LINEAR TABLES

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LINEAR TABLES

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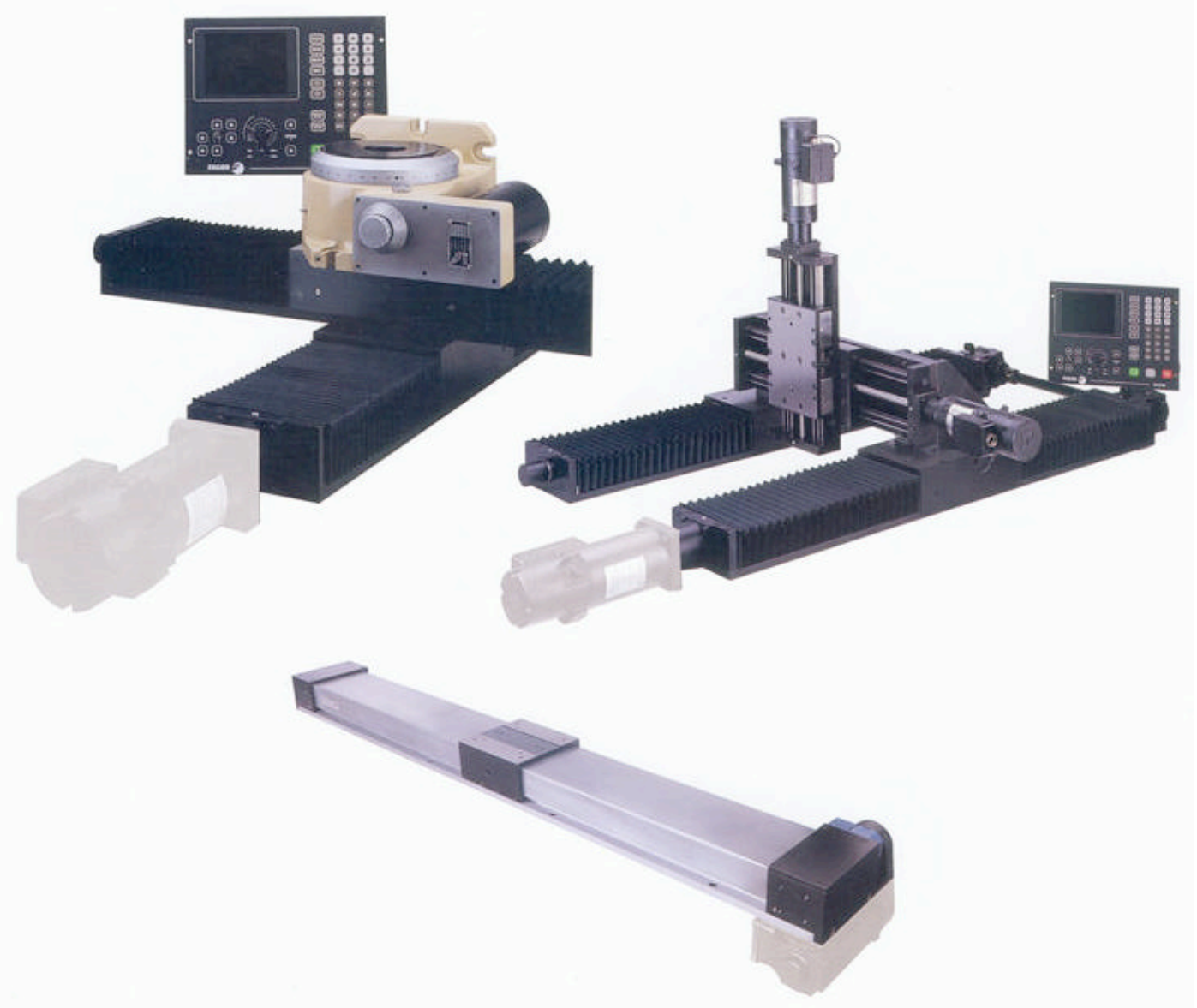

NIASA'S LINEAR TABLES are translating units that can be easily controlled manually or commanded by **CNC**. Due to their lightness and ease of application they are very useful elements for mechanisation and handling in automated and robotic systems. In combination with a rotary device a fourth axis for radial positioning can be provided.
All **NIASA'S LINEAR TABLES** are equipped with high precision recirculating ball guideways allowing smooth and low noise operation.

Likewise, depending on the positioning tolerance and travel speed, high precision rolled or ground ball screws can be incorporated.
These **LINEAR TABLES** are modular elements that can be assembled on one, two or three axes. This universal option offers a simple solution to most applications, allowing at the same time the transfer of heavy loads in an optimum way due to its guiding system.

USEFUL LIFE OF THE TABLE: SELECTION PROCESS

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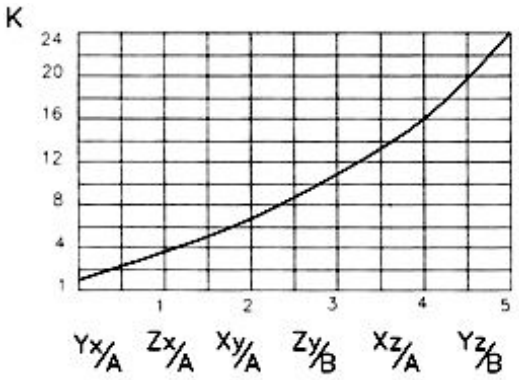
- When selecting the correct table for each application, we must take into account the correction factors that appear in the equation used to calculate the life.
- It is advisable to reach a minimum of 500.000 m. to obtain smooth and accurate movements.
- All the values indicated are valid for tables that have 3/4 of their length seated on a solid base.
- Whenever these requirements are not met the table's life may be shortened.

$$L=(F_z \cdot E \cdot f_L / (Fm \cdot K))^3 \cdot 5 \cdot 10^4 (m)$$

Where:
L=Useful life of the table (m).
F_z=Load capacity of the table (N).
E=Correction factor depending on the working conditions
***f*L**=Correction factor depending on the type of movement and speed
Fm=Average force that will act on the table at a constant speed (N).
K=Correction factor depending on the way of applying the force. Depending on the relation between the moments generated by the forces and the distance between bearing blocks



A, B → Distances between bearing blocks. See Charts of dimensions.

K APPLICATION OF THE LOAD

In order to obtain the suitable correction factors K, we must analyse in detail the way in which the load is applied on the table.
Whenever the load or loads are offcentered in several directions, the resulting K factors must be multiplied together. (See graphs bellow)

Fm AVERAGE LOAD

When the load that has to be supported by the table is not equal, the load must be calculated according to the following expression:

$$Fm=\sqrt[3]{F_1^3 \cdot (q_1 / 100) + F_2^3 \cdot (q_2 / 100) + F_3^3 \cdot (q_3/100)+...}$$

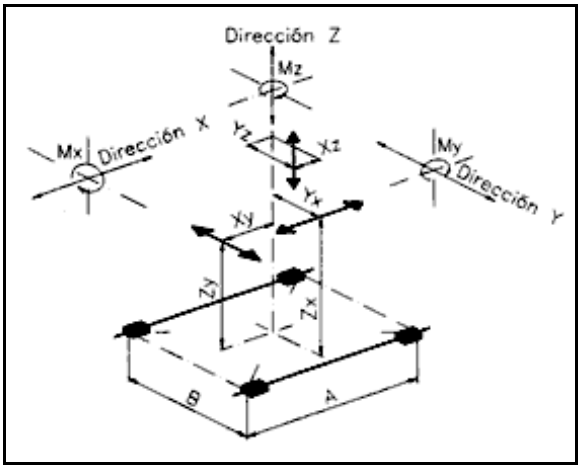
Where F1, F2, F3,... are the forces that will act during the time intervals q1,q2,q3,... as % of the total time.

E WORKING CONDITIONS

E Working conditions	
Small masses, light inpact	1,0..0,8
Medium masses,ligth vibrations or impacts	0,8..0,5
Large masses, large impacts, vibrations	0,5..0,3

*f*L SPEED AND TYPE OF MOVEMENT

*f*L Vitesse et type de mouvement		
Regular movements, low speeds	<15m/min.	1,0..0,8
Irregular movemets, medium speeds	<60m/min.	0,8..0,5
Osdillating movements, high speeds	>60m/min.	0,5..0,3



TORQUE CALCULATION REQUIRED POWER

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TORQUE

$M_T = M_m + M_h + M_c + M_r$

$M_m = I_m \cdot (2000 \cdot \P / p) \cdot a$

$M_h = I_h \cdot (2000 \cdot \P / p) \cdot a$

$M_c = (m_c + m_s) \cdot (p /(2000 \cdot \P)) \cdot a$

$M_r = (p / (2000 \cdot \P \cdot C)) \cdot F_x$

M_T = Required total torque (motor torque) (Nm)
M_m = Torque generated by the motor inertia (Nm)
M_h = Torque generated by the ball screw inertia (Nm)
M_c = Torque generated by the slide's inertia and the mass on the slide (Nm)
M_r = Resisting torque, due to the load and the slide's friction(Nm)

I_m = Motor's inertia (kgm^2)
I_h = Screw's inertia (kgm^2)
m_c = Slide mass (kg)
m_s = Mass on the slide (kg)
p = Screw pitch or feed per revolution (mm)
a = slide acceleration (m/sg^2)
C = 0,8 for the ball screw
0,2 for the trapezoid screw
F_x = Force in the feed direction (N)

POWER

$P_T = Mt \cdot n / 9550$

PT = Required motor power (kW)
n = motor speed (rpm)

MAINTENANCE, TYPE OF PROTECTION

The linear table needs lubrication similar to ball bearings. It is advisable to use grease lubrication. Should you require oil please check with our technicians.
In normal working conditions, the greasing period is approximately of 400-800 hours running. The unit is delivered lubricated with KLUBER ISOFLEX TOPAS NLGI Type 2 grease, according to DIN 51818 . When used at high speeds the table should be lubricated with Type 3 grease. Avoid excess greasing otherwise the oscillating movement will deposit too much grease on the guideway, thus producing friction and a rise in temperature.

PROTECTION USING BELLOWS

When using bellows to protect the table's transmission elements you will reduce the stroke due to the space occupied by the compressed bellows.
See below the chart with the strokes, values that have to be taken into account, depending on the useful stroke required:

SIZE	1020 STROKE		1532 STROKE		3040 STROKE	
BELLOWS	NO	YES	NO	YES	NO	YES
	250	170	250	180	250	190
	500	350	500	370	500	380
	750	550	750	580	750	600
	1000	750	1000	800	1000	840
	1250	1000	1250	1030	1250	1070
			1500	1250	1500	1300
			1750	1480	1750	1530
			2000	1700	2000	1750

For other strokes these data can be interpolated or please contact NIASA's technical department.

MAXIMUN TRAVEL SPEEDS AND LOAD COLUMN

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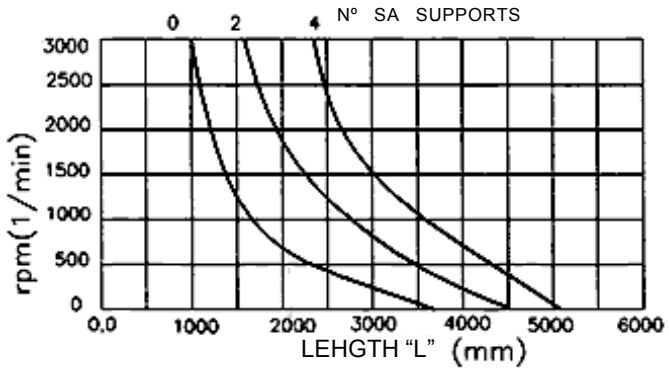
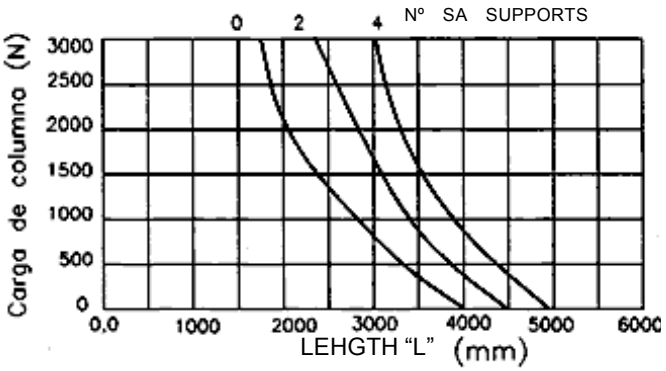
The following diagrams show the maximum speeds (rpm) of the tables equipped with a ball screw, depending on the table's length and on the loads applied. These limits can be increased using supports (SA) as showek on the following graphs.

SIZE 1020

SPEED (rpm)

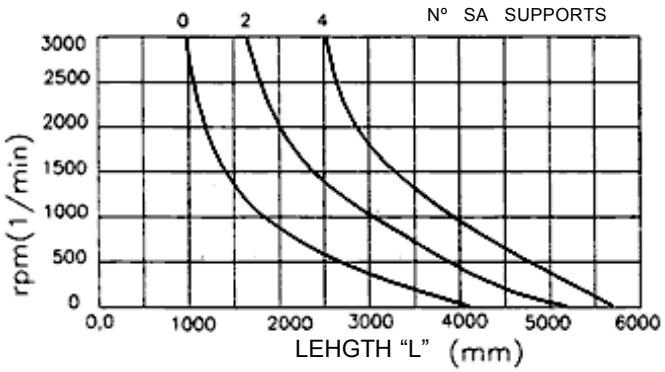


COLUMN LOAD

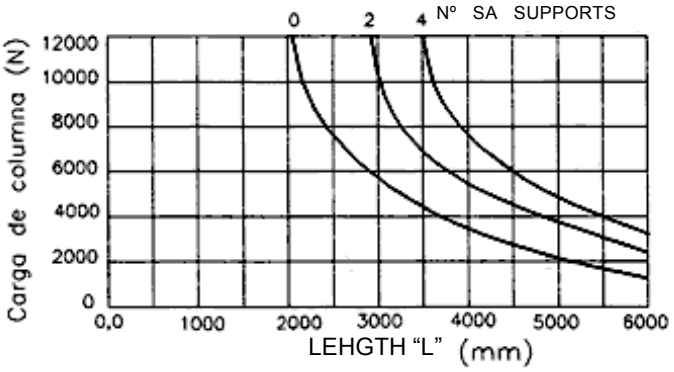


SIZE 1532

SPEED (rpm)

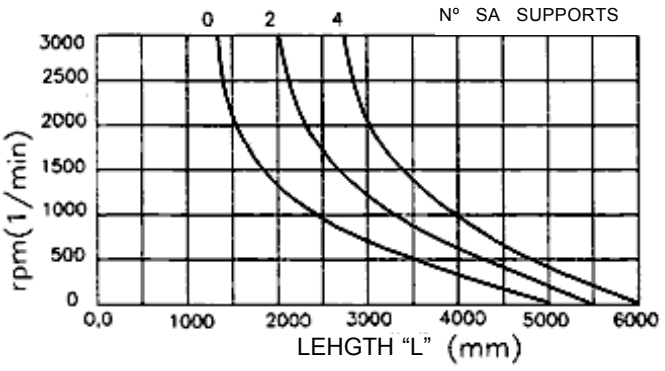


COLUMN LOAD

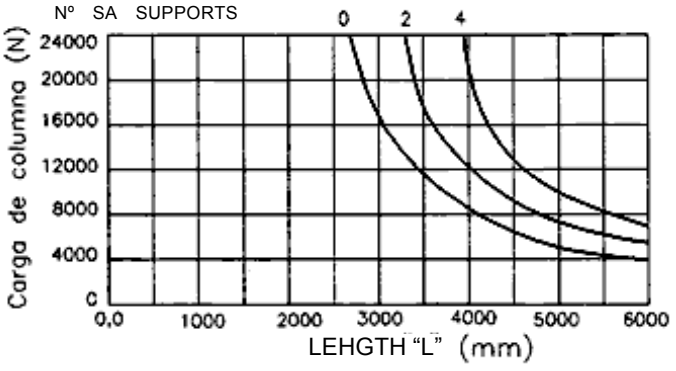


SIZE 3040

SPEED (rpm)



COLUMN LOAD



STANDARD LINEAR TABLES MLS

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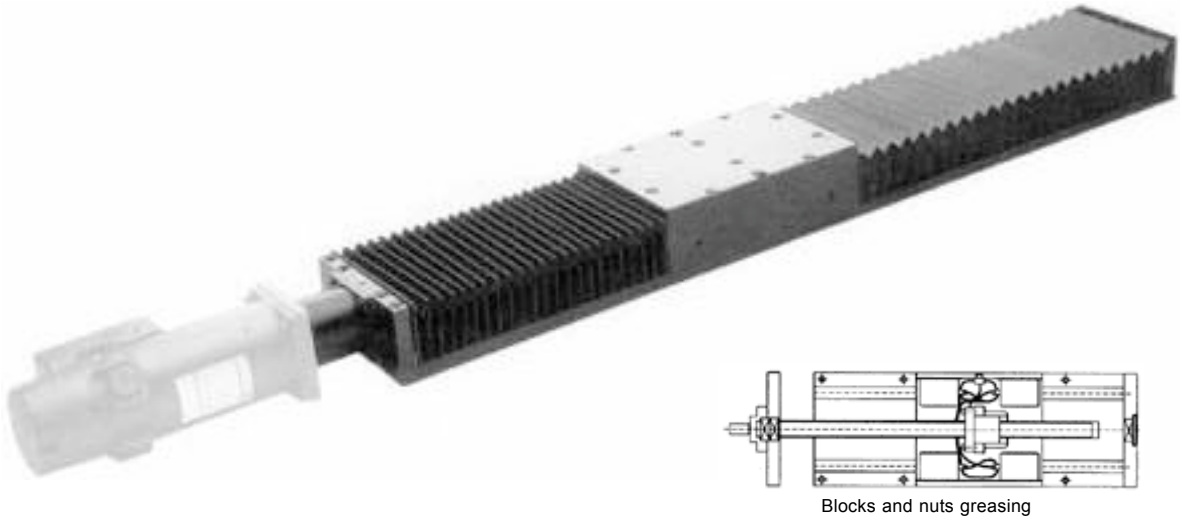

Blocks and nuts greasing

The standard linear table is the most popular of our tables, both in terms of production and versatility. It is a compact table, specially designed for heavy loads and to work on all axes as indicated in the introduction of the linear tables.

As a protection system against dust and other harmful elements that may interfere with its adequate functio-ning, it is possible to equip these tables with protecting bellows. Although these bellows do not hermetically seal the unit, they act as an important barrier against contamination of the table. It is essential to remember that these bellows reduce the slide's useful stroke, and therefore this information will have to be pro-vided to NIASA when ordering these tables.

All tables equipped with ballscrews can be fitted with preloaded double nuts, to eliminate all free movement between the drive screw and the carriage.

DESIGN EXAMPLE

Linear Standard Table MLS, Size 1020, Double nut, Screw pitch 5 mm, Stroke 1000 mm, without supports, Total length 1300 mm, without protecting bellows, with motor mounting and coupling.

	MLS	1020	FM	5	1000	0 SA	1300	0	MGK
Linear Standard Table									
Size 1020 / 1532 / 3040									
Nut	Simple = F Doble = FM								
Picth	1020: 5 / 20 / 50 1532:5 /10/20/40 3040:5 /10/20/40								
Stroke									
Supports									
Total Length									
Bellows[2]	With bellows: 1 Without bellows: 0								
Motor mounting and coupling									

STANDARD LINEAR TABLE MLS

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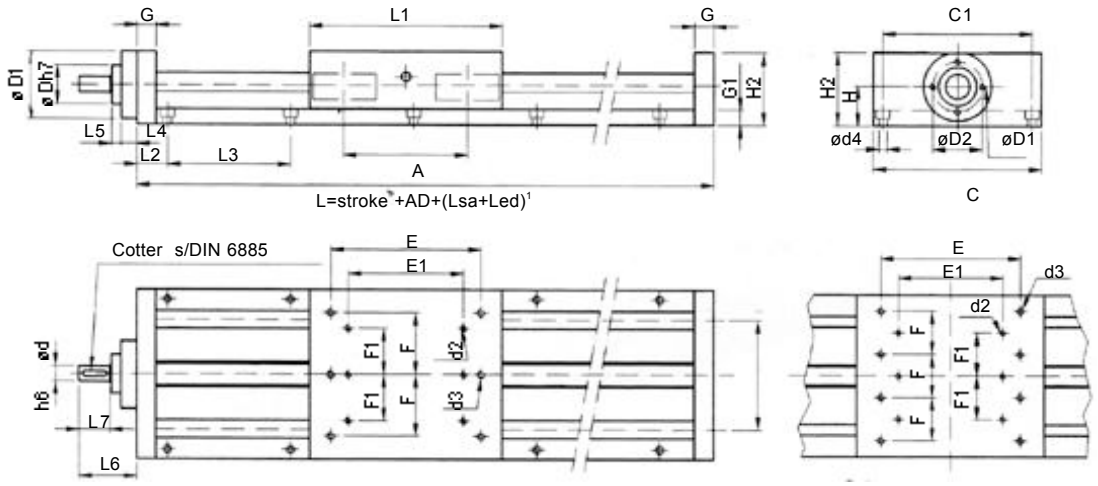


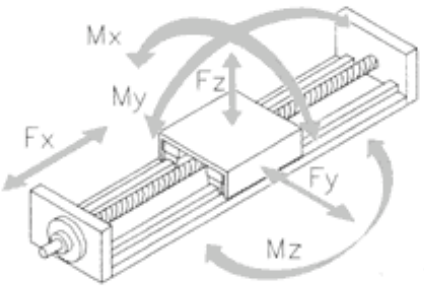
DIMENSIONS

Size	A	B	C	C1	d	d1	d2	d3	d4	D	D1	D2	E	E1	F	F1
1020	142	108	170	150	14	M8	-	M8	9	30	62	45	150	-	60	-
1532	161	142	220	195	20	M8	M8	M10	11	50	89	65	195	150	80	60
3040	218	200	300	260	25	M10	M10	M12	13	55	104	75	260	195	80	80

Size	G	G1	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	AD
1020	20	15	35	68	66	220	30	120	15	10	52	25	300
1532	25	20	51	95	94	250	40	160	20	13	75	40	350
3040	30	25	60	113	112	350	50	160	20	13	85	50	450

TECHNICAL DATA

Size	Fx N	Fy N	Fz N	Mx Nm	My Nm	Mzta Nm
1020	2300	26000	29000	1500	2000	1700
1532	9000	38000	42800	3000	3400	3000
3040	18000	70000	79200	7900	9000	7900



Size	Screw Pitch	speed max.	speed max.	Accel. max.	Screw Diameter	Stroke 0	Table's mass Each 100	Slide	Inertia Screw	Position Precision	Length3 Max.
	mm	rpm	m/m in	m/s2	mm	kg	kg	kg	kgm2/m	mm	mm
1020	5,20,50	3000	150	10	20	12,5	1,2	7	8,8.10-5	±0,05	5600
1532	5,10,20,40	3000	120	10	32	25	2,1	13	6,4.10-4	±0,05	5600
3040	5,10,20,40	3000	120	10	40	67	4,4	37	1,6.10-3	±0,05	5600

[1] **Lsa**: Supports (whenever the length requires).
Led : Additional space, for micro switches, etc.
[2] The bellws reduce the useful stroke.
[3] For other strokes please contact NIASA's technical departament.

COVERED LINEAR TABLE MLC

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The COVERED LINEAR TABLES, are translation units almost identical to the Standard Linear Tables. The main difference lies in the fact that these are equipped with a metal cover that protects the most sensitive components such as: the guides, the screws, the nuts, the linear bearings, etc.

This type of protection is more robust than the bellows used on the MLS range. The metal cover offers greater protection in an agressive environment, where high temperature, metal particles or where debris from other processes such as welding may be a problem.

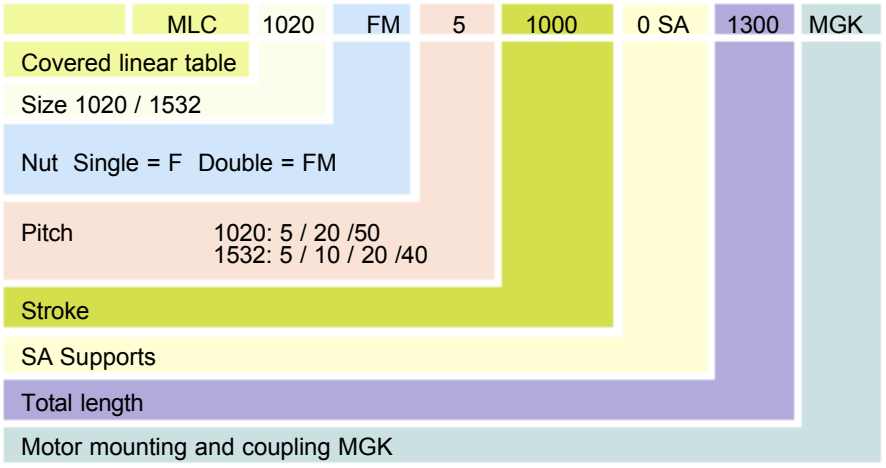
The second advantage is that the stroke is not reduced by the protecting cover because the carriage moves over the cover from one end of the table to the other.

As with the MLS tables, the MLC tables can be manually commanded or by using CNC. They are also equipped with high precision recirculating ball guides, and rolled or ground ball screws, also of high precision.

They can be assembled on one, two or three axis, and they are of great use in the mechanisation and multiple application devices.

DESIGN EXAMPLE

Linear standard table MLC, Size 1020, Double nut, Screw pitch 5 mm, Stroke 1000 mm, without SA supports, Total length 1300 mm, with motor mounting and coupling.



COVERED LINEAR TABLE MLC

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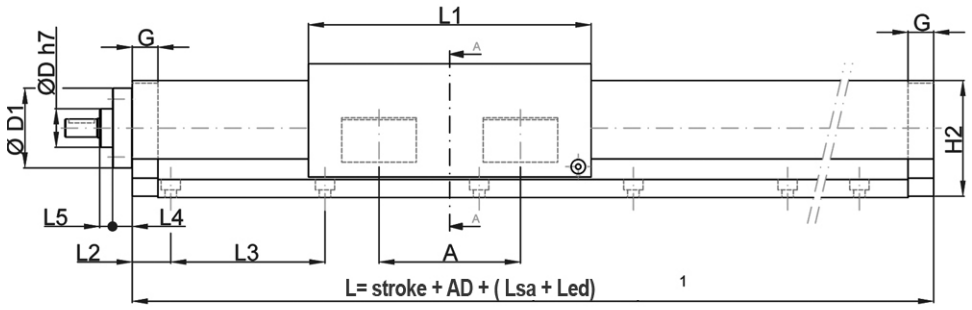
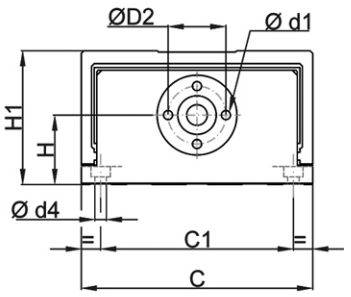
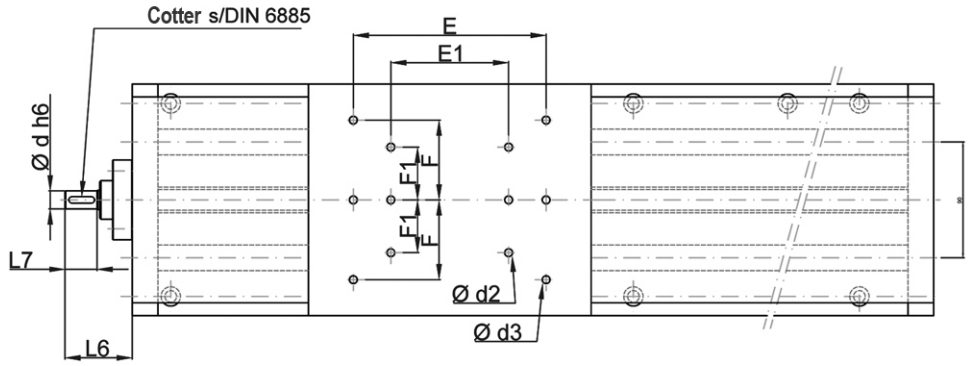
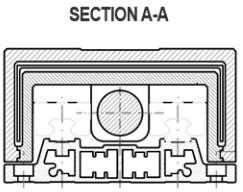








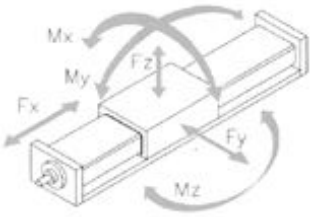
DIMENSIONS

Size	A	B	C	C1	d	d1	d2	d3	d4	D	D1	D2	E	E1	F	F1
1020	110	90	180	150	14	M8	-	M8	9	30	62	45	150	-	62	-
1532	145	122	235	200	20	M8	M8	M10	11	50	89	65	195	150	80	60

Size	G	G1	H	H1	H2	L1	L2	L3	L4	L5	L6	L7	AD
1020	20	14	54	104	90	220	30	120	15	10	52	25	300
1532	25	18	72	135	113,5	250	65	160	20	13	75	40	350

TECHNICAL DATA

Size	Fx N	Fy N	Fz N	Mx Nm	My Nm	Mz Nm
1020	2300	26000	29000	1300	1600	1400
1532	9000	38000	42800	2600	3100	2700



Size	Screw Picth	Speed max.	Spees max.	Accel. max.	Screw diameter	Table's mass Stroke 0	Table's mass Each 100	Slide	Inertia Screw	Position Precision	Length[2] Max.
	mm	rpm	m/min	m/s^2	mm	kg	kg	kg	kgm^2/m	mm	mm
1020	5,20,50	3000	150	10	20	19,1	1,4	11,8	$8,8.10^{-5}$	±0,05	5600
3040	5,10,20,40	3000	120	10	40	53,5	3,1	31,8	$6,4.10^{-4}$	±0,05	5600

[1]**Lsa**: Supports (whenever the length requires).
Led: Additional space, for micro switches etc.
[2]For other strokes please contact NIASA's technical department.

BELT-DRIVEN LINEAR TABLE MLK

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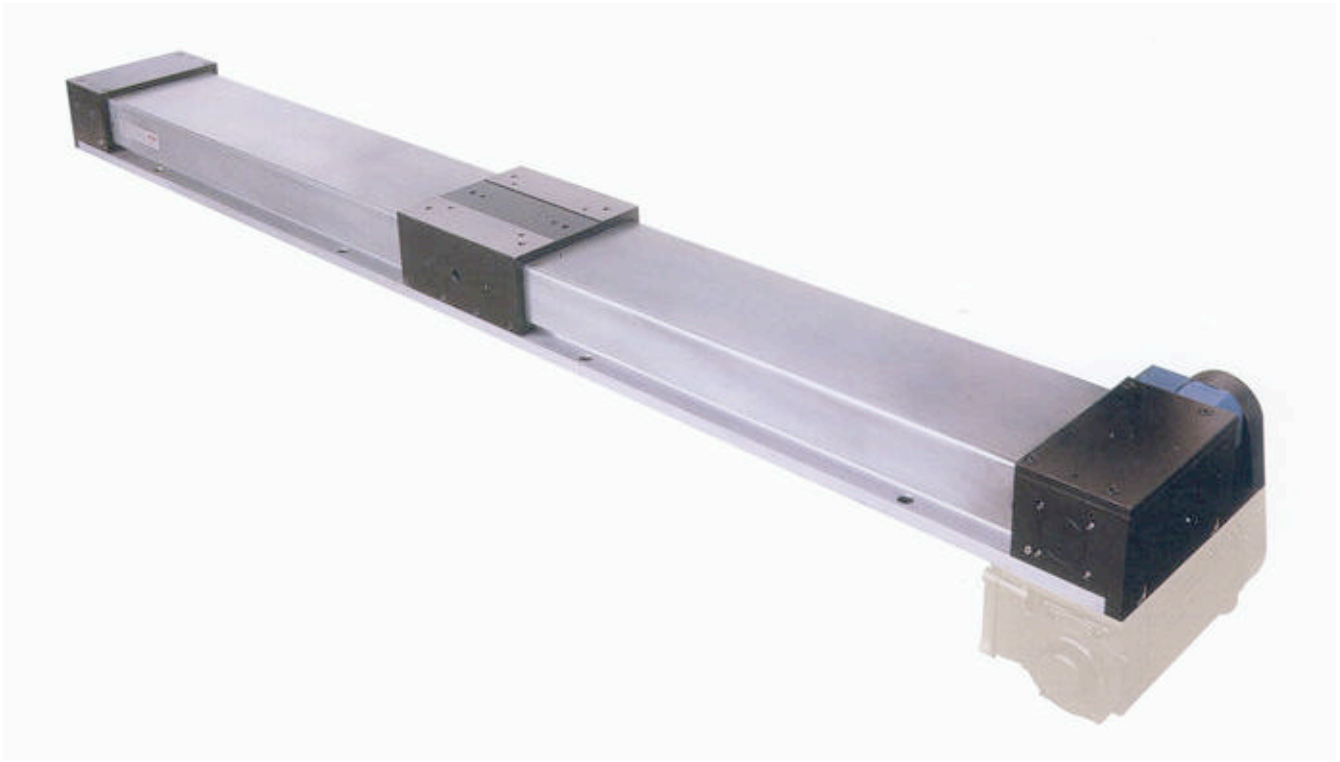

The Belt-driven linear table MLK has all the advantages of the standard MLC table:

- It is equipped with a protecting metal plate
- No stroke space is lost, because the slide moves over the metal cover.

Furthermore, this table has the advantage of being able to work at high speeds, because instead of using a screw it moves using a system of belt and pulleys.

Nevertheless, we must indicate that the precision is not the same as that provided by the ball screw, due to the belt properties.

This table has been designed for applications with the following characteristics:

- Hostile environments, as the MLC
- Work with medium/heavy loads.
- High working speeds.

DESIGN EXAMPLE

Belt-driven Linear table, Size 1020, Stroke 1000 mm, Total length 1450 mm., with motor mounting and coupling.

	MLK	1020	1000	1450	MGK
Belt-driven linear table					
Size 1020 / 1532					
Stroke					
Total length					
Motor mounting and coupling MGK					

BELT-DRIVEN LINEAR TABLE MLK

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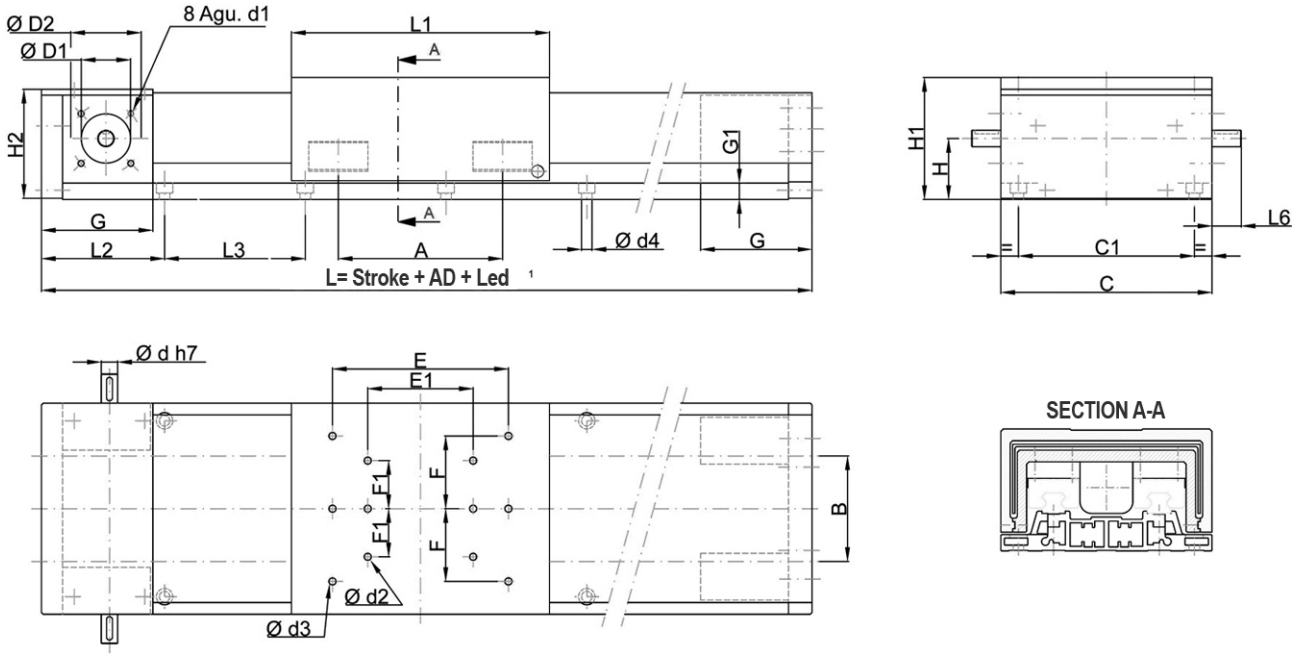


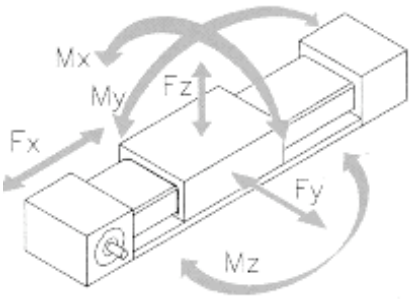
DIMENSIONS

Size	A	B	C	C1	d	d1	d2	d3	d4	D1	D2	E	E1	F	F1	G
1020	140	90	180	150	14	M6x15	-	M8	9	42	60	150	-	62	-	95
1532	145	122	235	200	24	M8x15	M8	M10	11	52	80	195	150	80	60	130

Size	G1	H	H1	H2	L1	L2	L3	L6	AD
1020	14	52	104	93	220	105	120	25	450
1532	18	65	135	131	250	170	160	50	550

TECHNICAL DATA

Size	Fx N	Fy N	Fz N	Mx Nm	My Nm	Mz Nm
1020	1300	26000	29000	1300	2000	1700
1532	4800	38000	42800	2600	3100	2700



Size	Feed per Revolution mm	Speed max. rpm	Speed max. m/min	Accel. max. m/s²	Table's mass Stroke 0 mm	Table's mass Each 100 kg	Table's mass Slide kg	Position Accuracy mm
1020	120	3000	150	20	21,6	1,2	11,2	±0,3
1532	200	3000	120	20	44,8	1,7	30,2	±0,3

[1]**Led**: Additional space, for micro switches etc.

LINEAR GUIDE WITH RACK GLC

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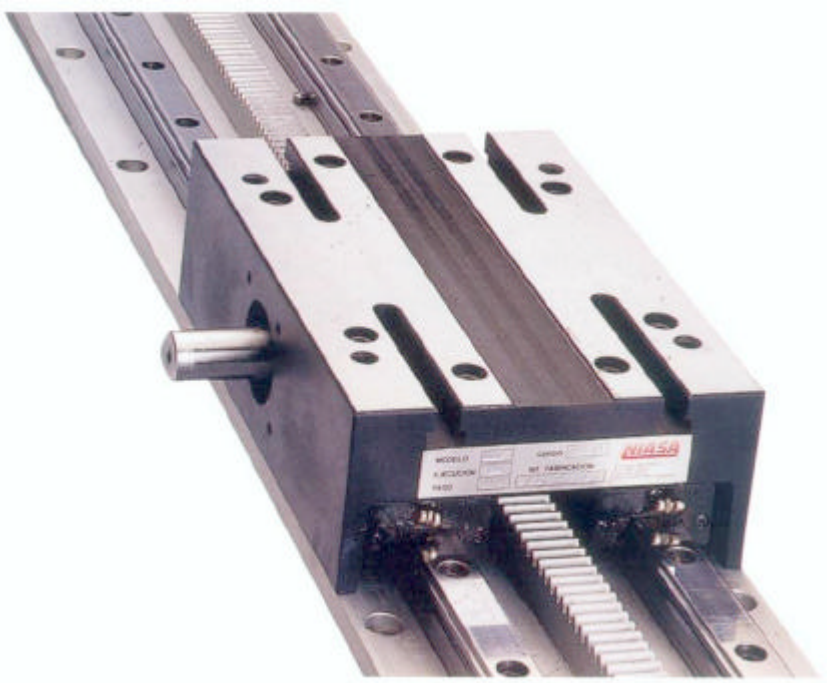

NIASA's GLC rack-pinion linear guides are translation units with no travel limitation. Their simple design and great robustness transform them into very useful elements for mechanisation. They are equipped with precision ball guides designed to support heavy loads, extremely high rigidity, maximum precision and very low noise levels.

The combination of the ball guides with the rack-pinion moving system has creates a compact linear translation unit with many advantages. In a hostile environment it is possible to fit bellows.

This guide is available in three standard sizes, and can be manufactured in any other length.

DESIGN EXAMPLE

Linear guide GLC, Size 10, Stroke 6.000 mm, Total length 6.220 mm, without protecting bellows, with motor mounting and coupling.

	GLC	10	6000	6220	0	MGK
Linear guide with rack and pinion						
Size 10 / 20 / 30						
Stroke						
Total length						
Bellows[2]	With bellows : 1 Without bellows : 0					
Motor mounting and coupling MGK						

LINEAR GUIDE WITH RACK GLC

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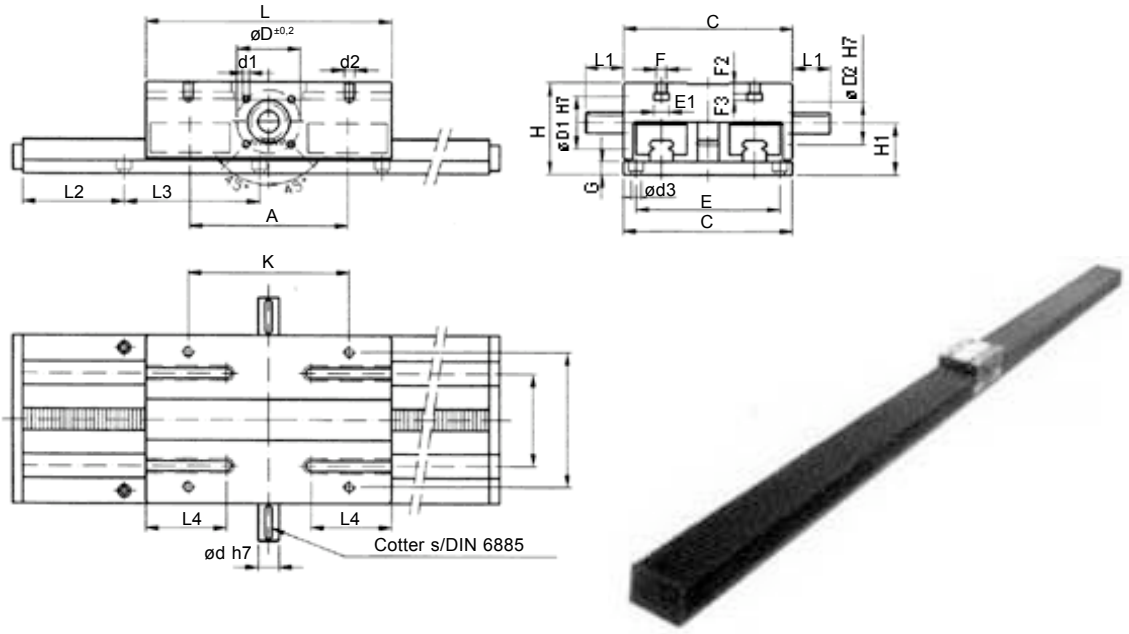


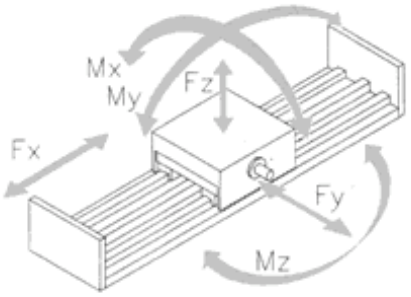
DIMENSIONS

Size	A	B	C	d	d1	d2	d3	D	D1	D2	E	F	F1	F2	F3	G
GLC10	142	68	130	20	M6	M10	9	60	47	35	110	10	16	10	8	15
GLC20	186	110	200	25	M8	M12	11	75	62	50	170	12	18	12	8	15
GLC30	290	180	310	35	M10	M16	13	112	80	90	270	14	25	14	11	25

Size	H	H1	J	K	L	L1	L2	L3	L4
GLC10	88	52	110	150	220	35	90	120	70
GLC20	108	61	160	190	290	45	120	160	95
GLC30	171	100	260	295	430	60	160	240	120

TECHNICAL DATA

Size	Fx N	Fy N	Fz N	Mx Nm	My Nm	Mz Nm	Par Trans. Nm
GLC10	1500	26000	29000	985	2000	1700	31
GLC20	2200	46000	52400	2900	4800	4200	61
GLC30	3000	92000	104000	8800	15000	13200	120

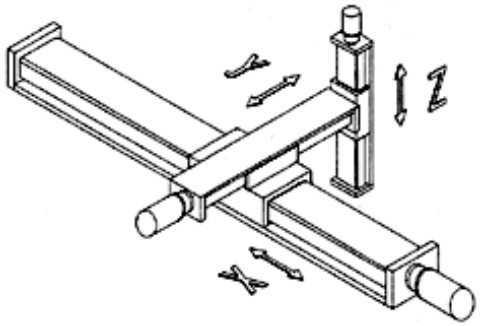


Size	Feed per revolution	Speed max.	Speed max.	Accel. max.	Table's mass Stroke 0	Table's mass Each 100	Slide	Position Precision
	mm	rpm	m/min	m/s²	mm	kg	kg	mm
GLC10	120	1250	150	30	11,8	1,1	9	±0,1
GLC20	150	1000	150	30	26,7	2,1	19,5	±0,1
GLC30	240	750	180	30	87	4,8	82	±0,1

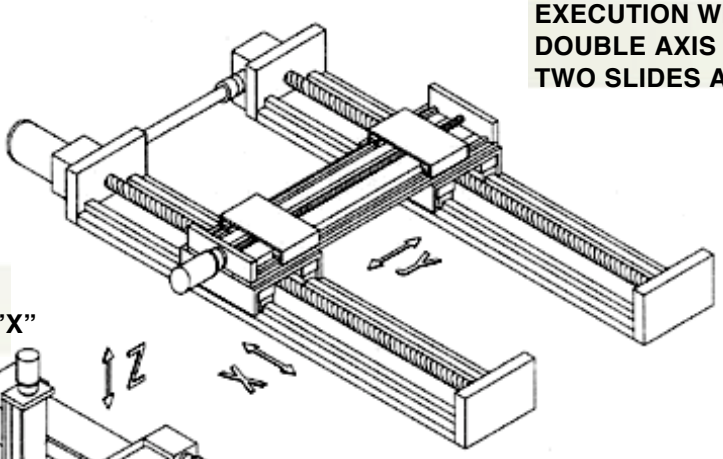
[2] The bellows reduce the useful stroke.

APPLICATION EXAMPLES

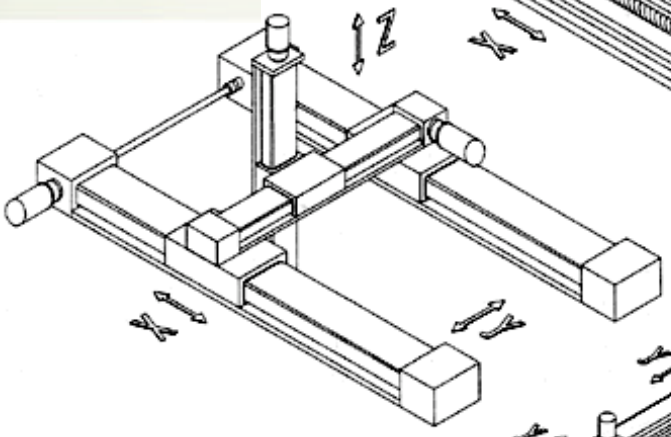
EXECUTION WITH 3 COORDINATES PROJECTING TABLE

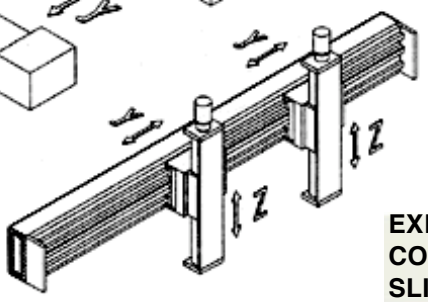


EXECUTION WITH 2 COORDINATES DOUBLE AXIS “X” TWO SLIDES AXIS “Y”



EXECUTION WITH 3 COORDINATES DOUBLE AXIS ”X”





EXECUTION WITH 2 COORDINATES INDEPENDENT SLIDES ON BOTH AXIS

LARGE DIMENSIONS