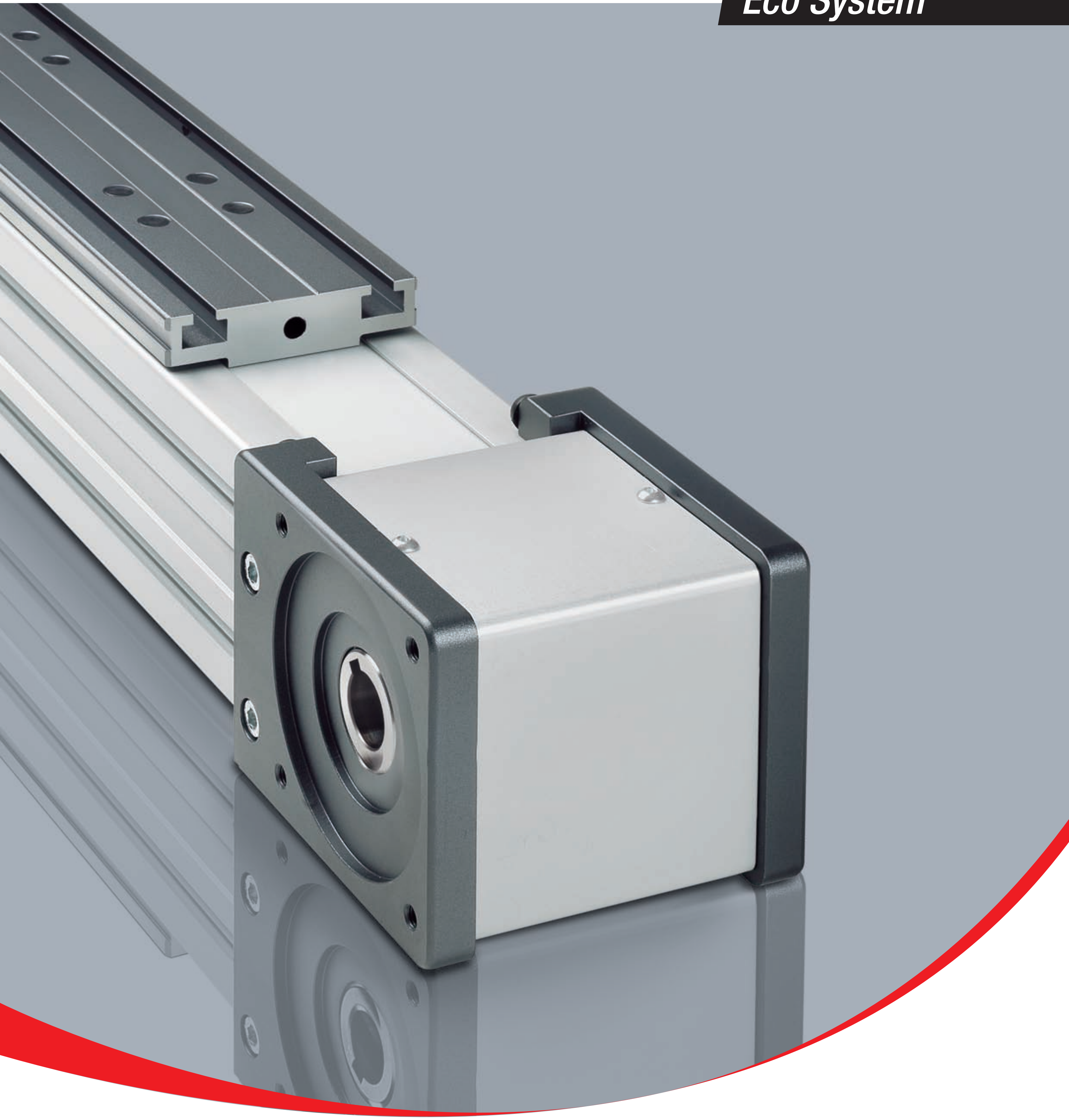
ROLLON®

LinearEvolution

Eco System



When you move. We move

Rollon S.p.A. was founded in 1975 as a manufacturer of linear motion components. Today Rollon group is a leading name in the design, production, and sale of linear rails, telescopic rails, and actuators, with headquarters based in Italy and offices and distributors located throughout the world. Rollon products are used in many industries, providing creative and efficient solutions in a wide variety of applications.

Rollon solutions for linear motion

Linear Line

Telescopic Line

Actuator Line

Actuator System Line

Linear Rails

Rails with roller bearings
Rails with caged ball bearings
Rails with recirculating ball bearing

Telescopic Rails

Rails with partial/total extension
Heavy duty rails
Rails for automated and manual applications

Actuators

Belt driven actuators
Ball screw driven actuators
Rack and pinion actuators

Solutions for industrial automation

Multi-axis for pick and place
Telescopic actuators
Seventh axis for robots
Solutions for metal sheet handling

Core Competencies

- Full range of linear rails, telescopic rails and actuators
- Worldwide presence with branches and distributors
- Fast delivery all over the world
- Large technical know-how for applications

Standard solutions

Wide range of products and sizes
Linear rails with roller and caged ball bearings
Heavy duty telescopic rails
Belt or ball screw driven linear actuators
Multi-axis systems

Collaboration

International know-how in several industries
Project consultancy
Maximizing performance and cost optimization

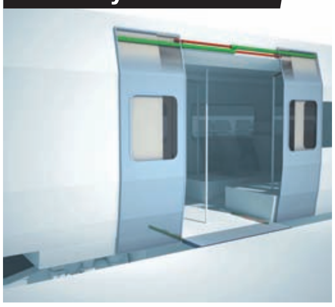
Customization

Special products
Research and development of new solutions
Technologies dedicated to different sectors
Optimal surface trea

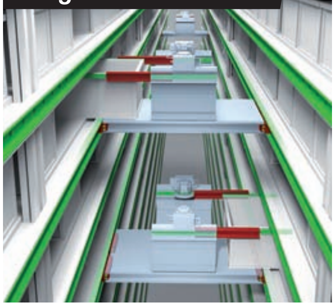
Applications

Aerospace

Railway



Logistics

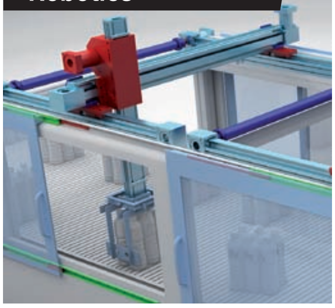


Industrial

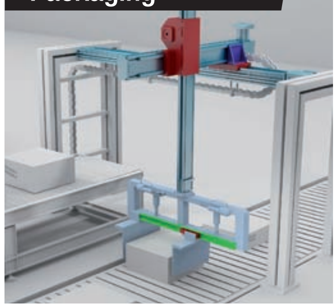
Medical

Special Vehicles

Robotics

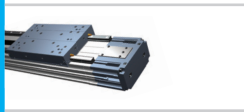
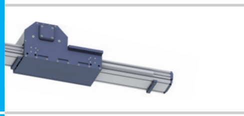
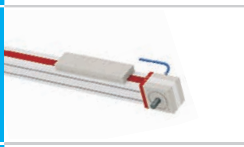
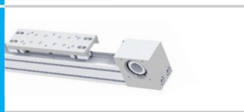
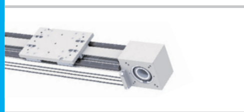
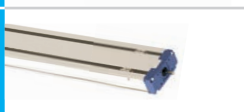
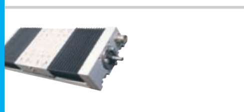
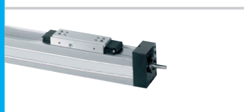


Packaging



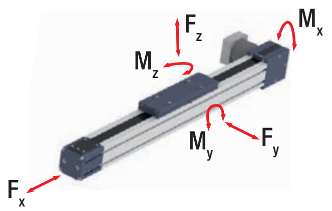
Eco System

Technical features overview

Reference			Section		Driving			Anticorrosion	Protection
Family		Product	Balls	Rollers	Toothed belt	Ball screw	Rack and pinion		
Plus System		ELM	✓	✓	✓			✓	✓
		ROBOT	✓	✓	✓			✓	✓
		SC	✓		✓			✓	✓
Clean Room System		ONE	✓		✓			✓	✓
Smart System		E-SMART	✓		✓				
		R-SMART	✓		✓				
		S-SMART	✓		✓				
Eco System		ECO	✓	✓	✓				✓
Uniline System		A/C/E/ED/H		✓	✓				✓
Precision System		TH	✓			✓			✓
		TT	✓			✓			✓
		TV	✓			✓			✓
		TK	✓			✓			✓

Reported data must be verified according to the application. See verification under static load and lifetime on page SL-2 and SL-7
For a complete overview about technical data, please consult our catalogues at www.rollon.com.
* Longer stroke is available for jointed version

Size	Max. load capacity per carriage [N]			Max. static moment per carriage [Nm]			Max. travel speed [m/s]	Max. acceleration [m/s²]	Repeatability accuracy [mm]	Max. travel or stroke (per system) [mm]	
	F_x	F_y	F_z	M_x	M_y	M_z					
50-65-80-110	4440	79000	79000	1180	7110	7110	5	50	± 0,05	6000*	PLS
100-130-160-220	8510	158000	158000	13588	17696	17696	5	50	± 0,05	6000*	
65-130-160	5957	86800	86800	6770	17577	17577	5	50	± 0,05	2500	
50-80-110	4440	92300	110760	1110	9968	8307	5	50	± 0,05	6000*	CRS
30-50-80-100	4440	87240	87240	1000	5527	5527	4	50	± 0,05	6000*	SS
120-160-220	8880	237000	237000	20145	30810	30810	4	50	± 0,05	6000*	
50-65-80	2250	51260	51260	520	3742	3742	4	50	± 0,05	2000	
60-80-100	4070	43400	43400	570	4297	4297	5	50	± 0,05	6000*	ES
40-55-75-100	1000	25000	17400	800,4	24917	15752	9	20	± 0,05	5700*	US
90-110-145	27000	86800	86800	3776	2855	2855	2		± 0,005	1500	PS
100-155-225-310	58300	230580	274500	30195	26627	22366	2,5		± 0,005	3000	
60-80-110-140	58300	48400	48400	2251	3049	3049	2,5		± 0,01	4000	
40-60-80	12462	50764	50764	1507	622	622	1,48		± 0,003	810	



ECO series

ECO series description

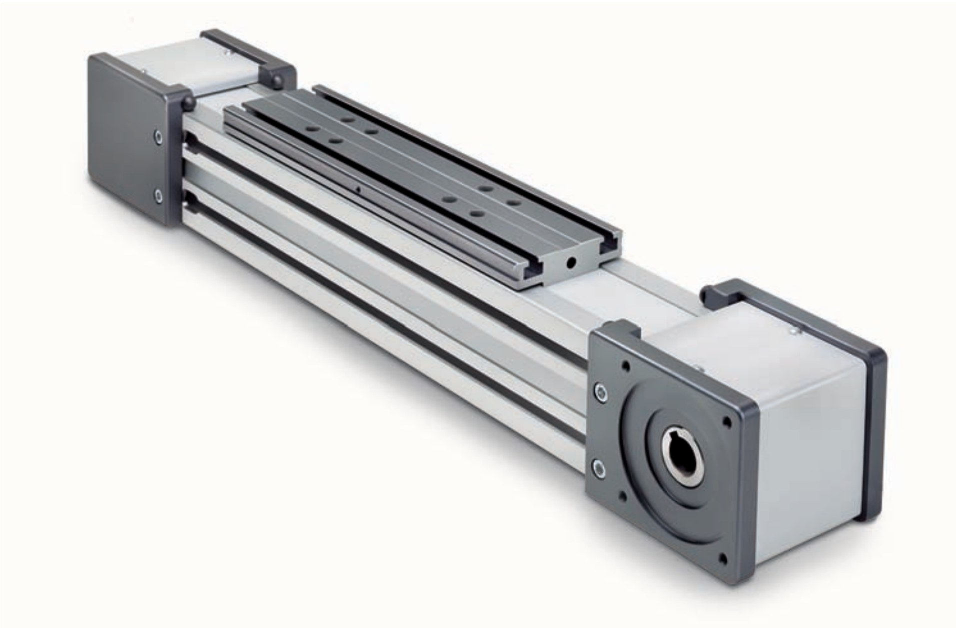


Fig. 1

The ECO SYSTEM units are linear actuators made of a self-supporting extruded aluminum frame and are driven by a polyurethane belt with AT metric profile steel inserts.

- Three different sizes available: 60mm, 80mm, 100mm
- Version available with recirculating ball bearing or roller rails
- Reduced weight ensured by the light frame and the aluminum sliders
- High sliding speed

The ECO SYSTEM series actuators are offered with two motion systems:

ECO SYSTEM – SP
Featuring a maintenance free recirculating linear guide rail fitted inside the profile.

ECO SYSTEM – CI
Featuring four rollers with a Gothic arch outer profile sliding on hardened steel bars placed inside the profile.

The components

Extruded bodies

The anodised aluminum extrusion used for the profile of the Rollon ECO series linear units was designed and manufactured by industry experts to optimise weight while maintaining mechanical strength. The anodised aluminum alloy 6060 used (see physical-chemical characteristics below) was extruded with dimensional tolerances complant with EN 755-9 standards.

Driving belt

The Rollon ECO series linear units use steel reinforced polyurethane drive belts with AT pitch. This belt is ideal due to its high load transmission characteristics, compact size and low noise. Used in conjunction with a backlash-free pulley, smooth alternating motion can be achieved.

Optimisation of the maximum belt width/body dimension ratio enables the following performance characteristics to be achieved:

- **High speed**
- **Low noise**
- **Low wear**

The driving belt is guided by specific slots in the aluminum extruded body thus covering the inside components.

Carriage

The carriage of the Rollon ECO series linear units is made of anodised aluminum. Two different length carriages are available for each type of linear unit.

General data about aluminum used: AL 6060

Chemical composition [%]

Al	Mg	Si	Fe	Mn	Zn	Cu	Impurites
Remainder	0.35-0.60	0.30-0.60	0.30	0.10	0.10	0.10	0.05-0.15

Tab. 1

Physical characteristics

Density	Coeff. of elasticity	Coeff. of thermal expansion (20°-100°C)	Thermal conductivity (20°C)	Specific heat (0°-100°C)	Resistivity	Melting point
$\frac{kg}{dm^3}$	$\frac{kN}{mm^2}$	$\frac{10^{-6}}{K}$	$\frac{W}{m \cdot K}$	$\frac{J}{kg \cdot K}$	$\Omega \cdot m \cdot 10^{-9}$	°C
2.70	69	23	200	880-900	33	600-655

Tab. 2

Mechanical characteristics

Rm	Rp (02)	A	HB
$\frac{N}{mm^2}$	$\frac{N}{mm^2}$	%	—
205	165	10	60-80

Tab. 3

ES

The linear motion system

The linear motion system has been designed to meet the load capacity, speed, and maximum acceleration conditions of a wide variety of applications. Two linear motion systems are offered:

ECO...SP with ball bearing guides

- A ball bearing guide with high load capacity is mounted in a dedicated seat on the inside of the aluminum body.
- The carriage is assembled on two pre-loaded ball bearing blocks.
- The two ball bearing blocks enable the carriage to withstand loading in the four main directions.
- The two blocks have seals on both sides and, if necessary, an additional scraper can be fitted for very dusty conditions.
- The ball bearing carriages of the SP versions are also fitted with a retention cage that eliminates "steel-steel" contact between adjacent revolving parts and prevents misalignment.
- Lubrication reservoirs (pockets) installed on the front of the ball bearing blocks supply the appropriate amount of grease, thus promoting a long maintenance interval.

The linear motion system described above offers:

- High speed and acceleration
- High load capacity
- High permissible bending moments
- Low friction
- Long life
- Maintenance Free (dependent on application)
- Low noise
- Suitable for long stroke

ECO...CI with gothic arch bearing guides inside the body

- Two hardened steel rods (58/60 HRC tolerance h6) are securely inserted inside the aluminum body.
- The carriage is fitted with six bearing assemblies each having a gothic arch groove machined into its outer race to run on the steel rods.
- The six bearings are mounted on steel pins, two of which are eccentric, to allow setting of running clearance and pre-load.
- To keep the running tracks clean and lubricated, four grease impregnated felt seals, complete with grease reservoirs, are fitted on the ends of the carriage.
- The driving belt is supported by the entire length of the profile in order to avoid deflection as well as to protect the linear guide.

The linear motion system described above offers:

- Good positioning accuracy
- Low noise
- Maintenance Free (dependent on application)

ECO SP

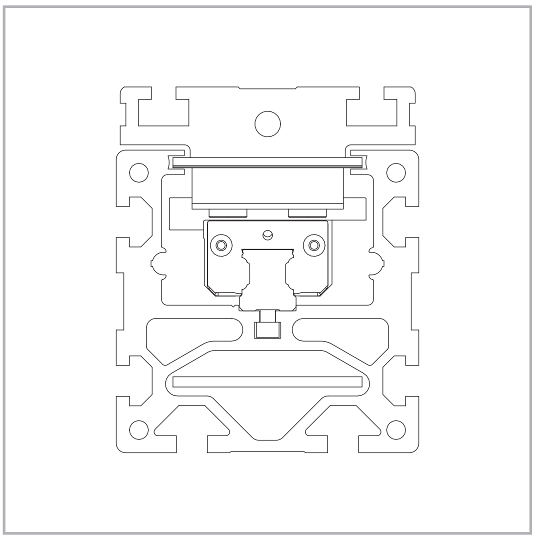


Fig. 2

ECO CI

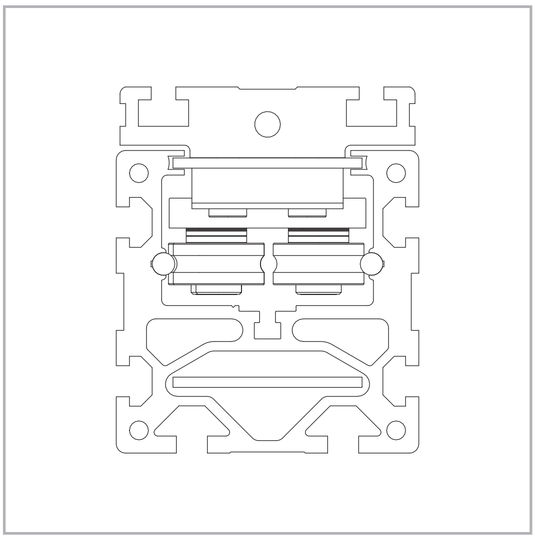
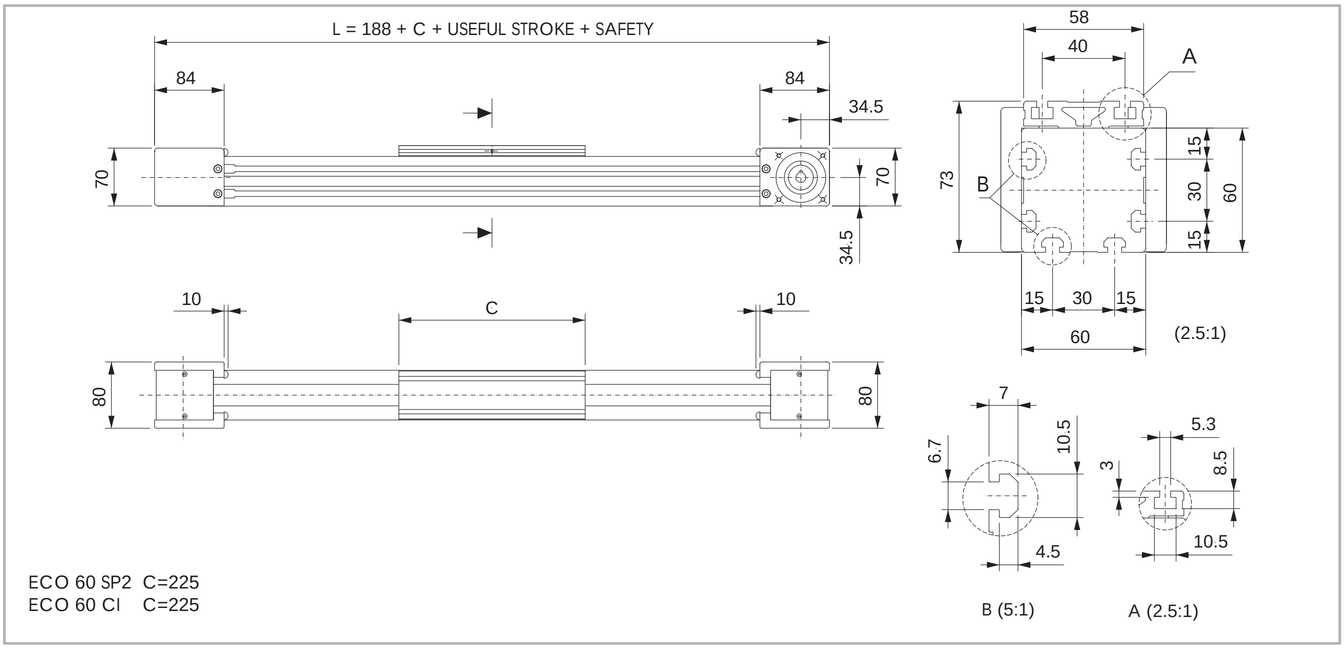


Fig. 3

ECO 60 SP2 - ECO 60 CI

ECO 60 SP2 - ECO 60 CI Dimensions



* The length of the safety stroke is provided on request according to the customer's specific requirements.

Fig. 4

Technical data

	Type	
	ECO 60 SP2	ECO 60 CI
Max. useful stroke length [mm]	3700	6000
Max. positioning repeatability [mm]*1	± 0.05	± 0.05
Max. speed [m/s]	4.0	1.5
Max. acceleration [m/s²]	50	1.5
Type of belt	32 AT 5	32 AT 5
Type of pulley	Z 28	Z 28
Pulley pitch diameter [mm]	44.56	44.56
Carriage displacement per pulley turn [mm]	140	140
Carriage weight [kg]	0.51	0.80
Zero travel weight [kg]	3.5	3.2
Weight for 100 mm useful stroke [kg]	0.45	0.68
Starting torque [Nm]	0.24	0.32
Moment of inertia of pulleys [g mm²]	163000	163000

*1) Positioning repeatability is dependant on the type of transmission used

Tab. 4

Moments of inertia of the aluminum body

Type	I_x [10^7 mm^4]	I_y [10^7 mm^4]	I_p [10^7 mm^4]
ECO 60	0.037	0.054	0.093

Tab. 5

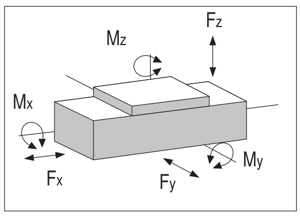
Driving belt

The driving belt is manufactured with friction resistant polyurethane, with steel cord reinforcement for high tensile stress resistance.

Type	Type of belt	Belt width [mm]	Weight kg/m
ECO 60	32 AT 5	32	0.105

Tab. 6

Belt length (mm) SP2/CI = 2 x L - 166



ECO 60 SP2 - ECO 60 CI - Load capacity

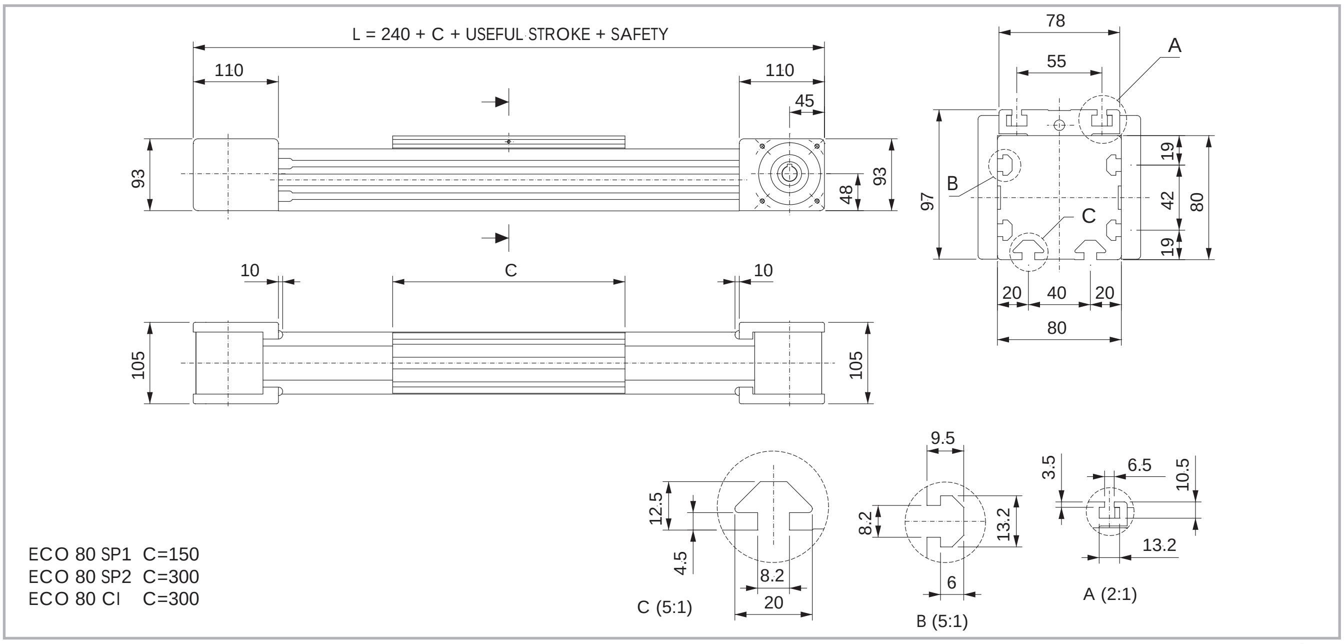
Type	F_x [N]		F_y [N]		F_z [N]		M_x [Nm]		M_y [Nm]		M_z [Nm]	
	Stat.	Dyn.	Stat.	Dyn	Stat.	Dyn	Stat.	Dyn	Stat.	Dyn	Stat.	Dyn
ECO 60 SP2	1360	1020	6930	4616	6930	4616	43	29	319	212	319	212
ECO 60 CI	1360	1020	1480	2540	910	1410	20	30	50	78	82	140

See verification under static load and lifetime on page SL-2 and SL-3

Tab. 7

ECO 80 SP2 - ECO 80 SP1 - ECO 80 CI

ECO 80 SP2 - ECO 80 SP1 - ECO 80 CI Dimensions



* The length of the safety stroke is provided on request according to the customer's specific requirements.

Fig. 5

Technical data

	Type		
	ECO 80 SP2	ECO 80 SP1	ECO 80 CI
Max. useful stroke length [mm]	6000	6000	6000
Max. positioning repeatability [mm]*1	± 0.05	± 0.05	± 0.05
Max. speed [m/s]	5.0	5.0	1.5
Max. acceleration [m/s²]	50	50	1.5
Type of belt	50 AT 5	50 AT 5	50 AT 5
Type of pulley	Z 37	Z 37	Z 37
Pulley pitch diameter [mm]	58.89	58.89	58.89
Carriage displacement per pulley turn [mm]	185	185	185
Carriage weight [kg]	1.6	0.9	2.1
Zero travel weight [kg]	7.7	5.9	8.2
Weight for 100 mm useful stroke [kg]	0.8	0.8	0.65
Starting torque [Nm]	0.75	0.75	0.75
Moment of inertia of pulleys [g mm²]	706000	706000	706000

*1) Positioning repeatability is dependant on the type of transmission used

Tab. 8

Moments of inertia of the aluminum body

Type	I_x [10^7 mm⁴]	I_y [10^7 mm⁴]	I_p [10^7 mm⁴]
ECO 80	0.117	0.173	0.280

Tab. 9

Driving belt

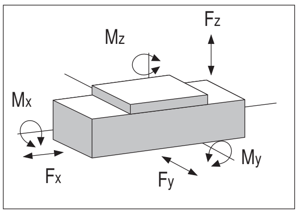
The driving belt is manufactured with friction resistant polyurethane, with steel cord reinforcement for high tensile stress resistance.

Type	Type of belt	Belt width [mm]	Weight kg/m
ECO 80	50 AT 5	50	0.164

Tab. 10

Belt length (mm) SP2/CI = 2 x L - 240

SP1= 2 x L - 90



ECO 80 SP2 - ECO 80 SP1 - ECO 80 CI - Load capacity

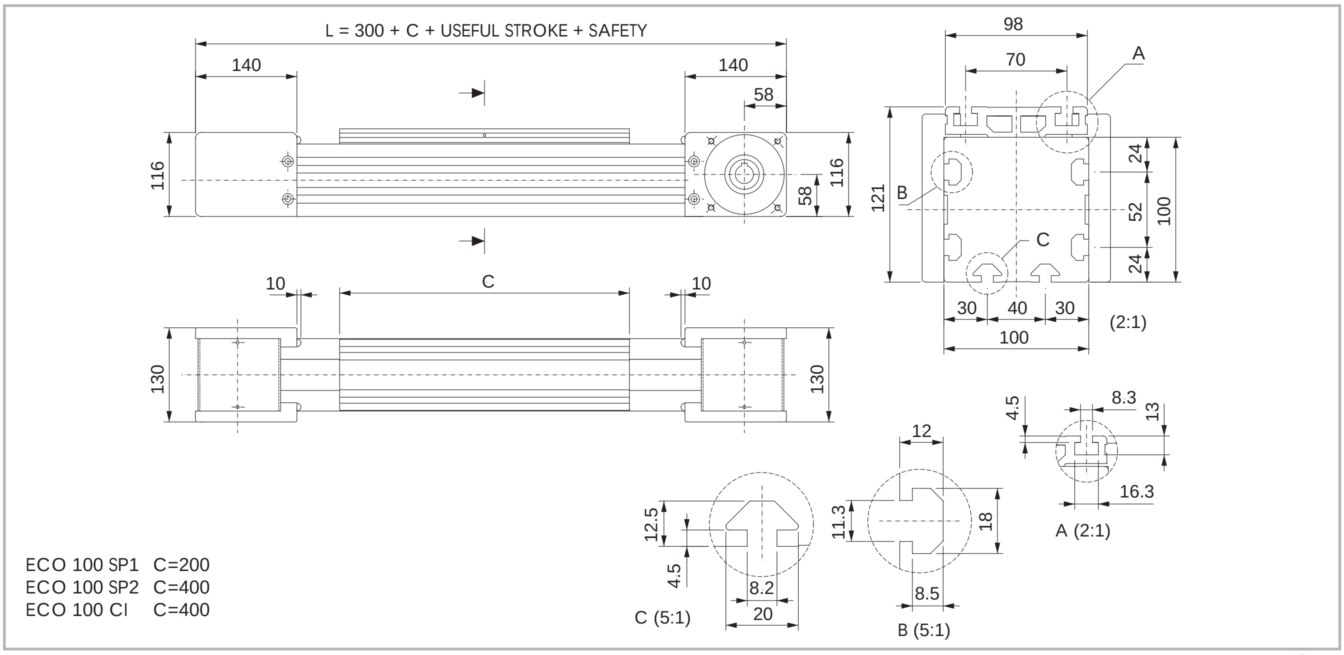
Type	F_x [N]		F_y [N]		F_z [N]		M_x [Nm]		M_y [Nm]		M_z [Nm]	
	Stat.	Dyn.	Stat.	Dyn	Stat.	Dyn	Stat.	Dyn	Stat.	Dyn	Stat.	Dyn
ECO 80 SP2	2120	1590	24200	14560	24200	14560	240	138	1706	1026	1706	1026
ECO 80 SP1	2120	1590	12100	7280	12100	7280	120	69	66	37	66	37
ECO 80 CI	2120	1590	3800	7340	2470	4080	68	110	210	340	320	610

See verification under static load and lifetime on page SL-2 and SL-3

Tab. 11

ECO 100 SP2 - ECO 100 SP1 - ECO 100 CI

ECO 100 SP2 - ECO 100 SP1 - ECO 100 CI Dimensions



* The length of the safety stroke is provided on request according to the customer's specific requirements.

Fig. 6

Technical data

	Type		
	ECO 100 SP2	ECO 100 SP1	ECO100 CI
Max. useful stroke length [mm]	6000	6000	6000
Max. positioning repeatability [mm]*1	± 0.05	± 0.05	± 0.05
Max. speed [m/s]	5.0	5.0	1.5
Max. acceleration [m/s²]	50	50	1.5
Type of belt	50 AT 10	50 AT 10	50 AT 10
Type of pulley	Z 24	Z 24	Z 24
Pulley pitch diameter [mm]	76.39	76.39	76.39
Carriage displacement per pulley turn [mm]	240	240	240
Carriage weight [kg]	2.9	1.5	3.3
Zero travel weight [kg]	16.7	12.5	17.1
Weight for 100 mm useful stroke [kg]	1.3	1.3	1.1
Starting torque [Nm]	1.90	1.35	1.35
Moment of inertia of pulleys [g mm²]	2070000	2070000	2070000

*1) Positioning repeatability is dependant on the type of transmission used

Tab. 12

Moments of inertia of the aluminum body

Type	I_x [10^7 mm^4]	I_y [10^7 mm^4]	I_p [10^7 mm^4]
ECO 100	0.342	0.439	0.781

Tab. 13

Driving belt

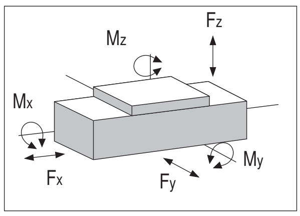
The driving belt is manufactured with friction resistant polyurethane, with steel cord reinforcement for high tensile stress resistance.

Type	Type of belt	Belt width [mm]	Weight kg/m
ECO 100	50 AT 10	50	0.290

Tab. 14

Belt length (mm) SP1 = 2 x L - 112

SP2/CI = 2 x L - 312



ECO 100 SP2 - ECO 100 SP1 - ECO 100 CI - Load capacity

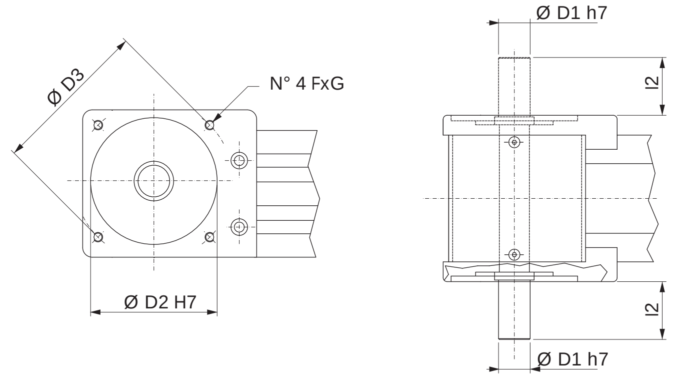
Type	F_x [N]		F_y [N]		F_z [N]		M_x [Nm]		M_y [Nm]		M_z [Nm]	
	Stat.	Dyn.	Stat.	Dyn	Stat.	Dyn	Stat.	Dyn	Stat.	Dyn	Stat.	Dyn
ECO 100 SP2	4410	3310	43400	34800	43400	34800	570	440	4297	3445	4297	3445
ECO 100 SP1	4410	3310	21700	17400	21700	17400	285	220	155	120	155	120
ECO 100 CI	4410	3310	8500	17000	4740	8700	160	300	520	950	930	1850

See verification under static load and lifetime on page SL-2 and SL-3

Tab. 15

Simple shafts

AS type simple shafts



Position of the simple shaft can be to the left or right of the drive head.

Fig. 7

Dimensions (mm)

Applicable to unit	Shaft type	D1	D2	D3	I2	F	G	Head code AS left	Head code AS right
ECO 60	**AS 12**	12	60	75	25	M5	12	2G	2I
ECO 80	**AS 20**	20	80	100	36.5	M6	16	2G	2I
ECO 100	**AS 25**	25	110	130	50	M8	20	2G	2I

Tab. 16

Hollow shafts

Transmission of torque to the drive pulley

Torque is transmitted to the drive pulley from a hollow shaft and keyway. This system may create backlash in the case of alternating loads and high level acceleration. For further information, contact our offices.

Hollow shaft

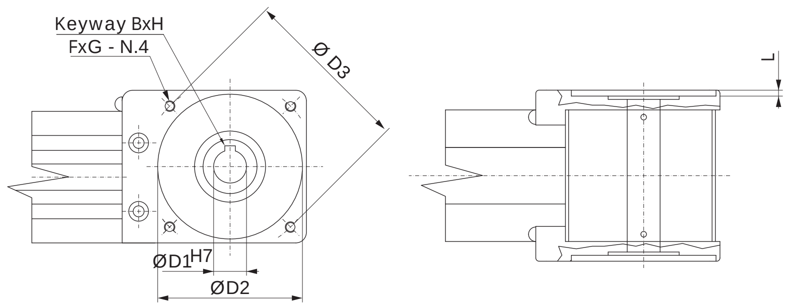


Fig. 8

An (optional) connection flange is required to fit the standard reduction units selected by Rollon. For further information, contact our offices

Unit	Shaft type	D1	D2	D3	L	Key way BxH	F	G	Drive head code
ECO 60	**AC 12**	12H7	60J6	75	3.5	4 x 4	M5	12	2A
ECO 80	**AC 19**	19H7	80J6	100	3.5	6 x 6	M6	16	2A
ECO 100	**AC 25**	25H7	110J6	130	4.5	8 x 7	M8	20	2A

Tab. 17

Linear units in parallel

Synchronisation kit for use of ECO linear units in parallel

When movement consisting of two linear units in parallel is essential, a synchronisation kit must be used. The kit contains original Rollon blade type precision joints complete with tapered splines and hollow aluminum drive shafts.

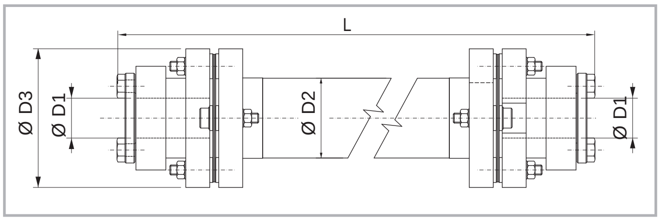


Fig. 9

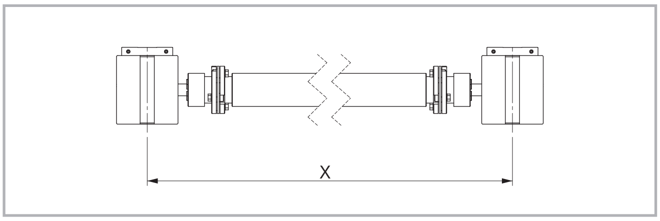


Fig. 10

Unit	Shaft type	D1	D2	D3	Code	Formula for length calculation
ECO 60	AP 12	12	25	45	GK12P...1A	L= X-88 [mm]
ECO 80	AP 20	20	40	69.5	GK20P...1A	L= X-116 [mm]
ECO 100	AP 25	25	70	99	GK25P...1A	L= X-165 [mm]

Tab. 18

Accessories

Fixing by brackets

The linear motion systems used for the Rollon ECO series linear units enables them to support loads in any direction. They can therefore be installed in any position.

To install the units, we recommend use of the dedicated T-slots in the aluminum extruded bodies as shown below.

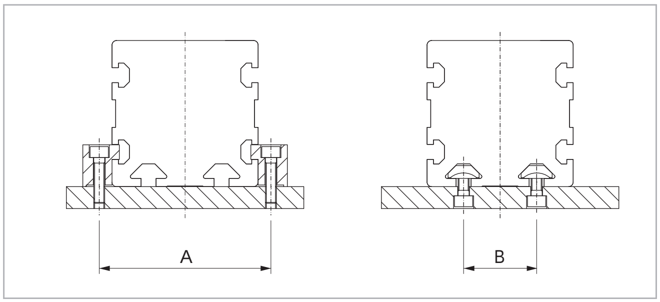


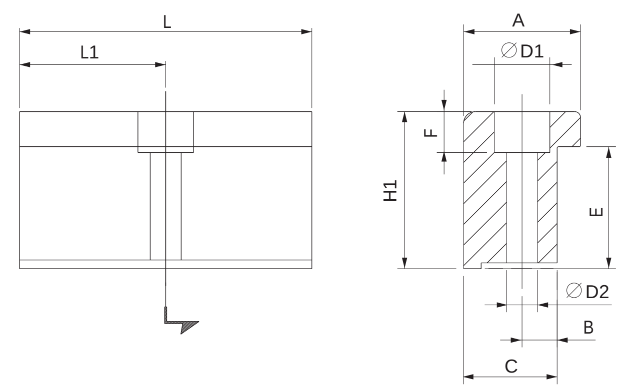
Fig. 11

Unit	A (mm)	B (mm)
ECO 60	72	30
ECO 80	94	40
ECO 100	120	40

Tab. 19

ES

Fixing brackets



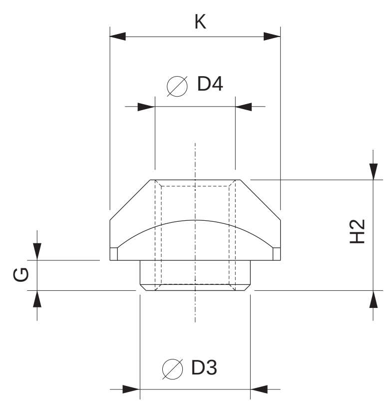
Anodised aluminum block for fixing the linear units through the side slots of the body

Fig. 12

Unit	A	H1	B	C	E	F	D1	D2	L	L1	Code
ECO 60	20	17.5	6	16	11.5	6	9.4	5.3	50	25	1001490
ECO 80	20	20.7	7	16	14.7	7	11	6.4	50	25	1001491
ECO 100	36.5	28.5	10	31	18.5	11.5	16.5	10.5	100	50	1001233

Tab. 20

T-nuts



Steel nuts to be used in the slots of the body.

Fig. 13

Dimensions (mm)

Unit		D3	D4	G	H2	K	Code
ECO 60	L	6.7	M5	2.3	6.5	10	1000627
ECO 60	C	-	M5	-	5	10	1000620
ECO 80	L	8	M6	3.3	8.3	13	1000043
ECO 80	C	-	M6	-	5.8	13	1000910
ECO 80	I	-	M6	-	6.5	17	1000911
ECO 100	L	11	M8	3	11	17	1000932
ECO 100	C	-	M8	-	8	16	1000942
ECO 100	I	-	M8	-	6.5	17	1000943

L = Side - **C** = Carriage - **I** = Lower

Tab. 21

Proximity

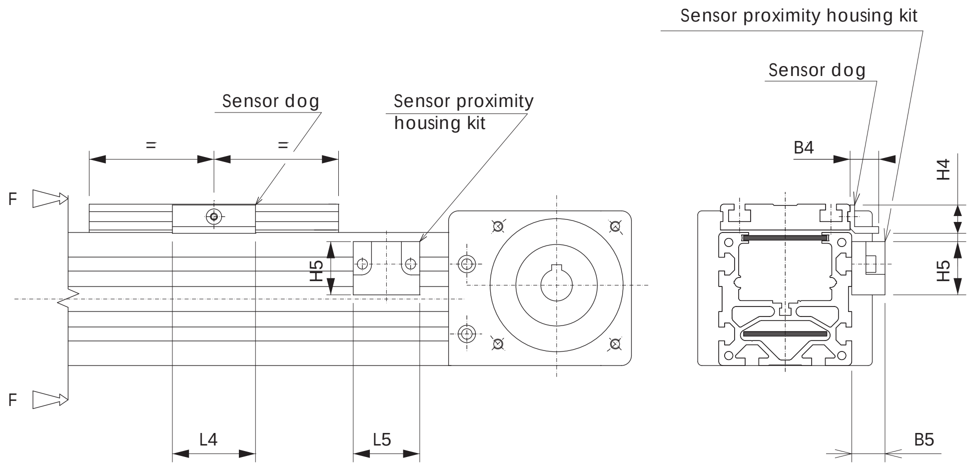


Fig. 14

Sensor proximity housing kit

Anodized aluminum block, red colour, equipped with T-nuts for fixing into the body slots.

Sensor dog

L-shaped bracket in zinc-plated iron, mounted on the carriage and used for the proximity switch operation.

Unit	B4	B5	L4	L5	H4	H5	For proximity	Sensor dog Code	Sensor proximity housing kit code
ECO 60	9.5	14	25	29	12	22.5	Ø 8	G000268	G000213
ECO 80	17.2	20	50	40	17	32	Ø 12	G000267	G000209
ECO 100	17.2	20	50	40	17	32	Ø 12	G000267	G000210

Tab. 22

Ordering key

Identification codes for the ECO linear unit

C	06	2A	0 2000	1A
	06=60 08=80 10=100			1A=SP1 2A=SP2 1C=CI
				Linear motion system *see pg. ES-4*
			L=total length of the unit	
		Driving head code *see pg. ES-8*		
	Linear unit size *see from pg. ES-5 to pg. ES-7*			
ECO series *see pg. ES-2*				

In order to create identification codes for Actuator Line, you can visit: **http://configureactuator.rollon.com**

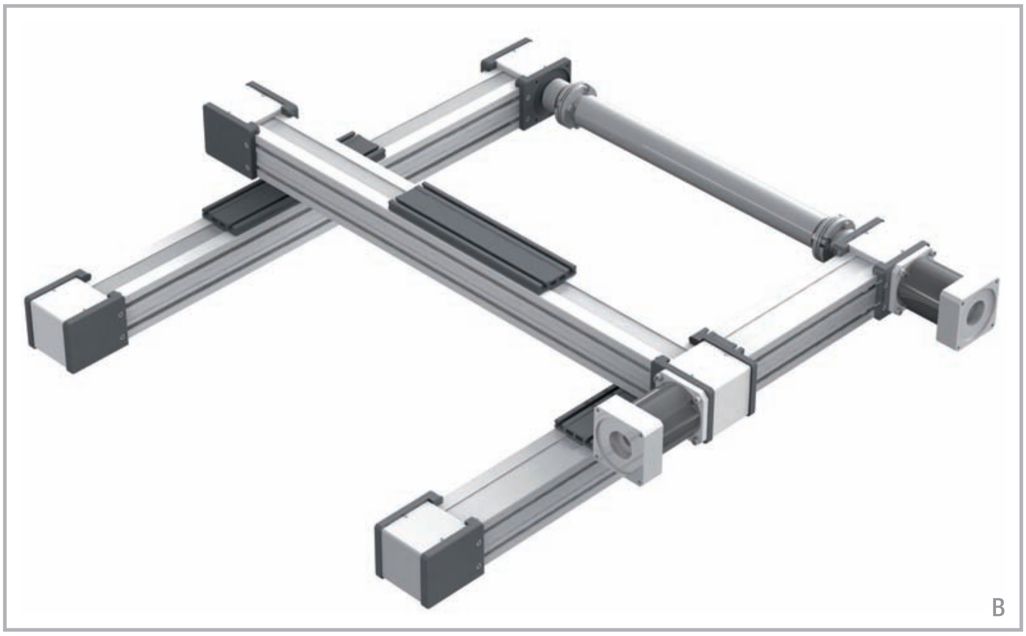
Multiaxis systems

Previously, customers wishing to build multiaxis units have had to design, draw and manufacture all the elements necessary to assemble two or more axis. Rollon now offers a set of fittings including brackets and cross plates to enable multiaxis units to be built. In addition to standard elements, Rollon also provides plates for special applications.

ECO axis system

A - Linear units: X axis 1 ECO 80

Two axis X-Y system



B - Linear units: X axis: 2 ECO 80 - Y axis 1 ECO 80

Connection kit: 2 Kits of fixing brackets for the ECO 80 unit (Y axis) on the carriages of the ECO 80 units (X axis).

Static load and service life Plus-Clean Room-Smart-Eco-Precision

Static load

In the static load test, the radial load rating F_y, the axial load rating F_z, and the moments M_x, M_y und M_z indicate the maximum allowed load values. Higher loads will impair the running characteristics. To check the static load, a safety factor S_0 is used, which accounts for the special conditions of the application defined in more detail in the table below:

Safety factor S_0

No shocks or vibrations, smooth and low-frequency change in direction High mounting accuracy, no elastic deformations, clean environment	2 - 3
Normal assembly conditions	3 - 5
Shocks and vibrations, high-frequency changes in direction, substantial elastic deformations	5 - 7

Fig. 1

The ratio of the actual to the maximum allowed load must not be higher than the reciprocal value of the assumed safety factor S_0.

$$\frac{P_{fy}}{F_y} \leq \frac{1}{S_0} \qquad \frac{P_{fz}}{F_z} \leq \frac{1}{S_0} \qquad \frac{M_1}{M_x} \leq \frac{1}{S_0} \qquad \frac{M_2}{M_y} \leq \frac{1}{S_0} \qquad \frac{M_3}{M_z} \leq \frac{1}{S_0}$$

Fig. 2

The above formulae only apply to a one load case. If one or more of the forces described are acting simultaneously, the following calculation must be carried out:

$$\frac{P_{fy}}{F_y} + \frac{P_{fz}}{F_z} + \frac{M_1}{M_x} + \frac{M_2}{M_y} + \frac{M_3}{M_z} \leq \frac{1}{S_0}$$

P_{fy} = acting load (y direction) (N)
F_y = static load rating (y direction) (N)
P_{fz} = acting load (z direction) (N)
F_z = static load rating (z direction) (N)
M_1, M_2, M_3 = external moments (Nm)
M_x, M_y, M_z = maximum allowed moments in the different load directions (Nm)

Fig. 3

The safety factor S_0 can be at the lower limit given if the acting forces can be determined with sufficient accuracy. If shocks and vibrations act on the system, the higher value should be selected. In dynamic applications, higher safeties are required. For further information, please contact our Application Engineering Department.

Belt safety factor referred to the dynamic F_X

Impact and vibrations	Speed / acceleration	Orietation	Safety Factor
No impacts and/or vibrations	Low	horizontal	1.4
		vertical	1.8
Light impacts and/or vibrations	Medium	horizontal	1.7
		vertical	2.2
Strong impacts and/or vibrations	High	horizontal	2.2
		vertical	3

Tab. 1

Service life

Calculation of the service life

The dynamic load rating C is a conventional quantity used for calculating the service life. This load corresponds to a nominal service life of 100 km.

The calculated service life, dynamic load rating and equivalent load are linked by the following formula:

$$L_{km} = 100\ \text{km} \cdot \left(\frac{Fz\text{-}dyn}{P_{eq}} \cdot \frac{1}{f_i}\right)^3$$

L_{km} = theoretical service life (km)
Fz-dyn = dynamic load rating (N)
P_{eq} = acting equivalent load (N)
f_i = service factor (see tab. 2)

Fig. 4

The effective equivalent load P_{eq} is the sum of the forces and moments acting simultaneously on a slider. If these different load components are known, P is obtained from the following equation:

For SP types

$$P_{eq} = P_{fy} + P_{fz} + \left(\frac{M_1}{M_x} + \frac{M_2}{M_y} + \frac{M_3}{M_z}\right) \cdot F_y$$

Fig. 5

For CI and CE types

$$P_{eq} = P_{fy} + \left(\frac{P_{fz}}{F_z} + \frac{M_1}{M_x} + \frac{M_2}{M_y} + \frac{M_3}{M_z}\right) \cdot F_y$$

Fig. 6

The external constants are assumed to be constant over time. Short-term loads that do not exceed the maximum load ratings have no relevant effect on the service life and can therefore be neglected in the calculation.

Service factor f_i

	f_i
no shocks or vibrations, smooth and low-frequency changes in direction; ($\alpha < 5m/s^2$) clean operating conditions; low speeds (<1 m/s)	1.5 - 2
Slight vibrations; medium speeds; (1-2 m/s) and medium-high frequency of the changes in direction ($5m/s^2 < \alpha < 10\ m/s^2$)	2 - 3
Shocks and vibrations; high speeds (>2 m/s) and high-frequency changes in direction; ($\alpha > 10m/s^2$) high contamination, very short stroke	> 3

Tab. 2

Static load and service life Uniline

Static load

In the static load test, the radial load rating C_{0rad}, the axial load rating C_{0ax}, and the moments M_x, M_y und M_z indicate the maximum allowed load values. Higher loads will impair the running characteristics. To check the static load, a safety factor S_0 is used, which accounts for the special conditions of the application defined in more detail in the table below:

Safety factor S_0

No shocks or vibrations, smooth and low-frequency change in direction High mounting accuracy, no elastic deformations, clean environment	1 - 1.5
Normal assembly conditions	1.5 - 2
Shocks and vibrations, high-frequency changes in direction, substantial elastic deformations	2 - 3.5

Fig. 7

The ratio of the actual to the maximum allowed load must not be higher than the reciprocal value of the assumed safety factor S_0.

$$\frac{P_{0rad}}{C_{0rad}} \leq \frac{1}{S_0} \qquad \frac{P_{0ax}}{C_{0ax}} \leq \frac{1}{S_0} \qquad \frac{M_1}{M_x} \leq \frac{1}{S_0} \qquad \frac{M_2}{M_y} \leq \frac{1}{S_0} \qquad \frac{M_3}{M_z} \leq \frac{1}{S_0}$$

Fig. 8

The above formulae apply to a one load case. If one or more of the forces described are acting simultaneously, the following test must be carried out:

$$\frac{P_{0rad}}{C_{0rad}} + \frac{P_{0ax}}{C_{0ax}} + \frac{M_1}{M_x} + \frac{M_2}{M_y} + \frac{M_3}{M_z} \leq \frac{1}{S_0}$$

P_{0rad} = acting radial load (N)
C_{0rad} = allowed radial load (N)
P_{0ax} = acting axial load (N)
C_{0ax} = allowed axial load (N)
M_1, M_2, M_3 = external moments (Nm)
M_x, M_y, M_z = maximum allowed moments in the different load directions (Nm)

Fig. 9

The safety factor S_0 can be at the lower limit given if the acting forces can be determined with sufficient accuracy. If shocks and vibrations act on the system, the higher value should be selected. In dynamic applications, higher safeties are required. For further information, please contact our Application Engineering Department.

Calculation formulae

Moments M_y and M_z for linear units with long slider plate

The allowed loads for the moments M_y and M_z depend on the length of the slider plate. The allowed moments M_{zn} and M_{yn} for each slider plate length are calculated by the following formulae:

$$S_n = S_{min} + n \cdot \Delta S$$

$$M_{zn} = \left(1 + \frac{S_n - S_{min}}{K}\right) \cdot M_{z\,min}$$

$$M_{yn} = \left(1 + \frac{S_n - S_{min}}{K}\right) \cdot M_{y\,min}$$

M_{zn} = allowed moment (Nm)
$M_{z\,min}$ = minimum values (Nm)
M_{yn} = allowed moment (Nm)
$M_{y\,min}$ = minimum values (Nm)
S_n = length of the slider plate (mm)
S_{min} = minimum length of the slider plate (mm)
ΔS = factor of the change in slider length
K = constant

Fig. 10

Type	$M_{y\,min}$ [Nm]	$M_{z\,min}$ [Nm]	S_{min} [mm]	ΔS	K
A40L	22	61	240	10	74
A55L	82	239	310		110
A75L	287	852	440		155
C55L	213	39	310		130
C75L	674	116	440		155
E55L	165	239	310		110
E75L	575	852	440		155
ED75L (M_z)	1174	852	440		155
ED75L (M_y)	1174	852	440		270

Tab. 3

Moments M_y and M_z for linear units with two slider plates

The allowed loads for the moments M_y and M_z are related to the value of the distance between the centers of the sliders. The allowed moments M_{yn} and M_{zn} for each distance between the centers of the sliders are calculated by the following formulae:

$$L_n = L_{min} + n \cdot \Delta L$$

$$M_y = \left(\frac{L_n}{L_{min}}\right) \cdot M_{y\,min}$$

$$M_z = \left(\frac{L_n}{L_{min}}\right) \cdot M_{z\,min}$$

M_y = allowed moment (Nm)
M_z = allowed moment (Nm)
$M_{y\,min}$ = minimum values (Nm)
$M_{z\,min}$ = minimum values (Nm)
L_n = distance between the centers of the sliders (mm)
L_{min} = minimum value for the distance between the centers of the sliders (mm)
ΔL = factor of the change in slider length

Fig. 11

Type	$M_{y\,min}$ [Nm]	$M_{z\,min}$ [Nm]	L_{min} [mm]	ΔL
A40D	70	193	235	5
A55D	225	652	300	5
A75D	771	2288	416	8
A100D	2851	4950	396	50
C55D	492	90	300	5
C75D	1809	312	416	8
E55D	450	652	300	5
E75D	1543	2288	416	8
ED75D	3619	2288	416	8

Tab. 4

Service life

Calculation of the service life

The dynamic load rating C is a conventional quantity used for calculating the service life. This load corresponds to a nominal service life of 100 km. The corresponding values for each liner unit are listed in Table 45 shown below. The calculated service life, dynamic load rating and equivalent load are linked by the following formula:

$$L_{km} = 100\text{ km} \cdot \left(\frac{C}{P} \cdot \frac{f_c}{f_i} \cdot f_h\right)^3$$

L_{km} = theoretical service life (km)
C = dynamic load rating (N)
P = acting equivalent load (N)
f_i = service factor (see tab. 5)
f_C = contact factor (see tab. 6)
f_h = stroke factor (see fig. 13)

Fig. 12

The effective equivalent load P is the sum of the forces and moments acting simultaneously on a slider. If these different load components are known, P is obtained from the following equation:

$$P = P_r + \left(\frac{P_a}{C_{0ax}} + \frac{M_1}{M_x} + \frac{M_2}{M_y} + \frac{M_3}{M_z}\right) \cdot C_{0rad}$$

Fig. 13

The external constants are assumed to be constant over time. Short-term loads that do not exceed the maximum load ratings have no relevant effect on the service life and can therefore be neglected in the calculation.

Service factor f_i

	f_i
No shocks or vibrations, smooth and low-frequency changes in direction; clean operating conditions; low speeds (<1 m/s)	1 - 1.5
Slight vibrations; medium speeds; (1-2,5 m/s) and medium-high frequency of the changes in direction	1.5 - 2
Shocks and vibrations; high speeds (>2.5 m/s) and high-frequency changes in direction; high contamination	2 - 3.5

Tab. 5

Contact factor f_c

	f_c
Standard slider	1
Long slider	0.8
Double slider	0.8

Tab. 6

Stroke factor f_h

The stroke factor f_h accounts for the higher stress on the raceways and rollers when short strokes are carried out at the same total run distance. The following diagram shows the corresponding values (for strokes above 1 m, f_h remains 1):

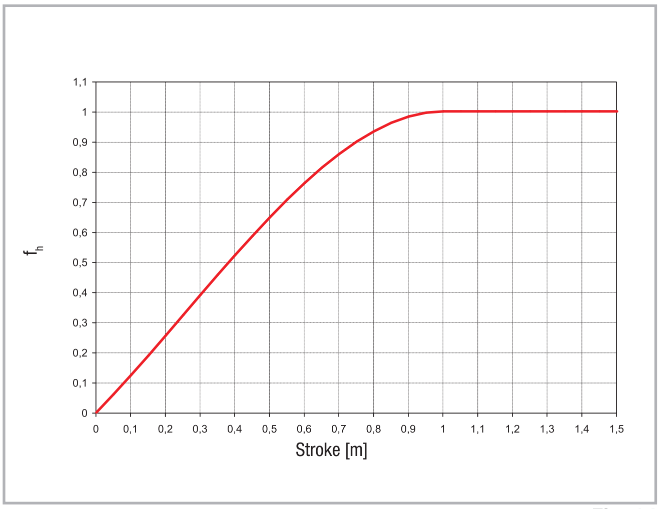


Fig. 14

Determination of the motor torque

The torque C_m required at the drive head of the linear axis is calculated by the following formula:

$$C_m = C_v + \left(F \cdot \frac{D_p}{2}\right)$$

C_m = torque of the motor (Nm)
C_v = starting torque (Nm)
F = force acting on the toothed belt (N)
D_p = pitch diameter of pulley (m)

Fig. 15

Notes

Data sheet

General data:

Date: .... Inquiry N°: ....

Address: ....

Contact: ....

Company: ....

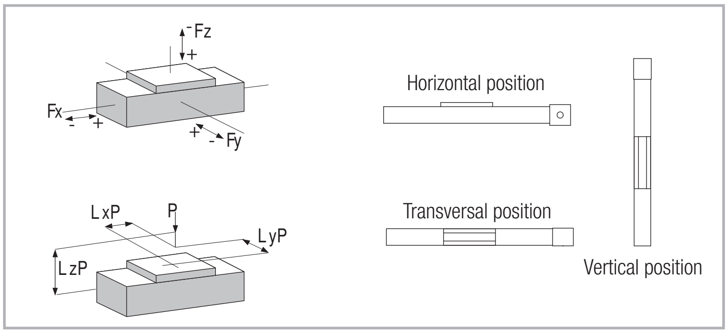
Date: ....

Phone: ....

Fax: ....

Technical data:

				X axis	Y axis	Z axis
Useful stroke (Including safety overtravel)		S	[mm]			
Load to be translated		P	[kg]			
Location of Load in the	X-Direction	LxP	[mm]			
	Y-Direction	LyP	[mm]			
	Z-Direction	LzP	[mm]			
Additional force	Direction (+/-)	Fx (Fy, Fz)	[N]			
Position of force	X-Direction	Lx Fx (Fy, Fz)	[mm]			
	Y-Direction	Ly Fx (Fy, Fz)	[mm]			
	Z-Direction	Lz Fx (Fy, Fz)	[mm]			
Assembly position (Horizontal/Vertical/Transversal						
Max. speed		V	[m/s]			
Max. acceleration		a	[m/s²]			
Positioning repeatability		Δs	[mm]			
Required life		L	yrs			



Attention: Please enclose drawing, sketches and sheet of the duty cycle

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