Linear guides

Overview

CAD data on our website **www.isel.com**

Linear guides

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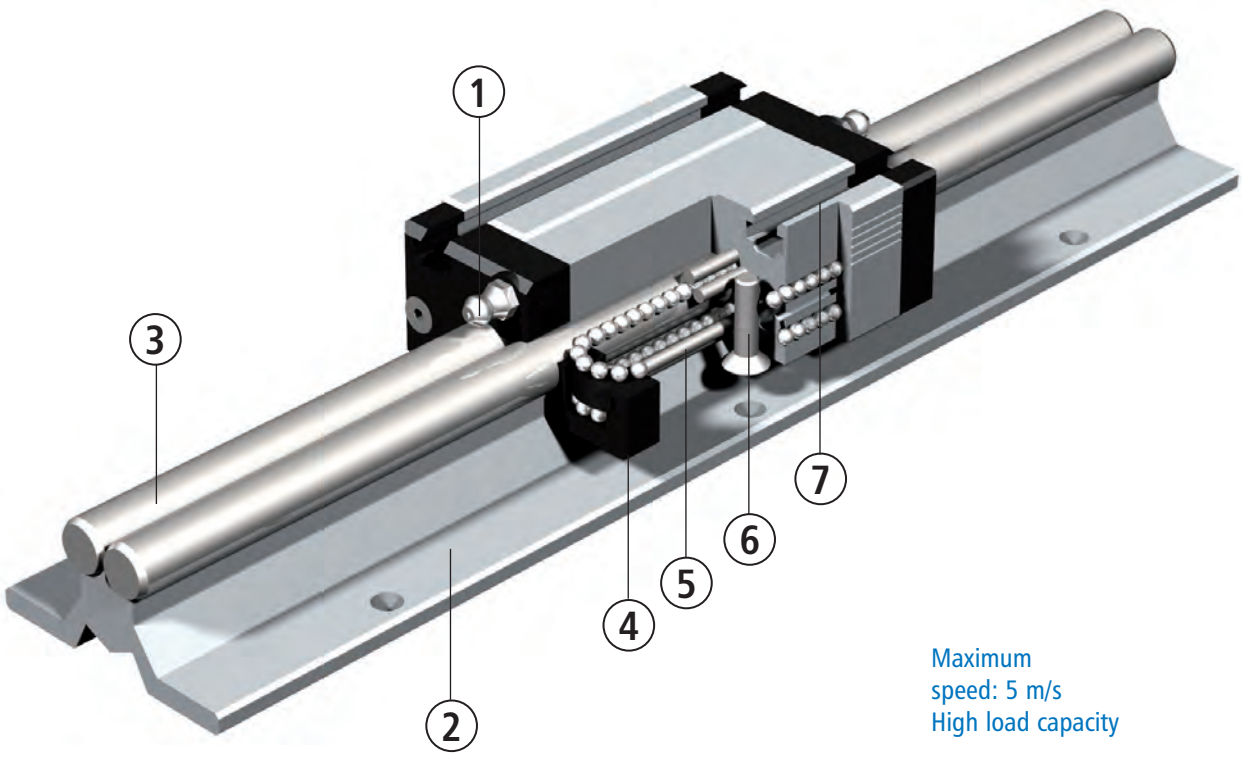
CAD data on our website **www.isel.com**

Linear guide slide function



Maximum
speed: 5 m/s
High load capacity

Aluminium shaft slides

The patented shaft slides are perfectly suited for assembling of complex multiple axis systems for handling and machining.

A wide range of models covers a multitude of applications.

All models can be produced to order with various profile lengths (70, 100, 150 and 200 mm).

1. Both sides greasing option for the recirculating balls.

2. The basic supports for all linear guides are extruded aluminium profiles to DIN EN 12020-2, which are provided with T-key inserts for fastening in the body of the profile or have fixing borings.

3. Precision steel shafts with a hardness of 60 ± 2 HRC are used as guide rails. All LFS-8 versions are optionally available with stainless steel shafts.

4. The recirculating ball steering is reinforced with glass fibre.

5. There are patented recirculating balls in the linear slides. Ball bearings run in each case between two ground steel pins and the guidance shaft.

6. The slide is adjusted with self-locking setting screws. This is how the rows of balls and shafts or pins are used with each other and thus pre-stressed. The slides are preset in the factory to the correct stress. All shaft slides are optinally available stainless.

7. To secure transport loads, slide plates, etc., the shaft slides are provided with T-key inserts or fixing borings.

General notes

Load capacity and working life

Installation position

In principal, the installation position for linear guides can be chosen anywhere. You merely have to consider whether all the forces and moments arising are below the maximum values for the relevant axes.

Temperatures

All linear guides are designed for continuous operation at ambient temperatures of up to 60 °C. In short-term operation, maximum temperatures of 80 °C are permissible.

Linear guides are unsuitable for temperatures below freezing.

Straightness/Warping

The aluminium profiles used are extruded profiles, which exhibit divergences from straightness and may be warped, owing to the manufacturing process.
The tolerance of this deviation is set out in DIN EN 12020-2.
In the worst case, the linear guide deviations equal these limits, but typically they are lower.

In order to achieve the desired guidance accuracy, the guide must be aligned using shims or clamped to a bearing service machined to the corresponding accuracy. This achieves tolerances of at least 0.1 mm/1,000 mm.

Principles Load capacity and working life

The dimensioning of a linear guide is based on the load capacity of the individual elements. The load capacity is described by:

- the dynamic load factor C
- the static load factor C_0
- the static torques M_{0X}, M_{0Y} and M_{0Z}

The basis of the dynamic load factors according to DIN is a nominal working life of 100,000 m displacement path. Far East suppliers often quote load factors for a nominal working life of 50,000 m displacement path; this produces load factor figures which are approximately 20% higher than those according to DIN.

Dynamic load capacity

The fatigue characteristics of the material determine the dynamic load capacity. The working life - the fatigue period - also depends on:

- the stress on the linear guide
- the speed at which the linear guide moves
- the statistical randomness of the first damage occurring

Useful life

Useful life means the working life actually achieved by a linear guide. The useful life may differ from the computed working life.

The following can lead to premature failure through wear or fatigue:

- Misalignments between guide rails or guidance elements
- Contamination of the guide rails
- insufficient lubrication
- oscillating motion with very small lifts (formation of grooves)
- Vibrations at rest (formation of grooves)

Owing to the multiplicity of installation and operating relationships, it is impossible to determine the useful life of a linear guide exactly in advance. The safest way to make an accurate estimate of the useful life is, as before, a comparison with similar installations.

mechanics

Linear guide rails

LFS-8-1
LFS-8-2

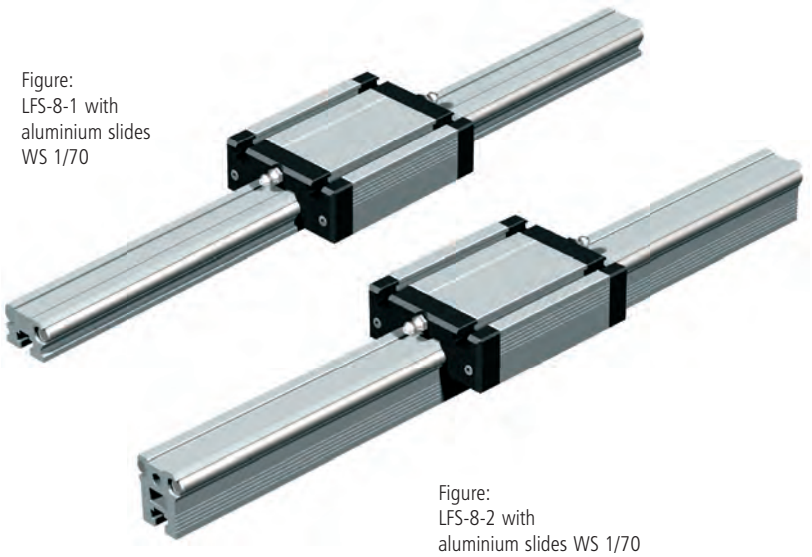


Figure:
LFS-8-1 with
aluminium slides
WS 1/70

Figure:
LFS-8-2 with
aluminium slides WS 1/70

Features

- W 30 x H 20 mm (LFS-8-1)
  W 30 x H 32.5 mm (LFS-8-2)
- 2 precision steel shafts Ø 8
- Anti-twist lock
- Aluminium shaft housing profile, naturally anodised
- Fixing from below with M6 tapped rails in T-key insert
- Conditionally self-supporting
- Special lengths to order
- Weights: appr.1.6 kg/m (LFS-8-1)
  appr. 2.0 kg/m (LFS-8-2)

Options:
- stainless design
- drilled for M6 (LFS-8-1 only)

Ordering key

235 00X XXXX

LFS-8-1/standard = **0**
LFS-8-1/stainless = **1**
LFS-8-2/standard = **2**
LFS-8-2/stainless = **3**

Length in mm (in 100 mm raster)
e.g. **0029** = Length 298
0299 = Length 2998

Steel shaft length: Total length L - 3 mm

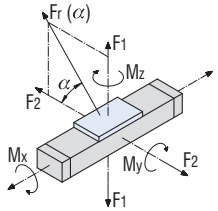
Profile up to 6,000 mm available without impact connection, steel shafts divided.

Load data

Shaft slide WS 1/70	
C_o	3114 N
C	1846 N
F_1 stat.	2659 N
F_1 dyn.	1576 N
F_2 stat.	3114 N
F_2 dyn.	1846 N
M_x stat.	37.3 Nm
M_y stat.	100.5 Nm
M_z stat.	117.6 Nm
M_x dyn.	22.1 Nm
M_y dyn.	59.5 Nm
M_z dyn.	69.7 Nm

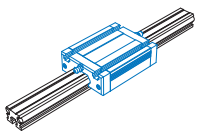
Shaft slide WS 1	
C_o	4590 N
C	2390 N
F_1 stat.	3920 N
F_1 dyn.	2041 N
F_2 stat.	4590 N
F_2 dyn.	2390 N
M_x stat.	55.0 Nm
M_y stat.	148.1 Nm
M_z stat.	173.4 Nm
M_x dyn.	28.6 Nm
M_y dyn.	77.1 Nm
M_z dyn.	90.2 Nm

Carriage LW 6	
C_o	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3792 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	121.1 Nm
M_y stat.	194.4 Nm
M_z stat.	97.2 Nm
M_x dyn.	106.3 Nm
M_y dyn.	170,6 Nm
M_z dyn.	180.0 Nm



$$Fr(\alpha) = \frac{F_2}{\cos \alpha}$$

$$Fr(\alpha) = \frac{F_1}{\sin \alpha}$$

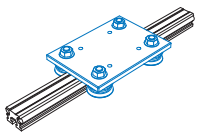


Aluminium slide

- With recirculating ball guide
- Clamping surface plane milled
- M6 T-key inserts
- Central lubrication option
- Adjustable for no play
- Option: stainless design

L 96 x W 72 x H 28.5 mm (WS 1/70)
(Weight: appr. 0.4 kg)
Part no.: **223100 0070**
Stainless steel: **223101 0070**

L 126 x W 72 x H 28.5 mm (WS 1)
(Weight: appr. 0.5 kg)
Part no.: **223100**
Stainless steel: **223101**



Carriage LW 6

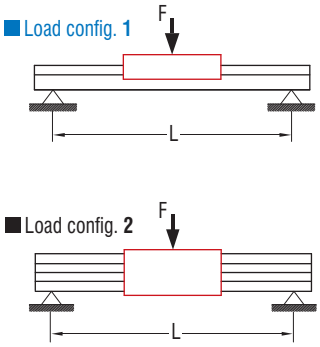
- L 125 × W 90 × H 7.7 mm
- ground steel plate
- 4 rollers Ø 31, sealed for life
- adjustable for no play
- Weight: appr. 1 kg

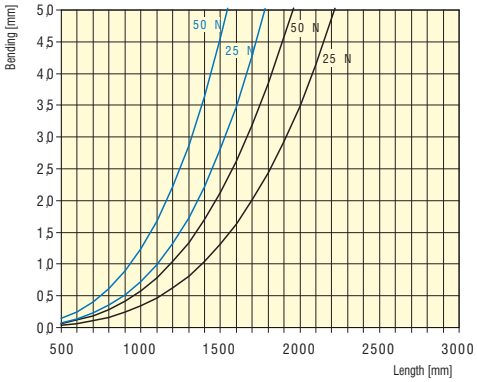
Part no.: **223011**

Linear guide rails

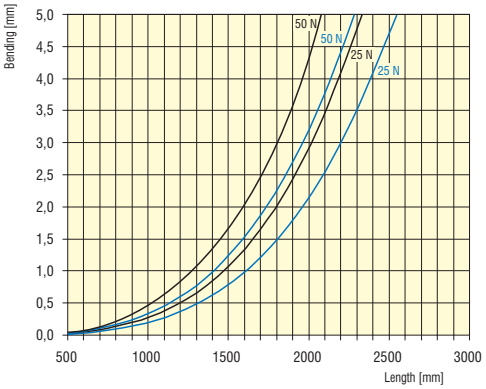
LFS-8-1
LFS-8-2

Bending



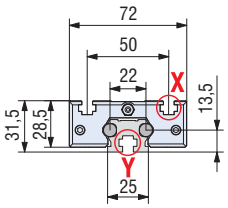


LFS-8-1

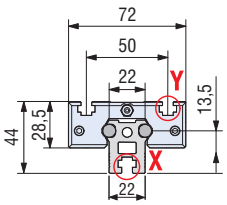


LFS-8-2

Dimensioned drawings

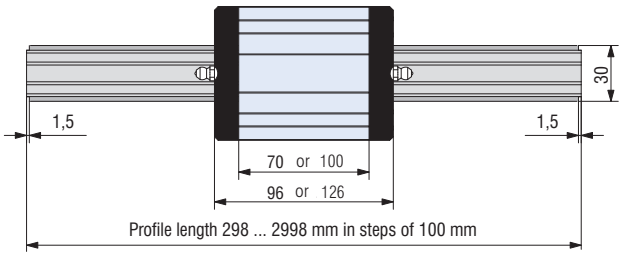


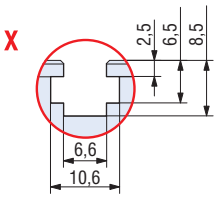
LFS-8-1

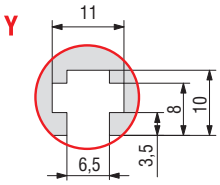


LFS-8-2

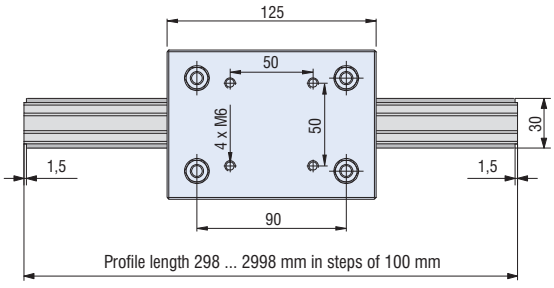
LFS-8-1 or **LFS-8-2** with aluminium slide **WS 1/70** or **WS 1**

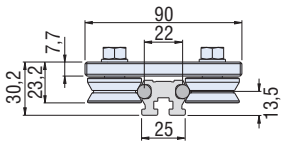




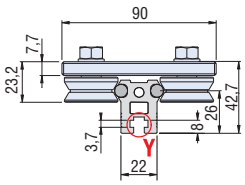


LFS-8-1 or **LFS-8-2** with carriage **LW 6**





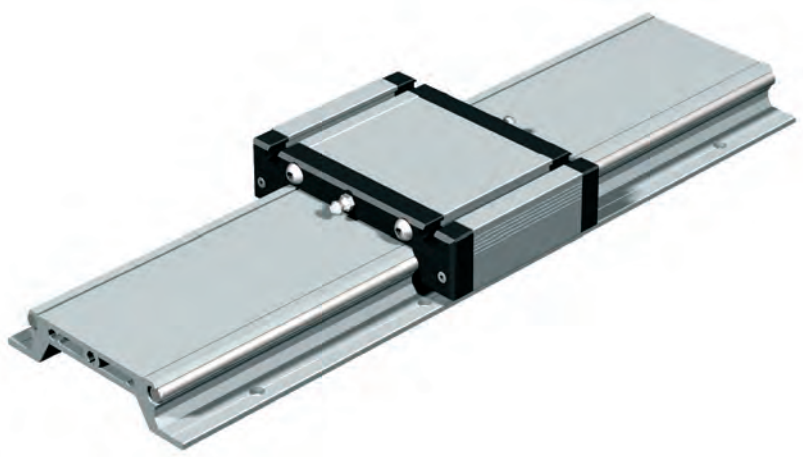
LFS-8-1



LFS-8-2

Linear guide rail

LFS-8-3



Features

- W 115 × H 25.5 mm
- 2 precision steel shafts Ø 8
- Particularly resistant to twisting
- Aluminium shaft housing profile, naturally anodised
- Fixing from above through M6 drillings in the raster 100 mm
- Conditionally self-supporting
- Special lengths to order
- Weight: appr. 3.2 kg/m
- Option: stainless design

Ordering key

235 00X XXXX

Standard = **4**
Stainless = **5**

Length in mm (in 100 mm raster)
e.g. **0029** = Length 296
0299 = Length 2996

Steel shaft length: Length overall L -1 mm

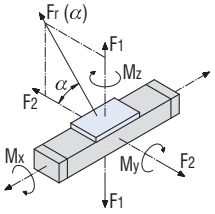
Profile up to 6000 mm available without impact link, steel shafts divided.

Load data

Shaft slide WS 3/70	
C_o	3141 N
C	1879 N
F_1 stat.	2682 N
F_1 dyn.	1604 N
F_2 stat.	3141 N
F_2 dyn.	1879 N
M_x stat.	115.7 Nm
M_y stat.	105.3 Nm
M_z stat.	123.3 Nm
M_x dyn.	69.2 Nm
M_y dyn.	62.9 Nm
M_z dyn.	73.7 Nm

Shaft slide WS 3	
C_o	6945 N
C	3190 N
F_1 stat.	5931 N
F_1 dyn.	2724 N
F_2 stat.	6945 N
F_2 dyn.	3190 N
M_x stat.	255.9 Nm
M_y stat.	232.8 Nm
M_z stat.	272.5 Nm
M_x dyn.	117.5 Nm
M_y dyn.	106.9 Nm
M_z dyn.	125.1 Nm

Carriage LW 7	
C_o	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3792 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	246.8 Nm
M_y stat.	302.4 Nm
M_z stat.	151.2 Nm
M_x dyn.	216.7 Nm
M_y dyn.	265.4 Nm
M_z dyn.	280.0 Nm



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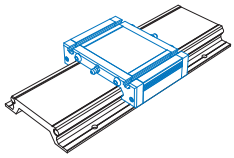
$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$

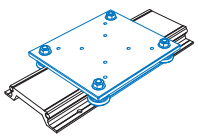


Aluminium slide

- With recirculating ball guide
- Clamping surface plane milled
- M6 T-key inserts
- Central lubrication option
- Adjustable for no play
- Option: stainless design

L 96 × W 130 × H 32 mm (WS 3/70)
(Weight: appr. 0.5 kg)
Part no.: **223103 0070**
Stainless steel: **223103 1070**

L 176 × W 130 × H 32 mm (WS 3)
(Weight: appr. 0.9 kg)
Part no.: **223103**
Stainless steel: **223103 1000**



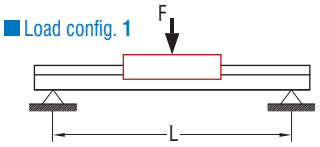
Carriage LW 7

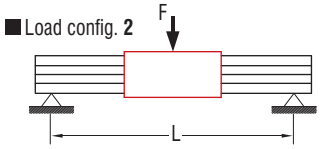
- L 175 × W 150 × H 7.5 mm
- ground steel plate
- 4 rollers Ø 31, sealed for life
- adjustable for no play
- Weight: appr. 2 kg

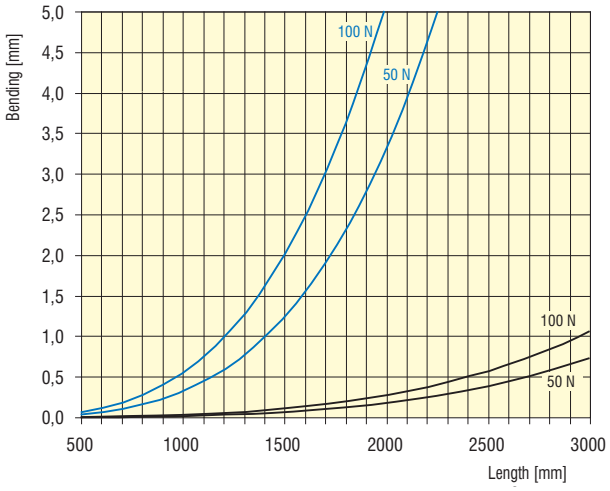
Part no.: **223012**

Linear guide rail LFS-8-3

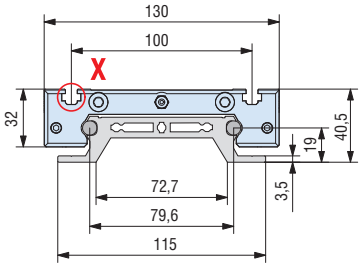
Bending

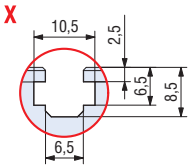




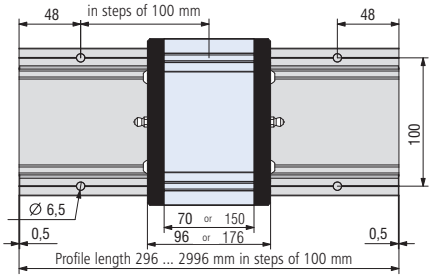


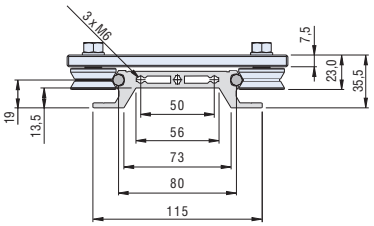
Dimensioned drawings



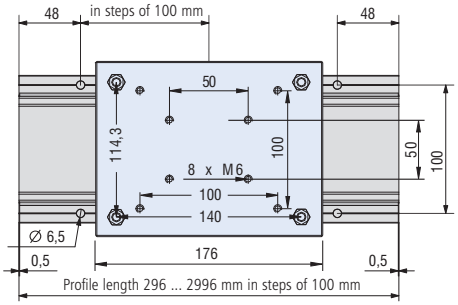


LFS-8-3 with aluminium slides **WS 3/70 or WS 3**





LFS-8-3 with carriage **LW 7**



Linear guide rail

LFS-8-4

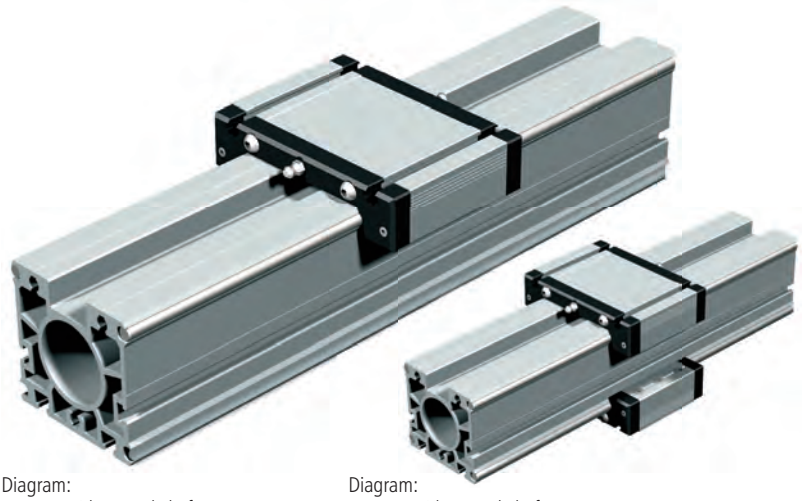


Diagram:
LFS-8-4 with 2 steel shafts
and an aluminium slide

Diagram:
LFS-8-4 with 4 steel shafts
and two aluminium slides (optional)

Features

- W 80 × H 80 mm
- 2 precision steel shafts Ø 8
- anti-twist
- Aluminium shaft housing profiles, naturally anodised
- Fixing from below with M6 tapped rails in the T-key inserts or in the head side through M8 drillings
- side T-key inserts for limit switch securing
- conditionally self-supporting
- Special lengths to order
- Weight: appr.7.2 kg/m
- Options: stainless design
  2 extra steel shafts
  2. slides or carriage

Ordering key

235 00X XXXX

Standard = **6**
Stainless = **7**

Length in mm (in 100 mm raster)
e.g. **0029** = Length 298
0299 = Length 2998

Steel shaft length: Length overall L -3 mm

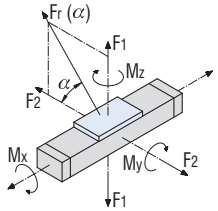
Profile up to 6000 mm available without impact link, steel shafts divided.

Load data

Shaft slide WS 3/70	
C_o	3141 N
C	1879 N
F_1 stat.	2682 N
F_1 dyn.	1604 N
F_2 stat.	3141 N
F_2 dyn.	1879 N
M_x stat.	115.7 Nm
M_y stat.	105.3 Nm
M_z stat.	123.3 Nm
M_x dyn.	69.2 Nm
M_y dyn.	62.9 Nm
M_z dyn.	73.7 Nm

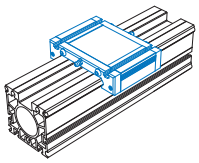
Shaft slide WS 3	
C_o	6945 N
C	3190 N
F_1 stat.	5931 N
F_1 dyn.	2724 N
F_2 stat.	6945 N
F_2 dyn.	3190 N
M_x stat.	255.9 Nm
M_y stat.	232.8 Nm
M_z stat.	272.5 Nm
M_x dyn.	117.5 Nm
M_y dyn.	106,9 Nm
M_z dyn.	125.1 Nm

Laufwagen LW 7	
C_o	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3792 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	246.8 Nm
M_y stat.	302.4 Nm
M_z stat.	151.2 Nm
M_x dyn.	216.7 Nm
M_y dyn.	265.4 Nm
M_z dyn.	280.0 Nm



$$Fr(\alpha) = \frac{F_2}{\cos \alpha}$$

$$Fr(\alpha) = \frac{F_1}{\sin \alpha}$$

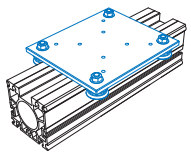


Aluminium slide

- Clamping surface plane milled
- M6 T-key inserts
- Central lubrication option
- adjustable for no play
- Option: stainless steel version

L 96 × W 130 × H 32 mm (WS 3/70)
(Weight: appr. 0.5 kg)
Part no.: **223103 0070**
Stainless steel: **223103 1070**

L 176 × W 130 × H 32 mm (WS 3)
(Weight: appr. 0.9 kg)
Part no.: **223103**
Stainless steel: **223103 1000**



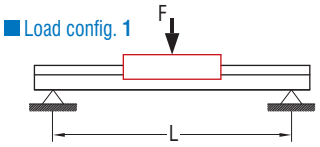
Carriage LW 7

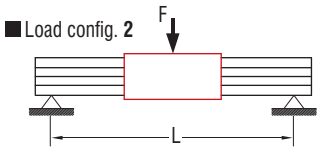
- L 175 × W 150 × H 7.5 mm
- ground steel plate
- 4 rollers Ø 31, sealed for life
- adjustable for no play
- Weight: appr. 2 kg

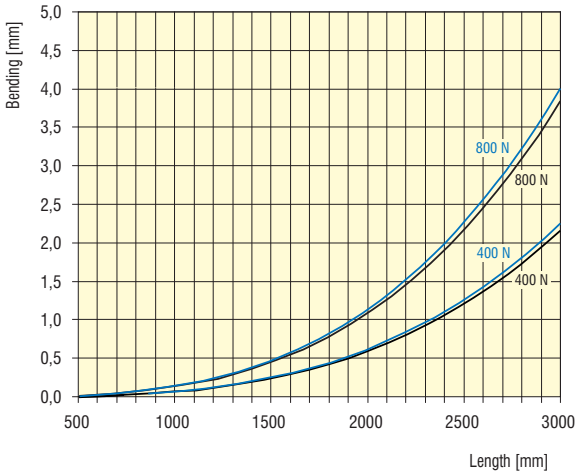
Part no.: **223012**

Linear guide rail LFS-8-4

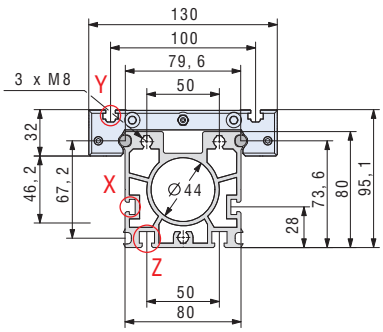
Bending



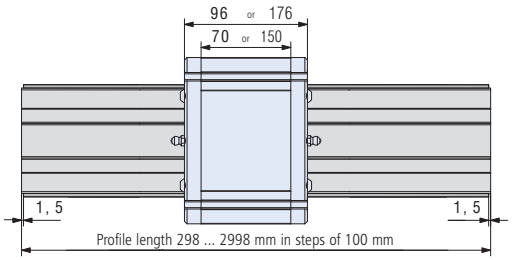




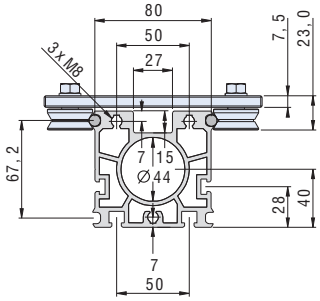
Dimensioned drawings

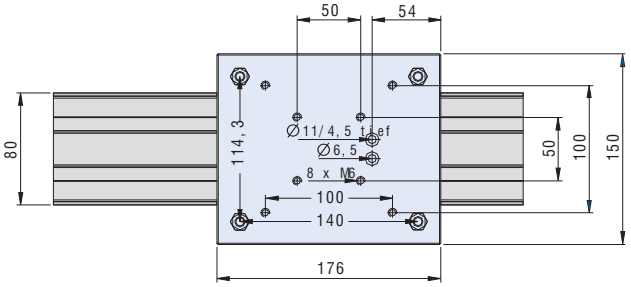


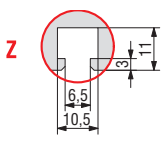
LFS-8-4 with aluminium slide WS 3/70 or WS 3



LFS-8-4 with carriage LW 7







mechanics

Linear guide rail

LFS-12-1

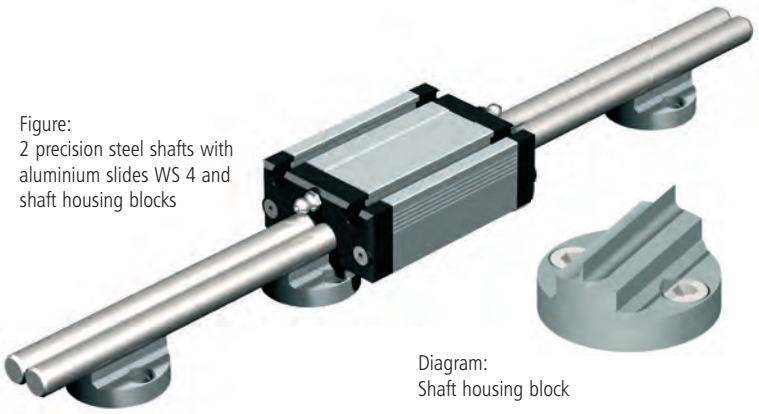


Figure:
2 precision steel shafts with aluminium slides WS 4 and shaft housing blocks

Diagram:
Shaft housing block

Features

- W 40 × H 27 mm
- 2 precision steel shafts Ø 12
- anti-twist
- Aluminium shaft housing blocks
- Securing from above or below with M6 drillings in the housing blocks
- Guide any length up to 3m
- Special lengths to order
- Weight: appr. 1.9 kg/m

Ordering key

227 312 XXXX

Length in mm (in 100 mm raster)
e.g. **0298** = Length 298
2998 = Length 2998

Special lengths to order

N.B.!
The part no. refers to one steel shaft only

Load data

Shaft slide WS 4/70	
C_0	3003 N
C	1873 N
F_1 stat.	2821 N
F_1 dyn.	1599 N
F_2 stat.	3303 N
F_2 dyn.	1873 N
M_x stat.	29.8 Nm
M_y stat.	105.3 Nm
M_z stat.	123.3 Nm
M_x dyn.	16.8 Nm
M_y dyn.	59.7 Nm
M_z dyn.	69.9 Nm

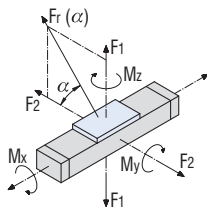
Shaft slide WS 4	
C_0	4868 N
C	2426 N
F_1 stat.	4157 N
F_1 dyn.	2071 N
F_2 stat.	4868 N
F_2 dyn.	2426 N
M_x stat.	43.9 Nm
M_y stat.	155.2 Nm
M_z stat.	181.7 Nm
M_x dyn.	21.8 Nm
M_y dyn.	77.3 Nm
M_z dyn.	90.5 Nm

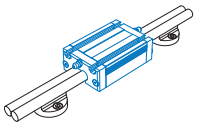
Steel slide LS 1	
C_0	3508 N
C	2105 N
F_1 stat.	3549 N
F_1 dyn.	2130 N
F_2 stat.	3508 N
F_2 dyn.	2105 N
M_x stat.	36.2 Nm
M_y stat.	129.0 Nm
M_z stat.	127.5 Nm
M_x dyn.	21.7 Nm
M_y dyn.	77.4 Nm
M_z dyn.	76.5 Nm

Carriage LW 8	
C_0	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3846 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	109.5 Nm
M_y stat.	194.4 Nm
M_z stat.	97.2 Nm
M_x dyn.	97.4 Nm
M_y dyn.	173.0 Nm
M_z dyn.	180.0 Nm

$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$



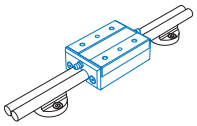


Aluminium slides

- Clamping surface plane milled
- Weight: appr. 0.3 kg
- Option: stainless design

L 94 x W 62 x H 31.5 mm (WS 4/70)
Part no.: 223104 0070
stainless steel: **223104 1070**

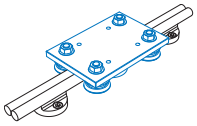
L 124 x W 62 x H 31.5 mm (WS 4)
Part no.: **223104**
Stainless: **223104 1000**



Steel slide LS 1

L 91 × W 60 × H 32 mm
- Clamping surface ground
- Weight: appr. 0.8 kg

Part no.: **223006**



Carriage LW 3

L 125 × W 85 × H 7.7 mm
- ground steel plate
- Weight: appr. 0.9 kg

Part no.: **223008**

Shaft housing blocks

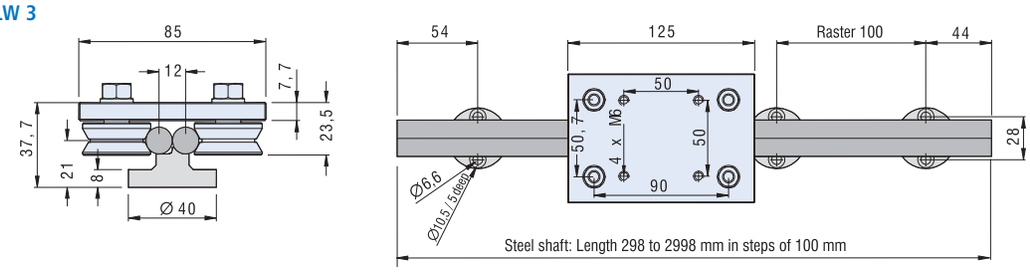
- Ø 40 mm, hole spacing 28 mm
- Cast zinc, VE 10 units

Part no.: **221501**

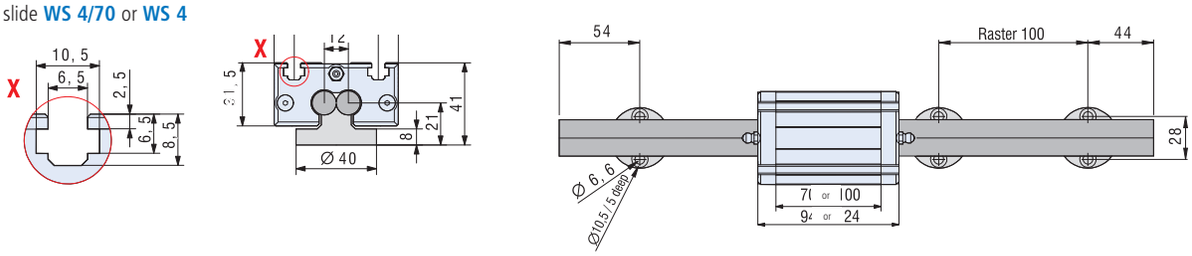
Linear guide rail LFS-12-1

Dimensioned drawings

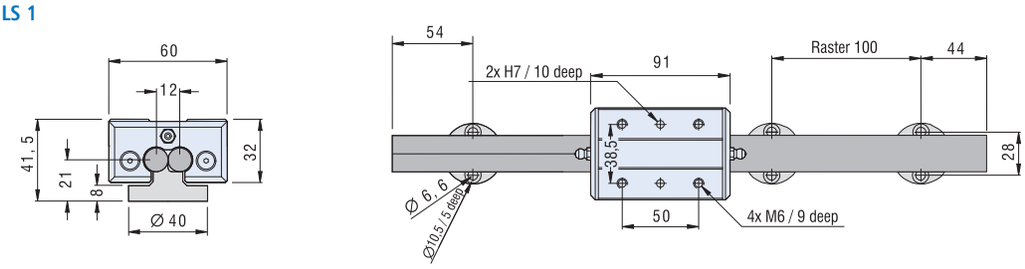
LFS-12-1 with Carriage **LW 3**



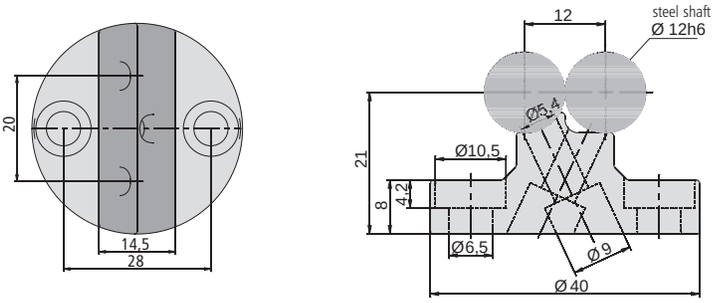
LFS-12-1 with
shaft slide **WS 4/70** or **WS 4**



LFS-12-1 with steel slide **LS 1**



Shaft housing block



mechanics

Linear guide rail

LFS-12-11

Features

- W 20 × H 31 mm
- Precision steel shaft Ø 12
- Aluminium shaft housing profile, naturally anodised
- Securing from below with M6 tapped rails in T-groove insert on flat surface
- Special lengths to order
- Weight: appr. 1.3 kg/m

Ordering key

220 002 XXXX

Length in mm
e.g. **0298** = Length 298
0998 = Length 998

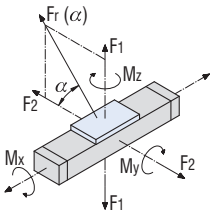
Profile length = Length overall L -2 mm

Loading data

Shaft slide WS 6/70	
C_o	3303 N
C	1873 N
F_1 stat.	2821 N
F_1 dyn.	1599 N
F_2 stat.	3303 N
F_2 dyn.	1873 N
M_x stat.	-
M_y stat.	105.3 Nm
M_z stat.	123.3 Nm
M_x dyn.	-
M_y dyn.	59.7 Nm
M_z dyn.	69.9 Nm

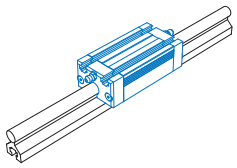
Shaft slide WS 6	
C_o	4868 N
C	2426 N
F_1 stat.	4157 N
F_1 dyn.	2071 N
F_2 stat.	4868 N
F_2 dyn.	2426 N
M_x stat.	-
M_y stat.	155.2 Nm
M_z stat.	181.7 Nm
M_x dyn.	-
M_y dyn.	77.3 Nm
M_z dyn.	90.5 Nm

Carriage LW 5	
C_o	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3846 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	-
M_y stat.	162.0 Nm
M_z stat.	81.0 Nm
M_x dyn.	-
M_y dyn.	144.2 Nm
M_z dyn.	150.0 Nm



$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$

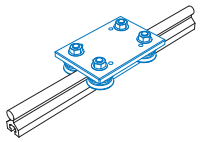


Aluminium slide

- With recirculating ball guide
- M6 T-groove inserts
- Central lubrication system option
- Adjustable for no play
- Option: stainless steel design

L 96 × W 50 × H 31.5 mm (WS 6/70)
(Weight: appr. 0.3 kg)
Part no.: **223106 0070**
Stainless steel: **223106 1070**

L 126 × W 50 × H 31.5 mm (WS 6)
(Weight: appr. 0.5 kg)
Part no.: **223106**
Stainless steel: **223106 1000**



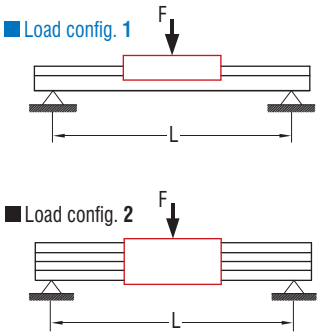
Carriage LW 5

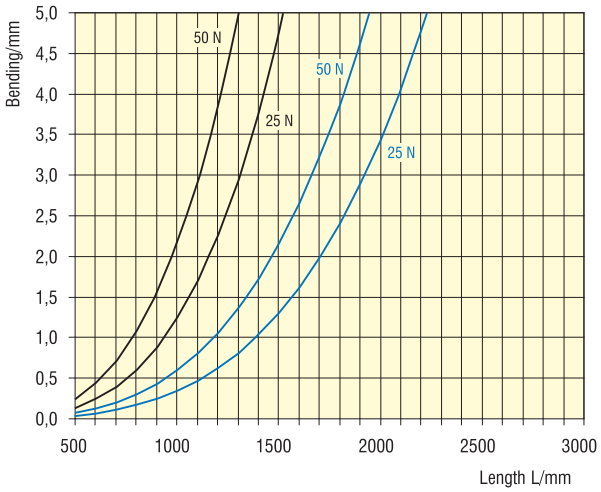
- L 110 × W 75 × H 7.7 mm
- ground steel plate
- 4 rollers Ø 31, sealed for life
- adjustable for no play
- Weight: 0.81 kg

Part no.: **223010**

Linear guide rail LFS-12-11

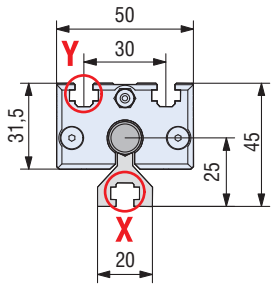
Bending

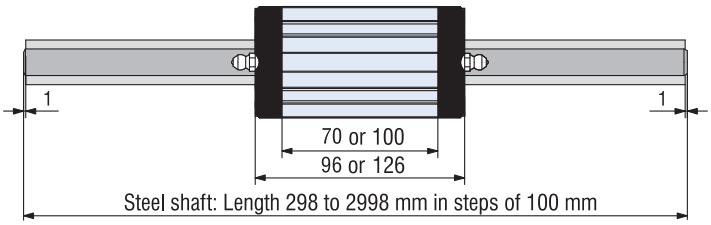


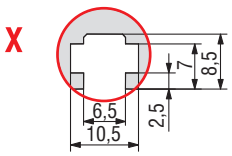


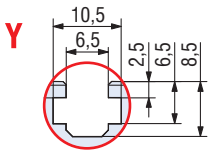
Dimensioned drawings

LFS-12-11 with aluminium slide **WS 6/70 or WS 6**

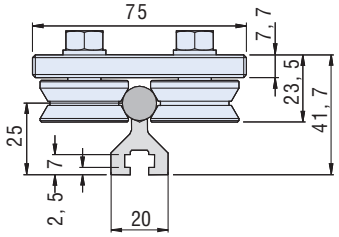


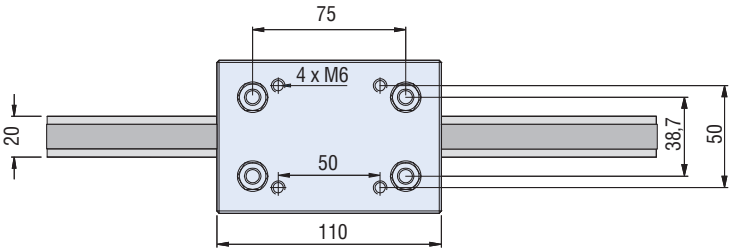






LFS-12-11 with Carriage **LW 5**





mechanics

Linear guide rail

LFS-12-2

Features

- W 62 × H 31 mm
- 2 precision steel shafts Ø 12
- Anti-twist lock
- Aluminium shaft housing profile, naturally anodised
- High parallelism through patented shaft housing outline
- High guidance accuracy
- Securing from above or below using drillings Ø 6.5 in 100 mm raster on flat surface
- Lengths in 100 mm raster
- Max. length up to 2998 mm
- Special lengths to order
- Weight: appr. 3.3 kg/m

Ordering key

235 200 XXXX

Length in mm
e.g. **0298** = Length 298
0998 = Length 998

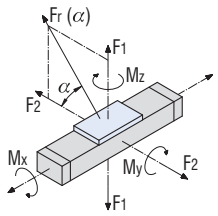
Profile length = Length overall L -2 mm

Loading data

Shaft slide WS 4/70	
C_0	3003 N
C	1873 N
F_1 stat.	2821 N
F_1 dyn.	1599 N
F_2 stat.	3303 N
F_2 dyn.	1873 N
M_x stat.	29.8 Nm
M_y stat.	105.3 Nm
M_z stat.	123.3 Nm
M_x dyn.	16.8 Nm
M_y dyn.	59.7 Nm
M_z dyn.	69.9 Nm

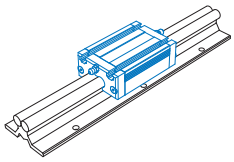
Shaft slide WS 4	
C_0	4868 N
C	2426 N
F_1 stat.	4157 N
F_1 dyn.	2071 N
F_2 stat.	4868 N
F_2 dyn.	2426 N
M_x stat.	43.9 Nm
M_y stat.	155.2 Nm
M_z stat.	181.7 Nm
M_x dyn.	21.8 Nm
M_y dyn.	77.3 Nm
M_z dyn.	90.5 Nm

Carriage LW 3	
C_0	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3846 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	109.5 Nm
M_y stat.	194.4 Nm
M_z stat.	97.2 Nm
M_x dyn.	97.4 Nm
M_y dyn.	173.0 Nm
M_z dyn.	180.0 Nm



$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$

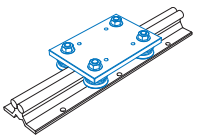


Aluminium slide

- With recirculating ball guide
- Clamping surface plane milled
- Option: stainless steel design

L 94 × W 62 × H 31.5 mm (WS 4/70)
(Weight: appr. 0.33 kg)
Part no.: **223104 0070**
Stainless steel: **223104 1070**

L 124 × W 62 × H 31.5 mm (WS 4)
(Weight: appr. 0.46 kg)
Part no.: **223104**
Stainless steel: **223104 1000**



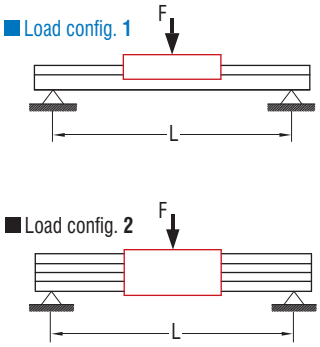
Carriage LW 3

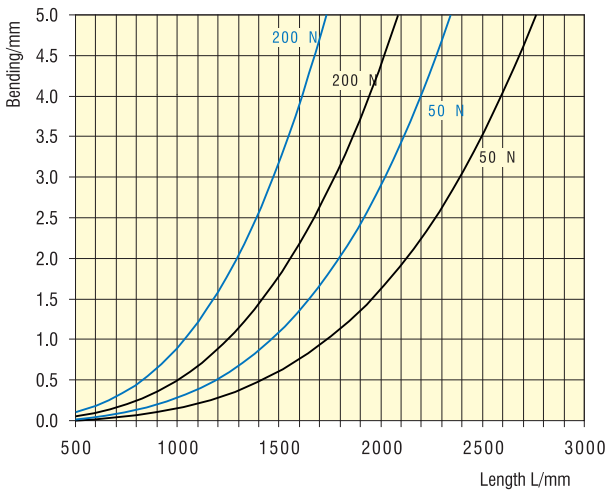
- L 125 × W 85 × H 7.7 mm
- ground steel plate
- Weight: 0.93 kg

Part no.: **223008**

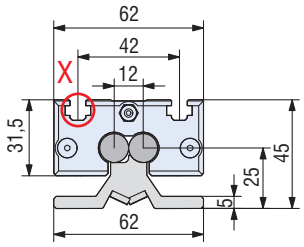
Linear guide rail LFS-12-2

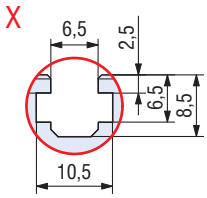
Bending



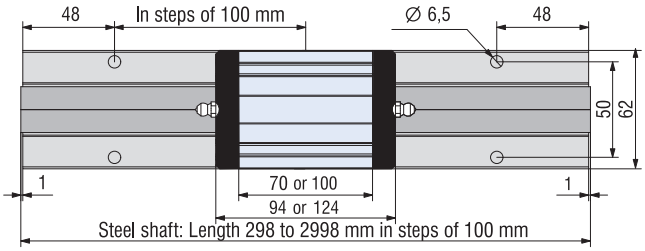


Dimensioned drawings

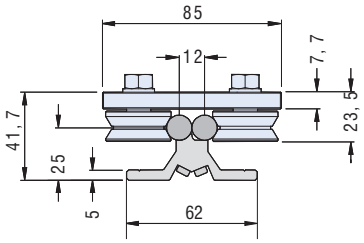


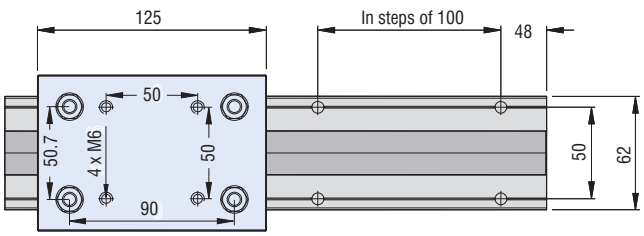


LFS-12-2 with aluminium slide **WS 4/70 or WS 4**



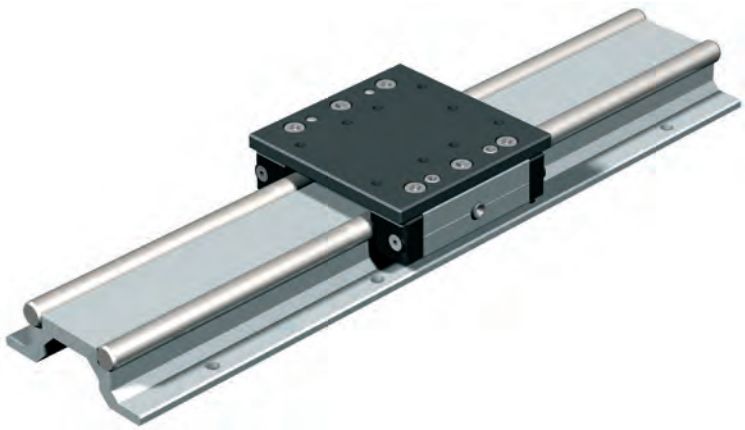
LFS-12-2 with Carriage **LW3**





Linear guide rail

LFS-12-3



Features

- W 90 × H 31 mm
- 2 precision steel shafts Ø 12
- anti-twist
- Aluminium shaft housing profile, naturally anodised
- increased shaft spacing allows higher torques to be absorbed
- Securing from above or below with M6 drillings in 100 mm raster
- Any guide length
- Weight: appr. 3.9 kg/m

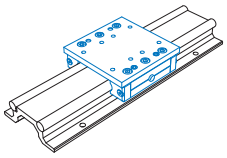
Ordering key

235 300 XXXX

Length in mm (in 100 mm raster)
e.g. **0029** = Length 298
0299 = Length 2998

Profile length = Length overall L -2 mm

Special lengths over 3000 mm with rod linkage to order.

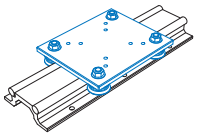


Slide

- ground steel plate
- central lubrication system option
- adjustable for no play

L 100 × W 100 × H 32 mm (WS 7/70)
(Weight: appr. 0.8 kg)
Part no.: **223107 0070**

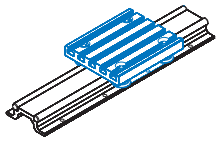
L 200 × W 100 × H 32 mm (WS 7)
(Weight: appr. 1.7 kg)
Part no.: **223107**



Carriage LW 8

- L 150 × W 125 × H 7.5 mm
- ground steel plate
- 4 rollers Ø 31, sealed for life
- adjustable for no play
- Weight: 1.51 kg

Part no.: **223013**



Carriage LW 2

- L 150 × W 125 × H 34.5 mm
- Aluminium T-groove plate
- 4 rollers Ø 31, sealed for life
- adjustable for no play
- Weight: 0.97 kg

Part no.: **223005**

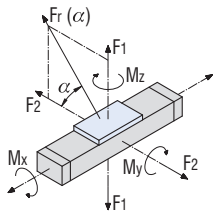
Loading data

Shaft slide WS 7/70	
C_o	3303 N
C	1873 N
F_1 stat.	2821 N
F_1 dyn.	1599 N
F_2 stat.	3303 N
F_2 dyn.	1873 N
M_x stat.	82.0 Nm
M_y stat.	105.3 Nm
M_z stat.	123.3 Nm
M_x dyn.	46.4 Nm
M_y dyn.	59.7 Nm
M_z dyn.	69.9 Nm

Shaft slide WS 7	
C_o	7303 N
C	3179 N
F_1 stat.	6237 N
F_1 dyn.	2715 N
F_2 stat.	7303 N
F_2 dyn.	3179 N
M_x stat.	181.2 Nm
M_y stat.	232.8 Nm
M_z stat.	272.5 Nm
M_x dyn.	78.8 Nm
M_y dyn.	101.3 Nm
M_z dyn.	118.6 Nm

Carriage LW 2	
C_o	3114 N
C	1846 N
F_1 stat.	2659 N
F_1 dyn.	1576 N
F_2 stat.	3114 N
F_2 dyn.	1846 N
M_x stat.	216.0 Nm
M_y stat.	100.5 Nm
M_z stat.	108.0 Nm
M_x dyn.	168.4 Nm
M_y dyn.	192.3 Nm
M_z dyn.	200.0 Nm

Carriage LW 8	
C_o	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3846 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	189.2 Nm
M_y stat.	248.4 Nm
M_z stat.	124.2 Nm
M_x dyn.	168.4 Nm
M_y dyn.	221.1 Nm
M_z dyn.	230.0 Nm

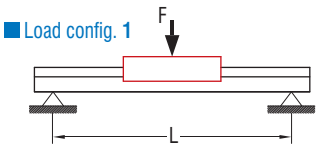


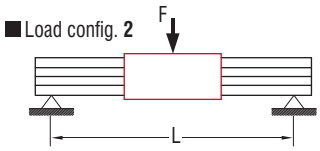
$$Fr(\alpha) = \frac{F_2}{\cos \alpha}$$

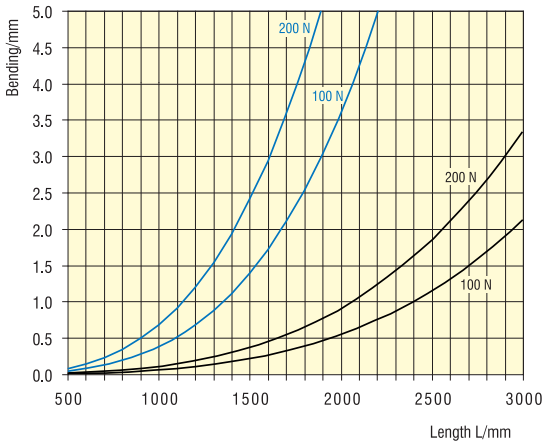
$$Fr(\alpha) = \frac{F_1}{\sin \alpha}$$

Linear guide rail LFS-12-3

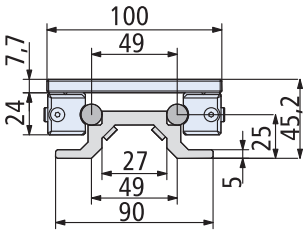
Bending



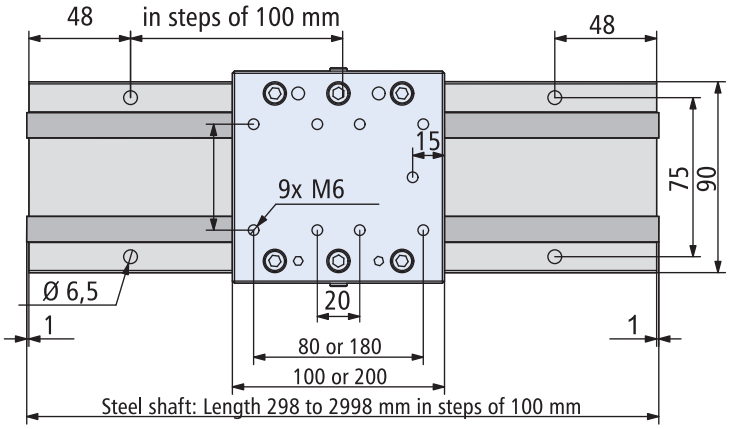


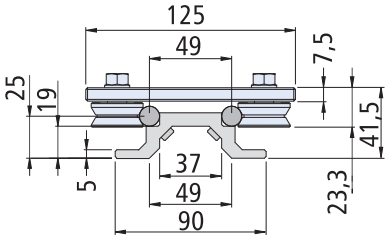


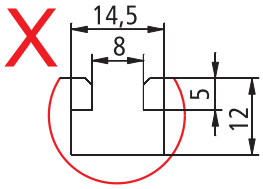
Dimensioned drawings

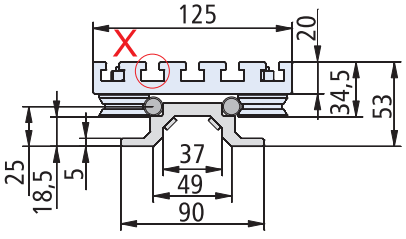


LFS-12-3 with aluminium slide **WS 7**

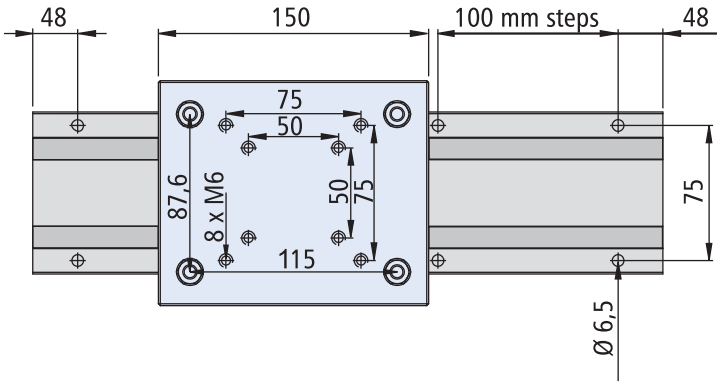




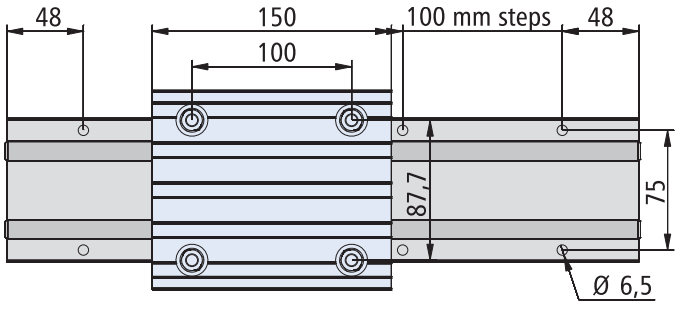




LFS-12-3 with Carriage **LW 8**

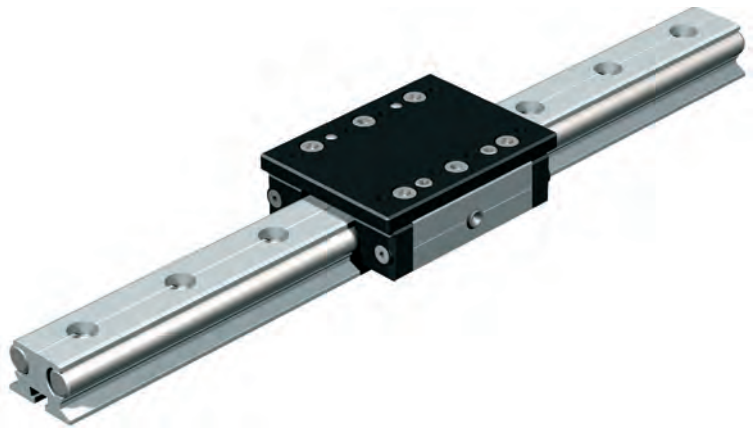


LFS-12-3 with Carriage **LW 2**



Linear guide rail

LFS-12-10



Features

- W 36 × H 24.5 mm
- 2 precision steel shafts Ø 12
- anti-twist
- Aluminium shaft housing profile, naturally anodised
- Fixing from below with M6 tapped rails in T-groove insert and from above M6 drillings in 50 mm raster
- conditionally freeloading
- Special lengths to order
- Weight: appr. 2.9 kg/m

Ordering key

220 001 XXXX

Length in mm (in 100 mm raster)
e.g. **0300** = Length 296
3000 = Length 2996

Profile length = Length overall L -1 mm

Special lengths over 3000 with rod linkage to order.

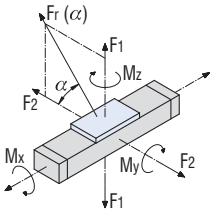
Loading data

Slide WS 8/70	
C_o	3303 N
C	1873 N
F_1 stat.	2821 N
F_1 dyn.	1599 N
F_2 stat.	3303 N
F_2 dyn.	1873 N
M_x stat.	46.7 Nm
M_y stat.	105.3 Nm
M_z stat.	123.3 Nm
M_x dyn.	26.4 Nm
M_y dyn.	59.7 Nm
M_z dyn.	69.9 Nm

Slide WS 8	
C_o	4868 N
C	2426 N
F_1 stat.	4157 N
F_1 dyn.	2071 N
F_2 stat.	4868 N
F_2 dyn.	2426 N
M_x stat.	68.8 Nm
M_y stat.	155.2 Nm
M_z stat.	181.7 Nm
M_x dyn.	34.2 Nm
M_y dyn.	77.3 Nm
M_z dyn.	90.5 Nm

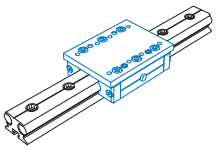
Carriage LW 4	
C_o	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3846 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	135.4 Nm
M_y stat.	194.4 Nm
M_z stat.	97.2 Nm
M_x dyn.	120.5 Nm
M_y dyn.	173,0 Nm
M_z dyn.	180.0 Nm

	Dual track set 1	Dual track set 2
C_o	645 N	1905 N
C	600 N	1125 N
F_1 stat.	652 N	1927 N
F_1 dyn.	607 N	1138 N
F_2 stat.	645 N	1905 N
F_2 dyn.	600 N	1125 N
M_x stat.	16.0 Nm	46.0 Nm
M_y stat.	13.0 Nm	119 Nm
M_z stat.	13.0 Nm	118 Nm
M_x dyn.	15.0 Nm	27.0 Nm
M_y dyn.	12.0 Nm	71.0 Nm
M_z dyn.	12.0 Nm	70.0 Nm



$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$

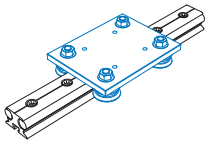


Slide

- ground steel plate
- lubrication system option
- adjustable for no play

L 100 × W 75 × H 31.5 mm (WS 8/70)
(Weight: appr. 0.7 kg)
Part no.: **223108 0070**

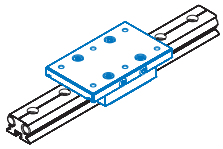
L 150 × W 75 × H 31.5 mm (WS 8)
(Weight: appr. 1.0 kg)
Part no.: **223108**



Carriage LW 4

- L 125 × W 97 × H 7.7 mm
- ground steel plate
- 4 rollers Ø 31, sealed for life
- adjustable for no play
- Weight: 1.02 kg

Part no.: **223009**



For steel shafts Ø 12 mm

Dual track set 1

- L75 x W75 x H30.2 mm
- with 2 SMALL linear ball bearings

Part no.: **223001**

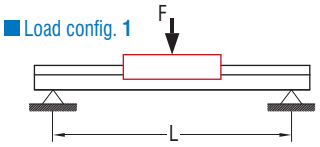
Dual track set 2

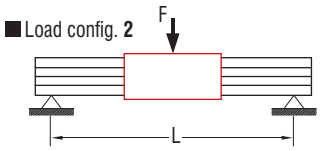
- L125 x W75 x H30.2 mm
- with 2 LARGE linear ball bearings

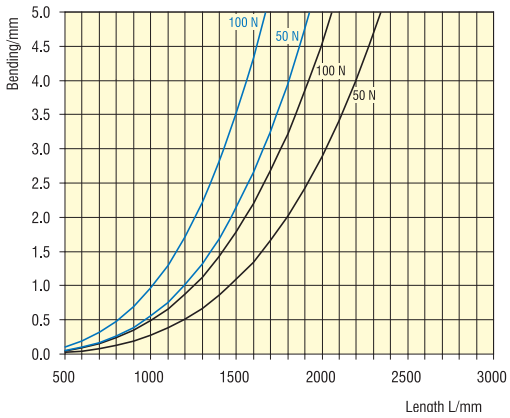
Part no.: **223002**

Linear guide rail LFS-12-10

Bending

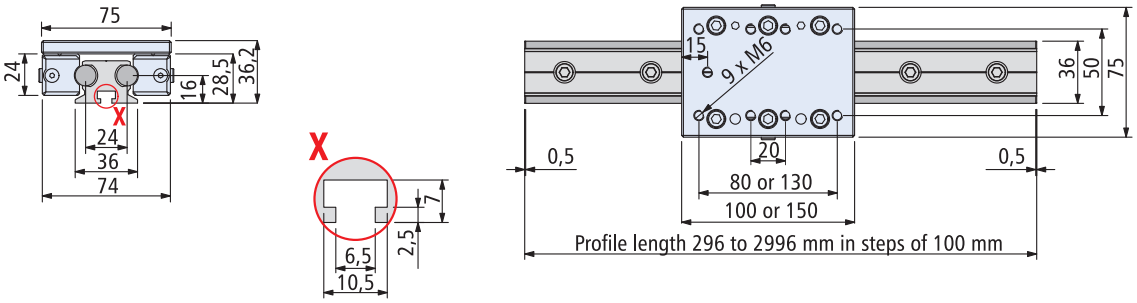




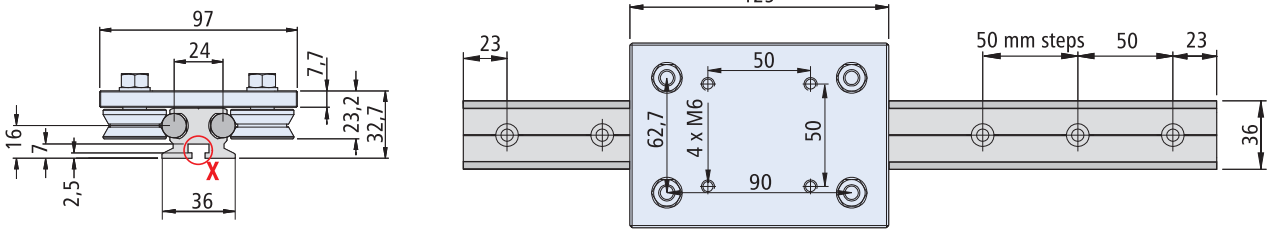


Dimensioned drawings

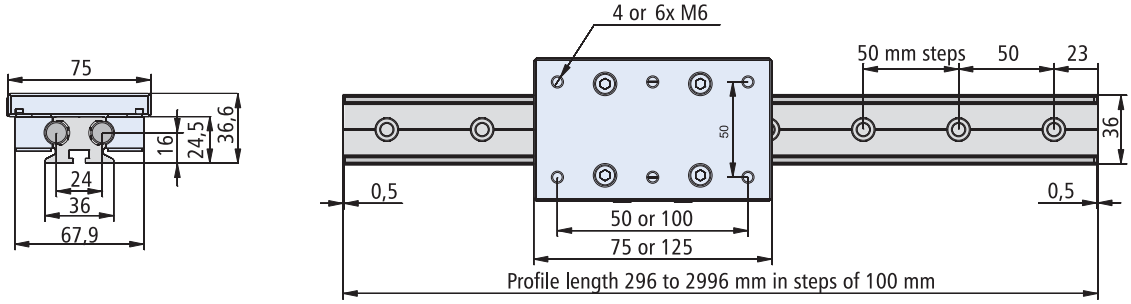
LFS-12-10 with slide **WS 8**



LFS-12-10 with Carriage **LW 4**



LFS-12-10 with dual track set



mechanics

Linear guide rail

LFS-16-2

Features

- W 25 × H 47.5 mm
- Precision steel shaft ∅ 16
- Aluminium shaft housing profile, naturally anodised
- Securing from below on flat surface with M6 tapped rails in T-groove insert
- not self-supporting
- Lengths in 100 mm raster
- max. Length 2998 mm
- Special lengths to order
- Weight: appr. 2.7 kg/m

Ordering key

220 004 XXXX

Length in mm (in 100 mm raster)
e.g. **0029** = Length 298
0299 = Length 2998

Profile length = Length overall L -2 mm
Special lengths to order

Loading data

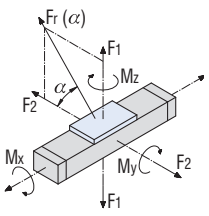
Carriage ILW 1	
C_0	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3897 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	-
M_y stat.	194.4 Nm
M_z stat.	97.2 Nm
M_x dyn.	-
M_y dyn.	175.3 Nm
M_z dyn.	180.0 Nm

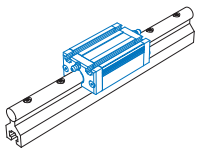
Slide IWS 1	
C_0	3286 N
C	1773 N
F_1 stat.	2806 N
F_1 dyn.	1514 N
F_2 stat.	3286 N
F_2 dyn.	1773 N
M_x stat.	--
M_y stat.	104.7 Nm
M_z stat.	122.6 Nm
M_x dyn.	--
M_y dyn.	56.4 Nm
M_z dyn.	66.1 Nm

Steel slide ILS 1	
C_0	5065 N
C	3238 N
F_1 stat.	4325 N
F_1 dyn.	2765 N
F_2 stat.	5065 N
F_2 dyn.	3238 N
M_x stat.	-
M_y stat.	113.4 Nm
M_z stat.	132.8 Nm
M_x dyn.	-
M_y dyn.	72.4 Nm
M_z dyn.	84.8 Nm

$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$

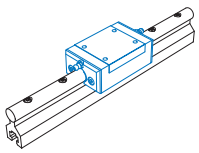




Aluminium slide IWS 1

- L 94 × W 55 × H 33.5 mm
- Clamping surface plane milled
- Weight: 0.32 kg
- Option: stainless steel design

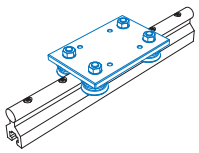
Part no.: **223220**
Stainless steel: **223220 0001**



Steel slide ILS 1

- L 94 × W 58 × H 33.7 mm
- Clamping surface ground
- Weight: 0.72 kg

Part no.: **223210**



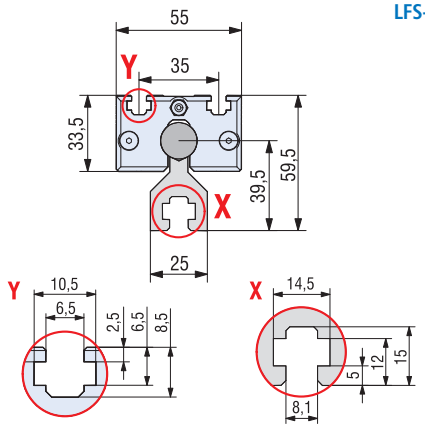
Carriage ILW 1

- L 125 × W 80 × H 7.7 mm
- ground steel plate
- Weight: 0.87 kg

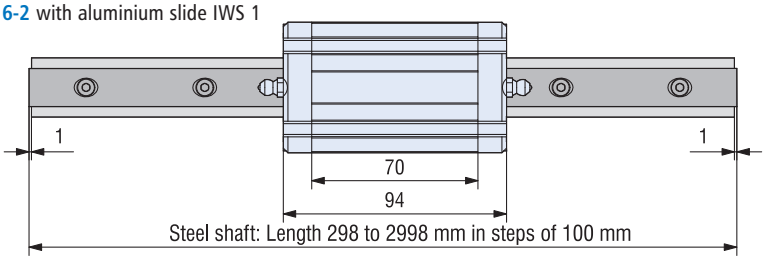
Part no.: **223230**

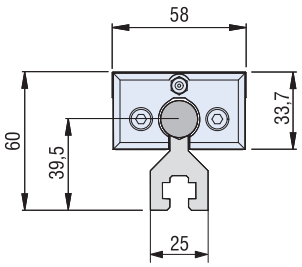
Linear guide rail LFS-16-2

Dimensioned drawings

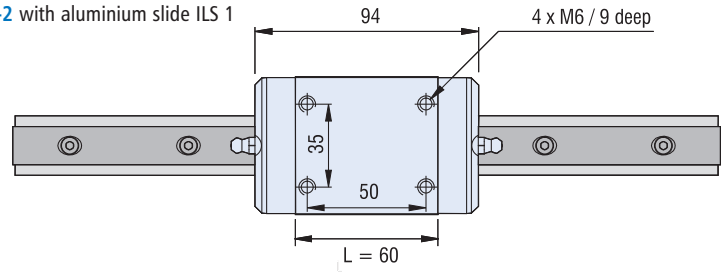


LFS-16-2 with aluminium slide IWS 1

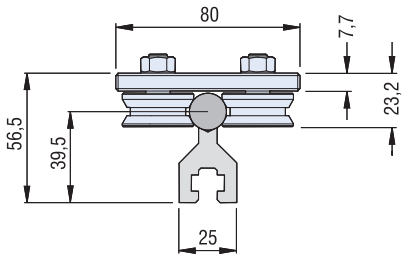


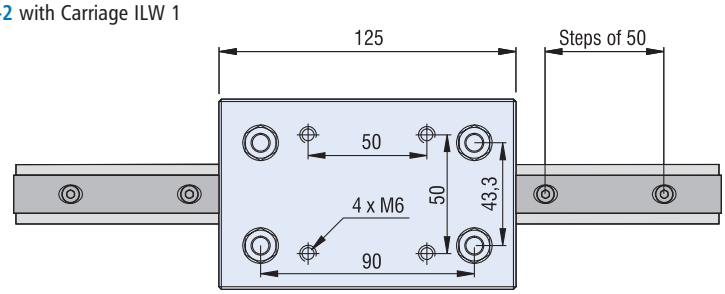


LFS-16-2 with aluminium slide ILS 1



LFS-16-2 with Carriage ILW 1

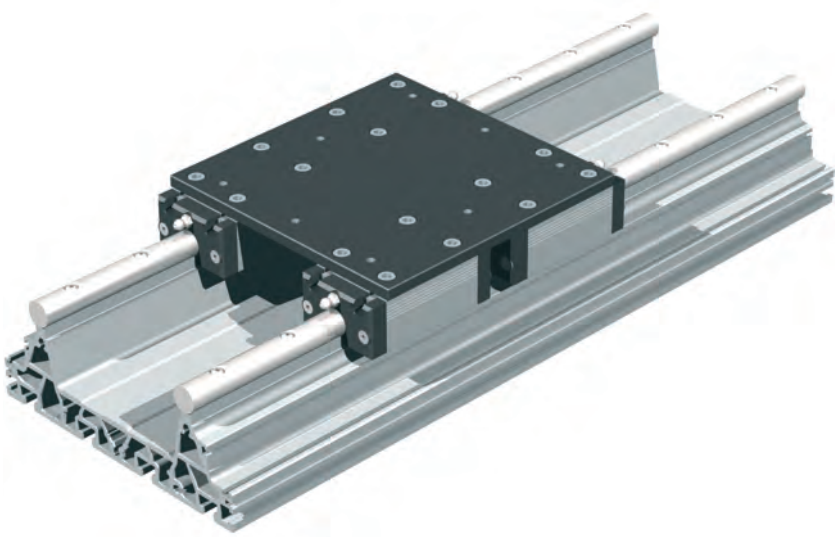




mechanics

Linear guide rail

LFS-16-120



Features

- W 190 × H 61 mm
- 2 precision steel shafts Ø 16
- anti-twist
- Aluminium shaft housing profile naturally anodised
- Securing from below with M6 tapped rails in T-groove profile
- conditionally not self-supporting
- Any guide length
- Weight: 10.2 kg/m

Ordering key

220 008 XXXX

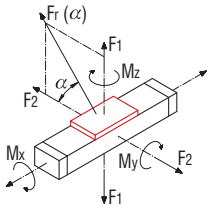
Length in mm (in 100 mm raster)
e.g. **0029** = Length 298
0299 = Length 2998

Profile length = Length overall L -2 mm
Special lengths to order

Loading data

$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$



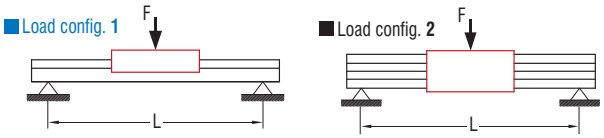
Unit with 2x IWS1	
C_0	4929 N
C	2660 N
F_1 stat.	4209 N
F_1 dyn.	2271 N
F_2 stat.	4929 N
F_2 dyn.	2660 N
M_x stat.	253 Nm
M_y stat.	147 Nm
M_z stat.	173 Nm
M_x dyn.	136 Nm
M_y dyn.	79 Nm
M_z dyn.	93 Nm

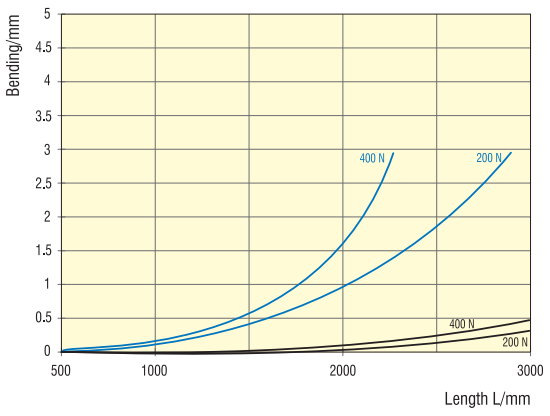
Unit with 2x ILS1	
C_0	7598 N
C	4857 N
F_1 stat.	6488 N
F_1 dyn.	4148 N
F_2 stat.	7598 N
F_2 dyn.	4857 N
M_x stat.	389 Nm
M_y stat.	195 Nm
M_z stat.	228 Nm
M_x dyn.	249 Nm
M_y dyn.	124 Nm
M_z dyn.	146 Nm

Unit with 4x IWS1	
C_0	6572 N
C	3546 N
F_1 stat.	5612 N
F_1 dyn.	3028 N
F_2 stat.	6572 N
F_2 dyn.	3546 N
M_x stat.	337 Nm
M_y stat.	309 Nm
M_z stat.	361 Nm
M_x dyn.	182 Nm
M_y dyn.	167 Nm
M_z dyn.	195 Nm

Unit with 4x ILS1	
C_0	10130 N
C	6476 N
F_1 stat.	8650 N
F_1 dyn.	5530 N
F_2 stat.	10130 N
F_2 dyn.	6476 N
M_x stat.	519 Nm
M_y stat.	476 Nm
M_z stat.	557 Nm
M_x dyn.	332 Nm
M_y dyn.	304 Nm
M_z dyn.	356 Nm

Bending

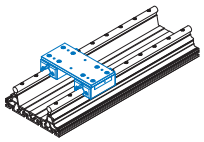




made by isel®

Linear guide rail LFS-16-120

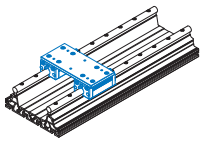
Slide unit
with 2 × steel slide
ILS 1 (kit)



- L 84 × W 178 × H 8 mm
- ground steel plate
- 2 x ILS 1,
  central lubrication option
- adjustable for no play
- Total weight: 2.30 kg

Part no.: **223240 0009**

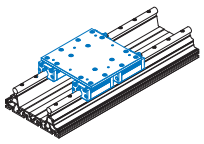
Slide unit
with 2 × aluminium slide
IWS 1 (kit)



- L 84 × W 178 × H 8 mm
- ground steel plate
- 2 × IWS 1,
  central lubrication option
- adjustable for no play
- Total weight: 1.50 kg

Part no.: **223240 0007**

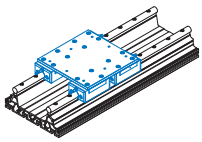
Slide unit
with 4 × aluminium slide
IWS 1 (kit)



- L 180 × W 178 × H 8 mm
- ground steel plate
- 4 × IWS 1,
  central lubrication option
- adjustable for no play

Part no.: **223240 0008**

Slide unit
with 4 × steel slide
ILS 1 (kit)

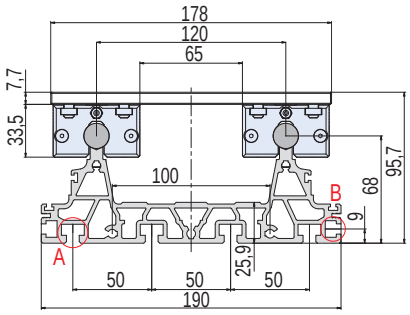


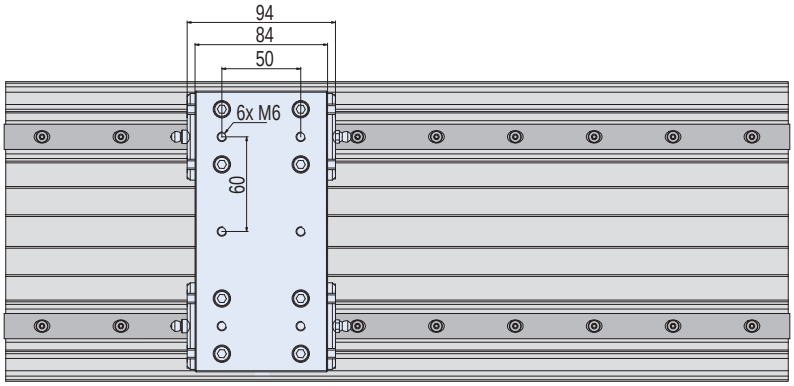
- L 180 × W 178 × H 8 mm
- ground steel plate
- 4 x ILS 1,
  central lubrication option
- adjustable for no play

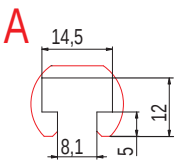
Part no.: **223240 0010**

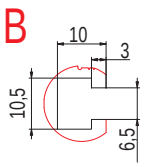
Dimensioned drawings

Aluminium slide IWS 1

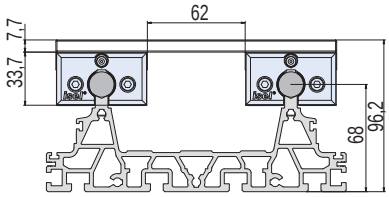


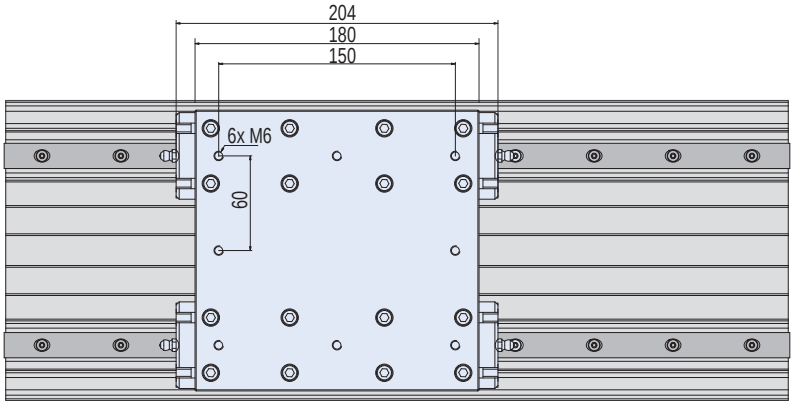






Steel slide ILS 1





mechanics

Linear guide

LFS-16-150

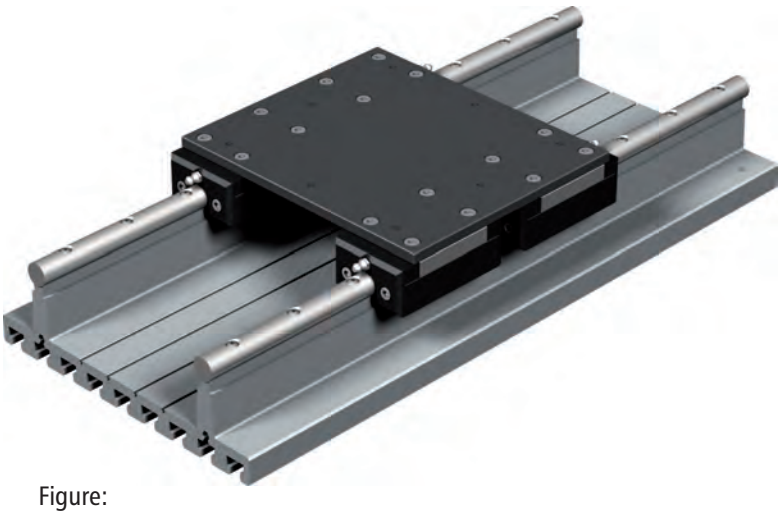


Figure:
Linear guide rail and 4 linear guide slide with slot plate

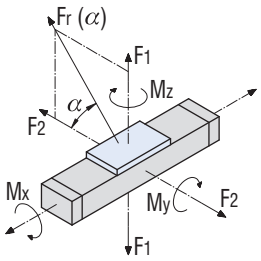
Loading data

Linear guide LFS-16-150 2 steel slide	
C_o	7598 N
C	4857 N
F_1 stat.	6488 N
F_1 dyn.	4148 N
F_2 stat.	7598 N
F_2 dyn.	4857 N
M_x stat.	486.6 Nm
M_y stat.	194.6 Nm
M_z stat.	227.9 Nm
M_x dyn.	311.1 Nm
M_y dyn.	124.4 Nm
M_z dyn.	145.7 Nm

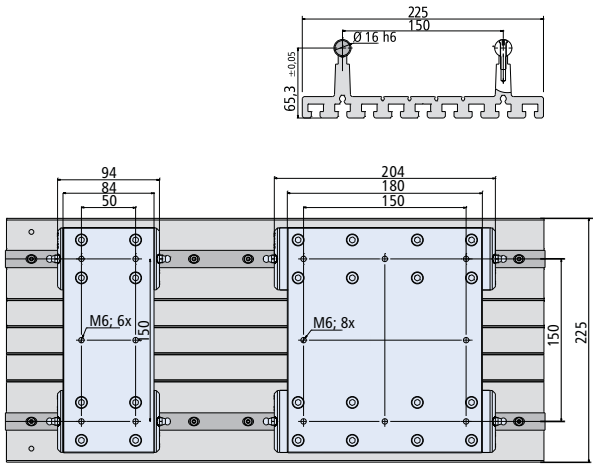
Linear guide LFS-16-150 4 steel slide	
C_o	10130 N
C	6476 N
F_1 stat.	8650 N
F_1 dyn.	5530 N
F_2 stat.	10130 N
F_2 dyn.	6476 N
M_x stat.	648.8 Nm
M_y stat.	475.8 Nm
M_z stat.	557.2 Nm
M_x dyn.	414.8 Nm
M_y dyn.	304.2 Nm
M_z dyn.	356.2 Nm

$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

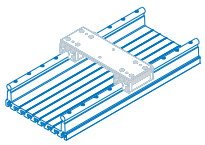
$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$



Dimensioned drawing



Linear guide rail LS-16-150



- 2 precision steel shafts Ø 16 mm
- Aluminium profile rail with T-groove inserts, raster 25 mm, anodised
- exact, shaft housing outline milled in a clamping fixture
- Conditionally freeloading
- Standard length 3 m, any number of segments
- Weight: 13.9 kg/m

Part no.: **220030 0099** (Length 1 m)
220030 0199 (Length 2 m)
220030 0299 (Length 3 m)

Option:
- Other lengths (longer or shorter)

Steel slide ILS 1

- Steel slide L 94 × W 58 × 33.7 mm
- 4 recirculating balls, adjustable for no play
- Grease nipple on front
- Weight: 0.7 kg

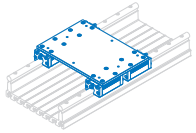
Part no.: **223210**

Aluminium slide IWS 1

- L 94 × W 55 × H 33.5 mm
- Clamping surface plane milled
- Weight: 0.32 kg
- Option: stainless steel design

Part no.: **223220**
Stainless steel: **223220 0001**

Aluminium slide IWS 1 with slot plate



- 2 or 4 linear guide slides
- Slot plate (ground steel)
- Adjustable for no play
- Weight: 2.5 kg or 5.1 kg

Part no.: **223240 0036** (2 slides)
223240 0037 (4 slides)

Linear guide

LFS-16-250

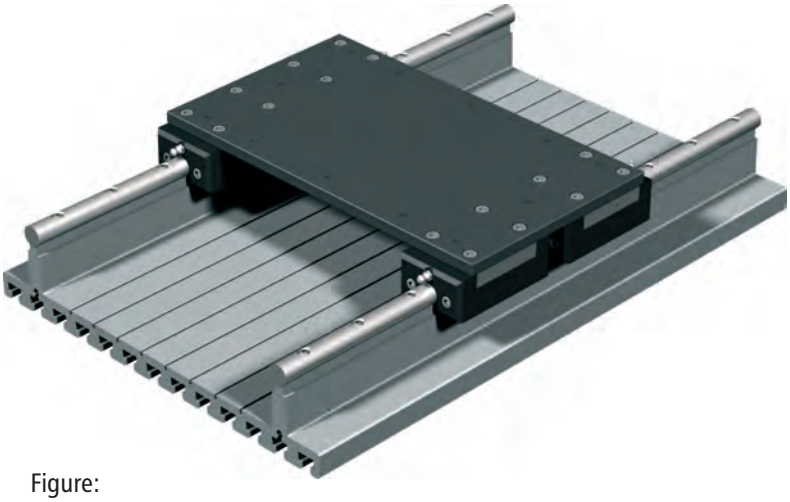


Figure:
Linear guide rail and 4 linear guide slide with slot plate

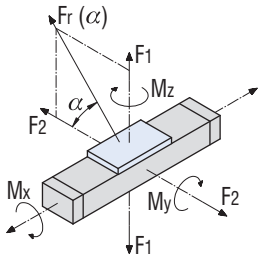
Loading data

Linear guide LFS-16-250 2 steel slide	
C_o	7598 N
C	4857 N
F_1 stat.	6488 N
F_1 dyn.	4148 N
F_2 stat.	7598 N
F_2 dyn.	4857 N
M_x stat.	810.9 Nm
M_y stat.	194.6 Nm
M_z stat.	227.9 Nm
M_x dyn.	518.4 Nm
M_y dyn.	124.4 Nm
M_z dyn.	145.7 Nm

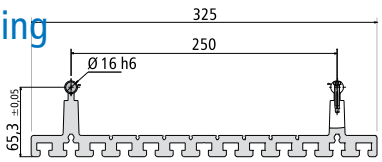
Linear guide LFS-16-250 4 steel slide	
C_o	10130 N
C	6476 N
F_1 stat.	8650 N
F_1 dyn.	5530 N
F_2 stat.	10130 N
F_2 dyn.	6476 N
M_x stat.	1081.3 Nm
M_y stat.	475.8 Nm
M_z stat.	557.2 Nm
M_x dyn.	691.3 Nm
M_y dyn.	304.2 Nm
M_z dyn.	356.2 Nm

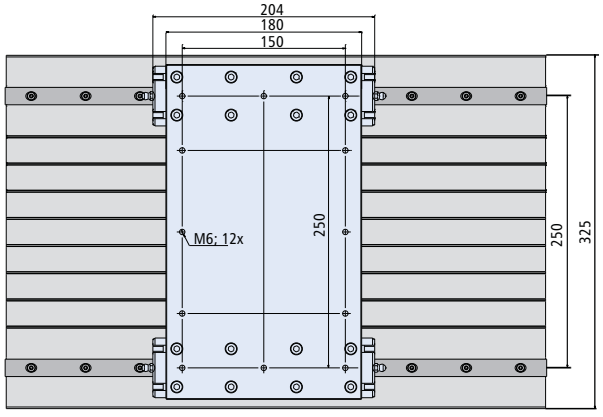
$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$

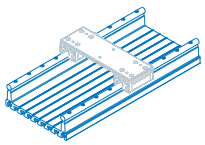


Dimensioned drawing





Linear guide rail LS-16-250



- 2 precision steel shafts Ø 16 mm
- Aluminium profile rail with T-groove inserts, raster 25 mm, anodised
- exact, shaft housing outline milled in a clamping fixture
- Conditionally not self-supporting
- Standard length 3 m, any number of segments
- Weight: 17.5 kg/m

Part no.: **220029 0099** (Length 1 m)
220029 0199 (Length 2 m)
220029 0299 (Length 3 m)

Option:
- Other lengths (longer or shorter)

Steel slide ILS 1

- Steel slide L 94 × W 58 × 33.7 mm
- 4 recirculating balls, adjustable for no play
- Grease nipple on front
- Weight: 0.7 kg

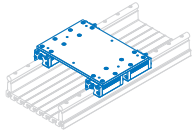
Part no.: **223210**

Aluminium slide IWS 1

- L 94 × W 55 × H 33.5 mm
- Clamping surface plane milled
- Weight: 0.32 kg
- Option: stainless steel design

Part no.: **223220**
Stainless steel: **223220 0001**

Aluminium slide IWS 1 with slot plate



- 2 or 4 linear guide slides
- Slot plate (ground steel)
- Adjustable for no play
- Weight: 3.5 kg or 7.0 kg

Part no.: **223240 0040** (2 slides)
223240 0041 (4 slides)

mechanics

Accessories

Tapped rails

M6 tapped rail
- 10 × 4 mm
- galvanised
- M6 Ra 50 mm
- VE 3 units at 1 m

Part no.: **209 011**

Sliding nuts

M6 sliding nut (Figure 1)
- L 25 × W 10 × H 3.5 mm
- galvanised
- VE 100 units
- all except PT/RE 40, 65

Part no.: **209 001 0005**

2 × M6 sliding nuts (Figure 2)
- L 45 × W 10 × H 3.5 mm
- galvanised
- VE 50 units
- for all except PT/RE 40, 65

Part no.: **209 002 0004**

2 × M6 sliding nuts (Figure 2)
- L 45 × W 13 × H 6 mm
- galvanised
- 2 × M6 Ra 25 mm
- VE 25 units
- for PT/RE 40, 65

Part no.: **209 005 0001**

Angle sliding nut
2 × M6 (Figure 3)
- galvanised
- VE 25 units
- for all except PT/RE 40, 65

Part no.: **209 021 0003**

Special angle sliding nut
3 × M6 (Figure 4)
- galvanised, VE 25 units
- for all except PT/RE 40, 65

Part no.: **209 022 0003**

Sliding nuts

M5 sliding nuts
- galvanised
- VE 20 units
- for all except PT25, PT 50, PS 200, RE 40 and RE 65 (Securing only possible from above)

with spring
Part no.: **209005 0002**
(M5/Figure 1)
Part no.: **209005 0003**
(M6/Figure 2)

with large chamfer
Part no.: **209005 0004**
(M6/Figure 3)

in rhombus shape
Part no.: **209005 0005**
(M5/Figure 4)
Part no.: **209005 0006**
(M6/Figure 5)

Linear ball bearing

For steel shafts Ø 12 mm

Linear ball bearing, **large**
- L80 × W20 × H19 mm, VE 2 units

Part no.: **222 002 0001**

Linear ball bearing, **medium**
- L60 × W20.5 × H17.8 mm, VE2 units

Part no.: **222 000**

Linear ball bearing, **small**
- L40 × W20 × H19 mm, VE 2 units

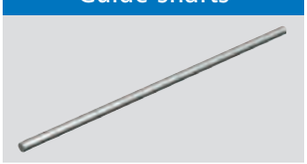
Part no.: **222 001**

Grease/grease gun

Grease
Part no.: **299 032 0002**

Impact press for grease and oil
Part no.: **299 032 0003**

Guide shafts



Guide shaft SF 12/SF 16
- Precision steel shafts Ø 12 or 16 mm, length 3 m
- Hardened and ground
- with M5 blind hole thread (SF12) or M6 (SF16) in 100 mm raster or with stepped bore for M4 (SF 12) or M5 (SF 16) in 100 mm raster

Part no.: **220019 0299**
(SF12, 3m, blind hole thread for M5)
Part no.: **220020 0299**
(SF12, 3m, stepped bore for M4)
Part no.: **220023 0299**
(SF16, 3m, stepped bore for M5)
Part no.: **220024 0299**
(SF16, 3m, blind hole thread for M6)

Rollers

Roller Ø 20 mm for SF 12
- with M4 tapped drilling
- VE 2 units

Part no.: **222 010**

Roller Ø 30 mm for SF 16
- with M6 tapped drilling
- VE 2 units

Part no.: **222 010 0003**

Rollers

Roller Ø 21 mm
- concentric
- VE 2 units

Part no.: **222 003**
- eccentric
- VE 2 units

Part no.: **222 004**

Roller Ø 31 mm
- concentric
- VE 2 units

Part no.: **222 006**
- eccentric
- VE 2 units

Part no.: **222 007**

Operating loads calculation

Effective loading calculation

Various factors affect the calculation of the loading of isel guides. This includes the position of the
C of G of the load, tensile and compressive forces, torques, load and acceleration forces.

For a linear bench on 4 bearings, the bearing forces are calculated according to the force application point for various load directions.

The calculation can also be applied to a slot configuration with 2 slide.

The dimension $L_L/2$ is used as the dimension L (see dimensioned drawings for the relevant guides).

The load factor in this case is $C_0/2$.

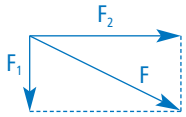
Combined load

If the load alignment of an element does not coincide with one of the main load directions, then the equivalent load is calculated:

$$P = |F_1| + |F_2|$$

If a force F and a torque M load an element simultaneously, then the dynamically equivalent load is:

$$P = |F| + |M| \cdot \frac{C_0}{M_{0(XYZ)}}$$



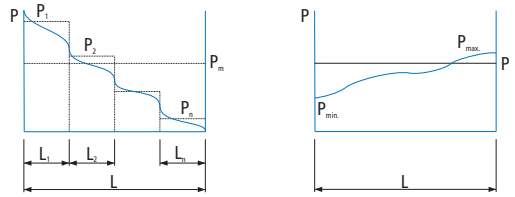
P [N]	dynamically equivalent load
F [N]	opposing force $= \sqrt{F_1^2 + F_2^2}$
F_1 [N]	vertical component see sketch (4)
F_2 [N]	horizontal component see sketch (4)
C_0 [N]	static load factor
M [Nm]	opposing torque
$M_{0(XYZ)}$ [Nm]	static torque in the direction of the opposing torque

According to DIN, the dynamically equivalent load should not exceed the value P = 0.5. C.

Equivalent load calculation

Operating conditions

A Incremental change **B** Uniform change



Equivalent load

$$P = \sqrt[3]{\frac{1}{L} \cdot (P_1^3 \cdot L_1 + P_2^3 \cdot L_2 + P_3^3 \cdot L_{3.....} + P_n^3 \cdot L_n)}$$

$$P = \frac{1}{3} \cdot (P_{min} + 2 \cdot P_{max})$$

P	dynamically equivalent load [N]
$P_{1...n}$	Individual load [N]
L	Total travel [m]
$L_{1...n}$	Individual travel [m]

P_{min}	smallest load [N]
P_{max}	largest load [N]

Static safety

Operating conditions	S_0
Normal motion	1.0 - 3.0
High speed	2.0 - 4.0
With impacts and vibration	3.0 - 5.0

$$S_0 = \frac{C_0}{P_0} = \frac{M_0}{M}$$

S_0	static load safety
C_0	static load factor [N]
P_0	statically equivalent bearing loading [N]
M_0	static loading torque [Nm]
M	equivalent static torque [Nm]

Nominal working life

The nominal working life is achieved or exceeded by 90% of an adequately large quantity of identical bearings, before the first signs of material fatigue become apparent.

$$L = \left(\frac{C}{P}\right)^3$$

$$L_h = \frac{833}{H \cdot n_{OSZ}} \cdot \left(\frac{C}{P}\right)^3$$

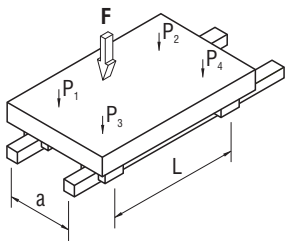
$$L_h = \frac{1666}{V} \cdot \left(\frac{C}{P}\right)^3$$

L [m]	nominal working life in units of 100,000 m
L_h [h]	nominal working life in hours run
C [N]	dynamic load factor
P [N]	dynamically equivalent load
H [m]	single stroke of the oscillating motion
n_{OSZ} [min]	Number of double strokes per minute
v [m/min]	average speed of movement

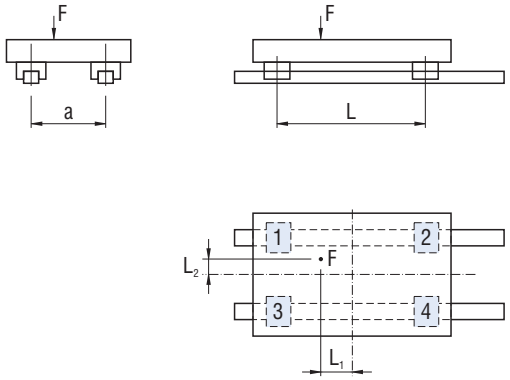
Operating loads calculation

Load vertically on the **bench surface**

Loading



Dimensioned figure



Load on a Carriage

$$P_1 = \frac{F}{4} + \frac{F \cdot L_1}{2L} + \frac{F \cdot L_2}{2a}$$

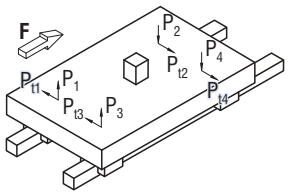
$$P_2 = \frac{F}{4} - \frac{F \cdot L_1}{2L} + \frac{F \cdot L_2}{2a}$$

$$P_3 = \frac{F}{4} + \frac{F \cdot L_1}{2L} - \frac{F \cdot L_2}{2a}$$

$$P_4 = \frac{F}{4} - \frac{F \cdot L_1}{2L} - \frac{F \cdot L_2}{2a}$$

Load in **direction of motion**

Loading



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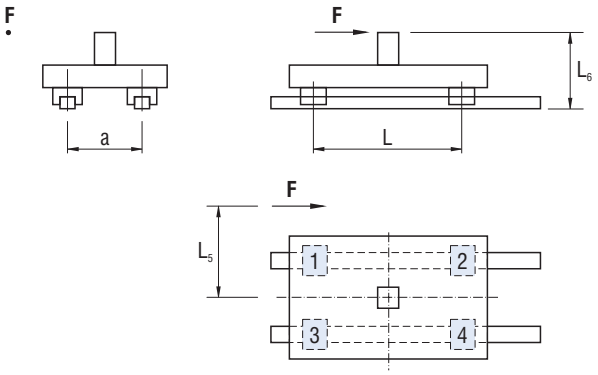


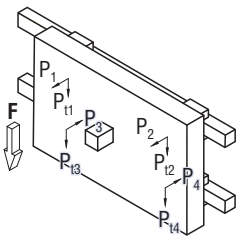
Load on a Carriage

$$P_1 \ldots P_4 = \frac{F \cdot L_6}{2L}$$

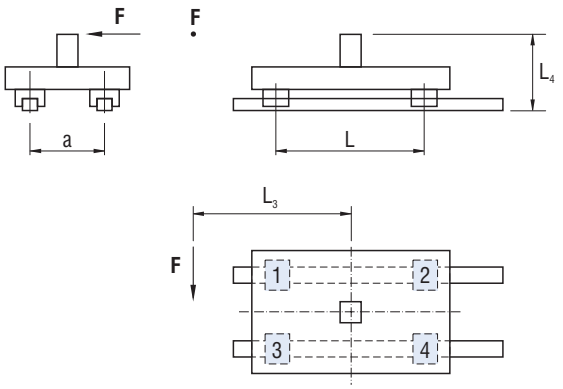
$$P_{t1} \ldots P_{t4} = \frac{F \cdot L_5}{2L}$$

Load at right angles to the **direction of motion**

Loading



Dimensioned figure



Load on a Carriage

$$P_1 \ldots P_4 = \frac{F \cdot L_4}{2a}$$

$$P_{t1} = P_{t3} = \frac{F}{4} + \frac{F \cdot L_3}{2L}$$

$$P_{t2} = P_{t4} = \frac{F}{4} - \frac{F \cdot L_3}{2L}$$