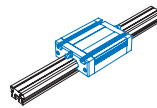
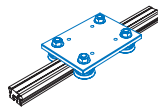
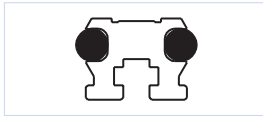


Linear Guides

Overview

MLF 1

Linear Guide Rail

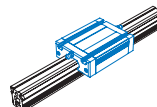
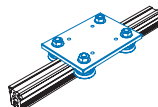
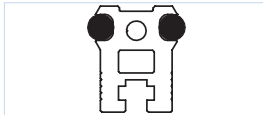


with roller carriage LW 6
with alu bearing carriage WS 1

B 30

MLF 2

Linear Guide Rail

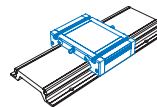
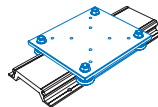
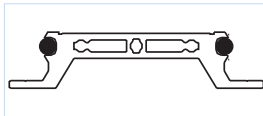


with roller carriage LW 6
with alu bearing carriage WS 1

B 32

MLF 3

Linear Guide Rail

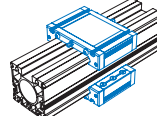
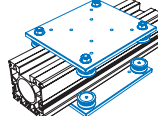
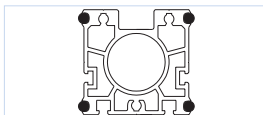


with roller carriage LW 7
with alu bearing carriage WS 3

B 34

MLF 4

Linear Guide Rail

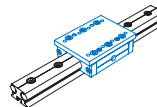
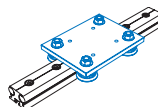
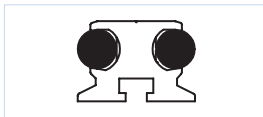


with 2 x roller carriage LW 7
with 2 x alu bearing carriage WS 3

B 36

DSF 1

Linear Guide Rail

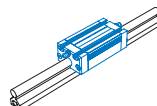
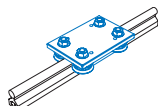
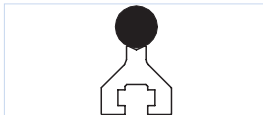


with roller carriage LW 4
with alu bearing carriage WS 8

B 38

ELF 1

Linear Guide Rail

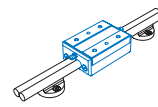
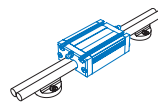
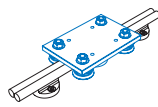
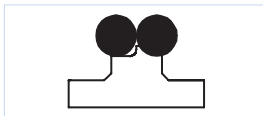


with roller carriage LW 5
with alu bearing carriage WS 6

B 40

LF 1

Linear Guide Rail

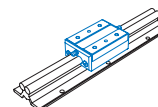
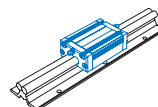
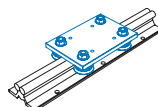
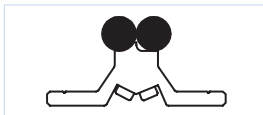


with roller carriage LW 3
with alu bearing carriage WS 6
with steel sledge LS 1

B 42

LF 2

Linear Guide Rail

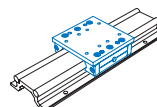
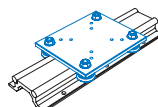
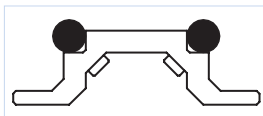


with roller carriage LW 3
with alu bearing carriage WS 4
with steel sledge LS 1

B 44

LF 3

Linear Guide Rail

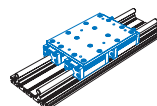
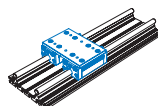
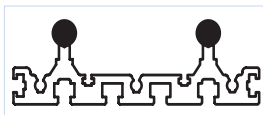


with roller carriage LW 8
with alu bearing carriage WS 7

B 46

LF 7

Linear Guide Rail



with 2 x alu bearing carriage WS 6
with 4 x alu bearing carriage WS 6

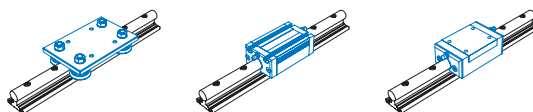
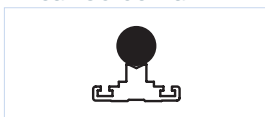
B 48

Linear Guides

Overview

ILF 1

Linear Guide Rail

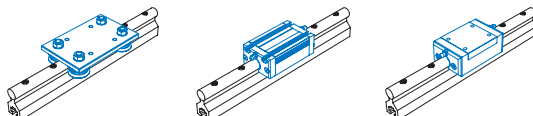
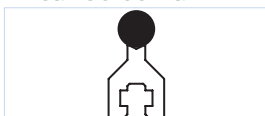


B 50

with roller carriage ILW 1
with alu bearing carriage IWS 1
with steel sledge ILS 1

ILF 2

Linear Guide Rail

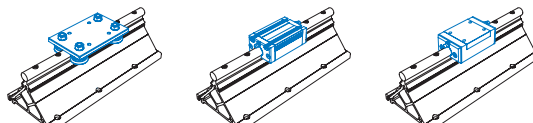
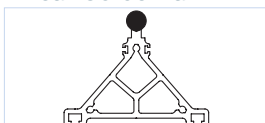


B 52

with roller carriage ILW 1
with alu bearing carriage IWS 1
with steel sledge ILS 1

ILF 3

Linear Guide Rail



B 54

with roller carriage ILW 1
with alu bearing carriage IWS 1
with steel sledge ILS 1

ILF 6

Linear Guide Rail

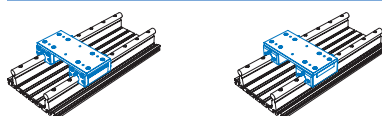
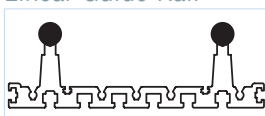


B 56

with 2 x alu bearing carriage IWS 1
with 4 x alu bearing carriage IWS 1
with 2 x steel sledge ILS 1
with 4 x steel sledge ILS 1

ILF 7

Linear Guide Rail

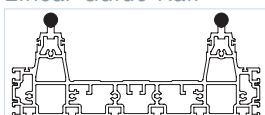


B 58

with 2 x alu bearing carriage IWS 1
with 4 x alu bearing carriage IWS 1
with 2 x steel sledge ILS 1
with 4 x steel sledge ILS 1

ILF 9

Linear Guide Rail

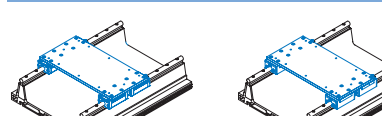
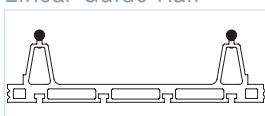


B 60

with 2 x alu bearing carriage IWS 1
with 4 x alu bearing carriage IWS 1
with 2 x steel sledge ILS 1
with 4 x steel sledge ILS 1

ILF 10

Linear Guide Rail



B 62

with 2 x alu bearing carriage IWS 1
with 2 x steel sledge ILS 1

Accessory

B 64

General References

B 65

Functions Overview

B 66

Adjustments

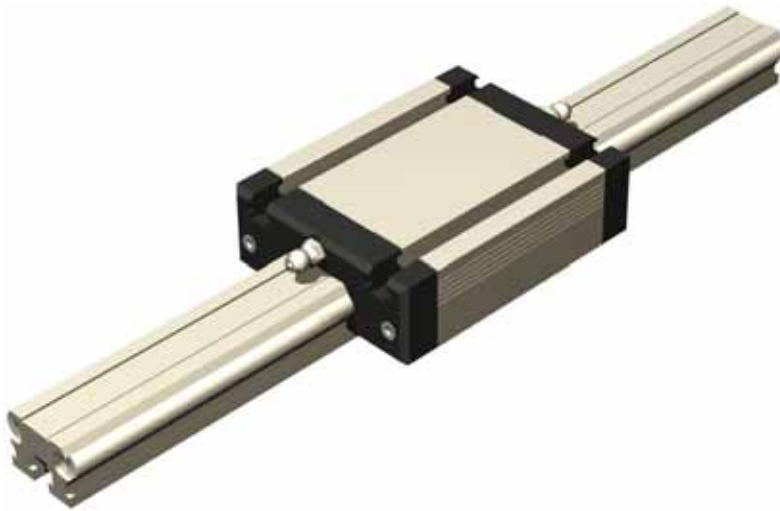
B 68

Calculation of Working Loads

B 70

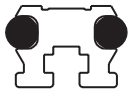
Linear Guide Rail

MLF 1



Features

- W 30 x H 20 mm
- 2 precision steel shafts Ø 8
- Stress-resistant
- Aluminium shaft profile, anodized
- Bottom-up mounting by means of thread rails M6 in the T-groove indentation
- Conditionally cantilevered
- Arbitrary guide rail length
- Weight: 1.61 kg/m
- Option: stainless version



Profile available up to 6.000 mm without butt joint, steel shafts separated...

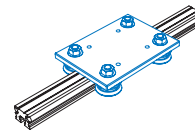
MLF 1

L [mm]	Item no.
298	235 000 0029
398	235 000 0039
498	235 000 0049
598	235 000 0059
698	235 000 0069
798	235 000 0079
898	235 000 0089
998	235 000 0099
1098	235 000 0109
1198	235 000 0119
1298	235 000 0129
1398	235 000 0139
1498	235 000 0149
1598	235 000 0159
1698	235 000 0169
1798	235 000 0179
1898	235 000 0189
1998	235 000 0199
2498	235 000 0249
2998	235 000 0299
Steel shaft length = L - 3 mm	

MLF 1 - stainless

L [mm]	Item no.
298	235 001 0029
398	235 001 0039
498	235 001 0049
598	235 001 0059
698	235 001 0069
798	235 001 0079
898	235 001 0089
998	235 001 0099
1098	235 001 0109
1198	235 001 0119
1298	235 001 0129
1398	235 001 0139
1498	235 001 0149
1598	235 001 0159
1698	235 001 0169
1798	235 001 0179
1898	235 001 0189
1998	235 001 0199
2498	235 001 0249
2998	235 001 0299
Steel shaft length = L - 3 mm	

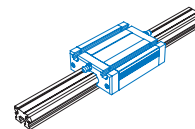
with roller carriage LW 6



- L 125 x W 90 x H 7,7 mm
- Polished steel plate
- 4 rollers Ø 31, life-time lubrication
- Clearance-free adjustable
- Weight: 1.03 kg

Item no.: **223 011**

with aluminium bearing carriage WS 1



- L 96 x W 72 x H 28,5 mm
- Milled clamping surface
- M6 T-grooves
- Central lubrication
- Clearance-free adjustable
- Weight: 0.35 kg
- Option: stainless version

Item no.: **223 100 0070**
stainless: **223 101 0070**

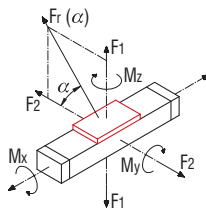
Linear Guide Rail

MLF 1

Load Data

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

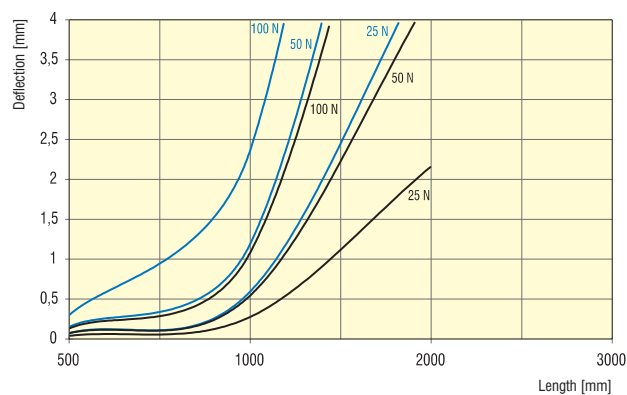
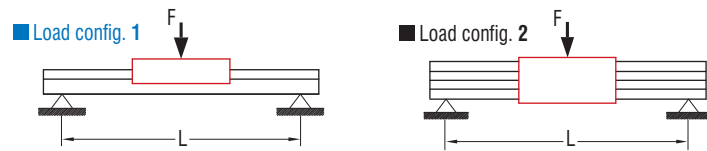
$$F_r(\alpha) = \frac{F_1}{\sin \alpha}$$



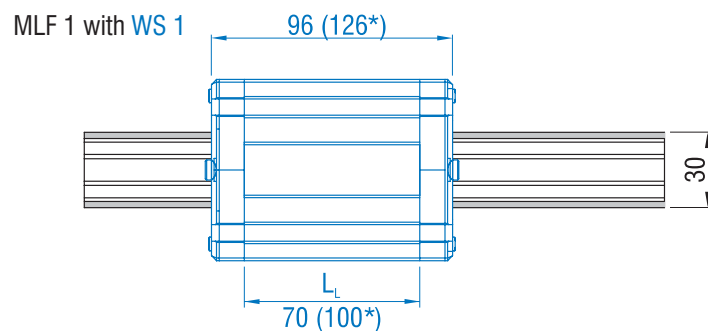
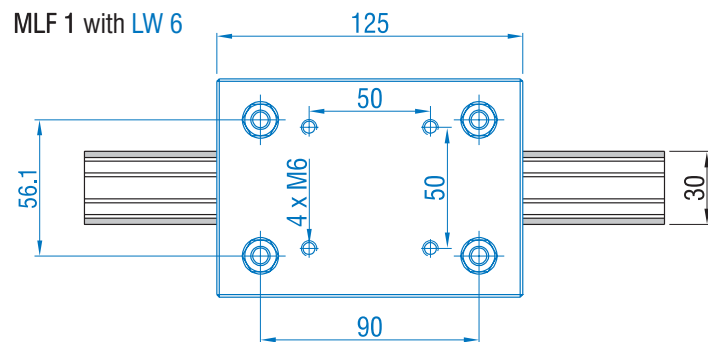
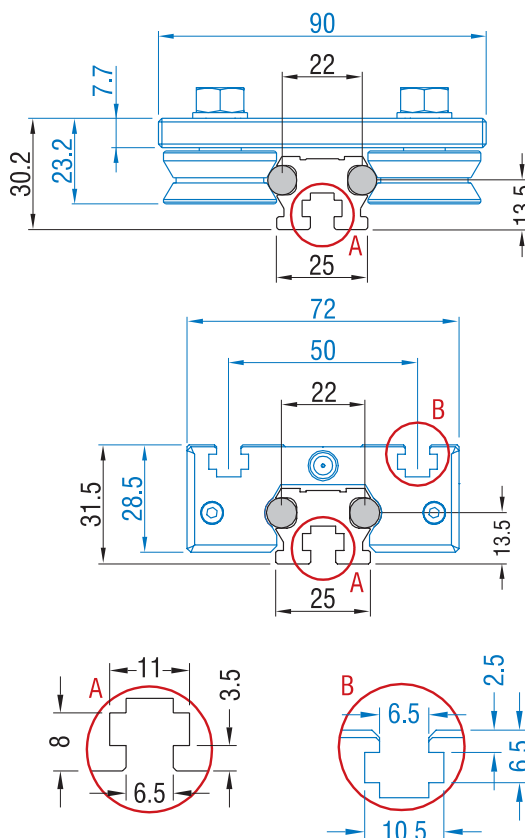
Roller Carriage LW 6	
C ₀	2160 N
C	4000 N
F _{1 stat.}	4320 N
F _{1 dyn.}	3792 N
F _{2 stat.}	2160 N
F _{2 dyn.}	4000 N
M _{x stat.}	121.1 Nm
M _{x stat.}	194.4 Nm
M _{z stat.}	97.2 Nm
M _{x dyn.}	106.3 Nm
M _{y dyn.}	170.6 Nm
M _{z dyn.}	180.0 Nm

Bearing Carriage WS 1	
C ₀	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 _{x 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

Deflection



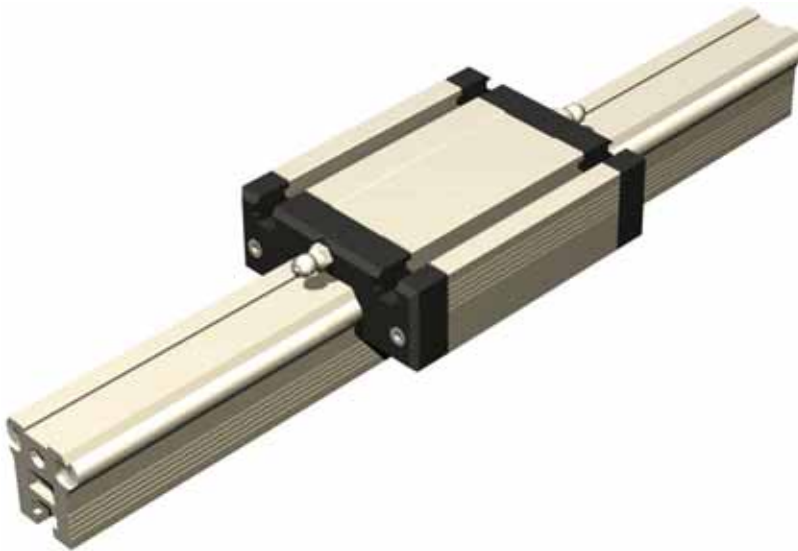
Scaled Drawings



* = available upon request

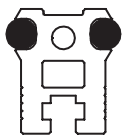
Linear Guide Rail

MLF 2



Features

- W 30 x H 32,5 mm
- 2 precision steel shafts Ø 8
- Stress-resistant
- Aluminium shaft profile, anodized
- Bottom-up mounting by means of thread rails M6 in the T-groove indentation
- Conditionally cantilevered
- Arbitrary guide rail length
- Weight: 2.01 kg/m
- Option: stainless version



Profile available up to 6.000 mm without butt joint, steel shafts separated...

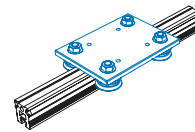
MLF 2

L [mm]	Item no.
298	235 002 0298
398	235 002 0398
498	235 002 0498
598	235 002 0598
698	235 002 0698
798	235 002 0798
898	235 002 0898
998	235 002 0998
1098	235 002 1098
1198	235 002 1198
1298	235 002 1298
1398	235 002 1398
1498	235 002 1498
1598	235 002 1598
1698	235 002 1698
1798	235 002 1798
1898	235 002 1898
1998	235 002 1998
2498	235 002 2498
2998	235 002 2998
Steel shaft length = L - 3 mm	

MLF 2 - stainless

L [mm]	Item no.
298	235 003 0298
398	235 003 0398
498	235 003 0498
598	235 003 0598
698	235 003 0698
798	235 003 0798
898	235 003 0898
998	235 003 0998
1098	235 003 1098
1198	235 003 1198
1298	235 003 1298
1398	235 003 1398
1498	235 003 1498
1598	235 003 1598
1698	235 003 1698
1798	235 003 1798
1898	235 003 1898
1998	235 003 1998
2498	235 003 2498
2998	235 003 2998
Steel shaft length = L - 3 mm	

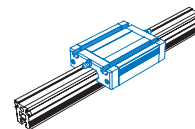
with roller carriage LW 6



- L 125 x W 90 x H 7,7 mm
- Polished steel plate
- 4 rollers Ø 31, life-time lubrication
- Clearance-free adjustable
- Weight: 1.03 kg

Item no.: **223 011**

with aluminum bearing carriage WS 1



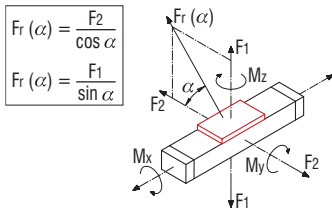
- L 96 x W 72 x H 28,5 mm
- Milled clamping surface
- M6 T-grooves
- Central lubrication
- Clearance-free adjustable
- Weight: 0.35 kg
- Option: stainless version

Item no.: **223 100 0070**
stainless: **223 101 0070**

Linear Guide Rail

MLF 2

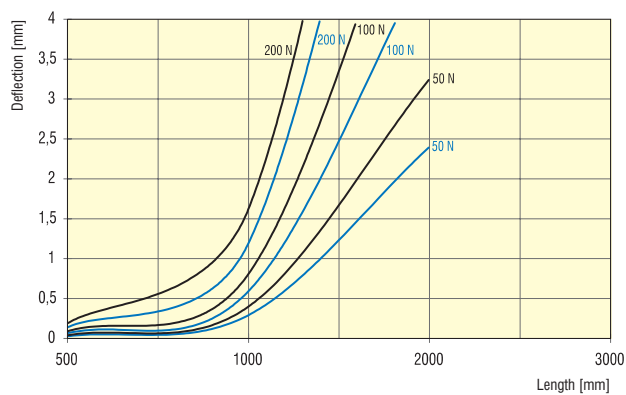
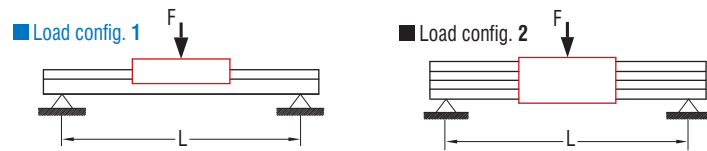
Load Data



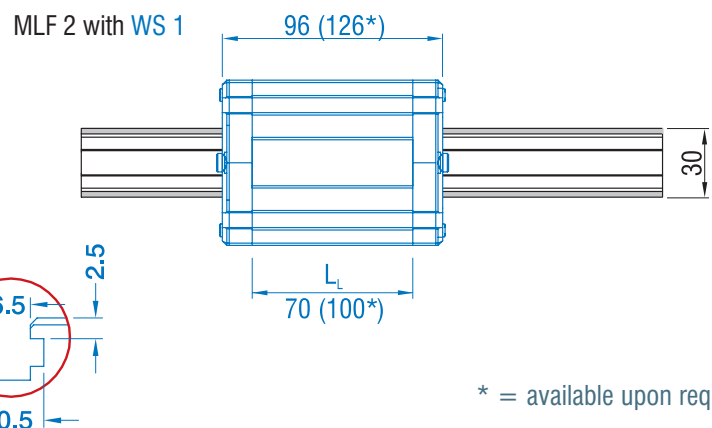
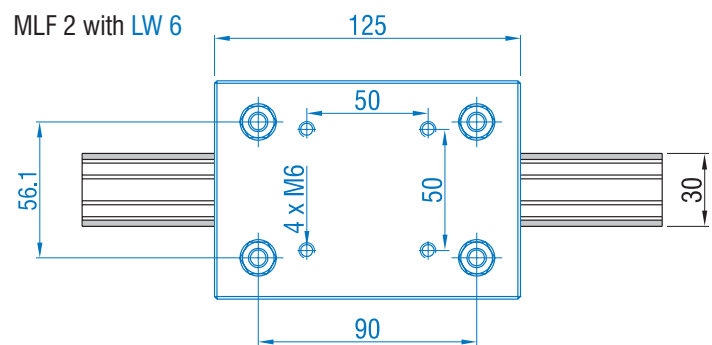
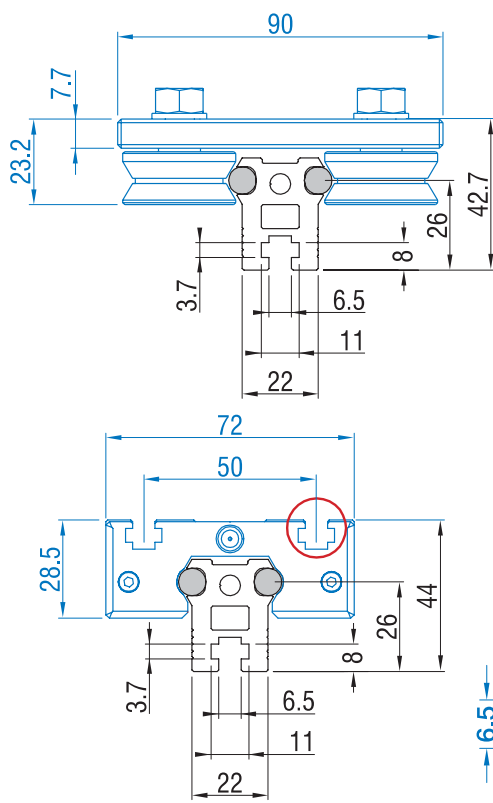
Roller Carriage LW 6	
C_0	2160 N
C	4000 N
F_1 stat.	4320 N
F_1 dyn.	3792 N
F_2 stat.	2160 N
F_2 dyn.	4000 N
M_x stat.	121.1 Nm
M_x stat.	194.4 Nm
M_z stat.	97.2 Nm
M_x dyn.	106.3 Nm
M_y dyn.	170.6 Nm
M_z dyn.	180.0 Nm

Bearing Carriage WS 1	
C_0	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

Deflection



Scaled Drawings



* = available upon request

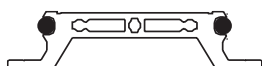
Linear Guide Rail

MLF 3



Features

- W 115 x H 25,5 mm
- 2 precision steel shafts Ø 8
- Stress-resistant
- Aluminium shaft profile, anodized
- Top-down mounting by means of through holes for M6 in a 100 mm raster
- Conditionally cantilevered
- Arbitrary guide rail length
- Weight: 3.22 kg/m
- Option: stainless version



Profile available up to 6.000 mm without butt joint, steel shafts separated...

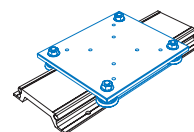
MLF 3

L [mm]	Item no.
296	235 004 0029
396	235 004 0039
496	235 004 0049
596	235 004 0059
696	235 004 0069
796	235 004 0079
896	235 004 0089
996	235 004 0099
1096	235 004 0109
1196	235 004 0119
1296	235 004 0129
1396	235 004 0139
1496	235 004 0149
1596	235 004 0159
1696	235 004 0169
1796	235 004 0179
1896	235 004 0189
1996	235 004 0199
2496	235 004 0249
2996	235 004 0299
Steel shaft length = L - 1 mm	

MLF 3 - stainless

L [mm]	Item no.
296	235 005 0029
396	235 005 0039
496	235 005 0049
596	235 005 0059
696	235 005 0069
796	235 005 0079
896	235 005 0089
996	235 005 0099
1096	235 005 0109
1196	235 005 0119
1296	235 005 0129
1396	235 005 0139
1496	235 005 0149
1596	235 005 0159
1696	235 005 0169
1796	235 005 0179
1896	235 005 0189
1996	235 005 0199
2496	235 005 0249
2996	235 005 0299
Steel shaft length = L - 1 mm	

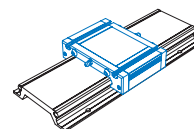
with roller carriage LW 7



- L 175 x W 150 x H 7,7 mm
- Polished steel plate
- 4 rollers Ø 31, life-time lubrication
- Clearance-free adjustable
- Weight: 2.03 kg

Item no.: **223 012**

with aluminium bearing carriage WS 3

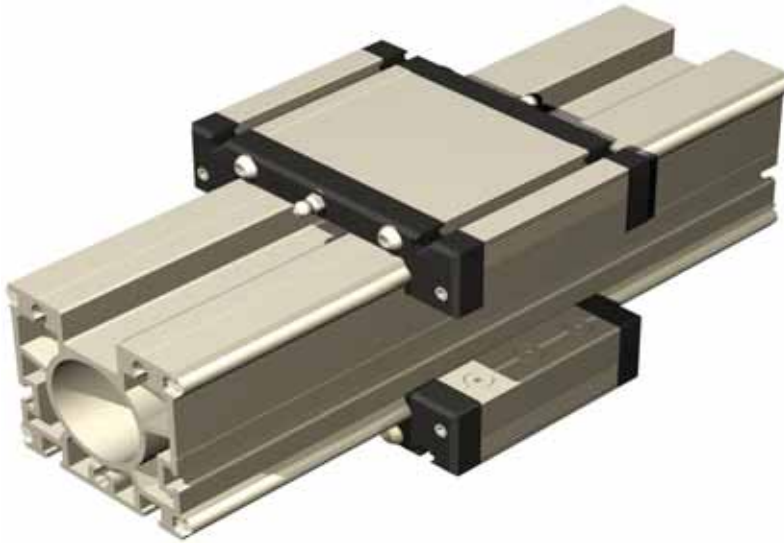


- L 96 x W 130 x H 32 mm
- Milled clamping surface
- M6 T-grooves
- Central lubrication
- Clearance-free adjustable
- Weight: 0.50 kg
- Option: stainless version

Item no.: **223 103 0070**
stainless: **223 103 1070**

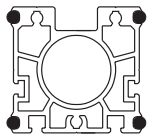
Linear Guide Rail

MLF 4



Features

- W 80 x H 80 mm
- 4 precision steel shafts Ø 8
- Stress-resistant
- Aluminium shaft seat profile, anodized
- Bottom-up mounting by means of thread rails M6 in the T-grooves or top-down mounting by means of holes for M8
- Lateral T-grooves for limit switch attachment
- Conditionally cantilevered
- Arbitrary guide rail length
- Weight: 7.15 kg/m
- Option: stainless version



Profile available up to 6.000 mm without butt joint, steel shafts separated...

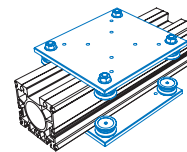
MLF 4

L [mm]	Item no.
298	235 006 0029
398	235 006 0039
498	235 006 0049
598	235 006 0059
698	235 006 0069
798	235 006 0079
898	235 006 0089
998	235 006 0099
1098	235 006 0109
1198	235 006 0119
1298	235 006 0129
1398	235 006 0139
1498	235 006 0149
1598	235 006 0159
1698	235 006 0169
1798	235 006 0179
1898	235 006 0189
1998	235 006 0199
2498	235 006 0249
2998	235 006 0299
Steel shaft length = L - 3 mm	

MLF 4 - stainless

L [mm]	Item no.
298	235 007 0029
398	235 007 0039
498	235 007 0049
598	235 007 0059
698	235 007 0069
798	235 007 0079
898	235 007 0089
998	235 007 0099
1098	235 007 0109
1198	235 007 0119
1298	235 007 0129
1398	235 007 0139
1498	235 007 0149
1598	235 007 0159
1698	235 007 0169
1798	235 007 0179
1898	235 007 0189
1998	235 007 0199
2498	235 007 0249
2998	235 007 0299
Steel shaft length = L - 3 mm	

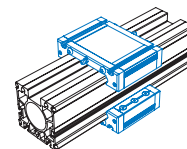
with 2 x roller carriage LW 7



- L 175 x W 150 x H 7,7 mm
- Polished steel plate
- 4 rollers Ø 31, life-time lubrication
- Clearance-free adjustable
- Weight: 2.03 kg

Item no.: **223 012**

with 2 x bearing carriage WS 3



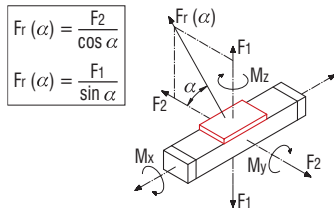
- L 96 x W 130 x H 32 mm
- Milled clamping surface
- M6 T-grooves
- Central lubrication
- Clearance-free adjustable
- Weight: 0.50 kg
- Option: stainless version

Item no.: **223 103 0070**
stainless: **223 103 1070**

Linear Guide Rail

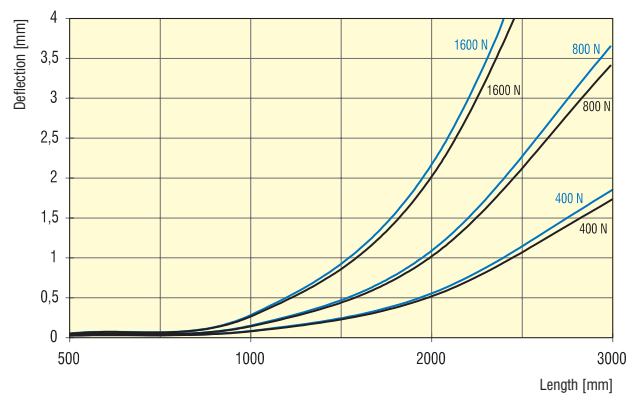
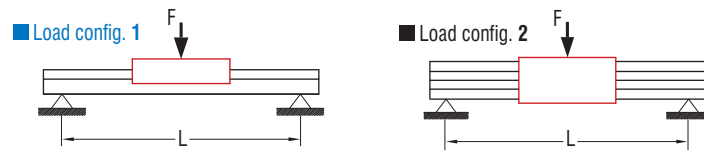
MLF 4

Load Data

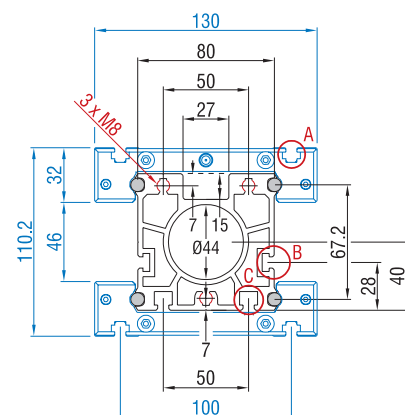
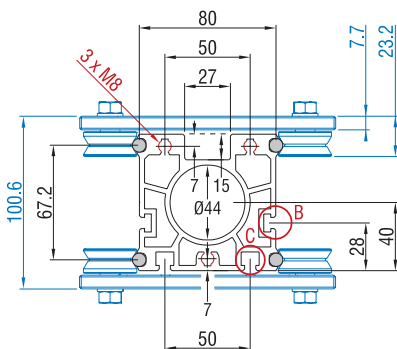


Roller Carriage LW 7		Bearing Carriage WS 3	
C ₀	2160 N	C ₀	3141 N
C	4000 N	C	1879 N
F ₁ stat.	4320 N	F ₁ stat.	2682 N
F ₁ dyn.	3792 N	F ₁ dyn.	1604 N
F ₂ stat.	2160 N	F ₂ stat.	3141 N
F ₂ dyn.	4000 N	F ₂ dyn.	1879 N
M _x stat.	246.8 Nm	M _x stat.	115.7 Nm
M _x stat.	302.4 Nm	M _x stat.	105.3 Nm
M _y stat.	151.2 Nm	M _y stat.	123.3 Nm
M _y dyn.	216.7 Nm	M _y dyn.	69.2 Nm
M _v dyn.	265.4 Nm	M _v dyn.	62.9 Nm
M _z dyn.	280.0 Nm	M _z dyn.	73.7 Nm

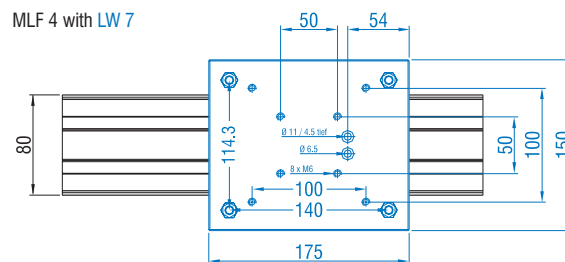
Deflection



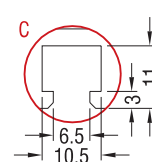
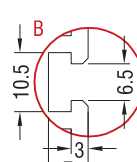
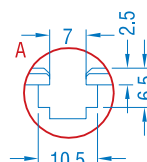
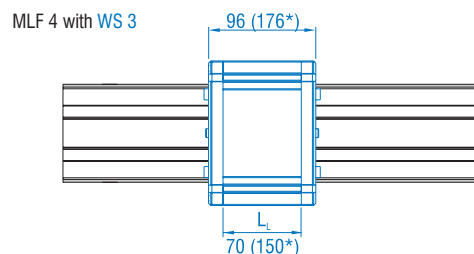
Scaled Drawings



MLF 4 with LW 7



MLF 4 with WS 3



* = available upon request

Linear Guide Rail

DSF 1



Features

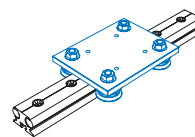
- W 36 x H 24,5 mm
- 2 precision steel shafts Ø 12
- Stress-resistant
- Aluminium shaft profile, anodized
- Bottom-up mounting by means of thread rails M6 in the T-grooves and top-down mounting by means of holes for M6 in a 50 mm raster
- Conditionally cantilevered
- Arbitrary guide rail length
- Weight: 2.90 kg/m



DSF 1

L [mm]	Item no.
296	220 001 0300
396	220 001 0400
496	220 001 0500
596	220 001 0600
696	220 001 0700
796	220 001 0800
896	220 001 0900
996	220 001 1000
1096	220 001 1100
1196	220 001 1200
1296	220 001 1300
1396	220 001 1400
1496	220 001 1500
1696	220 001 1700
1746	235 300 1750
1996	220 001 2000
2096	220 001 2100
2496	220 001 2500
2596	220 001 2600
2996	220 001 3000
Steel shaft length = L - 1 mm	

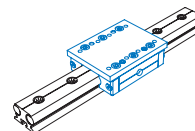
with roller carriage **LW 4**



- L 125 x W 97 x H 7,7 mm
- Polished steel plate
- 4 rollers Ø 31, life-time lubrication
- Clearance-free adjustable
- Weight: 1.02 kg

Item no.: **223 009**

with sledge **WS 8**



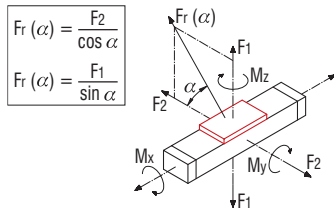
- L 100 x W 75 x H 32 mm
- Milled clamping surface
- Lubrication possibility
- Clearance-free adjustable
- Weight: 0.70 kg

Item no.: **223 108 0070**

Linear Guide Rail

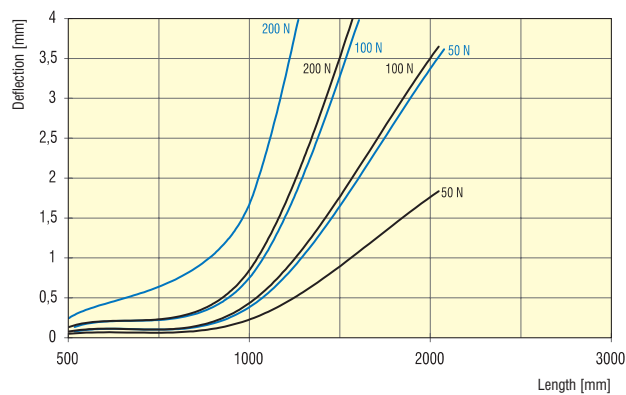
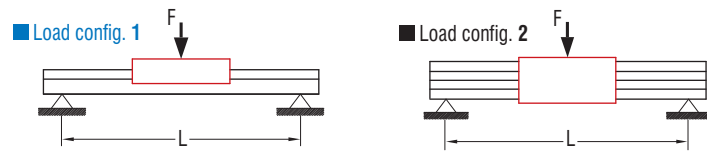
DSF 1

Load Data

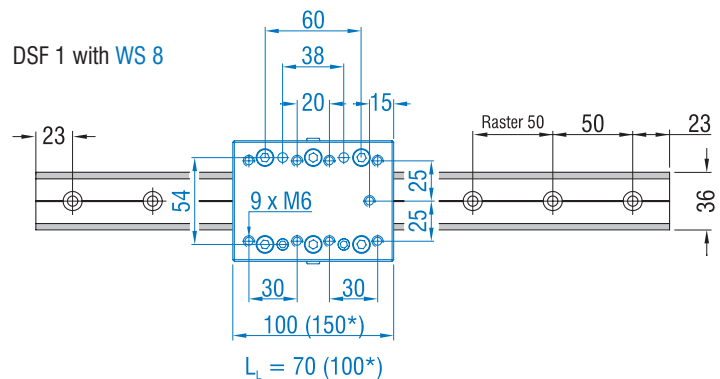
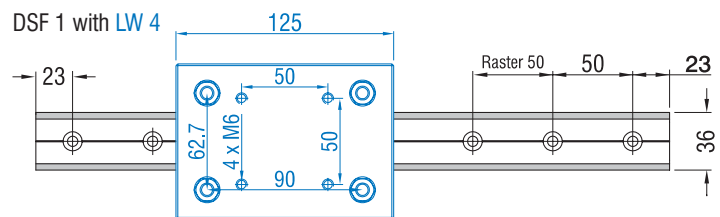
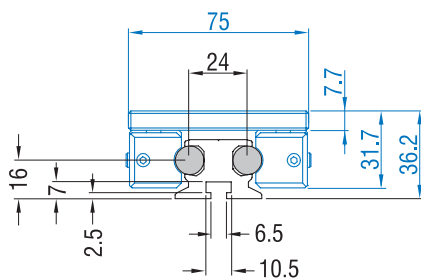
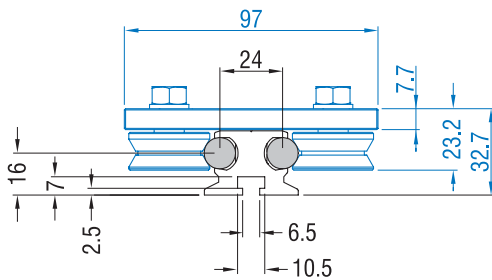


Roller Carriage LW 4		Sledge WS 8	
C_0	2160 N	C_0	3303 N
C	4000 N	C	1873 N
F_1 stat.	4320 N	F_1 stat.	2821 N
F_1 dyn.	3846 N	F_1 dyn.	1599 N
F_2 stat.	2160 N	F_2 stat.	3303 N
F_2 dyn.	4000 N	F_2 dyn.	1873 N
M_x stat.	135.4 Nm	M_x stat.	46.7 Nm
M_x stat.	194.4 Nm	M_x stat.	105.3 Nm
M_z stat.	97.2 Nm	M_z stat.	123.3 Nm
M_x dyn.	120.5 Nm	M_x dyn.	26.4 Nm
M_y dyn.	173.0 Nm	M_y dyn.	59.7 Nm
M_z dyn.	180.0 Nm	M_z dyn.	69.9 Nm

Deflection



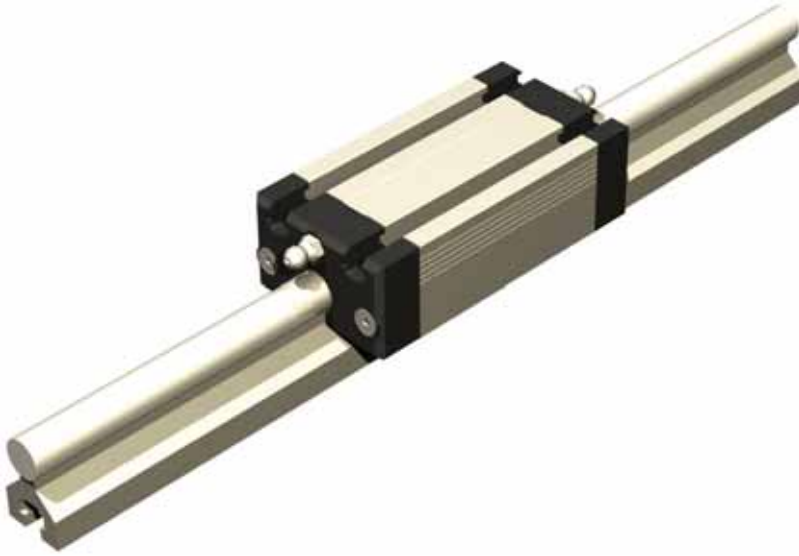
Scaled Drawings



* = available upon request

Linear Guide Rail

ELF 1



Features

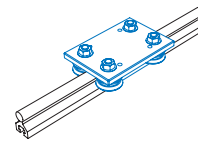
- W 20 x H 31 mm
- Precision steel shaft Ø 12
- Aluminium shaft profile, anodized
- Bottom-up mounting on a plane surface by means of thread rails M6 in the T-grooves
- Arbitrary guide rail length
- Weight: 1.26 kg/m



ELF 1

L [mm]	Item no.
298	220 002 0298
398	220 002 0398
498	220 002 0498
598	220 002 0598
698	220 002 0698
798	220 002 0798
898	220 002 0898
998	220 002 0998
1098	220 002 1098
1198	220 002 1198
1298	220 002 1298
1398	220 002 1398
1498	220 002 1498
1598	220 002 1598
1798	220 002 1798
1998	220 002 1998
2098	220 002 2098
2498	220 002 2498
2598	220 002 2598
2998	220 002 2998
Profile length = L - 2 mm	

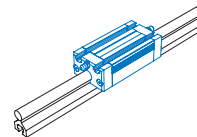
with roller carriage LW 5



- L 110 x W 75 x H 7,7 mm
- Polished steel plate
- 4 rollers Ø 31, life-time lubrication
- Clearance-free adjustable
- Weight: 0.81 kg

Item no.: **223 010**

with bearing carriage WS 6



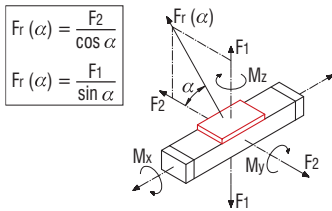
- L 100 x W 50 x H 31,5 mm
- T-grooves M6
- Central lubrication
- Clearance-free adjustable
- Weight: 0.30 kg
- Option: stainless version

Item no.: **223 106 0070**
stainless: **223 106 1070**

Linear Guide Rail

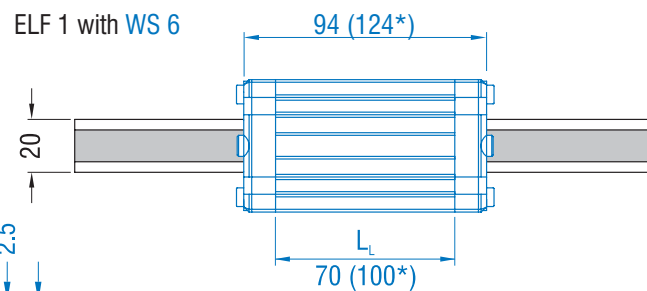
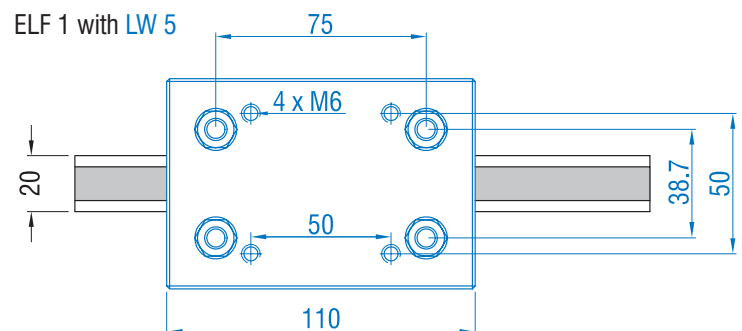
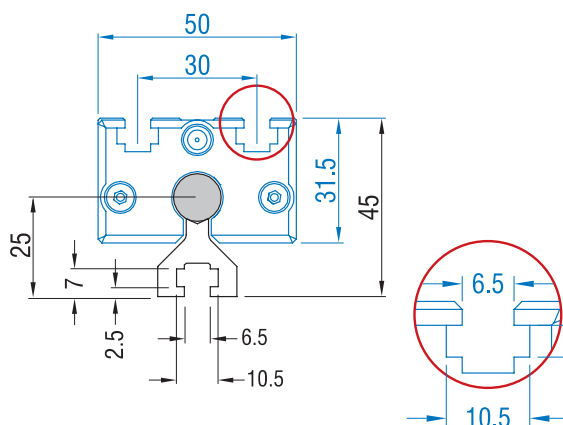
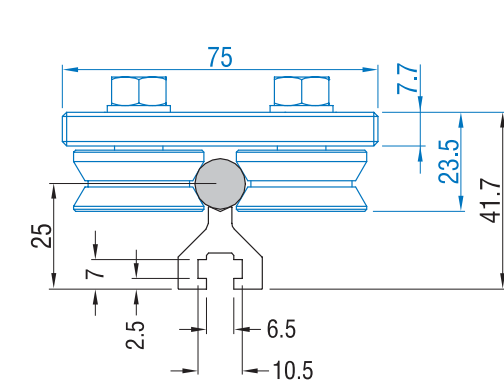
ELF 1

Load Data



Roller Carriage LW 5		Bearing Carriage WS 6	
C_0	2160 N	C_0	3303 N
C	4000 N	C	1873 N
F_1 stat.	4320 N	F_1 stat.	2821 N
F_1 dyn.	3846 N	F_1 dyn.	1599 N
F_2 stat.	2160 N	F_2 stat.	3303 N
F_2 dyn.	4000 N	F_2 dyn.	1873 N
M_1 stat.	-	M_1 stat.	-
M_1 dyn.	162.0 Nm	M_1 stat.	105.3 Nm
M_2 stat.	81.0 Nm	M_2 stat.	123.3 Nm
M_2 dyn.	-	M_2 dyn.	-
M_3 dyn.	144.2 Nm	M_3 dyn.	59.7 Nm
M_4 dyn.	150.0 Nm	M_4 dyn.	69.9 Nm

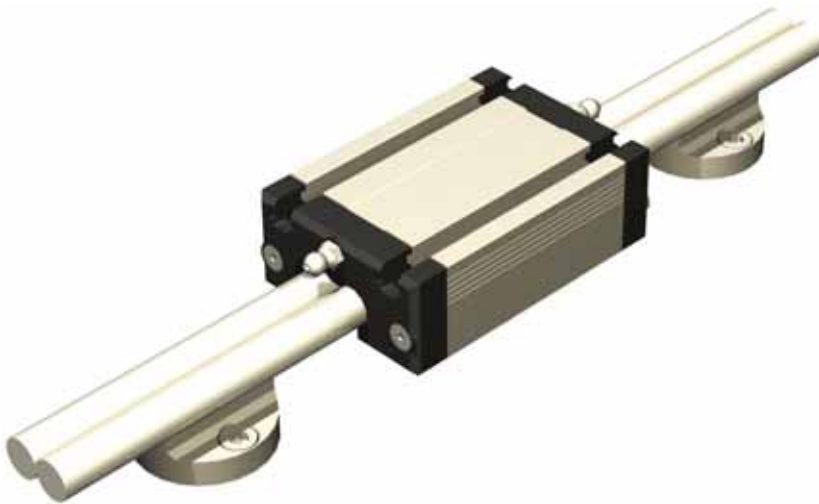
Scaled Drawings



* = available upon request

Linear Guide Rail

LF 1



Features

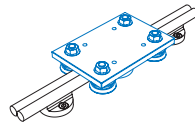
- W 40 x H 27 mm
- 2 precision steel shafts Ø 12
- Stress-resistant
- Aluminium shaft blocks
- Bottom-up or top-down mounting by means of through holes for M6 in the seat blocks
- Arbitrary guide rail length
- Weight: 1.93 kg/m



LF 1 (single steel shafts!)

L [mm]	Item no.
298	227 312 0298
398	227 312 0398
498	227 312 0498
598	227 312 0598
698	227 312 0698
798	227 312 0798
898	227 312 0898
998	227 312 0998
1098	227 312 1098
1198	227 312 1198
1298	227 312 1298
1398	227 312 1398
1498	227 312 1498
1598	227 312 1598
1798	227 312 1798
1998	227 312 1998
2098	227 312 2098
2498	227 312 2498
2998	227 312 2998

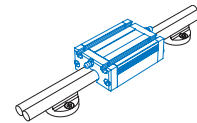
with Roller Carriage LW 3



- L 125 x W 85 x H 7,7 mm
- Polished steel plate
- Weight: 0.93 kg

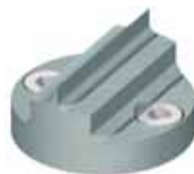
Item No.: **223 008**

with Aluminium Sledge WS 4



- L 94 x W 62 x H 31,5 mm
- Milled clamping surface
- Weight: 0.33 kg
- Option: stainless version

Item no.: **223 104 0070**
stainless: **223 104 1070**

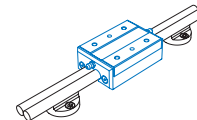


Shaft supporting blocks

- Ø40 mm, hole center distance 28 mm
- Zinc cast
- Packing unit: 10 pieces

Item no.: **221 501**

with Steel Sledge LS 1



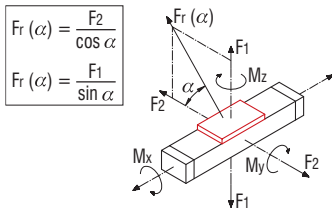
- L 91 x W 60 x H 32 mm
- Polished clamping surface
- Weight: 0.80 kg

Item no.: **223 006**

Linear Guide Rail

LF 1

Load Data

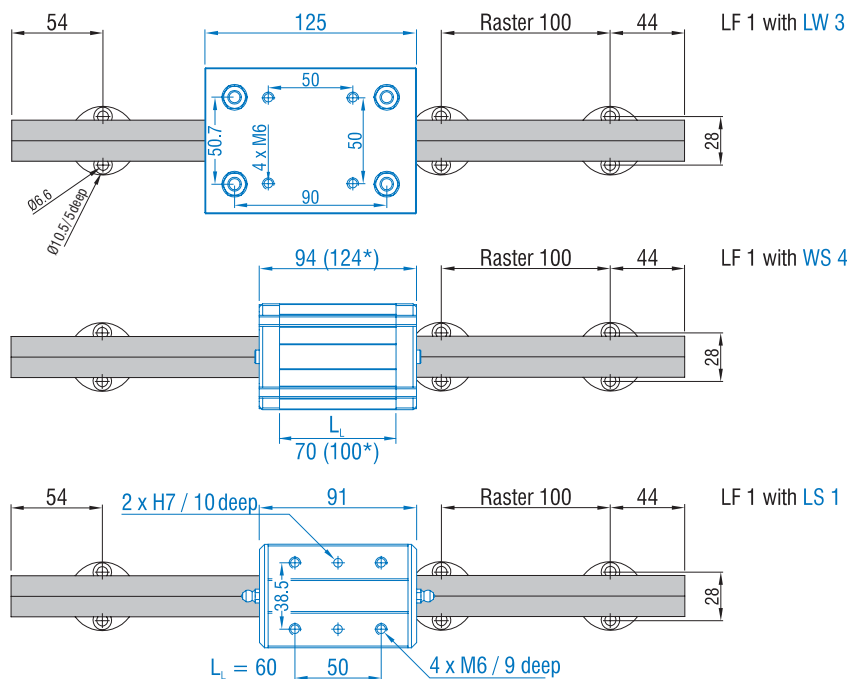
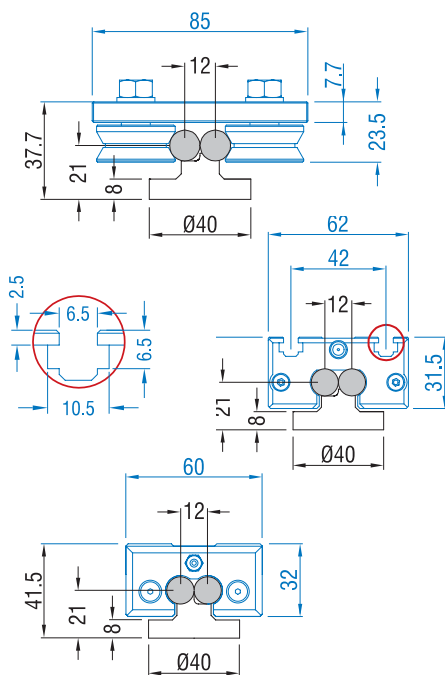


Roller Carriage LW 3	
C ₀	2160 N
C	4000 N
F ₁ stat.	4320 N
F ₁ dyn.	3846 N
F ₂ stat.	2160 N
F ₂ dyn.	4000 N
M ₁ stat.	109.5 Nm
M ₁ stat.	194.4 Nm
M ₂ stat.	97.2 Nm
M ₂ dyn.	97.4 Nm
M ₃ dyn.	173.0 Nm
M ₄ dyn.	180.0 Nm

Bearing Carriage WS 4	
C ₀	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 ₁ stat.	29.8 Nm
M ₁ stat.	105.3 Nm
M ₂ stat.	123.3 Nm
M ₃ dyn.	16.8 Nm
M ₃ dyn.	59.7 Nm
M ₄ dyn.	69.9 Nm

Bearing Carriage 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 ₁ stat.	36.2 Nm
M ₁ stat.	129.0 Nm
M ₂ stat.	127.5 Nm
M ₃ dyn.	21.7 Nm
M ₃ dyn.	77.4 Nm
M ₄ dyn.	76.5 Nm

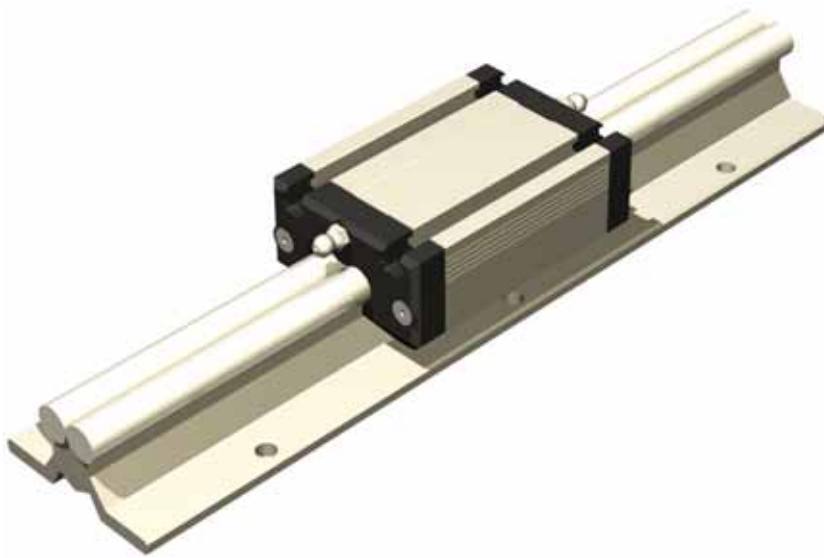
Scaled Drawings



* = available upon request

Linear Guide Rail

LF 2



Features

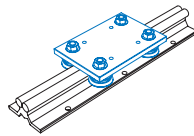
- W 62 x H 31 mm
- 2 precision steel shafts Ø 12
- Stress-resistant
- Aluminium shaft profile, anodized
- High parallelism due to patented shaft seat contour
- High guiding precision
- Bottom-up or top-down mounting on a plane surface by means of through holes
Ø 6,5 in a 100 mm raster
- Arbitrary guide rail length
- Weight: 3.29 kg/m



LF 2

L [mm]	Item no.
298	235 200 0298
398	235 200 0398
498	235 200 0498
598	235 200 0598
698	235 200 0698
798	235 200 0798
898	235 200 0898
998	235 200 0998
1098	235 200 1098
1198	235 200 1198
1298	235 200 1298
1398	235 200 1398
1498	235 200 1498
1598	235 200 1598
1798	235 200 1798
1998	235 200 1998
2098	235 200 2098
2498	235 200 2498
2598	235 200 2598
2998	235 200 2998
Profile length = L - 2 mm	

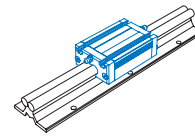
with roller carriage LW 3



- L 125 x W 85 x H 7,7 mm
- Polished steel plate
- Weight: 0.93 kg

Item no.: **223 008**

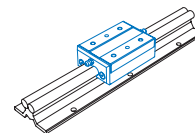
with aluminium bearing carriage WS 4



- L 94 x W 62 x H 31,5 mm
- Milled clamping surface
- Weight: 0.33 kg
- Option: stainless version

Item no.: **223 104 0070**
stainless: **223 104 1070**

with steel bearing carriage LS 1



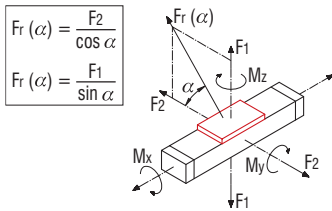
- L 91 x W 60 x H 32 mm
- Polished clamping surface
- Weight: 0.80 kg

Item no.: **223 006**

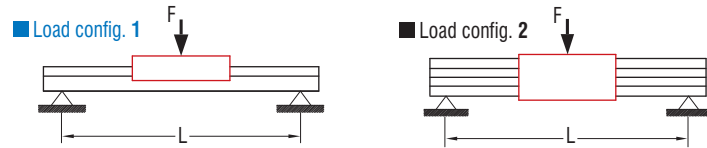
Linear Guide Rail

LF 2

Load Data



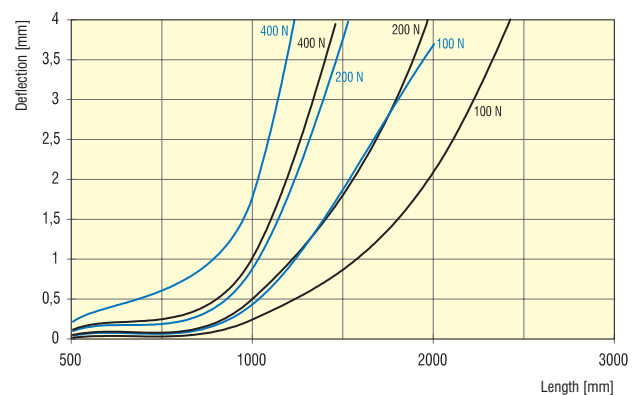
Deflection



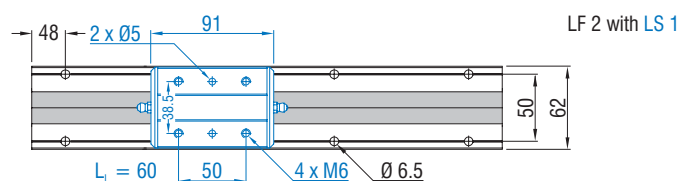
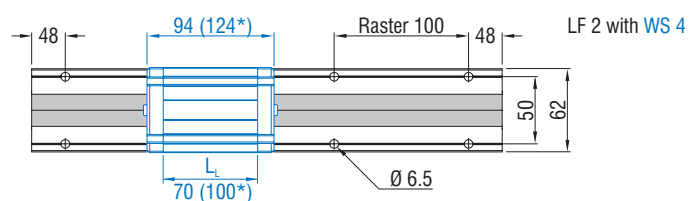
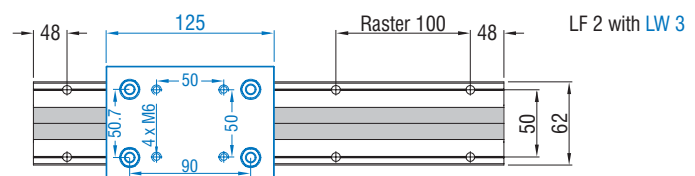
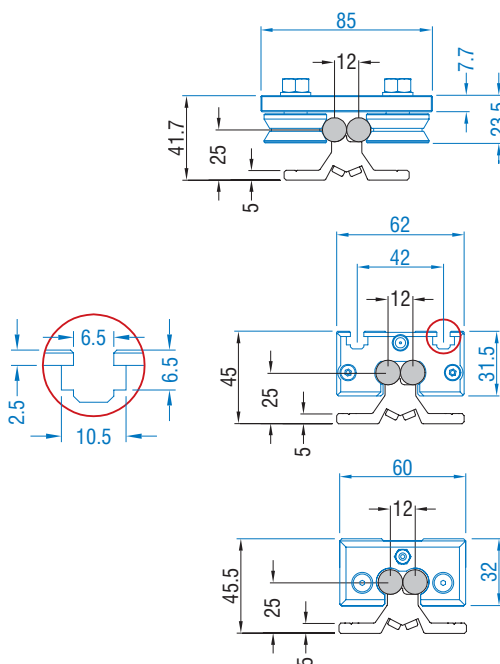
Roller Carriage LW 3	
C ₀	2160 N
C	4000 N
F ₁ stat.	4320 N
F ₁ dyn.	3846 N
F ₂ stat.	2160 N
F ₂ dyn.	4000 N
M ₁ stat.	109.5 Nm
M ₁ stat.	194.4 Nm
M ₂ stat.	97.2 Nm
M ₂ dyn.	97.4 Nm
M ₃ dyn.	173.0 Nm
M ₃ dyn.	180.0 Nm

Bearing Carriage WS 4	
C ₀	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 ₁ stat.	29.8 Nm
M ₁ stat.	105.3 Nm
M ₂ stat.	123.3 Nm
M ₂ dyn.	16.8 Nm
M ₃ dyn.	59.7 Nm
M ₃ dyn.	69.9 Nm

Bearing Carriage 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 ₁ stat.	36.2 Nm
M ₁ stat.	129.0 Nm
M ₂ stat.	127.5 Nm
M ₂ dyn.	21.7 Nm
M ₃ dyn.	77.4 Nm
M ₃ dyn.	76.5 Nm



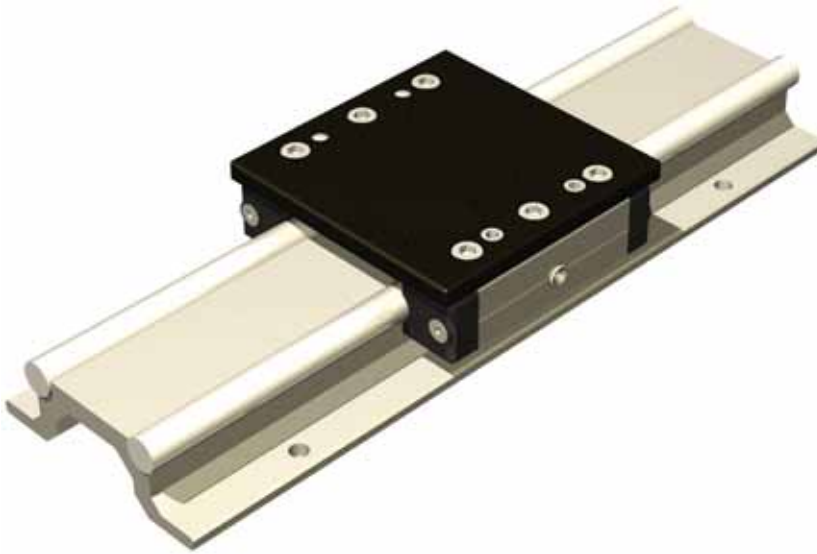
Scaled Drawings



* = available upon request

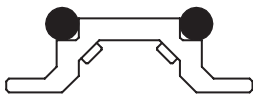
Linear Guide Rail

LF 3



Features

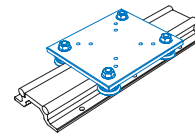
- W 90 x H 31 mm
- 2 precision steel shafts Ø 12
- Stress-resistant
- Aluminium shaft profile, anodized
- Increased shaft distance allows for taking up higher forces
- Bottom-up or top-down mounting by means of through holes for M6 in a 100 mm raster
- Arbitrary guide rail length
- Weight: 3.90 kg/m



LF 3

L [mm]	Item no.
298	235 300 0029
398	235 300 0039
498	235 300 0049
598	235 300 0059
698	235 300 0069
798	235 300 0079
898	235 300 0089
998	235 300 0099
1098	235 300 0109
1198	235 300 0119
1298	235 300 0129
1398	235 300 0139
1498	235 300 0149
1598	235 300 0159
1798	235 300 0179
1998	235 300 0199
2098	235 300 0209
2498	235 300 0249
2598	235 300 0259
2998	235 300 0299
Profile length = L - 2 mm	

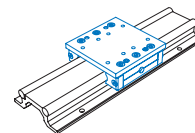
with roller carriage LW 8



- L 150 x W 125 x H 7,7 mm
- Polished steel plate
- 4 rollers Ø 31, life-time lubrication
- Clearance-free adjustable
- Weight: 1.51 kg

Item no.: **223 013**

mit bearing carriage WS 7



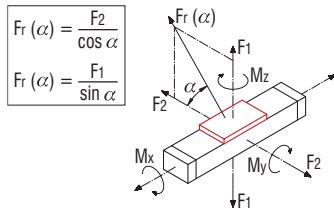
- L 100 x W 100 x H 32 mm
- Polished steel plate
- Central lubrication
- Clearance-free adjustable
- Weight: 1.67 kg

Item no.: **223 107 0070**

Linear Guide Rail

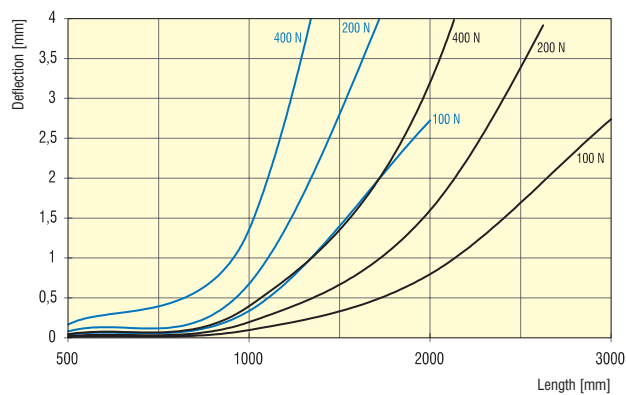
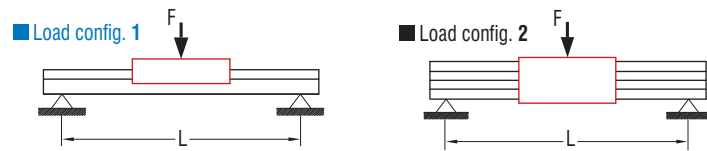
LF 3

Load Data

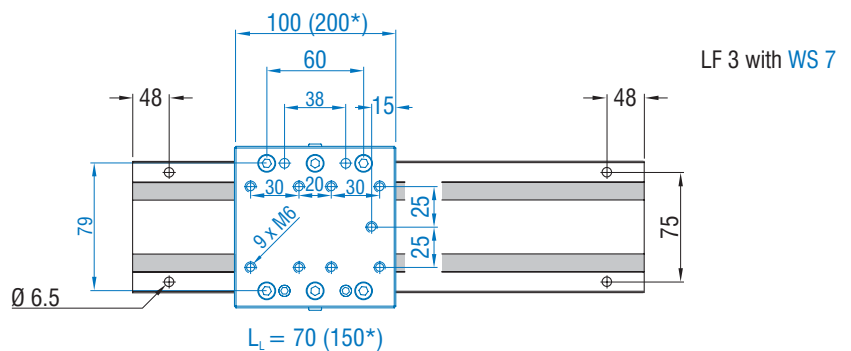
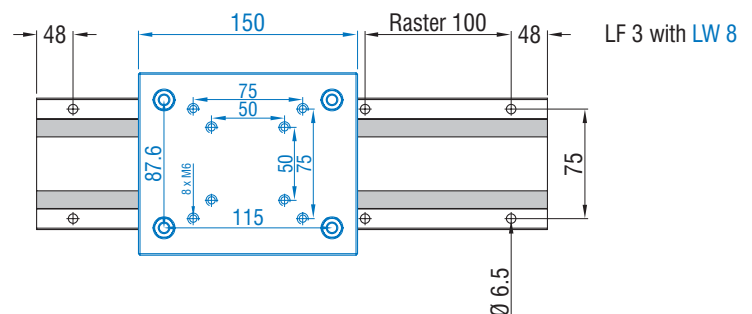
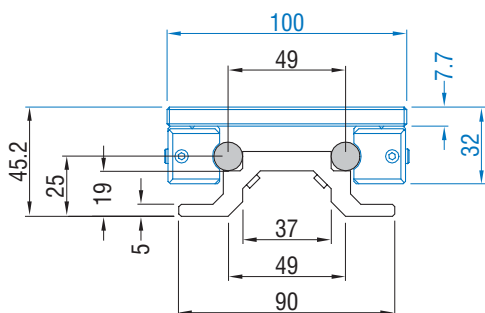
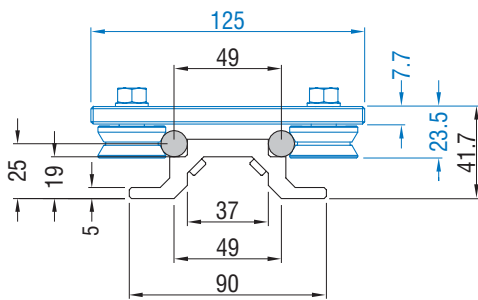


Roller Carriage LW 8		Bearing Carriage WS 7	
C_0	2160 N	C_0	3303 N
C	4000 N	C	1873 N
F_1 stat.	4320 N	F_1 stat.	2821 N
F_1 dyn.	3846 N	F_1 dyn.	1599 N
F_2 stat.	2160 N	F_2 stat.	3303 N
F_2 dyn.	4000 N	F_2 dyn.	1873 N
M_1 stat.	189.2 Nm	M_1 stat.	82.0 Nm
M_1 dyn.	248.4 Nm	M_1 dyn.	105.3 Nm
M_2 stat.	124.2 Nm	M_2 stat.	123.3 Nm
M_2 dyn.	168.4 Nm	M_2 dyn.	46.4 Nm
M_3 stat.	221.1 Nm	M_3 dyn.	59.7 Nm
M_3 dyn.	230.0 Nm	M_3 dyn.	69.9 Nm

Deflection



Scaled Drawings



* = available upon request

Linear Guide Rail

LF 7



Features

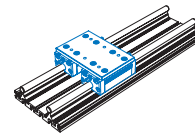
- W 128 x H 40 mm
- 2 precision steel shafts Ø 12
- Stress-resistant
- Aluminium shaft profile, anodized
- Attachment from below by thread rails in the T-groove extrusion,
- Conditionally cantilevered
- Arbitrary Guide Rail length
- Weight: 5.63 kg/m



LF 7

L [mm]	Item no.
298	220 006 0029
398	220 006 0039
498	220 006 0049
598	220 006 0059
698	220 006 0069
798	220 006 0079
898	220 006 0089
998	220 006 0099
1098	220 006 0109
1198	220 006 0119
1298	220 006 0129
1398	220 006 0139
1498	220 006 0149
1598	220 006 0159
1798	220 006 0179
1998	220 006 0199
2098	220 006 0209
2498	220 006 0249
2598	220 006 0259
2998	220 006 0299
Profile length = L - 2 mm	

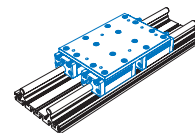
with 2 x aluminium bearing carriage **WS 6**



- L 84 x W 126 x H 8 mm
- Polished steel plate
- 2 x IWS 1, central lubrication
- Clearance-free adjustable
- Total Weight: 1.19 kg

Item no.: **223 240 0001**

with 4 x aluminium bearing carriage **WS 6**



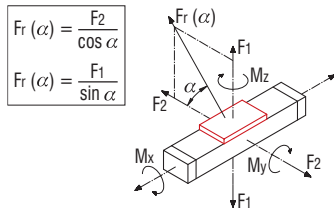
- L 180 x W 126 x H 8 mm
- Polished steel plate
- 4 x IWS 1, central lubrication
- Clearance-free adjustable
- Total Weight: 2.48 kg

Item no.: **223 240 0002**

Linear Guide Rail

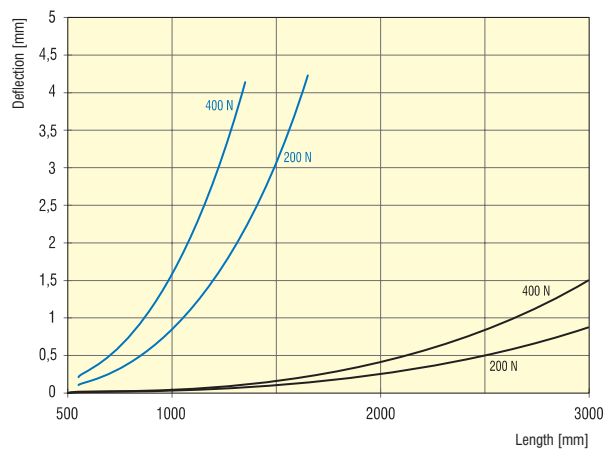
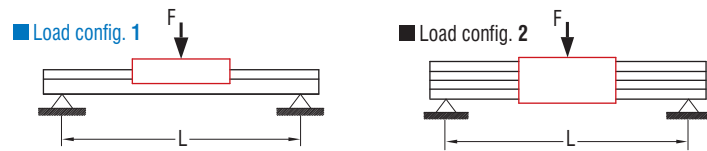
LF 7

Load Data

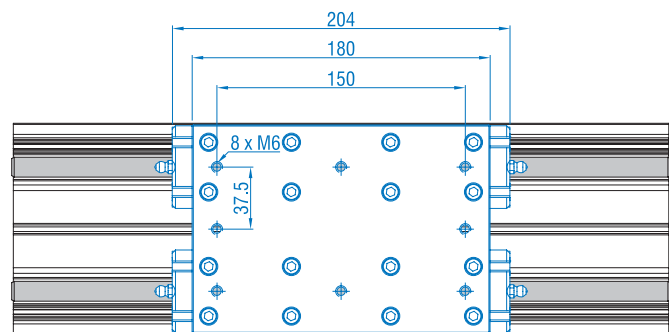
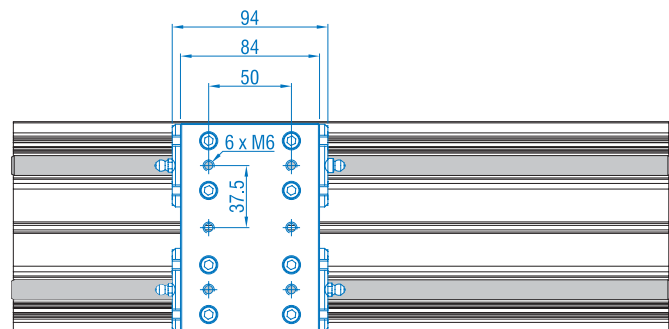
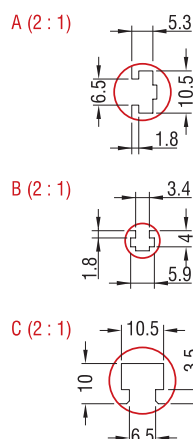
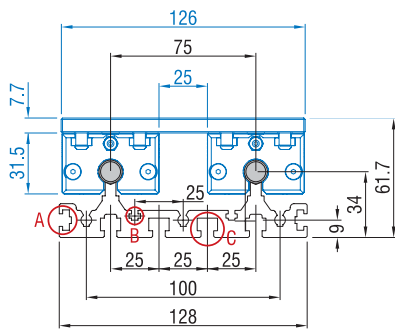


Unit with 2x WS 6		Unit with 4x WS 6	
C ₀	4955 N	C ₀	6606 N
C	2810 N	C	3746 N
F ₁ stat.	4232 N	F ₁ stat.	5642 N
F ₁ dyn.	2399 N	F ₁ dyn.	3198 N
F ₂ stat.	4955 N	F ₂ stat.	6606 N
F ₂ dyn.	2810 N	F ₂ dyn.	3746 N
M _x stat.	159 Nm	M _x stat.	212 Nm
M _x dyn.	148 Nm	M _x dyn.	310 Nm
M _y stat.	173 Nm	M _y stat.	363 Nm
M _y dyn.	90 Nm	M _y dyn.	120 Nm
M _z stat.	84 Nm	M _z stat.	176 Nm
M _z dyn.	98 Nm	M _z dyn.	206 Nm

Deflection



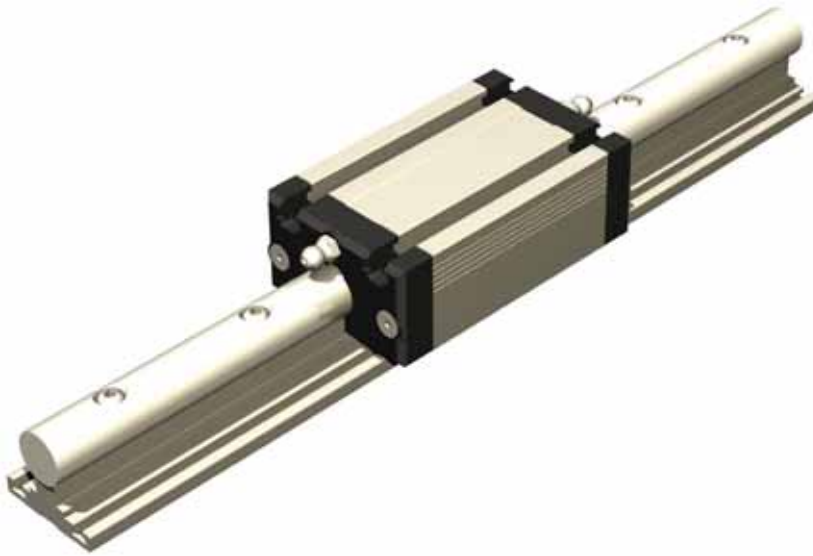
Scaled Drawings



* = available upon request

Linear Guide Rail

ILF 1



Features

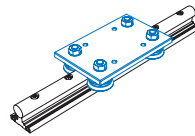
- W 34,5 x H 30 mm
- Precision steel shaft Ø 16
- Aluminium shaft profile, anodized
- Top-down mounting in a 100 mm raster on a plane surface by means of provided special screws M5
- Arbitrary guide rail length
- Weight: 2.2 kg/m



ILF 1

L [mm]	Item no.
298	220 003 0029
398	220 003 0039
498	220 003 0049
598	220 003 0059
698	220 003 0069
798	220 003 0079
898	220 003 0089
998	220 003 0099
1098	220 003 0109
1198	220 003 0119
1298	220 003 0129
1398	220 003 0139
1498	220 003 0149
1598	220 003 0159
1798	220 003 0179
1998	220 003 0199
2098	220 003 0209
2498	220 003 0249
2598	220 003 0259
2998	220 003 0299
Profile length = L - 2 mm	

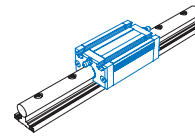
with roller carriage ILW 1



- L 125 x W 80 x H 7,7 mm
- Polished steel plate
- Weight: 0.87 kg

Item no.: **223 230**

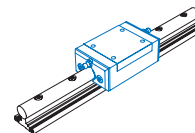
with aluminium bearing carriage IWS 1



- L 94 x W 55 x H 33,5 mm
- Milled clamping surface
- Weight: 0.32 kg
- Option: stainless version

Item no.: **223 220**
stainless: **223 220 0001**

with steel bearing carriage ILS 1



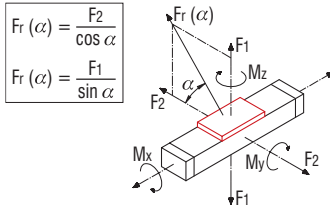
- L 94 x W 58 x H 33,7 mm
- Milled clamping surface
- Weight: 0.72 kg

Item no.: **223 210**

Linear Guide Rail

ILF 1

Load Data

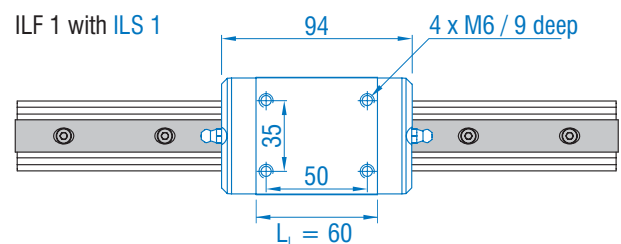
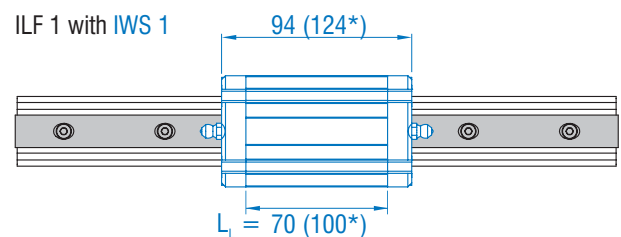
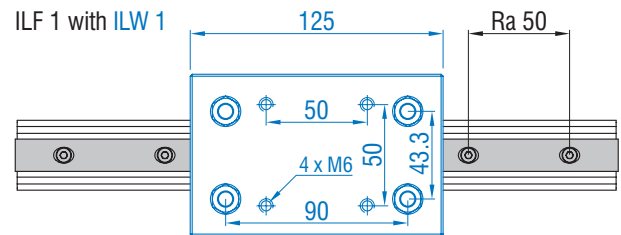
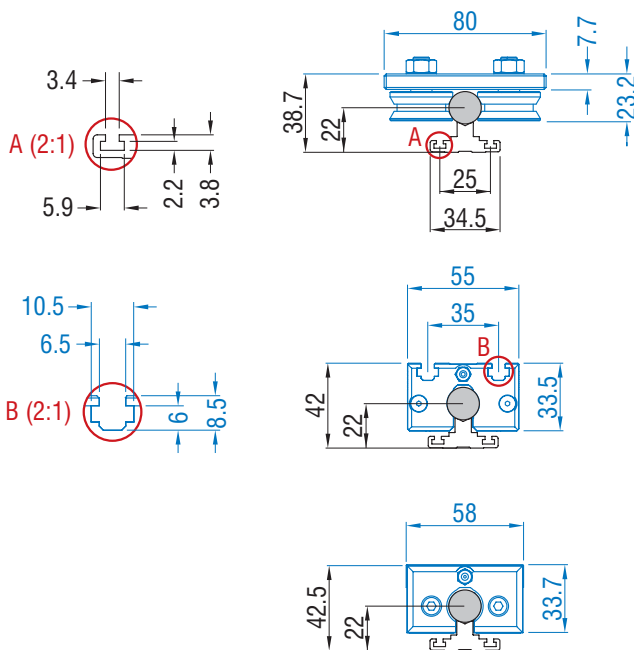


Roller Carriage ILW 1	
C ₀	2160 N
C	4000 N
F ₁ stat.	4320 N
F ₁ dyn.	3897 N
F ₂ stat.	2160 N
F ₂ dyn.	4000 N
M ₁ stat.	-
M ₁ stat.	194.4 Nm
M ₂ stat.	97.2 Nm
M ₁ dyn.	-
M ₁ dyn.	175.3 Nm
M ₂ dyn.	180.0 Nm

Bearing Carriage 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 ₁ stat.	--
M ₁ stat.	104.7 Nm
M ₂ stat.	122.6 Nm
M ₁ dyn.	--
M ₁ dyn.	56.4 Nm
M ₂ dyn.	66.1 Nm

Bearing Carriage 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 ₁ stat.	-
M ₁ stat.	113.4 Nm
M ₂ stat.	132.8 Nm
M ₁ dyn.	-
M ₁ dyn.	72.4 Nm
M ₂ dyn.	84.8 Nm

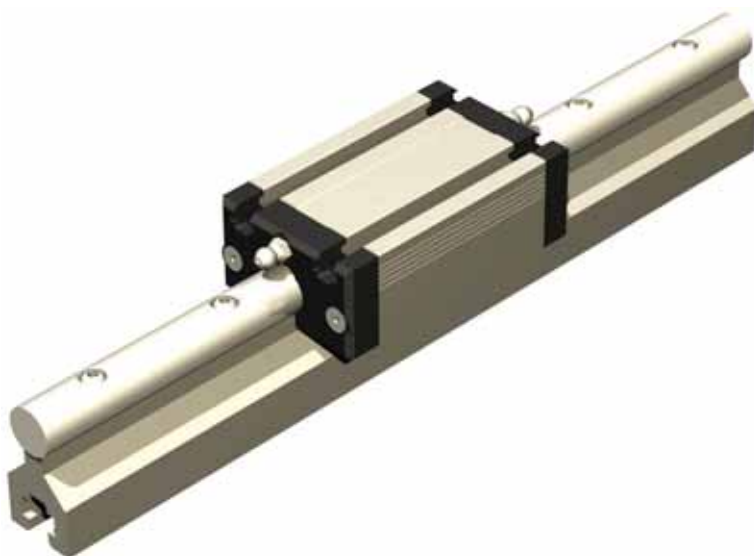
Scaled Drawings



* = available upon request

Linear Guide Rail

ILF 2



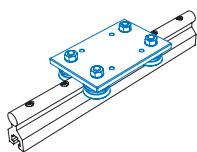
Features

- W 25 x H 47,5 mm
- Precision steel shaft Ø 16
- Aluminium shaft profile, anodized
- Bottom-up mounting on a plane surface by means of thread bars M6 in the T-groove indentation
- Not cantilevered
- Arbitrary guide rail length
- Weight: 2.70 kg/m

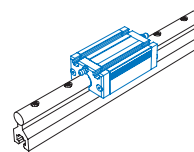


ILF 2

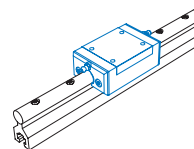
L [mm]	Item no.
298	220 004 0029
398	220 004 0039
498	220 004 0049
598	220 004 0059
698	220 004 0069
798	220 004 0079
898	220 004 0089
998	220 004 0099
1098	220 004 0109
1198	220 004 0119
1298	220 004 0129
1398	220 004 0139
1498	220 004 0149
1598	220 004 0159
1798	220 004 0179
1998	220 004 0199
2098	220 004 0209
2498	220 004 0249
2598	220 004 0259
2998	220 004 0299
Profile length = L - 2 mm	

with roller carriage **ILW 1**

- L 125 x W 80 x H 7,7 mm
- Polished steel plate
- Weight: 0.87 kg

Item no.: **223 230**with aluminium bearing carriage **IWS 1**

- L 94 x W 55 x H 33,5 mm
- Milled clamping surface
- Weight: 0.32 kg
- Option: stainless version

Item no.: **223 220**
stainless: **223 220 0001**with steel bearing carriage **ILS 1**

- L 94 x W 58 x H 33,7 mm
- Milled clamping surface
- Weight: 0.72 kg

Item no.: **223 210**

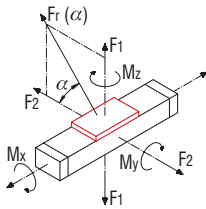
Linear Guide Rail

ILF 2

Load Data

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

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

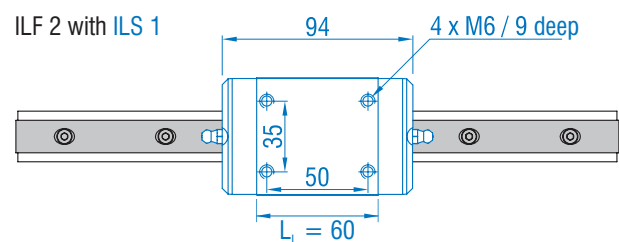
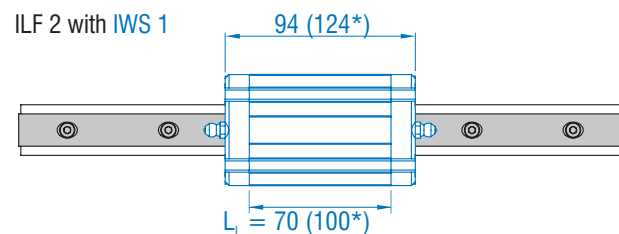
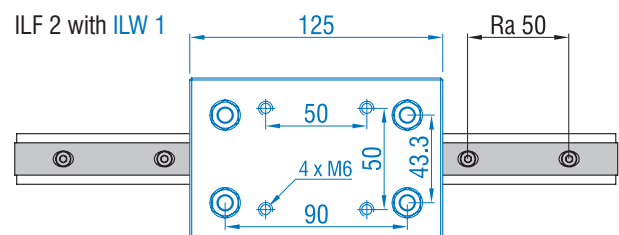
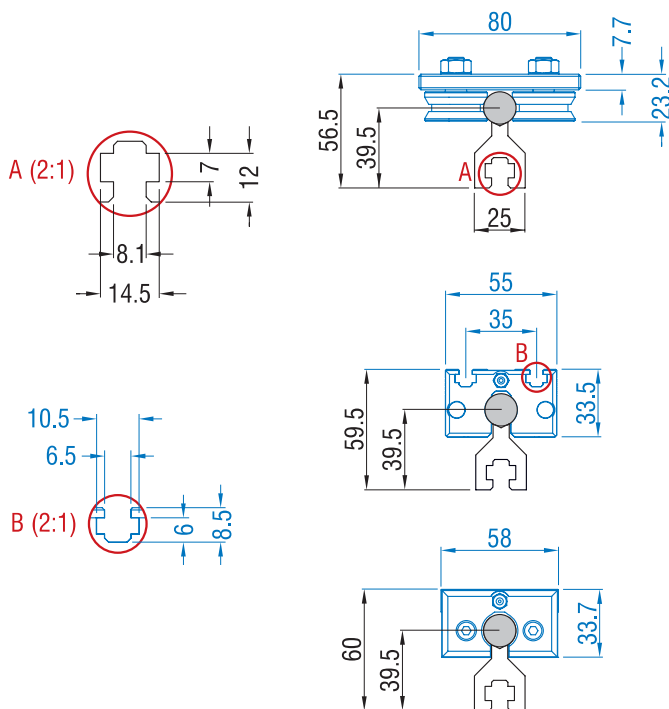


Roller Carriage ILW 1	
C ₀	2160 N
C	4000 N
F ₁ stat.	4320 N
F ₁ dyn.	3897 N
F ₂ stat.	2160 N
F ₂ dyn.	4000 N
M ₁ stat.	-
M ₁ stat.	194.4 Nm
M ₂ stat.	97.2 Nm
M ₁ dyn.	-
M ₁ dyn.	175.3 Nm
M ₂ dyn.	180.0 Nm

Bearing Carriage 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 ₁ stat.	--
M ₁ stat.	104.7 Nm
M ₂ stat.	122.6 Nm
M ₁ dyn.	--
M ₁ dyn.	56.4 Nm
M ₂ dyn.	66.1 Nm

Bearing Carriage 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 ₁ stat.	-
M ₁ stat.	113.4 Nm
M ₂ stat.	132.8 Nm
M ₁ dyn.	-
M ₁ dyn.	72.4 Nm
M ₂ dyn.	84.8 Nm

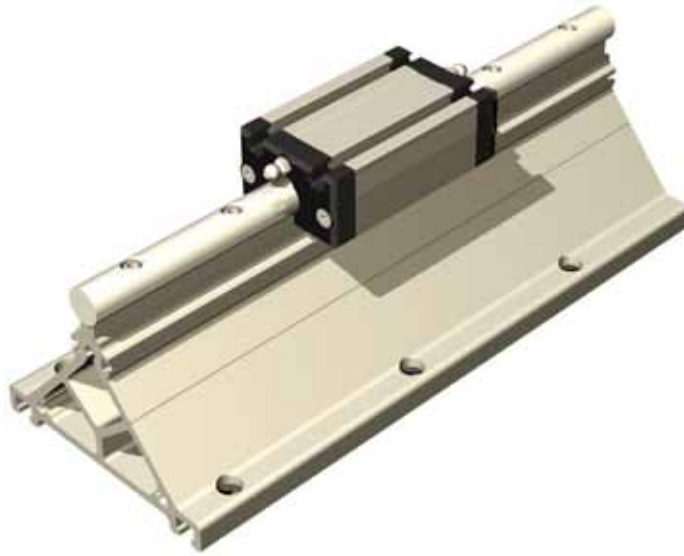
Scaled Drawings



* = available upon request

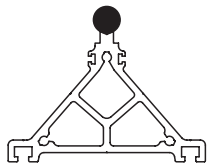
Linear Guide Rail

ILF 3



Features

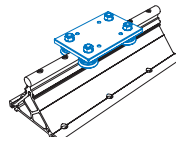
- W 118 x H 93,7 mm
- Precision steel shaft Ø 16
- Aluminium shaft profile, anodized
- Milled shaft seat contour
- Bottom-up mounting by means of thread rails in the T-groove indentation or top-down mounting by means of hole raster bar and screws M6
- Conditionally cantilevered
- Arbitrary guide rail length
- Weight: 6.5 kg/m



ILF 3

L [mm]	Item no.
298	220 005 0029
398	220 005 0039
498	220 005 0049
598	220 005 0059
698	220 005 0069
798	220 005 0079
898	220 005 0089
998	220 005 0099
1098	220 005 0109
1198	220 005 0119
1298	220 005 0129
1398	220 005 0139
1498	220 005 0149
1598	220 005 0159
1798	220 005 0179
1998	220 005 0199
2098	220 005 0209
2498	220 005 0249
2598	220 005 0259
2998	220 005 0299
Profile length = L - 2 mm	

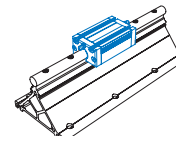
with roller carriage ILW 1



- L 125 x W 80 x H 7,7 mm
- Polished steel plate
- Weight: 0.87 kg

Item no.: **223 230**

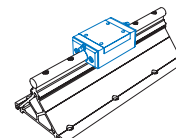
with aluminium bearing carriage IWS 1



- L 94 x W 55 x H 33,5 mm
- Milled clamping surface
- Weight: 0.32 kg
- Option: Stainless version

Item no.: **223 220**
stainless: **223 220 0001**

with steel bearing carriage ILS 1



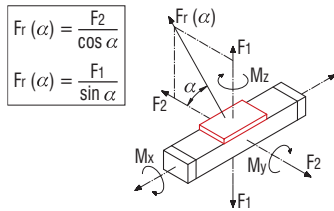
- L 94 x W 58 x H 33,7 mm
- Polished clamping surface
- Weight: 0.72 kg

Item no.: **223 210**

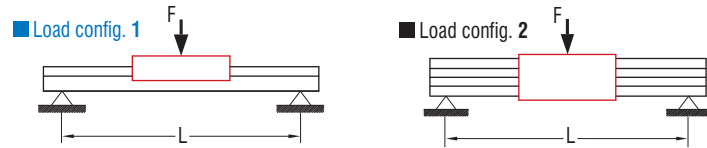
Linear Guide Rail

ILF 3

Load Data



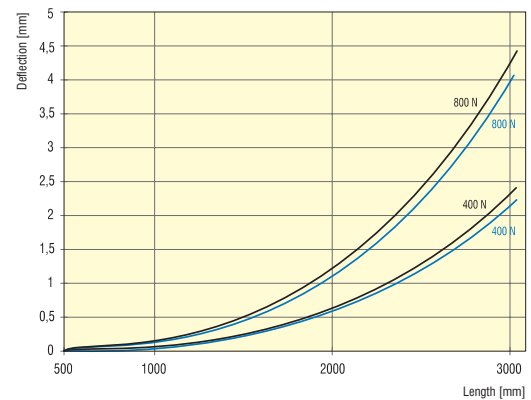
Deflection



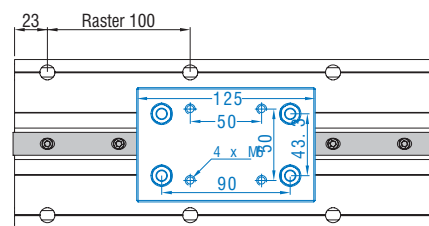
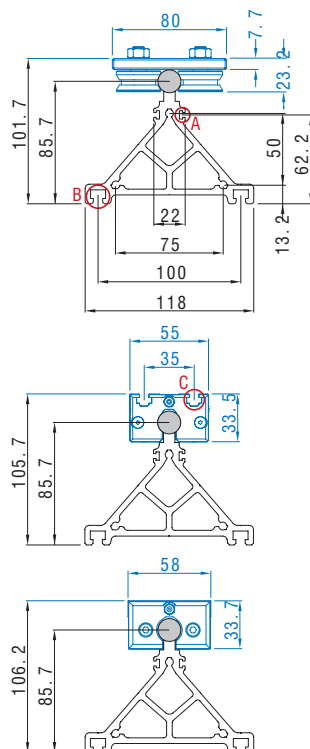
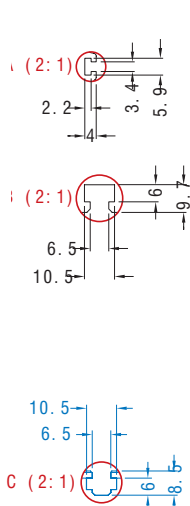
Roller Carriage ILW 1	
C ₀	2160 N
C	4000 N
F ₁ stat.	4320 N
F ₁ dyn.	3897 N
F ₂ stat.	2160 N
F ₂ dyn.	4000 N
M ₁ stat.	-
M ₁ stat.	194.4 Nm
M ₂ stat.	97.2 Nm
M ₁ dyn.	-
M ₁ dyn.	175.3 Nm
M ₂ dyn.	180.0 Nm

Bearing Carriage 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 ₁ stat.	--
M ₁ stat.	104.7 Nm
M ₂ stat.	122.6 Nm
M ₁ dyn.	--
M ₁ dyn.	56.4 Nm
M ₂ dyn.	66.1 Nm

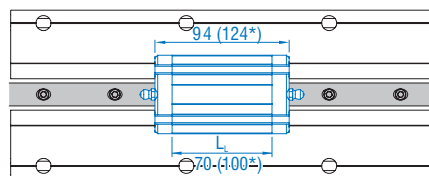
Bearing Carriage ILS 1	
C ₀	5065 N
C	3238 N
F ₁ stat.	4325 N
F ₁ dyn.	2765 N
F ₂ stat.	5065 N
F ₂ dyn.	3238 N
M ₁ stat.	-
M ₁ stat.	113.4 Nm
M ₂ stat.	132.8 Nm
M ₁ dyn.	-
M ₁ dyn.	72.4 Nm
M ₂ dyn.	84.8 Nm



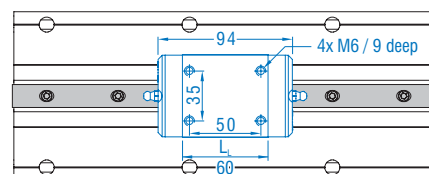
Scaled Drawings



ILF 1 with ILW 1



ILF 1 with IWS 1



ILF 1 with ILS 1

* = available upon request

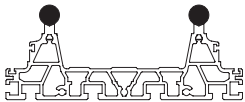
Linear Guide Rail

ILF 6



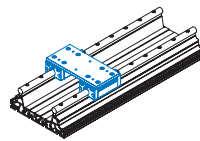
Features

- W 190 x H 61 mm
- 2 precision steel shafts Ø 16
- Stress-resistant
- Aluminium shaft profile, anodized
- Bottom-up mounting by means of thread rails M6 in the T-groove indentation
- Conditionally cantilevered
- Arbitrary guide rail length
- Weight: 10.17 kg/m

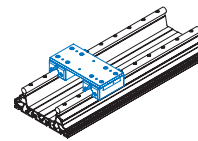


ILF 6

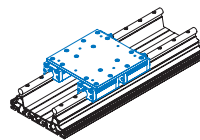
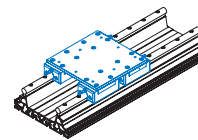
L [mm]	Item no.
298	220 008 0029
398	220 008 0039
498	220 008 0049
598	220 008 0059
698	220 008 0069
798	220 008 0079
898	220 008 0089
998	220 008 0099
1098	220 008 0109
1198	220 008 0119
1298	220 008 0129
1398	220 008 0139
1498	220 008 0149
1598	220 008 0159
1798	220 008 0179
1998	220 008 0199
2098	220 008 0209
2498	220 008 0249
2598	220 008 0259
2998	220 008 0299
Profile Length = L - 2 mm	

with 2 x aluminium bearing carriage **IWS 1**

- L 84 x W 183 x H 8 mm
- Polished steel plate
- 2 x IWS 1, central lubrication possibility
- Clearance-free adjustable
- Total weight: 1.50 kg

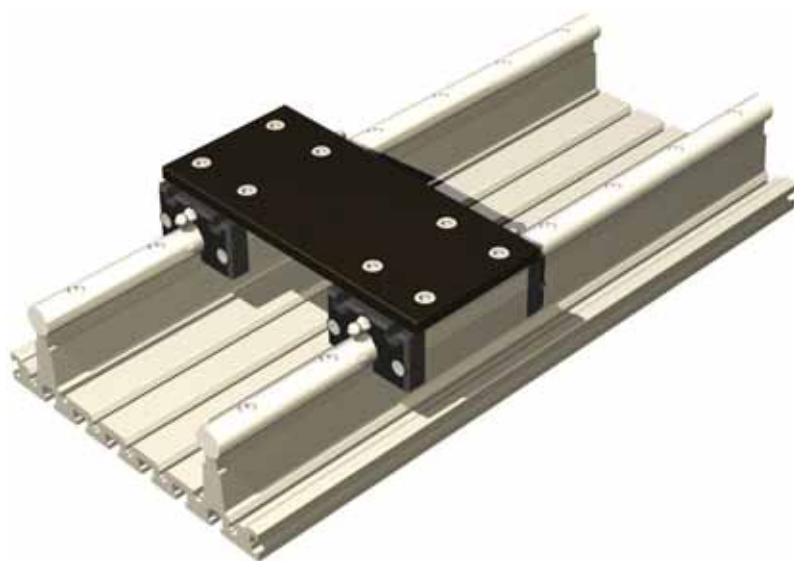
Item no.: **223 240 0007**with 2 x steel bearing carriage **ILS 1**

- L 84 x W 183 x H 8 mm
- Polished steel plate
- 2 x ILS 1, central lubrication possibility
- Clearance-free adjustable
- Total weight: 2.30 kg

Item no.: **223 240 0009**with 4 x aluminium bearing carriage **IWS 1**Item no.: **223 240 0008**with 4 x steel bearing carriage **ILS 1**Item no.: **223 240 0010**

Linear Guide Rail

ILF 7



Features

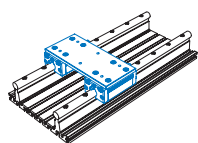
- W 185 x H 61 mm
- 2 precision steel shafts Ø 16
- Stress-resistant
- Aluminium shaft profile, anodized
- Bottom-up mounting by means of thread rails M6 in the T-groove indentation
- Conditionally cantilevered
- Arbitrary guide rail length
- Weight: 10.27 kg/m



ILF 7

L [mm]	Item no.
298	220 007 0029
398	220 007 0039
498	220 007 0049
598	220 007 0059
698	220 007 0069
798	220 007 0079
898	220 007 0089
998	220 007 0099
1098	220 007 0109
1198	220 007 0119
1298	220 007 0129
1398	220 007 0139
1498	220 007 0149
1598	220 007 0159
1798	220 007 0179
1998	220 007 0199
2098	220 007 0209
2498	220 007 0249
2598	220 007 0259
2998	220 007 0299
Profile length = L - 2 mm	

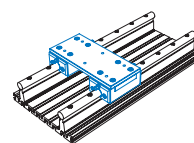
with 2 x aluminium bearing carriage **IWS 1**



- L 84 x W 183 x H 8 mm
- Polished steel plate
- 2 x IWS 1, central lubrication possibility
- Clearance-free adjustable
- Total weight: 1.52 kg

Item no.: **223 240 0003**

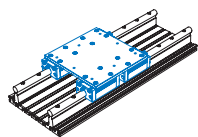
with 2 x steel bearing carriage **ILS 1**



- L 84 x W 183 x H 8 mm
- Polished steel plate
- 2 x ILS 1, central lubrication possibility
- Clearance-free adjustable
- Total weight: 2.32 kg

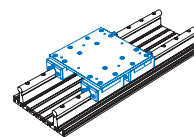
Item no.: **223 240 0005**

with 4 x aluminium bearing carriage **IWS 1**



Item no.: **223 240 0004**

with 4 x steel bearing carriage **ILS 1**

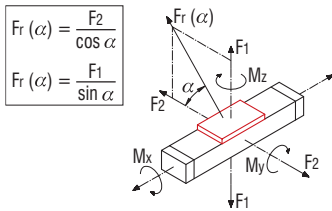


Item no.: **223 240 0006**

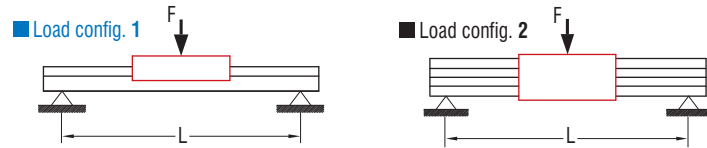
Linear Guide Rail

ILF 7

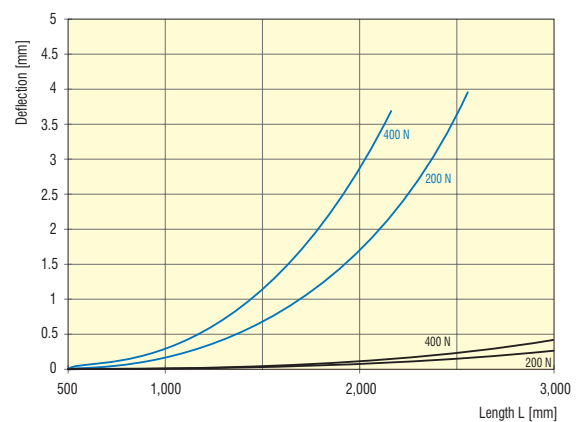
Load Data



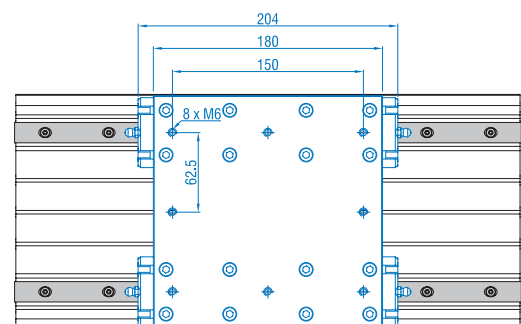
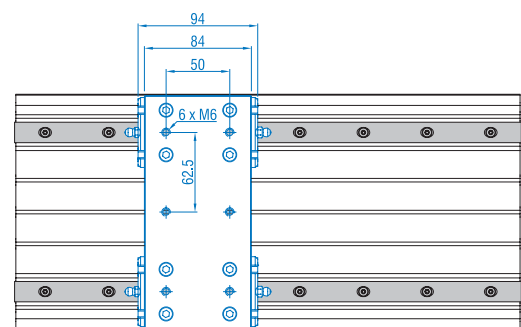
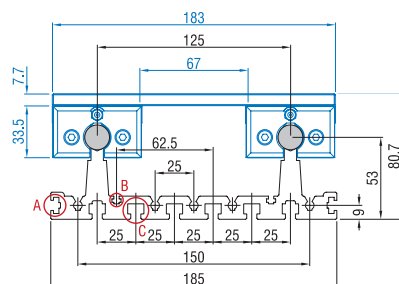
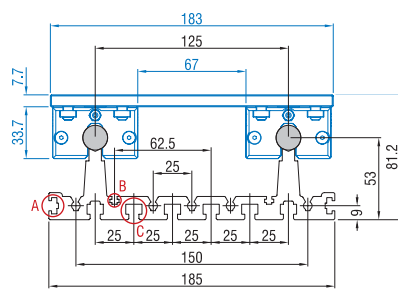
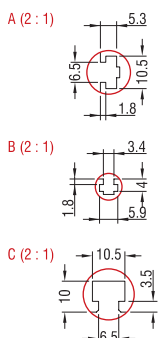
Deflection



Unit with 2x IWS 1		Unit with 2x ILS 1		Unit with 4x IWS 1		Unit with 4x ILS 1	
C ₀	4929 N	C ₀	7598 N	C ₀	6572 N	C ₀	10130 N
C	2660 N	C	4857 N	C	3546 N	C	6476 N
F ₁ stat.	4209 N	F ₁ stat.	6488 N	F ₁ stat.	5612 N	F ₁ stat.	8650 N
F ₁ dyn.	2271 N	F ₁ dyn.	4148 N	F ₁ dyn.	3028 N	F ₁ dyn.	5530 N
F ₂ stat.	4929 N	F ₂ stat.	7598 N	F ₂ stat.	6572 N	F ₂ stat.	10130 N
F ₂ dyn.	2660 N	F ₂ dyn.	4857 N	F ₂ dyn.	3546 N	F ₂ dyn.	6476 N
M _x stat.	263 Nm	M _x stat.	405 Nm	M _x stat.	351 Nm	M _x stat.	541 Nm
M _x stat.	147 Nm	M _x stat.	195 Nm	M _x stat.	309 Nm	M _x stat.	476 Nm
M _y stat.	173 Nm	M _y stat.	228 Nm	M _y stat.	361 Nm	M _y stat.	557 Nm
M _y dyn.	142 Nm	M _y dyn.	259 Nm	M _y dyn.	189 Nm	M _y dyn.	346 Nm
M _z dyn.	79 Nm	M _z dyn.	124 Nm	M _z dyn.	167 Nm	M _z dyn.	304 Nm
M _z dyn.	93 Nm	M _z dyn.	146 Nm	M _z dyn.	195 Nm	M _z dyn.	356 Nm

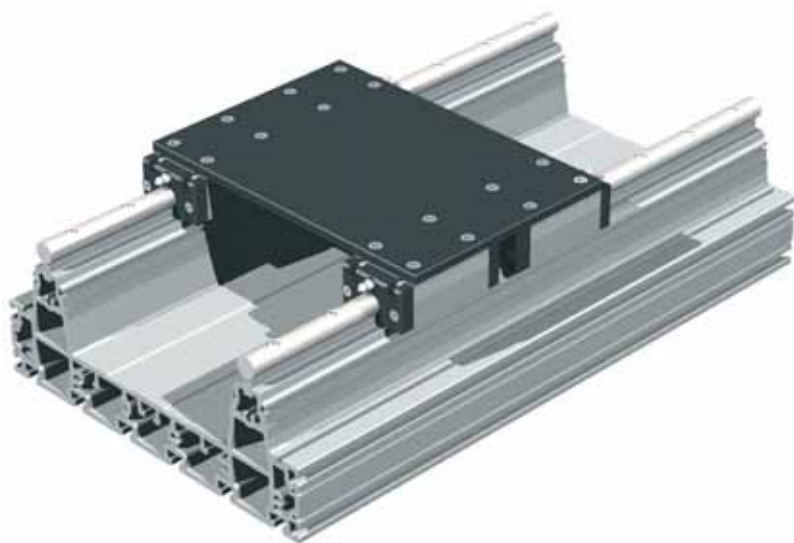


Scaled Drawings



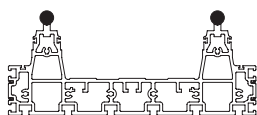
Linear Guide Rail

ILF 9



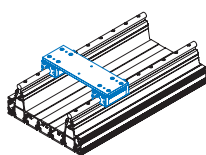
Features

- W 290 x H 61 mm
- 2 precision steel shafts Ø 16
- Stress-resistant
- Aluminium shaft profile, anodized
- Bottom-up mounting by means of thread rails M6 in the T-groove indentation
- Conditionally cantilevered
- Arbitrary guide rail length
- Weight: 19.78 kg/m

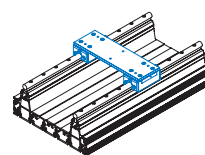


ILF 9

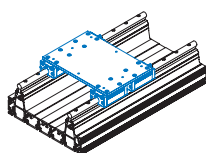
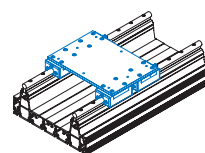
L [mm]	Item no.
298	220 009 0029
398	220 009 0039
498	220 009 0049
598	220 009 0059
698	220 009 0069
798	220 009 0079
898	220 009 0089
998	220 009 0099
1098	220 009 0109
1198	220 009 0119
1298	220 009 0129
1398	220 009 0139
1498	220 009 0149
1598	220 009 0159
1798	220 009 0179
1998	220 009 0199
2098	220 009 0209
2498	220 009 0249
2598	220 009 0259
2998	220 009 0299
Profile Length = L - 2 mm	

with 2 x aluminium bearing carriage **IWS 1**

- L 84 x W 183 x H 8 mm
- Polished steel plate
- 2 x IWS 1, central lubrication possibility
- Clearance-free adjustable
- Total weight: 1.90 kg

Item no.: **223 240 0011**with 2 x steel bearing carriage **ILS 1**

- L 84 x W 183 x H 8 mm
- Polished steel plate
- 2 x IWS 1, central lubrication possibility
- Clearance-free adjustable
- Total weight: 2.70 kg

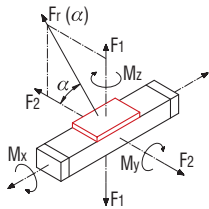
Item no.: **223 240 0013**with 4 x aluminium bearing carriage **IWS 1**Item no.: **223 240 00012**with 4 x steel bearing carriage **ILS 1**Item no.: **223 240 0014**

Linear Guide Rail

ILF 9

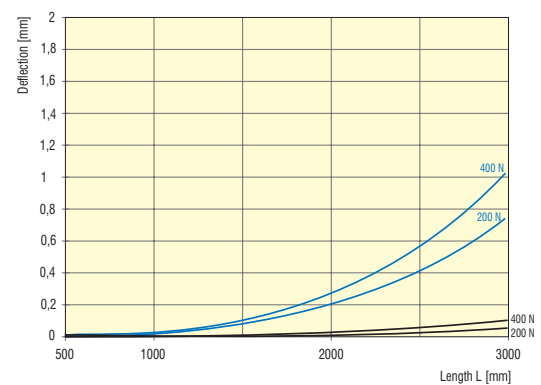
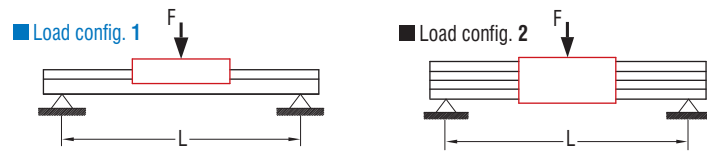
Load Data

$$\begin{aligned} F_r(\alpha) &= \frac{F_2}{\cos \alpha} \\ F_r(\alpha) &= \frac{F_1}{\sin \alpha} \end{aligned}$$

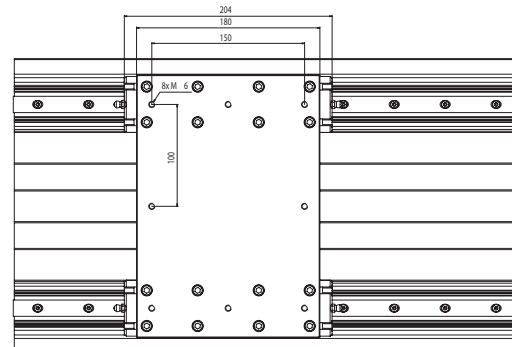
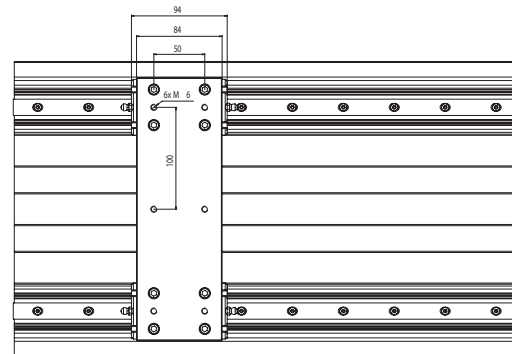
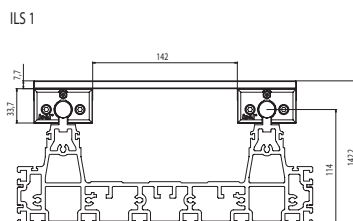
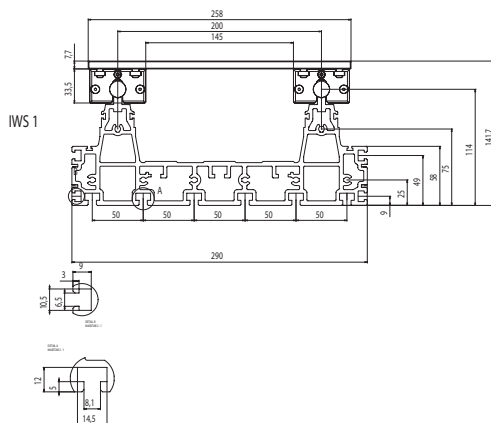


Unit with 2 x IWS 1	Unit with 2 x ILS 1	Unit with 4 x IWS 1	Unit with 4 x ILS 1
C ₀ 4929 N	C ₀ 7598 N	C ₀ 6572 N	C ₀ 10130 N
C 2660 N	C 4857 N	C 3546 N	C 8676 N
F ₁ stat. 4209 N	F ₁ stat. 6488 N	F ₁ stat. 5612 N	F ₁ stat. 8650 N
F ₁ dyn. 2271 N	F ₁ dyn. 4148 N	F ₁ dyn. 3028 N	F ₁ dyn. 5530 N
F ₂ stat. 4929 N	F ₂ stat. 7598 N	F ₂ stat. 6572 N	F ₂ stat. 10130 N
F ₂ dyn. 2660 N	F ₂ dyn. 4857 N	F ₂ dyn. 3546 N	F ₂ dyn. 6476 N
M _s stat. 253 Nm	M _s stat. 649 Nm	M _s stat. 337 Nm	M _s stat. 865 Nm
M _s stat. 147 Nm	M _s stat. 195 Nm	M _s stat. 309 Nm	M _s stat. 476 Nm
M _s stat. 173 Nm	M _s stat. 228 Nm	M _s stat. 361 Nm	M _s stat. 557 Nm
M _s dyn. 136 Nm	M _s dyn. 415 Nm	M _s dyn. 182 Nm	M _s dyn. 553 Nm
M _s dyn. 79 Nm	M _s dyn. 124 Nm	M _s dyn. 167 Nm	M _s dyn. 304 Nm
M _s dyn. 93 Nm	M _s dyn. 146 Nm	M _s dyn. 195 Nm	M _s dyn. 356 Nm

Deflection

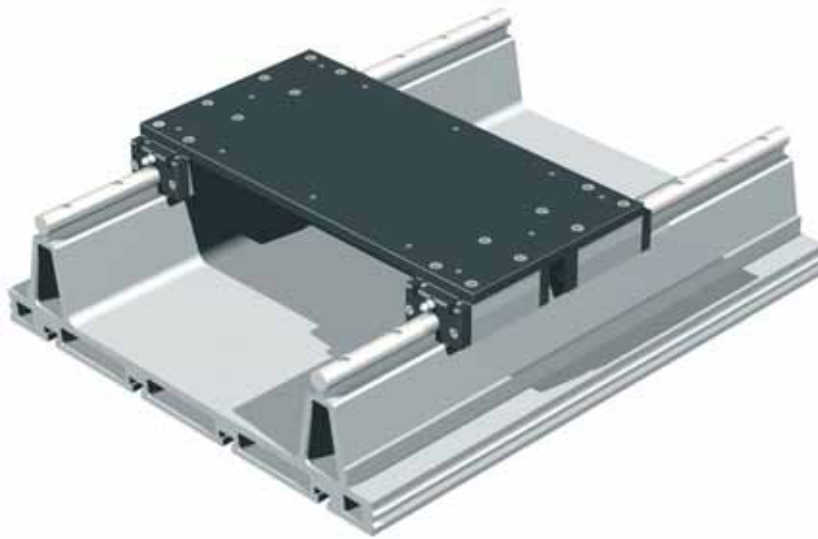


Scaled Drawings



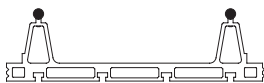
Linear Guide Rail

ILF 10



Features

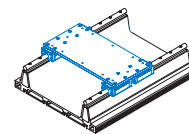
- W 400 x H 113 mm
- 2 precision steel shafts Ø 16
- Stress-resistant
- Aluminium shaft profile, anodized
- Bottom-up mounting by means of thread rails M6 in the T-groove indentation
- Conditionally cantilevered
- Arbitrary guide rail length
- Weight: 25.48 kg/m



ILF 10

L [mm]	Item no.
298	220 010 0029
398	220 010 0039
498	220 010 0049
598	220 010 0059
698	220 010 0069
798	220 010 0079
898	220 010 0089
998	220 010 0099
1098	220 010 0109
1198	220 010 0119
1298	220 010 0129
1398	220 010 0139
1498	220 010 0149
1598	220 010 0159
1798	220 010 0179
1998	220 010 0199
2098	220 010 0209
2498	220 010 0249
2598	220 010 0259
2998	220 010 0299
Profile Length = L - 2 mm	

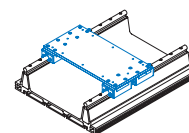
with 4 x aluminium bearing carriage **IWS 1**



- L 84 x W 183 x H 8 mm
- Polished steel plate
- 4 x IWS 1, central lubrication possibility
- Clearance-free adjustable
- Total weight: 6,06 kg

Item no.: **223 240 0015**

with 4 x steel bearing carriage **ILS 1**



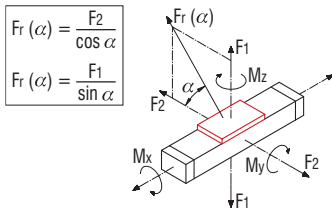
- L 84 x W 183 x H 8 mm
- Polished steel plate
- 4 x IWS 1, central lubrication possibility
- Clearance-free adjustable
- Total weight: 7,66 kg

Item no.: **223 240 0016**

Linear Guide Rail

ILF 10

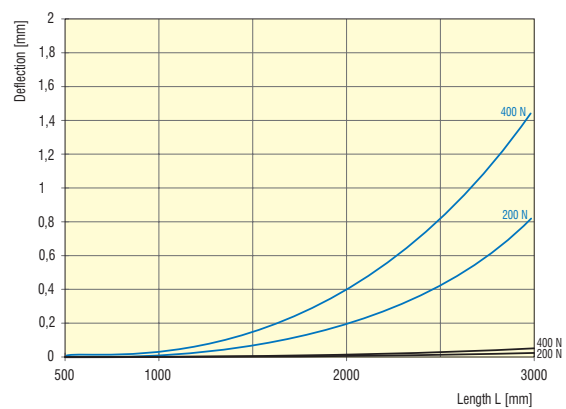
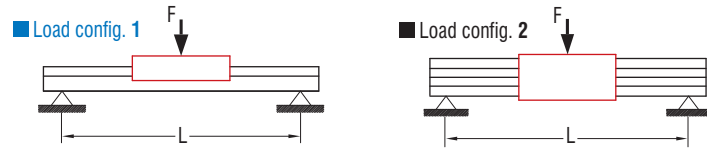
Load Data



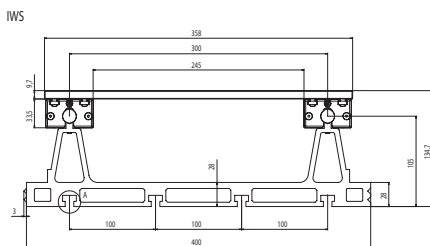
Unit with 4 x IWS 1	
C ₀	6572 N
C	3546 N
F ₁ stat.	5612 N
F ₁ dyn.	3028 N
F ₂ stat.	6572 N
F ₂ dyn.	3546 N
M _x stat.	842 Nm
M _x stat.	309 Nm
M _y stat.	361 Nm
M _y dyn.	454 Nm
M _z dyn.	167 Nm
M _z dyn.	195 Nm

Unit with 4 x ILS 1	
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.	1298 Nm
M _y stat.	476 Nm
M _y stat.	557 Nm
M _z dyn.	830 Nm
M _z dyn.	304 Nm
M _z dyn.	356 Nm

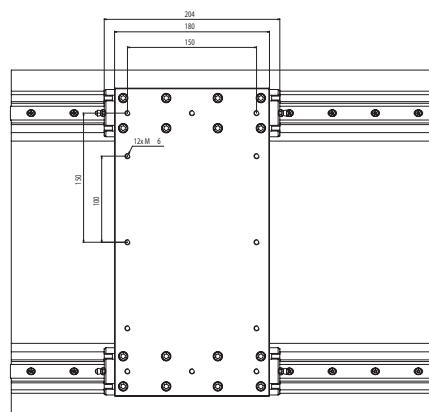
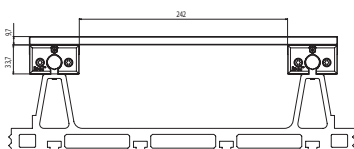
Deflection



Scaled Drawings

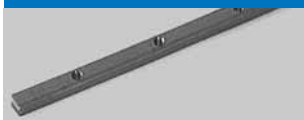


ILS



Accessory

Thread Rails



Thread Rail M6

- 10 x 4 mm
- galvanized
- M6 Ra 50 mm
- VE 3 pc. of 1 m
- for all except of PT / RE 40, 65 / SP / PG

Item no.: **209 011**

Slide Nuts



Slide Nut M6 (fig. 1)

- L 25 x W 10 x H 3,5
- galvanized
- PU 100 pieces
- for all except of PT / RE 40, 65 / PS 50 / SP / PG

Item no.: **209 001 0005**

Slide Nut M6 (fig. 1)

- L 25 x W 13 x H 5
- galvanized
- PU 50 pieces
- for all except of PT / RE 40, 65 / PG

Item no.: **209 004 0001**

Slide Nut 2 x M6 (fig. 2)

- L 45 x W 10 x H 3,5
- galvanized
- PU 50 pieces
- for all except of PT / RE 40, 65 / SP / PG

Item no.: **209 002 0004**

Slide Nut 2 x M6 (fig. 2)

- L 45 x W 13 x H 6
- galvanized
- 2 x M6 Ra 25 mm
- PU 25 pieces
- for PT / RE 40, 65 / PG

Item no.: **209 005 0001**

Angle Slide Nut 2 x M6 (fig. 3)

- galvanized
- PU 25 pieces
- for all except of PT / RE 40, 65 / SP / PG

Item no.: **209 021 0003**

Special Angle Slide Nut

3 x M6 (fig. 4)

- galvanized
- PU 25 pieces
- for all except of PT / RE 40, 65 / SP / PG

Item no.: **209 022 0003**

Linear Bearings



Linear Bearing LARGE

- L80 x W20 x H19 mm
- PU 2 pieces

Item no.: **222 002 0001**

Linear Bearing MEDIUM

- L60 x W20,5 x H17,8 mm
- PU 2 pieces

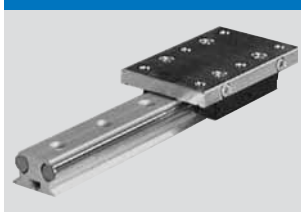
Item no.: **222 000**

Linear Bearing SMALL

- L40 x W20 x H19 mm
- PU 2 pieces

Item no.: **222 001**

Dual Track Set



Dual Track Set 1 for DSF 1

- L75 x W75 x H30,2 mm
- with 2 linear bearings

Item no.: **223 001**

Dual Track Set 2 for DSF 1

- L125 x W75 x H30,2 mm
- with 2 linear bearings LARGE

Item no.: **223 002**

Roller Carriage LW 2



Roller Carriage LW 2 for LF 3

- with aluminium T-groove plate
- L150 x W125, 4 rollers Ø 31 mm

Item no.: **223 005**

Rollers



Roller Ø 21 mm

- concentric
- PU 2 pieces

Item no.: **222 003**

- eccentric
- PU 2 pieces

Item no.: **222 004**

Roller Ø 31 mm

- concentric
- PU 2 pieces

Item no.: **222 006**

- eccentric
- PU 2 pieces

Item no.: **222 007**

Lubricating Grease / Grease Gun



Lubricating grease

Item no.: **299 031**

Rush-type hand gun

for grease and oil

Item no.: **931 170**

General References

Bearing Capacity and Life Time

Fitting Position

Basically, the fitting position of the linear guides is arbitrarily selectable. It simply has to be considered that all arising forces and moments are below the maximum values of the respective axes.

Temperatures

All linear guides are designed for ambient temperatures of up to 60 °C in continuous operation. For a short time of operation, temperatures of up to 80 °C are admissible. The linear guides are not suitable for temperatures below the freezing point.

Straightness/Torsion

The used aluminium profiles are extruded shapes that deviate with regard to straightness and torsion due to the manufacturing processes. The tolerance of this deviation is determined in the DIN 17615. In the worst case, the deviations of the linear guides correspond to these limit values, however they usually remain below those values. In order to achieve the desired linear guide precision, it is necessary to align the guide by using levelling plates and/or by clamping it on a precisely machined bearing surface. Thereby, tolerances of at least 0.1 mm/1000 mm are achieved.

Basic facts - bearing capacity and life time

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

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

According to DIN, the basis of the dynamic load rating is a nominal life time of 100.000 m traverse way. Far Eastern suppliers frequently indicate the load ratings for a nominal life time of 50.000 m; that results in load ratings that are more than 20% higher than the ones according to DIN.

Dynamic Bearing Capacity

The fatigue behaviour of the material determines the dynamic bearing capacity. The life time - the fatigue period - depends on:

- the load of the linear guide
- the traverse speed of the linear guide
- the statistic eventuality of the first case of damage

Working Life

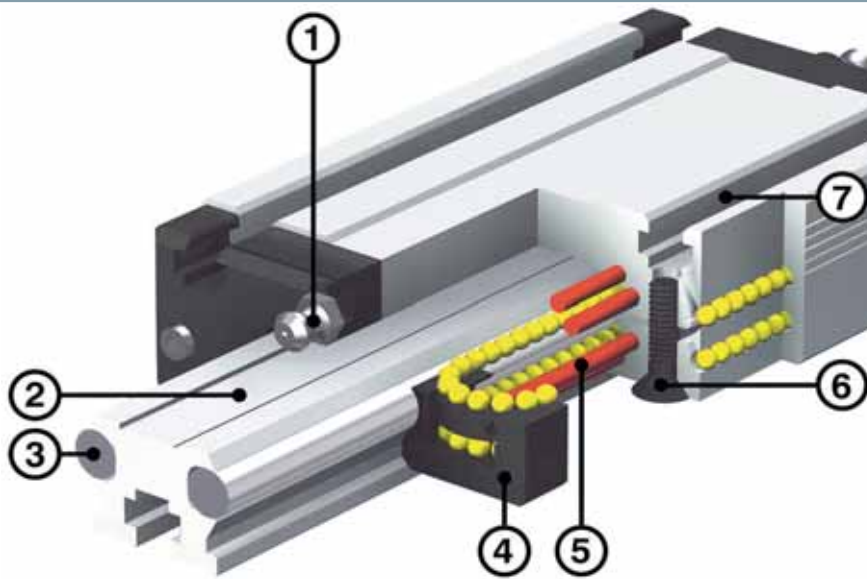
The definition of the working life is the actually reached life time. The working life can be different from the calculated life time.

Premature failure by wear or fatigue can be caused by:

- misalignments between guiding rails or guiding elements
- soiling of the guiding rails
- insufficient lubrication
- oscillating movement with very small strokes (rippling)
- vibrations while standing still (rippling)

Due to the variety of the installation and operation conditions, it is not possible to exactly determine the working life of a linear guide in advance. The safest way to get an applicable estimation of the working life still is the comparison with similar cases of installation.

Functions Overview



Aluminium Bearing Carriage

Maximum speed: 5 m/s
High loading capacity

Bearing Carriage.

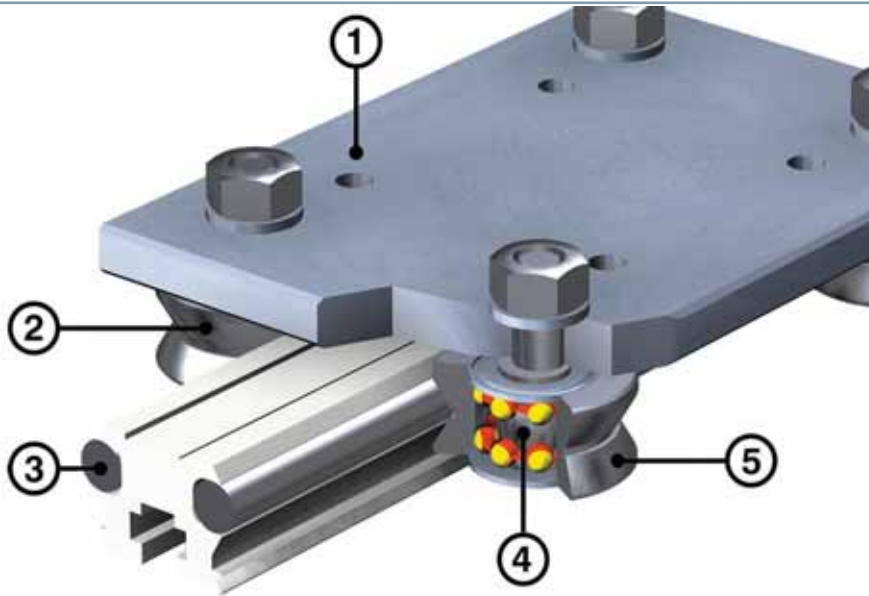
The patented bearing carriages are especially applicable for constructing complex multi-axis systems for handling and machining. A wide range of models makes it possible to cover many fields of application. Each model can be manufactured with different profile lengths (70, 100, 150 and 200 mm).

1. Lubrication possibilities for the recirculating balls on both sides.
2. The basic carriers of all linear guides are extruded aluminium profiles according to DIN 17615, which are provided with T-groove slots and/or mounting holes.
3. Precision steel shafts with a hardness of 60 ± 2 HRC are used as guide rails. All MLF types are optionally available with stainless steel shafts.
4. The ball recirculation is fibre reinforced.
5. Inside the linear carriage there are patented ball recirculations. Each supporting ball runs between two polished steel pins and the guiding shaft.
6. The adjustment of the carriage takes place by means of self-locking set screws: the ball rows and shafts and/or pins are screwed down and thus prestressed. The carriages are factory-adjusted to the respective prestress. All bearing carriages are optionally available in stainless design.
7. For the attachment of transportation loads, carriage plates etc., the Bearing Carriages are provided with T-groove slots and/or mounting holes.

Functions Overview

Roller Carriage

Maximum speed: 10 m/s
Medium loading capacity

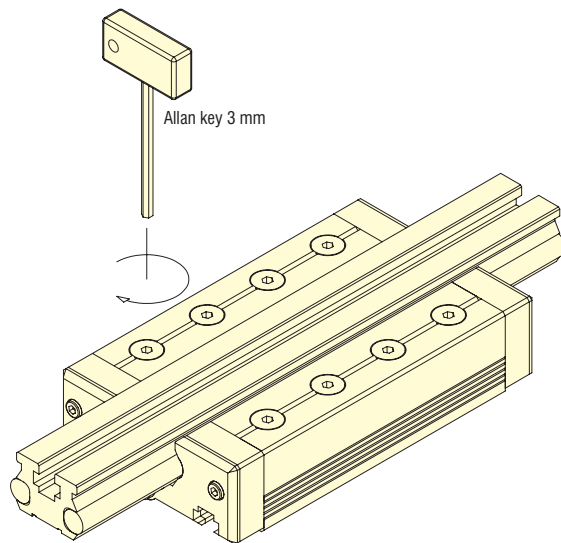


Roller Carriage.

The roller carriages are high-quality transportation linear units, preferably used for the fast positioning of light-weight up to medium-weight loads.

1. The polished fastening steel plate with a thickness of 8 mm is used for taking up the rollers as well as the transportation load. To this purpose it is provided with M6 mounting threads.
2. Firmly standing centric rollers.
3. All guide rails can be equipped with bearing carriages as well as with roller carriages (for more information, refer to "Bearing Carriages").
4. The roller principle corresponds to a similar double-row ball bearing with gothic track, life-time lubricated, with an axial play of max. 0.01 mm.
5. Eccentric rollers for adjusting the roller carriage. The delivery takes place with factory-presetting. If necessary, the roller carriages can be adjusted according to the desired application.

Adjustments



Aluminium Bearing Carriage

The bearing carriages are adjusted by crosswise tightening the set screws at the bottom side.

The desired prestress depends on the application. Together with the prestress, rigidity, moment loading capacity, guiding precision and traverse resistance increase. The life time decreases.

Maintenance

The bearing carriages must be lubricated once in 300 operating hours, however at least quarterly by using the lubrication nipples located at both faces of the carriages.

The factory presetting is appropriate for the respective data in the concerned product descriptions and describes an average value of the load data.

Note: The sliding onto the guiding rail takes place by slightly pushing forwards and back during the slide-on movement.

Lubricant

Sodium saponified lubrication grease based on mineral oil, recommended ISO viscosity class: ISO-VG 100 (original grease: gear grease 4223 of the manufacturer Siebert GmbH)

In case of too much prestress, the life time decreases.

Characteristic: The bearing carriage runs sluggishly and can be slid onto the guiding rail only with difficulty.

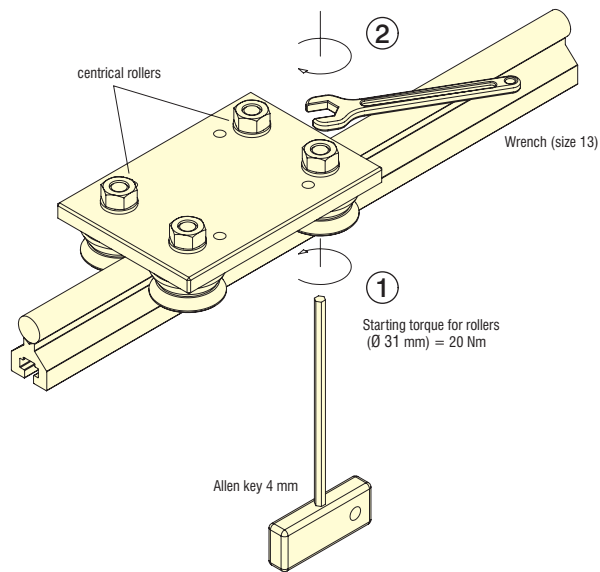
Lubricants available at

iselautomation KG:

Lubricating grease: item no. **299 031**

Grease gun: item no. **931 170**

Adjustments



Roller Carriage

Step 1:

Adjustment of the eccentric rollers

Using an Allen key, rotate the roller in such a way that the conical tracks are set to the steel shaft of the linear guide. Select the torque in such a way that zero backlash and smooth running between the opposite rollers are ensured.

Step 2:

Tightening of the hexagon nuts

Tighten the hexagon nut with a torque of 20 Nm.

While doing so, keep the rollers in the adjusted position by using an Allen key.

Verification

The roller carriage is adjusted correctly, if all rollers rotate when traversing and the roller carriage runs smoothly.

In case of too much prestress, which results from adjusting the rollers too tightly, the life time decreases.

Characteristic: The roller carriage runs sluggishly and can be slid onto the guiding rail only with difficulty.

Calculation of Working Loads

Calculation of the Effective Load

Different factors have an influence on the load calculation of isel Linear Guides. These are the position of the load center, pull- and push forces, force origins, load- and acceleration forces.

For a linear table on 4 bearings, the bearing forces are determined as a function of the force origins at different load directions.

The calculation is also applicable to a carriage arrangement of 2 carriages.

$L_L/2$ is used then instead of the dimension figure L (see dimensional drawings of the respective Linear Guides).

The load rating for this application is $C_0/2$.

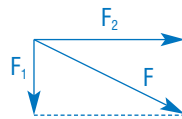
Combined Load

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

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

If a force F and a moment M load an element at the same time, the following applies for the dynamic equivalent load:

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



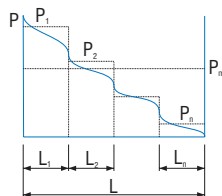
P [N]	dynamic equivalent load
F [N]	applying force = $\sqrt{F_1^2 + F_2^2}$
F_1 [N]	vertical component, see sketch (4)
F_2 [N]	horizontal component, see sketch (4)
C_0 [N]	static load rating
M [Nm]	applying moment
$M_{0(XYZ)}$ [Nm]	static moment towards the applying moment

According to DIN, the dynamic equivalent load should not exceed the value $P = 0,5 \cdot C$.

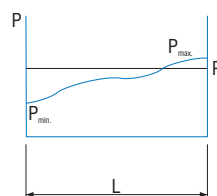
Calculation of the Equivalent Load

Operating conditions

A Gradual change



B Homogeneous change



Equivalent load

$$P = \sqrt[3]{\frac{1}{L} \cdot (P_1^3 \cdot L_1 + P_2^3 \cdot L_2 + P_3^3 \cdot L_3 + \dots + P_n^3 \cdot L_n)}$$

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

P	dynamical equivalent load [N]	$P_{\min}$	minimum load [N]
$P_{1...n}$	individual load [N]	$P_{\max}$	maximum load [N]
L	total travel [m]		
$L_{1...n}$	individual travel [m]		

Static Safety

Operating conditions

Normal movement	1,0 - 3,0
High speed	2,0 - 4,0
With jerks and vibrations	3,0 - 5,0

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

S_0	static bearing safety
C_0	static load rating [N]
P_0	static equivalent bearing stress [N]
M_0	static bearing moment [Nm]
M	equivalent static moment [Nm]

Nominal Life Time

90% of a sufficient large quantity of the same bearings reach or exceed the nominal life time, before the first signs of metal fatigue can be seen.

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

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

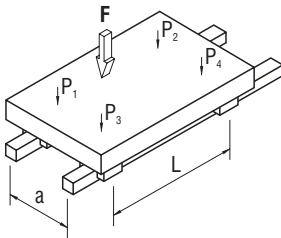
$$L_h = \frac{1666}{v} \cdot \left(\frac{C}{P} \right)^3$$

L [m]	nominal life time in 100.000 m
L_h [h]	nominal life time in operating hours
C [N]	dynamic load rating
P [N]	dynamic equivalent bearing
H [m]	single stroke length of the oscillating movement
n_{osz} [min]	number of double strokes per minute
v [m/min]	average traverse speed

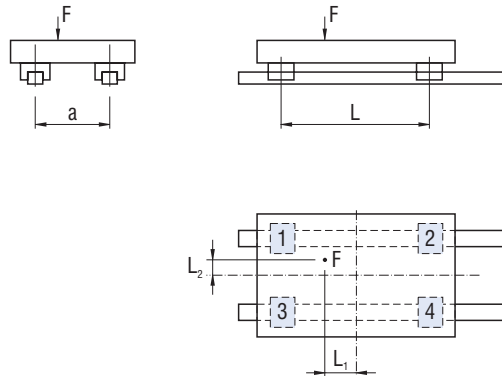
Calculation of Working Loads

Load normal to the table surface

Load application



Scale drawing



Load on one carriage

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

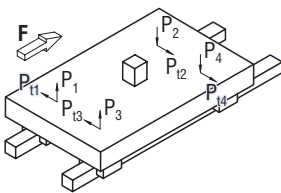
$$P_2 = \frac{F}{4} - \frac{F \cdot L_1}{2L} + \frac{F \cdot L_2}{2a}$$

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

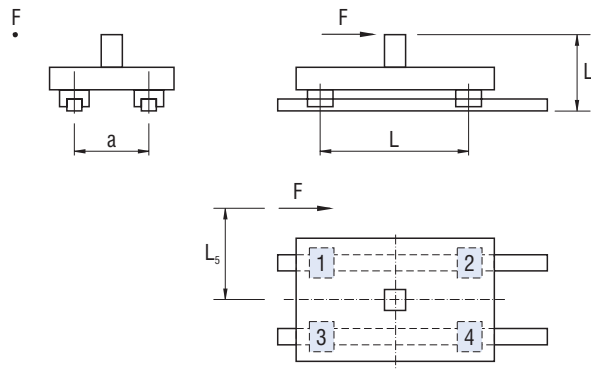
$$P_4 = \frac{F}{4} - \frac{F \cdot L_1}{2L} - \frac{F \cdot L_2}{2a}$$

Load in traversing direction

Load application



Scale drawing



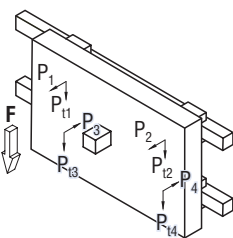
Load on one carriage

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

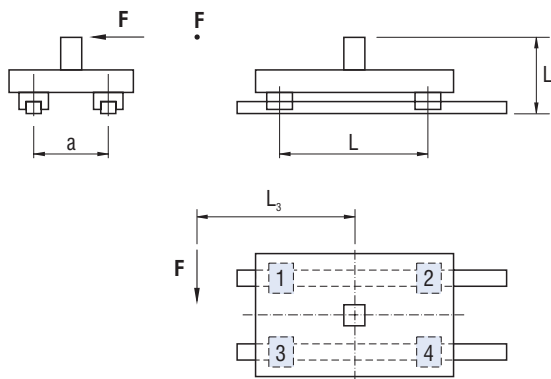
$$P_{t1} \dots P_{t4} = \frac{F \cdot L_5}{2L}$$

Load across the traversing direction

Load application



Scale drawing



Load on one carriage

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

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

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