Accessories

Profile connection cubes

Profile connection cubes black

- VE 10 pcs. + fixing material
- for PU 25

2×Part no.: **209104 0002**
3×Part no.: **209103 0002**

Profile connection cubes, black

- VE 10 pcs. + fixing material
- for PU 25

3×Part no.: **209106 0002**
4×Part no.: **209107 0002**

Profile connection cubes black

- VE 10 pcs. + fixing material
- for PU 25

4×Part no.: **209108 0002**
5×Part no.: **209109 0002**

T-groove cover

T-key cover

- VE 30 m
- (turquoise = similar to RAL 5018)
- for all except PT/RE 40, 65

black Part no.: **209201 0004**
turquoise Part no.: **209201 0003**
light grey Part no.: **209201 0007**

Profile covers

Profile covers, black

- PU 25 - 25 pcs.
  Part no.: **209105 0003**
- PU 50 - 25 pcs.
  Part no.: **209126 0003**
- PL 40 - 20 pcs.
  Part no.: **209127 0003**
- PL 80 - 20 pcs.
  Part no.: **209128 0003**
- PS 50 - 25 pcs.
  Part no.: **209129 0003**
- PS 80 - 20 pcs.
  Part no.: **209130 0003**
- PS 140 - 10 pcs.
  Part no.: **209130 1001**

Aluminium corner connectors

Aluminium corner connectors

- L 25 × W 25 × H 15 mm
- VE 10 pcs. + fixing material
- for PL, PS, PU, PP

natural
Part no.: **209114 0101**
black
Part no.: **209114 0111**

- L 40 × W 40 × H 22 mm
- VE 10 pcs. + fixing material
- for PP/PL/PS/PU

natural
Part no.: **209115 0101**
black
Part no.: **209115 0111**

- L 50 × W 50 × H 15 mm
- VE 10 pcs. + fixing material
- for RE/PU/PS

natural
Part no.: **209116 0101**
black
Part no.: **209116 0111**

- L 80 × W 80 × H 22 mm
- VE 10 pcs. + fixing material
- for PP/PL/PS/PU

natural
Part no.: **209117 0101**
black
Part no.: **209117 0111**

Plastic equipment bases

Plastic equipment bases
with rubber plate

- VE 4 pcs. + setting screws
- black

for PL 40/PS 50
- Ø 60
- M10 × 50 setting screws

Part no.: **209032 0003**

for PL 80/PS 80
- Ø 80
- M12 × 50 setting screws

Part no.: **209034 0001**

for PL 80/PS 80
- Ø 120
- Setting screws M12 × 50
- black

Part no.: **209033 0003**

Guide rollers

Rubber-tired guide rollers Ø 75 (M10)

- VE 4 pcs.
- 2 with and 2 without locking device
- for PL 40/PS 50

Part no.: **209043 0011**

Aluminium equipment bases

Aluminium equipment bases
with rubber plate

for PU 50
- VE 4 units, with setting screws and reducing bushings
- Ø 50
- M6 × 30 setting screws
- natural

Part no.: **209030 0000**

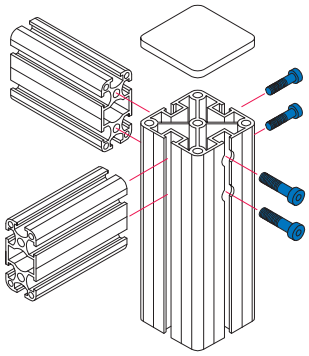
for PS 100/140
- Ø 170
- M16 × 100 setting screws
- black

Part no.: **209035 0001**

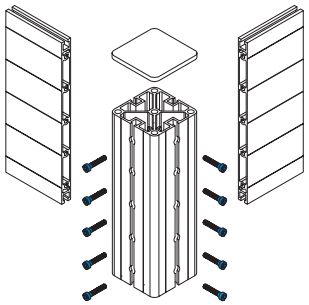
Profile connections

Examples:

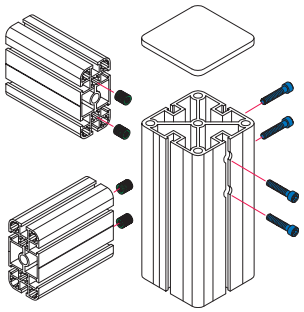
PS 50 with PU 50



PS 50 with PP 250



PS 80 with PL 80



Allen screws

Allen screws
M6 × 25 mm
- VE 10 pcs.
  Part no.: **209147 0009**
- VE 50 units
  Part no.: **209147 0010**

Allen screws
M6 × 50 mm
- VE 10 pcs.
  Part no.: **209147 0003**
- VE 50 units
  Part no.: **209147 0004**

Allen key
SW 5
- DIN 911
- VE 1 pcs.

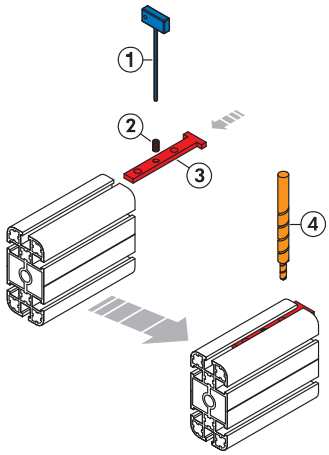
Part no.: **931152**

Tapped bushings

Tapped bushings
M9/M6
- VE 10 pcs.
  Part no.: **209147 0001**
- VE 50 units
  Part no.: **209147 0002**

Tapped bushings
M10/M6
- VE 10 pcs
  Part no.: **209147 0124**
- VE 50 pcs
  Part no.: **209147 0125**

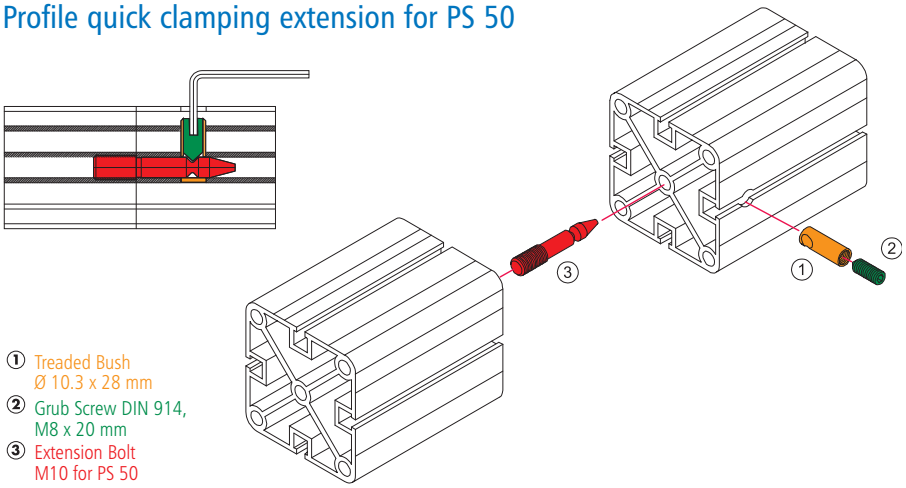
Example PL 80



① Hexagon-Socket Screwdriver
② Grub Srew
③ Drilling Template
④ Twist Drill
Ø 6 mm / Ø 10.4 mm

Example:

Profile quick clamping extension for PS 50



① Treaded Bush
Ø 10.3 x 28 mm
② Grub Screw DIN 914,
M8 x 20 mm
③ Extension Bolt
M10 for PS 50

for PS 50/PL 40 (M10)
- Locking bush, tapped pin, extension bolts

Part no.: **209147 0120**
- 50 sets
  Part no.: **209147 0121**

for PS 80/PL 80 (M12)
- Locking bush, tapped pin, extension bolts
- 10 sets
  Part no.: **209147 0122**
- 50 sets
  Part no.: **209147 0123**

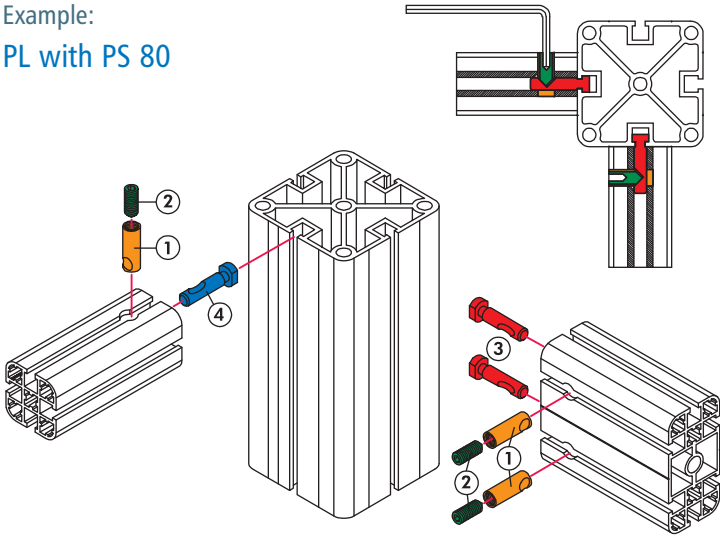
matching drill pattern 2
Part no.: **290015 0002**

Stepped drill
- Ø 6/Ø 10.4 mm
  Part no.: **400090**

Profile quick clamping connections

Example:

PL with PS 80

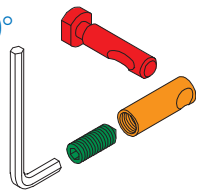


① Treaded Bush Ø 10.3 x 28 mm
② Grub Screw DIN 914, M6 x 20 mm
③ Connection Bolt 0° for PL 40 and PL 80
④ Connection Bolt 90° for PL 40 and PL 80

Quick Clamping Connection 0°

e.g. for

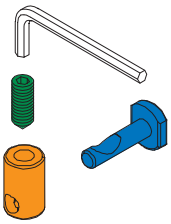
PL/PS 80



Quick Clamping Connection 90°

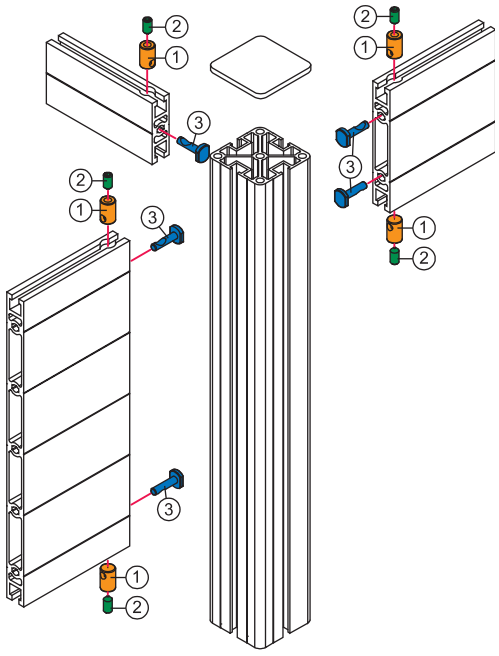
e.g. for

PP/PU/PS



Example:

PP with PS 50



① Treaded Bush Ø 10.3 x 16,5 mm
② Grub Screw DIN 914, M6 x 12 mm
③ Connection Bolt 90°

Quick clamping connection

for PL

- Locking bush, tapped pin and bolts 0°
- 10 sets:
  Part no.: **209147 0102**
- 50 sets:
  Part no.: **209147 0103**

for PL

- Locking bush, tapped pin and bolts 90°
- 10 sets:
  Part no.: **209147 0112**
- 50 sets:
  Part no.: **209147 0113**

for PP/PU

- Locking bush, tapped pin and bolts 0°
- 10 sets:
  Part no.: **209147 0100**
- 50 sets:
  Part no.: **209147 0101**

for PP/PU

- Locking bush, tapped pin and bolts 90°
- 10 sets:
  Part no.: **209147 0110**
- 50 sets:
  Part no.: **209147 0111**

Stepped drill

- Ø 6 mm/Ø 10.4 mm

Part no.: **400090**

matching drill pattern 2

Part no.: **290015 0002**

Allen key SW 3

- DIN 911

Part no.: **931150**

Linear guides

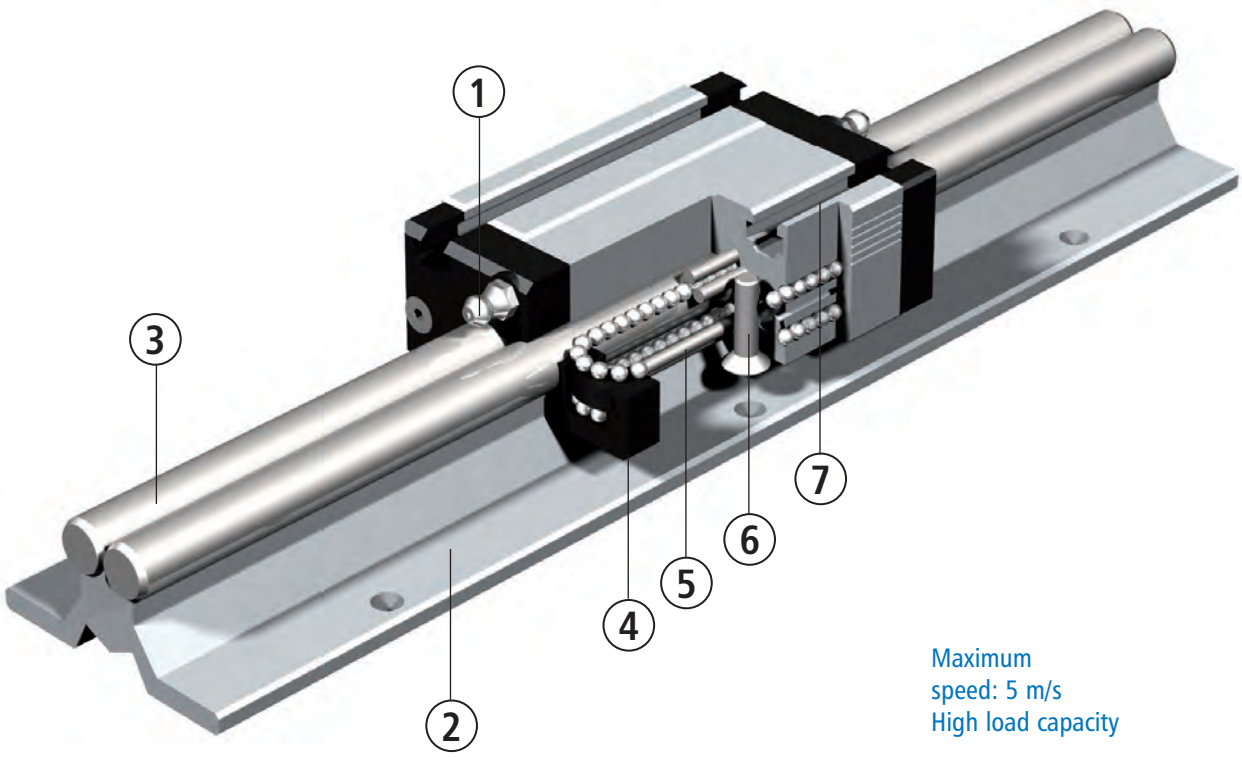
Overview

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

Linear guides — Overview

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

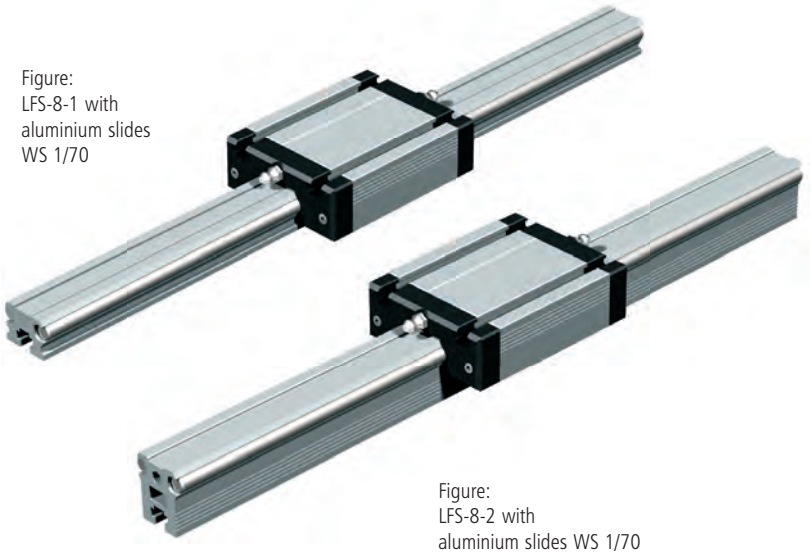


Figure:
LFS-8-1 with
aluminium slides
WS 1/70

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

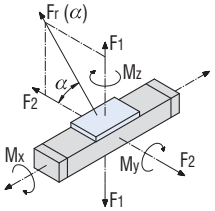
Profile up to 6,000 mm available without impact connection, steel shafts divided.

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

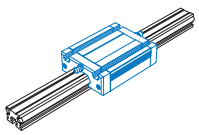
Shaft slide WS 1	
C_o	4590 N
C	2390 N
F_1 stat.	3920 N
F_1 dyn.	2041 N
F_2 stat.	4590 N
F_2 dyn.	2390 N
M_x stat.	55.0 Nm
M_y stat.	148.1 Nm
M_z stat.	173.4 Nm
M_x dyn.	28.6 Nm
M_y dyn.	77.1 Nm
M_z dyn.	90.2 Nm

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



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

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

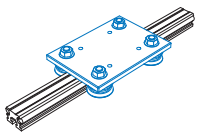


Aluminium slide

- 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

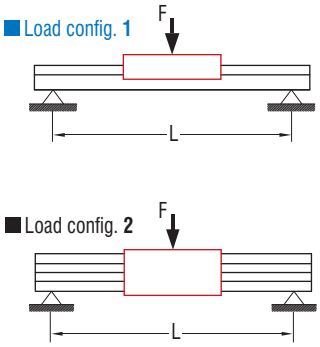
- L 125 × W 90 × H 7.7 mm
- ground steel plate
- 4 rollers Ø 31, sealed for life
- adjustable for no play
- Weight: appr. 1 kg

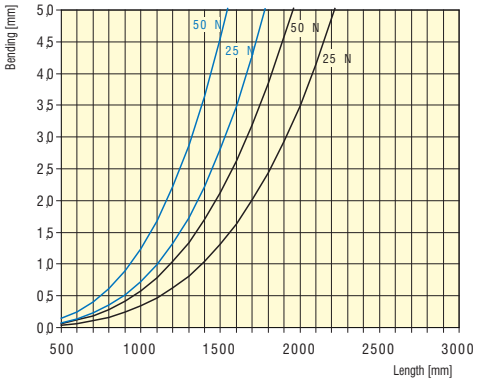
Part no.: **223011**

Linear guide rails

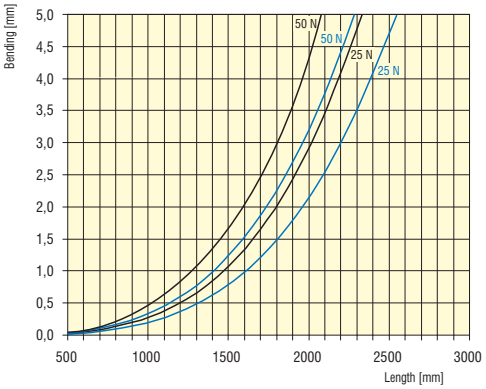
LFS-8-1
LFS-8-2

Bending



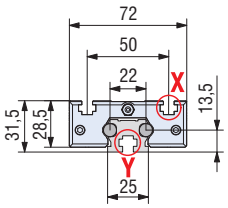


LFS-8-1

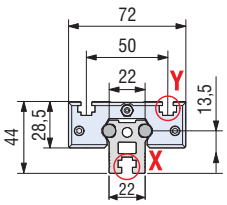


LFS-8-2

Dimensioned drawings

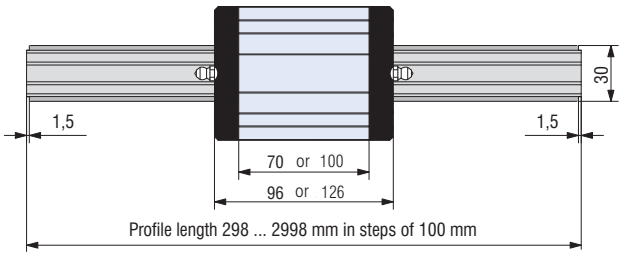


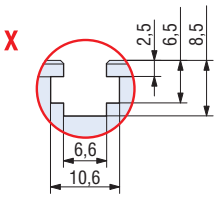
LFS-8-1

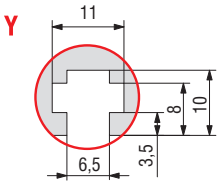


LFS-8-2

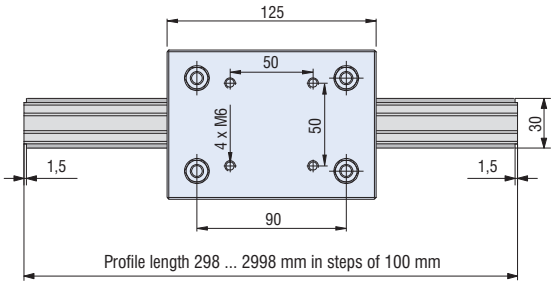
LFS-8-1 or **LFS-8-2** with aluminium slide **WS 1/70** or **WS 1**

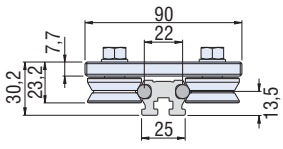




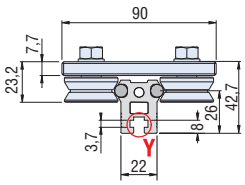


LFS-8-1 or **LFS-8-2** with carriage **LW 6**





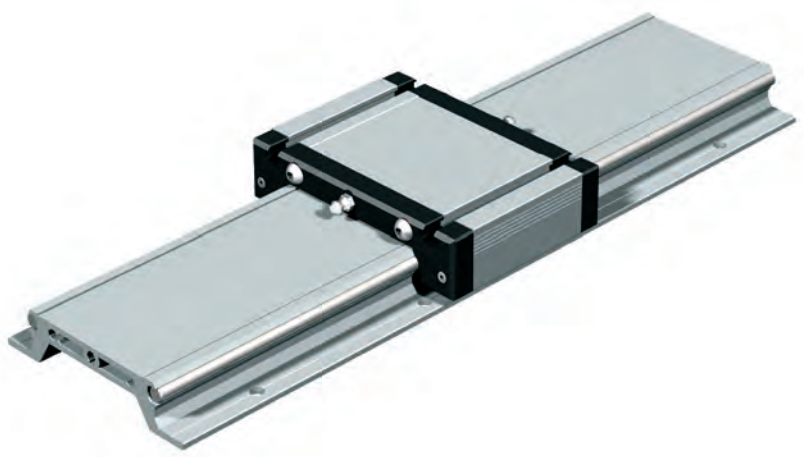
LFS-8-1



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

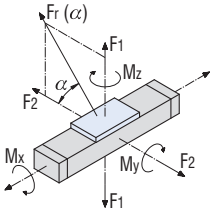
Profile up to 6000 mm available without impact link, steel shafts divided.

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

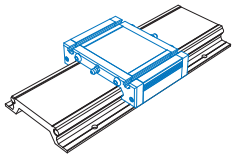
Shaft slide WS 3	
C_o	6945 N
C	3190 N
F_1 stat.	5931 N
F_1 dyn.	2724 N
F_2 stat.	6945 N
F_2 dyn.	3190 N
M_x stat.	255.9 Nm
M_y stat.	232.8 Nm
M_z stat.	272.5 Nm
M_x dyn.	117.5 Nm
M_y dyn.	106.9 Nm
M_z dyn.	125.1 Nm

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



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

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

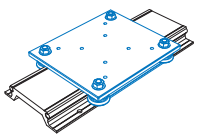


Aluminium slide

- 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

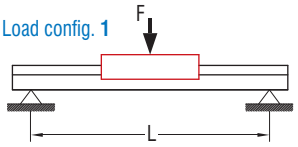
- L 175 × W 150 × H 7.5 mm
- ground steel plate
- 4 rollers Ø 31, sealed for life
- adjustable for no play
- Weight: appr. 2 kg

Part no.: **223012**

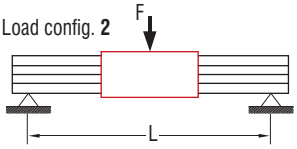
Linear guide rail LFS-8-3

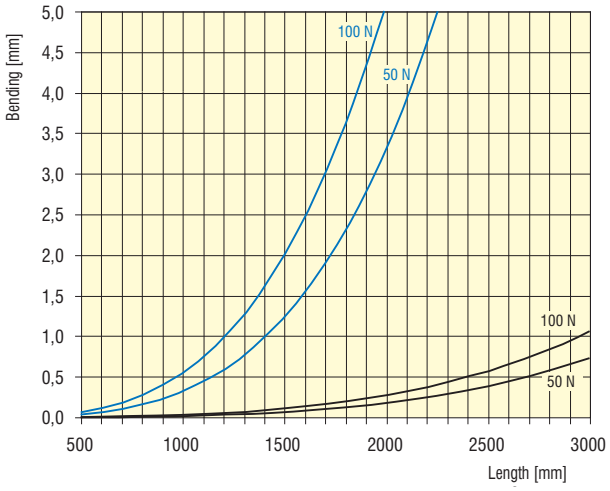
Bending

Load config. **1**

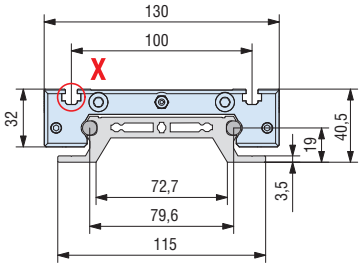


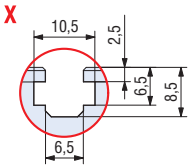
Load config. **2**



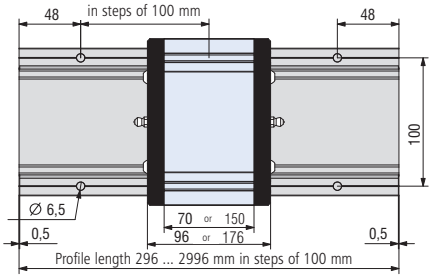


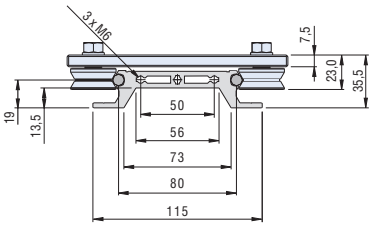
Dimensioned drawings



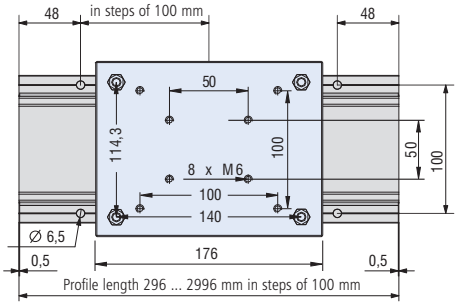


LFS-8-3 with aluminium slides **WS 3/70 or WS 3**





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



Linear guide rail

LFS-8-4

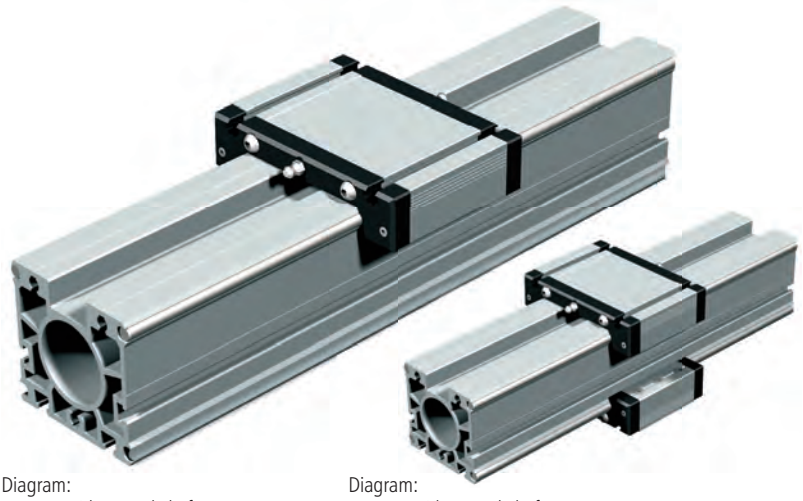


Diagram:
LFS-8-4 with 2 steel shafts
and an aluminium slide

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

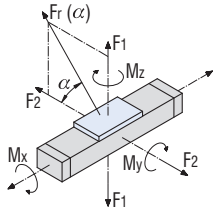
Profile up to 6000 mm available without impact link, steel shafts divided.

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

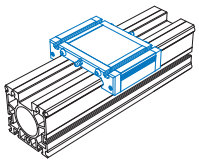
Shaft slide WS 3	
C_o	6945 N
C	3190 N
F_1 stat.	5931 N
F_1 dyn.	2724 N
F_2 stat.	6945 N
F_2 dyn.	3190 N
M_x stat.	255.9 Nm
M_y stat.	232.8 Nm
M_z stat.	272.5 Nm
M_x dyn.	117.5 Nm
M_y dyn.	106,9 Nm
M_z dyn.	125.1 Nm

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



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

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

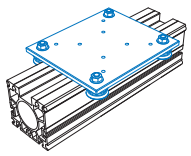


Aluminium slide

- 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**



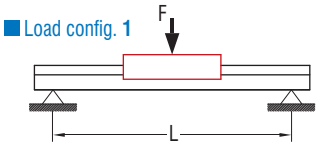
Carriage LW 7

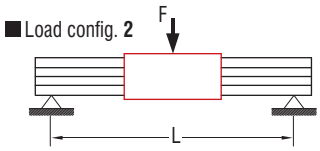
- L 175 × W 150 × H 7.5 mm
- ground steel plate
- 4 rollers Ø 31, sealed for life
- adjustable for no play
- Weight: appr. 2 kg

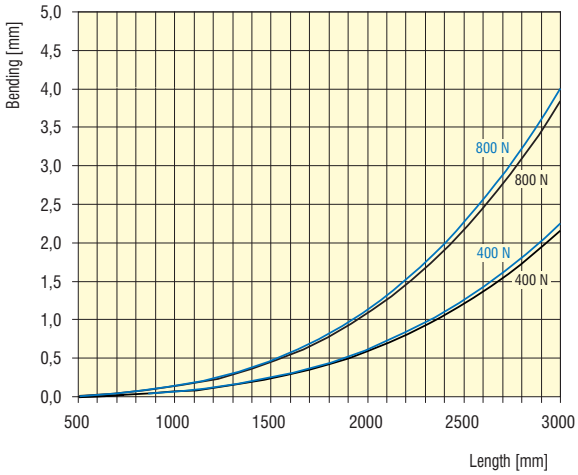
Part no.: **223012**

Linear guide rail LFS-8-4

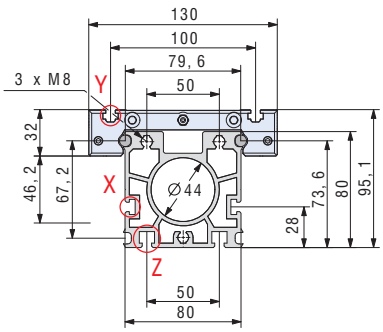
Bending



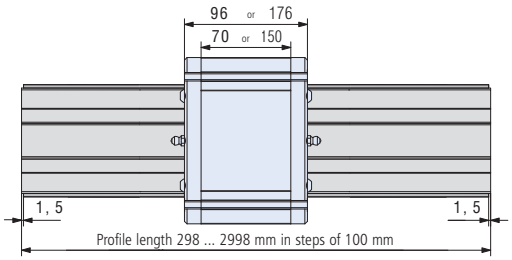


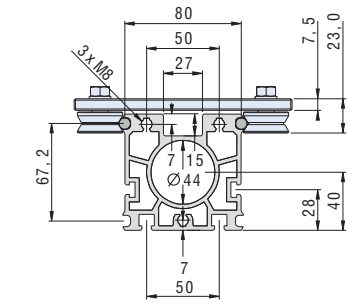


Dimensioned drawings

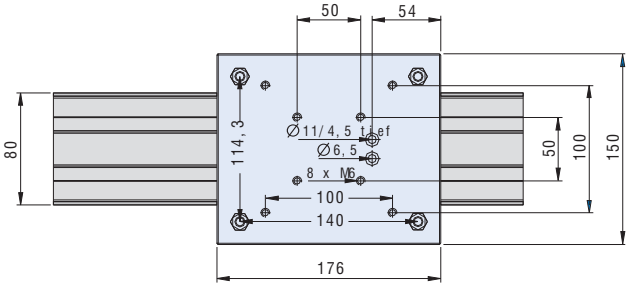


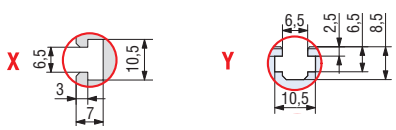
LFS-8-4 with aluminium slide WS 3/70 or WS 3

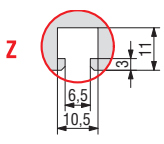




LFS-8-4 with carriage LW 7







mechanics

Linear guide rail

LFS-12-1

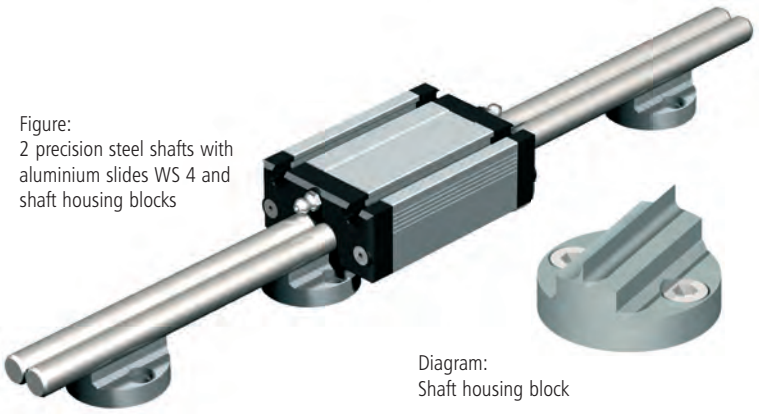


Figure:
2 precision steel shafts with aluminium slides WS 4 and shaft housing blocks

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

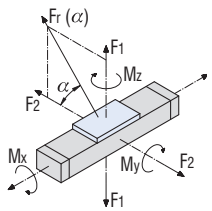
Shaft slide WS 4	
C_0	4868 N
C	2426 N
F_1 stat.	4157 N
F_1 dyn.	2071 N
F_2 stat.	4868 N
F_2 dyn.	2426 N
M_x stat.	43.9 Nm
M_y stat.	155.2 Nm
M_z stat.	181.7 Nm
M_x dyn.	21.8 Nm
M_y dyn.	77.3 Nm
M_z dyn.	90.5 Nm

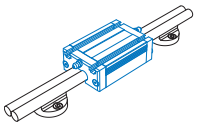
Steel slide LS 1	
C_0	3508 N
C	2105 N
F_1 stat.	3549 N
F_1 dyn.	2130 N
F_2 stat.	3508 N
F_2 dyn.	2105 N
M_x stat.	36.2 Nm
M_y stat.	129.0 Nm
M_z stat.	127.5 Nm
M_x dyn.	21.7 Nm
M_y dyn.	77.4 Nm
M_z dyn.	76.5 Nm

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

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

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



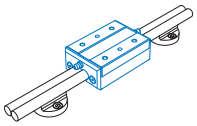


Aluminium slides

- 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**

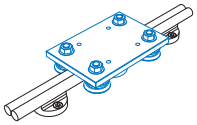
L 124 x W 62 x H 31.5 mm (WS 4)
Part no.: **223104**
Stainless: **223104 1000**



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

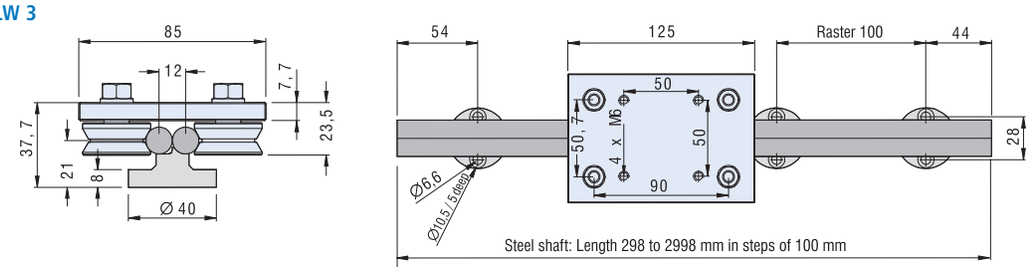
- Ø 40 mm, hole spacing 28 mm
- Cast zinc, VE 10 units

Part no.: **221501**

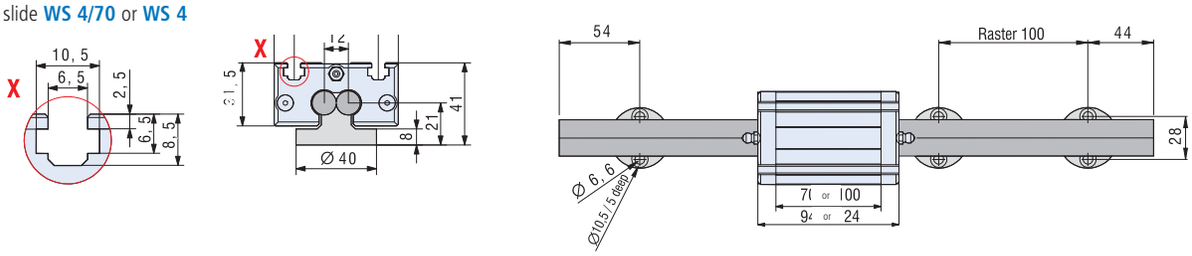
Linear guide rail LFS-12-1

Dimensioned drawings

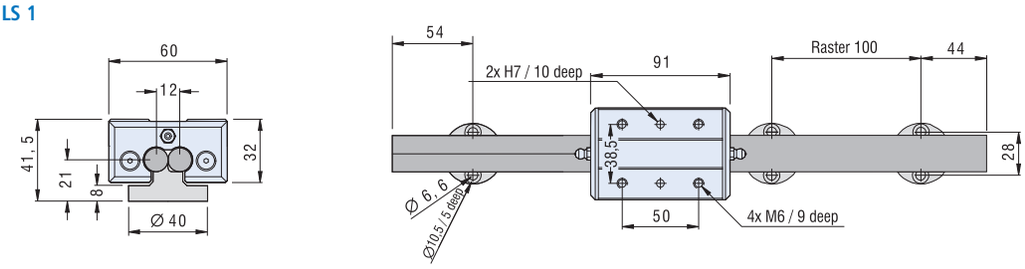
LFS-12-1 with Carriage **LW 3**



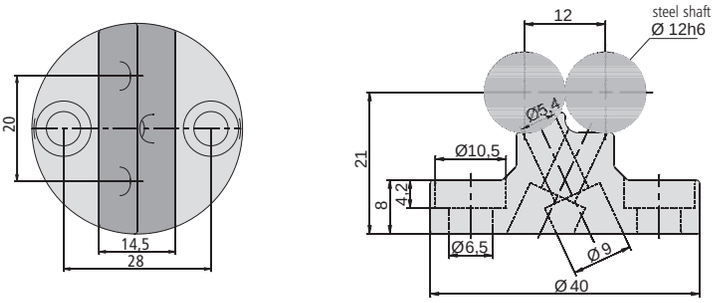
LFS-12-1 with
shaft slide **WS 4/70** or **WS 4**



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

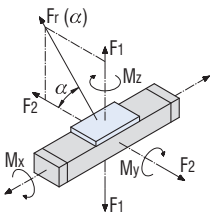
Profile length = Length overall L -2 mm

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

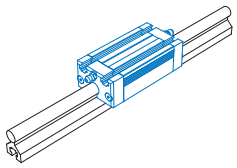
Shaft slide WS 6	
C_o	4868 N
C	2426 N
F_1 stat.	4157 N
F_1 dyn.	2071 N
F_2 stat.	4868 N
F_2 dyn.	2426 N
M_x stat.	-
M_y stat.	155.2 Nm
M_z stat.	181.7 Nm
M_x dyn.	-
M_y dyn.	77.3 Nm
M_z dyn.	90.5 Nm

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



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

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

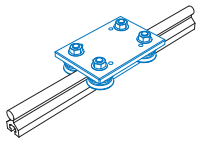


Aluminium slide

- 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**



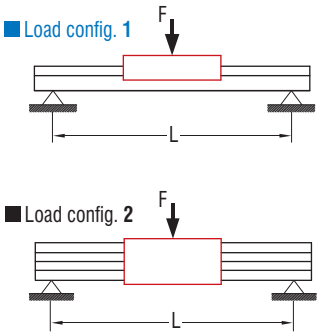
Carriage LW 5

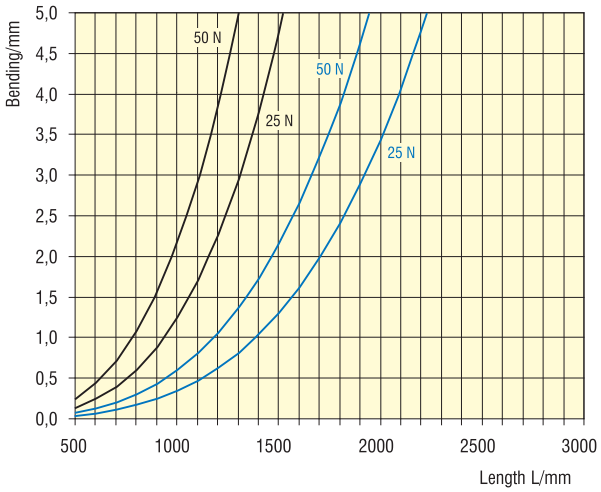
- L 110 × W 75 × H 7.7 mm
- ground steel plate
- 4 rollers Ø 31, sealed for life
- adjustable for no play
- Weight: 0.81 kg

Part no.: **223010**

Linear guide rail LFS-12-11

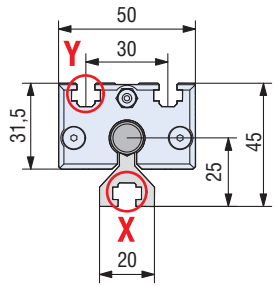
Bending

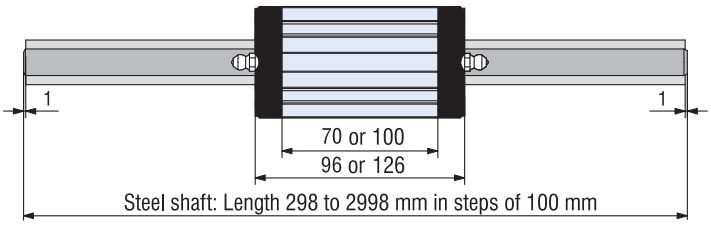


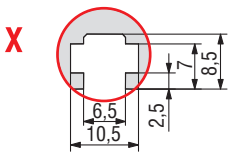


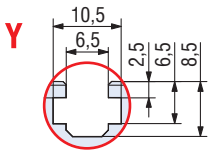
Dimensioned drawings

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

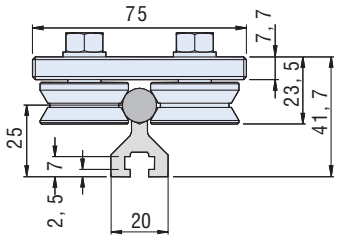


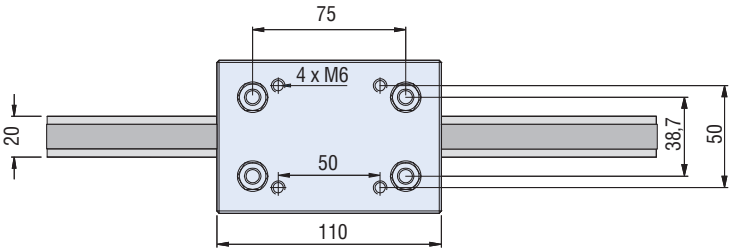






LFS-12-11 with Carriage **LW 5**





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

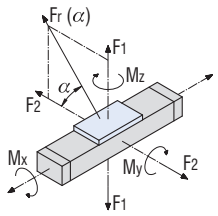
Profile length = Length overall L -2 mm

Loading data

Shaft slide WS 4/70	
C_o	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

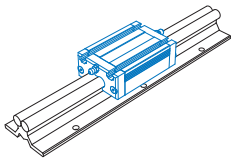
Shaft slide WS 4	
C_o	4868 N
C	2426 N
F_1 stat.	4157 N
F_1 dyn.	2071 N
F_2 stat.	4868 N
F_2 dyn.	2426 N
M_x stat.	43.9 Nm
M_y stat.	155.2 Nm
M_z stat.	181.7 Nm
M_x dyn.	21.8 Nm
M_y dyn.	77.3 Nm
M_z dyn.	90.5 Nm

Carriage LW 3	
C_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.	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



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

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

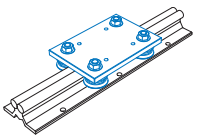


Aluminium slide

- 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**



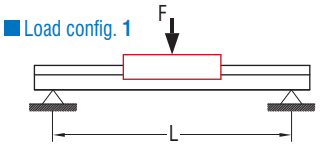
Carriage LW 3

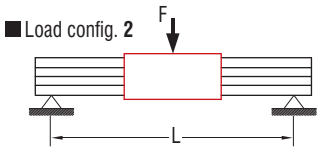
- L 125 × W 85 × H 7.7 mm
- ground steel plate
- Weight: 0.93 kg

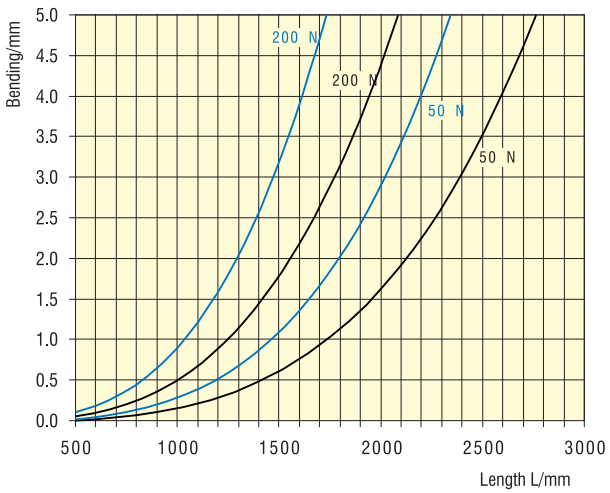
Part no.: **223008**

Linear guide rail LFS-12-2

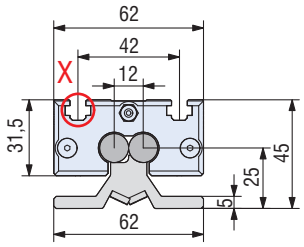
Bending

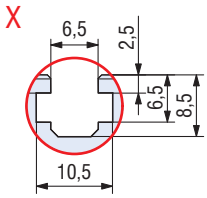




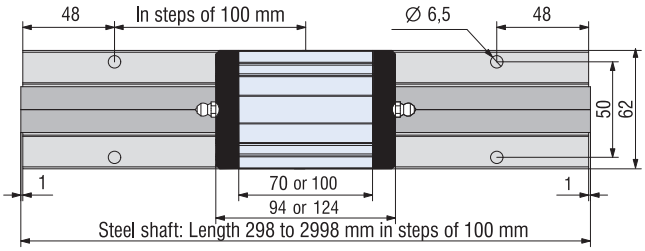


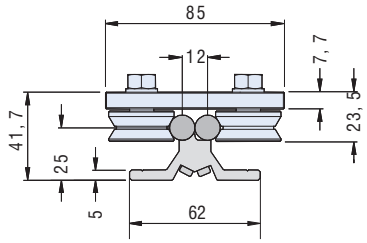
Dimensioned drawings



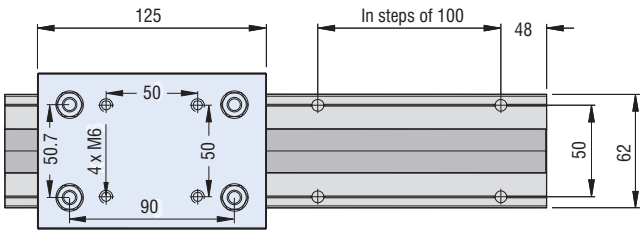


LFS-12-2 with aluminium slide **WS 4/70 or WS 4**





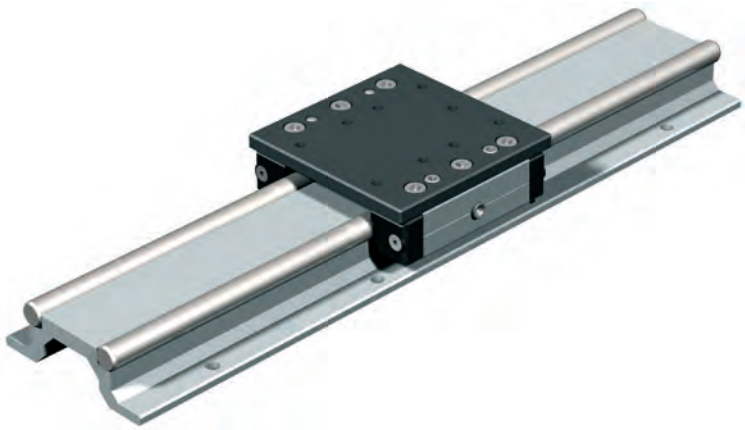
LFS-12-2 with Carriage **LW3**



mechanics

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

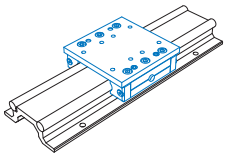
Ordering key

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.

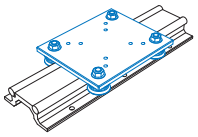


Slide

- 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**

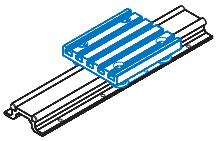
L 200 × W 100 × H 32 mm (WS 7)
(Weight: appr. 1.7 kg)
Part no.: **223107**



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**

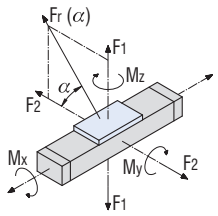
Loading data

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

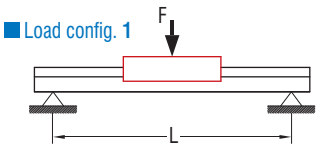


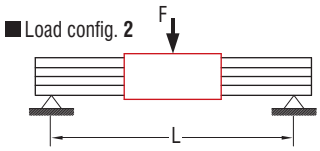
$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

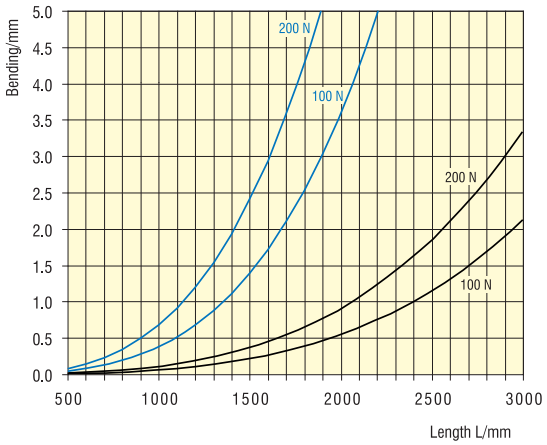
$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$

Linear guide rail LFS-12-3

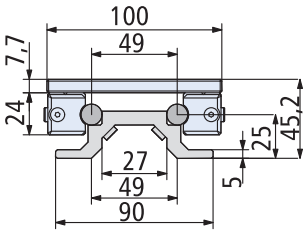
Bending



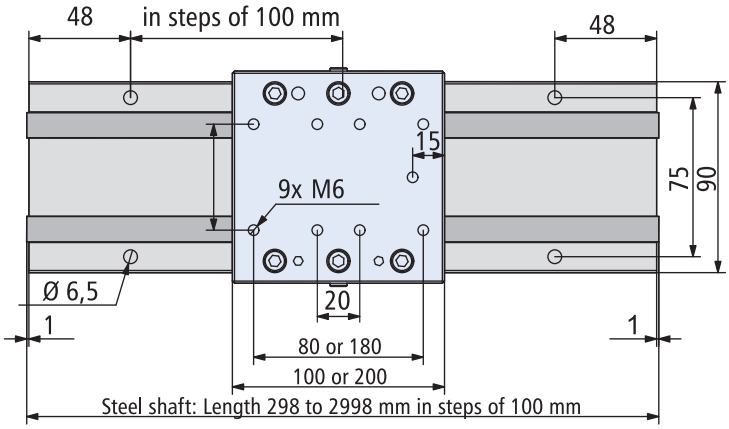


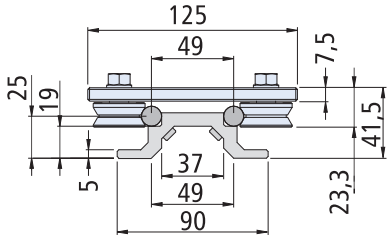


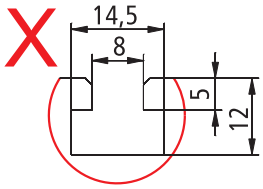
Dimensioned drawings

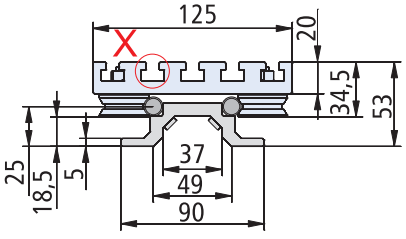


LFS-12-3 with aluminium slide **WS 7**

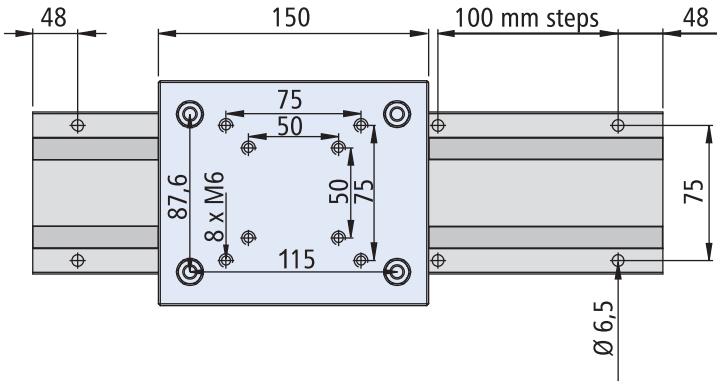




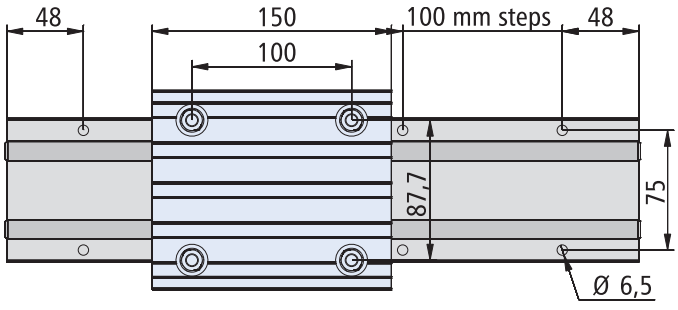




LFS-12-3 with Carriage **LW 8**

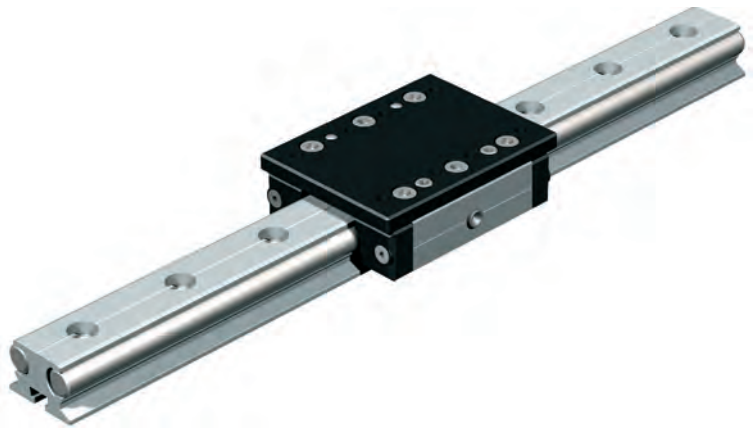


LFS-12-3 with Carriage **LW 2**



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.

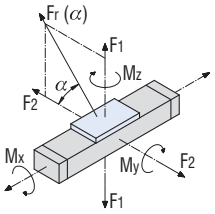
Loading data

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

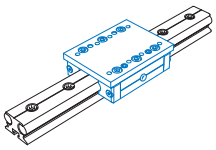
Carriage LW 4	
C_o	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3846 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	135.4 Nm
M_y stat.	194.4 Nm
M_z stat.	97.2 Nm
M_x dyn.	120.5 Nm
M_y dyn.	173,0 Nm
M_z dyn.	180.0 Nm

	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



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

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

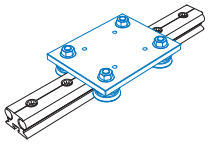


Slide

- 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**

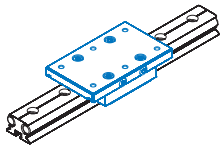
L 150 × W 75 × H 31.5 mm (WS 8)
(Weight: appr. 1.0 kg)
Part no.: **223108**



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**

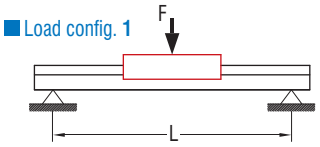
Dual track set 2

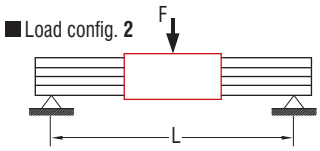
- L125 x W75 x H30.2 mm
- with 2 LARGE linear ball bearings

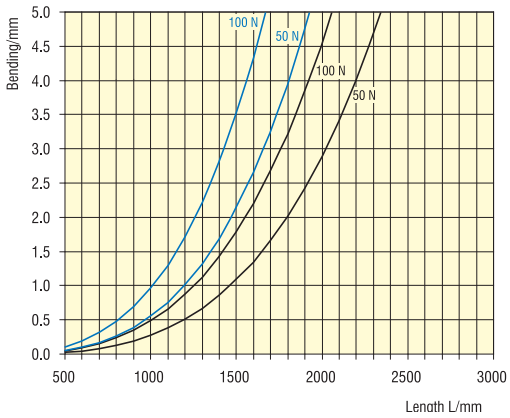
Part no.: **223002**

Linear guide rail LFS-12-10

Bending

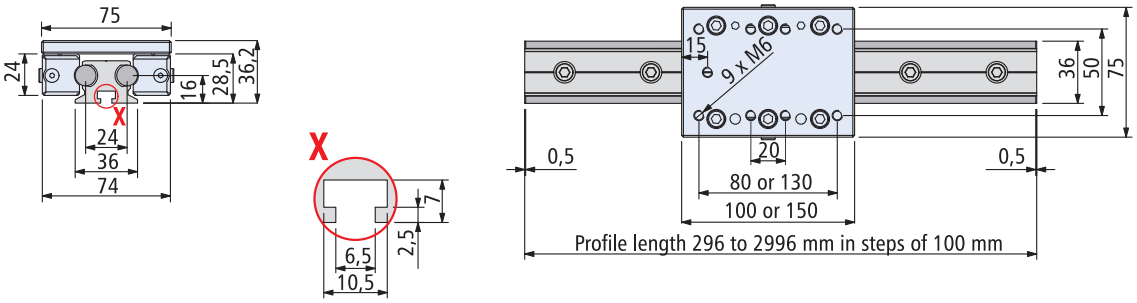




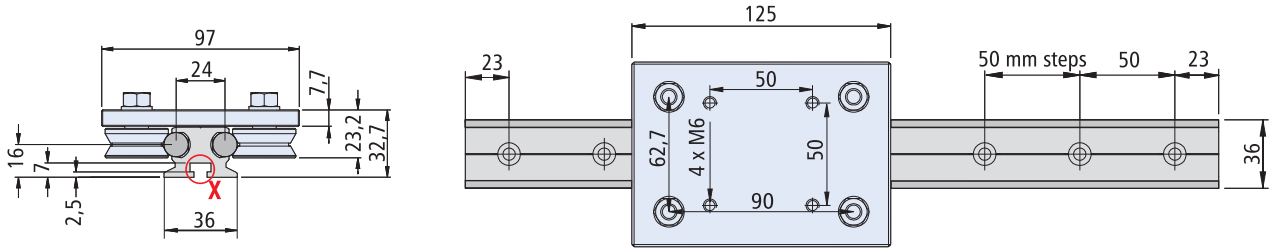


Dimensioned drawings

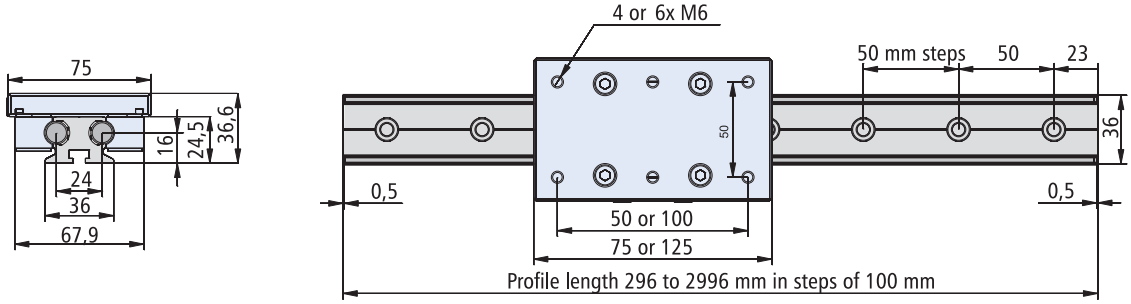
LFS-12-10 with slide **WS 8**



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

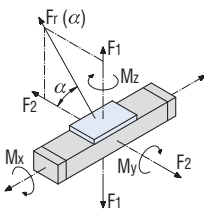
Carriage ILW 1	
C_0	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3897 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	-
M_y stat.	194.4 Nm
M_z stat.	97.2 Nm
M_x dyn.	-
M_y dyn.	175.3 Nm
M_z dyn.	180.0 Nm

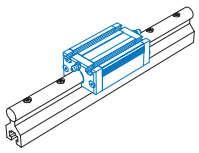
Slide IWS 1	
C_0	3286 N
C	1773 N
F_1 stat.	2806 N
F_1 dyn.	1514 N
F_2 stat.	3286 N
F_2 dyn.	1773 N
M_x stat.	--
M_y stat.	104.7 Nm
M_z stat.	122.6 Nm
M_x dyn.	--
M_y dyn.	56.4 Nm
M_z dyn.	66.1 Nm

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

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

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

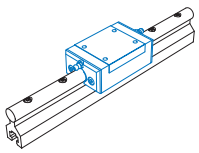




Aluminium slide IWS 1

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

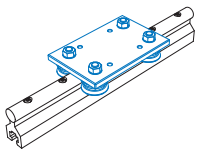
Part no.: **223220**
Stainless steel: **223220 0001**



Steel slide ILS 1

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

Part no.: **223210**



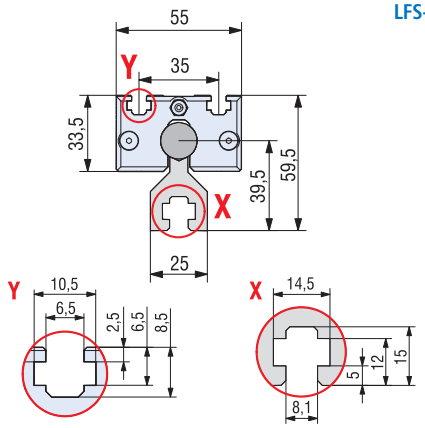
Carriage ILW 1

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

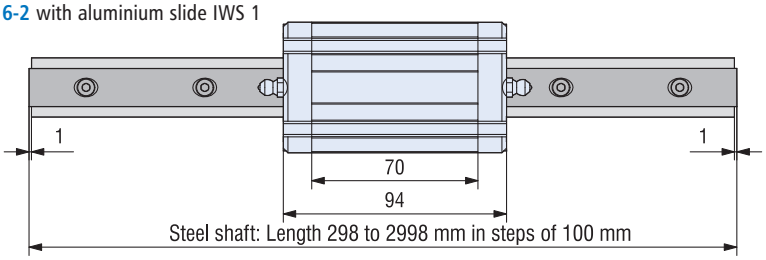
Part no.: **223230**

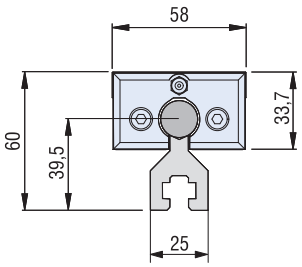
Linear guide rail LFS-16-2

Dimensioned drawings

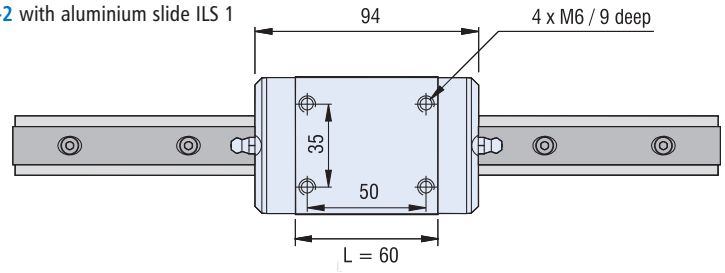


LFS-16-2 with aluminium slide IWS 1

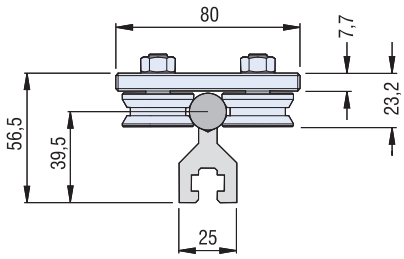


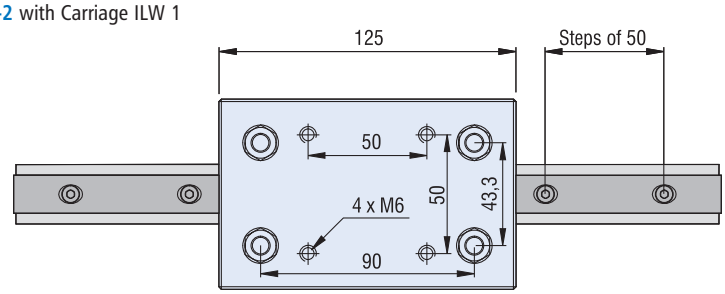


LFS-16-2 with aluminium slide ILS 1



LFS-16-2 with Carriage ILW 1

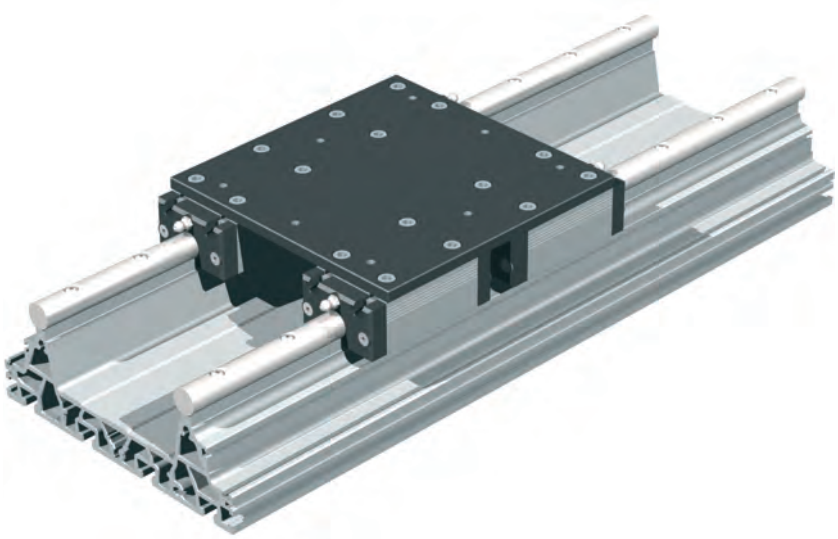




mechanics

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

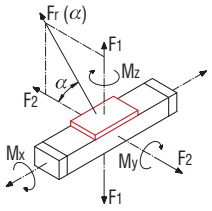
Length in mm (in 100 mm raster)
e.g. **0029** = Length 298
0299 = Length 2998

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

Loading data

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

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



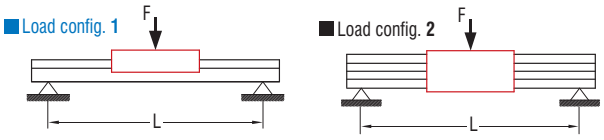
Unit with 2x IWS1	
C_0	4929 N
C	2660 N
F_1 stat.	4209 N
F_1 dyn.	2271 N
F_2 stat.	4929 N
F_2 dyn.	2660 N
M_x stat.	253 Nm
M_y stat.	147 Nm
M_z stat.	173 Nm
M_x dyn.	136 Nm
M_y dyn.	79 Nm
M_z dyn.	93 Nm

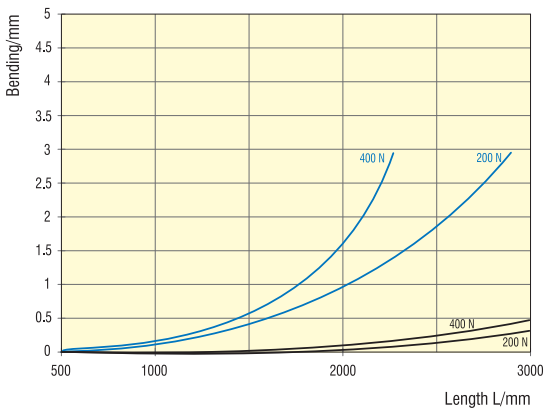
Unit with 2x ILS1	
C_0	7598 N
C	4857 N
F_1 stat.	6488 N
F_1 dyn.	4148 N
F_2 stat.	7598 N
F_2 dyn.	4857 N
M_x stat.	389 Nm
M_y stat.	195 Nm
M_z stat.	228 Nm
M_x dyn.	249 Nm
M_y dyn.	124 Nm
M_z dyn.	146 Nm

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

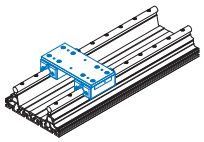




made by isel®

Linear guide rail LFS-16-120

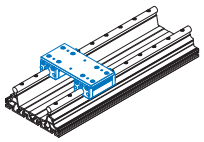
Slide unit
with 2 × steel slide
ILS 1 (kit)



- 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**

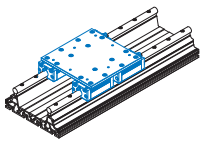
Slide unit
with 2 × aluminium slide
IWS 1 (kit)



- 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**

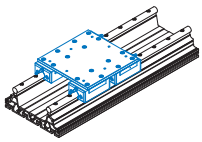
Slide unit
with 4 × aluminium slide
IWS 1 (kit)



- 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)

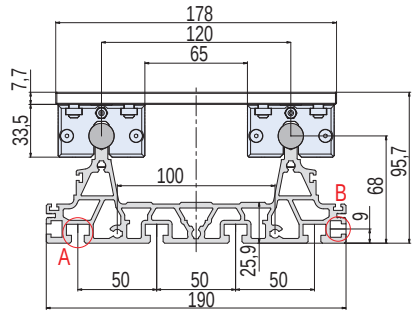


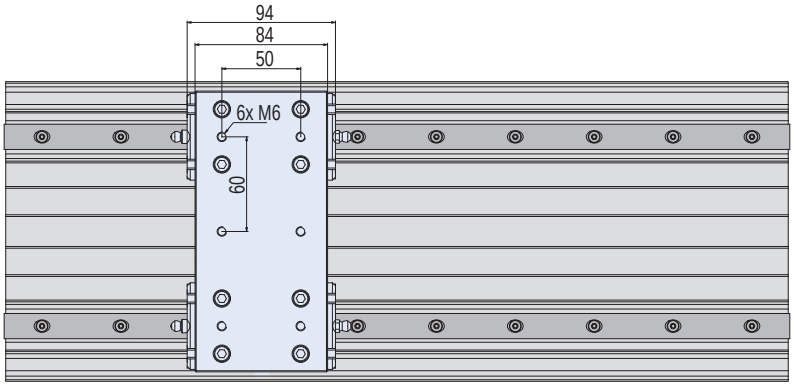
- L 180 × W 178 × H 8 mm
- ground steel plate
- 4 x ILS 1, central lubrication option
- adjustable for no play

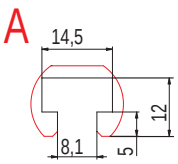
Part no.: **223240 0010**

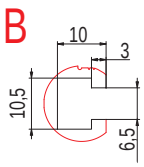
Dimensioned drawings

Aluminium slide IWS 1

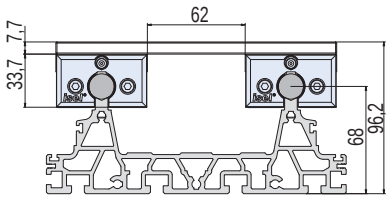


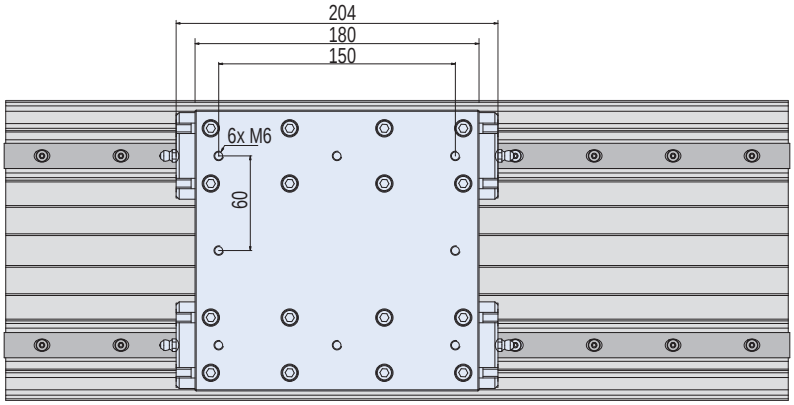






Steel slide ILS 1





mechanics

Linear guide

LFS-16-150

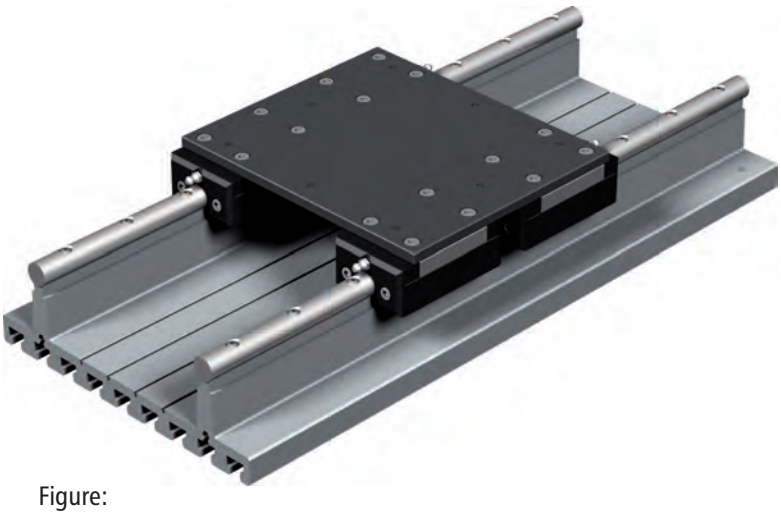


Figure:
Linear guide rail and 4 linear guide slide with slot plate

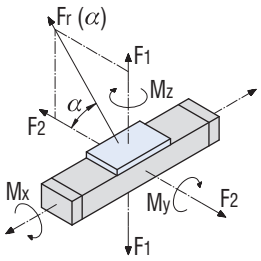
Loading data

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

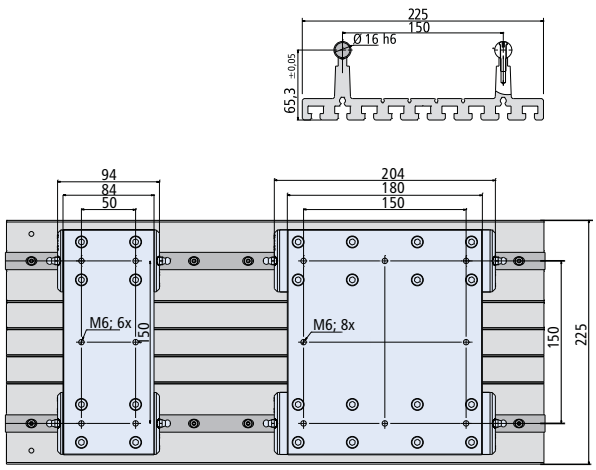
Linear guide LFS-16-150 4 steel slide	
C_o	10130 N
C	6476 N
F_1 stat.	8650 N
F_1 dyn.	5530 N
F_2 stat.	10130 N
F_2 dyn.	6476 N
M_x stat.	648.8 Nm
M_y stat.	475.8 Nm
M_z stat.	557.2 Nm
M_x dyn.	414.8 Nm
M_y dyn.	304.2 Nm
M_z dyn.	356.2 Nm

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

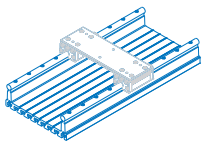
$$Fr(\alpha) = \frac{F1}{\sin \alpha}$$



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

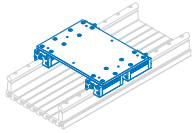
Part no.: **223210**

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

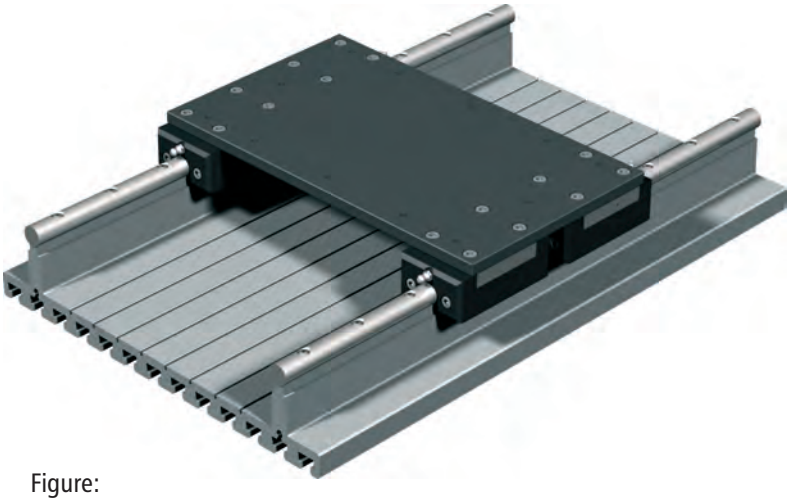


Figure:
Linear guide rail and 4 linear guide slide with slot plate

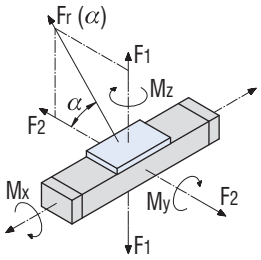
Loading data

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

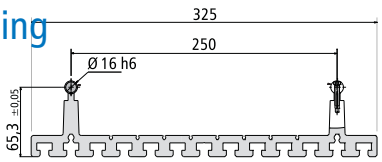
Linear guide LFS-16-250 4 steel slide	
C_o	10130 N
C	6476 N
F_1 stat.	8650 N
F_1 dyn.	5530 N
F_2 stat.	10130 N
F_2 dyn.	6476 N
M_x stat.	1081.3 Nm
M_y stat.	475.8 Nm
M_z stat.	557.2 Nm
M_x dyn.	691.3 Nm
M_y dyn.	304.2 Nm
M_z dyn.	356.2 Nm

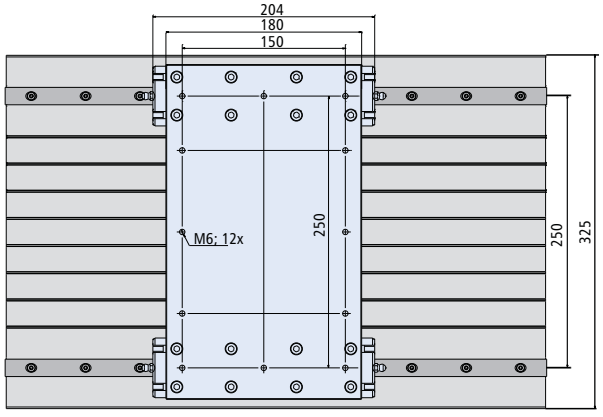
$$Fr(\alpha) = \frac{F2}{\cos \alpha}$$

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

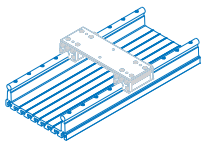


Dimensioned drawing





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

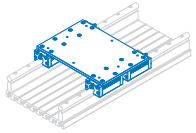
Part no.: **223210**

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 $C_0/2$.

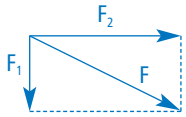
Combined load

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:

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



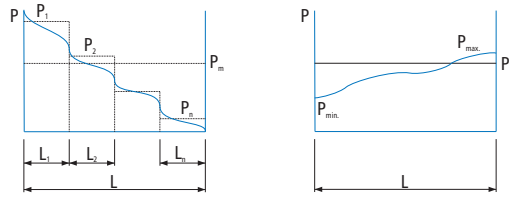
P [N]	dynamically equivalent load
F [N]	opposing force $= \sqrt{F_1^2 + F_2^2}$
F_1 [N]	vertical component see sketch (4)
F_2 [N]	horizontal component see sketch (4)
C_0 [N]	static load factor
M [Nm]	opposing torque
$M_{0(XYZ)}$ [Nm]	static torque in the direction of the opposing torque

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.

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

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

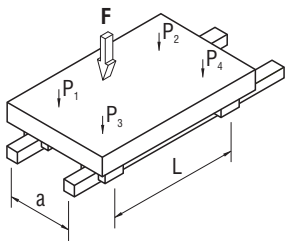
$$L_h = \frac{1666}{V} \cdot \left(\frac{C}{P}\right)^3$$

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

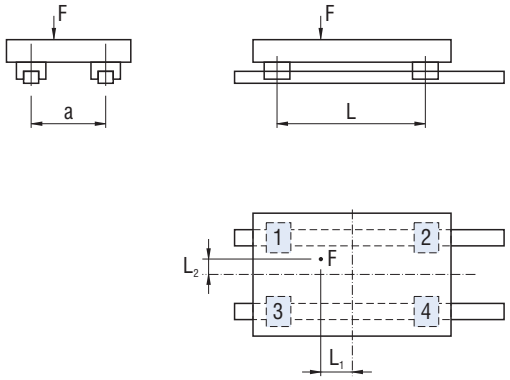
Operating loads calculation

Load vertically on the **bench surface**

Loading



Dimensioned figure



Load on a Carriage

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

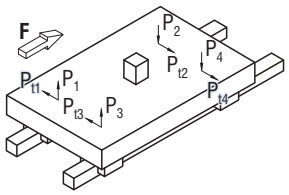
$$P_2 = \frac{F}{4} - \frac{F \cdot L_1}{2L} + \frac{F \cdot L_2}{2a}$$

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

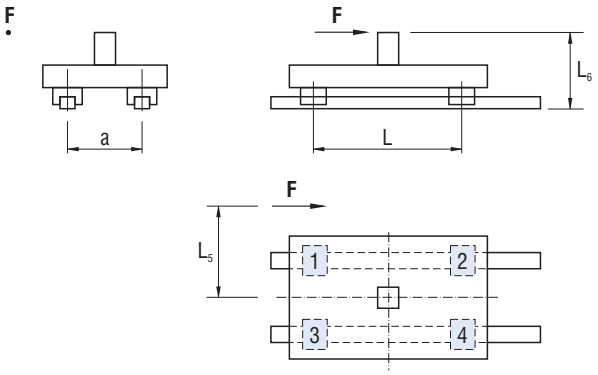
$$P_4 = \frac{F}{4} - \frac{F \cdot L_1}{2L} - \frac{F \cdot L_2}{2a}$$

Load in **direction of motion**

Loading



Dimensioned figure



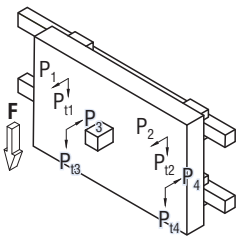
Load on a Carriage

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

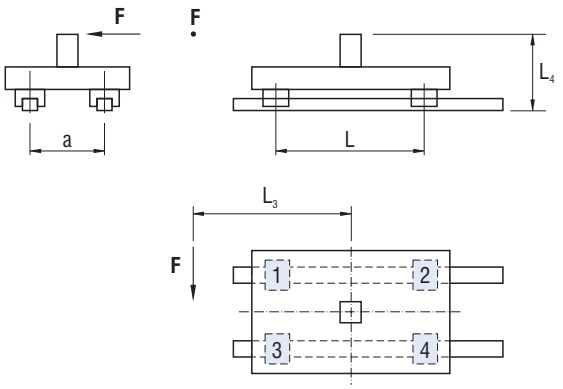
$$P_{t1} \ldots P_{t4} = \frac{F \cdot L_5}{2L}$$

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

Loading



Dimensioned figure



Load on a Carriage

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

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

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

Space for your notes

mechanics

Drive elements

Overview

Information

The ball screw nuts from **isel Germany AG** are of high quality, precise and abrasion-resistant (hardened and polished). Together with the ball screw spindles, they convert rotations into linear movements most friction-poorly.

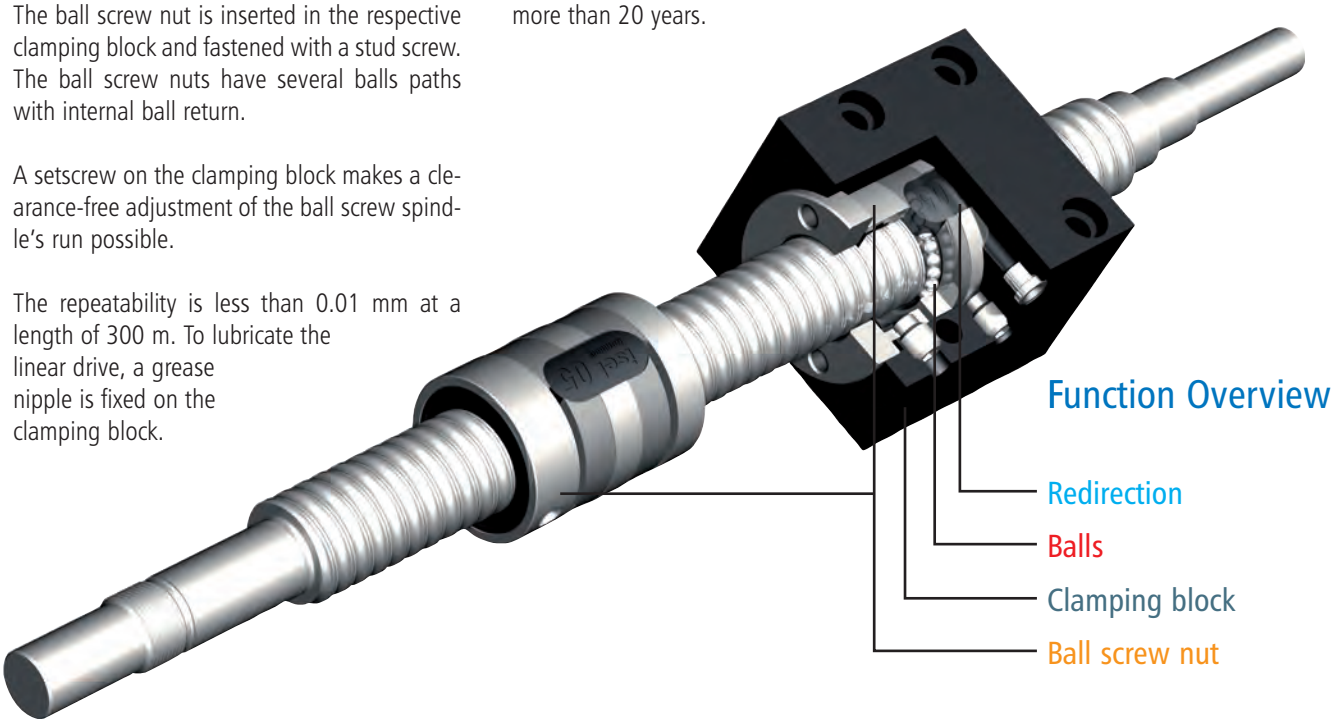
The ball screw nut is inserted in the respective clamping block and fastened with a stud screw. The ball screw nuts have several balls paths with internal ball return.

A setscrew on the clamping block makes a clearance-free adjustment of the ball screw spindle's run possible.

The repeatability is less than 0.01 mm at a length of 300 m. To lubricate the linear drive, a grease nipple is fixed on the clamping block.

The ball screw spindles are produced with modern machines; they are rolled, hardened and polished.

Our linear drives are technically mature and have stood the test in practice for more than 20 years.

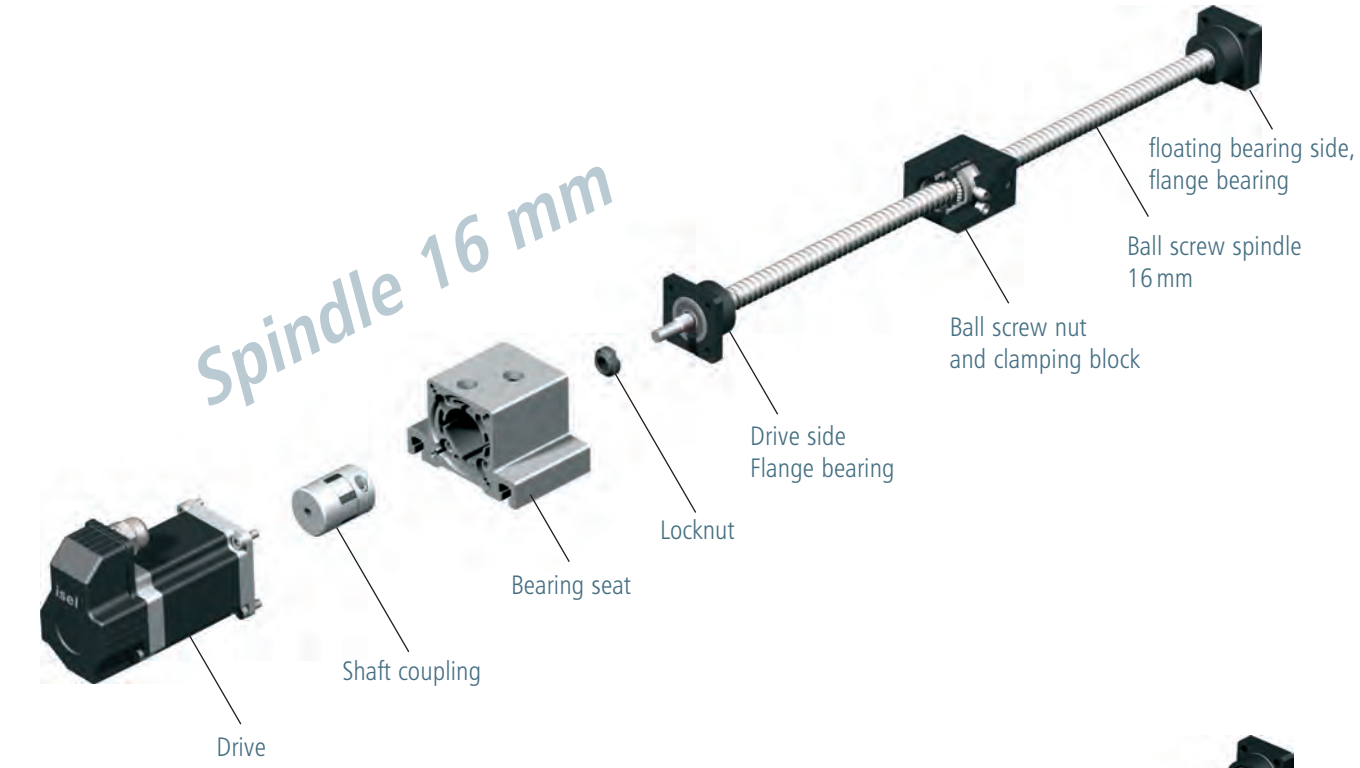


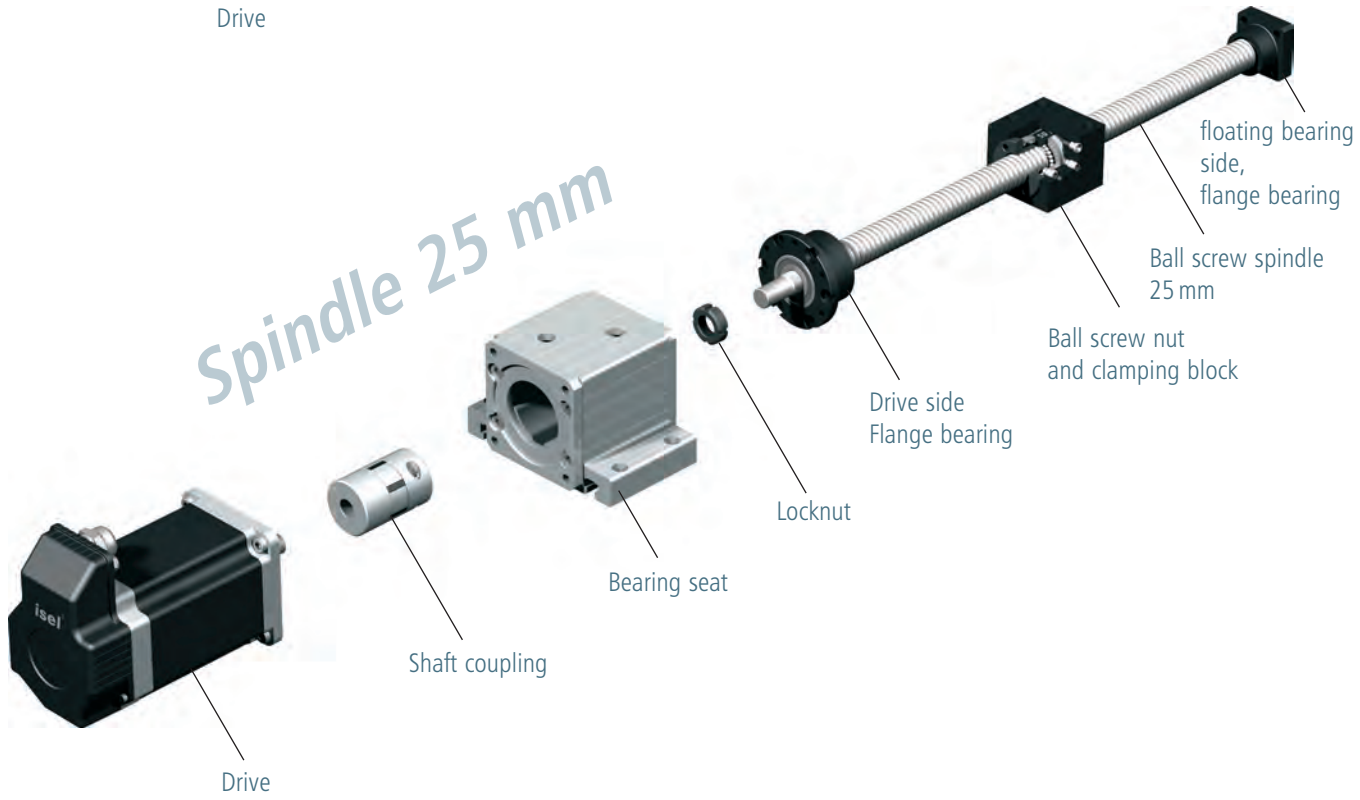
Drive elements

Overview

Linear Drives

The most commonly used type of drive for a linear unit is a directly or by a tooth belt driven ball screw spindle.





mechanics

Ball screw spindles Ø 16, 25 mm

Ø 16 features

- Ø16 mm, rolled, hardened and polished
- Material CF 53, inductively hardened (HRC 60 ± 2); (for detailed information see DIN 17212)
- Spindle pitches: 2.5 / 4 / 5 / 10 and 20 mm
- Lengths up to max. 3052 mm available
- End machining to isel standard or to order (see "Available lengths")
- Produced to DIN 69051, Part3, Tolerance class 7

Options
- End machining to order

Available lengths

Without end machining
in 100 mm raster
- 452 to 1052 mm
- 1252 mm • 1552 mm
- 1752 mm • 2052 mm
- 2252 mm • 2752 mm
- 3052 mm

Special length according to drawing: 211 13X 0998

Both-sided end machining
in 100 mm raster
- 368 mm to 3068 mm

Special length to drawing: 211 13X 5999

Ordering key

211 13X XXXX

Spindle pitch
2 = 2.5 mm
3 = 4 mm
4 = 5 mm
5 = 10 mm
6 = 20 mm

End machining
0 = not machined
5 = both-sided machining suitable for all feeds (aluminium profile length +78 mm)

Lengths
e.g. **045** = 452 mm
086 = 868 mm
305 = 3052 mm
(rounded to the final digit)

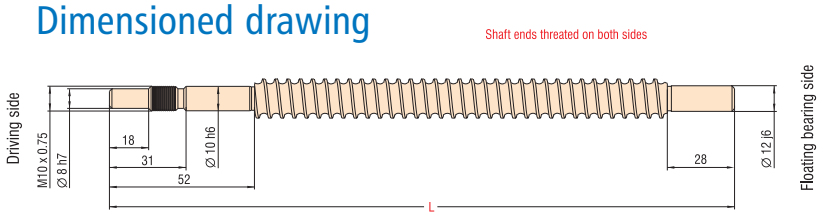
See "Available lengths" for permissible Combinations.

Ordering information

Slotted nut
- Self-locking
- M 10 x 0.75 mm

Part no.: **890257 0011**

Dimensioned drawing



Ø 25 features

- Ø 25 mm, hardened and polished
- Material CF 53, inductively hardened (HRC 60 ± 2); (for detailed information see DIN 17212)
- Spindle pitches: 5/10 and 20 mm
- Lengths up to max. 3052 mm available
- End machining to isel standard or to order (see "Available lengths")
- Produced to DIN 69051, Part 3, Tolerance class 7

Options
- End machining to order

Available lengths

Without end machining
in 100 mm raster
- 500 to 3,000 mm

Special length to drawing: 211 14X 0999

Shaft ends on both sides machined in steps of 100 mm
- 295 to 2,995 mm

Ordering key

211 14X XXXX

Spindle pitch
4 = 5 mm
5 = 10 mm
6 = 20 mm

End machining
0 = not machined
2 = both sides

Lengths
e.g. **050** = 500 mm
100 = 1000 mm
289 = 2895 mm
(rounded to the final digit)

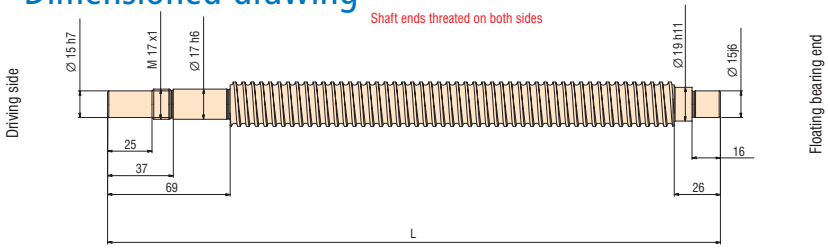
See "Available lengths" for permitted combinations.

Ordering information

Slotted nut
- Self-locking
- M 17 × 1.0 mm

Part no.: **890259 0011**

Dimensioned drawing



Ball bearing nuts

Version 2-Ø16

Features

- Material 16MnCr5 or 20MnCr5, pressed, hardened, polished
- Versions for recirculating ball spindle Ø16 mm
- Nut pitches: 2.5/4/5/10 mm
- Balls are rerouted internally
- as block housing with base fixing
- Regreasing through grease nipples 90°, 0°

Load factors

Pitch	Nominal Ø	Dynamic load factor	Static load factor
2.5 mm	16 mm	3500 N	5500 N
4.0 mm	16 mm	4600 N	7200 N
5.0 mm	16 mm	4600 N	7200 N
10.0 mm	16 mm	4200 N	6500 N

Ordering information

only for spindles Ø16

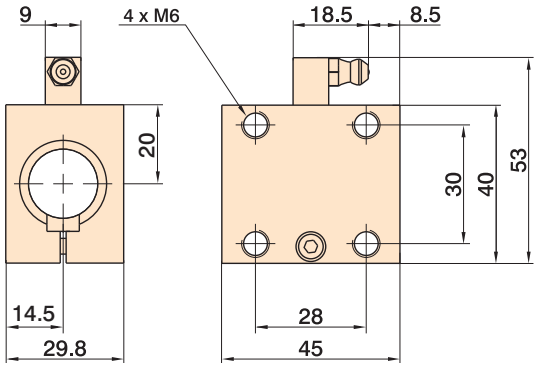
Pitch	Part no.
2.5 mm	213 003 1003
4.0 mm	213 003 1004
5.0 mm	213 003 1005
10.0 mm	213 003 1010

matching:

Dirt scraper

- VE 2 pcs. Part no.: 213500 0001

Dimensioned drawings



Version 3–Ø16 Ø25

Features

- Material 16MnCr5, ground
- Versions for recirculating ball spindles Ø16 and Ø25 mm
- Nut pitches: 2.5/4/5/10 and 20 mm (Ø 16 mm), 5/10 and 20 mm (Ø25 mm)
- Balls are rerouted internally
- The version with nut pitch 20 mm is supplied with scrapers

Load factors

Pitch (mm)	Nominal Ø (mm)	Dyn. load factor (N)	Static load factor (N)
2.5	16	3500	5500
4.0	16	4600	7200
5.0	16	4600	7200
10.0	16	4200	6500
5.0	25	5100	12600
10.0	25	5100	12600
20.0	25	3570	8800

Ordering information

only for spindles Ø 25

Pitch	Part no.
5.0 mm	213 700 0005
10.0 mm	213 700 0010
20.0 mm	213 700 0020

matching:

dirt scraper

- VE 2 pcs.

Part no.: 213700 9000

only for spindles Ø 16

Pitch	Part no.
2.5 mm	213 503
4.0 mm	213 514
5.0 mm	213 505
10.0 mm	213 510
20.0 mm	213 520

matching:

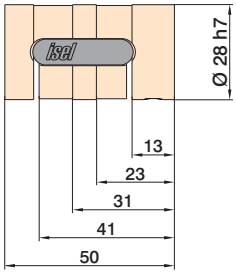
dirt scraper

- VE 2 pcs.

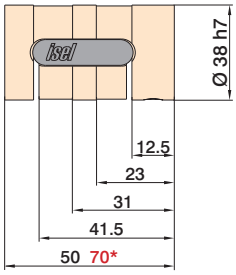
Part no.: 213500 0001

Dimensioned drawings

for spindle Ø 16



for spindle Ø 25



*) At pitch = 20

Clamping blocks For nut version 3

Flange securing

Base securing

Features

- Material steel, gunmetal finish
- Versions for recirculating ball spindles Ø 25 and Ø 16 mm
- Nut pitches
  5 / 10 and 20 mm (Ø 25 mm)
  2.5 / 4 / 5 / 10 and 20 mm (Ø 16 mm)
- Recirculating ball nuts are adjustable for no play
- Clamping blocks for base and flange securing

Ordering information

Clamping block 2 Ø16

Flange securing

Pitch	Part no.
all	213 501

Clamping block 1 Ø16

Base securing

Pitch	Part no.
all	213 500

Clamping block 2 Ø25

Flange securing

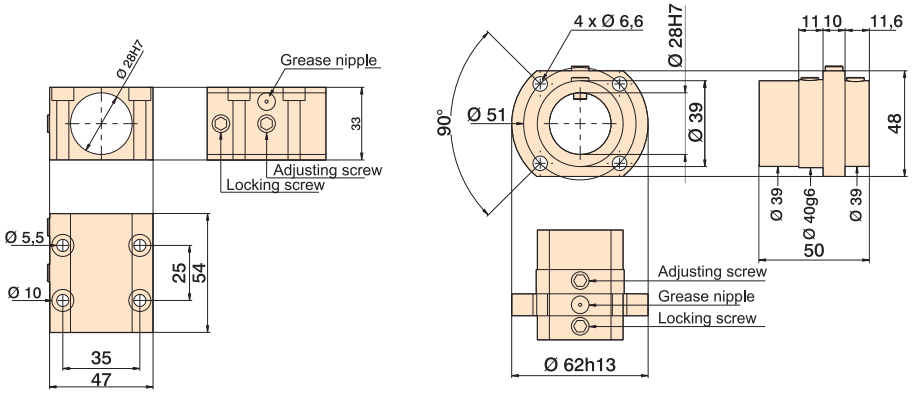
Pitch	Part no.
5 / 10	213 700 9003
20	213 700 9004

Clamping block 1 Ø25

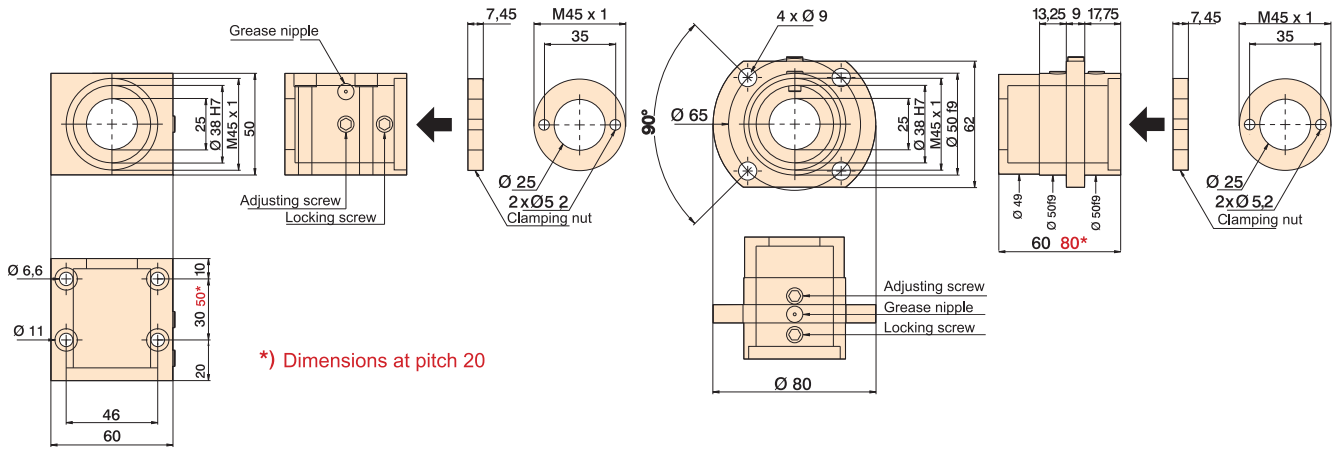
Base securing

Pitch	Part no.
5 / 10	213 700 9001
20	213 700 9002

Dimensioned drawings – spindle clamping blocks Ø 16



Dimensioned drawings – spindle clamping blocks Ø 25



Flange bearing

for spindle ∅ 16 mm

Flange bearing

drive side

Flange bearing

Floating bearing side

Ordering information

Flange bearing, drive side

Part no.: 216 504 0001

Flange bearing, floating bearing side

Part no.: 216 504 0002

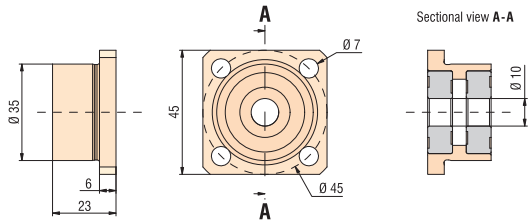
Features

- Bearing, spindle drive side (fixed bearing side) and the spindle floating bearing side
- Flange bearing, drive side: Bushing with two pressed angular contact ball bearings in an O-configuration
- Flange bearing, floating bearing side (counterbearing): bushing with a pressed needle bearing

Dimensioned drawings

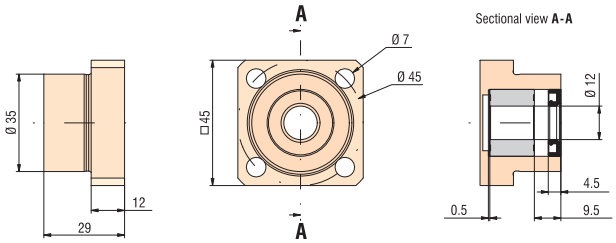
Flange bearing

drive side



Flange bearing

Floating bearing side



for spindle ∅ 25 mm

Flange bearing

drive side

Flange bearing

floating bearing side

Ordering information

Flange bearing, drive side

Part no.: 216 504 0006

Flange bearing, floating bearing side

Part no.: 216 504 0005

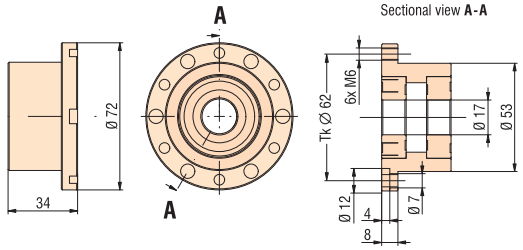
Features

- Bearing, spindle drive side (fixed bearing side) and the spindle floating bearing side
- Flange bearing, drive side: Bushing with two pressed angular contact ball bearings in an O-configuration
- Flange bearing, floating bearing side (counterbearing): bushing with a pressed needle bearing

Dimensioned drawings

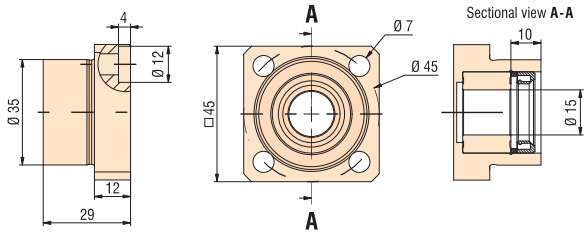
Flange bearing

drive side



Flange bearing

floating bearing side



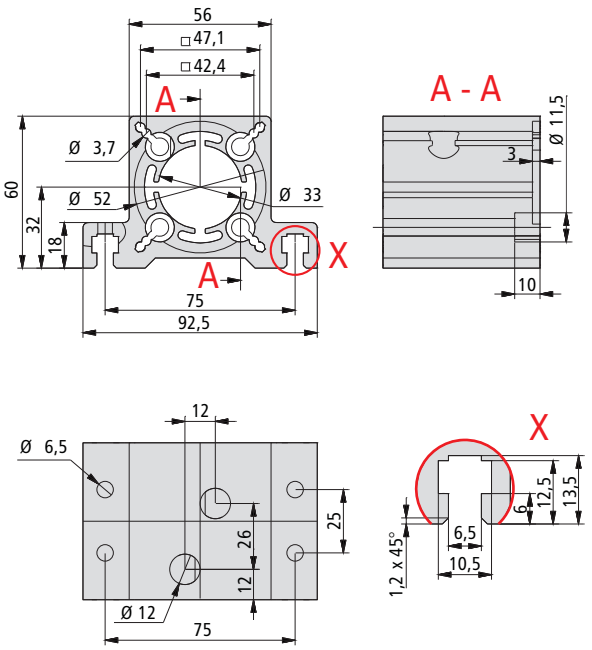
Bearing supports

Bearing support 1

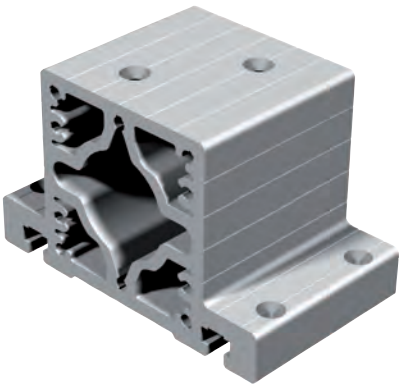
- Aluminium profile to DIN EN 12020-2
- As a parallel connection of flange bearing and motor flange
- Flat milled securing surfaces
- Version for recirculating ball spindle Ø 16 mm
- Universal securing options

.

Part no.: **216504 0007**



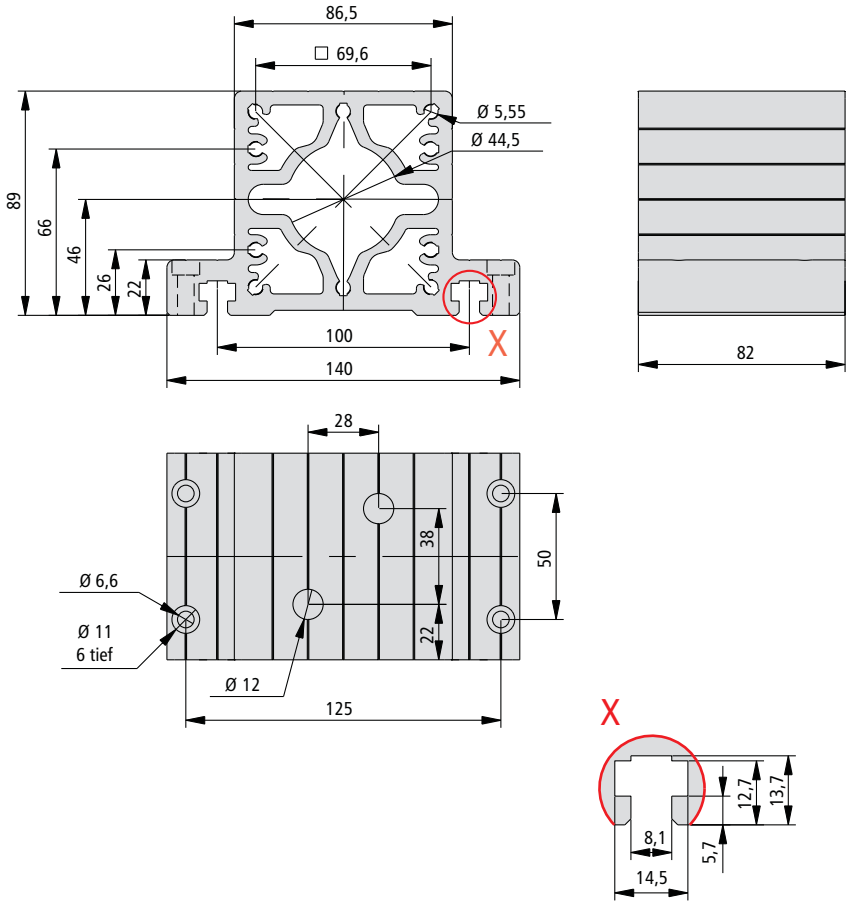
Bearing support 2



- Aluminium profile to DIN EN 12020-2
- As a parallel linkage of flange bearing and motor flange
- Version for recirculating ball spindle Ø 25 mm
- Universal securing options

.

Part no.: **216504 0008**



Shaft couplings

Connection options Direct drive	LES 4	LES 6	LES 5	Angular transmission Securing 0°	Angular transmission Securing 90°
MS 135 HT - 2 MS 200 HT - 2 DC 100 EC 60	Connection via clutch housing 1 short bushing with corresponding shaft coupling				Clutch housing 1 long bushing
MS 600 HT MS 900 HT DC 300 EC 86	Connection via clutch housing 2 short bushing with corresponding shaft coupling				Clutch housing 2 long bushing
Angular transmission Securing 0°	split clutch housing short bushing with corresponding shaft coupling			Connection via Transmission shaft set	
Angular transmission Securing 90°	split clutch housing long bushing with corresponding shaft coupling				

Shaft couplings

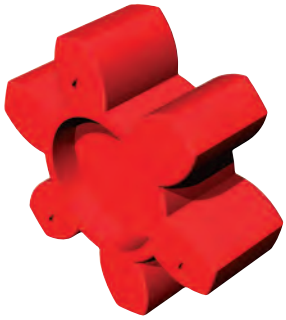
Deliverables: 2 aluminium blocks,
3 PUR sprockets (86°, 92° and 98° Shore) and matching adjusting screws

For part no. see table

Clutch	Part no.	d 1	d 2
20/30	218001 5060	5.0	6.0
	218001 9999	from 4 to 7 mm	
30/40	218002 6380	6.35	8.0
	218002 8080	8.0	8.0
	218002 9999	from 4 to 13 mm	
40/60	218003 9580	9.52	8.0
	218003 9999	from 4 to 18 mm	

Other clutches to order.

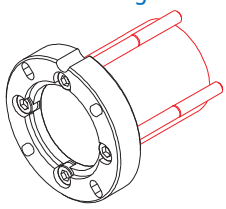
PUR sprockets



for WK 20/30 Part no.: 217 011 00**
for WK 30/40 Part no.: 217 012 00**
for WK 40/60 Part no.: 217 013 00**

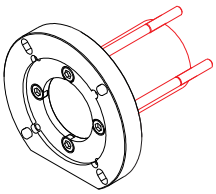
for ** use the Shore hardness

Clutch housing 1 + 2



short bushing
Part no.: 218 100 0001

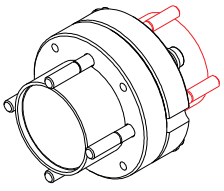
long bushing
Part no.: 218 100 0002



short bushing
Part no.: 218 100 1001

long bushing
Part no.: 218 100 1002

split clutch housing



short bushing
Part-no.: 218 100 2001

long bushing
Part-no.: 218 100 2002

Linear units Overview

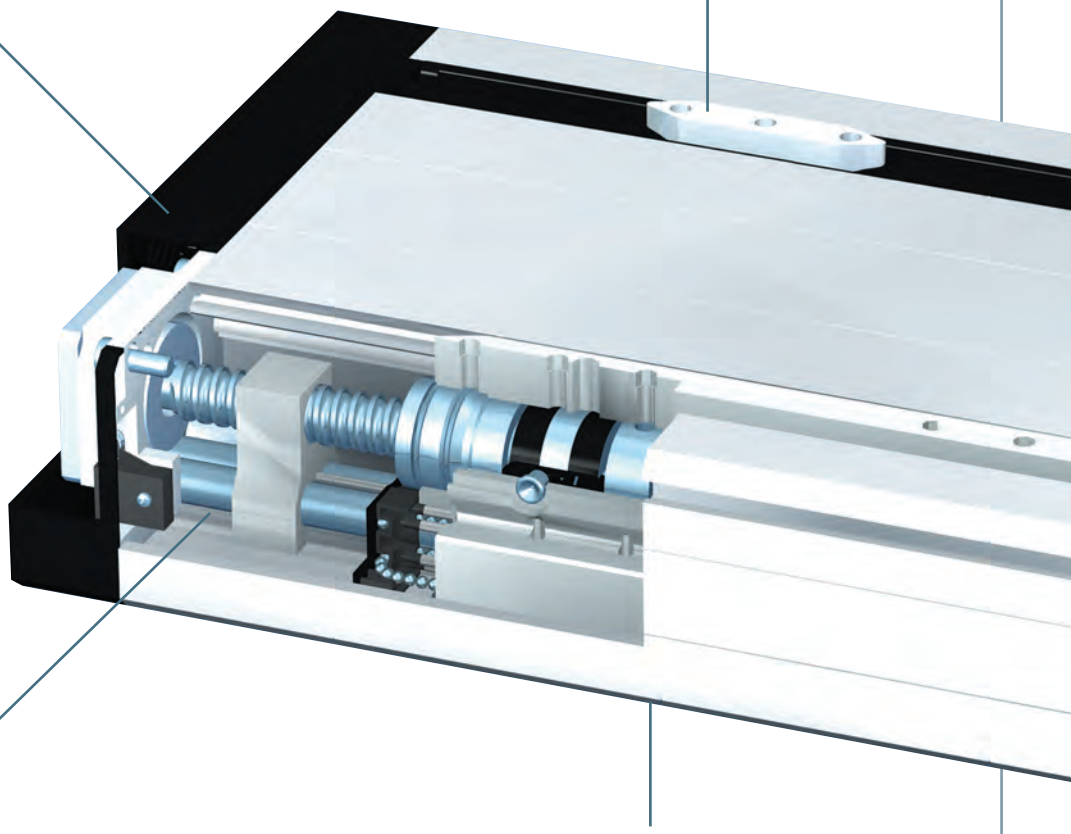
Linear units

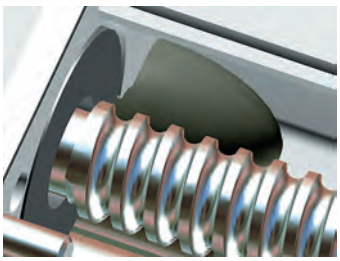
Overview

CAD data on our website **www.isel-germany.de**

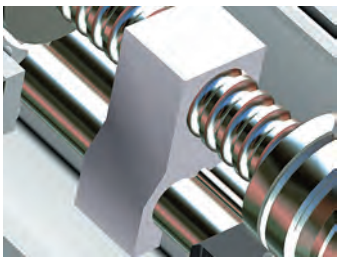
Functional overview

at example LES 5

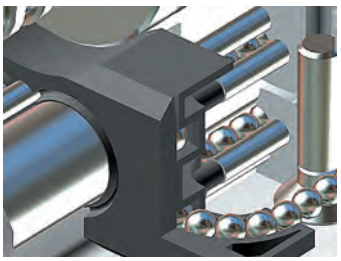




- End position buffering both sides with soft PVC parabolic springs
- Counter-bearing with 2 needle bushings



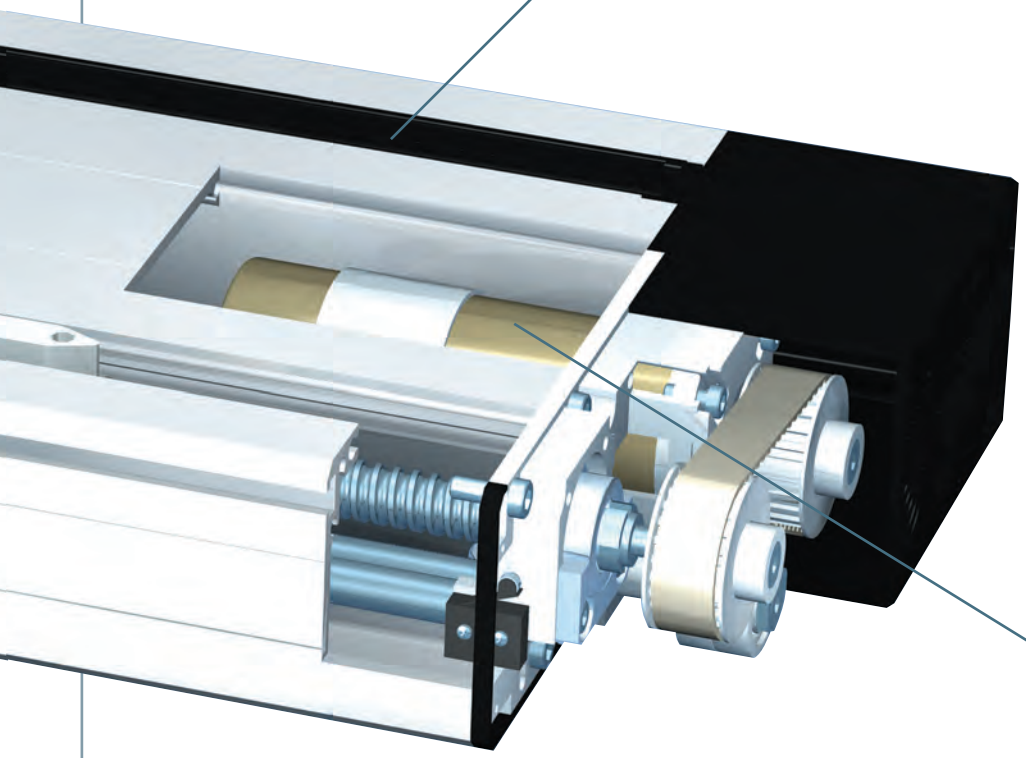
- Spindle support from a profile length of 1500 mm without limiting the travel

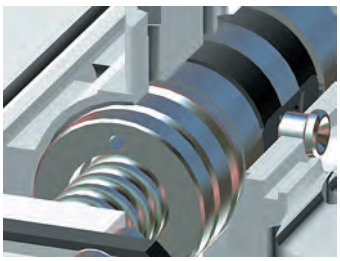


- Recirculating ball in patented aluminium linear slots
- Glass fibre reinforced loop components with scrapers

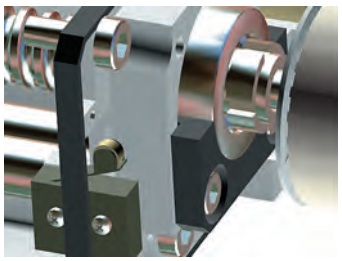
Functional overview

at example LES 5

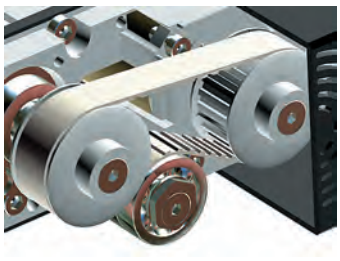




- Preset play-free recirculating ball nut with scrapers
- Central lubrication system for recirculating ball nut and circulations



- Integrated overrun limit switch
- Spindle bearing with angular contact bearings
- Axially free from play by means of self-locking special nuts

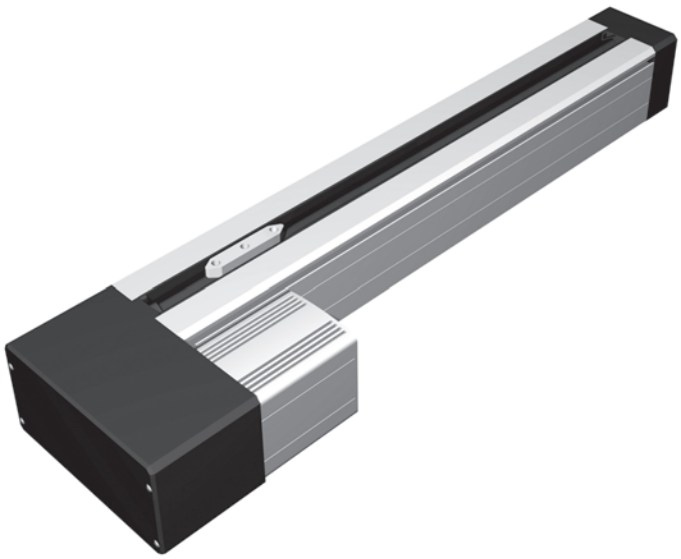


- Belt return and connecting electronics covered completely by protective cap

mechanics

Linear units
with spindle drive

LES 4



LES 4 with side belt drive module

Features

- Aluminium shaft housing profile W75 × H75 mm, naturally anodised
- Clamping area and profile underside milled flat
- with 2 precision steel shafts Ø 12 h6, material Cf53, Hardness 60 ± 2 HRC
- Aluminium shaft slots WS 5/70, 2 x WS 5/70 (70 mm long), adjustable for no play, central lubrication system
- Recirculating ball transmission with 2.5/4/5/10 and 20 mm pitches
- Profile sealing with friction-resistant lip seals
- Cast aluminium end plates
- with 2 limit or reference switches, Repeatability ± 0.02 mm
- sealed angular contact bearings in drive - steel flange

Options:
- Black powder-coated aluminium profile
- Electromagnetic brake
- Steel slots LS2 (Part no. 223007)
- Limit switch attachment kit (see accessories)

Ordering key

234 XXX 0XXX

Drive
0 = Preparation Direct drive modules
1 = Preparation Belt drive module

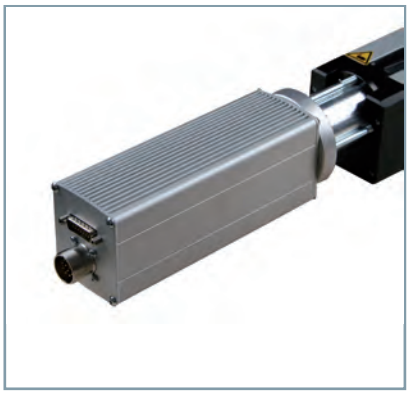
Shaft slots
0 = 1 Shaft slots 70 mm
2 = 2 shaft slots 70 mm

Profile length (L1)
e.g. 029 = 290 mm (min.)
299 = 2990 mm (max.)
(rounded to the last digit)
Standard profile lengths in 100 mm raster - to order

Recirculating ball drive
0 = none
1 = Pitch 2.5 mm
2 = Pitch 4.0 mm
3 = Pitch 5.0 mm
4 = Pitch 10 mm
5 = Pitch 20 mm

Drive modules

see page 72 et seq. of the catalogue



Technical specification
Aluminium profile

Aluminium profile LES 4	
Moment of inertia I_x	107.711 cm⁴
Moment of inertia I_y	125.843 cm⁴
*Centre of gravity see dimensioned drawing	33.23 mm
Cross-sectional area	18.81 cm²
Material	AlMgSiO, 5F22
Anodising	E6/EV1
Weight with steel shafts	6.2 kg/m
Weight with steel shafts and spindles	7.6 kg/m

No load running torques

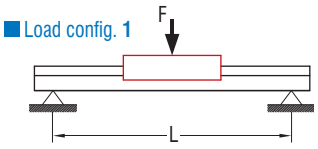
No load running torques					
Speed (rpm)	Spindle pitch				
	2.5	4	5	10	20
500	15	15	16	17	18
1500	19	19	19	20	21
3000	23	24	24	25	26

Linear units
with spindle drive

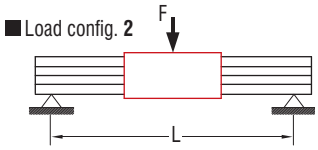
LES 4

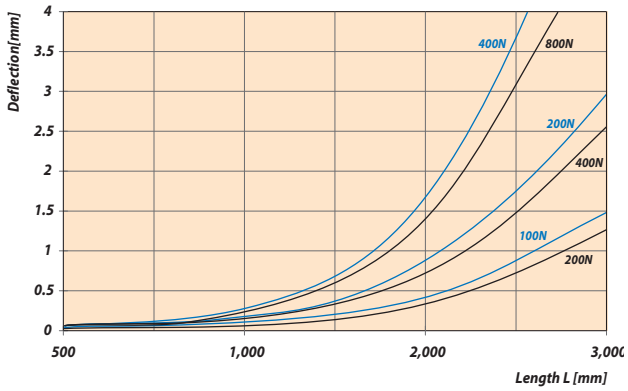
Bending

Load config. **1**



Load config. **2**

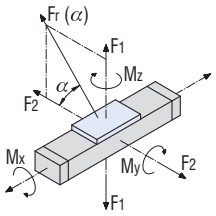




Load factors

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

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



LES 4 with one WS 5/70	
C_0	2576.65 N
C	1461,14 N
F_1 stat.	2200.67 N
F_1 dyn.	1247.93 N
F_2 stat.	2576.65 N
F_2 dyn.	1461.14 N
M_x stat.	36.45 Nm
M_y stat.	82.16 Nm
M_z stat.	96.20 Nm
M_x dyn.	20.67 Nm
M_y dyn.	46.59 Nm
M_z dyn.	54.55 Nm

LES 4 with two WS 5/70	
C_0	*4,954.5 N*
C	*2,809.5 N*
F_1 stat.	*4,231.5 N*
F_1 dyn.	*2,398.5 N*
F_2 stat.	*4,954.5 N*
F_2 dyn.	*2,809.5 N*
M_x stat.	*44.7 Nm*
M_y stat.	*126.945 Nm*
M_z stat.	*148.635 Nm*
M_x dyn.	*25.2 Nm*
M_y dyn.	*71.955 Nm*
M_z dyn.	*84.285 Nm*

permissible spindle speeds

LES 4 / 5 / 6	Spindle pitch p [mm]	2.5	4	5	10	20
Profile length L [mm]	max. permissible spindle speed n [rpm]	max. permissible feed speed v permissible [mm/s]				
490	4000	167	267	333	667	1333
990	3000	125	200	250	500	1000
1390	1500	63	100	125	250	500
1490 *	3000	125	200	250	500	1000
1990 *	1650	69	110	138	275	550
2490 *	1050	44	70	88	175	350
2990 *	750	31	50	63	125	250

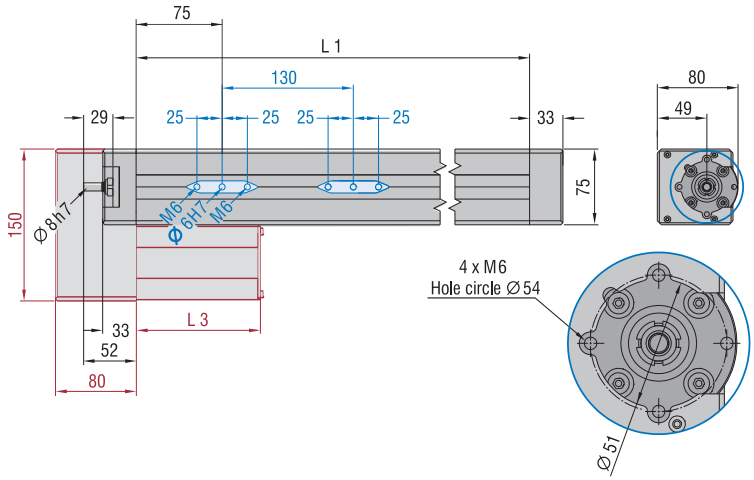
* with spindle support

Dimensioned drawing

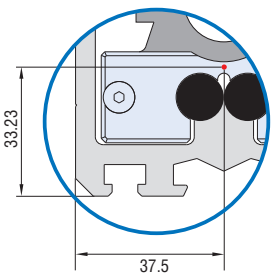
process travel

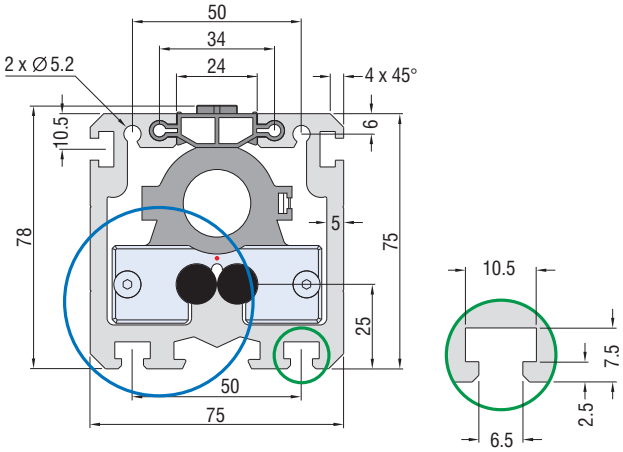
at 1xWS 5/70 = L1 -150 mm
at 2xWS 5/70 = L1 -280 mm

external limit switches see page **C85**



Dimensioned drawing
Aluminium profile





mechanics

Linear units
with spindle drive

LES 6

LES 6 with side belt drive module

Features

- Aluminium shaft housing profile W150 × H75 mm, naturally anodised
- Clamping area and profile underside milled flat
- with 4 precision steel shafts Ø 12 h6, material Cf53, Hardness 60 ± 2 HRC
- Aluminium shaft slots WS 5/70, 2 x WS 5/70 (70 mm long), adjustable for no play, central lubrication system
- Recirculating ball transmission with 2.5/4/5/10 and 20 mm pitches
- Profile sealing with friction-resistant lip seals
- Cast aluminium end plates
- with 2 limit or reference switches, Repeatability ± 0.02 mm
- sealed angular contact bearings in drive - steel flange

Options:
- Black powder-coated aluminium profile
- Electromagnetic brake
- Steel slots LS2 (Part no. 223007)
- Limit switch attachment kit (see accessories)

Ordering key

234 XXX 0XXX

Drive
6 = Preparation Direct drive modules
7 = Preparation Belt drive module

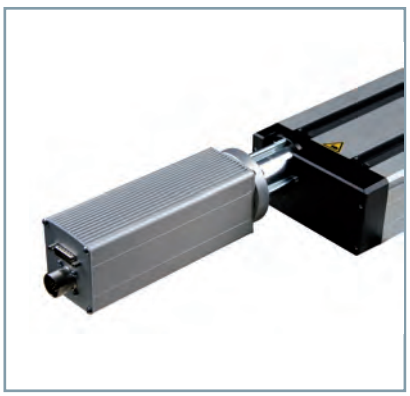
Shaft slots
0 = 2 shaft slots 70 mm
2 = 4 shaft slots 70 mm

Recirculating ball drive
0 = none
1 = Pitch 2.5 mm
2 = Pitch 4.0 mm
3 = Pitch 5.0 mm
4 = Pitch 10 mm
5 = Pitch 20 mm

Profil length (L1)
e.g. 029 = 290 mm (min.)
299 = 2990 mm (max.)
(rounded to the last digit)
Standard profile length in 100 mm raster – to order

Drive modules

see page 72 et seq. of the catalogue



Technical specification
Aluminium profile

Aluminium profile LES 6	
Moment of inertia I_x	707.100 cm^4
Moment of inertia I_y	212.200 cm^4
*Centre of gravity see dimensioned drawing	32.78 mm
Cross-sectional area	30.07 cm^2
Material	AlMgSiO, 5F22
Anodising	E6/EV1
Weight with steel shafts	11.4 kg/m
Weight with steel shafts and spindles	12.8 kg/m

No load running torques

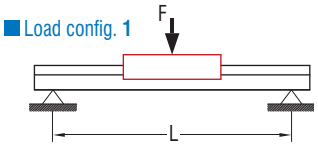
No load running torques (Ncm)					
Speed (rpm)	Spindle pitch				
	2.5	4	5	10	20
500	17	17	18	20	21
1500	20	20	22	24	25
3000	24	25	26	29	30

Linear units
with spindle drive

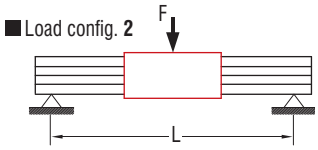
LES 6

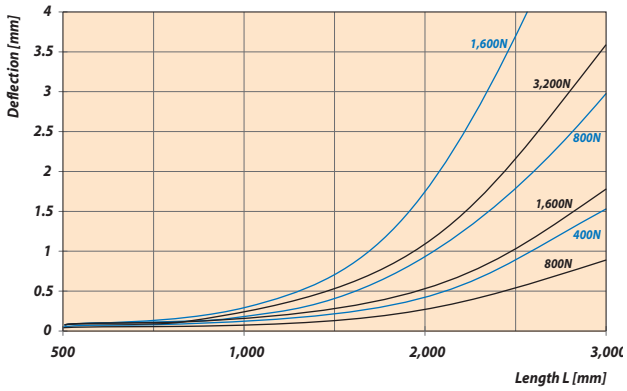
Bending

Load config. **1**



Load config. **2**

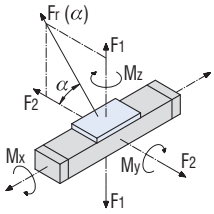




Load factors

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

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



LES 6 with two WS 5/70	
C_0	5153.30 N
C	2319.41 N
F_1 stat.	4401.33 N
F_1 dyn.	1980.96 N
F_2 stat.	5153.30 N
F_2 dyn.	2319.14 N
M_x stat.	211.54 Nm
M_y stat.	164.31 Nm
M_z stat.	192.39 Nm
M_x dyn.	95.21 Nm
M_y dyn.	73.95 Nm
M_z dyn.	86.59 Nm

LES 6 with four WS 5/70	
C_0	6,606 N
C	3,746 N
F_1 stat.	5,642 N
F_1 dyn.	3,198 N
F_2 stat.	6,606 N
F_2 dyn.	3,746 N
M_x stat.	211.575 Nm
M_y stat.	366.73 Nm
M_z stat.	429.39 Nm
M_x dyn.	119.925 Nm
M_y dyn.	207.87 Nm
M_z dyn.	243.49 Nm

permissible spindle speeds

LES 4 / 5 / 6	Spindle pitch [mm]	2.5	4	5	10	20
Profil length L [mm]	max. permissible feed speed [rpm]	max. permissible feed speed v permissible [mm/s]				
490	4000	167	267	333	667	1333
990	3000	125	200	250	500	1000
1390	1500	63	100	125	250	500
1490 *	3000	125	200	250	500	1000
1990 *	1650	69	110	138	275	550
2490 *	1050	44	70	88	175	350
2990 *	750	31	50	63	125	250

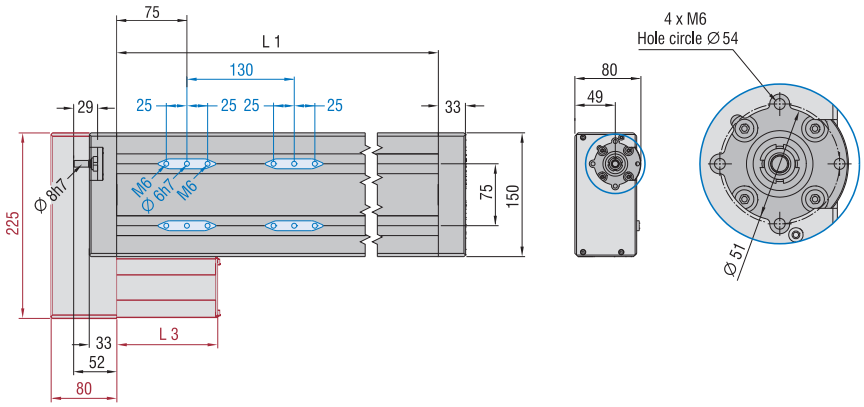
* with spindle support

Dimensioned drawing

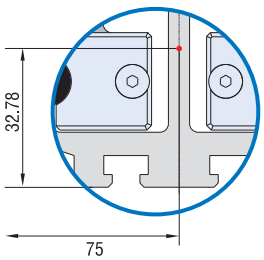
process travel

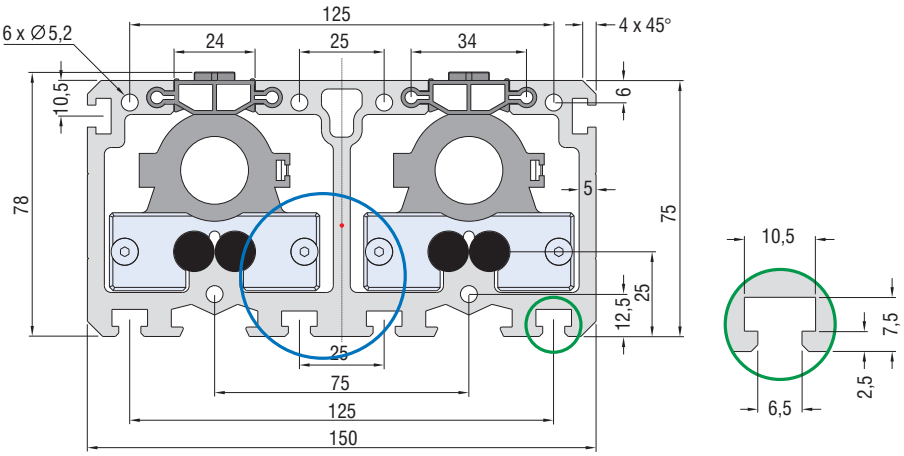
at 2 × WS 5/70 = L1 -150 mm
at 4 × WS 5/70 = L1 -280 mm

external limit switches see page **C85**



Dimensioned drawing
Aluminium profile





Linear units
with spindle drive

LES 5

LES 5 with integrated belt drive module

Features

- Aluminium shaft housing profile W225 × H75 mm, naturally anodised
- Clamping area and profile underside milled flat
- with 4 precision steel shafts Ø 12 h6, material Cf53, Hardness 60 ± 2 HRC
- Aluminium shaft slots WS 5/70, 2 x WS 5/70 (70 mm long), adjustable for no play, central lubrication system
- Recirculating ball transmission with 2.5/4/5/10 and 20 mm pitches
- Profile sealing with friction-resistant lip seals
- Cast aluminium end plates
- with 2 limit or reference switches, Repeatability ± 0.02 mm
- sealed angular contact bearings in drive - steel flange

Options:
- Black powder-coated aluminium profile
- Electromagnetic brake
- Steel slots LS2 (Part no. 223007)
- Limit switch attachment kit (see accessories)

Ordering key

234 XXX 0XXX

Drive
3 = Preparation Direct drive modules
4 = Preparation Belt drive module

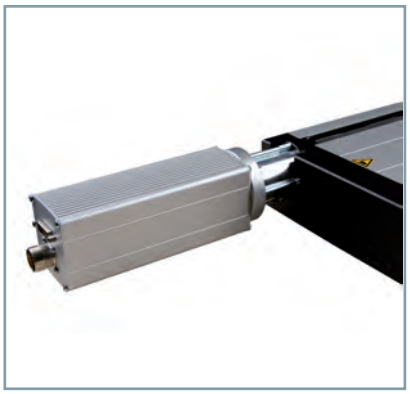
Shaft slots
0 = 2 shaft slots 70 mm
2 = 4 shaft slots 70 mm

Profile length (L1)
e.g. 029 = 290 mm (min.)
299 = 2990 mm (max.)
(rounded to the last digit)
Standard profile lengths in 100 mm raster - to order

Recirculating ball drive
0 = none
1 = Pitch 2.5 mm
2 = Pitch 4.0 mm
3 = Pitch 5.0 mm
4 = Pitch 10 mm
5 = Pitch 20 mm

Drive modules

See page 72 et seq. of the catalogue



Technical specification
Aluminium profile

Aluminium profile LES 5	
Moment of inertia I_x	2,361.654 cm^4
Moment of inertia I_y	298.925 cm^4
*Centre of gravity see dimensioned drawing	33.39 mm
Cross-sectional area	42.49 cm^2
Material	AlMgSiO, 5F22
Anodising	E6/EV1
Weight with steel shafts	13.8 kg/m
Weight with steel shafts and spindles	15.2 kg/m

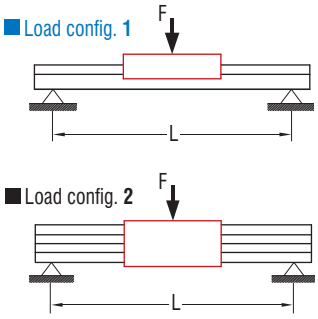
No load running torques

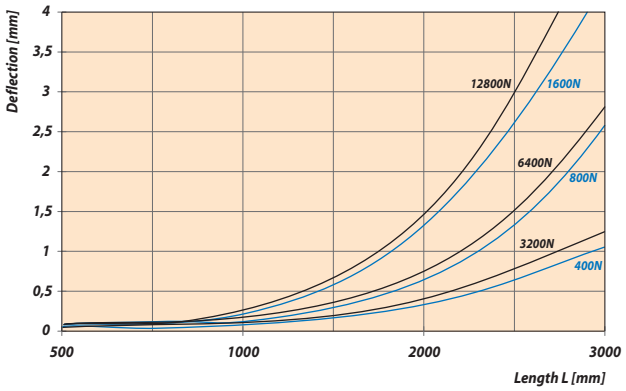
No load running torques (Ncm)					
Speed (rpm)	Spindle pitch				
	2.5	4	5	10	20
500	15	15	16	17	18
1500	19	19	19	20	21
3000	23	24	24	25	26

Linear units
with spindle drive

LES 5

Bending

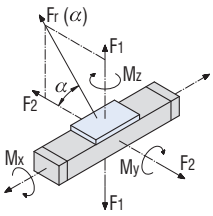




Load factors

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

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



LES 5 with two WS 5/70	
C_0	5153.30 N
C	2319.41 N
F_1 stat.	4401.33 N
F_1 dyn.	1980.96 N
F_2 stat.	5153.30 N
F_2 dyn.	2319.14 N
M_x stat.	376.59 Nm
M_y stat.	164.31 Nm
M_z stat.	192.39 Nm
M_x dyn.	169.49 Nm
M_y dyn.	73.95 Nm
M_z dyn.	86.59 Nm

LES 5 with four WS 5/70	
C_0	6,606 N
C	3,746 N
F_1 stat.	5,642 N
F_1 dyn.	3,198 N
F_2 stat.	6,606 N
F_2 dyn.	3,746 N
M_x stat.	423.15 Nm
M_y stat.	366.73 Nm
M_z stat.	429.39 Nm
M_x dyn.	239.85 Nm
M_y dyn.	207.87 Nm
M_z dyn.	243.49 Nm

permissible spindle speeds

LES 4 / 5 / 6	Spindle pitch p [mm]	2.5	4	5	10	20
Profil length L [mm]	max. permissible spindle speed n [rpm]	max. permissible feed speed v permissible [mm/s]				
490	4000	167	267	333	667	1333
990	3000	125	200	250	500	1000
1390	1500	63	100	125	250	500
1490 *	3000	125	200	250	500	500
1990 *	1650	69	110	138	275	550
2490 *	1050	44	70	88	175	350
2990 *	750	31	50	63	125	250

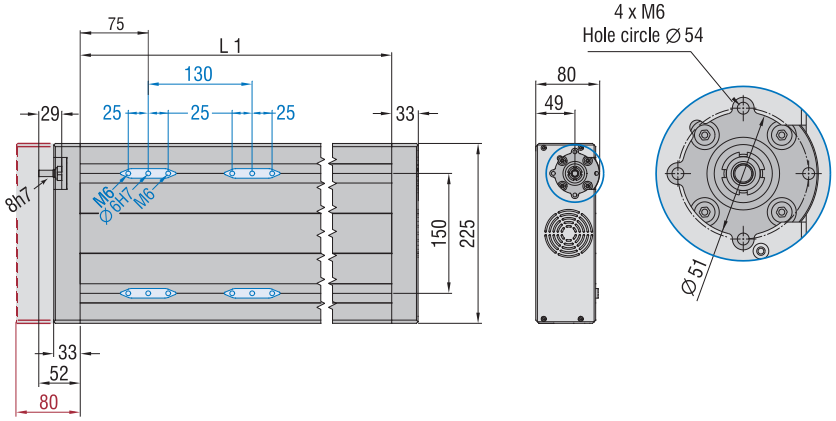
* with spindle support

Dimensioned drawing

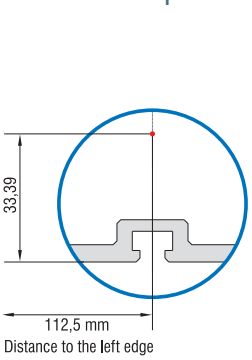
process travel

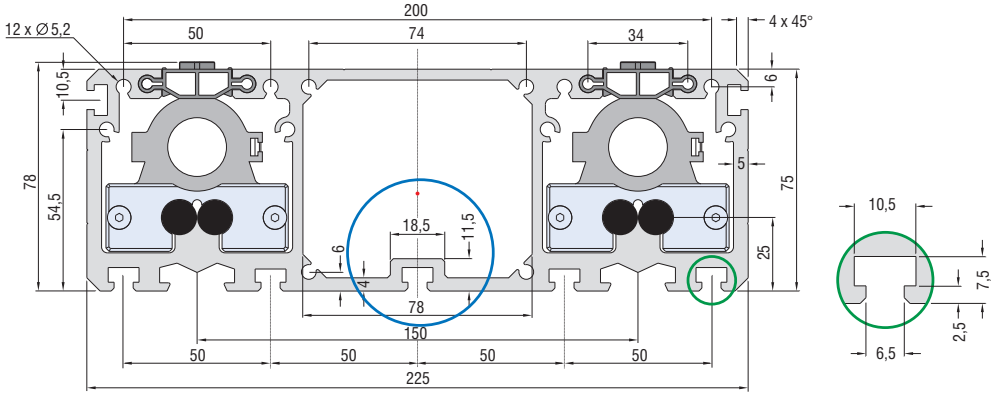
at 2xWS 5/70 = L1 -150 mm
at 4xWS 5/70 = L1 -280 mm

external limit switches see page **C85**



Dimensioned drawing
Aluminium profile

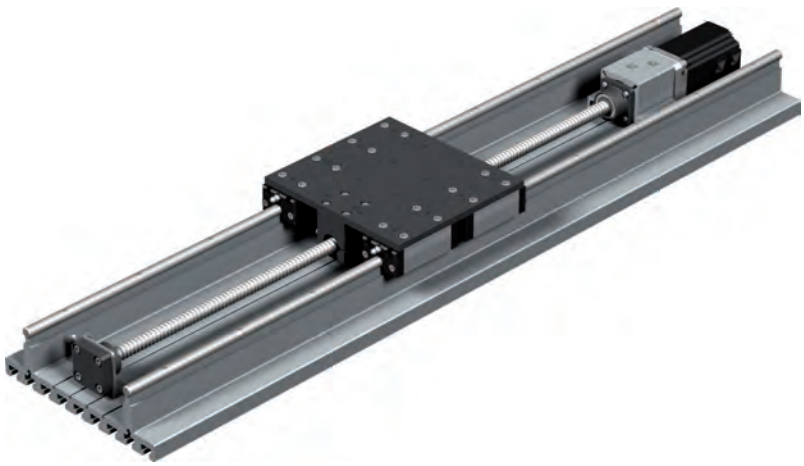




mechanics

Linear units
with spindle drive

LES 16-150



Features

- Aluminium shaft housing profile W 225 × H 65.3 mm
- Length: 0.5/1.0/1.5 m Intermediate sizes to order
- 2 precision steel shafts Ø 16 mm with exactly milled shaft housings
- 4 aluminium slides IWS 1
- Central lubrication option
- 2 limit or reference switches
- Repeatability ± 0.01 mm
- Recirculating ball drive Ø 16 × 5 mm
- various drive options

Options:
- Other lengths (longer or shorter)
- Profile cover
- Ball screw drive Ø16×2.5mm /10mm

General

Linear units in the LES series with spindle drive are of modular construction and can be used for a wide variety of applications. They are based on rigid aluminium profiles with precision steel shafts. Recirculating ball drives produce the feed movement, multiphase motors or servomotors are used as motor drives. Linear units in the LES series can be used either horizontally or vertically. Patented shaft slots with recirculating balls are used as guide slots. The load-bearing balls also run between 2 ground steel pins and the guide shaft respectively. The desired dimensions can be delivered up to a length of 3 metres according to customer requirements.

Technical specification

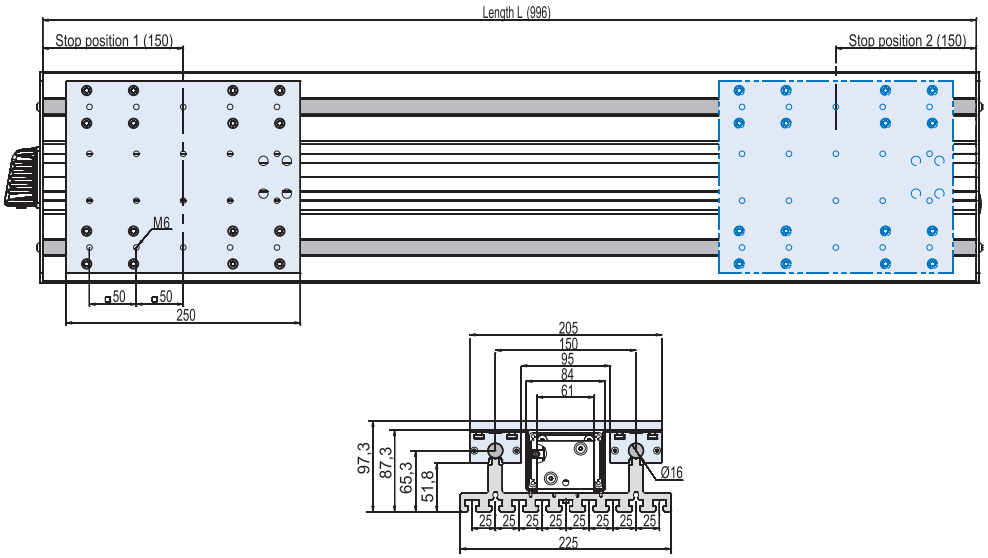
Moment of inertia I_x	1899.61 cm^4
Moment of inertia I_y	104.94 cm^4
Cross-sectional area	39.63 cm^2
Material	AlMgSiO, 5F 22
Anodising	E6/EV 1
Weight with steel shafts	12.43 kg/m

Ordering data

Part-no.: **238053 004907*** (Length 0,5 m)
Part-no.: **238053 009907*** (Length 1 m)
Part-no.: **238053 014907*** (Length 1.5 m)

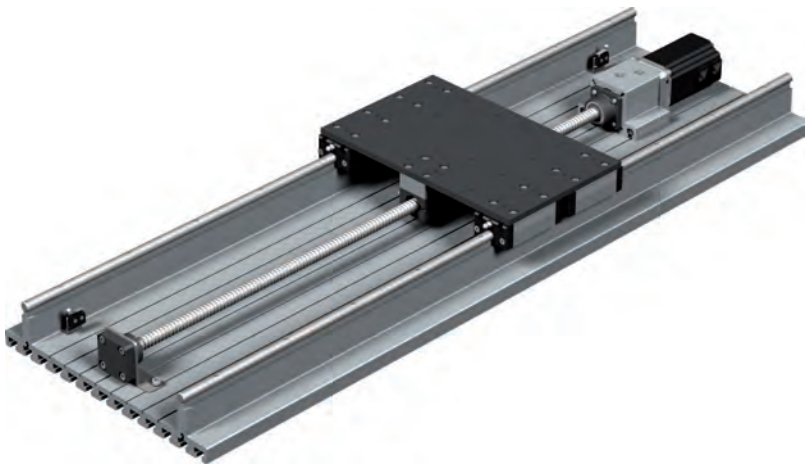
* inkluding Motor

Dimensioned drawing



Linear units
with spindle drive

LES 16-250



Features

- Aluminium shaft housing profile W 325 × H 65.3 mm
- Length: 0.5/1.0/1.5 m Intermediate sizes to order
- 2 precision steel shafts Ø 16 mm with exactly milled shaft housings
- 4 aluminium slides IWS 1
- Central lubrication option
- 2 limit or reference switches
- Repeatability ± 0.01 mm
- Recirculating ball drive Ø 16 × 5 mm
- various drive options

Options:
- Other lengths (longer or shorter)
- Profile cover
- Ball screw drive Ø 16 × 2.5 mm/10 mm

General

Linear units in the LES series with spindle drive are of modular construction and can be used for a wide variety of applications. They are based on rigid aluminium profiles with precision steel shafts. Recirculating ball drives produce the feed movement, multi-phase motors or servomotors are used as motor drives. Linear units in the LES series can be used either horizontally or vertically. Patented shaft slots with recirculating balls are used as guide slots. The load-bearing balls also run between 2 ground steel pins and the guide shaft respectively. The desired dimensions can be delivered up to a length of 3 metres according to customer requirements.

Technical specifications

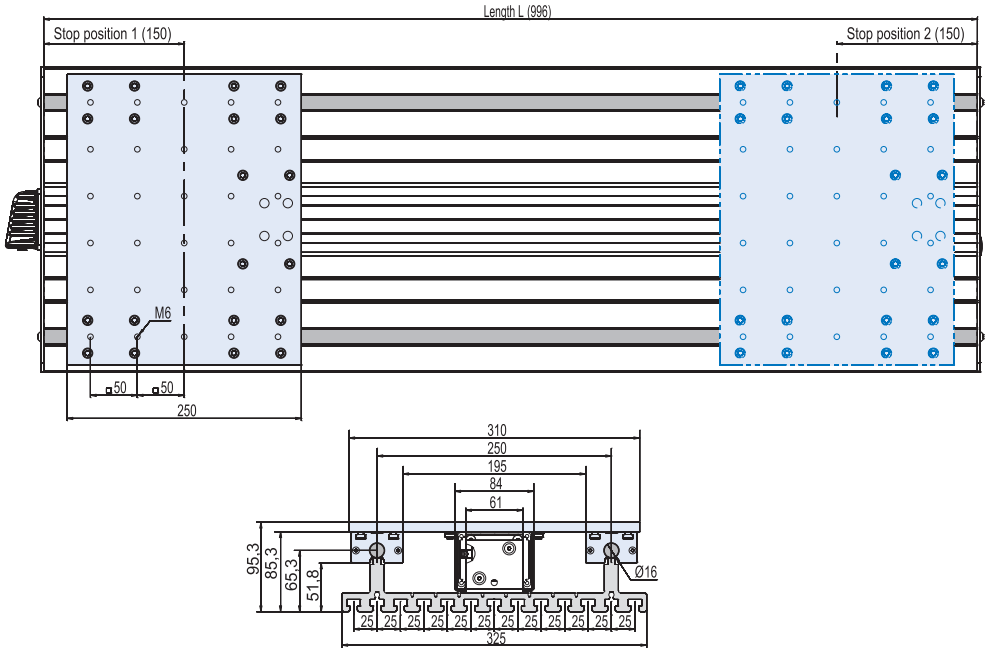
Moment of inertia I_x	5637.55 cm^4
Moment of inertia I_y	121,37 cm^4
Cross-sectional area	53.63 cm^2
Material	AlMgSiO, 5F22
Anodising	E6/EV1
Weight with steel shafts	14.41 kg/m

Ordering data

Part no.: **238063 004907*** (Length 0.5m)
Part no.: **238063 009907*** (Length 1m)
Part no.: **238063 014907*** (Length 1.5 m)

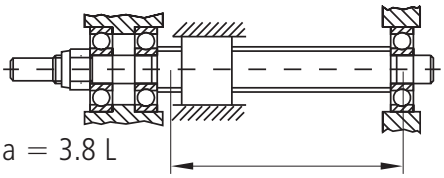
* including motor

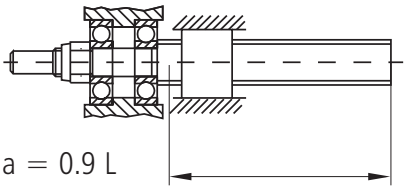
Dimensioned drawing



mechanics

Theoretically critical speed Calculations





Definitions

$n_{perm.}$	[min^{-1}]	maximum permissible speed
a		Installation coefficient
d_2	[mm]	Spindle core diameter
L	[mm]	Spindle length between the spindle bearings and spindle ends

Critical speed

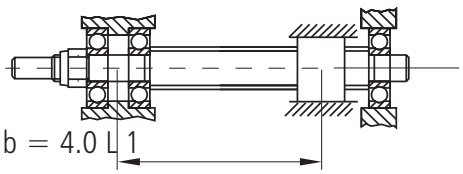
In most applications, you need to check tapped spindles at their critical speed.

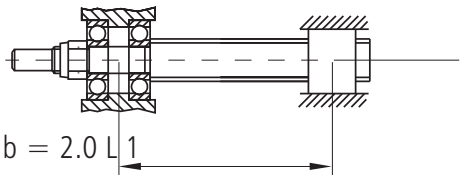
The critical speed is that speed which causes resonance oscillations of this spindle.

This critical speed depends on the core diameter, the free load-bearing length and on the way the tapped spindle is constructed.

Given a general safety factor of 0.8, the maximum permissible speed can be calculated as follows:

$$n_{perm} = 392 \bullet \frac{a \bullet d_2}{L^2} 10^5$$





Definitions

F_{perm}	[N]	permissible compressive loading
d_2	[mm]	Spindle core diameter
L_1	[mm]	free buckling length, i.e. the maximum distance between the central bearing and the centre of the tapped nut
b		Installation coefficient

Buckling load

The recirculating ball spindle should as far as possible be subjected only to tensile stress. If it is subjected to compressive loads, then the spindle may buckle.

With a safety factor of 3.0 against buckling, the result is

$$F_{zul} = \frac{34\,000 \bullet b \bullet d_2^4}{L_1^2}$$

Drive dimensioning

Calculations

Drive torque calculation

The required drive torque is made up of
- Load torque M_{load}
- Acceleration torques M_{trans} and M_{rot}
- No load torque $M_{no\ load}$

$$M_A = M_{load} + M_{trans} + M_{rot} + M_{no\ load}$$

Load torque

$$M_{last} = \frac{F_X \bullet p}{2 \bullet \pi \bullet 1000}$$

with feed force $F_X = m \bullet g \bullet \mu$

Translational Acceleration torque

$$M_{trans} = \frac{F_a \bullet p}{2 \bullet \pi \bullet 1000}$$

with feed force $F_a = m \bullet a$

If used vertically, the mass acceleration a must be added to the acceleration due to gravity g (9.81 m/s^2).

Rotational acceleration torque

$$M_{rot} = \frac{J_{sp} \bullet L \bullet n_{max} \bullet a \bullet 2 \bullet \pi}{V_{max} \bullet 60 \bullet 1000}$$

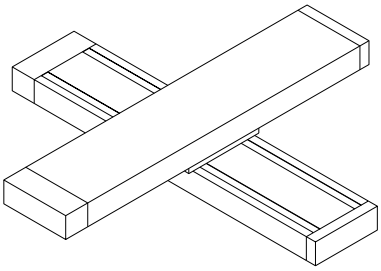
Drive power

$$P = \frac{M_A \bullet n_{max}}{9550}$$

Definitions

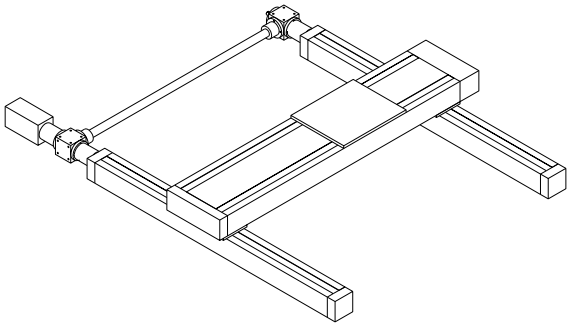
M_A	[Nm]	required drive torque
M_{leer}	[Nm]	Torque, resulting from the various loads
M_{leer}	[Nm]	No load torque
M_{rot}	[Nm]	Rotational acceleration torque
M_{trans}	[Nm]	translational acceleration torque
Fx	[N]	Feed force
g	[m/s^2]	Acceleration due to gravity
v_{max}	[m/s]	maximum process speed
m	[kg]	The weight tob e conveyed
a	[m/s2]	Acceleration
p	[mm]	Spindle pitch
P	[kW]	Power
L	[mm]	Lenght
n_{max}	[rpm]	maximum speed
μ		coefficient of friction
J_{sp}	[kgm^2/m]	Inertial torque of inertia of the spindle per meter
F_a	[N]	Accelerating force

Combination examples



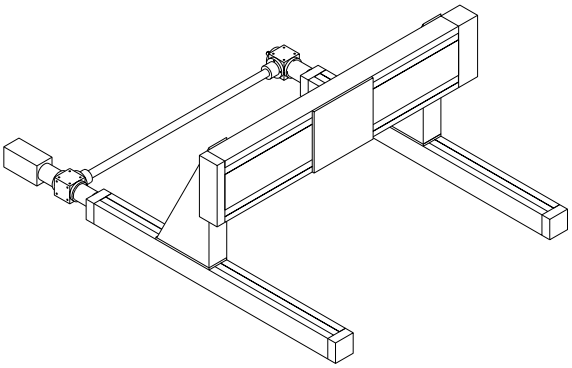
Crossbench

2 x LES 5
PS 4 with VP 2



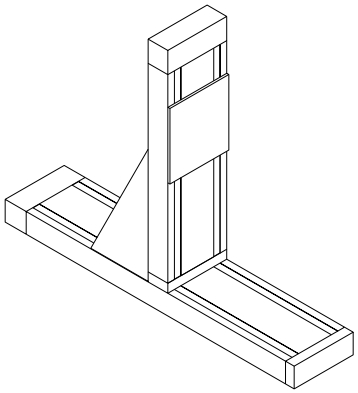
2-axis H-design

2 × LES 4, LES 5, angular transmission kit,
2 x PS 6, PS 4



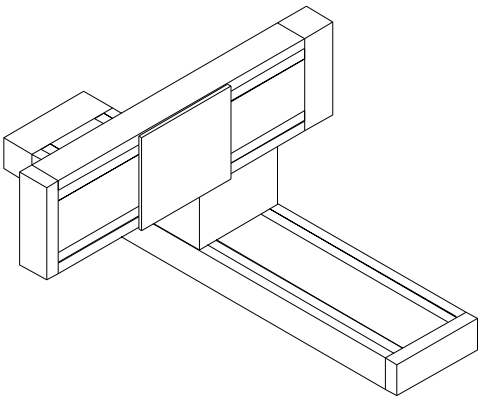
2-axis flatbed configuration

2 × LES 4, LES 5, angular transmission kit,
2 x PS 2, 2 × WV 2, PS 4



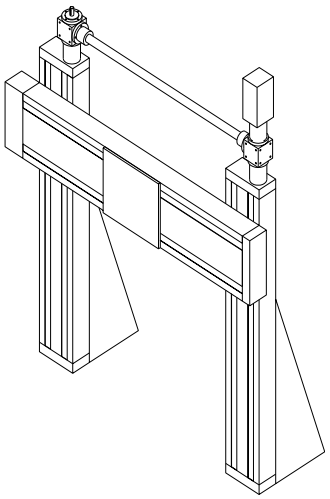
2-axis lifting configuration

2 × LES 5, 2 × PS 4
WV 6



2-axis boom configuration

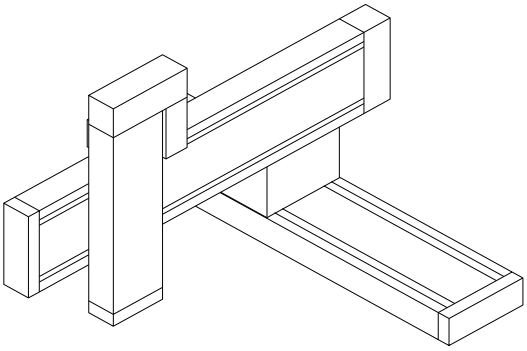
2 × LES 5
2 × PS 4
WV 3



2-axis H-design

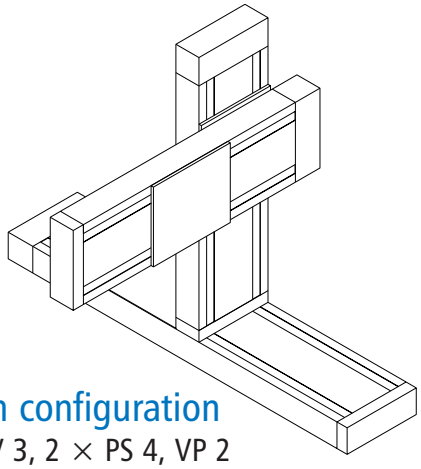
LES 5, 2 × LES 6, 2 × WV 7
Angular transmission kit, 2 × PS 12
PS 4

Combination examples



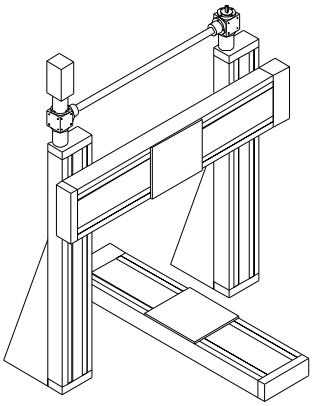
3-axis boom configuration

2 × LES 5, LES 6, WV 3, 2 × PS 4, PS 7



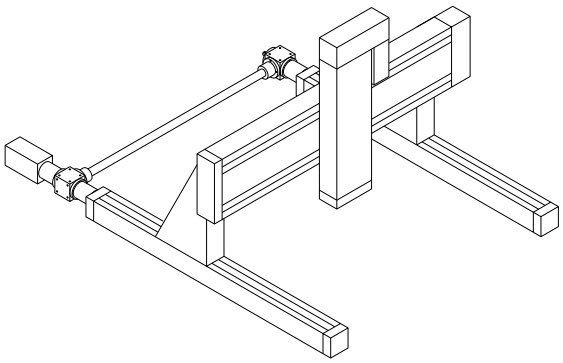
3-axis raised boom configuration

3 × LES 5, WV 3, 2 × PS 4, VP 2



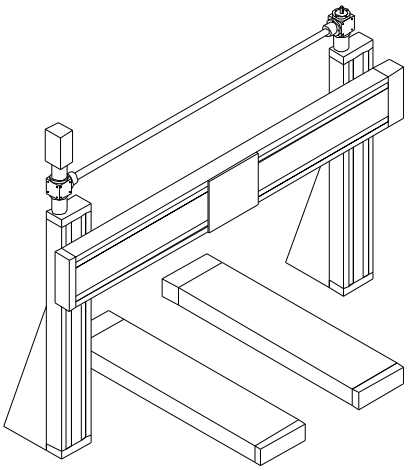
3-axis portal configuration

2 × LES 5, 2 × LES 6, 2 × WV 7
Angular transmission kit, 2 × PS4, PS 12



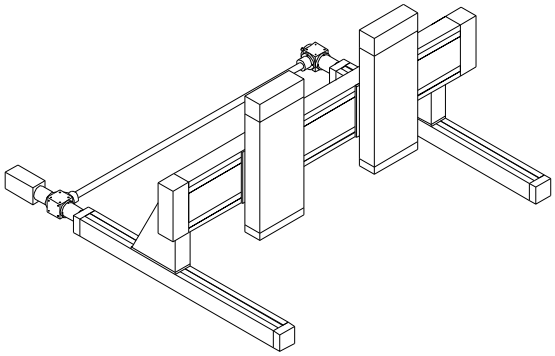
3-axis flatbed configuration

2 × LES 4, LES 5, LES 6, 2 × PS 2, 2 × WV 2
Angular transmission kit, PS 4, PS 7



4-axis portal configuration

3 × LES 5, 2 × LES 6, 2 × WV 7
Angular transmission kit
3 × PS 4
2 × PS 12



5-axis flatbed configuration

2 × LES 5 (Z-axes)
LES 5 (2 spindle drives)
2 × LES 4, 2 × PS 2, 2 × WV 2
Angular transmission kit, 2 × PS4 with VP 2