## Slides functional overview

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<td>Linear guide rails with LW 6 trolley</td>
<td>2-22</td>
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<tr>
<td>LFS-8-2</td>
<td>Linear guide rails with WS1 aluminium slide</td>
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<td>LFS-8-3</td>
<td>Linear guide rails with LW 7 trolley</td>
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<td>Linear guide rails with WS3 aluminium slide</td>
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<td>Linear guide rails with LW 3 trolley</td>
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<tr>
<td></td>
<td>with LS1 steel slides</td>
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<td>LFS-12-2</td>
<td>Linear guide rails with LW 5 trolley</td>
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<tr>
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<td>with WS6 aluminium slide</td>
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<tr>
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<td>with LW 3 trolley</td>
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<tr>
<td>LFS-12-2</td>
<td>Linear guide rails with WS4 aluminium slide</td>
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</tr>
</tbody>
</table>

General notes

CAD data on our website [www.isel-germany.de](http://www.isel-germany.de)
# Linear guides

## Overview

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<th>Description</th>
<th>Page</th>
</tr>
</thead>
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CAD data on our website [www.isel-germany.de](http://www.isel-germany.de)
Linear guide slide function

**Aluminium shaft slides**

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

The 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. Lubrication options to both sides for the recirculating balls.

2. The basic supports for all linear guides are extruded aluminium profiles compliant with DIN EN 12020-2, which are provided with T-slot inserts for fastening in the body of the profile or with drilled hole fixing points.

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 systems are glass fibre reinforced.

5. There are patented recirculating balls in the linear slide. 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 slide are preset in the factory to the correct stress. All shaft slides are optionally available in a stainless version.

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

Maximum Speed: 5 m/s

High load capacity
General notes

Load capacity and working life

Installation site

In principal, the installation site 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 regarding 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/1000 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 C0
- the static torques M0X, M0Y and M0Z

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.
### Linear guide rails

#### LFS-8-1

- **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 the T-key insert
  - Conditionally self-supporting
  - Special lengths to order
  - Weights: approx. 1.6 kg/m (LFS-8-1)
  - approx. 2.0 kg/m (LFS-8-2)

#### LFS-8-2

- **Features**
  - Stainless steel version
  - 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 6000 mm available without impact connection, steel shafts divided.

### Load data

<table>
<thead>
<tr>
<th>Shaft slide WS 1/70</th>
<th>Shaft slide WS 5</th>
<th>Trolley LW 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1: 3114 N</td>
<td>C5: 4590 N</td>
<td>C: 2160 N</td>
</tr>
<tr>
<td>C: 1846 N</td>
<td>C: 2390 N</td>
<td>C: 4000 N</td>
</tr>
<tr>
<td>F1: static 2659 N</td>
<td>F1: static 9920 N</td>
<td>F1: static 4320 N</td>
</tr>
<tr>
<td>F1: dynamic 1576 N</td>
<td>F1: dynamic 2041 N</td>
<td>F1: dynamic 3792 N</td>
</tr>
<tr>
<td>F2: static 3114 N</td>
<td>F2: static 4590 N</td>
<td>F2: static 2160 N</td>
</tr>
<tr>
<td>F2: dynamic 1846 N</td>
<td>F2: dynamic 2390 N</td>
<td>F2: static 4000 N</td>
</tr>
<tr>
<td>M1: static 37.3 Nm</td>
<td>M1: static 55.0 Nm</td>
<td>M1: static 121.1 Nm</td>
</tr>
<tr>
<td>M1: dynamic 117.6 Nm</td>
<td>M1: dynamic 148.1 Nm</td>
<td>M1: dynamic 170.6 Nm</td>
</tr>
<tr>
<td>M2: static 22.1 Nm</td>
<td>M2: static 28.6 Nm</td>
<td>M2: static 97.2 Nm</td>
</tr>
<tr>
<td>M2: dynamic 59.5 Nm</td>
<td>M2: dynamic 77.1 Nm</td>
<td>M2: static 106.3 Nm</td>
</tr>
<tr>
<td>M3: static 69.7 Nm</td>
<td>M3: static 90.2 Nm</td>
<td>M3: dynamic 170.6 Nm</td>
</tr>
<tr>
<td>M3: dynamic 117.6 Nm</td>
<td>M3: dynamic 180.0 Nm</td>
<td>M3: dynamic 180.0 Nm</td>
</tr>
</tbody>
</table>

F1 (αz) = F2 cos αz
F1 (αy) = F1 sin αz

### Aluminium slide

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

#### Load data

L 96 × W 72 × H 28.5 mm (WS 1/70)
- (weight: approx. 0.4 kg)
- Part no.: 223100 0070
- Stainless steel: 223101 0070

L 126 × W 72 × H 28.5 mm (WS 1)
- (weight: approx. 0.5 kg)
- Part no.: 223100
- Stainless steel: 223101

### Trolley LW 6

- L 125 x W 90 x H 7.7 mm
- ground steel plate
- 4 rollers Ø 31, sealed for life
- adjustable for no play
- weight: approx. 1 kg
- Part no.: 223011
Linear guide rails

Bending

Load config. 1

Load config. 2

Dimensioned drawings

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

Profile length 298 ... 2998 mm in steps of 100 mm

LFS-8-1 or LFS-8-2 with trolley LW6

Profile length 298 ... 2998 mm in steps of 100 mm
### Linear guide rails LFS-8-3

#### Features
- W 115 x 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: approx. 3.2 kg/m
- Option: stainless steel version

#### Ordering key

**235 00X XXXX**

- Standard = 4
- Length in mm (in 100 mm raster)
- Stainless = 5
- e.g. 0029 = Length 296
  0299 = Length 2996

Length overall L - 1 mm

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

#### Load data

**Shaft slide WS 3/70**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>$C_s$</td>
<td>3141 N</td>
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<tr>
<td>$C$</td>
<td>1879 N</td>
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<tr>
<td>$F_{1, static}$</td>
<td>2682 N</td>
</tr>
<tr>
<td>$F_{1, dynamic}$</td>
<td>1604 N</td>
</tr>
<tr>
<td>$F_{2, static}$</td>
<td>3141 N</td>
</tr>
<tr>
<td>$F_{2, dynamic}$</td>
<td>1879 N</td>
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<tr>
<td>$M_{x, static}$</td>
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<tr>
<td>$M_{x, dynamic}$</td>
<td>69.2 Nm</td>
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<tr>
<td>$M_{y, static}$</td>
<td>105.3 Nm</td>
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<tr>
<td>$M_{y, dynamic}$</td>
<td>123.3 Nm</td>
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<tr>
<td>$M_{z, static}$</td>
<td>117.5 Nm</td>
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<tr>
<td>$M_{z, dynamic}$</td>
<td>123.7 Nm</td>
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**Shaft slide WS 3**

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<tr>
<td>$F_{1, static}$</td>
<td>5931 N</td>
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<tr>
<td>$F_{1, dynamic}$</td>
<td>2724 N</td>
</tr>
<tr>
<td>$F_{2, static}$</td>
<td>6945 N</td>
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<tr>
<td>$F_{2, dynamic}$</td>
<td>3190 N</td>
</tr>
<tr>
<td>$M_{x, static}$</td>
<td>235.9 Nm</td>
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<td>232.8 Nm</td>
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<tr>
<td>$M_{y, dynamic}$</td>
<td>272.5 Nm</td>
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</tbody>
</table>

**Trolley LW 7**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
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<td>4000 N</td>
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<tr>
<td>$M_{x, static}$</td>
<td>246.8 Nm</td>
</tr>
<tr>
<td>$M_{x, dynamic}$</td>
<td>151.2 Nm</td>
</tr>
<tr>
<td>$M_{y, static}$</td>
<td>302.4 Nm</td>
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<tr>
<td>$M_{y, dynamic}$</td>
<td>216.7 Nm</td>
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<tr>
<td>$M_{z, static}$</td>
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</tr>
<tr>
<td>$M_{z, dynamic}$</td>
<td>280 Nm</td>
</tr>
</tbody>
</table>

#### Aluminium slide

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

**Part no.:**

- **223103 0070** Stainless steel: **223103 1070**
- **L 96 x W 130 x H 32 mm (WS 3/70)** (weight: approx. 0.5 kg)
- **Part no.:** **223103** Stainless steel: **223103 1000**
- **L 176 x W 130 x H 32 mm (WS 3)** (weight: approx. 0.9 kg)

#### Trolley LW 7

- **L 175 x W 150 x H 7.5 mm**
- ground steel plate
- 4 rollers Ø 31, sealed for life
- adjustable for no play
- weight: approx. 2 kg

**Part no.:** **223012**
Linear guide rails

**LFS-8-3**

**Bending**

- **Load config. 1**
  ![Load config. 1](image)
  
- **Load config. 2**
  ![Load config. 2](image)

**Dimensioned drawings**

- **LFS-8-3 with aluminium slide WS 3/70 or WS 3**
  ![LFS-8-3 with aluminium slide WS 3/70 or WS 3](image)
  
- **LFS-8-3 with trolley LW 7**
  ![LFS-8-3 with trolley LW 7](image)
## Linear guide rails

### LFS-8-4

**Features**
- W 80 x H 80 mm
- 4 precision steel shafts Ø 8
- anti-twist
- aluminium shaft housing profiles, naturally anodised
- fixing from below with M6 tapped rails in the T-slot 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: approx. 7.2 kg/m
- options: stainless steel version with 2 steel shafts 2 slide or trolley

### 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: total length L - 3 mm

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

### Load data

<table>
<thead>
<tr>
<th>Part</th>
<th>Load Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaft slide WS 3/70</td>
<td>Shaft slide WS 3</td>
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<table>
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<tr>
<th>Trolley LW 7</th>
<th>Shaft slide WS 3</th>
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<td>M₀ static</td>
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<td>216.7 Nm</td>
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<tr>
<td>M₁ dynamic</td>
<td>265.4 Nm</td>
</tr>
<tr>
<td>M₂ dynamic</td>
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</tr>
</tbody>
</table>

### Aluminium slide

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

L 96 x W 130 x H 32 mm (WS 3/70)
(weight: approx. 0.5 kg)

- Part no.: 223103 0070
- Stainless steel: 223103 1070

L 176 x W 130 x H 32 mm (WS 3)
(weight: approx. 0.9 kg)

- Part no.: 223103 0000
- Stainless steel: 223103 1000

### Trolley LW 7

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

- Part no.: 223012
Linear guide rails

**Bending**

![Bending diagram]

**Dimensioned drawings**

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

- **LFS-8-4 with trolley LW 7**

Profile length: 298 mm to 2998 mm in steps of 100 mm

---

**Linear guides**

*made by isel*
Linear guide rails

LFS-12-1

Features

- W 40 x 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: approx. 1.9 kg/m

Aluminium slide

- clamping surface plane milled
- weight: approx. 0.3 kg
- option: stainless steel version

Steel slide LS 1

L 91 x W 60 x H 32 mm
- clamping surface ground
- weight: approx. 0.8 kg

Trolley LW 3

L 125 x W 85 x H 7.7 mm
- ground steel plate
- weight: approx. 0.9 kg

Shaft housing blocks

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

Ordering key

227 312 XXXX

Length in mm (in 100 mm raster)

<table>
<thead>
<tr>
<th>Length (in mm)</th>
<th>Part no.</th>
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</thead>
<tbody>
<tr>
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<tr>
<td>2998</td>
<td>223104</td>
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</table>

Special lengths to order

N.B.!

The part no. refers to one steel shaft only!

Load data

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</tbody>
</table>

made by iSel
Linear guide rails

LFS-12-1

Dimensioned drawings

LFS-12-1 with trolley 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

Stahlwelle Ø 12h6

Steel shaft Length: 298 to 2986 mm in steps of 100 mm

Shaft slide WS 4/70 or WS 4

Steel shaft Ø 12h6
Linear guide rail

**LFS-12-11**

**Features**
- **W** 20 x **H** 31 mm
- Precision steel shaft Ø 12
- Aluminium shaft housing profile, naturally anodised
- Securing from below with M6 tapped rail in T-slot insert on flat surface
- Special lengths available on request
- Weight: approx. 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

**Load data**

<table>
<thead>
<tr>
<th>Shaft slides WS 6/70</th>
<th>Shaft slides WS 6</th>
<th>Trolley LW 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>C₁</td>
<td>C₁</td>
<td>C₁</td>
</tr>
<tr>
<td>3303 N</td>
<td>4868 N</td>
<td>2160 N</td>
</tr>
<tr>
<td>C</td>
<td>2426 N</td>
<td>4000 N</td>
</tr>
<tr>
<td>1973 N</td>
<td>4157 N</td>
<td>4320 N</td>
</tr>
<tr>
<td>F₁ static</td>
<td>F₁ static</td>
<td>F₁ static</td>
</tr>
<tr>
<td>2821 N</td>
<td>2071 N</td>
<td>3846 N</td>
</tr>
<tr>
<td>F₁ dynamic</td>
<td>F₁ dynamic</td>
<td>F₁ dynamic</td>
</tr>
<tr>
<td>3303 N</td>
<td>4886 N</td>
<td>2160 N</td>
</tr>
<tr>
<td>1973 N</td>
<td>2426 N</td>
<td>4000 N</td>
</tr>
<tr>
<td>M₁ static</td>
<td>M₁ static</td>
<td>M₁ static</td>
</tr>
<tr>
<td>105.3 Nm</td>
<td>155.2 Nm</td>
<td>162.0 Nm</td>
</tr>
<tr>
<td>M₁ dynamic</td>
<td>M₁ dynamic</td>
<td>M₁ dynamic</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>M₂ static</td>
<td>M₂ static</td>
<td>M₂ static</td>
</tr>
<tr>
<td>123.3 Nm</td>
<td>181.7 Nm</td>
<td>81.0 Nm</td>
</tr>
<tr>
<td>M₂ dynamic</td>
<td>M₂ dynamic</td>
<td>M₂ dynamic</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>M₃ static</td>
<td>M₃ static</td>
<td>M₃ static</td>
</tr>
<tr>
<td>59.7 Nm</td>
<td>73.3 Nm</td>
<td>144.2 Nm</td>
</tr>
<tr>
<td>M₃ dynamic</td>
<td>M₃ dynamic</td>
<td>M₃ dynamic</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>M₄ static</td>
<td>M₄ static</td>
<td>M₄ static</td>
</tr>
<tr>
<td>69.9 Nm</td>
<td>90.5 Nm</td>
<td>150.0 Nm</td>
</tr>
<tr>
<td>M₄ dynamic</td>
<td>M₄ dynamic</td>
<td>M₄ dynamic</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Aluminium slides**
- With recirculating ball guide
- M6 T-slot inserts
- Central lubrication system option
- Adjustable for no play
- Option: stainless steel version

L 96 x W 50 x H 31.5 mm (WS 6/70)
(weight: approx. 0.3 kg)
Part no.: 223106 0070
Stainless steel: 223106 1070

L 126 x W 50 x H 31.5 mm (WS 6)
(weight: approx. 0.5 kg)
Part no.: 223106 1000
Stainless steel: 223106 1000

**Trolley LW 5**
- **L** 110 x W 75 x 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

Load config. 1

Load config. 2

Dimensioned drawings

LFS-12-11 with aluminium slides WS 6/70 or WS 6

Steel shaft: Length 298 to 2998 mm in steps of 100 mm

LFS-12-11 with trolley LW5
Linear guides

Linear guide rail LFS-12-2

Features
- W 62 x 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 drilled holes 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: approx. 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

Load data

<table>
<thead>
<tr>
<th>Shaft slides WS 4/70</th>
<th>Shaft slides WS 4</th>
<th>Trolley LW 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ct</td>
<td>3993 N</td>
<td>Ct</td>
</tr>
<tr>
<td>C</td>
<td>1873 N</td>
<td>C</td>
</tr>
<tr>
<td>F1 static</td>
<td>2821 N</td>
<td>F1 static</td>
</tr>
<tr>
<td>F1 dynamic</td>
<td>1599 N</td>
<td>F1 dynamic</td>
</tr>
<tr>
<td>F2 static</td>
<td>3303 N</td>
<td>F2 static</td>
</tr>
<tr>
<td>F2 dynamic</td>
<td>1873 N</td>
<td>F2 dynamic</td>
</tr>
<tr>
<td>M1 static</td>
<td>25.8 Nm</td>
<td>M1 static</td>
</tr>
<tr>
<td>M1 dynamic</td>
<td>105.3 Nm</td>
<td>M1 dynamic</td>
</tr>
<tr>
<td>M2 static</td>
<td>123.5 Nm</td>
<td>M2 static</td>
</tr>
<tr>
<td>M2 dynamic</td>
<td>59.7 Nm</td>
<td>M2 dynamic</td>
</tr>
<tr>
<td>M3 static</td>
<td>99.9 Nm</td>
<td>M3 static</td>
</tr>
<tr>
<td>M3 dynamic</td>
<td>69.9 Nm</td>
<td>M3 dynamic</td>
</tr>
</tbody>
</table>

Shaft slides WS 4
- C = 1873 N
- F1 static = 2821 N
- F1 dynamic = 1599 N
- F2 static = 3303 N
- F2 dynamic = 1873 N
- M1 static = 25.8 Nm
- M1 dynamic = 105.3 Nm
- M2 static = 123.5 Nm
- M2 dynamic = 59.7 Nm
- M3 static = 99.9 Nm
- M3 dynamic = 69.9 Nm

Trolley LW 3
- C = 2160 N
- F1 static = 4157 N
- F1 dynamic = 2071 N
- F2 static = 4868 N
- F2 dynamic = 2426 N
- M1 static = 43.9 Nm
- M1 dynamic = 155.2 Nm
- M2 static = 151.7 Nm
- M2 dynamic = 71.8 Nm
- M3 static = 77.3 Nm
- M3 dynamic = 90.5 Nm

 Aluminium slides
- With recirculating ball guide
- Clamping surface plane milled
- Option: stainless steel version

L 94 x W 62 x H 31.5 mm (WS 4/70)
- (weight: approx. 0.33 kg)
- Part no.: 223104 0070
- Stainless steel: 223104 1070

L 124 x W 62 x H 31.5 mm (WS 4)
- (weight: approx. 0.46 kg)
- Part no.: 223104 1000
- Stainless steel: 223104 1000

Trolley LW 3
- L 125 x W 85 x H 7.7 mm
- Ground steel plate
- Weight: 0.93 kg
- Part no.: 223008

Shaft slides WS 4/70
- C = 1873 N
- F1 static = 2821 N
- F1 dynamic = 1599 N
- F2 static = 3303 N
- F2 dynamic = 1873 N
- M1 static = 25.8 Nm
- M1 dynamic = 105.3 Nm
- M2 static = 123.5 Nm
- M2 dynamic = 59.7 Nm
- M3 static = 99.9 Nm
- M3 dynamic = 69.9 Nm

Trolley LW 3
- C = 2160 N
- F1 static = 4157 N
- F1 dynamic = 2071 N
- F2 static = 4868 N
- F2 dynamic = 2426 N
- M1 static = 43.9 Nm
- M1 dynamic = 155.2 Nm
- M2 static = 151.7 Nm
- M2 dynamic = 71.8 Nm
- M3 static = 77.3 Nm
- M3 dynamic = 90.5 Nm

Part no.: 223008

Made by isel®
Linear guide rail  

Bending

- Load config. 1
- Load config. 2

Dimensioned drawings

LFS-12-2 with aluminium slides WS 4/70 or WS 4

Steel shaft: Length 258 to 2988 mm in steps of 100 mm

LFS-12-2 with trolley LW3
Linear guide rail

### Features
- W 90 x 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: approx. 3.9 kg/m

### Slides
- Ground steel plate
- Central lubrication system option
- Adjustable for no play

#### L 100 x W 100 x H 32 mm (WS 7/70)
- Weight: approx. 0.8 kg
- Part no.: 223107

#### L 200 x W 100 x H 32 mm (WS 7)
- Weight: approx. 1.7 kg
- Part no.: 223107

### Trolley LW 8
- L 150 x W 125 x 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

### Trolley LW 2
- L 150 x W 125 x H 34.5 mm
- Aluminium T-slot plate
- 4 rollers Ø 31, sealed for life
- Adjustable for no play
- Weight: 0.97 kg
- Part no.: 223005

### Load data

#### Shaft slides WS 5/70
- C: 3033 N
- F1 static: 2821 N
- F1 dynamic: 1599 N
- M1 static: 62 Nm
- M1 dynamic: 69.9 Nm
- 
#### Shaft slides WS 7
- C: 3179 N
- F1 static: 6237 N
- F1 dynamic: 2715 N
- M1 static: 105.3 Nm
- M1 dynamic: 123.3 Nm
- 
#### Trolley LW 2
- C: 3114 N
- F1 static: 2659 N
- F1 dynamic: 1576 N
- M1 static: 222.8 Nm
- M1 dynamic: 272.5 Nm
- 
#### Trolley LW 8
- C: 2160 N
- F1 static: 1599 N
- F1 dynamic: 1846 N
- M1 static: 4000 N
- M1 dynamic: 4000 N
- 

### 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.
Linear guide rail

**LFS-12-3**

**Bending**

- Load config. 1
- Load config. 2

**Dimensioned drawings**

- LFS-12-3 with aluminium slides WS 7
- LFS-12-3 with Carriage LW 8
- LFS-12-3 with Carriage LW 2

**Load config.**

1. F

Steel shaft: Length 298 to 2998 mm in steps of 100 mm.
Linear guide rail

**LFS-12-10**

### Features
- **W 36 x H 24.5 mm**
- 2 precision steel shafts Ø 12
- Anti-twist
- Aluminium shaft housing profile, naturally anodised
- Fixing from below with M6 tapped rail in T-slot insert and from above M6 drillings in the Raster 50 mm
- Conditionally self-supporting
- Special lengths to order
- Weight: approx. 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 mm with rod linkage to order.

### Load data

<table>
<thead>
<tr>
<th>Slides WS 8/70</th>
<th>Slides WS 8</th>
<th>Trolley LW 4</th>
<th>Dual track set 1</th>
<th>Dual track set 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>L</td>
<td>1873 N</td>
<td>2428 N</td>
<td>2160 N</td>
<td>1905 N</td>
</tr>
<tr>
<td>F1 static</td>
<td>2821 N</td>
<td>4017 N</td>
<td>4320 N</td>
<td>3959 N</td>
</tr>
<tr>
<td>F1 dynamic</td>
<td>1599 N</td>
<td>2071 N</td>
<td>3846 N</td>
<td>3420 N</td>
</tr>
<tr>
<td>F2 static</td>
<td>3303 N</td>
<td>4868 N</td>
<td>2160 N</td>
<td>1905 N</td>
</tr>
<tr>
<td>F2 dynamic</td>
<td>1873 N</td>
<td>2428 N</td>
<td>4000 N</td>
<td>3600 N</td>
</tr>
<tr>
<td>M1 static</td>
<td>46.7 N</td>
<td>68.8 N</td>
<td>135.4 N</td>
<td>120.5 N</td>
</tr>
<tr>
<td>M1 static</td>
<td>105.3 N</td>
<td>155.2 N</td>
<td>194.4 N</td>
<td>180.0 N</td>
</tr>
<tr>
<td>M1 static</td>
<td>123.3 N</td>
<td>181.7 N</td>
<td>97.2 N</td>
<td>85.0 N</td>
</tr>
<tr>
<td>M2 static</td>
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<td>34.2 N</td>
<td>120.5 N</td>
<td>107.0 N</td>
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<tr>
<td>M2 static</td>
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<td>77.3 N</td>
<td>173.0 N</td>
<td>160.0 N</td>
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<tr>
<td>M2 static</td>
<td>89.9 N</td>
<td>90.5 N</td>
<td>180.0 N</td>
<td>168.0 N</td>
</tr>
</tbody>
</table>

### Slides
- Ground steel plate
- Lubrication system option
- Adjustable for no play

*L 100 x W 75 x H 31.5 mm (WS 8/70)*
(weight: approx. 0.7 kg)
Part no.: **223108 0070**

*L 150 x W 75 x H 31.5 mm (WS 8)*
(weight: approx. 1.0 kg)
Part no.: **223108**

### Trolley LW 4
- **L 125 x W 97 x 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**
- **L 75 x W 75 x H 90.2 mm**
- With 2 SMALL linear ball bearings
Part no.: **223001**

**Dual track set 2**
- **L 125 x W 75 x H 90.2 mm**
- With 2 LARGE linear ball bearings
Part no.: **223002**
Linear guide rail

**Bending**

- **Load config. 1**
  - $F_1$ applied at the center of the rail.

- **Load config. 2**
  - $F_1$ applied at one end of the rail.

**Dimensioned drawings**

- **LFS-12-10 with slides WS 8**
  - Profile length 296 to 2966 mm in steps of 100 mm.

- **LFS-12-10 with trolley LW 4**
  - Length 125 mm.

- **LFS-12-10 with dual track set**
  - Length 50 mm steps.
  - Profile length 296 to 2996 mm in steps of 100 mm.
Linear guide rail LFS-16-120

Features
- W 190 x H 61 mm
- 2 precision steel shafts Ø 16
- Anti-twist
- Aluminium shaft housing profile naturally anodised
- Securing from below with M6 tapped rail in T-slot profile
- Conditionally 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 available on request!

Load data

Bending


d Load config. 1
 F


d Load config. 2
 F

Length L/mm
Linear guide rail LFS-16-120

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

- L 84 x W 178 x 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 slides
IWS 1 (kit)

- L 84 x W 178 x 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 slides
IWS 1 (kit)

- L 180 x W 178 x H 8 mm
- Ground steel plate
- 4 x IWS 1, central lubrication option
- Adjustable for no play

Part no.: 223240 0008

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

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

Part no.: 223240 0010

Dimensioned drawings

Aluminium slides IWS 1

Steel slides ILS 1
## Accessories

### Tapped rail
- **M6 tapped rail**
  - 10 x 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 x W 10 x H 3.5 mm
  - Galvanised
  - VE 100 unit
  - All except PT/RE 40, 65
  - Part no.: 209 001 0005
- **2 x M6 sliding nuts** (Figure 2)
  - L 45 x W 10 x H 3.5 mm
  - Galvanised
  - VE 50 unit
  - For all except PT/RE 40, 65
  - Part no.: 209 002 0004
- **Angle sliding nut**
  - 2 x M6 (Figure 3)
  - Galvanised
  - VE 25 unit
  - For PT/RE 40, 65
  - Part no.: 209 021 0003
- **Special angle sliding nut**
  - 3 x M6 (Figure 4)
  - Galvanised, VE 25 unit
  - For all except PT/RE 40, 65
  - Part no.: 209 022 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 tapping (SF12) or M6 (SF16) in 100 mm raster
  - Or with drilled holes for M4 (SF 12) or M5 (SF 16) in 100 mm raster
  - Part no.: 220019 0299 (SF12, 3m, with blind holes for M5)
  - Part no.: 220020 0299 (SF12, 3m, with stepped holes for M4)
  - Part no.: 220023 0299 (SF16, 3m, with stepped holes for M5)
  - Part no.: 220024 0299 (SF16, 3m, with blind holes for M6)

### Rollers
- **Roller Ø 20 mm** for SF 12
  - With M4 tapped drilling
  - VE 2 units
  - Part no.: 222 010

### Linear ball bearing
- **Linear ball bearing large**
  - L 80 x W 20 x H 19 mm, VE 2 units
  - Part no.: 222 002 0001
- **Linear ball bearing medium**
  - L 60 x W 20.5 x H 17.8 mm, VE 2 units
  - Part no.: 222 000
- **Linear ball bearing small**
  - L 40 x W 20 x H 19 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

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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 slide configuration with 2 slides.

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

The load factor in this case is CO/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:

\[ P = \sqrt{F_1^2 + F_2^2} \]

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

\[ P = \left| F \right| + \left| M \right| C_0 \frac{M_{0(XYZ)}}{M_{0(XYZ)}} \]

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

Equivalent load calculation

Operating conditions

A incremental change  B uniform change

Equivalent load

\[ P = \sqrt{\left| F_1 \right|^2 + \left| F_2 \right|^2 + \left| F_3 \right|^2} \cdot \left( P_1 \cdot L_1 + P_2 \cdot L_2 + P_3 \cdot L_3 + \ldots + P_n \cdot L_n \right) \]

\[ P = \frac{1}{3} \cdot \left( P_{\text{min}} + 2 \cdot P_{\text{max}} \right) \]

Static safety

Operating conditions

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

\[ S_0 = \frac{C_0}{P_0} = \frac{M_0}{M} \]

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.

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

\[ L_1 = 833 \cdot \frac{C}{P} \frac{n_{\text{max}}}{H} \]

\[ L_2 = 1666 \cdot \frac{C}{P} \frac{n_{\text{max}}}{v} \]

Nominal working life in units of 100,000 m
Nominal working life in hours run
Dynamic load factor
Dynamically equivalent load
Single stroke of the oscillating motion
Number of double strokes per minute
Average speed of movement
Operating loads calculation

Load vertical on the bench surface

**Loading**

**Dimensioned figure**

**Load on a trolley**

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

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

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

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

Load in direction of motion

**Loading**

**Dimensioned figure**

**Load on a trolley**

\[
P_1, \ldots P_4 = \frac{F \cdot L_a}{2L}
\]

\[
P_{1a}, \ldots P_{4a} = \frac{F \cdot L_a}{2L}
\]

Load at right angles to the direction of motion

**Loading**

**Dimensioned figure**

**Load on a trolley**

\[
P_1, \ldots P_4 = \frac{F \cdot L_a}{2a}
\]

\[
P_{1a}, \ldots P_{4a} = \frac{F}{4} + \frac{F \cdot L_a}{2L}
\]

\[
P_{4a} = \frac{F}{4} - \frac{F \cdot L_a}{2L}
\]