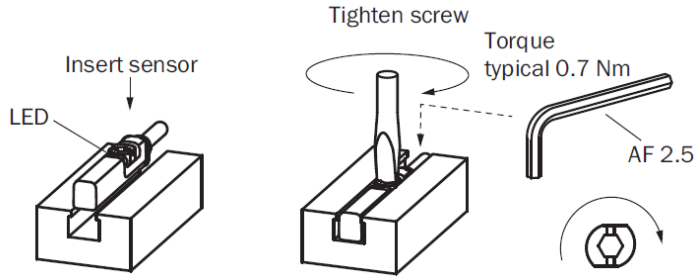


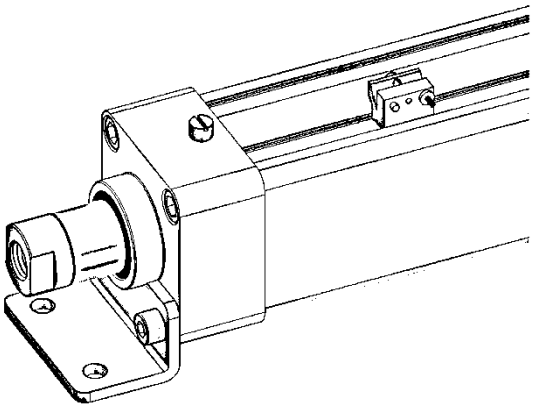
FTV sensor mounting

The **FTV** sensor consists of two elements held together by a screw: the sensor FTV and the fixing bracket. After fitting the sensor and the bracket from the top, it is necessary to align them and partially screw the fixing screw. The group can then be moved along the slot in the desired position and finally locked by tightening the screw.

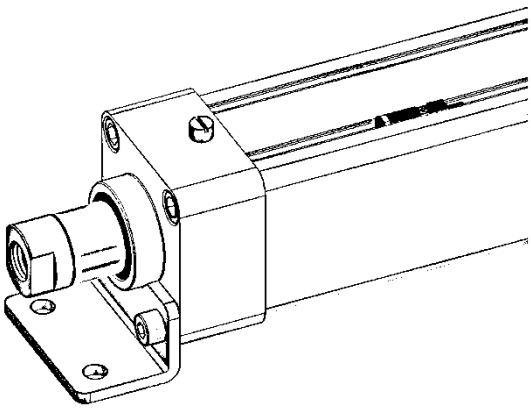
FCM sensor mounting

The **FCM** sensor is fitted from the top; when in the required position, they can be fixed by turning clockwise the screw until stroke end.





FTV Sensor



FCM Sensor

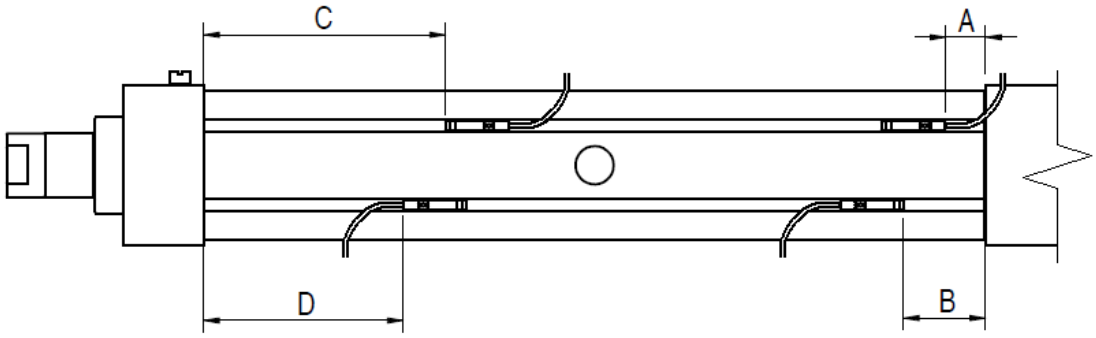
⚠ THE SENSORS PLACED ON THEIR LIMIT POSITIONS, WILL SWITCH WITH THE PUSH ROD IN POSITIONS “LC” AND “LA” INDICATED ON OUR CATALOG AND IN THIS MANUAL (SEE SECTION 6.10).

⚠ THE SENSORS PLACED BEYOND THE LIMIT POSITIONS CANNOT BE REACHED AND ACTIVATED BY THE MAGNET MOUNTED ON THE NUT BALL.

⚠ DO NEVER FIX THE SENSORS OVER THE LIMIT POSITIONS.

⚠ WITH NOT WORKING SENSORS, THE SERVO ACTUATOR MAY BREAK COLLIDING WITH ITS INTERNAL MECHANICAL STOPS.

FCM sensors



FTV sensors

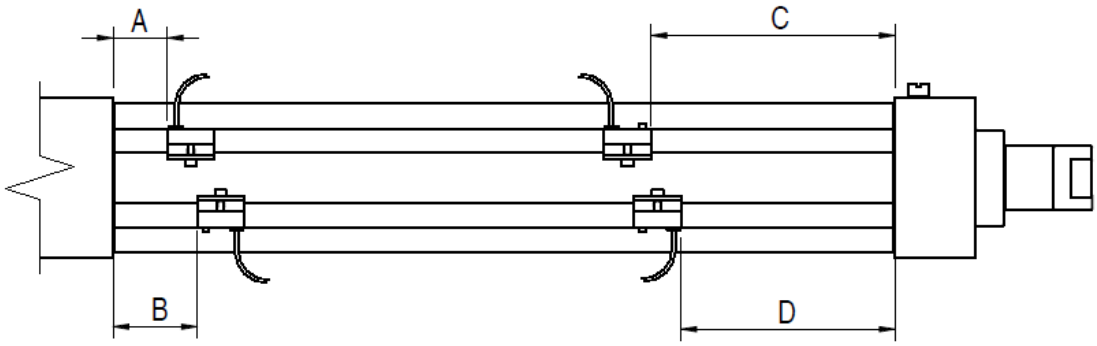


Figure 6.7 – Stroke end limit switches position

		Servo actuators sizes													
		SAM 0		SAM 1		SAM 2		SAM 3		SAM 4		SAM 5		SAM 6	
		FCM	FTV	FCM	FTV	FCM	FTV	FCM	FTV	FCM	FTV	FCM	FTV	FCM	FTV
Sensors limit positions	A	10.6	10.5	10.6	10.5	21.6	21.5	25.6	25.5	29.6	29.5	36.6	36.5	42.6	42.5
	B	16.9	24.5	16.9	24.5	27.9	35.5	31.9	39.5	35.9	43.5	42.9	50.5	48.9	56.5
	C	87.9	95.5§	96.9	104.5	84.9	92.5	106.9	114.5	120.9	128.5	146.9	154.5	171.9	179.5
	D	81.6	81.5*	90.6	90.5	78.6	78.5	100.6	100.5	114.6	114.5	140.6	140.5	165.6	165.5

Table 6.8 – Sensors limit positions

§: FTV sensor limit position - valid for strokes C≥150mm only

*: FTV sensor limit position - valid for strokes C≥100mm only

6.5. *Limit switches wiring*

Linearmech servo actuators can be provided with limit switches (sensors) in two different types; see characteristics on following table.

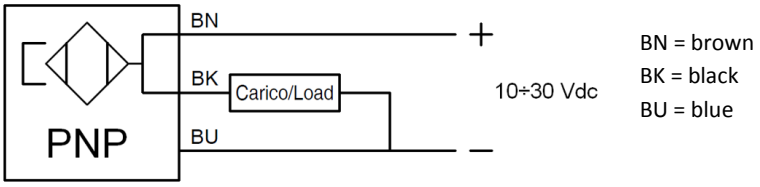
	FTV	FCM
Contact	NO	NC
Output signal	PNP	
LED signal	YES	
Power supply	10÷30 Vdc	
Voltage drop	0.8 V	≤ 2V
Max current	200 mA	100 mA
Switching delay OFF	20 ms (switching delay electronically obtained; it enables signal readout at high speed conditions)	-
Inverted-power supply polarity protection	YES	
Short circuit protection	YES	
Operating temperature	-20°C ÷ +70°C	-30°C ÷ +80°C
Enclosure rating	IP67	IP65
Housing material	ZA4	Plastic
Cable	PVC black 3x0.25mm² - L = 3m	PUR black 3x0.14mm² - L = 2m
Wiring diagram		

Table 6.9 – Sensors technical data

6.6. *Push rod shifting direction*

The push-rod movement direction must comply all needs of machine command and control system; the push-rod movement direction and the motor rotation are related as follows.

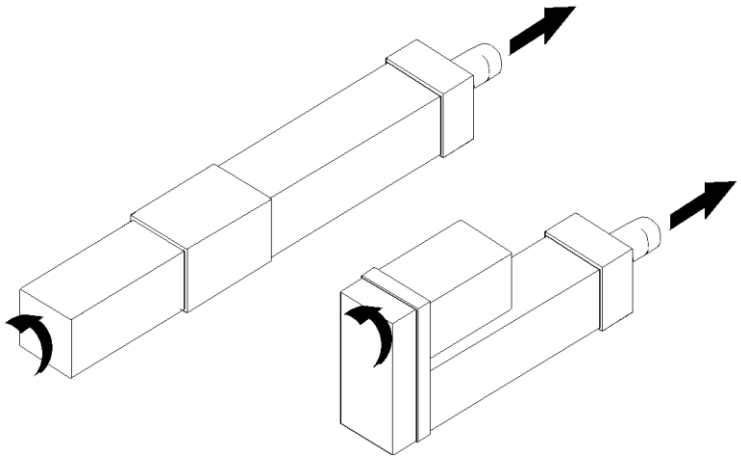


Figure 6.10 – Push rod shifting direction

6.7. *Actuator mechanical installation*

⚠ THE BALL SCREW LINEAR ACTUATOR SA SERIES IS NOT SELF-LOCKING. BEFORE TO APPLY ANY AXIAL LOAD ON THE PUSH ROD, LOCK THE INPUT SHAFT OR USE THE MOTOR BRAKE.

- Check that all fixing elements on the machine are well machined and clean; they must fit the dimensions of servo actuator coupling elements.

⚠ ALL OPERATIONS IN FOLLOWING MUST BE CARRIED OUT AFTER AN ADEGUATE PARAMETERIZATION OF DRIVE AND CONTROL SYSTEMS, AS WELL AS THE MOTOR FEEDBACK DEVICE SET, AND ACTUATOR HOME POSITIONING SET. EVERYTHING DONE ACCORDINGLY TO ALL PRESCRIPTIONS STATED ON INSTRUCTION MANUALS OF DRIVE AND CONTROL SYSTEMS MANUFACTURERS.

- If the length of the actuator should be varied (actuator push-rod more extended or retracted), the movement must be carried out at the minimum speeds and current possible, to minimize the kinetic energy and the load capacity, in the event of shocks against mechanical ends of actuator or mechanical ends of kinematics connected to actuator itself (JOG mode, following all requirements of manufacturers of drive and control system).
- The end stroke control devices (limit switches on servo actuator or on the machine) must be already activated and set.

⚠ All security guards and all electrical protections must be assembled and active to prevent damages and/or injuries.

⚠ DO NOT SET THE ACTUATOR LENGTH OUT OF ITS LIMITS:

- “Lc” = retracted actuator length
- “La” = extended actuator length

Dimensions “Lc” and “La” are indicated on following picture; custom product execution could have different lengths and are contractually defined.

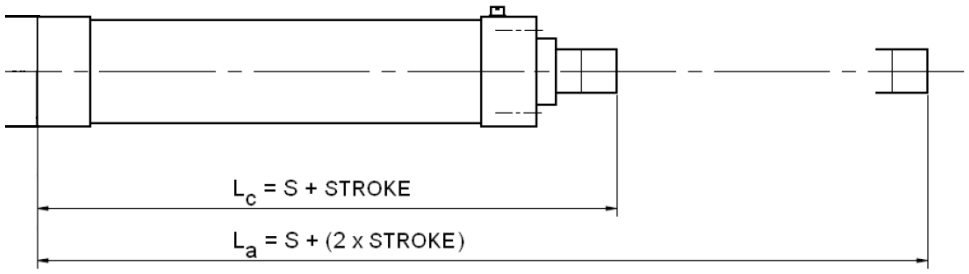


Figure 6.11 – “Lc” and “La” dimensions

Actuator size	SAM 0	SAM 1	SAM 2	SAM 3	SAM 4	SAM 5	SAM 6
“S” quote	229	246	264	296	330	453	538

- Assemble the actuator in the machine in order to have ONLY axial load acting on actuator.
- Take care of alignments between the actuator and the elements connected to it.

⚠ ACTUATOR PERFORMANCES AND ITS CORRECT SERVICE ARE NOT GUARANTEED IF BENDING MOMENTS AND/OR NON AXIAL LOADS AND/OR MISALIGNMENTS ARE APPLIED.

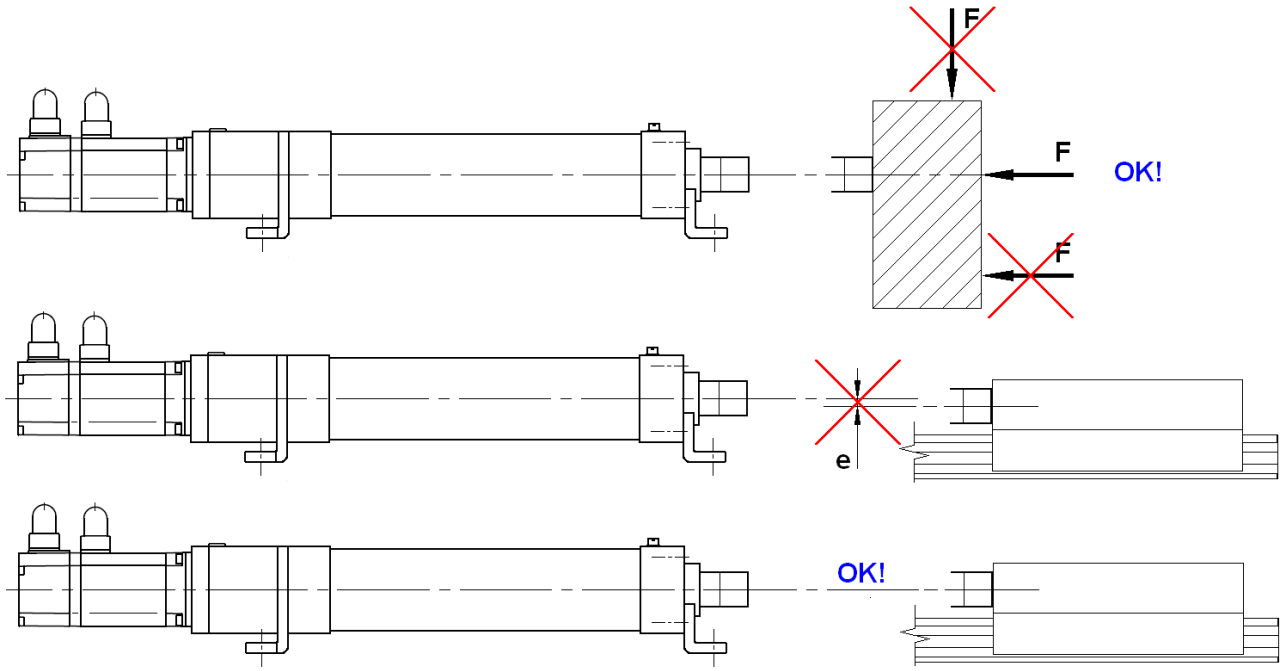


Figure 6.12 – Installation and load on actuator

6.7.1. Installation of rod end fitting elements

- To install a fitting element on the rod end threaded bore, use a wrench on the rod end to counterhold the locking torque.

⚠ The actuator is equipped with internal anti-rotation device: DO NOT TRANSFER ANY TORQUE TO THE PISTON ROD.

⚠ WARNING: in case of torque transfer into the actuator, the internal mechanical components can be damaged.

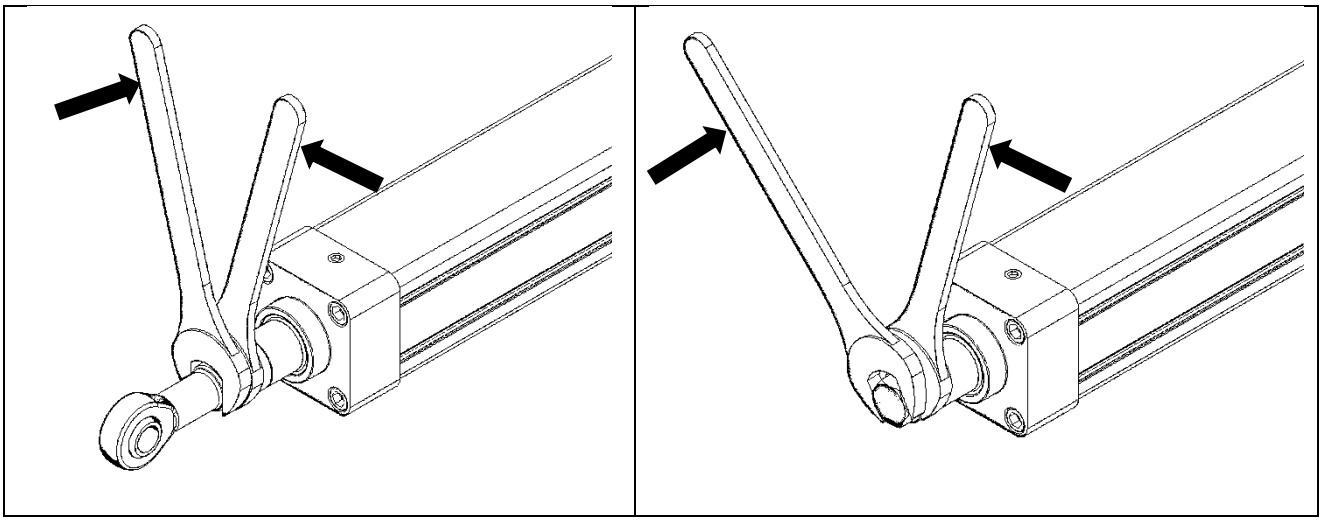


Figure 6.13 – Installation of rod end fitting elements

6.8. ***Start up***

- SAM servo actuators are supplied already lubricated and ready to be used.
- Perform a complete working cycle with reduced speed and current.
- Perform some working cycles, increasing by degrees speed and current, up to the values required.
- If necessary, adjust the previously set limit switches position (see Section 6.4), without travelling over the maximum stroke lengths (see Section 6.7).

7. MAINTENANCE

7.1. *General controls*

- Check periodically the actuator general conditions.
- Clean the servo actuator periodically.
- Check that the breather for internal pressure compensation is not chocked. The breather is made by sintered bronze: if necessary wash it with solvents or replace it.

7.2. *Servo actuator lubrication*

- SAM servo actuators are supplied already lubricated and ready to be used.
- Thrust bearings are long-life lubricated.
- Ball screw must be periodically lubricated. The lubricating time interval is affected by servo actuator use conditions, in term of stroke, speed, accelerations, ambient temperature. In general, if vibrations/shocks are applied, a shorter lubrication interval is required.

To re-lube the ball screw, the grease must be put inside the ball nut through the M6×1 concave grease nipple (DIN 3405-A) fixed on the ball nut. The bore on the outer square profile must be aligned with the grease nipple on the ball nut.

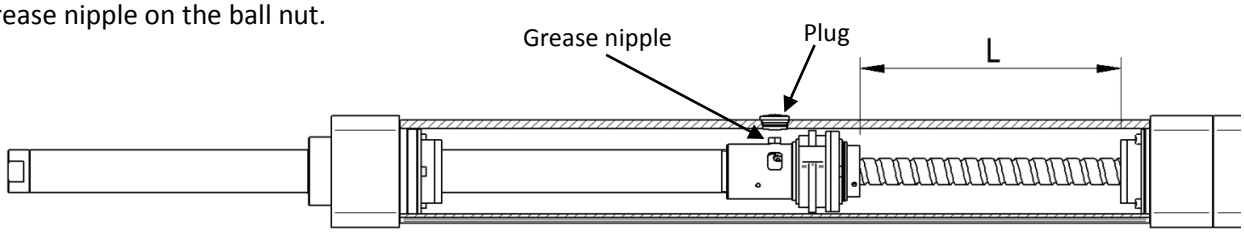


Figure 7.1 – Servo actuator lubrication

To relube the ball nut it is necessary to use LUB ferrule lubricators, specific for concave grease nipples.

⚠ OPERATIONS DESCRIBED IN FOLLOWING LIST MUST BE DONE IN MANUAL MODE (JOG MODE), AT REDUCED SPEED AND MOTOR TORQUE (~10÷15MM/S AND MINIMUM TORQUE TO MOVE THE PUSH-ROD, WITHOUT OR UNDER LIMITED EXTERNAL LOAD). PLEASE REFER TO DRIVE AND CONTROL USERS MANUALS PROVIDED BY MANUFACTURERS.

To access the grease nipple, please do as follows:

- run back the push-rod until contact with the rear shock absorber;
- move the push-rod forward for a stroke value *L*. The grease nipple should be then aligned with the bore on the external profile;
- take out the protective plug on the aluminium profile;
- insert the greaser with LUB ferrule for nut lubricating (about lubricant type and quantity see Sections 7.3 and 7.4).

The opening stroke length *L* is:

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

where:
L [mm] = linear distance for lubrication
C [mm] = servo actuator linear stroke
A = constant value specific for each size (see following table):

Actuator size	SAM 0	SAM 1	SAM 2	SAM 3	SAM 4	SAM 5	SAM 6
A	4.5	2.5	3	7	6	-3.5	-5.5

Table 7.2 – Lubrication position

7.3. *Lubricant*

SAM servoatuator are supplied already lubricated, with lubricant indicated in the table below.

LUBCON Thermoplex® ALN 1001 - Technical data			
Characteristics			Reference norms
Colour	Light beige		
Thickener	Aluminium complex soap		
Base oil	PAO / Ester		
Consistency class (NLGI)	1		DIN 51818
Operating temperature range	-40 ÷ +140	°C	
Dropping point	> 200	°C	DIN ISO 2176
Density at 20°C	0.8382	g/cm^3	DIN 51757
Kin. viscosity of the base oil at 40°C	100	mm^2/s	DIN EN ISO 3104
Kin. viscosity of the base oil at 100°C	14	mm^2/s	DIN EN ISO 3104
Worked penetration	310 ÷ 340	mm/10	DIN ISO 2176

Table 7.3 – Lubricant

For further relubrication, it is recommended to use the same grease.

As alternative following lubricants could be used:
FUCHS: RENOLIT AX 2P
AGIP: AGIP GREASE AC 1
MOBIL: MOBIL GREASE FM 101
KLUBER: KLUBERSYNTH UH1 14-151

- ⚠ DO NOT USE GREASES DIFFERENT FROM THOSE ABOVE MENTIONED.
- ⚠ DO NOT MIX DIFFERENT GREASES: THEY LOSE THEIR EFFECTIVENESS IF NOT COMPATIBLE.
- ⚠ IF YOU SHOULD USE DIFFERENT GREASES, PLEASE CONTACT SERVOMECH BEFORE PROCEED.
- ⚠ IN CASE OF CUSTOM PRODUCT EXECUTION, THE LUBRICANTS COULD BE DIFFERENT FROM THE STANDARD ABOVE.

Standard lubricant is suitable for the whole speed range performable by the servo actuators, while operating with ambient temperature +0°C ÷ +40°C. In case of different operating temperature, we recommend to contact Servomech S.p.A. to evaluate the use of different lubricant.

- ⚠ PRECAUTIONS FOR GREASE STORAGE AND HANDLING MUST BE DONE IN COMPLIANCE WITH MSDS PROVIDED BY GREASES MANUFACTURERS.

7.4. *Relubrication intervals*

For a servo actuator use under nominal performances and standard environment conditions, the lubricating time interval is set to 10^7 ball screw rotations.

In case of heavier or particular working conditions, please contact Servomech S.p.a. to evaluate different lubrication interval.

Following table gives all lubricating information for all sizes and versions available.

Servo actuator size	Ball screw identification code	Lubricant quantity [cm^3]	Re-lubrication frequency [km]
SAM 0	BS1 (Ø12x5)	0.4	50
	BS2 (Ø12x10)	0.4	100
SAM 1	BS1 (Ø14x5)	0.9	50
	BS2 (Ø14x10)	0.7	100
SAM 2	BS1 (Ø16X5)	1.2	50
	BS2 (Ø16x10)	0.9	100
	BS3 (Ø16x16)	1.0	160
SAM 3	BS1 (Ø20x5)	1.8	50
	BS2 (Ø20x10)	1.3	100
	BS3 (Ø20x20)	1.2	200
SAM 4	BS1 (Ø25x5)	2.8	50
	BS2 (Ø25X10)	2.6	100
	BS3 (Ø25x25)	1.7	250
SAM 5	BS1 (Ø32x5)	4.9	50
	BS2 (Ø32x10)	8.8	100
	BS3 (Ø32x20)	6.1	200
	BS4 (Ø32x32)	6.4	320
SAM 6	BS1 (Ø40x5)	7.1	50
	BS2 (Ø40x10)	13.4	100
	BS3 (Ø40x20)	9.3	200
	BS4 (Ø40x40)	8.6	400

Table 7.4 – Maintenance

8. Removal and replacement

Servo actuator components may only be dismantled and replaced by Servomech.
The only exception to this rule is the disassembling of the motor. The disassembly procedures are described in following sections.

8.1.*In line motor disassembly (SAM IL)*

Disassembly of the motor is carried out in the reverse order (see Section 6.2).

8.2.*Parallel motor disassembly (SAM PD)*

- Referring to Fig. 6.5, remove the screws (14), cover (12) and sealing (13).
- Unscrew the motor plate screws (8), in order that the motor plate (2) is free to shift on the support plate (9).
- Completely loosen the adjusting screw (10) to reach the minimum center distance between pulleys.
- Remove the belt (11) from the pulleys.
- Referring to Fig. 6.3, remove the screws (3) and unmount the motor (1) from motor plate (2).
- Unbend the MB washer (6) to unlock the KM nut (7).
- Unscrew the KM nut countering the torque with the hexagonal wrench on the clamp (4).
- Referring to Fig. 8.1, insert the puller flange (15) on the back of the pulley and the push plate (16) in front of the clamp.
- NOTE: the puller flange and push plate are not included with the actuator, they must be separately ordered. Check the ordering code in Tab. 8.2.
- Remove the pulley from the clamp using a proper mechanical puller: put the bar of the puller onto the push plate (16) and the jaws of the puller on the puller flange (15).

⚠ DO NOT put the jaws directly on the pulley, but always use the puller flange. If the mechanical puller is used directly on the pulley, this can be damaged.

- Remove the clamp from the motor shaft.

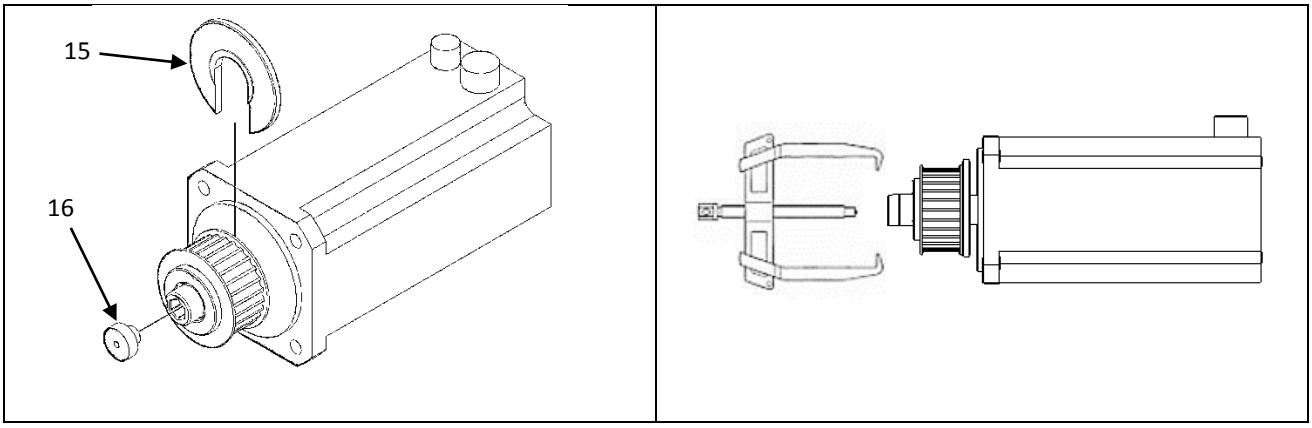


Figure 8.1 – Disassembly of the motor pulley

Motor shaft diameter [mm]	Ø6 Ø8	Ø9	Ø11 Ø14	Ø16 Ø19	Ø22 Ø24	Ø28 Ø32	Ø35 Ø38
Puller flange code	40.00.M02	40.01.M02	40.02.M02	40.03.M02	40.04.M02	40.05.M02	40.06.M02
Push plate code	40.00.M03	40.01.M03	40.02.M03	40.03.M03	40.04.M03	40.05.M03	40.06.M03

Table 8.2 – Equipment for disassembly of the motor pulley

8.3.*Disassembly of driven pulley*

- Referring to Fig. 6.5, remove the screws (14), cover (12) and sealing (13).
- Unscrew the motor plate screws (8), in order that the motor plate (2) is free to shift on the support plate (9).
- Completely loosen the adjusting screw (10) to reach the minimum center distance between pulleys.
- Remove the belt (11) from the pulleys.
- Referring to Fig. 8.3, loosen and remove the taper lock screws (17) and screw them into the release threads (18) of the front ring, pressing off the rear ring and releasing the taper lock. Take out pulley and taper lock, remove the screws from the release threads and position them again into lock threads.

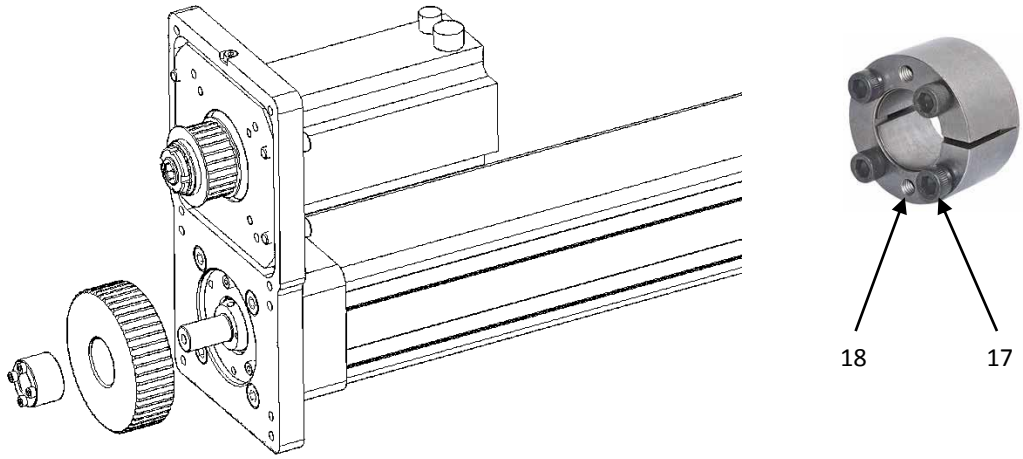


Figure 8.3 – Disassembly of driven pulley

Re-assembly of driven pulley:

- Insert the taper lock with driven pulley into the shaft up to mechanical stop.
- Tighten the screws lightly in diametrically opposite sequence, in several stages, up to tightening torque indicated in Table 8.4. At the end re-check the tightening torque of all the screws.
- NOTE: the release threads of the front ring, used for removal, have to be positioned to uncutted spaces of the front ring.

Actuator size	SAM 0	SAM 1	SAM 2	SAM 3	SAM 4	SAM 5	SAM 6
Screws	M2,5	M2,5	M2,5	M3	M4	M5	M6
Tightening torque [Nm]	1,2	1,2	1,2	2,1	4,9	9,7	16,5

Table 8.4 – Taper lock tightening torque