Quick-Guide Linear Motion Designer

Version 3.2



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Quick-Guide Linear Motion Designer Start page

Linear Motion Designer			- 🗆 🗙	Menu
E Linear Motion D	esigner Version 3.2		A Bosch Company	Sottings
> New > Load > Save Settings > Language > Units	program for Profiled Rail ew Assemblies and Linear			 Language Units User settings
 > User settings > Update Info > Conditions of License > Help > Calculation Planning Guide > Version > Exit 		 Profiled rail system Selection of Screw Assembly Linear bushing 		 Information Conditions of license Version / Releasenotes Help Calculation Planning Guide
	M			Dimensioning / Calculation
				 Profiled Rail System (PRS)
				 Screw Assemblies (SA)
				PRS and SA in one step
				 Linear Bushings



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Quick-Guide Linear Motion Designer Application





Applies to Profiled rail system and Linear bushing

If your application is not included you are welcome to contact Bosch Rexroth.

Choose the tab Project > Request of Information or visit <u>www.boschrexroth.com/Imd</u>





Quick-Guide Linear Motion Designer System dimensions Runner Block





Applies to Profiled rail system and Linear bushing

Drive

Enter the position of the drive

Schematic representation

Stiffness in X-direction

Stiffness of the drive, if known (Influence on the displacement calculation in X-direction)

Dimensioning

- Enter runner block/bushing distance
- Enter guide rails/shafts distance (Required fields)

Rotation angle

- Rotation angle a: Rotation around the X-axis (e.g. 90° at wall mounting)
- Rotation angle β: Rotation around the Y-axis (e.g. 90° at vertical applications)

Text with dotted subline = Mouseover help text



Quick-Guide Linear Motion Designer System dimensions Screw Assembly







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Quick-Guide Linear Motion Designer Dynamics





Input options

Dynamic cycle *

Enter velocity, acceleration, time, distance

Part of time *

 Enter percentage duty cycle of the respective phases and average speed

Percentage of stroke *

Distance of the respective phases and average speed

Motion profile

- Predefined cycles
- Input via stroke and time
- * A change between the input options is possible

Text with dotted subline = mouseover help text

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Quick-Guide Linear Motion Designer Process





Process data



- Input up to 9 masses
- Masses activated in all phases, de-activate if not required
- Acceleration forces in direction of travel are calculated automatically
- For multi-axis applications, enter the lateral acceleration (a_{quer, y} and a_{quer, z}) in the respective phases. The lateral forces are calculated automatically

Forces

- Input up to 12 forces
- Forces must still be activated in the active phases

Additional loads

The additional load is added to each carriage in each phases

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Tips: calculation assumptions and design tips



Quick-Guide Linear Motion Designer Result Runner Block





- Service Performance: Input data for service performance or required lifetime
- Lubrication: Calculation to lubrication interval and quantity
- Selection guide: Product proposal based on industry and application specifications

Calculation

- Automatic detection if the runner block distance is to small (deselected)
- Automatic detection from short stroke (deselected)
- Automatic matching from limiting values (max. acceleration, max. velocity, ...)
- Notes at low load ratio

Show Deflection (See next page)

Help

Shows the legend to descriptions and information about the various load ratios



Quick-Guide Linear Motion Designer Deflection



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i li	near Mo	tion De	signer ve	rsion 3.1										rex	roth	
Displac	ements of th	e force anni	ication point	s based on u	nloaded con	dition	-								×	
onopiao		io force appr	roacion point		noaded con	untion		\sim								
					S	elected Gui	de R1853	322 2x								
** **	Coor	Coordinates of force 1			Coordinates of force 2			Coordinates of force 3			Coordinates of force 4			Coordinates of force		
	X=200 mm Y=200 mm Z=500 mm		Z=500 mm	X=150 mm Y=200 mm Z=500 mm			X=0 mm Y=0 mm Z=0 mm			X=0 mm Y=0 mm Z=0 mm			X=0 mm Y=0 mm 200			
Phase	ΔX [µm]	ΔY [µm]	ΔΖ [µm]	ΔX [µm]	ΔY [µm]	ΔΖ [µm]	ΔX [µm]	ΔY [µm]	ΔΖ [µm]	ΔX [µm]	ΔY [] m]	ΔΖ [µm]	ΔX [µm]	ΔY [µm]	ΔZ [
T1	0.41	2.05	-2.23	0.41	2.04	-2.20	-			-			-		-	
Г2	0.66	2.04	-2.32	0.66	2.04	-2.26	-	-	-	-	-	•	-	-	-	
ГЗ	0.90	2.03	-2.40	0.90	2.03	-2.32	-	-	-	-	-		N.		-	
T4	0.90	2.03	-2.40	0.90	2.03	-2.32	-	-	-	-	-	-	-	-	-	
5	0.66	2.04	-2.32	0.66	2.04	-2.26	-	-	-	-	-	-	- \	-	-	
6	0.41	2.05	-2.23	0.41	2.04	-2.20	-	-	-	-	-	-	- -		-	
7			-	-			-	-	-	-	-	-	-		-	
8			-	-		-	-	-		-	-		-			
F9	-	-	-	-	-	-	-	-	-	-	-	-	-			
Г10			-	-		-	-	-	-	-	-	-	-	-	-	
F11		-		-	-		-	-	-	-	-	-	-	-	-	
12				-	-		-	-		-	-		-	-	-	
F13		-		-	-	-	-	-		-	-		-	-	-	
14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Г16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T17			-	-		-	-	-		-	-	-	-	-	-	
Г18	-	-		-	-	-	-	-	-	-	-	-	-		-	

Deflection values of the individual application force points in the respective phases

i Red values are max. values per phase, per appl. force point

Deflection of the application force points refer to unloaded condition

 Starting position is an unloaded condition on the runner blocks

Deflection of the application force points refer to phase T1...T18

 e.g. phase T2, the deflection values in phase T2 are set to zero



Quick-Guide Linear Motion Designer Result Linear Bushing



Filter criteria

Preselection for a much quicker bushing selection

Calculation

- Automatic detection if the bushing distance is to small (deselected)
- Automatic detection from short stroke (deselected)
- Automatic matching from limiting values (max. acceleration, max. velocity, ...)
- Consideration of reduction factors due to shaft hardness >60HRC, temperature >100°C
- Notes at low load ratio

Help

Shows the legend to descriptions and information about the various load ratios

Quick-Guide Linear Motion Designer Result Screw Assembly - Nut

St	tart A	pplication	System o Runn	dimensions er block	s System Screw	dimensions Assembly
Nut	Unit end b	earing Lubri	cation	Servio	e perform	ance 🔶
Driver	n element	Screw	- 1	Folerance (class T	Г5
Type o	of Screw	Standard BSA		Preload	(01
nssen Type o	of nut	FEM-E-B	- S	Sealing	I	ip type
_						
≚ s⊦	hort stroke fact	or (t _s) 1	((f _w)	Tactor	1
Bearir distar	ng centre to ce nce (L _s)	ntre 1000		Lead of scr	rew (P) 1	10 -
Bearir distan	ng centre to ce nce (L _s)	ntre 1000 Shor	[mm] L w select Fv	Lead of scr tion	rew (P) 1	10 ▼ Vmax
Bearir distan d₀ N	ng centre to cen nce (L _s) Material numbe	ntre 1000 Show Direction of lead	[mm] L w select Fv [N]	Lead of scr tion C [N]	rew (P) 1	v _{max} [m/min]
Bearir distan do M 12 F	ng centre to ce nce (L _s) Material numb R1532 490 06	ntre 1000 Shor er Direction of lead R	[mm] L w select Fv [N] 50	Lead of scr tion [N] 3000	rew (P) 1 C0 [N] 3600	v _{max} [m/min] 60.0
do r 12 F 16 F	ng centre to ce nce (L _s) Material numbor R1532 490 06 R1502 040 83	ntre 1000 Show Pr of lead R R R	[mm] L w select Fv [N] 50 190	Lead of scr tion C [N] 3000 11500	rew (P) 1 C0 [N] 3600 12300 21200	V _{max} [m/min] 60.0 60.0
do P 12 F 20 F	ng centre to cen nce (L _s) Material number R1532 490 06 R1502 040 83 R1502 140 63 B1502 040 83	ntre 1000 Shor er Direction of lead R R R R	[mm] L w select Fv [N] 50 190 280 310	Lead of scr C [N] 3000 11500 16900	rew (P) 1 C0 [N] 3600 12300 21300 27000	Vmax [m/min] 60.0 60.0 60.0
Bearin distan 12 F 16 F 20 F 25 F	ng centre to cence (L _s) Material numbe R1532 490 06 R1502 040 83 R1502 140 63 R1502 240 83 R1502 340 84	ntre 1000 Show of lead R R R R R R R	[mm] L w select Fv [N] 50 190 280 310 630	Linead of scr tion C [N] 3000 11500 16900 18800 38000	CO [N] 3600 12300 21300 27000 58300	Vmax [m/min] 60.0 60.0 60.0 60.0 60.0 46.8
Bearin distar 12 F 16 F 20 F 25 F 32 F	ng centre to cence (L _s) Material numbe R1532 490 06 R1502 040 83 R1502 140 63 R1502 240 83 R1502 340 84 R1502 440 83	ntre 1000 Shor er Oflead R R R R R R R R R	[mm] L w select Fv [N] 50 190 280 310 630 1000	Lion C [N] 3000 11500 16900 18800 38000 60000	CO [N] 3600 12300 21300 27000 58300 86400	Vmax [m/min] 60.0 60.0 60.0 60.0 60.0 46.8 37.8
Bearin distan	ng centre to cence (L _s) Material number R1532 490 06 R1502 140 63 R1502 140 63 R1502 240 83 R1502 340 84 R1502 440 63	ntre 1000 Shor er Direction of lead R R R R R R R R L	[mm] L w select Fv [N] 50 190 280 310 630 1000 1000	Lion C [N] 3000 11500 16900 18900 38000 60000 60000	CO [N] 3600 12300 21300 27000 58300 86400 86400	Vmax [m/min] 60.0 60.0 60.0 60.0 46.8 37.8 37.8

- Unit end bearing: Specification of spindle ends or end bearing
- Lubrication: Calculation of lubrication interval and quantity
- Service Performance: Input data for service performance, or required lifetime

Calculation

- Automatic detection of critical speed and max. permissible axial load
- Automatic detection from short stroke (deselected)
- Automatic matching from limiting values (max. acceleration, max. velocity, ...)
- Notes at low load ratio

Show critical speed (See next page)

- Help
 - Shows the legend to description and information about the various load ratios

Quick-Guide Linear Motion Designer Critical speed

Depending on the position the critical speed can be read off the diagram. Thus in certain stroke ranges the permissible critical speed can be higher.

Quick-Guide Linear Motion Designer Result Screw Assembly - Spindle

Dynamics

Linear Motion Designer

Linear Motion Designer Version 3.1

Application

Unit end bearing

Standard BSA FEM-E-B 25x10 i=4

System dimensions

Runner block

Lubrication

System dimensio

Service performance

Screw Assembly

Nut

Selected nut

- Selection of a suitable bearing unit
 - Form and version are defined
- Selection form and version of the spindle ends
 - Details in the product catalogue
- Bearing centre to centre distance
 - Value from "system dimensions"
- **Minimum length**
 - The minimum bearing centre to centre distance calculated via stroke, length of the nut and nonusable spindle length
- Warning messages
 - Matching of the max. permissible drive torgue on the spindle journal
 - Matching of the load capacity of the end bearing < load capacity of the nut
- Help

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Result Runne

block

Process

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Project

Shows the legend to description and information about the various load ratios

Quick-Guide Linear Motion Designer Project

Linear Motion Designer	Designer Version 3.1						- ×	1	Documentation
Start Applicati	ion System dimensions Runner block	System dimensions Screw Assembly	Dynamics	Process	Result Runner block	Result Screw Assembly	Project		 Create a rtf-document (Print-out)
Customer			Project e	ngineer					
Company			Company					2	CAD
Street Address			Address						 Link to the configurator
Contact Phone			Contact Phone						
E-Mail			E-Mail						 Transferring the existing parameters to the configurator
			_					3	Online catalogue
Note / Addition Project name			Direct co Contact Phone	ntact					 Direct link to the calculated product at the online catalogue for additional information
			E-Mail						
								4	Request consultation
			1 •	ocumentation	3	Online cat	alog		 Mailbox of the technical design and support centre at Bosch-Beyroth Linear technology
			2	CAD	4	Request cons	ultation		centre at Bosen nexiotin Enteal technology
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Quick-Guide Linear Motion Designer General information, definitions

Zero point

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- Centerline between the runner blocks/bushings in X-direction
- Centerline between the guide rails/shafts in Y-direction
- On the top mounting surface plane in Z-direction

Rotation of the axis

• The coordinate system also rotates

Definition moving direction

Moving direction of the axis is always X-direction

System requirements at Profiled rails system

- Moving: Guide rails fixed; runner blocks are moving
- Mounting: Lateral retention for guide rails and runner blocks

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