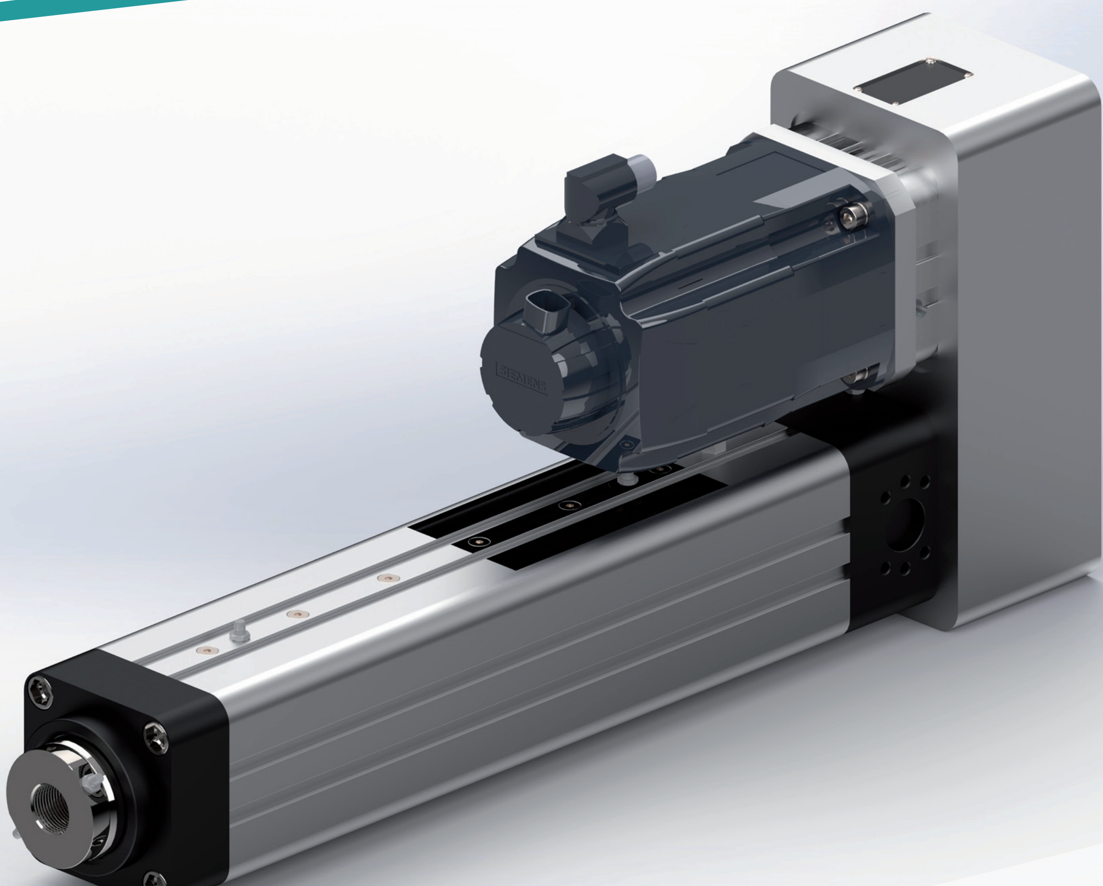
Marzorati
Drive your e-motion

EN

LAM

ISO15552 LINEAR SERVO ACTUATORS



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PRESENTATION: LAM SERVO ACTUATORS

To complete the Marzorati range of linear motion, we present a new line of **Linear Servo Actuators** equipped with high-precision **Ball Screw and Roller Nut Ball Screws,** characterized by compact size, lightweight, high efficiency, speed, and load capacity.

• They comply with **ISO 15552** standards and are designed to be highly versatile in terms of mounting options, thanks to **numerous accessories** that allow easy integration with the industrial plant. They are fully compatible with standard ISO 15552 accessories, and we have designed high-load mounting systems for larger sizes.

• They are designed to replace **Pneumatic Cylinders** (smaller sizes) and **Hydraulic Cylinders** (larger sizes), improving performance, ease of maintenance, overall efficiency, and repeatability.

• The **Outer Body** is designed to fully withstand the maximum load in any mounting position, thanks to the CNC-machined aluminum outer body, which, along with the extruded aluminum piston rod, keeps the weight low.

• The **Bearing Group** consists of high-precision and stiffness **Angular Contact Ball Bearings,** which can be mounted in tandem to maintain high durability.

• They can mount **Brushless Servomotors** and **Stepper Motors** in various mounting positions: coaxial with bellows coupling or elastomeric coupling, or parallel with high-precision timing belt and zero-backlash couplings. **High-precision Planetary Gearboxes** can be fully integrated into any configuration. They can also accept **induction motors**, even in parallel configuration.

• The low-friction Internal **Anti-Rotation System** can be supplied in all sizes and is made from highly durable 3D-printed Technopolymers that are resistant to wear, with optimized geometry to ensure longer system life and full integration.

• **Magnetic Limit Switch Sensors** are provided as standard and are fully adjustable along the actuator's standard grooves.

Caratteristiche Generali		
External Conditions	Ambient Temperature	0°C / +70°C
	Protection Class	IP55/IP65
	Humidity	0% - 90%
Materials and Technology	Mounting System	ISO 15552
	Duty Cycle	Up to 100%
	Internal Anti-Rotation	All Sizes
	Limit Switch Sensors	Hall Effect Sensors
	Body Material	Anodized Al 6082 T6
	Front Flange Material	Anodized Al 6082 T6
	Extruded Body Material	Anodized Al 6060 T6
	Parallel Body Material	Anodized Al 6082 T6 or Anodized Al 7075 T6
	Rod Material	Chrome-Plated Steel or AISI 304

Applications: injection molding, testing equipment, servo presses, metals, paper processing, packaging, medical applications, energy, vehicles, nonwoven fabric machinery.

PRODUCT CODING

LAM050	P1	1	A	500	TS	GT	-	TO	-	RM1	K0	M30-PCD70C50Q60-D14	-	-	-

Electric Cylinder Size:
LAM032: ISO Ø32
LAM040: ISO Ø40
LAM050: ISO Ø50
LAM063: ISO Ø63
LAM080: ISO Ø80
LAM100: ISO Ø100
LAM125: ISO Ø125

Motor Configuration:
COAXIAL: D1 - D2 - R1 - R2 - M0
PARALLEL: P1 - P2 - PR1 - PR2
See Tab.1

Reduction Ratio:
See Table 2

Ball Screws / Roller Screws
See Table 3

Stroke Length:
LAM032: 0-800
LAM040: 0-1000
LAM050: 0-1500
LAM063: 0-1800
LAM080: 0-2000
LAM100: 0-2400
LAM125: 0-2400

Rod Ends:
TS: Spherical Joint
TF: Fork
TSA: Self-aligning
TM: Male Thread
TMF: Female Thread

Internal Accessories
GT: Anti-rotation
IN: Additional Greasing – see *Page 34*
AM: Shock Absorbers
CP: Reinforced Bearing

Additional Accessories
PE: Bellows Protection
SF: Bellows Coupling
TF: Breather Plug

Rear Mounting Accessory
See Tab. (4)

Body Mounting Accessory:
PL: Side Pins
PF: Front Plate
PA: Side Plates

Sensors and Orientation
RM1,2,3,4
A1,2,3,4 ... See *Page 36*

Accessory Orientation
K0: 0° relative to the vertical
K1: 90° relative to the vertical

Internal Coding
Motor Flange
See *Page 7*

Gearbox Code
Only with R..., PR...
See *Page 13*

Motor Code
Only with D2, P2, R2, PR2
See *Page 7*

Special Accessories

Tab. 1 Configurations

D1	HOUSING + COUPLING + FLANGE	COAXIAL
D2	HOUSING + COUPLING + FLANGE + MOTOR	COAXIAL
M0	BASE MODULE WITH EXTENDING SHAFT	COAXIAL
R1	HOUSING + COUPLING + FLANGE + PLANETARY GEARBOX	COAXIAL
R2	HOUSING + COUPLING + FLANGE + PLANETARY GEARBOX + STANDARD MOTOR	COAXIAL
P1	PARALLEL WITH TIMING BELT TRANSMISSION PREPARED FOR MOTOR	PARALLEL
P2	PARALLEL WITH TIMING BELT TRANSMISSION AND STANDARD MOTOR	PARALLEL
PR1	PARALLEL WITH TIMING BELT TRANSMISSION AND PLANETARY GEARBOX	PARALLEL
PR2	PARALLEL WITH TIMING BELT TRANSMISSION, PLANETARY GEARBOX AND MOTOR	PARALLEL

Tab. 2 Reduction Ratios

SIZE	DISP. PR..., R...	DISP. P...	DISP. D.., M0
LAM032	4-5-7-8-10	1	1
LAM040	4-5-7-8-10	1	1
LAM050	3-4-5-7-8-10-14-16-20	1-2	1
LAM063	3-4-5-7-8-10-14-16-20	1-2	1
LAM080	3-4-5-7-8-10-14-16-20	1-2	1
LAM100	3-4-5-7-8-10-14-16-20	1-2	1
LAM125	3-4-5-7-8-10-14-16-20	1	1

Tab. 4 - Rear Accessories

DESCRIPTION	CODE
REAR BRACKET	STO
REAR FIXED EYELET	TO
REAR BRACKET	TSTO
REAR SPHERICAL EYELET	PTS
CENTERING DISC	AC

Tab. 3 Ball Screws

SIZE	DxP	CODE
LAM032	12x5	A
	12x10	B
LAM040	16x5	A
	16x16	B
LAM050	20x5	A
	20x10	B
	20x20	C
LAM063	25x5	A
	25x10	B
	25x25	C
LAM080	32x5	A
	32x10	B
	32x32	C
LAM100	40x5	A
	40x10	B
	40x20	C
	40x40	D
	50x10	E
	50x20	F
LAM125	63x10	A
	63x20	B

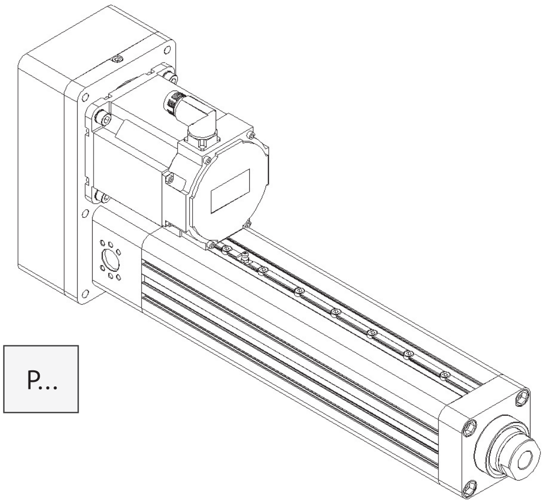
Tab. 5 Extra-Stroke Standard

SIZE	DxP	[mm]
LAM032	12x5	5
	12x10	10
LAM040	16x5	5
	16x16	16
LAM050	20x5	5
	20x10	10
	20x20	20
LAM063	25x5	5
	25x10	10
	25x25	25
LAM080	32x5	5
	32x10	10
	32x32	32
LAM100	40x5	10
	40x10	10
	40x20	20
	40x40	40
	50x10	10
	50x20	20
LAM125	63x10	15
	63x20	25

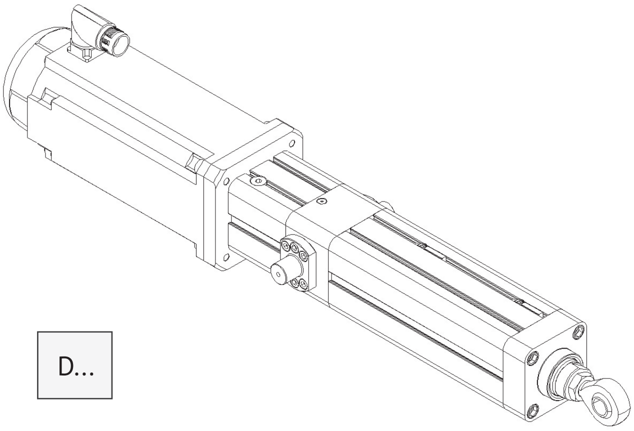
EXTRA STROKE

It is standard with every actuator and varies depending on the pitch of the ball screw. All actuator lengths include the extra-stroke. In some cases, it is advisable to customize it based on operational conditions. Table 5 to the side shows the extra-stroke values for **both sides** for each actuator size. Specifically, this means that the actuator, in addition to the nominal stroke, has the ability to move backward, in the fully closed position, by the value of the extra-stroke indicated, and in the “fully open” position, it can move forward by the same value. Making contact with the upper and lower bodies is never recommended: the extra-stroke is there to prevent accidental contacts during incorrect maneuvers. If contact is necessary, the use of shock absorbers is recommended (see *Page 34*).

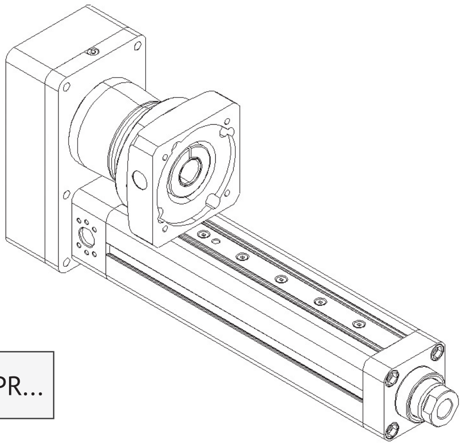
CONFIGURATIONS



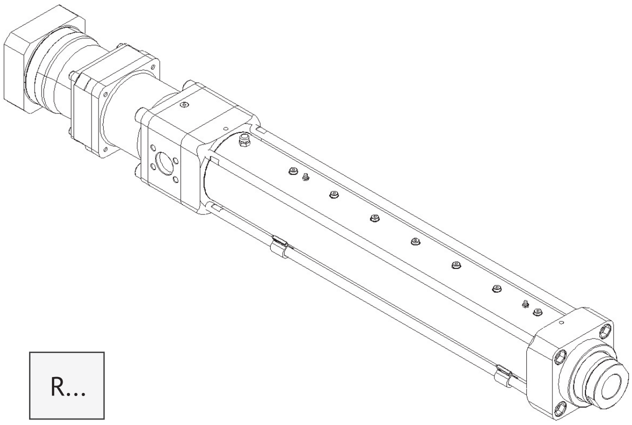
P...



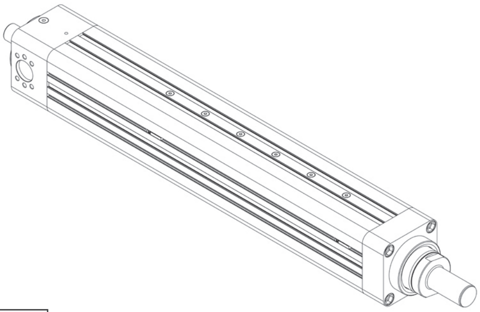
D...



PR...



R...



M0

The LAM servo actuators can be requested with the configurations as above, as well as according to the coding on *Page 4*. Regarding the motor supply, the coding specifies how the actuators are supplied. The **second "slot"** after the actuator size **identifies the motor configuration**: if it contains the number "**1**," the actuator is supplied without a motor, and the assembly is left to the customer; if it contains the number "**2,**" Marzorati will take care of both the motor supply and assembly, thus providing the complete package.

GENERAL PERFORMANCE

GENERAL PERFORMANCE		LAM032		LAM040		LAM050			LAM063		
MAX ACTUATOR STATIC LOAD	[N]	2500		4000		8000			12500		
MAX ACTUATOR DYNAMIC LOAD	[N]	2500		4000		8000		6800	12500		8500
BALL SCREW CODE		A	B	A	B	A	B	C	A	B	C
BALL SCREW DIAMETER	[mm]	12		16		20			25		
BALL SCREW PITCH	[mm]	5	10	5	16	5	10	20	5	10	25
DYNAMIC LOAD COEFFICIENT C_a	[N]	6259	7946	13979	9614	15696	18345	12361	20493	22171	16873
AVERAGE LOAD TO 2000km LIFE F_a	[N]	849	1359	1897	1923	2130	3137	2663	2781	3791	3916
DIRECT DRIVE EFFICIENCY* η_d		0,90	0,95	0,89	0,96	0,88	0,93	0,96	0,82	0,90	0,95
SCREW'S SHAFT MAX LOAD TORQUE	[Nm]	2,3	4,2	3,6	10,6	7,1	13,5	22,4	11,6	21,2	35,1
DIRECT DRIVE MEDIAN BACKLASH	[mm]	0,035	0,035	0,035	0,035	0,035	0,05	0,035	0,035	0,035	0,035
MAX LINEAR SPEED v_t	[mm/s]	625	1167	567	1813	413	567	1533	307	617	1459
MAX SCREW SHAFT SPEED n_u	[rpm]	7500	7000	6800	6800	4950	3400	4600	3680	3700	3500
MAX LINEAR ACELERATION a_u	[m/s²]	12,26	7,85	12,26	9,81	12,26	7,85	9,81	9,81	9,81	9,81
$J_{0,u}$ ZERO STROKE	[kgxm²x10⁻⁴]	0,0354	0,0368	0,0640	0,0667	0,1813	0,2078	0,2187	0,5022	0,6107	0,6594
$J_{100,u}$ INCREMENTS EVERY 100mm	[kgxm²x10⁻⁴]	0,0130	0,0126	0,0347	0,0292	0,0908	0,0919	0,0890	0,2350	0,2665	0,2478
$M_{0,c}$ LINEAR MASS ZERO STROKE	[kg]	0,241	0,254	0,439	0,483	0,652	0,786	0,759	1,007	1,175	1,198
$M_{100,c}$ INCREMENTS EVERY 100mm	[kg]	0.125		0.161		0.199			0.235		
BELT DRIVE SYSTEM EFFICIENCY η_p		0.99		0.99		0.985			0.985		
PLANETARY GEARBOX EFFICIENCY η_R		0.97		0.97		0.97			0.97		
MAX BELT TORQUE i=1	[Nm]	4.9		6.0		25.0			35.0		
MAX STANDARD STROKE	[mm]	800		1000		1500			1800		

Rolled Screw	
Grounded Screw	

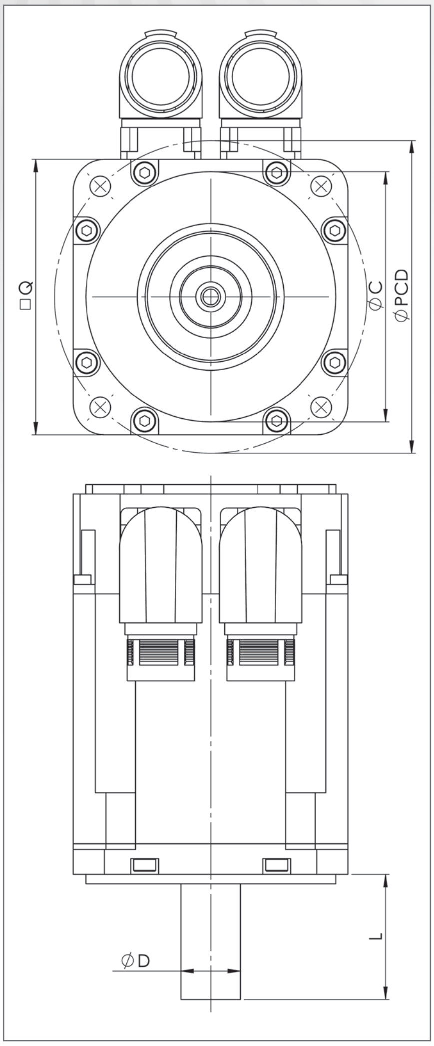
GENERAL PERFORMANCE		LAM080			LAM100						LAM125	
MAX ACTUATOR STATIC LOAD	[N]	30000			60000						150000	
MAX ACTUATOR DYNAMIC LOAD	[N]	17500	30000	15000	30000	50000	40000	35000	60000		125000	150000
BALL SCREW CODE		A	B	C	A	B	C	D	E	F	A	B
BALL SCREW DIAMETER	[mm]	32			40				50		63	
BALL SCREW PITCH	[mm]	5	10	32	5	10	20	40	10	20	10	20
DYNAMIC LOAD COEFFICIENT C_a	[N]	29234	45500	25702	35687	80148	61509	51699	137400	139200	216900	301500
AVERAGE LOAD TO 2000km LIFE F_a	[N]	3968	7780	6477	4843	13705	13252	14033	23495	29990	37089	64956
DIRECT DRIVE EFFICIENCY* η_d		0,78	0,88	0,96	0,74	0,89	0,92	0,95	0,85	0,89*°°	0,84	0,88
SCREW'S SHAFT MAX LOAD TORQUE	[Nm]	16,8	53,1	79,8	29,1	92,4	135,2	230,3	109,8	208,5	239,2	526,2
DIRECT DRIVE MEDIAN BACKLASH	[mm]	0,035	0,05	0,035	0,035	0,05	0,05	0,05	0,032	0,032	0,037	0,037
MAX LINEAR SPEED v_t	[mm/s]	225	375	1483	192	400	850	1733	300	800	292	650
MAX SCREW SHAFT SPEED n_u	[rpm]	2700	2250	2781	2300	2400	2550	2600	1800	2400	1752	1950
MAX LINEAR ACELERATION a_u	[m/s²]	9,81	7,52	9,81	9,81	9,81	9,81	9,81	9,81	11,5	11,5	11,5
$J_{0,u}$ ZERO STROKE	[kgxm²x10⁻⁴]	1,681	1,946	2,365	4,818	5,044	5,025	5,811	9,463	12,950	45,892	49,563
$J_{100,u}$ INCREMENTS EVERY 100mm	[kgxm²x10⁻⁴]	0,663	0,556	0,664	1,682	1,167	1,169	1,143	3,246	3,722	9,772	8,924
$M_{0,c}$ LINEAR MASS ZERO STROKE	[kg]	2,040	2,331	2,662	4,358	5,021	5,148	5,566	6,226	7,823	12,173	15,851
$M_{100,c}$ INCREMENTS EVERY 100mm	[kg]	0.490			0.796						1.516	
BELT DRIVE SYSTEM EFFICIENCY η_p		0.98			0,965	0,97	0,975	0,975	0,97	0,97	0.97	
PLANETARY GEARBOX EFFICIENCY η_R		0.97			0.97						0.97	
MAX BELT TORQUE i=1	[Nm]	79.8			230*°						530	
MAX STANDARD STROKE	[mm]	2000			2400						2400	

Rolled Screw	
Grounded Screw	

*°HIGH LOAD BELT
*°°TRIPLE BEARINGS TANDEM

STANDARD MOTORS

Standard Servomotor Flanges									
Ø D	**CORPO**	**DIMENSIONI**	**LAM032**	**LAM040**	**LAM050**	**LAM063**	**LAM080**	**LAM100**	**LAM125**
8	40	PCD46C30Q40	M20						
9-11	55-58	PCD63C40Q55-58	M25S-M25K	M25S-M25K					
9	58	PCD65C40Q58	M28	M29					
14	58-60	PCD70C50Q60-58	M30-M30K	M30-M30K	M30				
14	72	PCD75C60Q72	M36	M36S-M36K	M36S-M36K	M36S-M36K			
14	70	PCD85C60Q70		M38	M38	M38			
16-19	80-84	PCD90C70Q84-80			M40K-M40	M40K-M40	M40K-M40		
19	84	PCD90C60Q84			M42	M42	M42		
19	84-88	PCD100C80Q84-88			M45K-M45	M45K-M45	M45K-M45		
19	96	PCD100C80Q98				M48	M48		
19-24	108-105	PCD115C95Q105-108				M50-M50S	M50-M50S	M50-M50S	
24	108-114	PCD130C110Q114					M55	M55	
24	126	PCD130C110Q126					M63	M63	
24-28	130	PCD145C110Q130					M65	M65	
32	142	PCD165C130Q142						M71-M71K	M71
32	155	PCD165C130Q155						M80	M80
35	180	PCD200C114,3Q180							M95
38	188-192	PCD215C180Q196-185							M100
MAX Parallel Motor Housing			**Shaft**						
LAM032	□70	PCD75	14	**Standard Stepper Motor Flange**					
LAM040	□72	PCD85	14	**BODY**	**LAM032**	**LAM040**	**LAM050**	**LAM063**	**LAM080**	**LAM100**
LAM050	□88	PCD100	19 (R=1)	NEMA 17	x					
LAM063	□96	PCD115	19	NEMA 23	x	x				
LAM080	□130	PCD145	24	NEMA 24	x	x	x			
LAM100	□155	PCD165	32	NEMA 34			x	x		
LAM125	□192	PCD215	42	NEMA 42					x	x



The nomenclature of the standard motor flanges is indicated in the table above. The range of motors that can be mounted consists of servomotors with a **square housing size ranging from 40mm to 200mm**, thus covering all performance requirements of the LAM Servo Actuators range.
Marzorati relies on third parties for the supply of servomotors and is free to mount any brand available on the market, ensuring maximum flexibility.
A standardized nomenclature has therefore been defined based on the typical sizes of motors available on the market, for which standard flanges have been designed to ensure proper coupling in every actuator configuration. The table shows the generic motor measurements following the drawing above: **bolt circle, centering, and square flange**, respectively PCD... C... Q.... These dimensions have been associated with internal codes M... to identify the flanges; furthermore, the motor shaft diameter D... must be indicated in the coding, which can be **adapted to any diameter** as long as it is smaller than the diameters listed in the table. To create the description to be included in the coding, the following instructions must be followed.

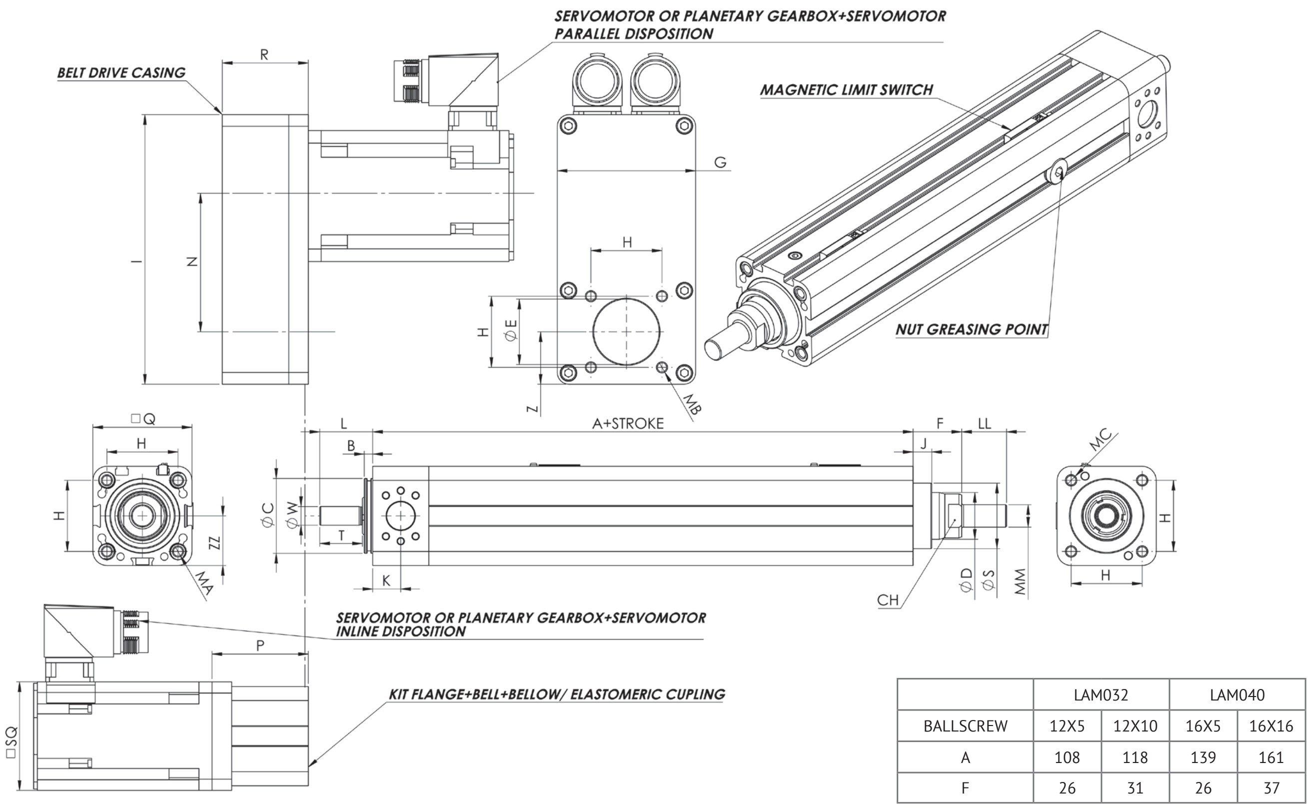
M...-PCD...C...Q...-D...

Selected Motor: PCD = 75mm C = 60mm Q = 72mm
Motor Shaft D = 16mm

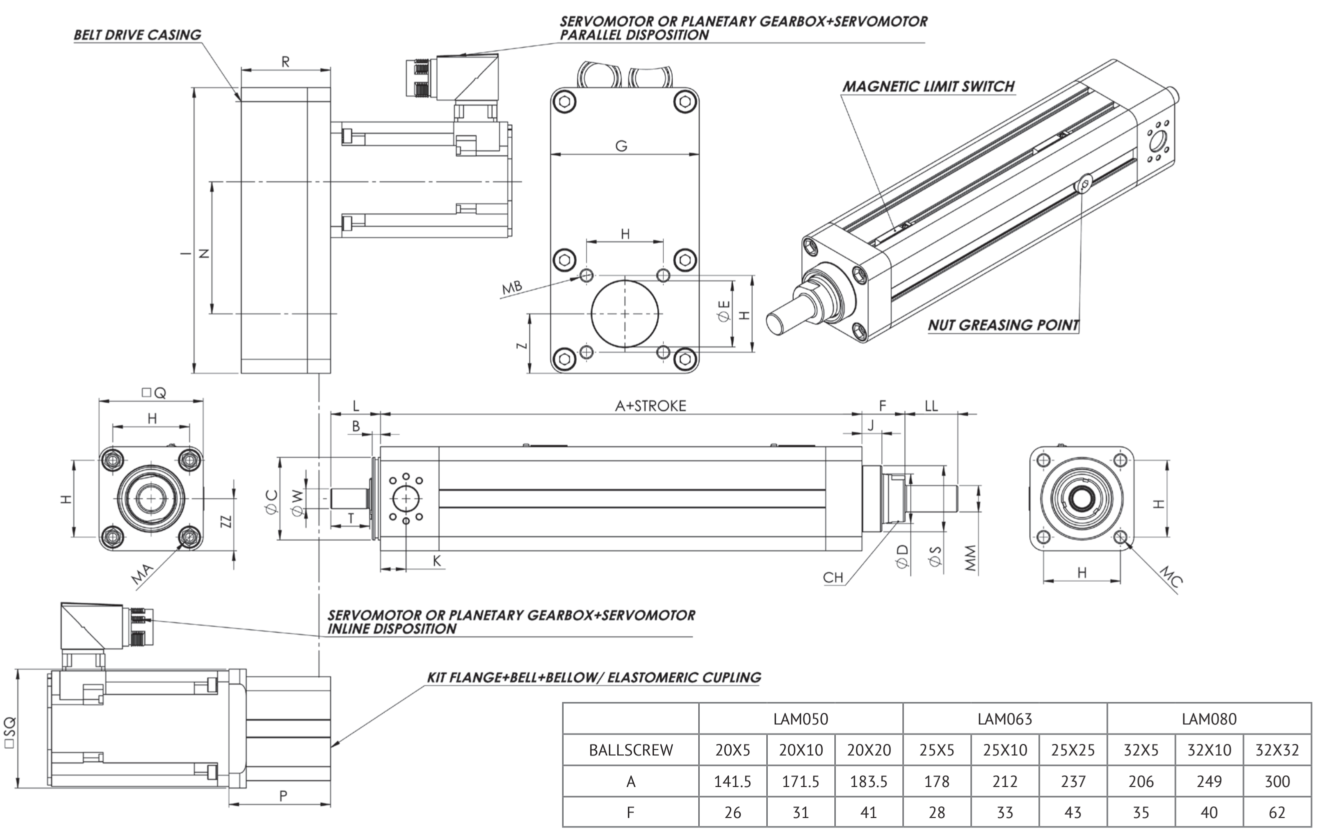
M36-PCD75C60Q72-D16

Note: Marzorati has the capability to produce coupling flanges that differ from the catalog.

DIMENSIONAL DRAWINGS

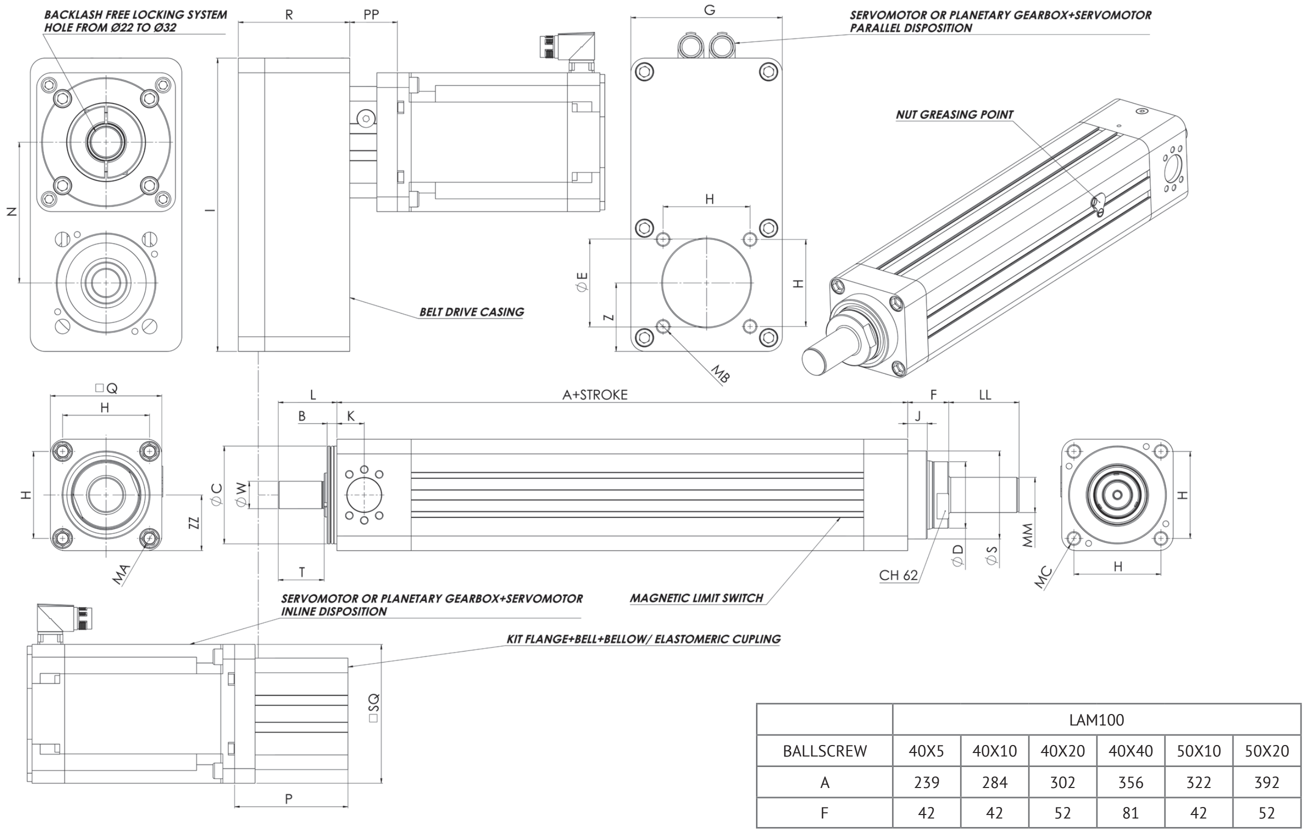


	LAM032		LAM040	
BALLSCREW	12X5	12X10	16X5	16X16
A	108	118	139	161
F	26	31	26	37

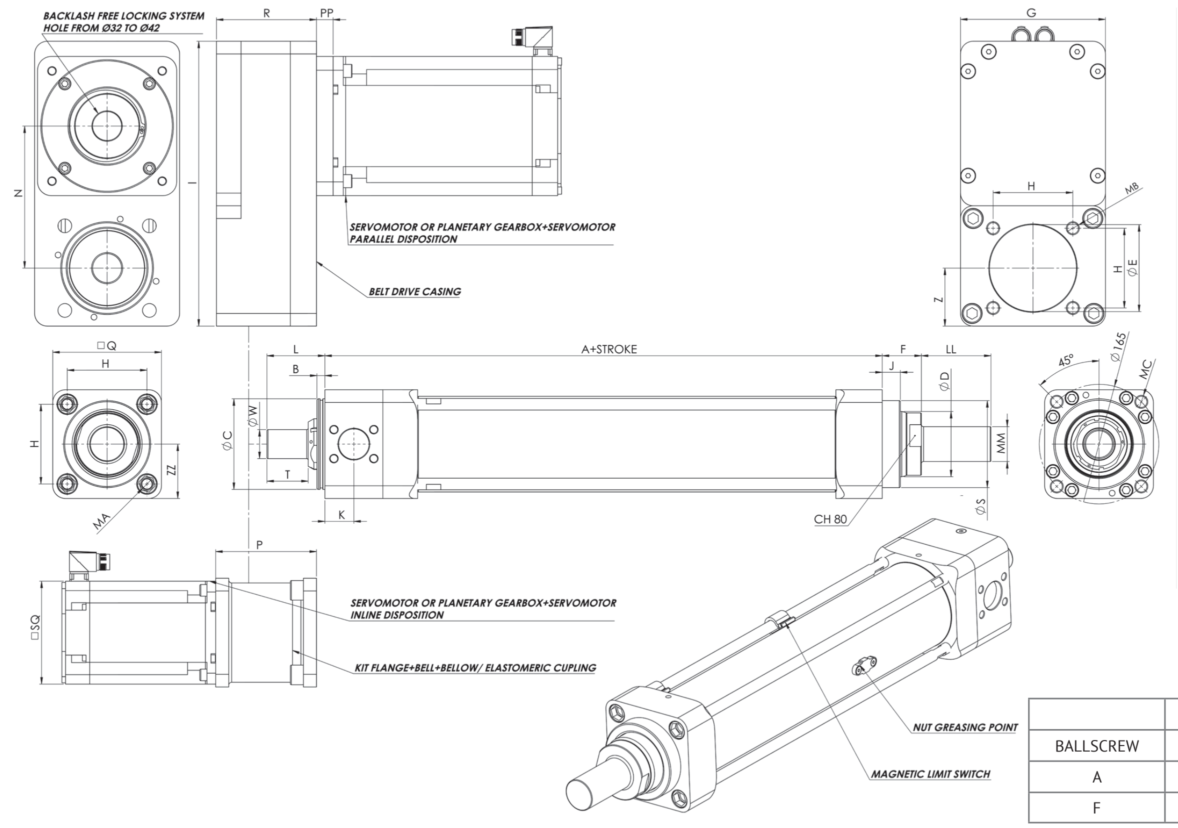


	LAM050			LAM063			LAM080		
BALLSCREW	20X5	20X10	20X20	25X5	25X10	25X25	32X5	32X10	32X32
A	141.5	171.5	183.5	178	212	237	206	249	300
F	26	31	41	28	33	43	35	40	62

DIMENSIONAL DRAWINGS



	LAM100					
BALLSCREW	40X5	40X10	40X20	40X40	50X10	50X20
A	239	284	302	356	322	392
F	42	42	52	81	42	52



	LAM125	
BALLSCREW	63x10	63x20
A	424	469
F	60	70

DIMENSIONAL TABLES AND INERTIA DATA

The table below shows the standard dimensions of the LAM Servo Actuators range. This table should be supplemented with the table on *Page 11*, where the dimensions of the bell housing + coupling + flange kit are provided in order to determine the total actuator size.

On our website, the portal is available to download the **3D model** of any LAM Servo Actuator configuration.

In the case of special accessories, these dimensions may change.

STANDARD DIMENSIONS							
SIZE	LAM032	LAM040	LAM050	LAM063	LAM080	LAM100	LAM125
B	4,5	4,5	5	5	6	10	11
ØC	32 f7	40 f7	50 f7	63 f7	80 f7	100 f7	125 f7
SQ max	70	72	88	96	130	155	192
CH	16	20	26	30	38	62	80
ØD Rod	20	25	30	35	45	70	90
ØE	30 H7 ↓ 4	35 H7 ↓ 4	40 H7 ↓ 4	45 H7 ↓ 5	60 H7 ↓ 6	90 H7 ↓ 7	120 H7 ↓ 10
G	68	74	90	98	135	155	200
H	32,5	38	46,5	56,5	72	89	110
I	127	144	173	190	256	300	393
J	10	10	12	12	16	20	25
K	10	15	15,5	20	25	28	40
L	25	30	30	40	50	60	82
LL	20	24	32	32	40	72	96
MA	M6x12	M6x12	M8x17	M8x17	M12x23	M14x23	M18x32
MB	M6x10	M6x10	M8x12	M8x12	M12x17	M14x19	M18x27
MC	M6x12	M6x12	M8x12	M8x15	M12x23	M14x25	M18x32
MM	M10x1,25	M12x1,25	M16x1,5	M16x1,5	M20x1,5	M36x2	M48x2
N	60	72,5	80	90	117	145	196
P	var.	var.	var.	var.	var.	var.	var.
PP	\	\	\	\	\	var.	var.
□Q	45	53	63	76,5	94	114	150
R	45,5	46	54	64	82	114	138
ØS	30 h7	35 h7	40 h7	45 h7	60 h7	90 h7	120 h7
T	19	24,5	23,5	28	37	47	59
ØW	8 h6	10 h6	12 h6	14 h6	19 h6	28 h6	38 h6
Z	25	28	36	42,25	59	70	80
ZZ	22,5	26,5	31,5	38,25	47	57	75

The following table completes all the actuator lengths in the D... configuration with the bell housing + coupling + flange kit. These refer to the assembly with the elastomeric coupling. This is the standard configuration, providing the right balance between precision and installation cost. The inertias indicated in the table refer only to the elastomeric coupling, to which the inertias of other transmission components must be added according to the formulas on *Page 24*.

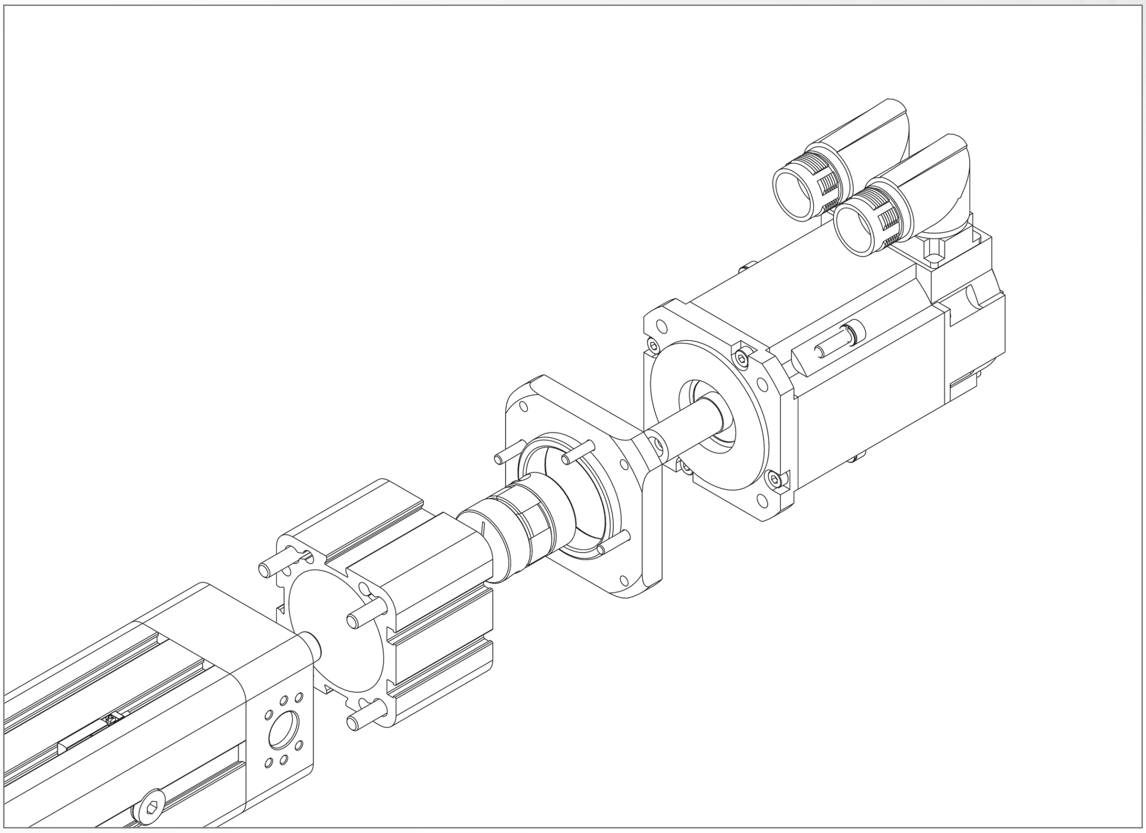
DIMENSIONAL TABLES AND INERTIA DATA

SIZE	CODE	HOUSING + COUPLING + FLANGE KIT "P" DIMENSION [MM]							ROTATIONAL INERTIA ELASTOMERIC COUPLING [kgxm^2] J_{ec}						
SERVOMOTORS		LAM032	LAM040	LAM050	LAM063	LAM080	LAM100	LAM125	LAM032	LAM040	LAM050	LAM063	LAM080	LAM100	LAM125
PCD46C30Q40	M20	52							$1,1 \times 10^{-6}$						
PCD63C40Q55-58	M25S-M25K	48,5	48,5-51,5						$2,4 \times 10^{-6}$	$2,4 \times 10^{-6}$					
PCD65C40Q58	M28	48,5	48,5						$2,4 \times 10^{-6}$	$2,4 \times 10^{-6}$					
PCD70C50Q60-58	M30-M30K	60,5	60,5	61,5					$6,2 \times 10^{-6}$	$6,2 \times 10^{-6}$	$6,2 \times 10^{-6}$				
PCD75C60Q72	M36-M36K	60,5	60,5	61,5	69				$6,2 \times 10^{-6}$	$6,2 \times 10^{-6}$	$6,2 \times 10^{-6}$	$6,2 \times 10^{-6}$			
PCD85C60Q70	M38		60,5	61,5	69					$6,2 \times 10^{-6}$	$6,2 \times 10^{-6}$	$6,2 \times 10^{-6}$			
PCD90C70Q84-80	M40K-M40			83	89	90					$3,1 \times 10^{-5}$	$3,1 \times 10^{-5}$	$3,1 \times 10^{-5}$		
PCD90C60Q84	M42			83	89	90					$3,1 \times 10^{-5}$	$3,1 \times 10^{-5}$	$3,1 \times 10^{-5}$		
PCD100C80Q84-88	M45K-M45			83	89	90					$3,1 \times 10^{-5}$	$3,1 \times 10^{-5}$	$3,1 \times 10^{-5}$		
PCD100C80Q98	M48				89	90						$3,1 \times 10^{-5}$	$3,1 \times 10^{-5}$		
PCD115C95Q105-108	M50-M50S				89-103	91-106	106-97					$8,2 \times 10^{-5}$	$8,2 \times 10^{-5}$	$8,2 \times 10^{-5}$	
PCD130C110Q114	M55					106	106						$8,2 \times 10^{-5}$	$8,2 \times 10^{-5}$	
PCD130C110Q126	M63					106	106						$8,2 \times 10^{-5}$	$8,2 \times 10^{-5}$	
PCD145C110Q130	M65					110	111						$8,2 \times 10^{-5}$	$8,2 \times 10^{-5}$	
PCD165C130Q142	M71-M71K						116	139						$2,6 \times 10^{-4}$	$2,6 \times 10^{-4}$
PCD165C130Q155	M80						116	139						$2,6 \times 10^{-4}$	$2,6 \times 10^{-4}$
PCD200C114,3Q180	M95							154							$8,7 \times 10^{-4}$
PCD215C180Q196-185	M100							162							$8,7 \times 10^{-4}$
STEPPER MOTORS															
FRAME 40	NEMA 17	51							$1,1 \times 10^{-6}$						
FRAME 56	NEMA 23	48,5	51,5						$1,1 \times 10^{-6}$	$1,1 \times 10^{-6}$					
FRAME 60	NEMA 24	48,5	51,5	56,5					$1,1 \times 10^{-6}$	$1,1 \times 10^{-6}$	$6,2 \times 10^{-6}$				
FRAME 85	NEMA 34			69	75						$6,2 \times 10^{-6}$	$6,2 \times 10^{-6}$			
FRAME 110	NEMA 42					105	106						$3,1 \times 10^{-5}$	$8,2 \times 10^{-5}$	
INDUCTION MOTORS															
STANDARD FLANGES INDUCTION MOTORS EUROPEAN DIMENSIONS	M56B14	48,5	48,5						$1,1 \times 10^{-6}$	$1,1 \times 10^{-6}$					
	M63B14			58							$6,2 \times 10^{-6}$				
	M71B14			61,5							$6,2 \times 10^{-6}$				
	M80B14				89							$3,1 \times 10^{-5}$			
	M80B5					90							$3,1 \times 10^{-5}$		
	M90B14					107							$8,2 \times 10^{-5}$		
	M90B5						106							$8,2 \times 10^{-5}$	
	M100B14						116	154						$1,3 \times 10^{-4}$	$2,6 \times 10^{-4}$
	M132B14							159							$8,7 \times 10^{-4}$
PLANETARY GEARBOXES															
PCD44C35FM4 B14	EN005	53	54						$6,2 \times 10^{-6}$	$6,2 \times 10^{-6}$					
PCD62C52FM5 B14	EN015			81	84						$3,1 \times 10^{-5}$	$3,1 \times 10^{-5}$			
PCD80C68FM6 B14	EN025					99	103						$1,3 \times 10^{-4}$	$1,3 \times 10^{-4}$	
PCD108C90FM8 B14	EN035						127	153						$2,6 \times 10^{-4}$	$8,7 \times 10^{-4}$
PCD140C120FM10 B14	EN045							167							$3,1 \times 10^{-3}$
PCD68C60Q62 B5	EF060			93	102						$3,1 \times 10^{-5}$	$8,2 \times 10^{-5}$			
PCD85C70Q76 B5	EF075					109	114						$1,3 \times 10^{-4}$	$1,3 \times 10^{-4}$	
PCD120C90Q101 B5	EF100						153	166						$8,7 \times 10^{-4}$	$8,7 \times 10^{-4}$
PCD165C130Q141 B5	EF140							182							$3,1 \times 10^{-3}$

DIMENSIONAL TABLES AND INERTIA DATA

If greater torsional stiffness is required, for each size, a **Kit with a bellows coupling** adapted to the motor/gearbox necessary for the application can be supplied by selecting the **SF** accessory in the order code. The dimensions of the kit with the bellows coupling are not standard, so it is necessary to contact the technical department. Below are the performance limits.

	Max Torque [Nm]	Max Shaft [mm]
LAM032	2	12.7
LAM040	4.5	16
LAM050	15	28
LAM063	30	32
LAM80	60	35
LAM100	150	38
LAM125	300	42



To complete the discussion on the inertias of the entire system up to the actuator, the inertias of the parallel group with belt transmission, referred to the motor shaft, are listed below in order to calculate the transient torque using the formulas on *pages 23-24*.

ROTATIONAL INERTIA OF THE BELT DRIVE [kgxm^2] DISPOSITIONS P...							
SIZE	**LAM032**	**LAM040**	**LAM050**	**LAM063**	**LAM080**	**LAM100**	**LAM125**
I=1	$2{,}2\times10^{-5}$	$3{,}6\times10^{-5}$	$8{,}2\times10^{-5}$	$1{,}3\times10^{-4}$	$1{,}1\times10^{-3}$	$3{,}4\times10^{-3}$	$1{,}6\times10^{-2}$
I=2	\	\	$3{,}9\times10^{-5}$	$8{,}6\times10^{-5}$	$6{,}6\times10^{-4}$	$2{,}3\times10^{-3}$	\

*** It refers to combinations with maximum motor shaft (thus bushing) dimensions, lower values are possible ***

PRECISION PLANETARY GEARBOXES

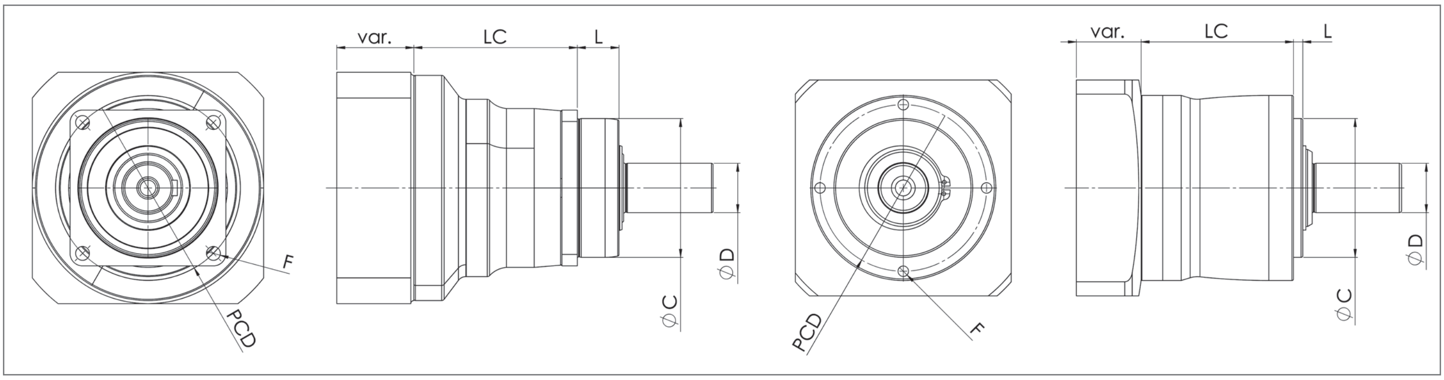
The LAM series allows the installation of **precision epicyclic reducers** in both parallel and coaxial arrangements. The actuators are designed to accommodate two types that differ from each other in terms of backlash, dimensions, and transmitted torque. The **EN** series is the base series for cyclic applications up to 50%; when higher torques or more demanding cycles are required, the **EF** series is the most suitable.

If desired, reducers from various manufacturers can be installed, as our flanges allow the mounting of the most common types of precision reducers available on the market.

The nominal angular backlash values are indicated in the table below: they can be reduced upon request to as low as 1 arcmin. Similarly, backlash increases when the application involves continuous operation.

Below are dimensional drawings and performance tables of the reducers.

PLANETARY GEARBOXES										
	PDC	F	ØC	ØD	L	LC	NOMINAL TORQUE	SINGLE-STAGE BACKLASH	SINGLE-STAGE REDUCTION	TWO-STAGE REDUCTION
EN005	44	M4	35	12	4	49,9	5,2Nm	6 arcmin	fino a 10:1	fino a 100:1
EN015	62	M5	52	16	5	67,7	21Nm	6 arcmin	fino a 10:1	fino a 100:1
EN025	80	M6	68	22	5	80,5	50Nm	6 arcmin	fino a 10:1	fino a 100:1
EN035	108	M8	90	32	6	98,8	130Nm	6 arcmin	fino a 10:1	fino a 100:1
EN045	140	M10	120	40	8	122,9	350Nm	6 arcmin	fino a 10:1	fino a 100:1
EF060	68	5,5	60	16	20	66	32Nm	4 arcmin	fino a 10:1	fino a 100:1
EF075	85	6,6	70	22	20	78,5	90Nm	4 arcmin	fino a 10:1	fino a 100:1
EF100	120	9	90	32	30	89	169Nm	3 arcmin	fino a 10:1	fino a 100:1
EF140	165	11	130	40	30	121,3	350Nm	3 arcmin	fino a 10:1	fino a 100:1



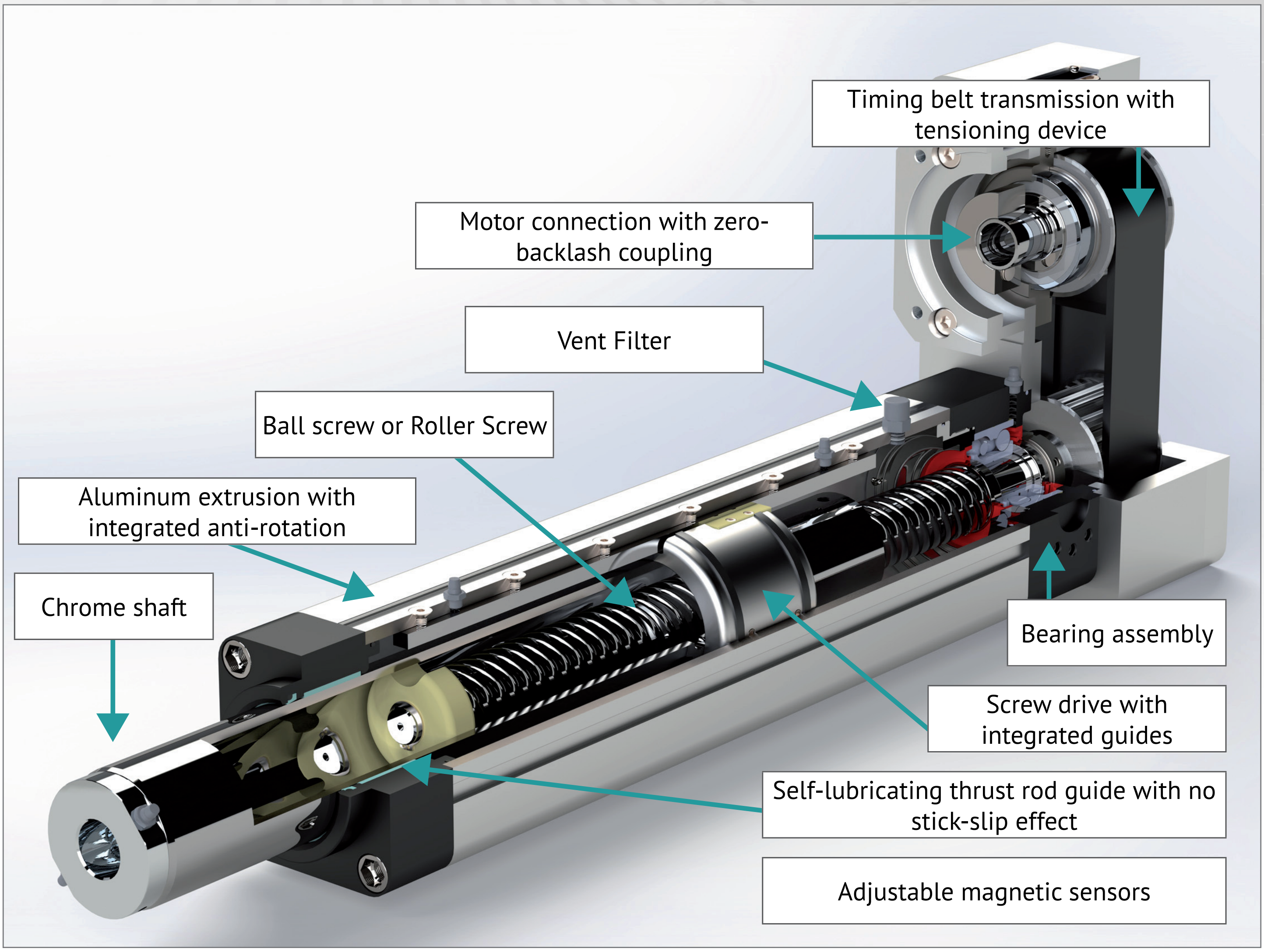
The LC dimensions refer to the single-stage reducers. To know the dimensions of the two-stage reducers, please contact the technical office.

The rotational inertia of the reducer depends on the reduction ratio and the coupling clamp with the motor: contact the technical office for further details.

Planetary gear reducers can be **installed** in **both coaxial arrangements** (in the 'R1' coding) **and in parallel arrangements** with the belt transmission downstream of the reducer (in the 'PR1' coding).

To choose the appropriate reducer for the application, follow the formulas on *page 23*: if the operating torque remains consistently below the values listed in the table, with an input speed to the reducer below 2500rpm, a service life of over 20,000 hours for the planetary reducer is guaranteed. If a lower service life of around 10,000 hours is required, the operating torque can exceed the values listed in the table.

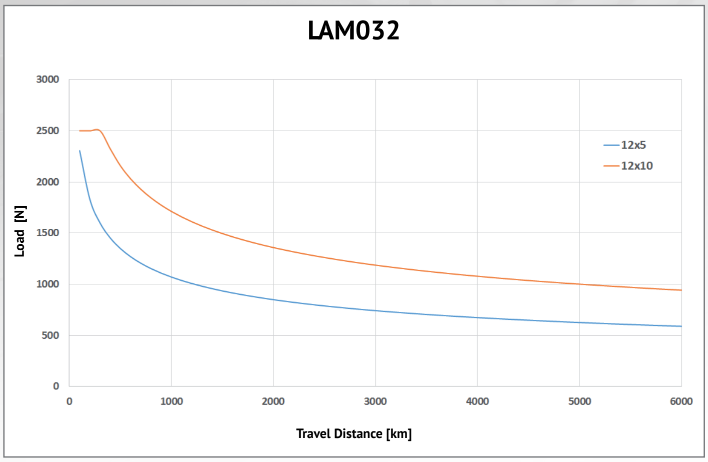
STATE OF THE ART

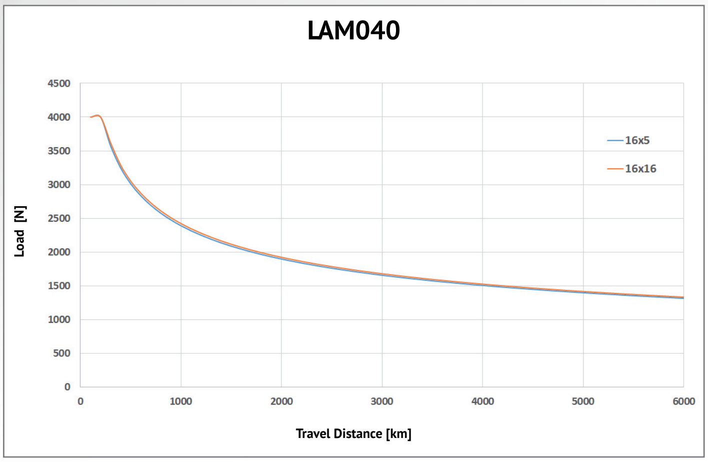


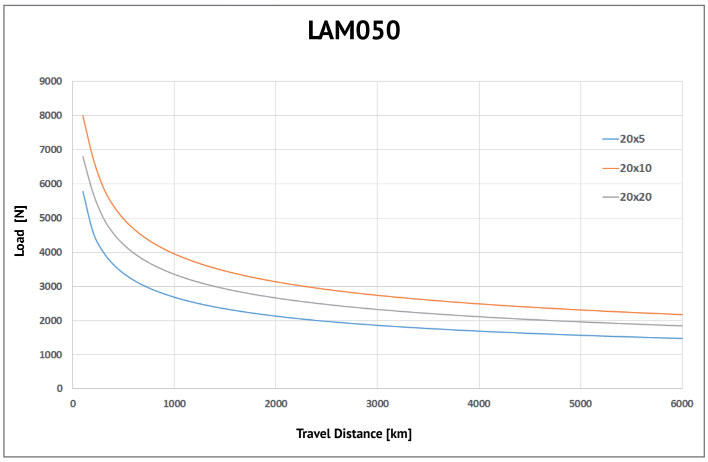
The **Belt Tensioning System** is included across all sizes.
Actuators in coaxial configurations "D..." with bell housing + coupling kit are rated **IP65**.
LAM032, LAM040, and LAM050 in the **"M0" configuration** are rated **IP54**; from LAM063 to LAM125 in the same "**M0**" configuration, the rating is **IP65**.
From LAM032 to LAM080 (inclusive), in **Parallel Configurations** with motor and internal gearbox mounting, **IP65** protection is guaranteed; if the mounting is performed by the customer, this protection rating is not guaranteed.
LAM100 and LAM125 in **Parallel Configurations** are always **IP65**.

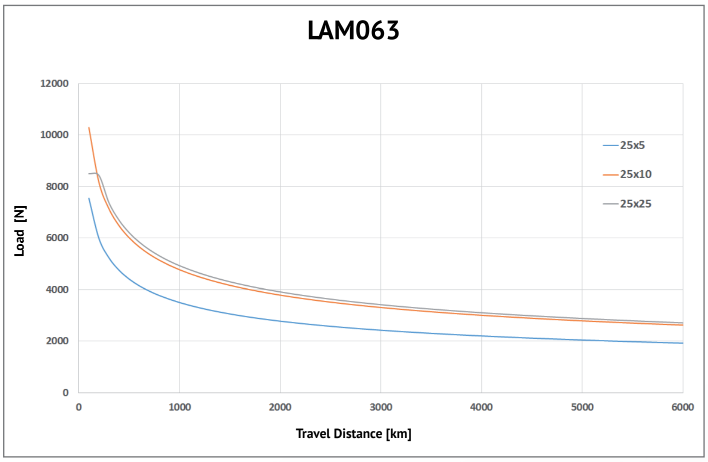
CALCULATION DATA

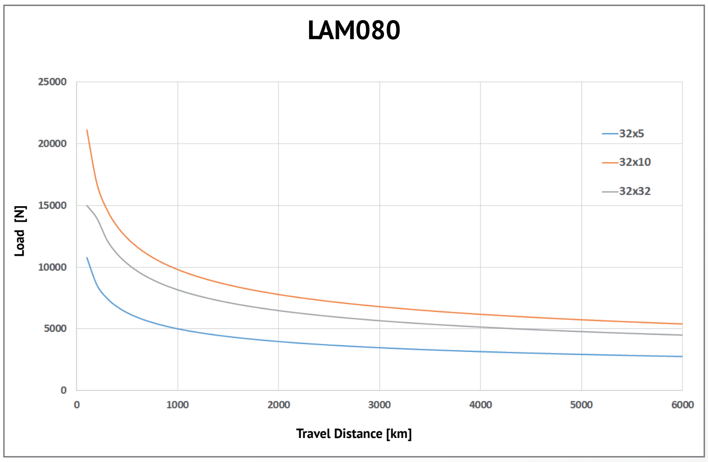
One of the first factors to consider when sizing the appropriate servo actuator is determining the magnitude of the external load and the required **linear service life**, expressed in [km]. Using the following graphs, it is generally possible to identify the appropriate actuator size. Once this is done, it is important to evaluate whether the duty cycle can be simplified to a constant load at constant speed. If so, the following graphs provide a good approximation of the actual service life of the servo actuator.
If the cycle is more complex – composed of sub-cycles with variable load and speed and/or significant overloads due to rapid transients – it is recommended to **follow the formulas below** to calculate the cycle's equivalent force according to ISO 3408, and consequently, the ball screw service life in number of revolutions.

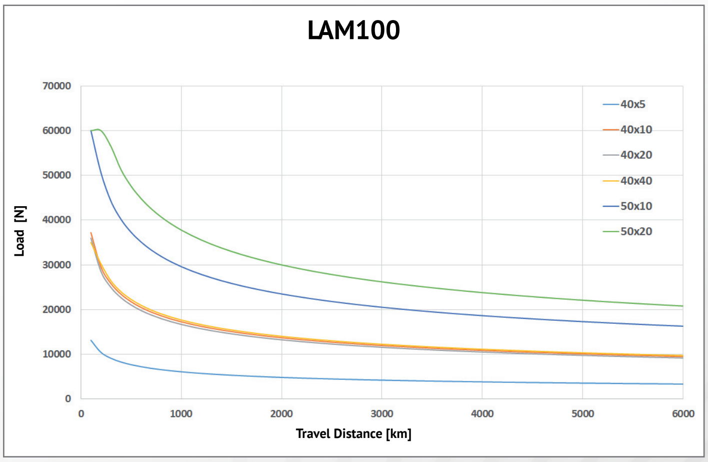




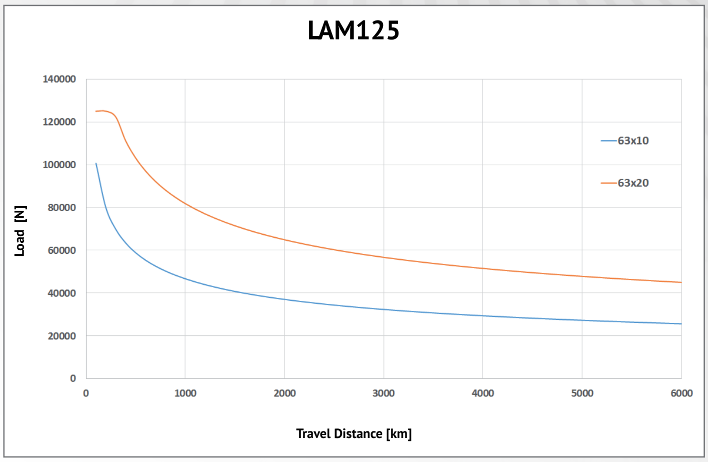








CALCULATION DATA



THE GRAPHS REFER TO:
25°C, PROPER LUBRICATION WITHOUT CONTAMINANTS,
no lateral load, no shocks or sudden loads,
no micro-oscillations or strong vibrations,
life calculated with a 90% reliability factor.

BALL SCREW LIFE IN REVOLUTIONS FROM SERVICE LIFE IN KILOMETERS

Below are the formulas to convert the **service life in [km],** obtained from the previous graphs, into the corresponding ball screw life in **number of revolutions**.

$$L_{10} = \frac{L_{km}\, 10^6}{p}$$

p = passo vite [mm]

FORMULAS FOR BALL SCREW LIFE UNDER VARIABLE LOAD AND VARIABLE SPEED

Below are the formulas compliant with ISO 3408 for calculating the service life of the ball screw under complex duty cycles.

Con: **Q_i = Time interval of the i-th phase [s]** **t_{tot} = Total cycle time [s]**

n_i = Speed during the i-th phase [1/s] **F_i = i-th phase applied load [N]**

Si ha:

$$q_i = \frac{Q_i\, 100}{t_{tot}}$$ **i-th phase cycle percentage interval**

$$n_m = \sum_{i=1}^{n} n_i \frac{q_i}{100}$$ **Effective mean speed – total cycle [rpm]**

$$n_{m,ist} = \frac{n_i}{n_m}$$ **Average instantaneous speed factor of the i-th phase**

As a result: $F_{MED} = \sqrt[3]{\sum_{i=1}^{n} F_i^3\, n_{m,ist} \frac{q_i}{100}}$ **Average load – complex cycle [N]**

BALL SCREW LIFE IN REVOLUTIONS AND HOURS WITH MEAN LOAD

Finally, the service life in revolutions and hours is calculated as a function of the average speed.

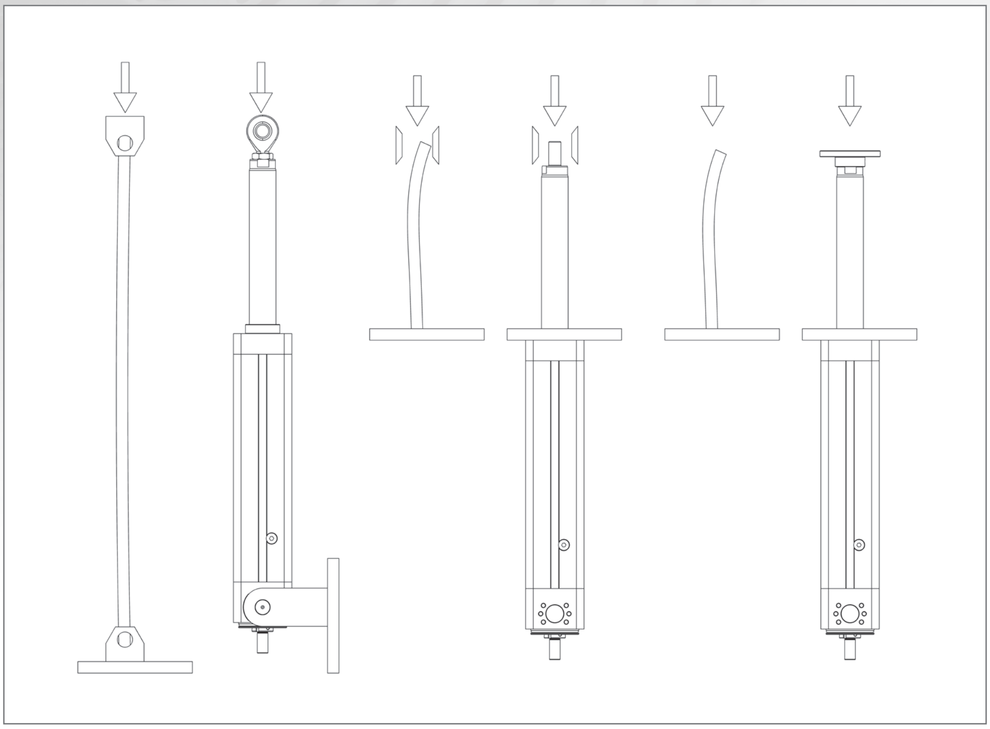
$$L_{10} = \left(\frac{C_a}{F_{MED}}\right)^3 f_a\, 10^6 \qquad L_h = \frac{L_{10}}{n_m\, 60}$$

f_a	
Reliability	factor
90%	1
95%	0,63
96%	0,53
97%	0,44
98%	0,33
99%	0,21

CRITICAL COMPRESSION LOAD

Another element for the sizing of the Servoattuatore is the **Critical Compression Load**. It depends on how the actuator is mounted in the system, on the size of the actuator, on the type of screw drive used, and on the actuator stroke. Below are some of the possible cases depending on the type of mounting of the Servoattuatore in the system.

CASE 1 **CASE 2** **CASE 3**



CASE 1:

THE GRAPHS REFER TO PARALLEL CONFIGURATION WITH REAR TERMINAL TO AND TS TILTING

CASE 2:

THE GRAPHS REFER TO FRONT MOUNTING AND ROD GUIDED IN MACHINE

CASE 3:

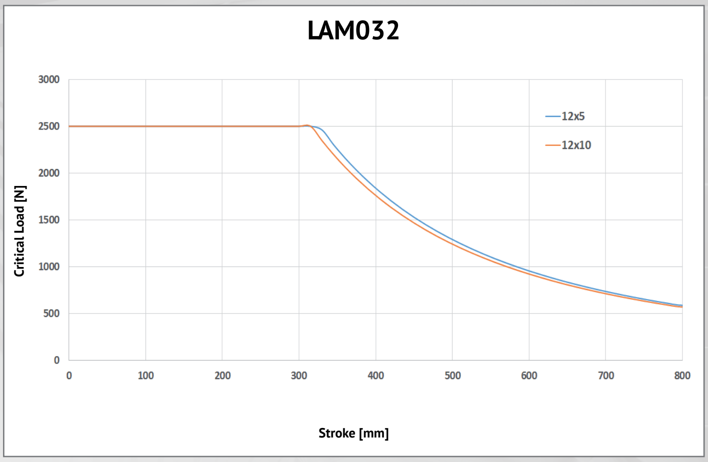
THE GRAPHS REFER TO FRONT MOUNTING AND UNGUIDED ROD

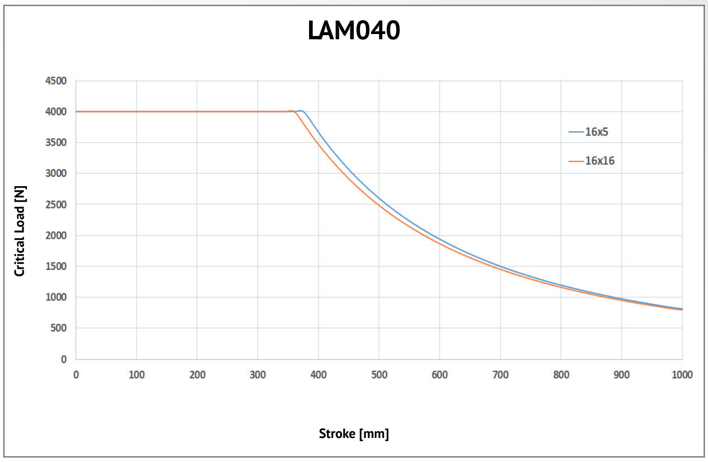
All graphs represent the maximum admissible load, considering a **Safety Factor of 4**, in order to guarantee the application of such load even under dynamic conditions.

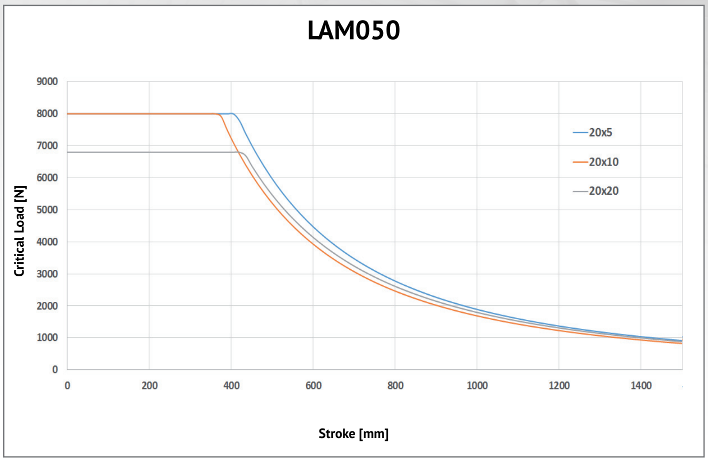
If the load is tensile and is lower than the maximum load indicated in table on *Page 6*, then it is verified. If it exceeds the limit of some accessories mounted on the actuator, the actuator size must be increased or special mounting systems must be implemented.

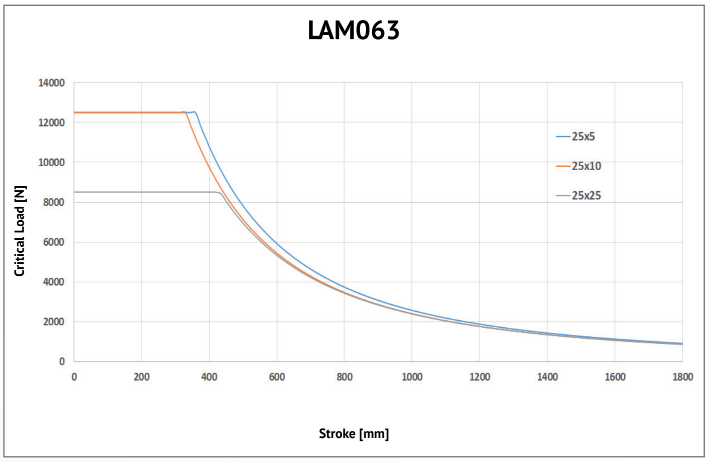
Other configurations not listed may exist: mounting with rear threaded holes and guided/unguided rod, or mounting with lateral tilting pins. If your application falls under a non-listed configuration, please contact the technical department.

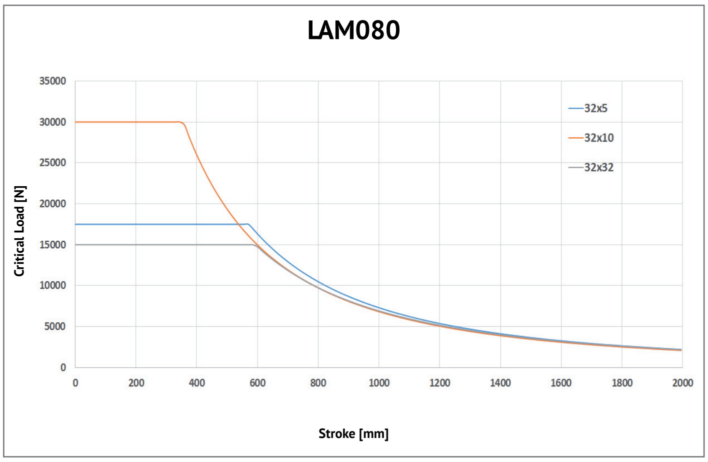
CASE 1
TILTING
(Euler 2)

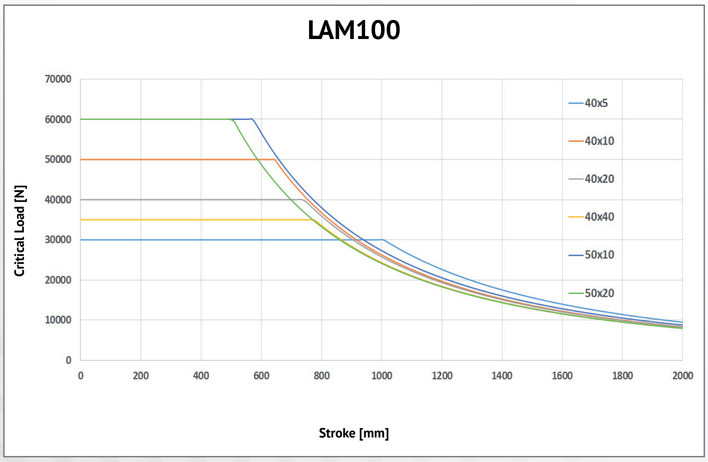


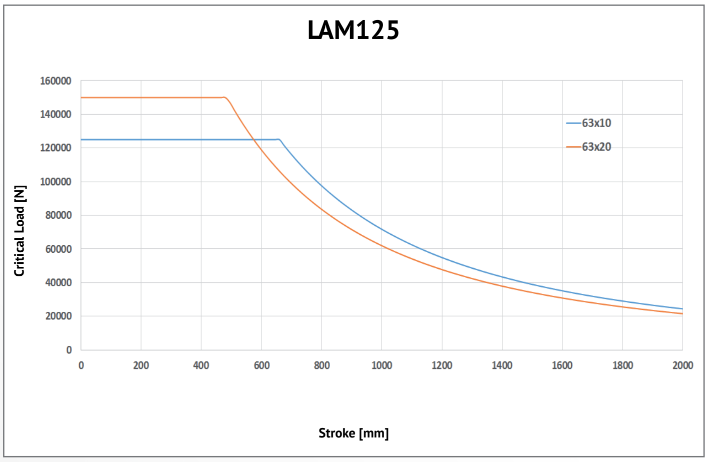










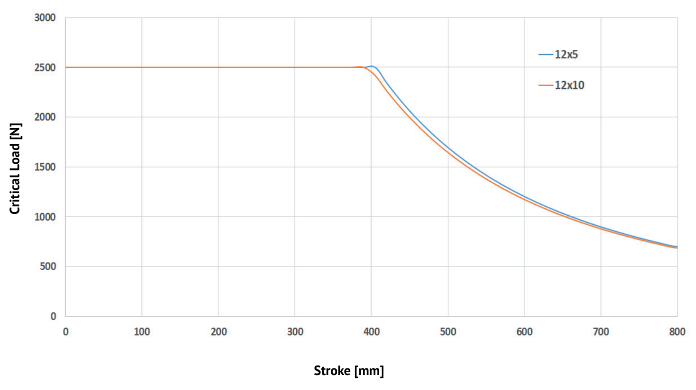


CASE 2

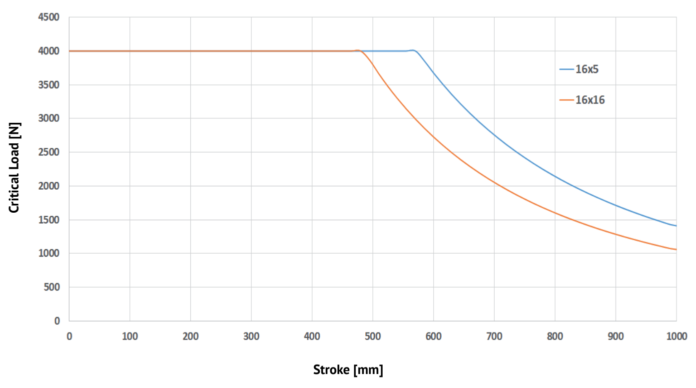
FIXED BODY - GUIDED ROD

(Euler 3)

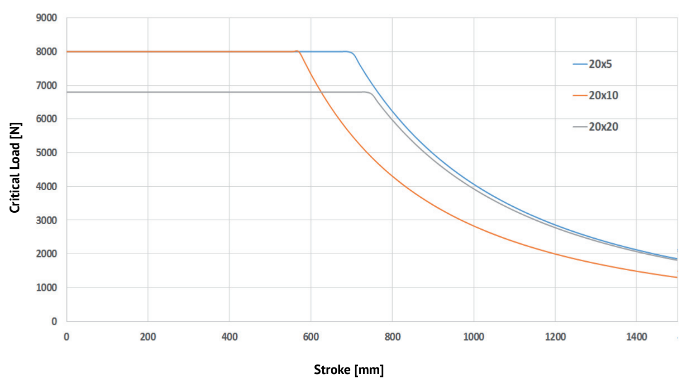
LAM032



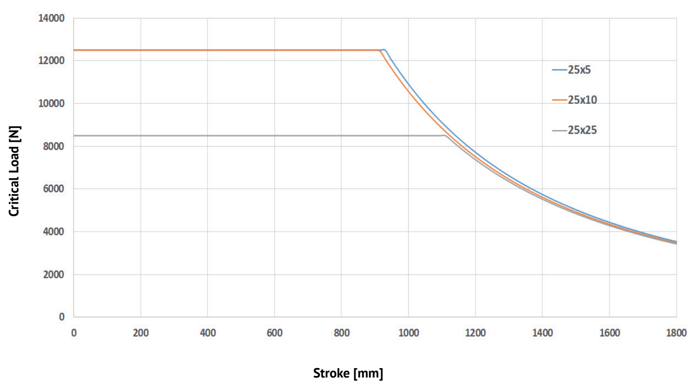
LAM040



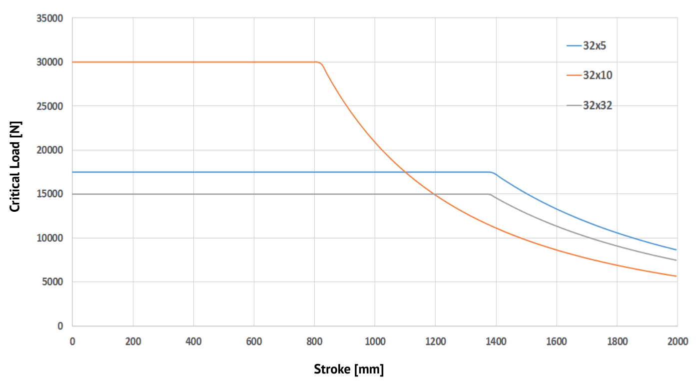
LAM050



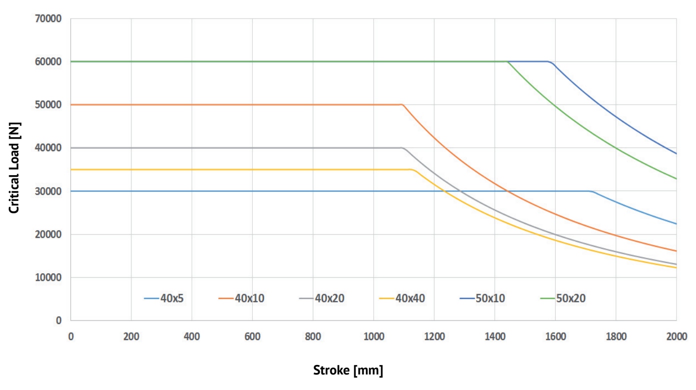
LAM063



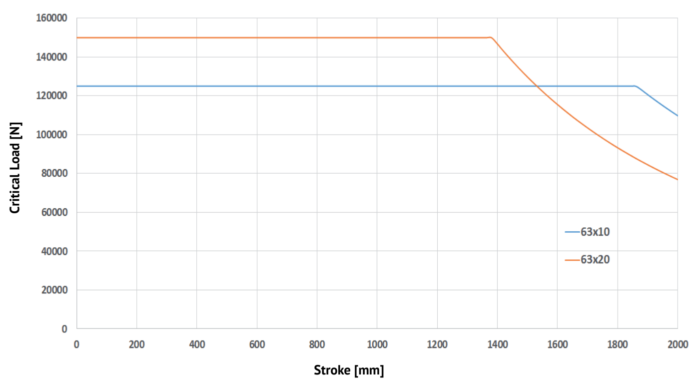
LAM080



LAM100



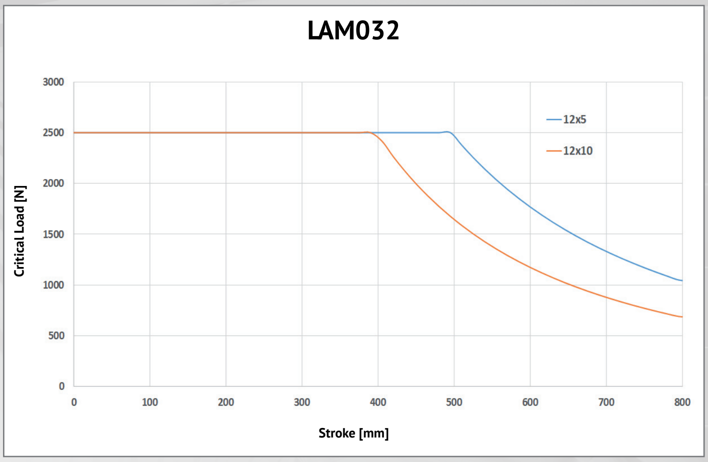
LAM125

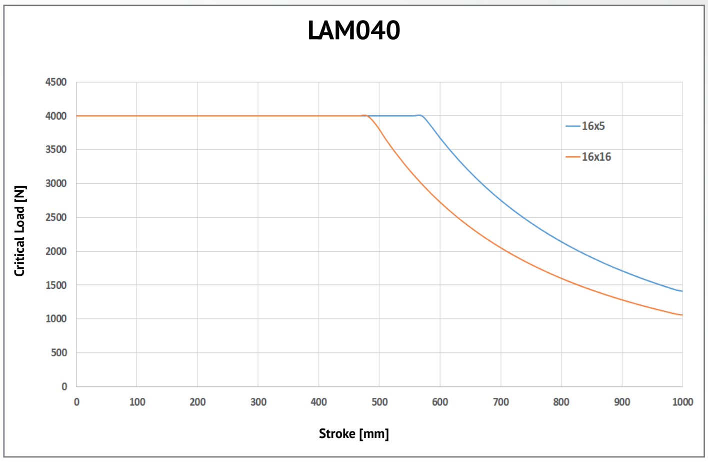


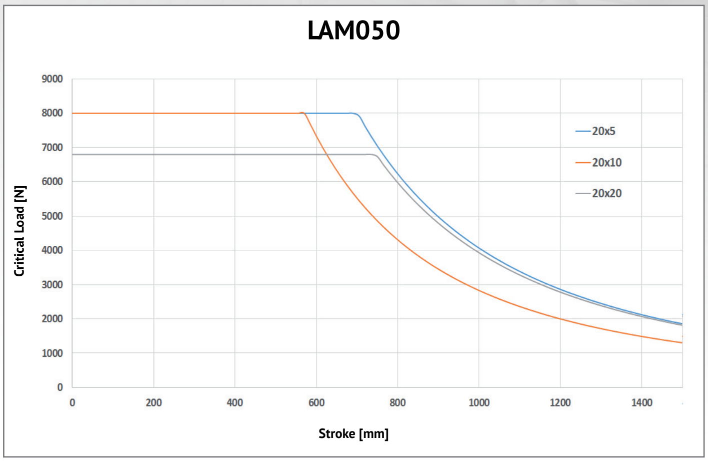
CASE 3

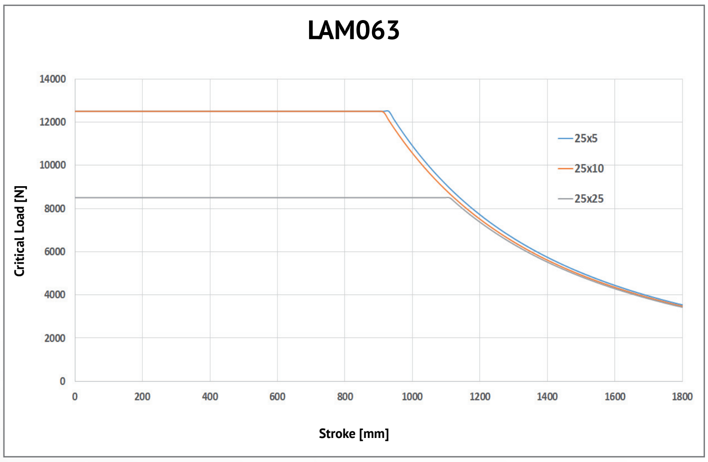
FIXED BODY - FREE ROD

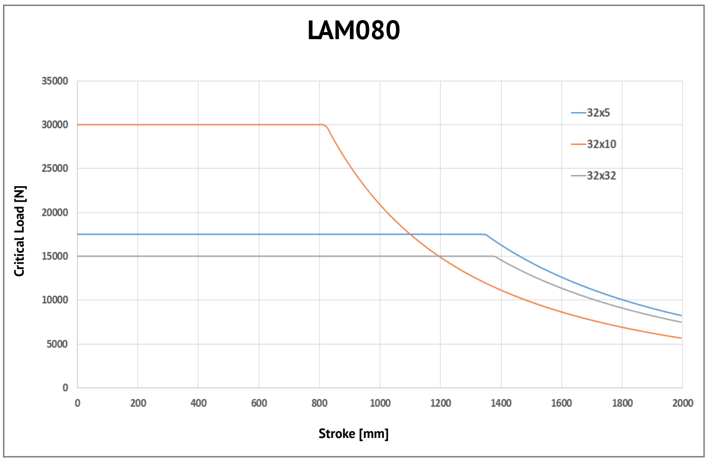
(Euler 1)

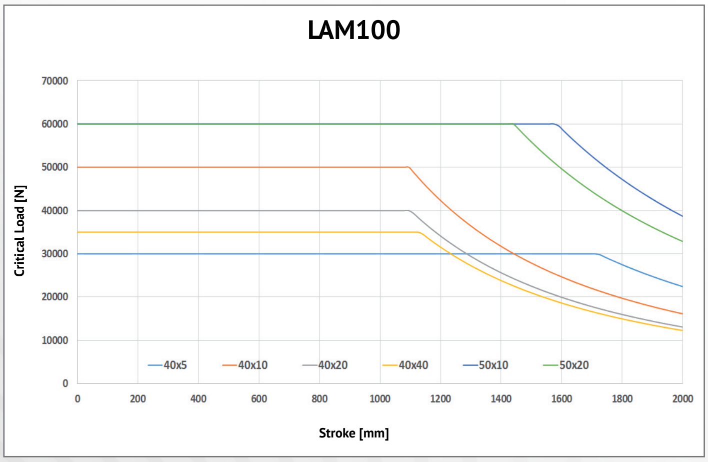


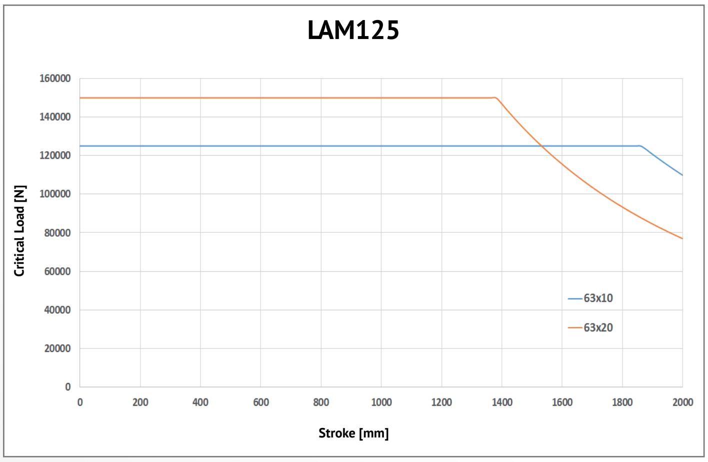












CRITICAL BENDING SPEED AND MAXIMUM NUT SPEED

In applications with high **Linear Speeds**, it is important to check the speed limit related to the bending stability of the ball screw. This depends on the root diameter of the screw, its length (therefore also on the actuator stroke), and how it is constrained inside the actuator. In LAM Servoactuators, the screw drive is constrained on one side with an interference-fit system, supported by high-rigidity angular contact ball bearings, and on the other side by a Technopolymer support inside the chrome-plated rod. This results in a **FIXED–SUPPORTED** constraint. The length to be considered is the stroke length plus the internal geometry length, which refers to the distance between constraints, indicated in the table by the letter "x".

Critical Bending Speed n_c

$$n_c = 7.74 \times 10^5 \left(\frac{\phi}{(x+c)^2} \Big/ S_F \right)$$

S_F = Service Factor = 1.25

ϕ = Calculation Coefficient

C = Stroke [mm]

x = Screw Length Factor [mm]

	Ball Screw	ϕ	x
LAM032	A	2404,69	32
LAM032	B	2404,69	45
LAM040	A	3206,18	50
LAM040	B	3000,86	61
LAM050	A	4174,98	49
LAM050	B	3840,37	64
LAM050	C	4174,98	92
LAM063	A	5385,98	53
LAM063	B	5385,98	67
LAM063	C	5385,98	82

	Ball Screw	ϕ	x
LAM080	A	7081,93	56
LAM080	B	6412,37	84
LAM080	C	6914,81	109
LAM100	A	9018,98	70
LAM100	B	8349,97	94
LAM100	C	7939,32	97
LAM100	D	7865,57	128
LAM100	E	10437,35	109
LAM100	F	10102,95	154
LAM125	A	13753,26	146
LAM125	B	12582,53	171

Another parameter that limits the **Maximum Operating Speed** for each actuator size is the rotational speed based on the DN value of the ball nut, which depends on its geometry and the type of lubricant used.
In the case of LAM Servoactuators, standard lubrication is provided with EP-additive grease, and combined with nuts optimized for high speed, **DN values from 90,000 to 120,000** are guaranteed for **Rolled Screws**, and from **120,000 to 150,000** for **Ground Screws**.
The maximum speeds of each actuator, regardless of stroke, are indicated in the performance table on *Pag 6*.
If, during sizing, the application falls near the limit of the above parameters, it is recommended to increase the actuator size, change the screw drive, or contact the technical department to study a special solution.

LATERAL LOAD ON ROD

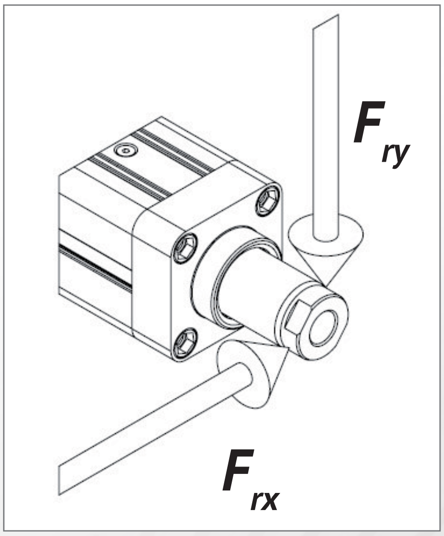
In general, linear Servoactuators are suitable for applications with lateral loads, which may be due, for example, to their use in tilting systems or to misalignments within the machine.
It is important, however, to ensure that such loads remain below the **Lateral Load Limit Curves** for each actuator, depending on the stroke and the extension of the rod at which the load is applied.

The following graphs refer to the load applied as shown in the diagram. They are valid at a temperature of 25°C with an average linear speed of 500 mm/s up to and including LAM080, and 250 mm/s for LAM100 and LAM125.

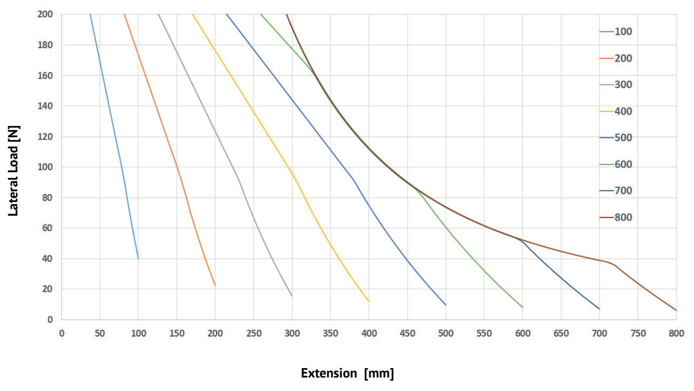
The indicated loads, under the above conditions, are calculated with **safety factors ranging from 6 to 8** (depending on the size), and they ensure guide service life consistent with the ball screw's lifespan.
As shown, there is a curve that, for longer strokes, limits the lateral load when the rod is highly extended: this represents the maximum deflection limit of the rod, established to ensure system stiffness and to prevent excessive bending.

If lateral loads exceed the limits shown in the graphs, the service life of the actuator's internal guides cannot be guaranteed.

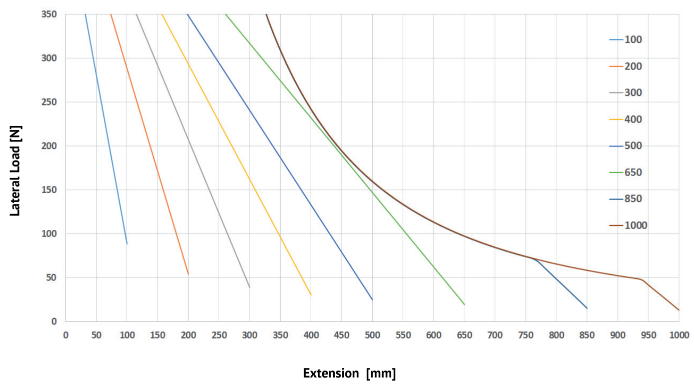
As lateral loads increase, actuator efficiency decreases: contact the technical department for an accurate performance evaluation.



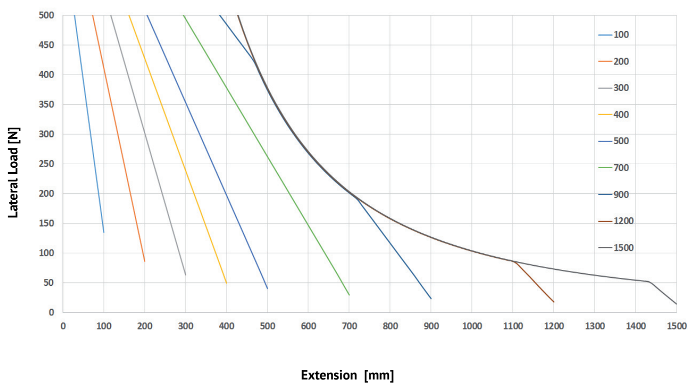
LAM032



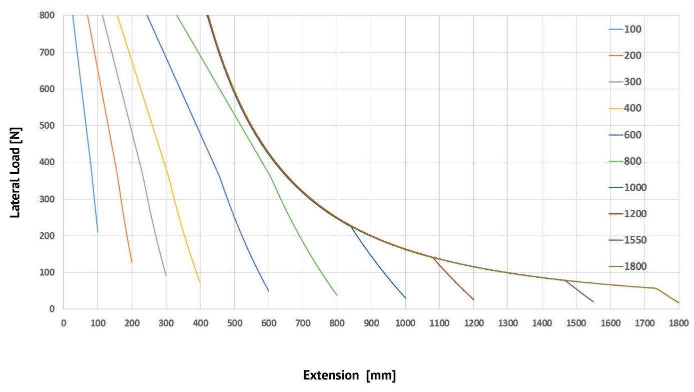
LAM040



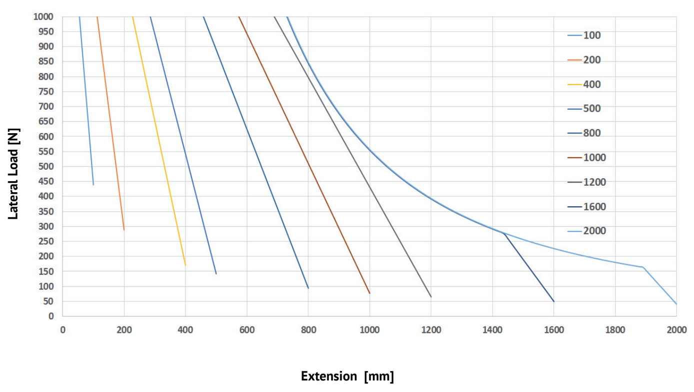
LAM050



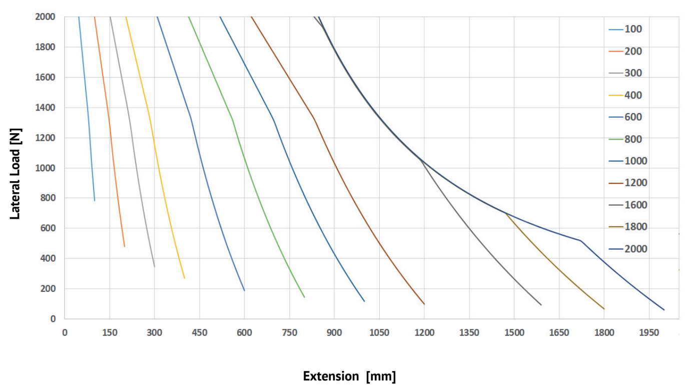
LAM063



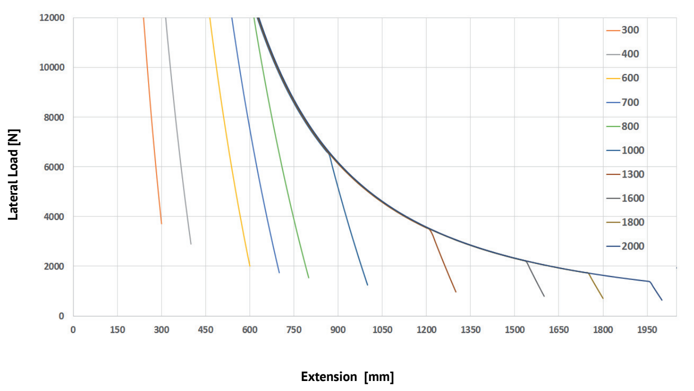
LAM080



LAM100



LAM125



OPERATING TORQUE AND POWER

In order to correctly size the motor and/or the transmission system, it is necessary to calculate the **Resulting Torque** and the **Utilization Power.** Using the following formula and the data provided in the table on *Page 6*, a reliable estimation can be made.

*Note: Efficiency depends on load, rotational speed, temperature, and lateral load; the value in the table is an average based on typical operating conditions without lateral load. If lateral load is present and/or the application deviates from standard conditions, it is advisable to contact the technical department.

The following formula can be applied to all possible configurations of LAM Servoactuators.

$$C_m = \frac{F_a\, p}{2000\, \pi\, \eta_d \eta_p \eta_r i}$$

C_m = Motor Torque [Nm]
p = Screw Lead [mm]
F_a = Applied Axial Load [N]
η_p = Belt Transmission Efficiency
i = Total Reduction Ratio
η_d = Actuator Efficiency
η_r = Gearbox Efficiency

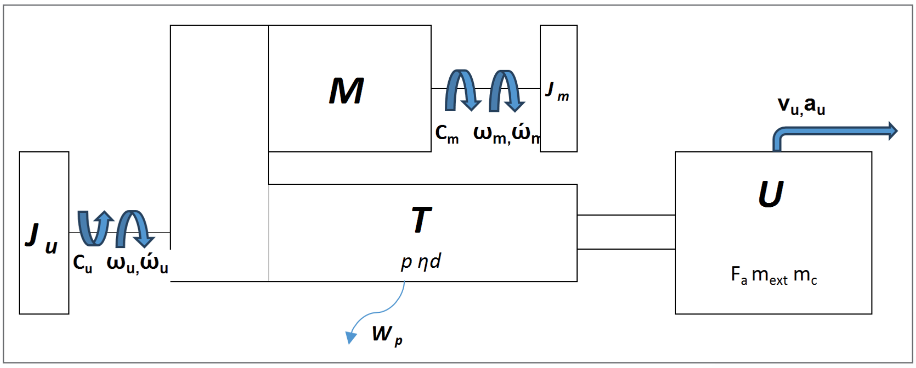
To calculate the **Motor Power** required to move the load at **Steady State**, reaching the desired linear speed, use the following formula.

$$P_m = C_m n_m \frac{2\pi}{60000}$$

Below are additional kinematic formulas to convert the actuator's linear speed v_l in [mm/s] into the motor's rotational speed n_m in [rpm].

$$n_m = v_l \frac{60\, i}{p}$$

It is important, in order to correctly size the motor, to calculate the torque peak caused by a **Transient Phase**. For simplicity, the following paragraph analyzes the torque during an acceleration transient, assuming the acceleration time, the mass to be moved, and all operating parameters of the actuator, motor, and gearbox are known. In a real-world case, the cycle will consist of dynamic events and complex sub-cycles: it is important to analyze the most critical event in order to size the motor with sufficient margin for the application.



The image above shows the MTU Model of a LAM Servoactuator. Below are some considerations:

- The **Inertia At The Motor** J_m is considered as the sum of the **Inertia Of The Servomotor** to be used J_{sm}, the **Inertia** of the optional **Belt Transmission** J_p and the **Inertia** of the optional **Planetary Gearbox** J_{rid}

$$J_m = J_{sm} + J_{rid} + J_p$$

- The User Inertia J_u includes the rotational inertia, depending on the stroke, of the selected servoactuator, and the **Coupling Inertia** J_{ec} (only in coaxial configurations D..., R...) (data available in the table on *page 6*).

$$J_u = J_{0,u} + J_{100,u} + J_{ec}$$

- The **Mass** To Be Moved Linearly m_c [kg] consists of the internal mass of the actuator, which depends on the stroke, and the **External Mass** to be moved m_{ext}. The External Load F_a is the load seen by the actuator at steady state, expressed in [N].

$$m_c = m_{0,c} + m_{100,c}$$

- It is necessary to know the **Acceleration Time** t_a during which the transient occurs, that is, the **Rotational Speed Difference** of the motor during the transient Δn_m used to calculate the **Angular Acceleration** at the motor shaft $\dot{\omega}_m$.

Finally, the formula to calculate the motor torque during the transient is as follows:

$$\dot{\omega}_m = \frac{\Delta n_m 2\pi}{\tau\, 60} \qquad C_{m,t} = F_a \frac{A}{\eta_{tot}} + J_m \dot{\omega}_m + J_u \dot{\omega}_m \frac{\tau^2}{\eta_{tot}} + (m_{ext} + m_c) \frac{A^2}{\eta_{tot}} \dot{\omega}_m$$

with η_{tot}, A e τ corresponding to:

$$\tau = \frac{1}{i} \qquad A = \frac{p\tau}{2000\pi} \qquad \eta_{tot} = \eta_d \eta_p \eta_r$$

τ = Total Transmission Ratio

A = Motor Factor

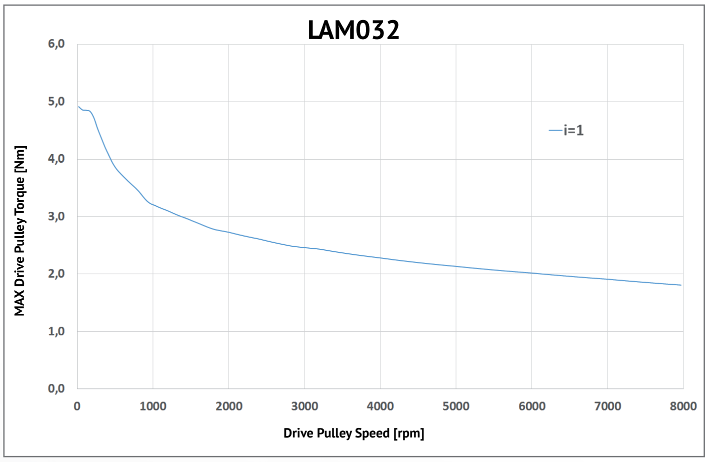
η_{tot} = Total Efficiency

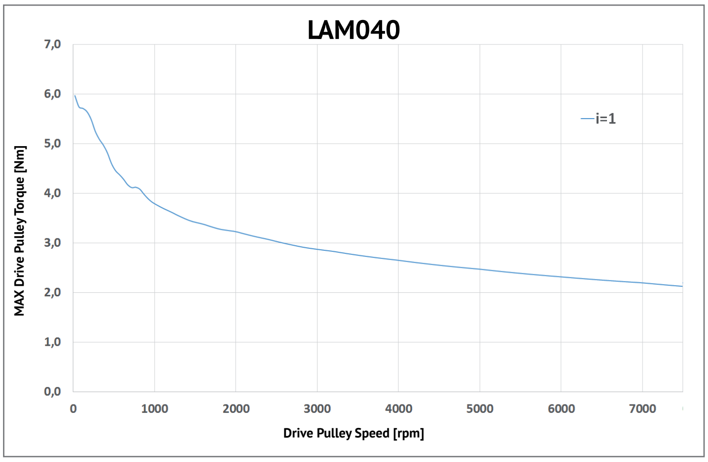
Another important consideration is to choose a servomotor with inertia based on the inertial mass to be moved, in order to maintain maximum control over it.

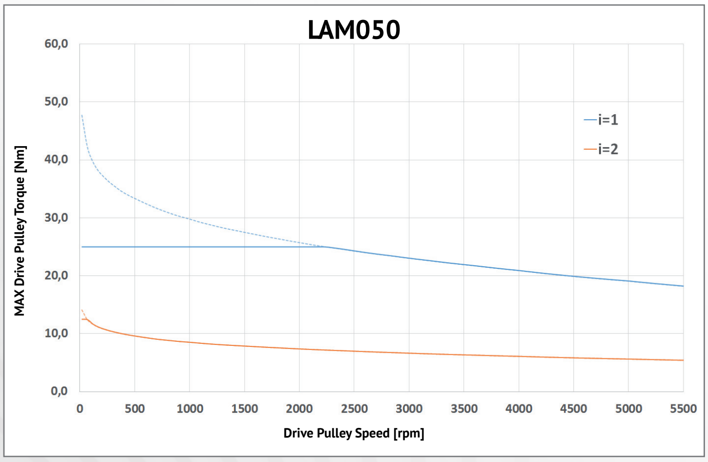
TIMING BELT DRIVE

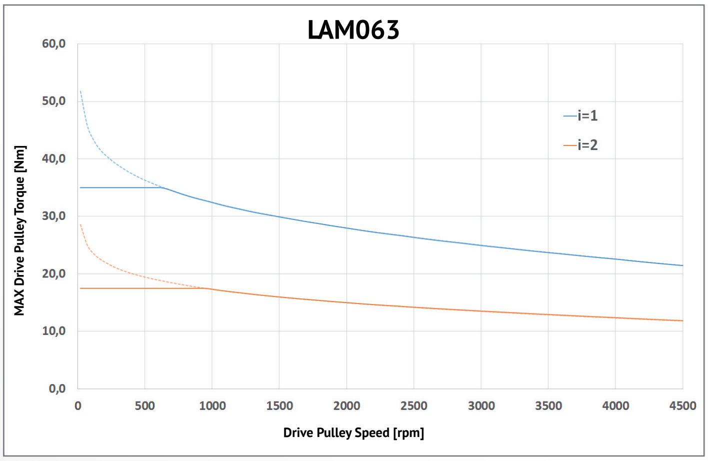
Below are the Torque [Nm] vs. Speed [rpm] graphs on the **Drive Pulley.** These define the limits of the timing belt transmission for each actuator size and depend on the installed belt and the reduction ratio. It has been decided to use, in each actuator size, timing belts with a tooth profile optimized for torque transmission: the profile minimizes backlash, and the tensioning system ensures repeatable and constant movements throughout the actuator's service life, guaranteeing long-lasting operation at low noise levels.

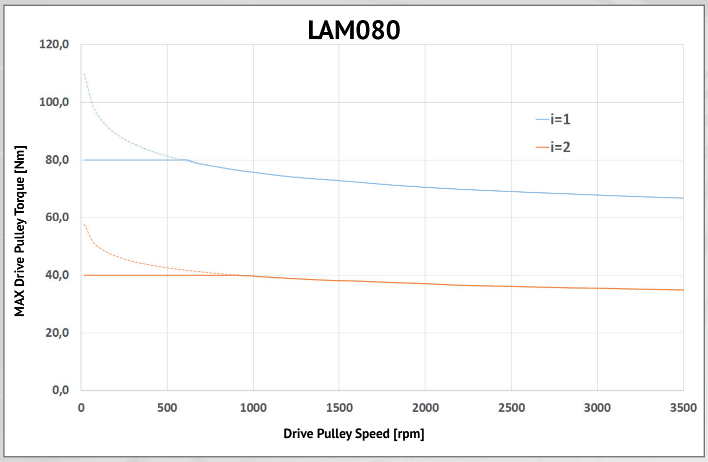
The LAM Servoactuator timing belt transmissions are designed to cover all possible applications, even those with higher service factors, including those with rapid load reversals and cycles with 100% duty cycle.

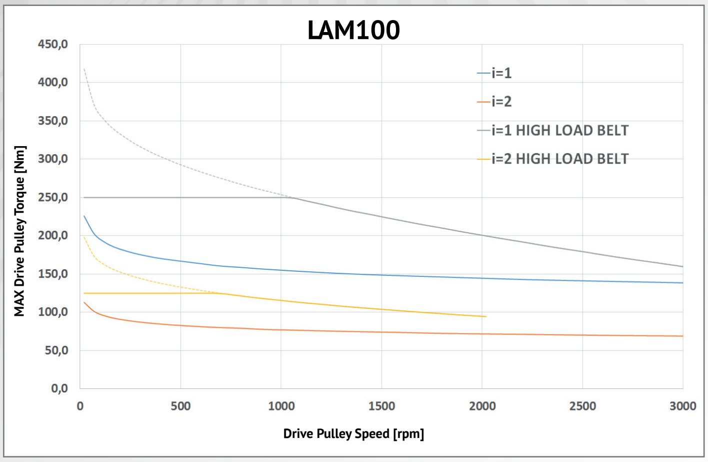


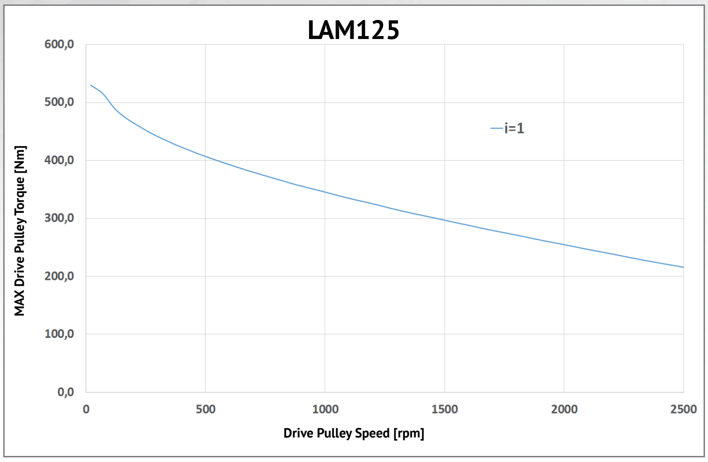












The graphs refer to the **maximum torque on the drive pulley** for a 40% duty cycle: they account for movements with reversals (actuator moving in and out). To correctly use the graphs for sizing with load cycles exceeding 40%, it is necessary to calculate a **Design Torque** $C_{pm,p}$ [Nm] by introducing corrective factors that increase the **Operating Torque** C_{pm} , thus ensuring the belt's durability even under the most adverse conditions. A belt service life of approximately 20,000 hours of operation is guaranteed.

$$C_{pm,p} = C_{pm} f_c$$

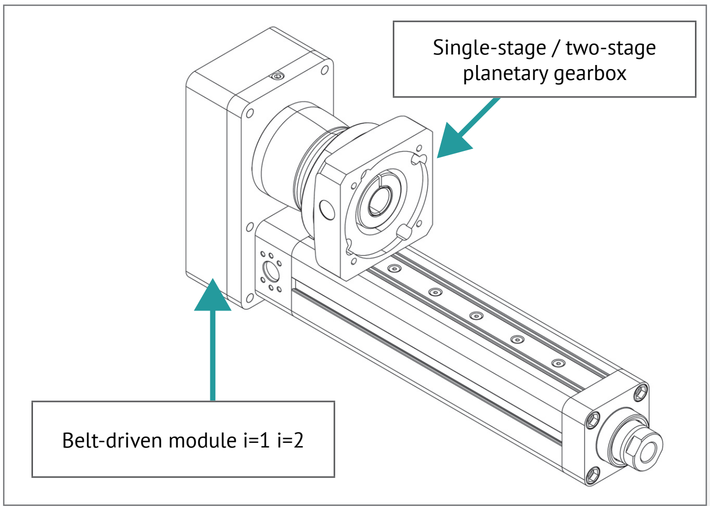
f_c =1.10 40% < usage ≥ 60%

f_c =1.18 60% < usage ≥ 80%

f_c =1.25 80% < usage ≥ 100%

It should be noted that the **Operating Torque** C_{pm} at the driving pulley depends on the applied external load [N] and the lead [mm] of the selected drive screw, similarly to the formula shown on *page 23*, taking into account the efficiency of both the actuator's base module and the belt.

$$C_{pm} = \frac{F_a\, p}{2000\, \pi\, \eta_d \eta_p i}$$



Parallel transmissions with toothed belts for each size have been designed to allow the coupling of a precision planetary gearbox (see *page 13*, 'PR1 Configuration') directly to the driving pulley. By also adopting a belt reduction ratio of 2, it is possible to achieve reduction ratios up to 20 using single-stage gearboxes, without compromising their lifespan and while increasing the product's versatility.

It is always important to evaluate the maximum torque at the actuator shaft as the maximum allowable torque limit, using the previously mentioned formula with a reduction ratio of 1. If this limit is exceeded, it is advisable either to reduce the screw lead or to increase the actuator size.

ROLLER NUT BALL SCREW

Planetary roller screws allow LAM Servo Actuators to deliver maximum performance. Below is a summary table featuring some of the **Roller Nut Ball Screws** that can be mounted on our actuators. If required by the application, alternative screw diameters and leads can be selected in order to customize the actuator according to specific performance needs.

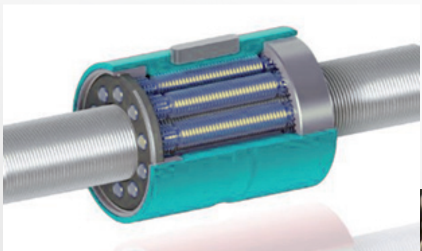
DATI VITI A RULLI SATELLITI		LAM032		LAM040		LAM050		LAM063	
MAX ACTUATOR DYNAMIC LOAD	[N]	2500		4000		8000		12500	
ROLLER SCREW CODE		RA	RB	RA	RB	RA	RB	RA	RB
ROLLER SCREW DIAMETER	[mm]	8		12		15		18	
ROLLER SCREW PITCH	[mm]	2	4	4	8	4	8	5	10
DYNAMIC LOAD COEFFICIENT C_a	[N]	10000	10700	17200	18600	26800	31400	36600	42700
AVERAGE LOAD TO 2000km LIFE F_a	[N]	1000	1348	2167	2953	3377	4984	4967	7302
DIRECT DRIVE EFFICIENCY η_d		0,72	0,83	0,83	0,83	0,83	0,85	0,82	0,84
SCREW'S SHAFT MAX LOAD TORQUE	[Nm]	1,1	1,9	3,1	6,2	6,1	11,9	12,0	23,5
DIRECT DRIVE BACKLASH **G5-G1**	[mm]	0,02-0,00	0,04-0,00	0,02-0,00	0,04-0,00	0,025-0,00	0,04-0,00	0,03-0,00	0,05-0,00
MAX LINEAR SPEED v_l	[mm/s]	300	600	535	1066	413	820	466	966
MAX SCREW SHAFT SPEED n_u	[rpm]	9000	9000	8025	7995	6188	6150	5592	5796
MAX LINEAR ACELERATION a_u	[m/s2]	29,4	29,4	29,4	29,4	29,4	29,4	29,4	29,4

Different screw diameters and leads are available

DATI VITI A RULLI SATELLITI		LAM080		LAM100				LAM125	
MAX ACTUATOR DYNAMIC LOAD	[N]	30000		60000				125000	150000
ROLLER SCREW CODE		RA	RB	RA	RB	RC	RD	RA	RB
ROLLER SCREW DIAMETER	[mm]	25		30		36		51	
ROLLER SCREW PITCH	[mm]	5	10	5	10	10	20	5	20
DYNAMIC LOAD COEFFICIENT C_a	[N]	81300	89600	107200	126300	159600	207300	263000	425800
AVERAGE LOAD TO 2000km LIFE F_a	[N]	11034	15321	14549	21597	27291	44661	35695	91736
DIRECT DRIVE EFFICIENCY η_d		0,81	0,83	0,77	0,84	0,84	0,84	0,70	0,84
SCREW'S SHAFT MAX LOAD TORQUE	[Nm]	29,3	57,7	61,7	112,9	113,4	227,0	144,0	571,0
DIRECT DRIVE BACKLASH **G5-G1**	[mm]	0,03-0,00	0,05-0,00	0,03-0,00	0,04-0,00	0,04-0,00	0,05-0,00	0,03-0,00	0,05-0,00
MAX LINEAR SPEED v_l	[mm/s]	375	755	292	600	500	1000	175	716
MAX SCREW SHAFT SPEED n_u	[rpm]	4500	4530	3504	3600	3000	3000	2100	2148
MAX LINEAR ACELERATION a_u	[m/s2]	29,4	29,4	29,4	29,4	29,4	29,4	29,4	29,4

Different screw diameters and leads are available

Planetary roller screws offer significant advantages in terms of reliability. For the same actuator size, they deliver performance up to five times higher. Although they involve a higher initial investment, they ensure a substantial return in terms of system performance and long-term reliability.
They are particularly suitable for applications requiring **maximum positioning and motion accuracy**. In terms of dynamics, they reach DN values up to 160,000 with grease lubrication, allowing for higher linear speeds. Lubrication is also maintained under **acceleration ramps up to 3G**.
A limitation is their sensitivity to strong vibrations: due to their higher stiffness, their damping behavior differs from that of ball screws. They also feature mixed friction between the rollers and the screw threads, resulting in lower efficiency compared to ball screws.
Examples of applications using roller screw servo actuators: nuclear, marine, medical, aerospace, and in general, applications with limited maintenance access or where 99% reliability is required.



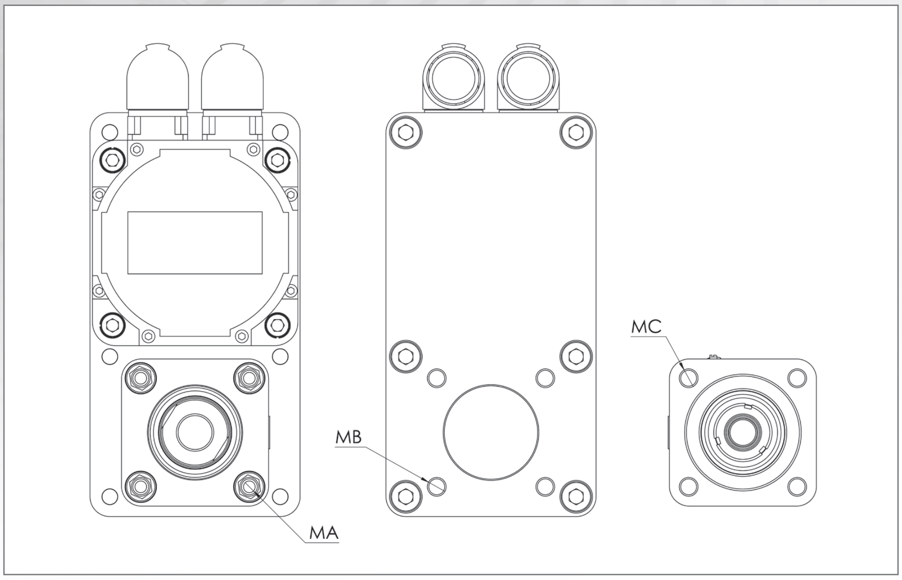
	Ballscrew	RollerScrew
Precision Repeatability	G7-G5, G0 With Preload, Shortened Life	G5-G1, G0 With Preload, Shortened Life
Linear Speed	up to 160000 DN generally 90000/120000 DN	160000 DN
Linear Acceleration	up to 1,5g	up to 3g
Screw Efficency	up to 0,97	up to 0,90
Expected life with same Diameter and Pich of Screw	✓	✓✓✓
In Stock Availability	✓	X
Initial Investiment	1x	5x

MOUNTING METHODS

LAM Servo Actuators comply with the ISO 15552 standard for pneumatic cylinders and share similar mounting methods.

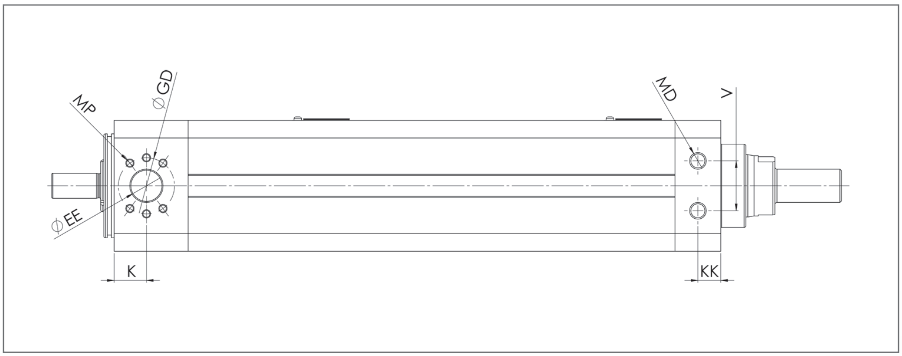
Mounting with Front and Rear Threaded Holes

Ensure the correct tightening torques are applied, as specified in the technical data sheet supplied with the product.
**With this configuration, the actuator can support the maximum dynamic load for each size. **



Mounting with Side Holes on the Body

Ensure the correct tightening torques are applied, as specified in the technical data sheet supplied with the product.
Always follow the recommended tightening torques provided in the product's technical documentation.



MOUNTING HOLES							
SIZE	**ØEE**	**GD**	**K**	**KK**	**MD**	**MP**	**V**
LAM032	10H7 ↓ 3	21,5	10	12,5	M6x7	NR. 4 M4	16
LAM040	15H7 ↓ 3	27	15	14	M6x8	NR. 6 M4	20
LAM050	15H7 ↓ 3	27	15,5	15	M8x12	NR. 6 M4	24
LAM063	23H7 ↓ 3,5	37	20	17,5	M8x15	NR. 6 M6	30
LAM080	23H7 ↓ 3,5	37	25	20	M12x20	NR. 6 M6	40

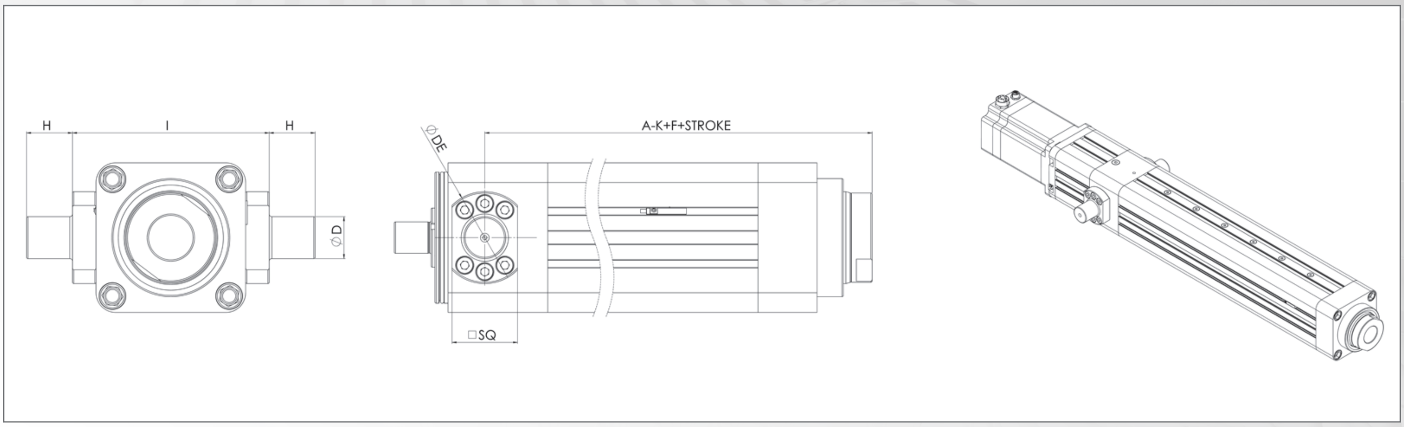
Mounting with mounting accessories

LAM Servo Actuators offer a wide range of mounting accessories. Some are compatible with ISO 15552 pneumatic cylinder accessories, while others are specifically designed to meet the enhanced performance requirements of electro cylinders.

MOUNTING ACCESSORIES

Side Pins: PL

Material: Zinc-plated 42CrMo4 Steel or AISI 304 upon request, Black Oxide Screws or Stainless Steel

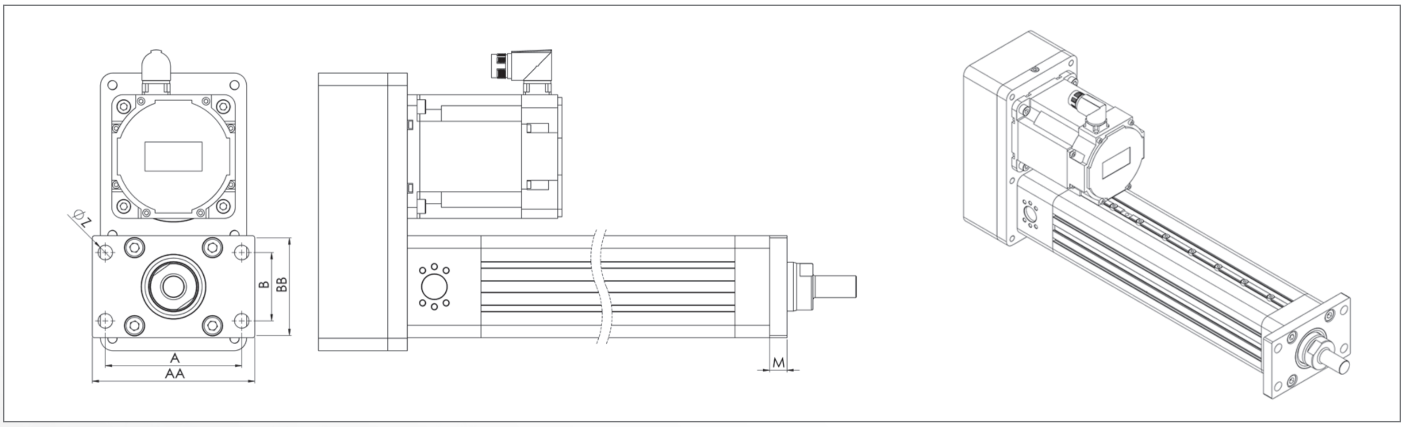


PL COAXIAL – CONFIGURATION D.. R.. M0						
SIZE	**D g6**	**H**	**DE**	**I**	**SQ**	**I (parallel)**
LAM032	12	12	31	55	20	69
LAM040	16	16	38	69	26	75
LAM050	16	16	38	79	26	91
LAM063	20	20	49	95	33	100
LAM080	20	20	49	112,5	33	136
LAM100	32	35	70	150	50	156
LAM125	40	40	92	200	78	200

* Compatible with maximum load applications

Front Plate: PF

Material: Zinc-plated 42CrMo4 steel or AISI 304 upon request, black oxide screws or stainless steel



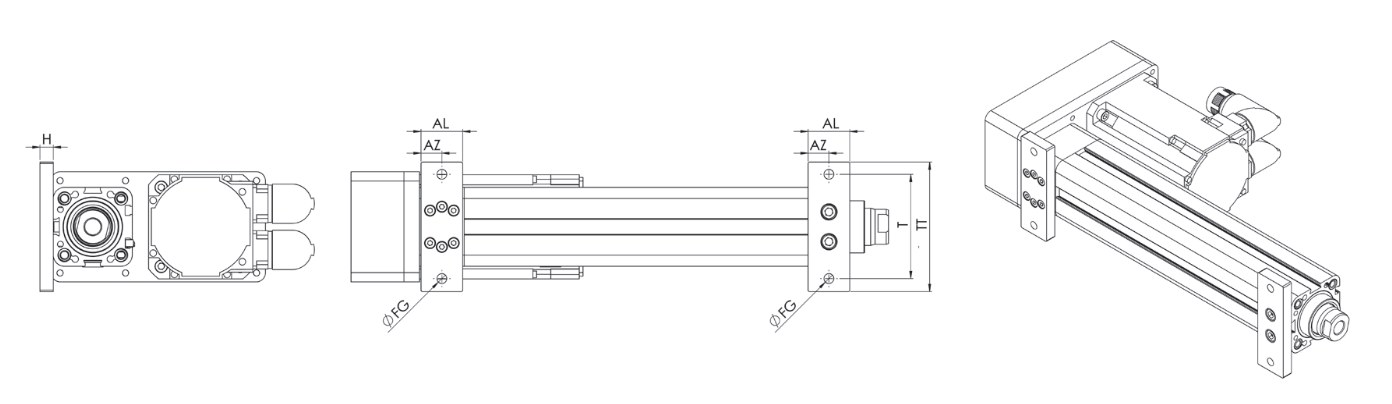
PF						
SIZE	**A**	**AA**	**B**	**BB**	**M**	**Z**
LAM032	64	80	32	45	10	6,6
LAM040	72	90	36	54	10	9
LAM050	90	110	45	65	12	9
LAM063	100	120	50	75	12	9
LAM080	126	150	63	94	16	13,5
LAM100	150	180	75	115	20	15
LAM125	180	210	90	150	25	20

* Compatible with maximum load applications

MOUNTING ACCESSORIES

***Side Plates:* PA**

Material: Zinc-plated 42CrMo4 steel or AISI 304 upon request, black oxide screws or stainless steel



PA						
SIZE	**T**	**TT**	**ØFG**	**AL**	**AZ**	**H**
LAM032	62	78	6,6	25	12,5	8
LAM040	70	87	6,6	28	14	9
LAM050	84	104	9	30	15	10
LAM063	102	124	9	35	17,5	11
LAM080	120	144	13	40	20	12

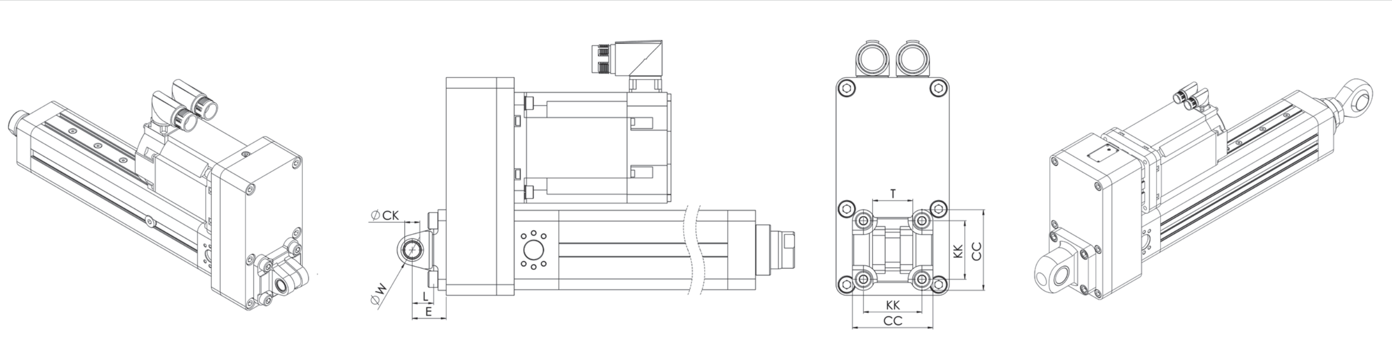
The load applied to the actuator with the "PA" accessory is the maximum rated load up to and including size LAM050.
For larger sizes, each case must be evaluated individually by consulting the technical department.

REAR MOUNTING ACCESSORIES

Below are the mounting accessories compatible with servo actuators in parallel configuration P..., PR....

***Rear Eye:* TO**

Material TO: Up to and including LAM063 -> die-cast aluminum with PTFE bushings
Material TO: ≥ LAM080 -> anticorodal 6082 T6 aluminum or aerospace-grade 7075 T6 aluminum with sintered bronze/PTFE bushings

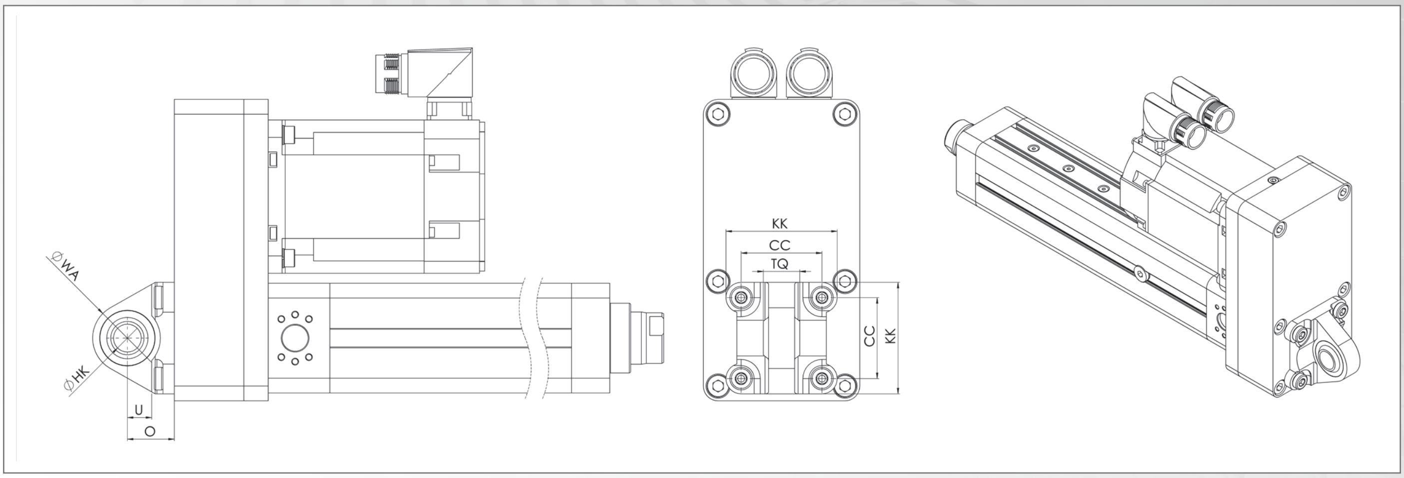


TO							
SIZE	**CK**	**L**	**E**	**W**	**T**	**CC**	**KK**
LAM032	10	14	22	20	26	32,5	45
LAM040	12	16	25	24	28	38	54
LAM050	12	16	27	24	32	46,5	64
LAM063	16	21	32	32	40	56,5	75
LAM080	25	32	50	68	35	72	94
LAM100	35	42	64	90	42	89	115
LAM125	50	63	92	138	60	110	150

REAR MOUNTING ACCESSORIES

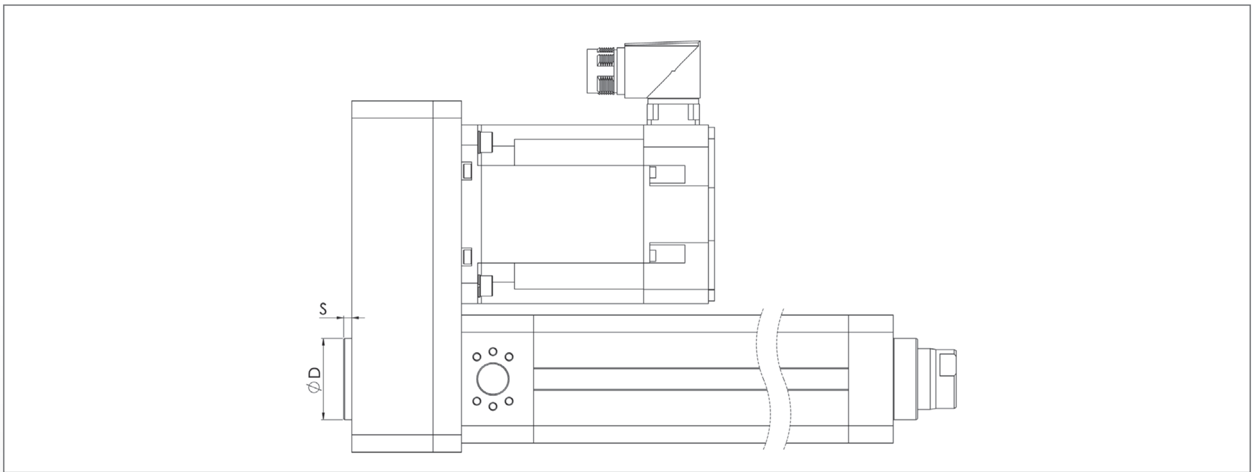
*Rear Spherical Joint: **PTS***

Material PTS: die-cast aluminum



PTS							
SIZE	**HK**	**U**	**O**	**WA**	**TQ**	**CC**	**KK**
LAM032	10	14	22	30	14	32,5	45
LAM040	12	16	25	34	16	38	54
LAM050	16	16	27	40	21	46,5	64
LAM063	16	21	32	46	21	56,5	75

*Centering Disc: **AC***

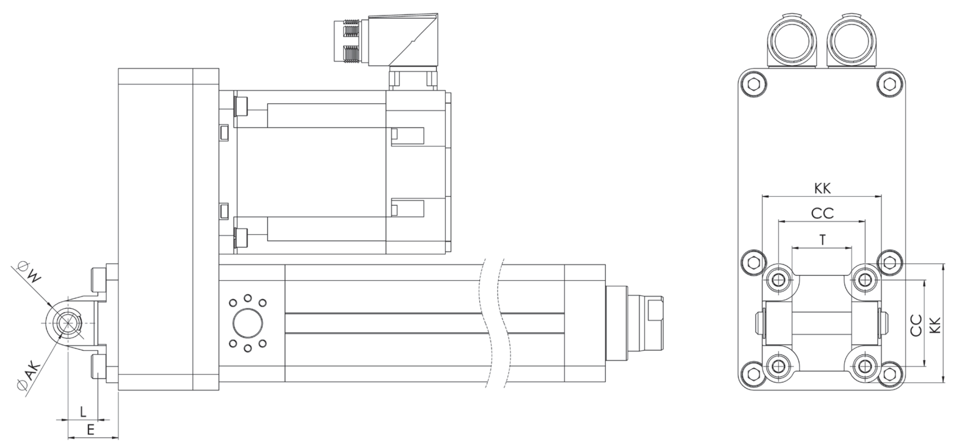


AC		
SIZE	**D h7**	**S**
LAM032	30	4
LAM040	35	4
LAM050	40	4
LAM063	45	5
LAM080	60	6
LAM100	90	7
LAM125	120	10

REAR MOUNTING ACCESSORIES

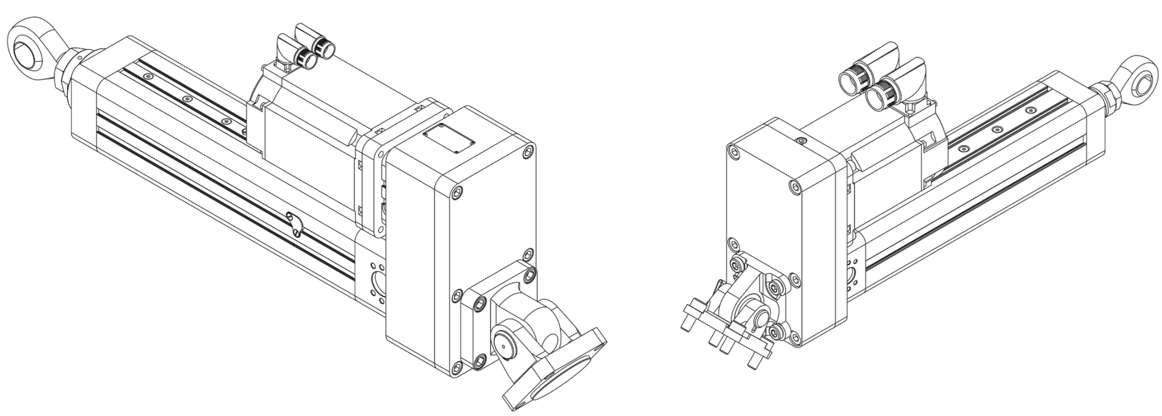
***Bracket With Pin:* STO TSTO**

Material: Up to and including LAM063 -> die-cast aluminum
Material: ⩾ LAM080 -> anticorodal 6082 T6 aluminum or aerospace-grade 7075 T6 aluminum
TSTO available only up to and including LAM063



STO TSTO									
SIZE	AK	AK TSTO	L	E	W	T	T TSTO	CC	KK
LAM032	10	10	14	22	20	26	14	32,5	45
LAM040	12	12	16	25	24	28	16	38	54
LAM050	12	16	16	27	24	32	21	46,5	64
LAM063	16	16	21	32	32	40	21	56,5	75
LAM080	25	-	35	53	46	35	-	72	94
LAM100	35	-	47	69	56	42	-	89	115
LAM125	50	-	68	97	80	60	-	110	150

The STO-TO-PTS accessories are compatible up to size LAM063 with all ISO15552 mounting brackets on the “system” side. The only limitation is the applicable load, which may restrict their use (please contact the technical department).
Marzorati has the capability to design and manufacture custom brackets for system integration, in order to best adapt the actuator to the application.



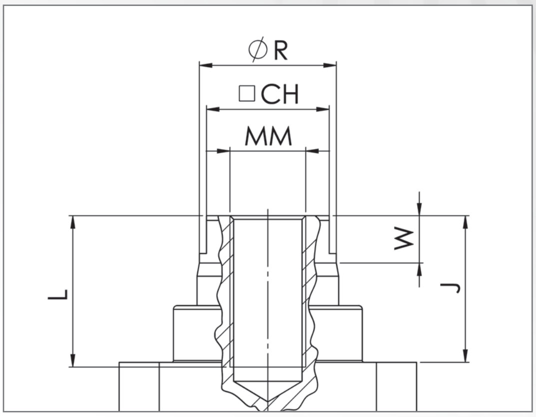
Below are the rod-end accessories compatible with the rod of LAM servo actuators.
The drawing on pages 8–9 shows the TM rod-end with dimensions; therefore, it will not be listed below.

STEM ENDS AND BELLOWS PROTECTION

Below are the rod-end accessories compatible with the rod of LAM servo actuators.
The drawing on *pages 8–9* shows the TM rod-end with dimensions; therefore, it will not be listed below.

Female Threaded Rod-End: ***TMF***

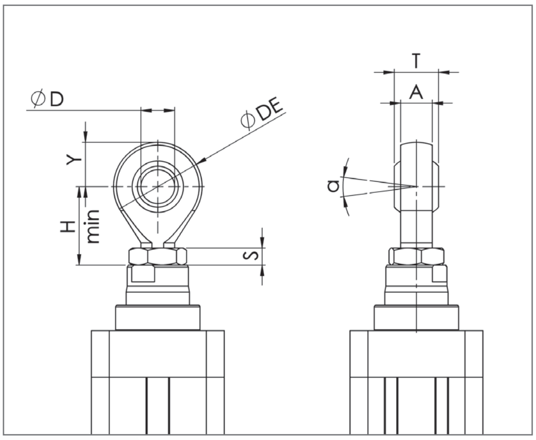
Maintains the "J" dimension of the TM rod-end – see *pages 8–9*
Material: 42CrMo4 steel or AISI 304 stainless steel



ROD-END TMF					
SIZE	R	CH	MM	L	W
LAM032	18	16	M10x1,25	20	9
LAM040	23,5	20	M12x1,25	25	9
LAM050	29	26	M16x1,5	30	10
LAM063	33,5	30	M16x1,5	32	12
LAM080	43	38	M20x1,5	45	15
LAM100	68	62	M36x2	60	16
LAM125	86	80	M48x2	85	21

Rod-End With Spherical Joint ISO12240: ***TS***

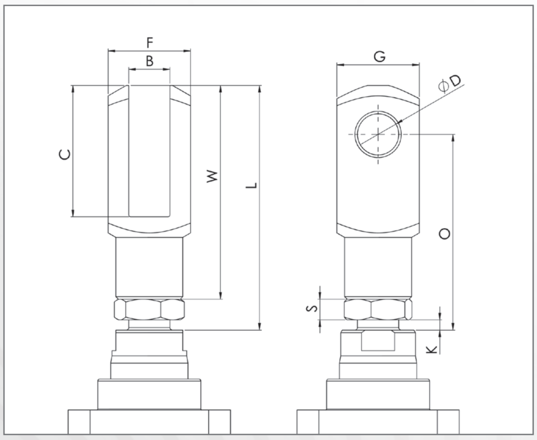
Maintenance-free, anti-friction insert in bronze/PTFE
Rod-end body: high-alloy steel, stainless steel, or nickel-coated steel for harsh environments
Compensates for angular misalignments of the mounting pins
To be paired with the TMF rod-end



TS ISO 12240									
SIZE	D	DE	Y	α	A	T	H min	S	max load
LAM032	10	28	14	13°	10,5	14	28	6	max
LAM040	12	32	16	15°	12	16	29	6	max
LAM050	16	42	21	15°	15	21	37	8	max
LAM063	16	42	21	15°	15	21	37	8	max
LAM080	20	50	25	15°	18	25	40	10	21500
LAM100	35	80	40	15°	28	43	78	18	55000
LAM125	50	117	58,5	15°	45	60	108	24	max

Clevis Rod-End ISO8410: ***TF***

Material: Steel, white zinc-plated steel, or AISI 304 stainless steel

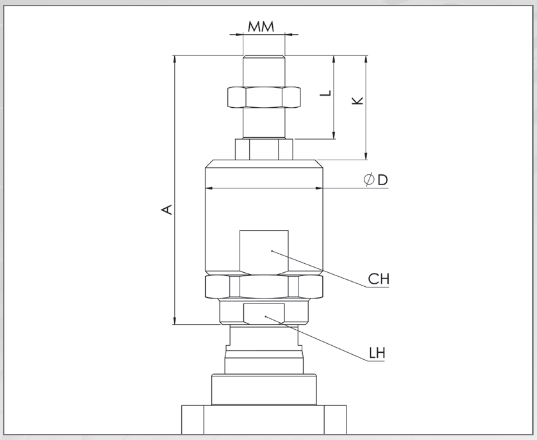


TF ISO 8140										
SIZE	D	G	O	S	Kmin	F	B	C	W	L
LAM032	10	20	49	6	3	20	10	32	52	61
LAM040	12	24	57	6	3	24	12	38	62	71
LAM050	16	32	76	8	4	32	16	51	83	95
LAM063	16	32	76	8	4	32	16	51	83	95
LAM080	20	40	94	10	4	40	20	65	105	119
LAM100	35	70	167	18	5	70	35	98	187	210
LAM125	50	96	221	24	5	96	50	169	265	294

STEM ENDS AND BELLOWS PROTECTION

Self-Aligning Coupling Rod-End: ***TSA***

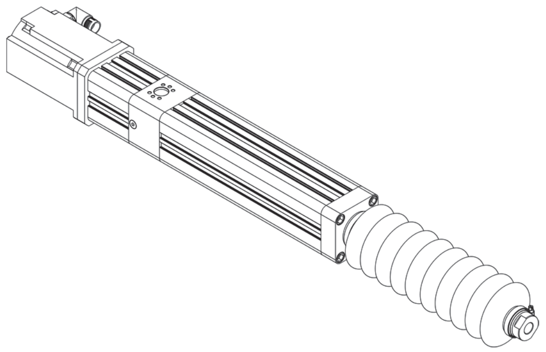
Compensates for angular misalignments up to 4° and radial misalignments up to 1 mm

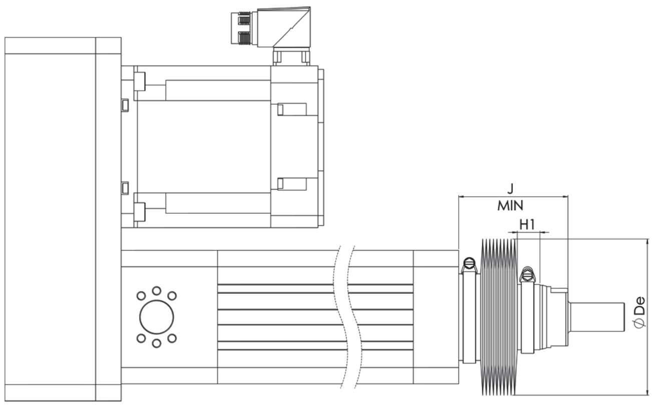


ROD-END TSA								
SIZE	**D**	**A**	**MM**	**L**	**K**	**CH**	**LH**	**max load**
LAM032	32	69,5	M10x1,25	20	26,5	30	19	max
LAM040	32	74,5	M12x1,25	24	30,5	30	19	max
LAM050	45	103	M16x1,5	32	40	41	30	max
LAM063	45	103	M16x1,5	32	40	41	30	10000
LAM080	45	120	M20x1,5	40	48	41	30	10000
LAM100	79,5	251	M36x2	72	93	75	75	40000
LAM125	-	-	-	-	-	-	-	-

Bellows Protection: ***PE***

Material: PVC + polyester or aluminized vermiculite for high-temperature applications (60°C and above) and accidental contact with hot materials.





$$J_{min} \approx \left(\frac{C}{A_{max}} + 1\right) f + 3H_1$$

f = 2.5

PE			
SIZE	Amax	De	H1
LAM032	18	58	10
LAM040	18	70	10
LAM050	18	85	12
LAM063	18	95	12
LAM080	33	110	16
LAM100	33	135	20
LAM125	33	170	25

OPERATING ACCESSORIES

Anti-rotation: GT

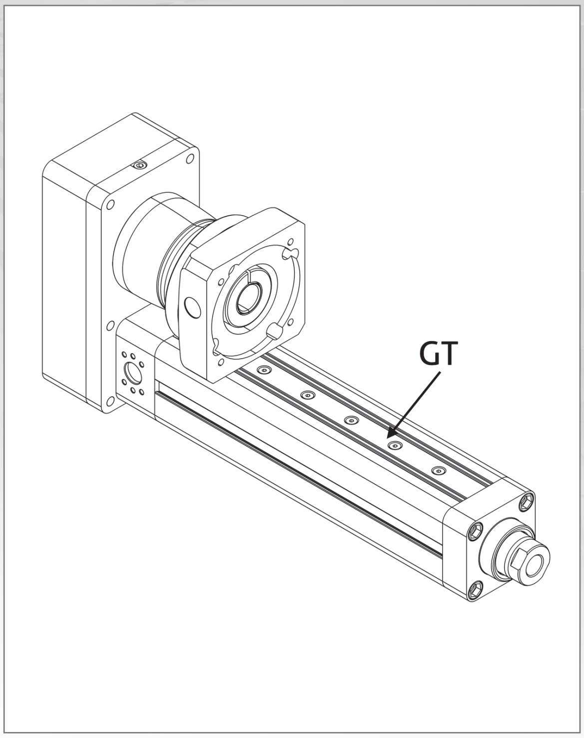
Internal anti-rotation system fully integrated, allowing the rod to be locked against rotation during translation. This enables the movement of free loads or the use of coupling joints that compensate for system misalignments, without compromising repeatability.

It consists of robust 3D-printed inserts made from low-friction, high-temperature-resistant technopolymer, suitable for operation without lubrication.

This accessory maintains the possible IP65 rating of the Servo Actuator and does not alter the overall dimensions or performance in terms of lifespan and supported lateral load.

In applications with bidirectional load, the system ensures maximum repeatability. Naturally, during operation, the inserts wear over time, increasing play; upon request, a zero-play system can be designed to maintain performance throughout the life of the actuator's lead screw.

NOTE: To ensure the integrity of the anti-rotation system, operation must be free from shocks, overloads, external obstructions, and collisions at the upper and lower end-of-stroke positions.



Shock Absorbers: AM

Material: Polyurethane, Shore hardness 70/75A

They allow full stroke travel at end-of-stroke positions while reducing the risk of internal damage to the Servo Actuator—though not completely eliminating it.

Not compatible with the GT anti-rotation accessory.
Adds to the "A" dimension length – see drawings on *page 8-9* and table alongside.

The AM shock absorber accessory does not affect the internal overtravel of the actuator.

For smaller sizes (LAM032, LAM040), the shock absorber can only be added on the bearing group side; therefore, the actuator is not protected from collisions beyond the maximum stroke.

AM		
SIZE	EXTRA STROKE	POSITION
LAM032	6	BEARING SIDE
LAM040	6	BEARING SIDE
LAM050	16	BOTH SIDES
LAM063	16	BOTH SIDES
LAM080	24	BOTH SIDES
LAM100	30	BOTH SIDES
LAM125	30	BOTH SIDES

Reinforced Bearing: CP

With a modification to the bearing assembly, its lifespan is increased without the need to upscale the actuator size.
This accessory offers great synergy in applications with unidirectional load, roller screws, and scenarios requiring 99% reliability.

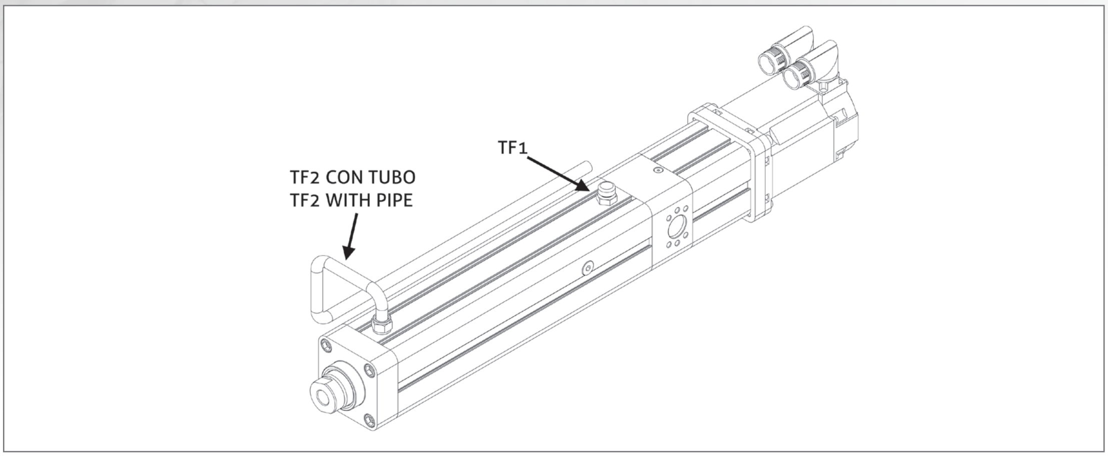
CP	
SIZE	EXTRA STROKE
LAM032	4
LAM040	0
LAM050	16
LAM063	14
LAM080	17
LAM100	19
LAM125	0

ACCESSORY POSITIONS AND LIMIT SWITCHES

As for the following operating accessories, it is necessary to specify their position relative to the other accessories and to the mounting position of the other accessories

Breather Plug: TF1, TF2

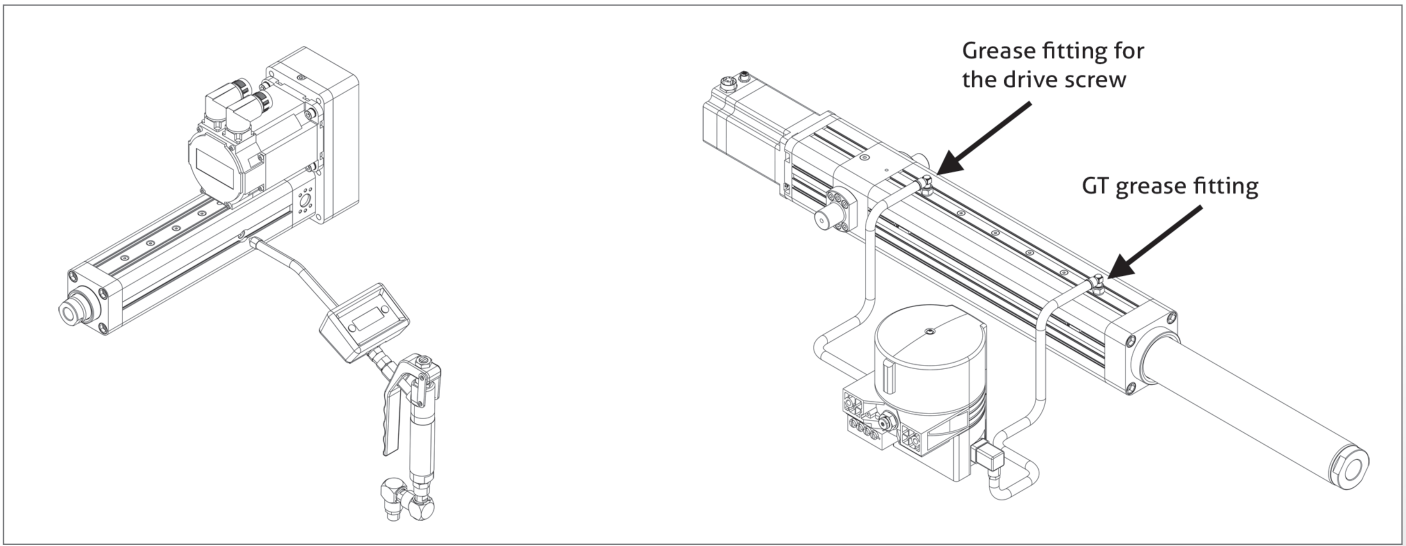
The breather plug allows **internal pressure equalization** within the actuator bore caused by the movement of the nut and piston. If the linear speed is below 300 mm/s, the breather plug is not necessary, as the actuator's internal geometry provides sufficient flow compensation. If the linear speed exceeds 300 mm/s, the internal geometry is not sufficient, and the use of the breather plug is recommended.
If the actuator operates in contaminated environments, it is advisable to use a tube that connects the actuator's interior to a clean environment.
Below is a table showing the hydraulic thread types made on the actuator extrusion for each actuator size when the TF accessory is selected.
Threads can be made on either the bearing side (TF1) or the front head side (TF2) of the actuator, as shown in the image below.
TF1 position is always feasible, while TF2 position may not be possible in certain cases (please contact the technical department).



BREATHER PLUG	
SIZE	PLUG
LAM032	G1/8
LAM040	G1/8
LAM050	G1/8
LAM063	G1/4
LAM080	G1/4
LAM100	G3/8
LAM125	G3/8

Lubrication method and additional grease fittings: IN, INA

Each servo actuator has a standard grease point that allows lubrication of the ball nut. It is accessible through an IP65 plug and, using a manual grease pump with male conical LUB tips, it enables replenishing the grease in the ball screw nut.



The lubrication positions are specified in the following paragraph. To lubricate the actuator directly at the ball nut (as shown in the image above), it must be brought to the initial stroke position.
Lubrication intervals depend on the actuator's operating cycle, and the amount of grease per lubrication depends on the actuator size (this information is provided in the technical datasheet supplied at the time of order).
The grease used for the lead screw is an **EP additive lithium soap grease**: LEGHERMAISTER 2 EP for high-load applications, and ISOFLEX NCA15 for high-speed or low-temperature applications.
The bearing housing is permanently greased but can be accessed through dedicated plugs for eventual grease replenishment.

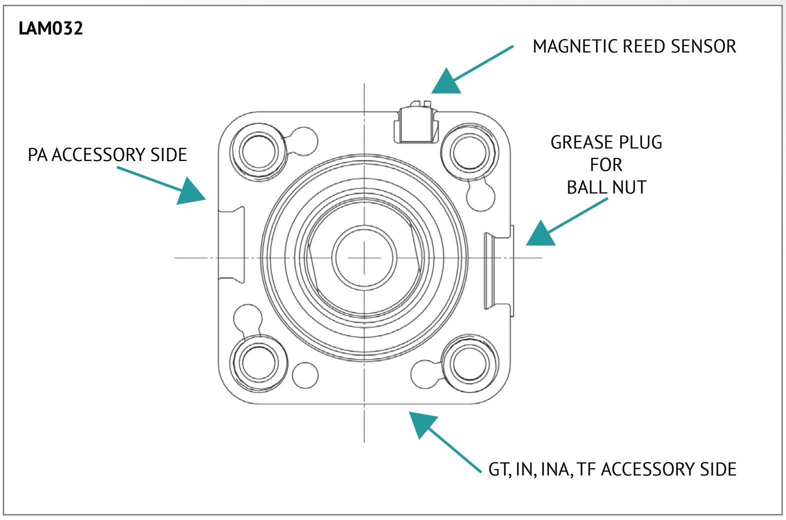
ACCESSORY POSITIONS AND LIMIT SWITCHES

The bearing housing is designed to be lubricated with a cooled oil recirculation system for applications involving cyclic thrust (contact the technical department).

It is possible to order the actuator with additional grease fittings IN along the stroke, useful in applications with long travel and/or with anti-rotation systems. The **IN** fittings ensure proper lubrication of the anti-rotation system, which is beneficial in high-duty cycle applications. The **INA** additional grease fittings are equipped with connectors and junctions for connection to an Automatic Lubrication Unit, and are positioned to lubricate both the lead screw and the optional anti-rotation system when the actuator reaches the upper end-of-stroke position. The lubrication unit can be supplied upon request at the time of order (contact the technical department).

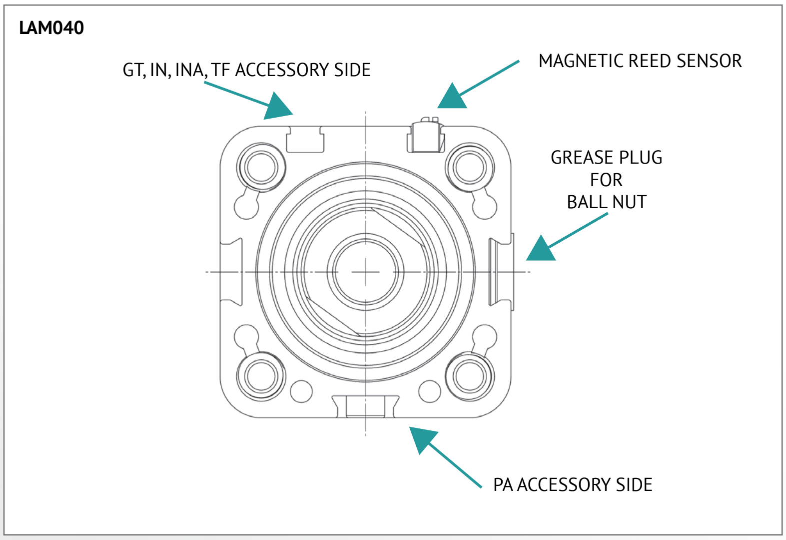
REED sensor positions, breather plugs, and grease points

The following images illustrate the location of various accessories on the actuator body, as well as their relative position to each other and to the mounting plane of the side pins. The housing of the belt transmission module is always to be considered perpendicular to the axis of the pins.
It is possible to request the actuator without sensors: the accessory arrangement logic remains unchanged, and the code must include the designation **A1, A2, A3, or A4** accordingly.



Example image LAM032 layout RM1-A1
Changing the layout results in a rotation of all indicated elements by 90° (RM2), 180° (RM3), or 270° (RM4) clockwise relative to the adjacent drawing.

The relative position of the accessories remains unchanged.

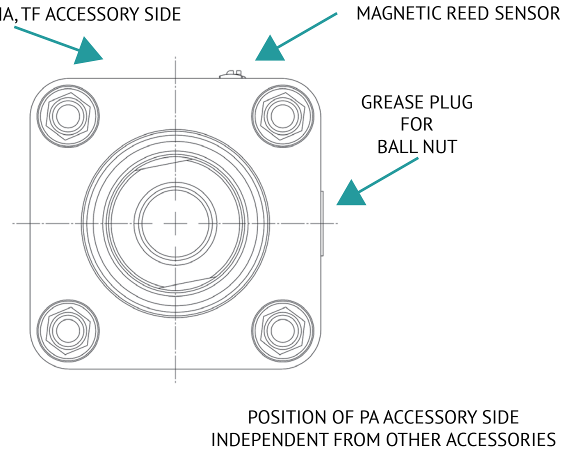


Example image LAM040 layout RM1-A1
Changing the layout results in the rotation of all indicated elements by 90° (RM2), 180° (RM3), or 270° (RM4) clockwise relative to the adjacent drawing.

The relative position of the accessories remains unchanged.

ACCESSORY POSITIONS AND LIMIT SWITCHES

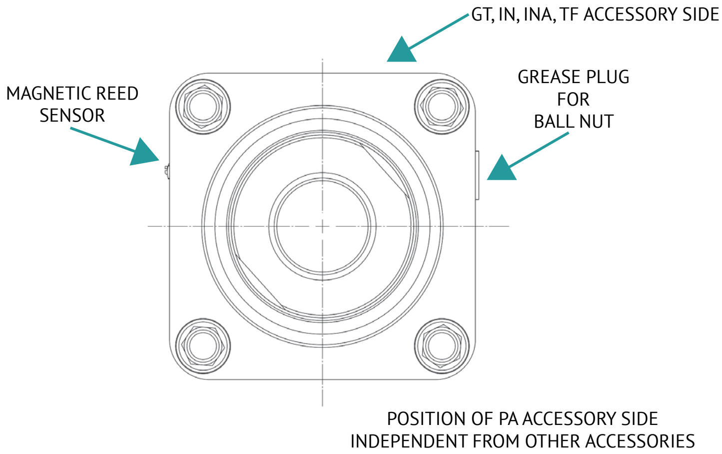
LAM050-063



Example image LAM050-063 layout RM1-A1
Changing the layout results in the rotation of all indicated elements by 90° (RM2), 180° (RM3), or 270° (RM4) clockwise relative to the adjacent drawing.

The relative position of the accessories remains unchanged.

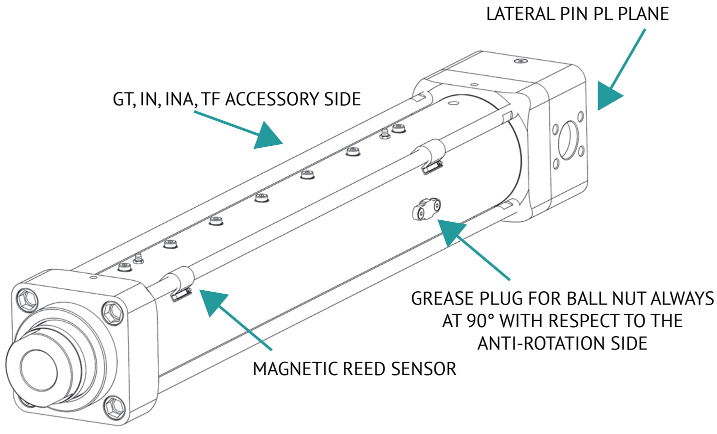
LAM080-100



Example image LAM080-100 layout RM1-A1
Changing the layout results in the rotation of all indicated elements by 90° (RM2), 180° (RM3), or 270° (RM4) clockwise relative to the adjacent drawing.

The relative position of the accessories remains unchanged.

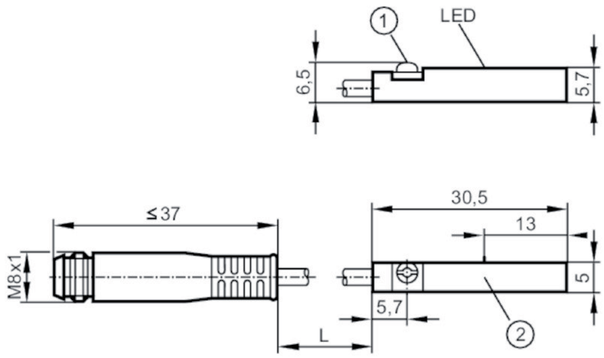
LAM125



Example image LAM125 layout RM1-A1
The position of the Reed sensor, when the anti-rotation system is not present, is independent of the other accessories and follows the same rotation logic as the other sizes.

LIMIT SWITCH SENSOR

The extruded aluminum body made of 6060 T6 allows the use of adjustable magnetic REED-type sensors along the T-slots (standard), and upon request, REED sensors for C-slots.
Below are the technical specifications of our standard sensors.

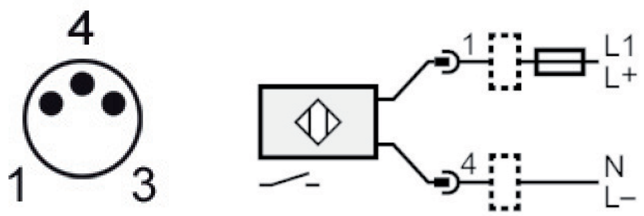


1. Fixing eccentric with slotted/hex socket combination head. Hex key size 1.5
2. Active surface

LIMIT SWITCH SENSOR	
Electrical model	**PNP/NPN**
Output function	NO
Operating voltage [V]	2...50 AC / 5...60 DC
Repeatability [mm]	0.2
Response time [ms]	0.1
Switching status indicator	Yellow Led
Protection rating	IP67
Operating temperature	-20°C / +70°C

Cables L=1m or L=3m upon request

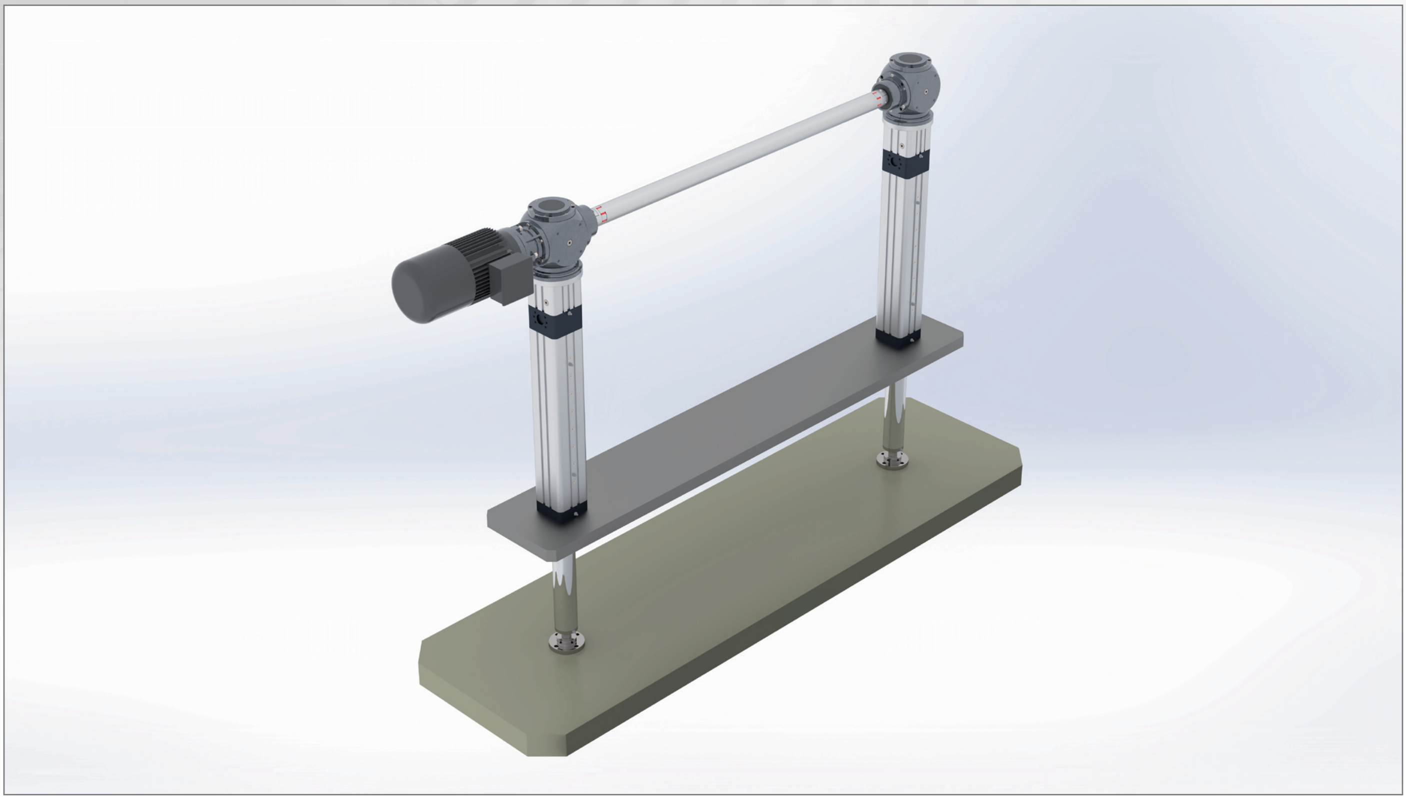
Schema di collegamento



NOTE:
Miniature fuse according to
IEC60127-2 Sheet 1 ≤ 0.175 A fast-acting

PLANT APPLICATION

Marzorati's product range includes everything needed to supply coupled actuators that form coordinated lifting or handling systems.
It is possible to couple bevel gearboxes from our RA series to the LAM servo actuators using a special bell housing + coupling + flange kit, which consists of either an elastomer or bellows coupling.
The gearboxes can be supplied in various configurations and with different output shafts, which, together with the use of extensions, allow actuators to be connected within the system.
The bevel gearboxes are also designed for mounting servomotors via flange and shrink disc.



Marzorati
Drive your e-motion

We're Here
To Help You

Marzorati

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