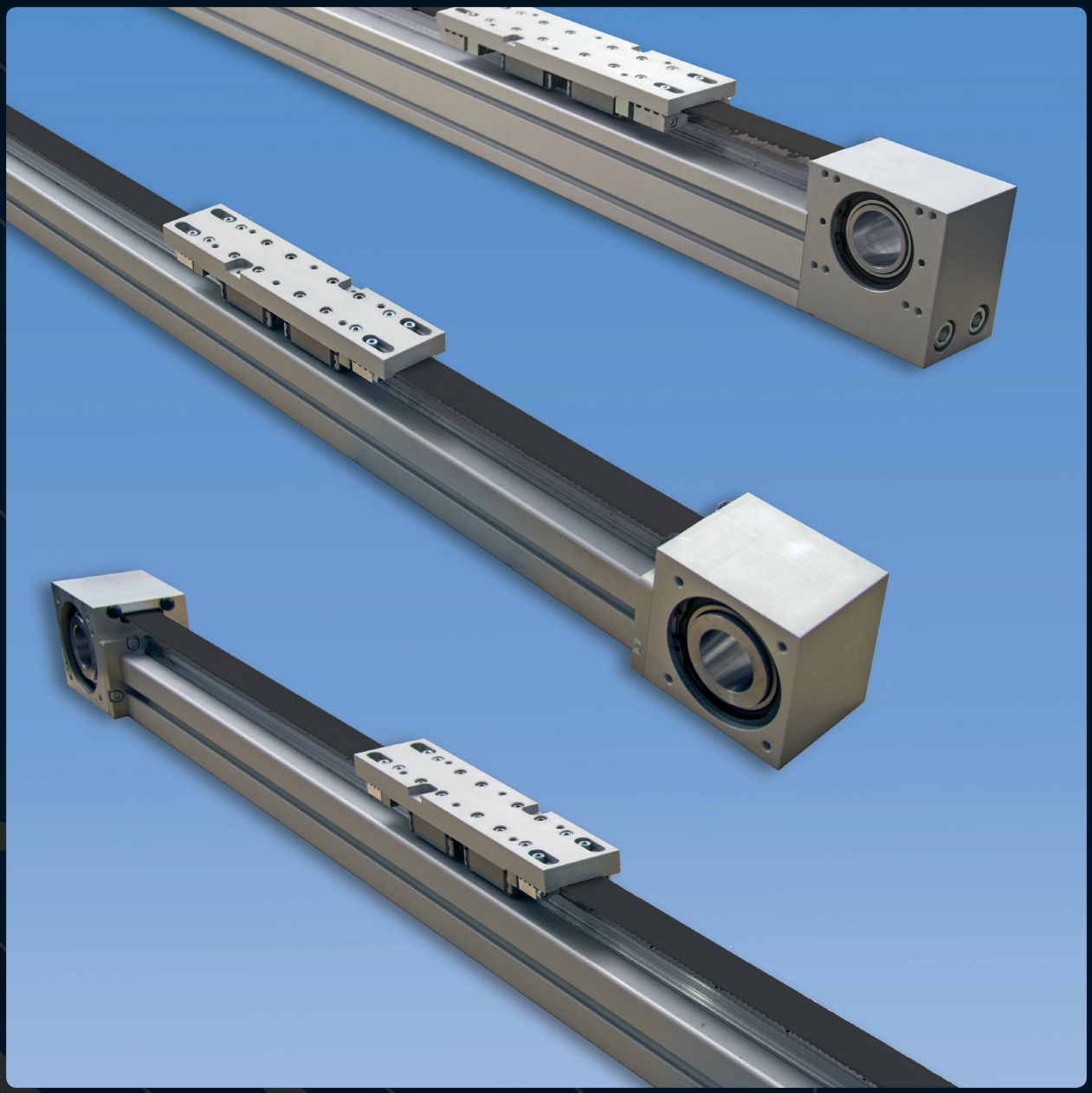
LINEAR UNIT
E-SMART



ROLLCO

SPECIALIZED
ON LINEAR MOTION

CLIMATE
COMPENSATED
PAPER

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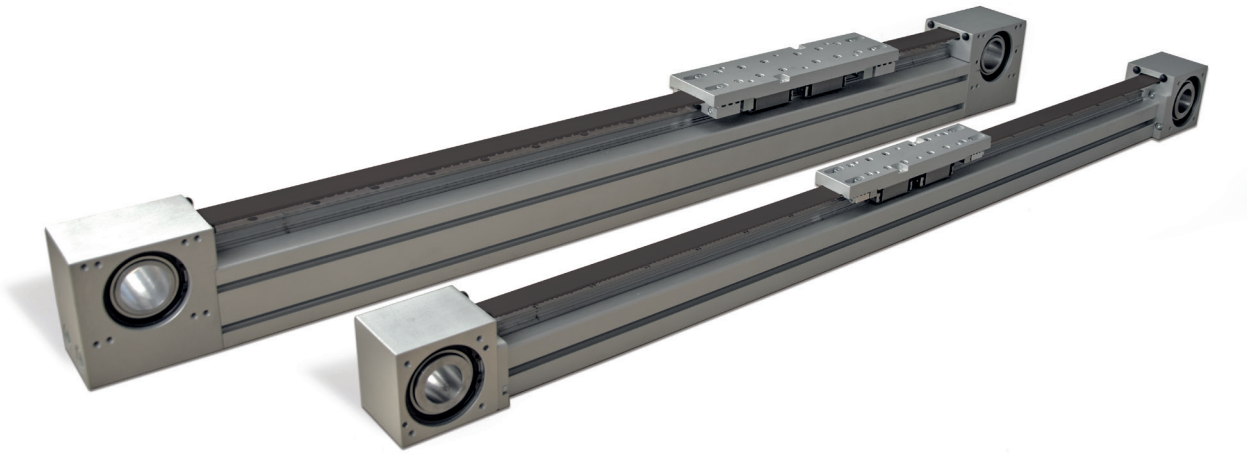
Product Overview



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. The E-Smart linear units have an extruded and anodized aluminium self-supporting structure with a profile available in four sizes from 30 to 100 mm. Transmission is achieved with a polyurethane steel reinforced driving belt. Also featured is a single rail with one or more recirculating ball bearing runner blocks.

Performance characteristics

- The ball bearing guides with high load capacity are mounted in a dedicated seat on the aluminium body.
- The carriage of the linear unit is assembled on preloaded ball bearing blocks that enables the carriage to withstand loading in the four main directions.
- 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.
- The blocks have seals on both sides and, when necessary, an additional scraper can be fitted for very dusty conditions.

The linear motion system described above offers:

- High speed and acceleration
- High load capacity
- High permissible bending moments
- Low friction
- Long life
- Low noise

Components

Extruded bodies

The anodized aluminium extrusions used for the bodies of the E-smart linear units were designed and manufactured in cooperation with a leading company in this field to obtain the right combination of high mechanical strength and reduced weight. The anodized aluminium alloy 6060 used was extruded with dimensional tolerances complying with EN 755-9 standards.

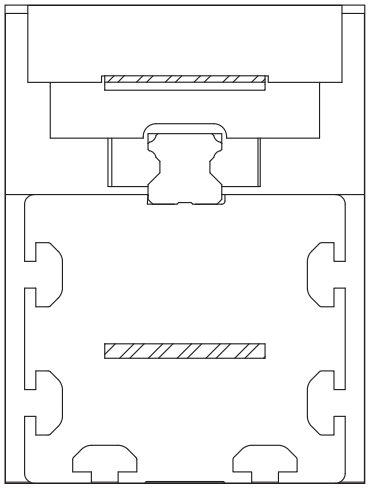
Driving belt

The E-smart linear units use steel reinforced polyurethane drive belts with AT pitch. This type of 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. Optimization of the maximum belt width/body dimension ratio enables the following performance characteristics to be achieved:

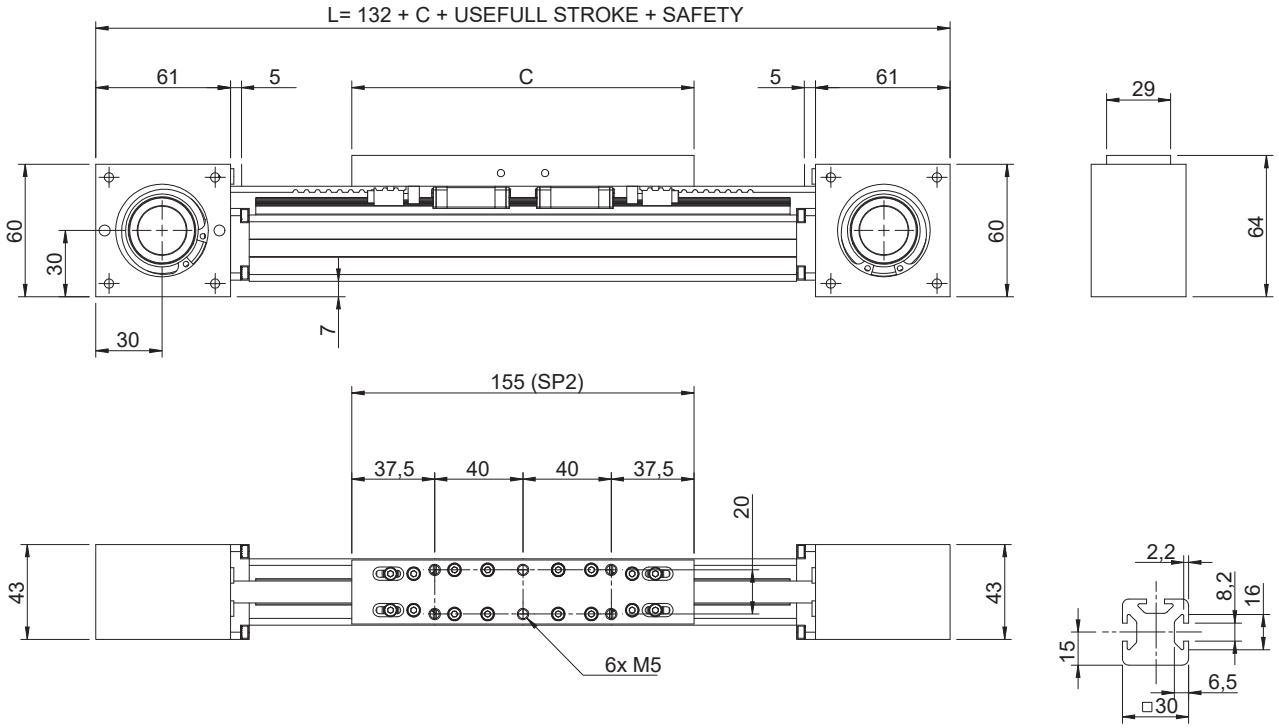
- High speed
- Low noise
- Low wear

Carriage

The carriage of the E-Smart linear units is made entirely of machined anodized aluminium. The dimensions vary depending on the type. Rollco offers multiple carriages to accomodate a vast array of applications.



Dimensions



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

Technical Data

	E-SMART 30 SP2
Max. useful stroke length (mm)	3700
Max. positioning repeatability (mm)*1	0.1
Max. speed (m/s)	4.0
Max. acceleration (m/s²)	50
Type of belt	10 AT 5
Type of pulley	Z 24
Pulley pitch diameter (mm)	38.2
Carriage displacement per pulley turn (mm)	120
Carriage weight (kg)	0.28
Zero travel weight (kg)	1.83
Weight for 100 mm useful stroke (kg)	0.16
Starting torque (Nm)	0.15
Moment of inertia of pulleys (g · mm²)	57.630

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

Moments of inertia of the aluminium body

Type	I_x (10^7 mm^4)	I_y (10^7 mm^4)	I_p (10^7 mm^4)
E-SMART 30 SP2	0.003	0.003	0.007

Driving belt

The driving belt is manufactured from a friction resistant polyurethane and with steel cords for high tensile stress resistance.

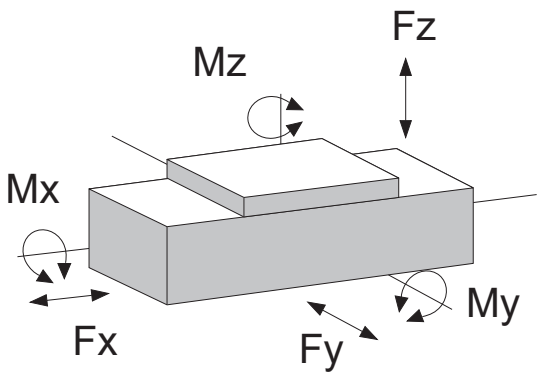
Type	Type of belt	Belt width (mm)	Weight (kg/m)
E-SMART 30 SP2	10 AT 5	10	0.033

Belt length (mm) = 2 x L - 100 (SP2)

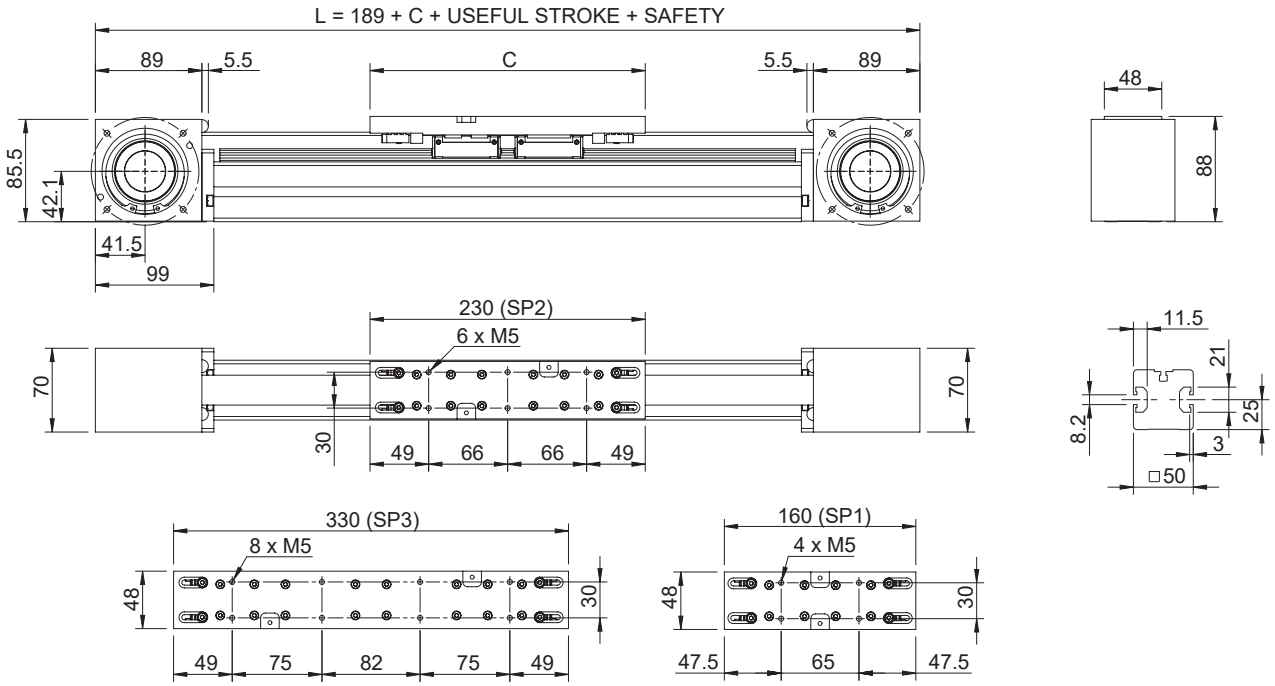
Load capacity

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.
E-SMART 30 SP2	385	242	6930	4616	6930	4616	43	29	132	88	132	88

See verification under Static load and Service life in Technical Information section.



Dimensions



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

Technical Data

	E-SMART 50 SP1	E-SMART 50 SP2	E-SMART 50 SP3
Max. useful stroke length (mm)*1	6120	6050	5950
Max. positioning repeatability (mm)*2	0.1	0.1	0.1
Max. speed (m/s)	4.0	4.0	4.0
Max. acceleration (m/s²)	50	50	50
Type of belt	25 AT 5	25 AT 5	25 AT 5
Type of pulley	Z 40	Z 40	Z 40
Pulley pitch diameter (mm)	63.66	63.66	63.66
Carriage displacement per pulley turn (mm)	200	200	200
Carriage weight (kg)	0.54	0.85	1.21
Zero travel weight (kg)	4.89	5.4	6.16
Weight for 100 mm useful stroke (kg)	0.34	0.34	0.34
Starting torque (Nm)	0.35	0.345	0.55
Moment of inertia of pulleys (g · mm²)	891.270	891.270	891.270

*1) It is possible to obtain stroke up to 11.270 (SP1), 11.200 (SP2), 11.100 (SP3) by means of special joints.
*2) Positioning repeatability is dependent on the type of transmission used.

Moments of inertia of the aluminium body

Type	I_x (10^7 mm^4)	I_y (10^7 mm^4)	I_p (10^7 mm^4)
E-SMART 50 SP	0.021	0.020	0.041

Driving belt

The driving belt is manufactured from a friction resistant polyurethane and with steel cords for high tensile stress resistance.

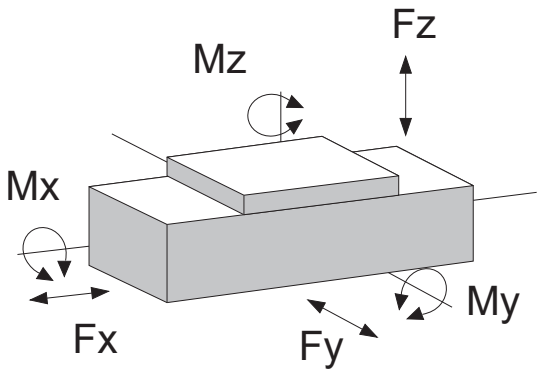
Type	Type of belt	Belt width (mm)	Weight (kg/m)
E-SMART 50 SP	25 AT 5	25	0.080

Belt length (mm) = 2 x L - 60 (SP1
2 x L - 125 (SP2)
2 x L - 225 (SP3)

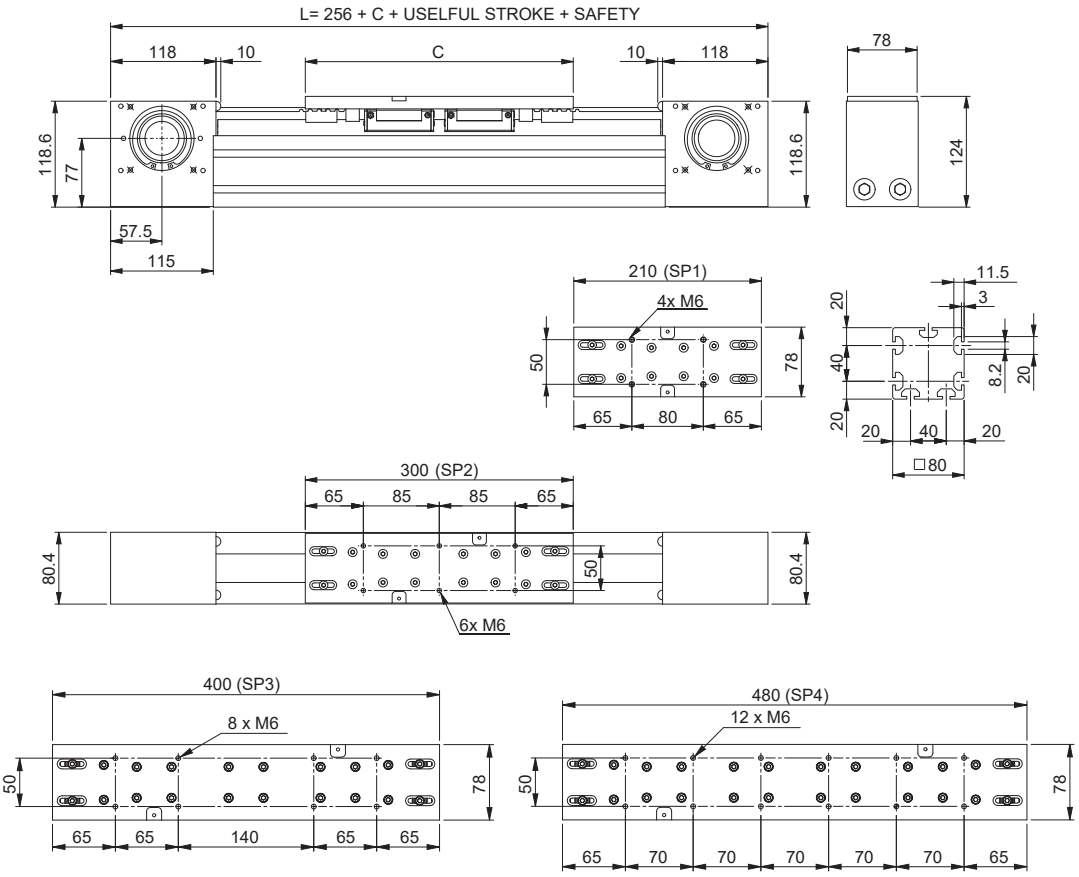
Load capacity

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.
E-SMART 50 SP1	1050	750	15280	9945	15280	9945	120	78	90	59	90	59
E-SMART 50 SP2	1050	750	30560	19890	30560	19890	240	156	856	557	856	557
E-SMART 50 SP3	1050	750	45840	29835	45840	29835	360	234	2582	1681	2582	1681

See verification under Static load and Service life in Technical Information section.



Dimensions



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

Technical Data

	E-SMART 80 SP1	E-SMART 80 SP2	E-SMART 80 SP3	E-SMART 80 SP4
Max. useful stroke length (mm)*1	6060	5970	5870	5790
Max. positioning repeatability (mm)*2	0.1	0.1	0.1	0.1
Max. speed (m/s)	4.0	4.0	4.0	4.0
Max. acceleration (m/s²)	50	50	50	50
Type of belt	32 AT 10	32 AT 10	32 AT 10	32 AT 10
Type of pulley	Z 21	Z 21	Z 21	Z 21
Pulley pitch diameter (mm)	66,84	66,84	66,84	66,84
Carriage displacement per pulley turn (mm)	210	210	210	210
Carriage weight (kg)	1.34	1.97	2.63	3.23
Zero travel weight (kg)	9.94	11.31	12.83	14.06
Weight for 100 mm useful stroke (kg)	0.76	0.76	0.76	0.76
Starting torque (Nm)	0.95	1.3	1.4	1.52
Moment of inertia of pulleys (g · mm²)	938.860	938.860	938.860	938.860

*1) It is possible to obtain stroke up to 11.190 (SP1), 11.100 (SP2), 11.000 (SP3), 10.920 (SP4) by means of special joints.
*2) Positioning repeatability is dependent on the type of transmission used.

Moments of inertia of the aluminium body

Type	I_x (10^7 mm^4)	I_y (10^7 mm^4)	I_p (10^7 mm^4)
E-SMART 80 SP	0.143	0.137	0.280

Driving belt

The driving belt is manufactured from a friction resistant polyurethane and with steel cords for high tensile stress resistance.

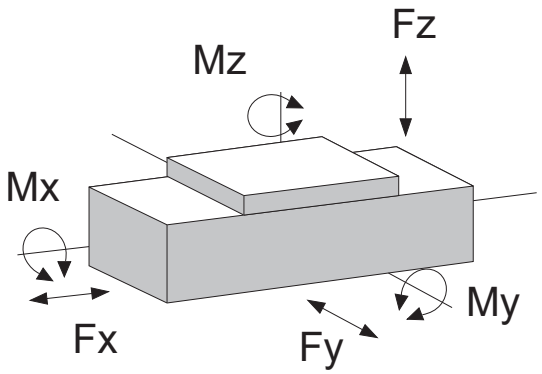
Type	Type of belt	Belt width (mm)	Weight (kg/m)
E-SMART 80 SP	32 AT 10	32	0.186

Belt length (mm) = 2 x L - 135 (SP1)
2 x L - 225 (SP2)
2 x L - 325 (SP3)
2 x L - 405 (SP4)

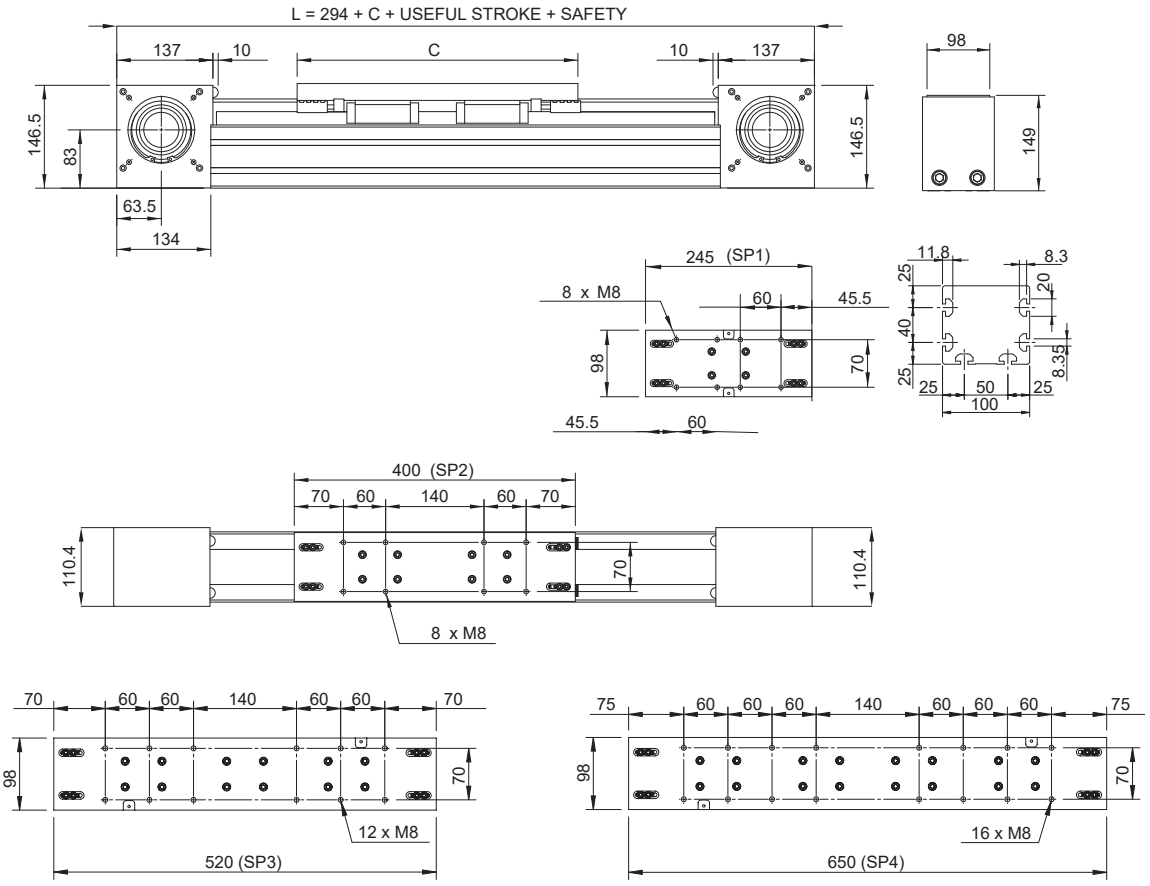
Load capacity

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.
E-SMART 80 SP1	2250	1459	25630	18318	25630	18318	260	186	190	136	190	136
E-SMART 80 SP2	2250	1459	51260	36637	51260	36637	520	372	1874	1339	1874	1339
E-SMART 80 SP3	2250	1459	76890	54956	76890	54956	780	557	4870	3481	4870	3481
E-SMART 80 SP4	2250	1459	102520	73274	102520	73274	1040	743	7689	5496	7689	5496

See verification under Static load and Service life in Technical Information section.



Dimensions



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

Technical Data

	E-SMART 100 SP1	E-SMART 100 SP2	E-SMART 100 SP3	E-SMART 100 SP4
Max. useful stroke length (mm)*1	6025	5870	5790	5620
Max. positioning repeatability (mm)*2	0.1	0.1	0.1	0.1
Max. speed (m/s)	4.0	4.0	4.0	4.0
Max. acceleration (m/s²)	50	50	50	50
Type of belt	50 AT 10	50 AT 10	50 AT 10	50 AT 10
Type of pulley	Z 27	Z 27	Z 27	Z 27
Pulley pitch diameter (mm)	85.94	85.94	85.94	85.94
Carriage displacement per pulley turn (mm)	270	270	270	270
Carriage weight (kg)	2.72	4.42	5.85	7.34
Zero travel weight (kg)	18.86	22.38	25.22	28.25
Weight for 100 mm useful stroke (kg)	1.3	1.3	1.3	1.3
Starting torque (Nm)	2.1	2.4	2.6	2.8
Moment of inertia of pulleys (g · mm²)	4.035.390	4.035.390	4.035.390	4.035.390

*1) It is possible to obtain stroke up to 11.155 (SP1), 11.000 (SP2), 10.880 (SP3), 10.750 (SP4) by means of special joints.
*2) Positioning repeatability is dependent on the type of transmission used.

Moments of inertia of the aluminium body

Type	I_x (10^7 mm^4)	I_y (10^7 mm^4)	I_p (10^7 mm^4)
E-SMART 100 SP	0.247	0.316	0.536

Driving belt

The driving belt is manufactured from a friction resistant polyurethane and with steel cords for high tensile stress resistance.

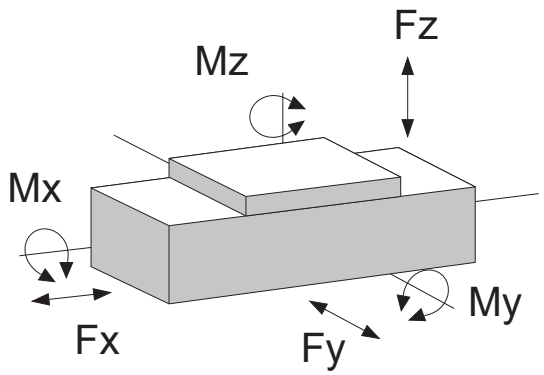
Type	Type of belt	Belt width (mm)	Weight (kg/m)
E-SMART 100 SP	50 AT 10	50	0.290

Belt length (mm) = 2 x L - 120 (SP1)
2 x L - 275 (SP2)
2 x L - 395 (SP3)
2 x L - 252 (SP4)

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.
E-SMART 100 SP1	4440	3060	43620	31192	43620	31192	500	358	450	322	450	322
E-SMART 100 SP2	4440	3060	87240	62385	87240	62385	1000	715	5527	3952	5527	3952
E-SMART 100 SP3	4440	3060	130860	93577	130860	93577	1500	1073	12039	8609	12039	8609
E-SMART 100 SP4	4440	3060	174480	124770	174480	124770	2000	1430	19416	13884	19416	13884

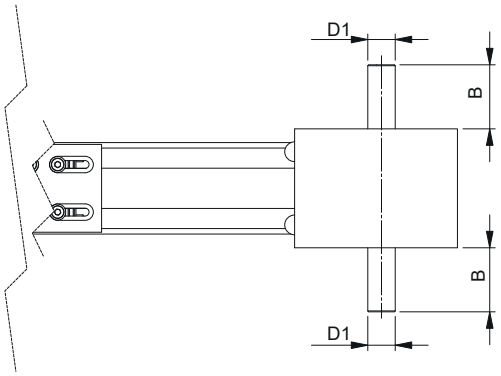
See verification under Static load and Service life in Technical Information section.



Shafts

Shaft type AS

This head configuration is obtained by utilizing an assembly kit delivered as a separate accessory item.
Shaft can be installed on the left or right side of the drive head as decided by the customer.

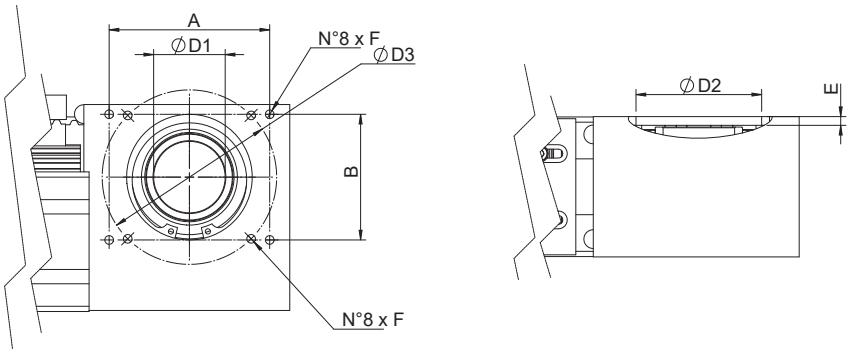


Position of the shaft can be to the right or to the left of the drive head.

Applicable to unit	Shaft type	B (mm)	D1
E-SMART 30	AS 12	25	12h7
E-SMART 50	AS 15	35	15h7
E-SMART 80	AS 20	36.5	20h7
E-SMART 100	AS 25	50	25h7

Hollow shaft

Hollow shaft type FP - Standard supply

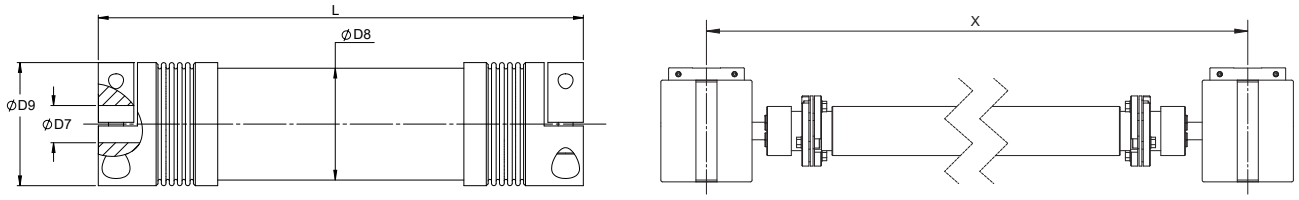


Applicable to unit	Shaft type	D1	D2	D3 (mm)	E (mm)	F	A x B (mm)
E-SMART 30	FP 22	22H7	42J6	68	3	M5	-
E-SMART 50	FP 34	34H7	72J6	90	3.5	M6	-
E-SMART 80	FP 41	41H7	72J6	100	5	M6	92x72
E-SMART 100	FP 50	50H7	95J6	130	3.5	M8	109x109

Synchronization kit

Synchronization kit for use of linear units in parallel

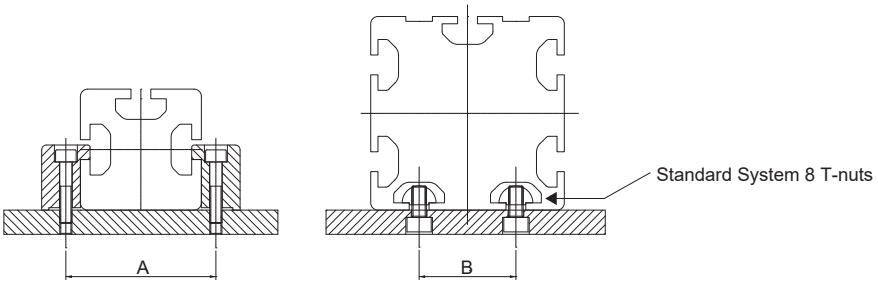
When movement consisting of two linear units in parallel is essential, a synchronization kit must be used. This consist of fully split clamping hubs, torsional rigid metal bellow couplings and a balanced hollow shaft.



Applicable to unit	Shaft type	D7 (mm)	D8 (mm)	D9 (mm)	Formula for length calc. (mm)
E-SMART 30	ZAE 10	12	35	400	L = X-71
E-SMART 50	ZAE 30	15	50	55	L = X-108
E-SMART 80	ZAE 60	20	60	66	L = X-113
E-SMART 100	ZAE 150	25	75	81	L = X-134

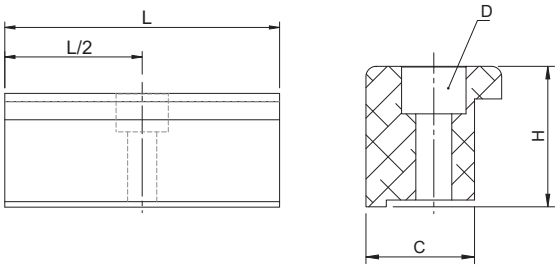
Fixing methods

The ball bearing guide linear drive system of E-Smart 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 one of the systems indicated below:



Type	A (mm)	B (mm)
E-SMART 30	42	-
E-SMART 50	62	-
E-SMART 80	92	40
E-SMART 100	120	50

Fixing brackets



Type	Item code	C (mm)	H (mm)	L (mm)	D
E-SMART 30	1001490	16	17.5	50	M5
E-SMART 50	1000097	16	26.9	50	M5
E-SMART 80	1000111	16	20.7	50	M5
E-SMART 100	1002377	31	28.5	100	M10

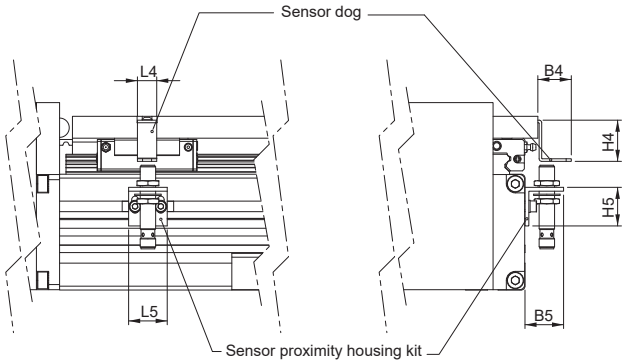
Proximity

Sensor proximity housing kit

Aluminium block equipped with T-nuts for fixing

Sensor dog

Iron plate mounted on the carriage used for the proximity operation

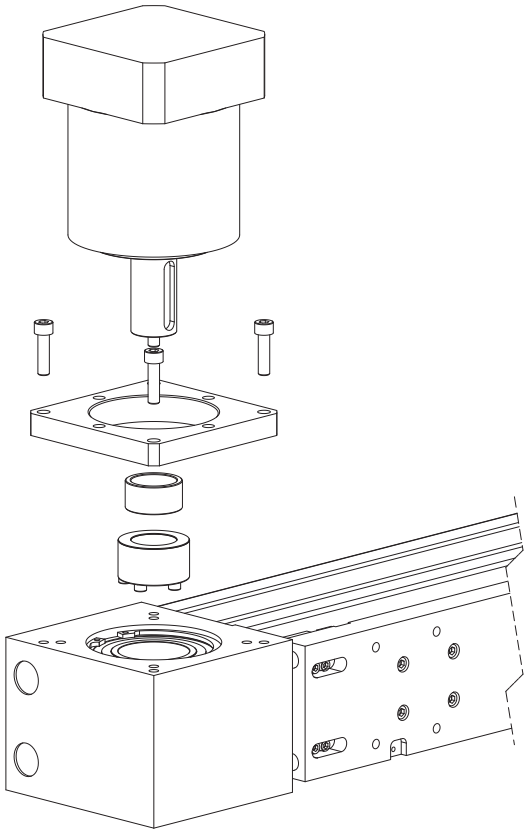


Type	Sensor dog code	Sensor proximity kit code	B4	B5	L4	L5	H4	H5	For proximity
			(mm)						
E-SMART 30	G000847	G000901	30	30	30	30	15	30	Ø 8
E-SMART 50	G000833	G000838	26	30	15	30	32	30	Ø 8
E-SMART 80	G000833	G000838	26	30	15	30	32	30	Ø 8
E-SMART 100	G000833	G000838	26	30	15	30	32	30	Ø 8

Adapter flange for gearbox assembly

Assembly kit includes: shrink disk, adapter plate, fastners.

Unit type	Gearbox type (not included)
E-SMART 30	MP053
	LCO50; LPO50; PE2
	SW030
E-SMART 50	MP060; PLE60
	LCO70; MPV00; LPO70; PE3
	SW040
E-SMART 80	P3
	MP080
	LCO90; MPV01; LPO90; PE4
	MP105
	PE3; LP070
	SPO75; PLN090
	SP060; PLN070
	SW040
	SW050
E-SMART 100	MP130
	LC120; MPV02; LP120; PE5
	LC090
	MP105
	SW050



For other gearbox types, ask Rollco.

E-Smart Linear Unit

E-Smart - 80 - (2)SP2 - 1000 - 400

Unit size
(30, 50, 80 or 100)

No. of carriages
- = 1 carriage
2 = 2 carriages

Length of carriages
SP1 = Carriage with single bearing block
SP2 = Carriage with dual bearing blocks
SP3 = Carriage with tripple bearing blocks
SP4 = Carriage with quadruple bearing blocks

Stroke length (mm)

C/c distance between carriages* (mm)

* When applicable

Technical Information

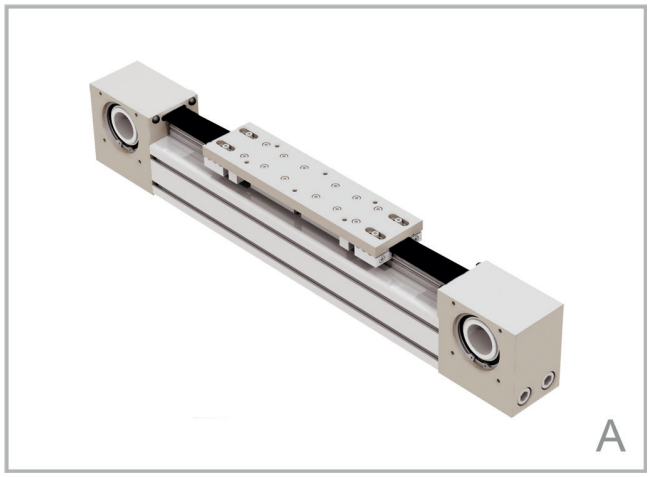
Multiaxis systems

Previously, customers wishing to build multiaxis units have had to design, draw and manufacture all the elements necessary to assemble two or more axes. Rollco now offers a set of components, including brackets and plates, to enable multiaxis units to be built.

In addition to the standard elements, Rollco can supply plates for special applications.

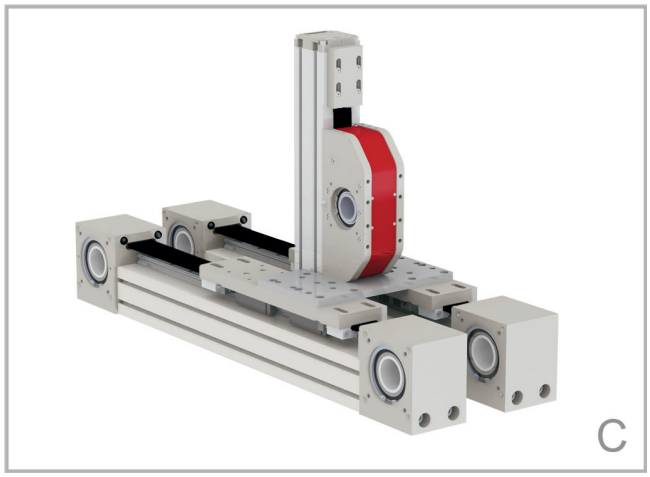
Application examples:

One axis system



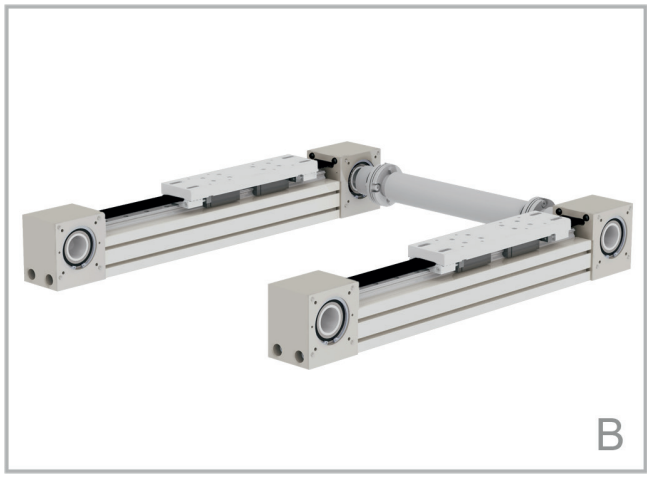
A - X Axis: E-Smart

Two axis Y-Z system



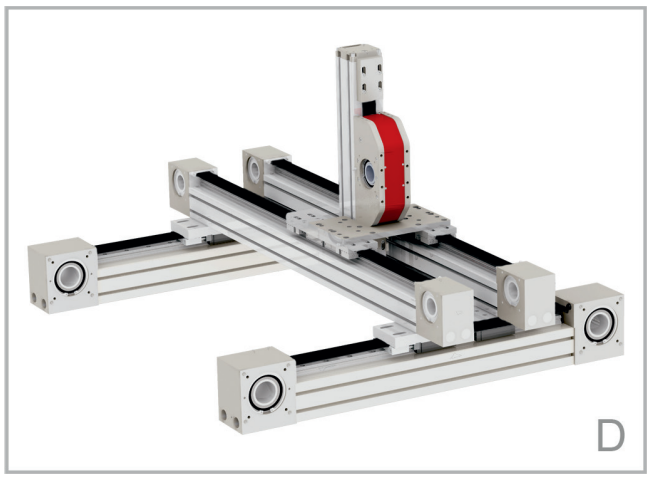
C - Linear units: Y Axis 2 E-Smart - Z Axis 1 S-Smart
Connection kit: Connection plate Kit for S-Smart (Z axis) on 2 E-Smart (Y axis)

Two parallel axis system



B - Linear units: 2 E-Smart
Connection kit: Parallel Kit

Three axis - X-Y-Z system



D - Linear units: X Axis 2 E-Smart - Y Axis 2 E-Smart - Z Axis 1 S-Smart
Connection kit: 2 fixing brackets Kit for 2 E-Smart (X axis) on 2 E-Smart (Y axis). Connection plate Kit for S-Smart (Z axis) on 2 E-Smart (Y axis). Parallel Kit

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

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.

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

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)

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 Rollco.

Belt safety factor referred to the dynamic F_x

Impact and vibrations	Speed/acceleration	Orientation	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

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:

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

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)

The effective equivalent load Peq 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

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

For CI and CE types

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

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

No shocks or vibrations, smooth and low-frequency changes in direction; ($\alpha < 5 m/s^2$) 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 ($5 m/s^2 < \alpha < 10 m/s^2$)	2 - 3
Shocks and vibrations; high speeds (>2 m/s) and high-frequency changes in direction; ($\alpha > 10 m/s^2$) high contamination, very short stroke	> 3

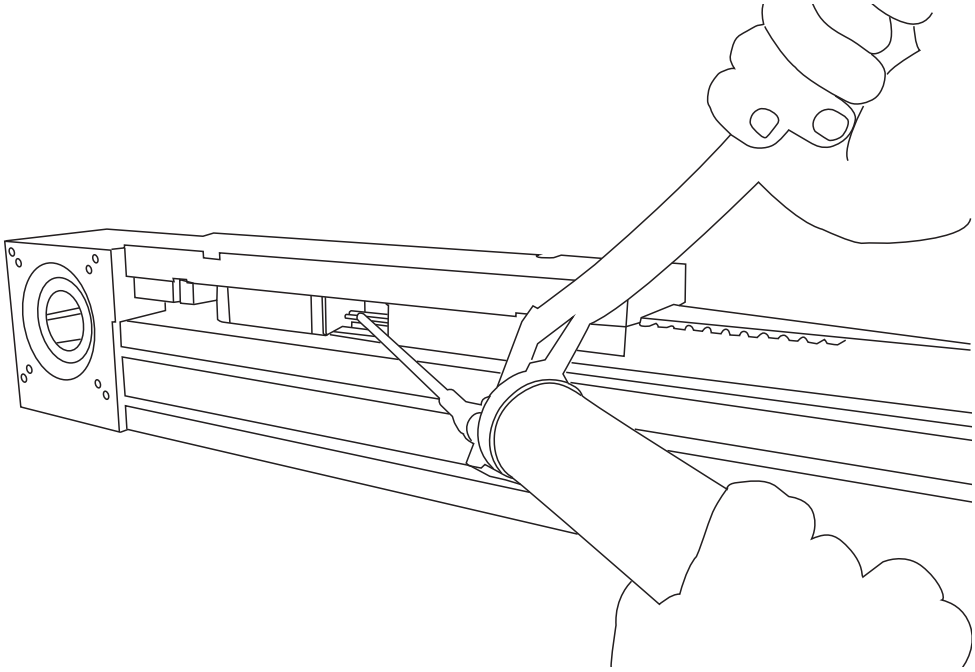
Maintenance

Lubrication

SP linear units with ball bearing guides

The ball bearing carriages of the SP versions are fitted with a retention cage that eliminates "steel-steel" contact between adjacent revolving parts and prevents misalignment of these in the circuits.

This system guarantees a long interval between maintenances: SP version: every 5000 km or 1 year of use, based on the value reached first. If a longer service life is required or in case of high dynamic or high loaded applications please contact Rollco for further verification.



- Insert the tip of the grease gun into the specific grease blocks.
- Type of lubricant: Lithium soap grease of class NLGI 2.
- For specially stressed applications or hostile environmental conditions, lubrication should be applied more frequently.

Contact Rollco for further advice

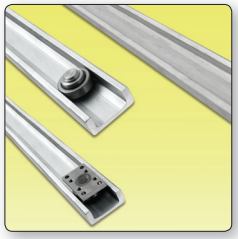
Quantity of lubricant necessary for re-lubrication of each block:

Type	Unit (g)
E-SMART 30	1
E-SMART 50	1
E-SMART 80	2-3
E-SMART 100	5-6

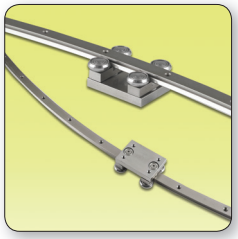
Rollco Products

COMPACT RAIL

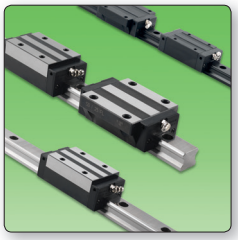
C-RAIL



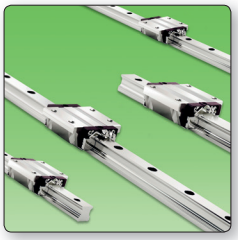
U-RAIL



CURVI LINE



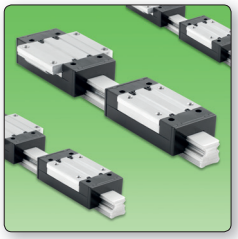
LINEAR RAIL SBI



LINEAR RAIL
BALL CHAIN

LINEAR MINIATURE
GUIDE

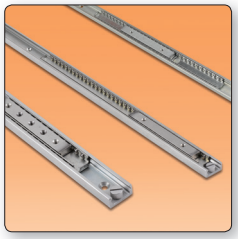
LINEAR ROLLER
GUIDE



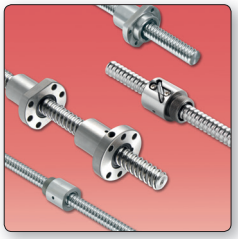
LINEAR RAIL
ALUMINIUM

TELESCOPIC RAIL
HEAVY

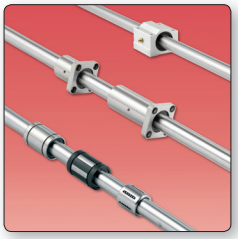
TELESCOPIC RAIL
LIGHT



EASYSLIDE

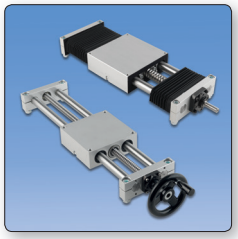


BALL SCREWS

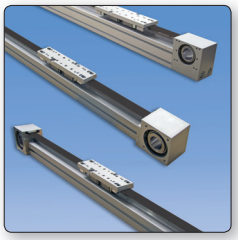


BALL BEARINGS
& STEEL SHAFTS

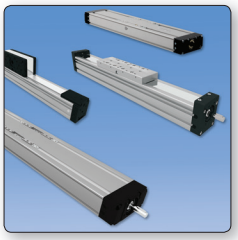
LINEAR UNIT RHL



LINEAR UNIT QME



LINEAR UNIT E-SMART



LINEAR UNITS CT & MT

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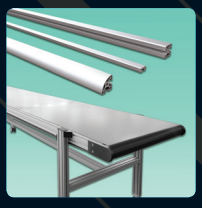
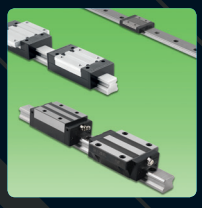


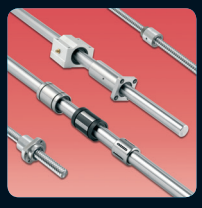

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