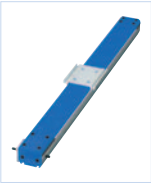
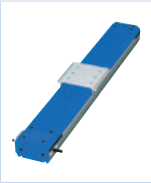


Timing Belt Feed Axes

Overview

Functions		B 120
	BlueLine Series 1 and BlueLine Series 3	
Functions		B 122
	Timing Belt Feed Axes LEZ 2 and LEZ 3	
LEZ 1 G (BlueLine Series 1)		B 124
		Closed Timing Belt Feed Axis
LEZ 3 G (BlueLine Series 3)		B 130
		Closed Timing Belt Feed Axis
LEZ 1 (ZF 1)		B 136
		Open Timing Belt Feed Axis
LEZ 2 (ZF 2)		B 140
		Open Timing Belt Feed Axis
LEZ 3 (ZF 3)		B 146
		Open Timing Belt Feed Axis

Timing Belt Feed Axes

Overview

LEZ 6
(LUT 2)

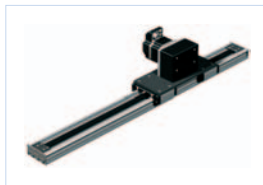
B 152



Open Timing Belt Feed Axis

LEZ 7
(LUT 4)

B 154



Open Timing Belt Feed Axis

LEZ 8
(LUT 5)

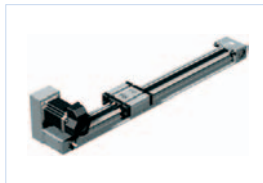
B 156



Open Timing Belt Feed Axis

LEZ 9
(LUT 6)

B 158



Open Timing Belt Feed Axis

LEZ 4
(Double Track Timing Belt Feed Axis)

B 160



Open Timing Belt Feed Axis

Drive Dimensioning

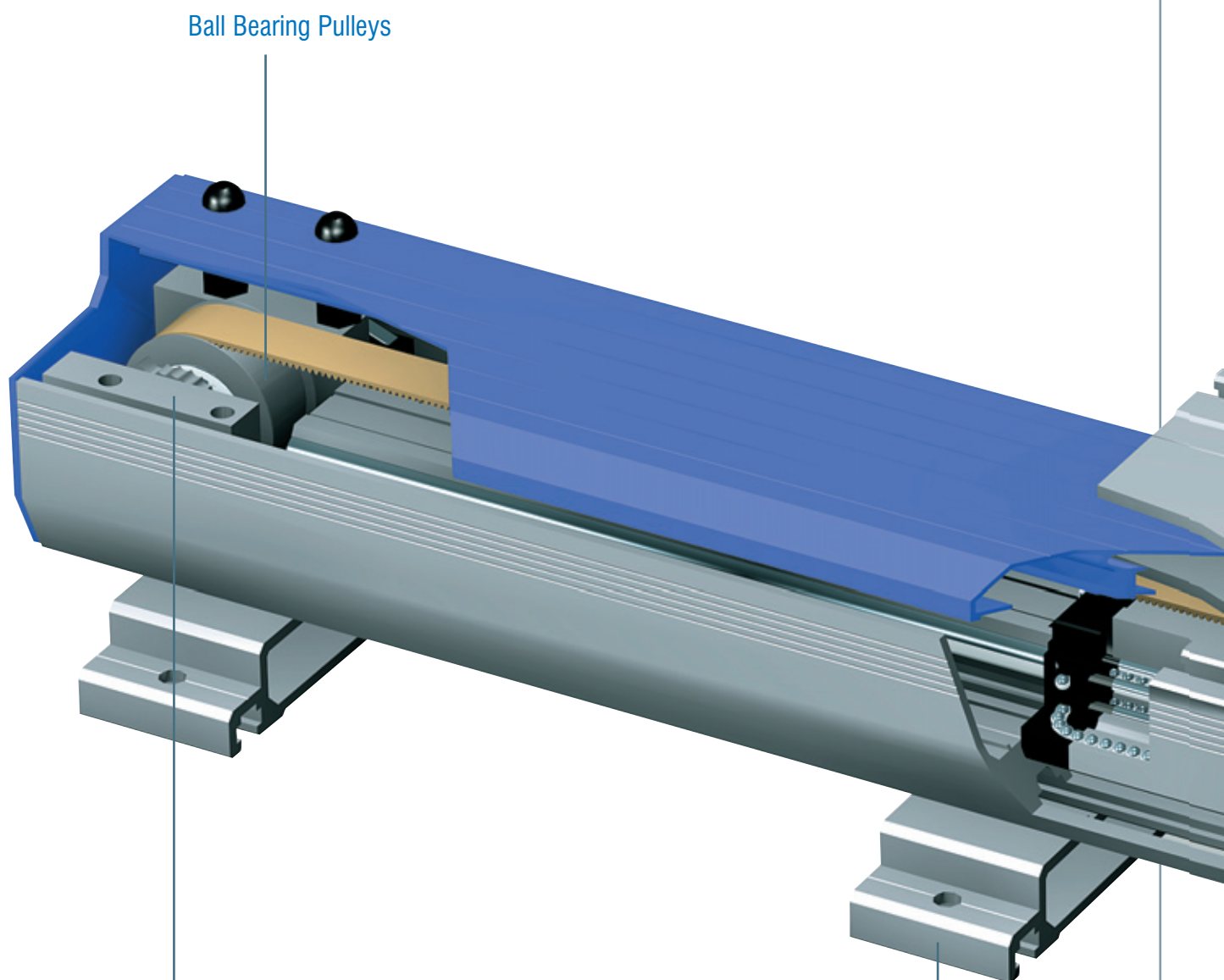
B 162

Application Samples

B 163

Functions

LEZ 1 G and LEZ 3 G



Ball Bearing Pulleys

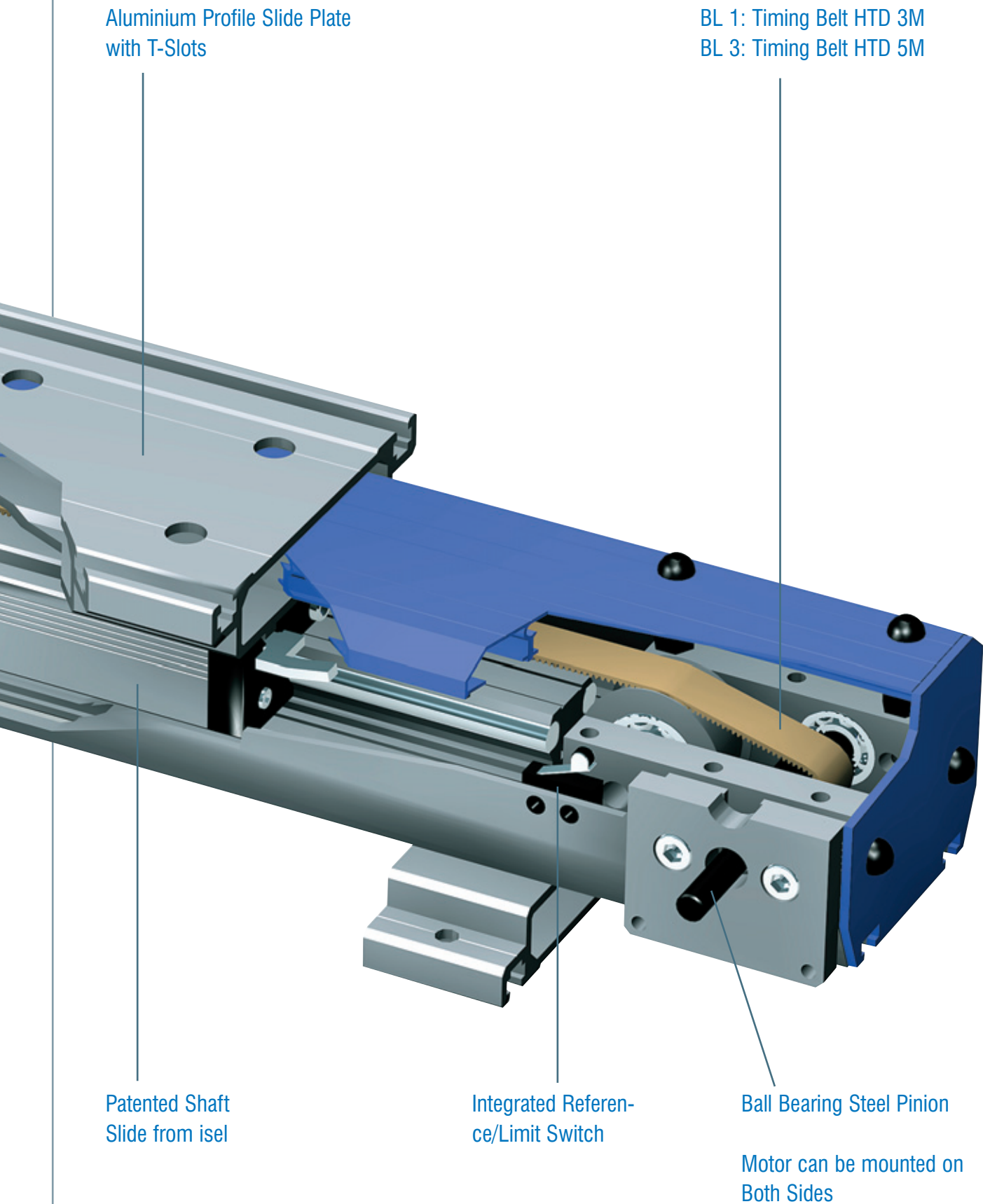
Eccentric Spanner enables an
easy tensing of the Belt

Foot Mounting, optional

Assembly and Quantity as
required

Functions

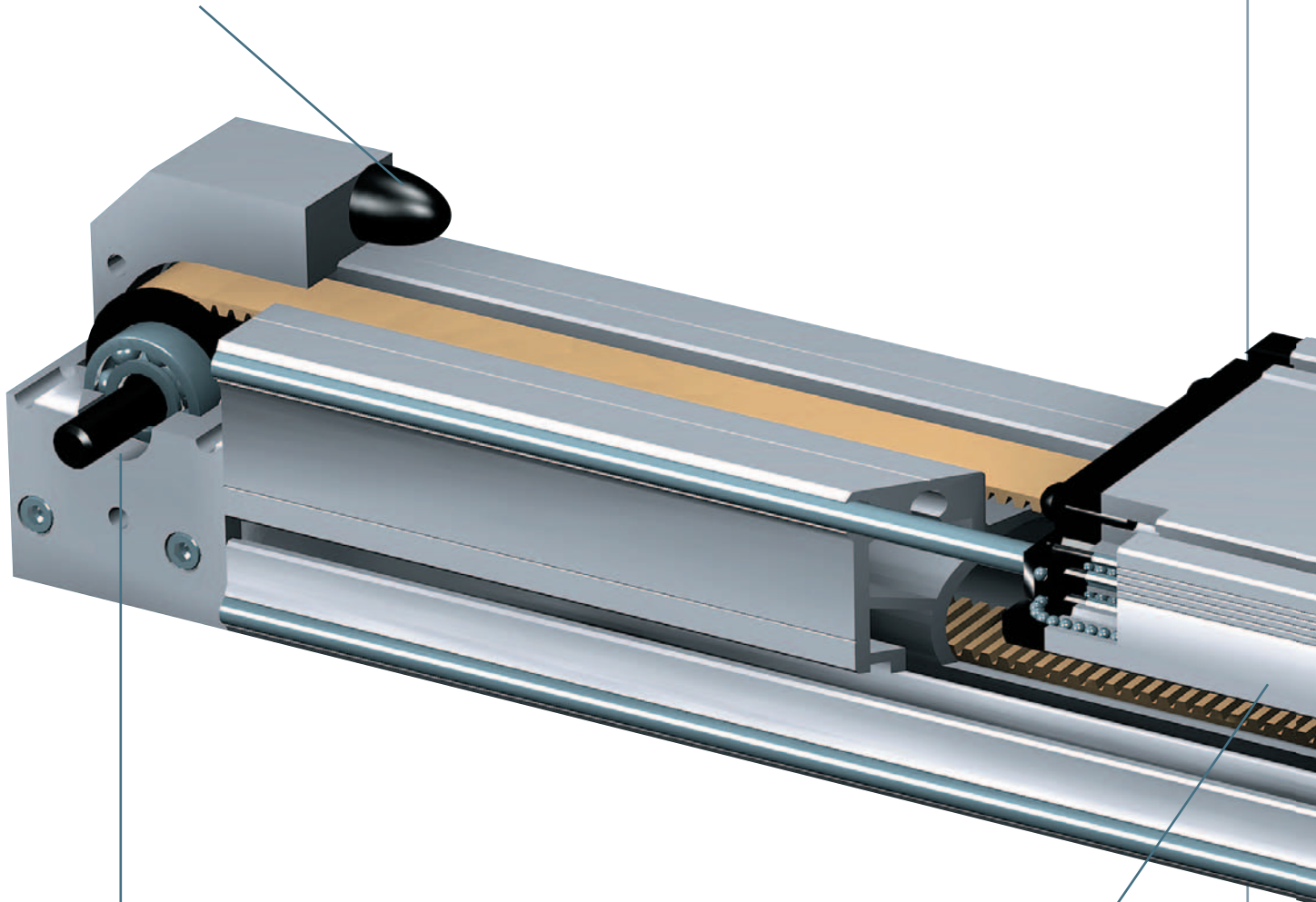
LEZ 1 G and LEZ 3 G



Functions

Timing Belt Feed Axes LEZ 2 and LEZ 3

Bilateral Limit Position Buffer
with Parabola Springs



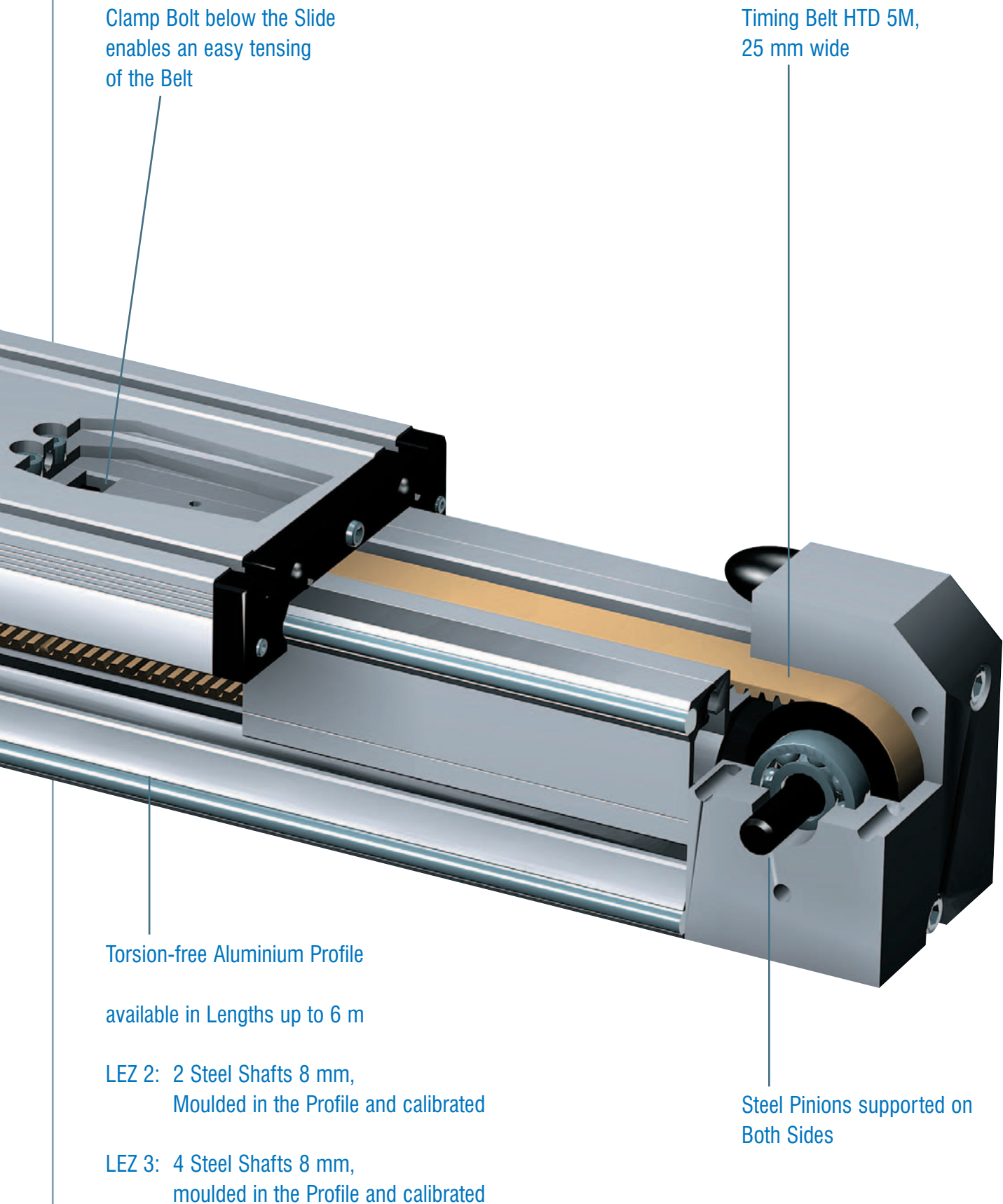
LEZ 3: Motor can be flanged
in any Position

Patented Shaft slide from isel

LEZ 3: Two Slides - either Shaft Slides
or Carriages - can be Mounted

Functions

Timing Belt Feed Axes LEZ 2 and LEZ 3



Timing Belt Feed Axis

Closed Timing Belt Feed Axis

LEZ 1 G

(BlueLine-Series 1)

Feeds and Shaft Slides are also available in Rust-Proof Designs!



Features

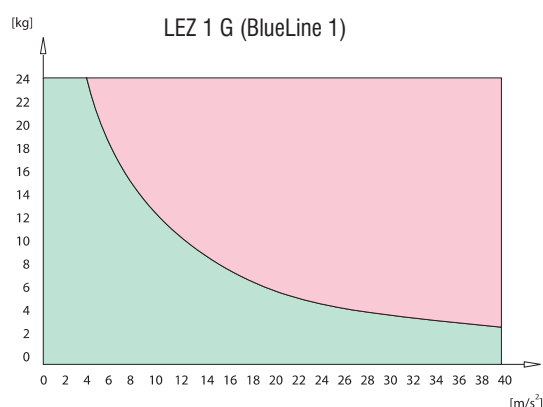
- Aluminium profile with midjet linear guide LFS-8-1
- Clearance-free feed with timing belt feed axis - timing belt with 3 mm pitch, width 15 mm
- Feed 2.4 m/s, at the most
- Shaft slide WS 1 L 126 x W 72 mm
- Repetitive accuracy less or equal ± 0.2 mm
- Limit and/or reference switch Accuracy < 0.1 mm
- Available in lengths up to 2.05 m
- Motor can be mounted on both sides due to an extended shaft end on the driving side
- Numerous combination possibilities due to additional special and angle profiles
- Integrated reference switch

Technical Data

Belt version.....	HTD 3M, width 15 mm
Mass of slide.....	0.730 kg
Weight without drive module.....	1,000 mm $\cong$ 6.25 kg
Nominal mass of timing belt.....	0.0375 kg/m
Nominal weight of feed axis.....	0.440 kg/100 mm
Effective diameter of the synchronized pulleys...	$\varnothing 15.28$ mm
Moment of inertia of the synchronized pulleys...	$1.461 \cdot 10^{-6}$ kgm ²
Feed per revolution.....	48 mm

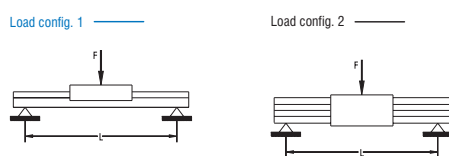
Load Diagram

Permissible accelerated masses related to belt strength*

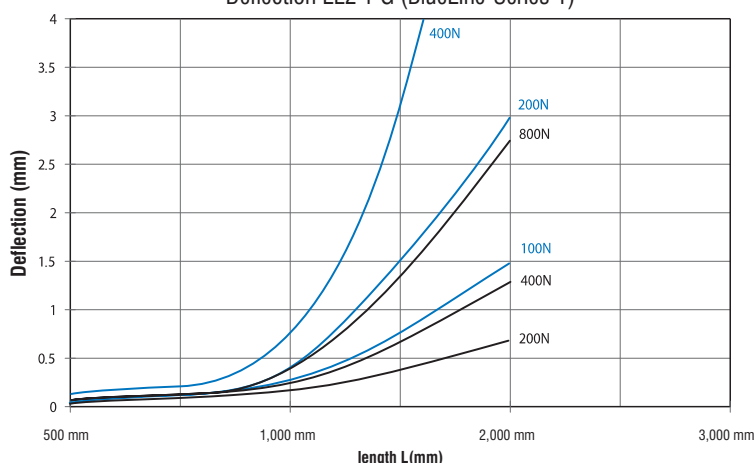


*At vertical assembly, the acceleration due to gravity ($g = 9.81$ m/s²) has to be taken into account

Deflection



Deflection LEZ 1 G (BlueLine-Series 1)



Idle Torques

Revolution [1/min]	Idle torque [Nm]
500	0.06
1,500	0.09
3,000	0.13

LEZ 1 G

(BlueLine-Series 1)

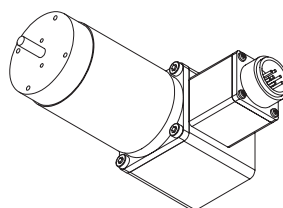
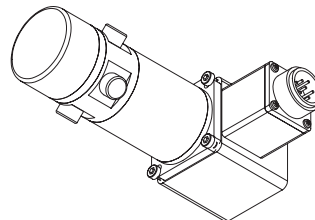
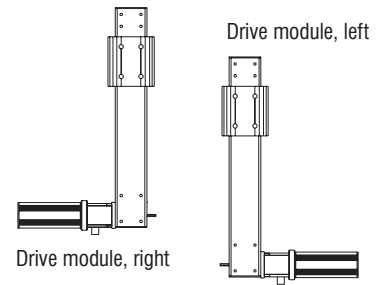
Länge L von 450 bis 2050 mm lieferbar

Technical drawing of a rectangular plate with the following dimensions and specifications:

- Overall width: 116.5
- Overall height: 19.5
- Distance between hole centers: 66.5
- Distance from top edge to hole center line: 50
- Hole diameters: $\phi 0.5$ and $\phi 11$

LEZ 1 G

(BlueLine-Series 1)

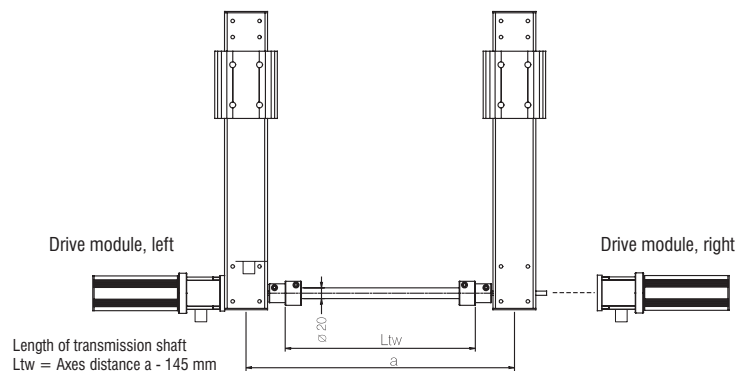


Timing Belt Feed Axis

LEZ 1 G (BlueLine-Series 1)

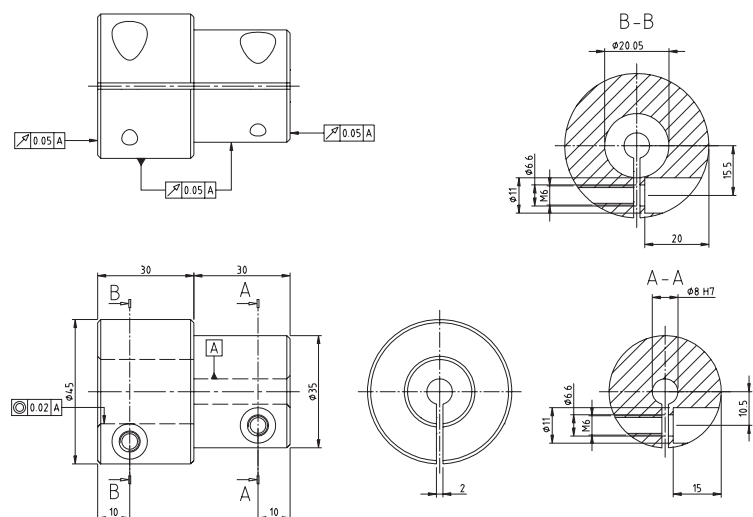
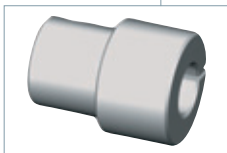
Connection of two Timing Belt Feed Axes

Transmission Shaft



Connection of two Timing Belt Feed Axes

Coupling for Transmission Shaft



Moments of Inertia

for Coupling and Transmission Shaft

Coupling

$$J_k = 4.258 \cdot 10^{-5} \text{ kgm}^2$$

Transmission shaft (per 100 mm)

$$J_{Trs} = 2.513 \cdot 10^{-6} \text{ kgm}^2/100 \text{ mm}$$

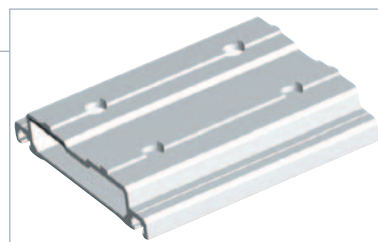
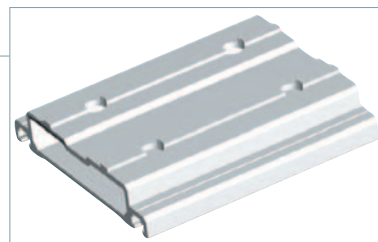
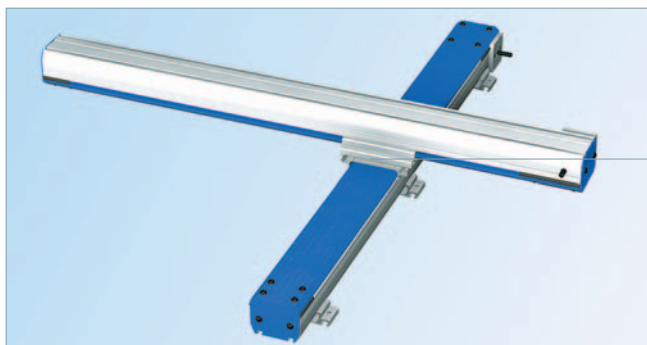
Timing Belt Feed Axis

LEZ 1 G

(BlueLine-Series 1)

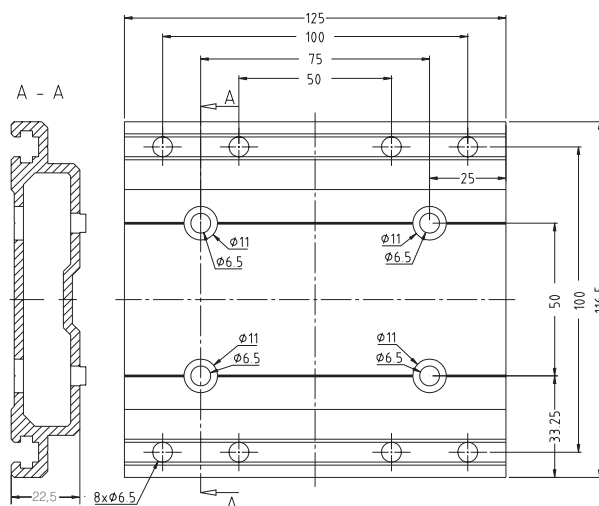
Compound Table Construction

Connecting Slides for Compound Tables



One of the timing belt feed axes has to be supplied with a connecting slide for compound tables in order to make the compound table construction possible.

The assembly takes place in the factory.



Timing Belt Feed Axis

LEZ 1 G (BlueLine-Series 1)

Order Key

Motor

- 0 = without motor
- 1 = with stepping motor MS 160
- 2 = with DC servo motor MV 120

Driving Side

- 0 = motor connection, right*
- 1 = motor connection, left*

* Motor flange for drive is mounted on the right resp. left side

232 1XX XXXX

Slide / Connection

- 0 = with standard slide profile
- 1 = with connecting slides for compound tables
- 2 = with angle slide, right
- 3 = with angle slide, left

Basic Profile Lengths (mm)

450, 550, 650, 750, 850, 950,
1,050, 1,150, 1,250, 1,350, 1,450,
1,550, 1,650, 1,750, 1,850, 1,950,
2,050
(e. g. 450 mm = 045
2,050 mm = 205)

Travel = L -307 mm

Order Samples



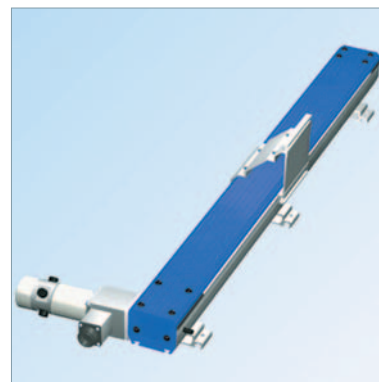
- without motor
- motor connection, left
- with standard slide profile
- basic profile length 750 mm

Item no.: 232101 0075



- with stepping motor MS 160
- motor connection, left
- with standard slide profile
- basic profile length 750 mm

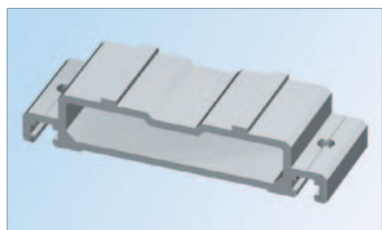
Item no.: 232111 0075



- with DC servo motor MV 120
- motor connection, left
- with angle slide, right
- basic profile length 750 mm

Item no.: 232121 2075

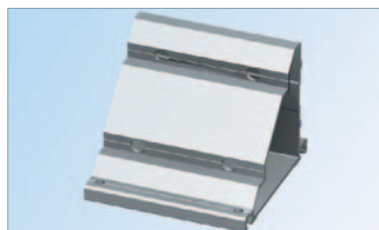
Accessory



Feet

- for BlueLine series 1
- 116.5 x 40 x 22.5 mm
- packing unit: 2 pieces

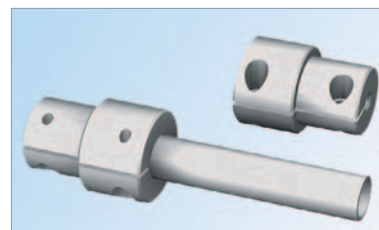
Item no.: 232199 0001



Angle slide as angle bracket

- for BlueLine series 1
- incl. fastening

Item no.: 232199 0002



Coupling for transmission shaft

- for BlueLine series 1
- packaging unit: 2 couplings

Item no.: 218050 0001

Transmission shaft Ø 20 mm

- for BlueLine-Series 1

Length 1 m, item no.: 219001 0120

Length 2 m, item no.: 219001 0220

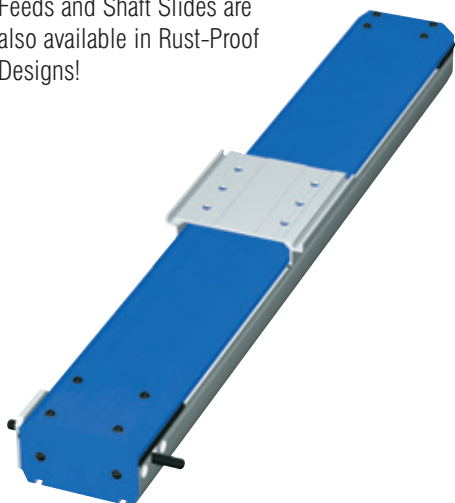
Timing Belt Feed Axis

Closed Timing Belt Feed Axis

LEZ 3 G

(BlueLine-Series 3)

Feeds and Shaft Slides are also available in Rust-Proof Designs!



Features

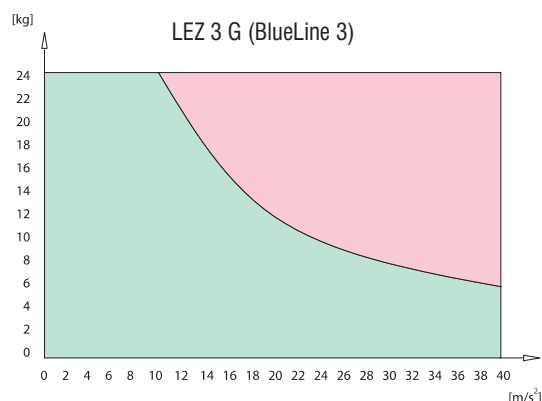
- Aluminium profile with midjet linear guide LFS-8-3
- Clearance-free feed with timing belt feed axis - timing belt with 5 mm pitch, width 25 mm
- Feed 5 m/s, at the most
- Shaft slide WS 3, L 176 x W 130 mm
- Repeatability less or equal ± 0.2 mm
- Limit and/or reference switch, accuracy < 0.1 mm
- Available in lengths up to 3 m
- Motor can be mounted on both sides due to an extended shaft end on the driving side
- Numerous combination possibilities due to additional special and angle profiles
- Integrated reference switch
- Option:
special lengths (100 1/mm raster) upon request, max. 3,000 mm

Technical Data

Belt version.....HTD 5M, width 25 mm
 Mass of slide.....1.753 kg
 Weight without drive module.....1,000 mm $\hat{=}$ 12 kg
 Nominal mass of timing belt.....0.09 kg/m
 Nominal weight of feed axis.....0.850 kg/100 mm
 Effective diameter of the synchronized pulleys.. $\varnothing$ 22.28 mm
 Moment of inertia of the synchronized pulleys.. $8.542 \cdot 10^{-5}$ kgm²
 Feed per revolution.....70 mm

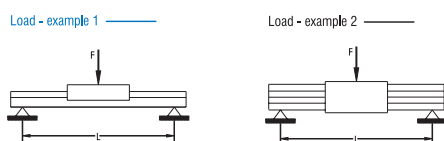
Load Diagram

Permissible accelerated masses related to belt strength*

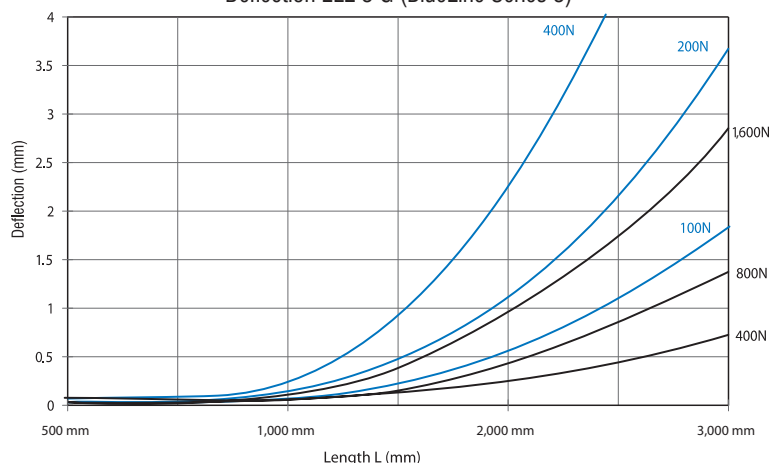


* At vertical assembly, the acceleration due to gravity ($g = 9.81 \text{ m/s}^2$) has to be taken into account

Deflection



Deflection LEZ 3 G (BlueLine Series 3)

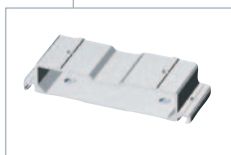
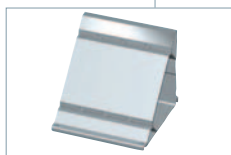
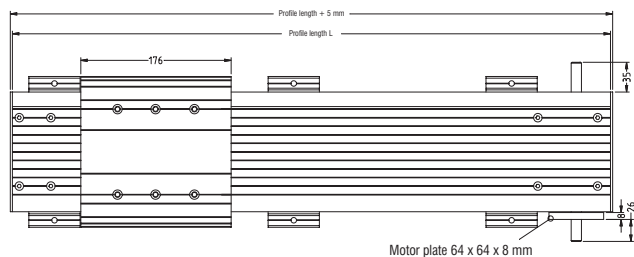
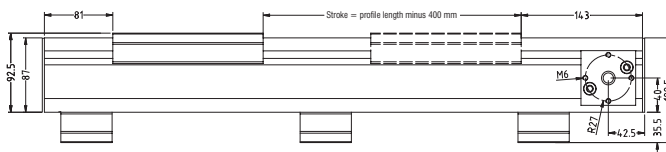
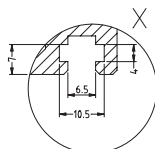
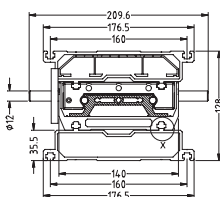


Idle Torques

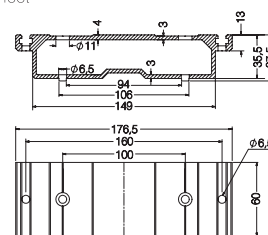
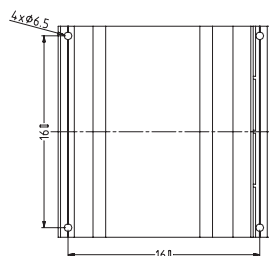
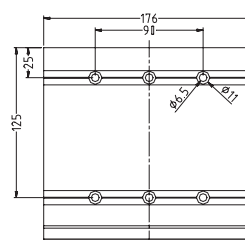
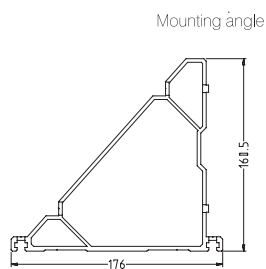
Revolution [1/min]	Idle torque [Nm]
500	0.06
1,500	0.09
3,000	0.13

LEZ 3 G

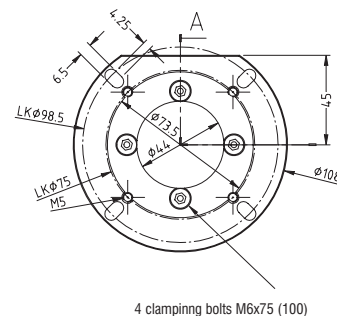
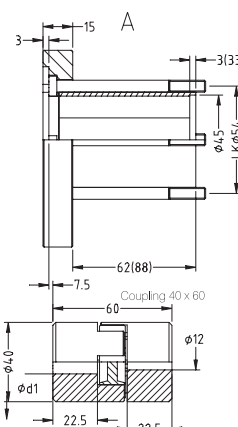
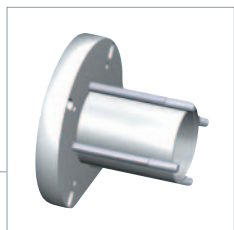
(BlueLine-Series 3)



Item no.: 232399 0001



A 3D CAD model of a parallel robot mechanism. It features two long, blue rectangular links connected at one end to a common base and at the other end to a central horizontal shaft. The shaft is supported by bearings and has a motor or actuator at one end. The links are also supported by bearings at their base connection points. The entire assembly is shown against a light blue background.



d1 = motor shaft diameter 9.52 mm or 11 mm

LEZ 3 G

(BlueLine-Series 3)

Drive Modules

Stepping Motor MS 430 HT

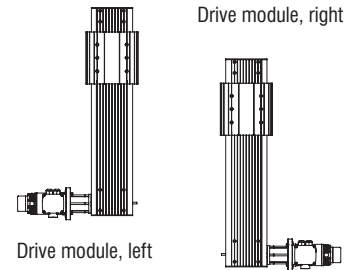
Holding torque – bipolar.....	600 Ncm
Stepping angle, full step.....	1.8 deg
half step.....	0.9 deg
Nominal voltage – bipolar.....	2.8 V
Resistance of winding.....	0.66 Ω
Inductance of winding.....	2.5 mH
Current of winding – bipolar....	5.9 A

DC Servo Motor MV 300

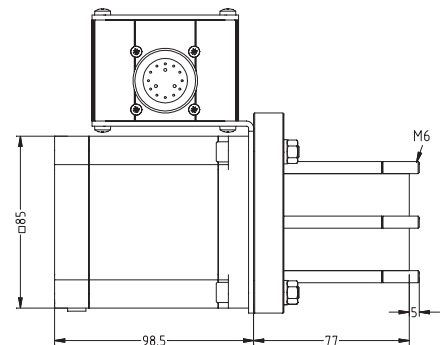
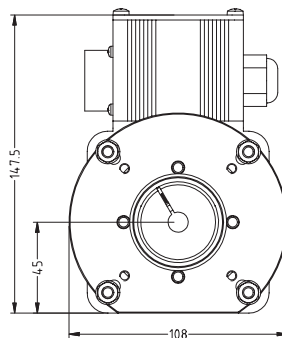
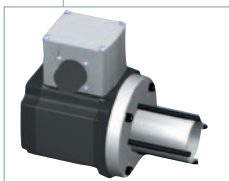
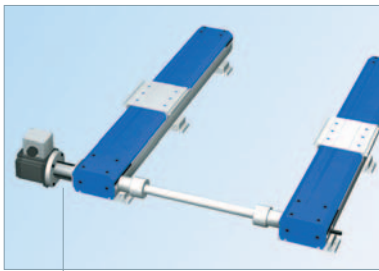
Nominal power.....	300 W
Nominal speed.....	2,500 rpm
Nominal torque.....	1,20 Nm
Nominal current.....	5.1 A
Nominal voltage.....	75 V
Peak torque.....	3,60 Nm
Current at peak torque.....	15,3 A
Ambient temperature.....	0 - 40 °C

AC Servo Motor MY 073

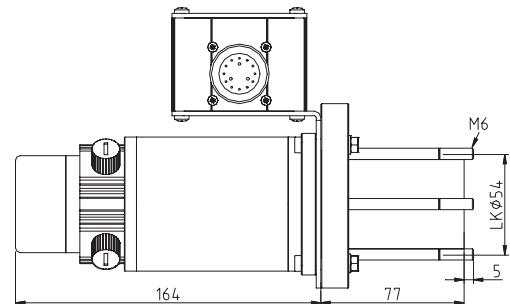
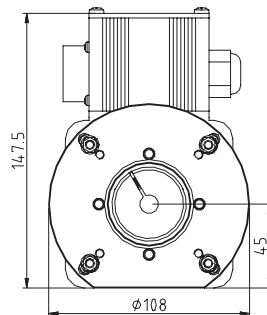
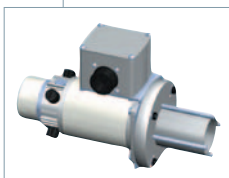
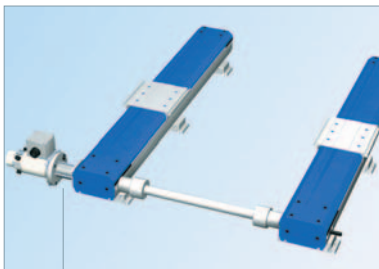
Nominal power.....	830 W
Nominal speed.....	4,000 rpm
Nominal permanent torque.....	200 Ncm
Nominal permanent current.....	4.7 A
Voltage constant.....	26.3 V/1000
Moment of inertia of rotor.....	0.57 kgcm ²



Drive Module with Stepping Motor MS 430 HT



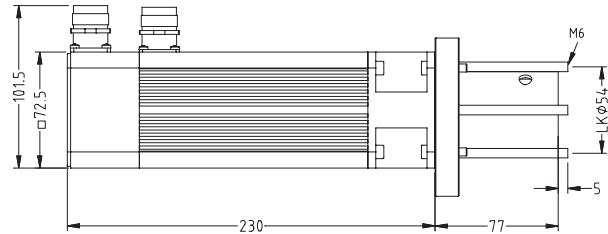
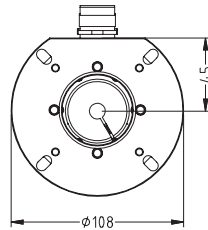
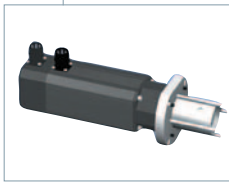
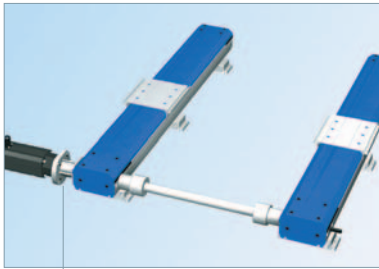
Drive Module with DC Servo Motor MV 300



Timing Belt Feed Axis

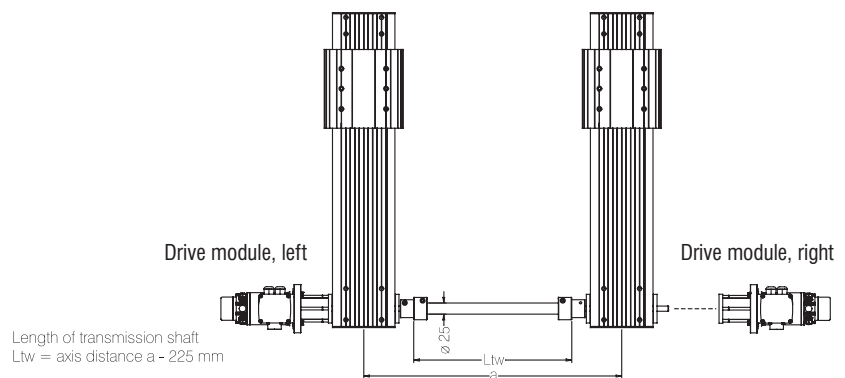
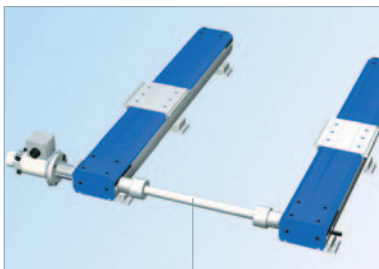
LEZ 3 G (BlueLine-Series 3)

Drive Module with AC Servo Motor MY 073



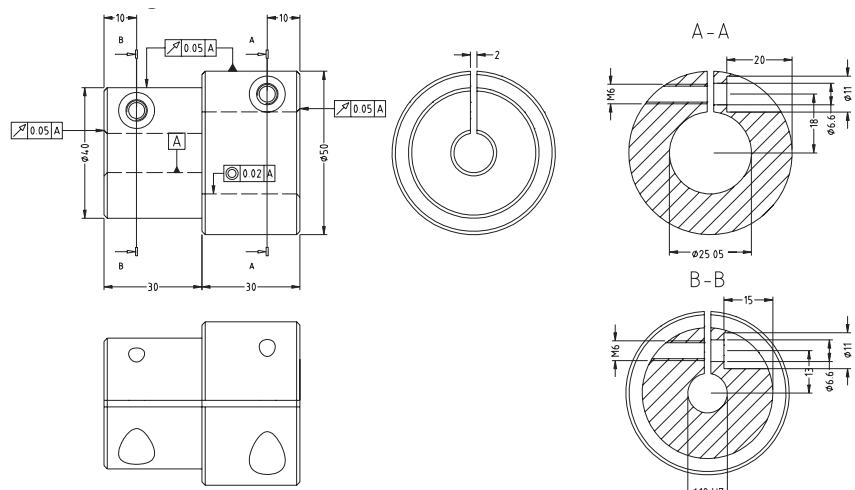
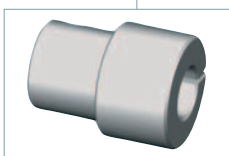
Connection of two Timing Belt Feed Axes

Transmission Shaft



Connection of two Timing Belt Feed Axes

Coupling for Transmission Shaft



Timing Belt Feed Axis

LEZ 3 G

(BlueLine-Series 3)

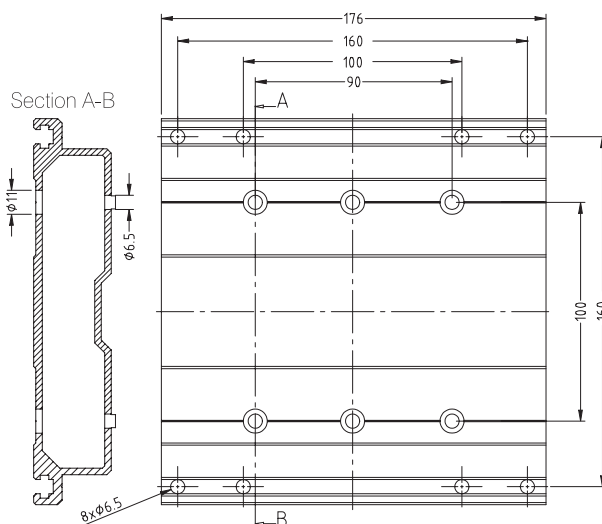
Compound Table Construction

Cross-Table Junction Slide



One of the timing belt feed axes has to be supplied with a connecting slide for compound tables in order to make the compound table construction possible.

The assembly takes place in the factory.



Moments of Inertia

for Coupling and Transmission Shaft

Coupling

$$J_k = 6.643 \cdot 10^{-5} \text{ kgm}^2$$

Transmission Shaft (per 100 mm)

$$J_{Trs} = 5.218 \cdot 10^{-6} \text{ kgm}^2/100 \text{ mm}$$

Timing Belt Feed Axis

LEZ 3 G (BlueLine-Series 3)

Order Key

232 30X XXXX

Driving Side

- 0 = motor connection, right
1 = motor connection, left

Travel = L -400 mm

Slide / Connection

- 0 = with standard slide profile
1 = with connecting slides for compound tables

Basic Profile Lengths (mm)

800	(Item no.:075)
1,100	(Item no.:105)
1,200	(Item no.:115)
1,600	(Item no.:155)
2,100	(Item no.:205)
2,600	(Item no.:255)
2,900	(Item no.:285)
3,000	(Item no.:295)

Drives*

Stepping motor	MS 430 HT
DC servo motor	MV 330
AC servo motor	MY 073

Drive on the right Side

Item no.
396085 0193
396104 0093
396573 0020

Drive on the left Side

Item no.
396085 0020
396104 0020
396573 0020

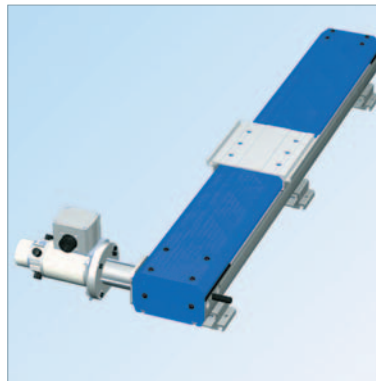
* Please, order the drive modules separately; use the above-stated item numbers for this purpose. Do not forget to specify whether the delivery should take place with or without extension. Regarding the AC servo motor MY 073, the driving side has to be stated separately.

Order Samples



- with stepping motor MS 430 HT
- motor connection, left
- with standard slide profile
- basic profile length 800 mm

Item no.: **232301 0075** (feed)
Item no.: **396085 0020** (drive)



- with DC servo motor MV 330
- motor connection, left
- with angle bracket, right
- basic profile length 800 mm

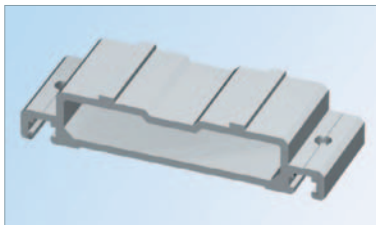
Item no.: **232301 0075** (feed)
Item no.: **396104 0020** (drive)



- with AC servo motor MY 073
- motor connection, left
- with standard slide profile
- basic profile length 800 mm

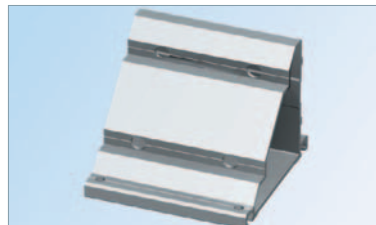
Item no.: **232301 0075** (feed)
Item no.: **396573 0020** (drive)

Accessory



Feet

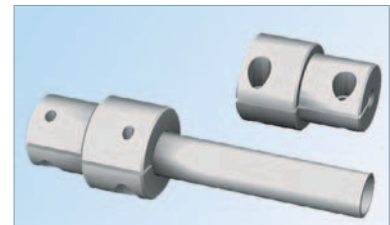
- for LEZ 3 G
 - 176.5 x 60 x 35.5 mm
 - packing unit: 2 pieces
- Item no.: **232399 0001**



Angl brackets

- incl. fastening
- for LEZ 3 G

Item no.: **232399 0002**



Coupling for transmission shaft

- for LEZ 3 G
- packing unit: 2 couplings

Item no.: **218050 0002**

Transmission shaft Ø 25 mm

- for LEZ 3 G

Length 1 m Item no.: **219001 0125**

Length 2 m Item no.: **219001 0225**

Timing Belt Feed Axis

(Open Timing Belt Feed Axis)

LEZ 1

(ZF 1)

Feeds and Shaft Slides are also available in Rust-Proof Designs!



- Option:
Special length in steps of 100 mm on request, max. 6000 mm
- Connection about integrated thread rails M6, in steps of 50 mm

Features

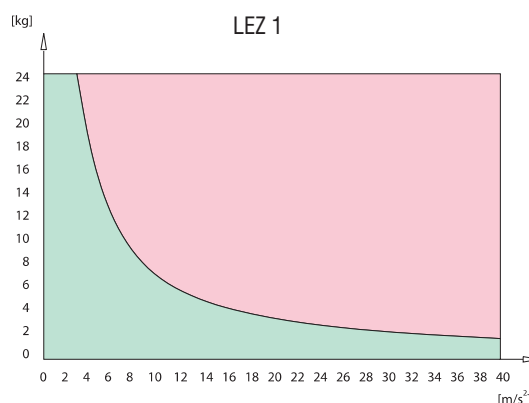
- Aluminium profile with midjet linear guide LFS-8-2
- Clearance-free feed with timing belt feed axis
- timing belt with 3 mm pitch, width 9 mm
- Feed per revolution: 60 mm
- Repeatability less or equal ± 0.2 mm
- Feed 1.5 m/s, at the most
- Limit and/or reference switch accuracy < 0.1 mm (with drive modules)

Technical Data

Belt version.....	HTD 3M, width 9 mm
Weight of slide.....	0.430 kg
Weight without drive module.....	1000 mm $\cong$ 3 kg
Nominal mass of timing belt.....	0.0225 kg/m
Weight of carriage.....	1.03 kg
Nominal weight of guide.....	0.200 kg/100 mm
Effective diameter of the synchronized pulleys..	$\varnothing 19.10$ mm
Moment of inertia of the synchronized pulleys..	$5.585 \cdot 10^{-7}$ kgm ²
Feed per revolution.....	60 mm

Load Diagram

Permissible accelerated masses related to belt strength*

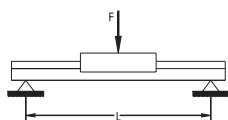


* At vertical assembly, the acceleration due to gravity ($g = 9.81$ m/s²) has to be taken into account

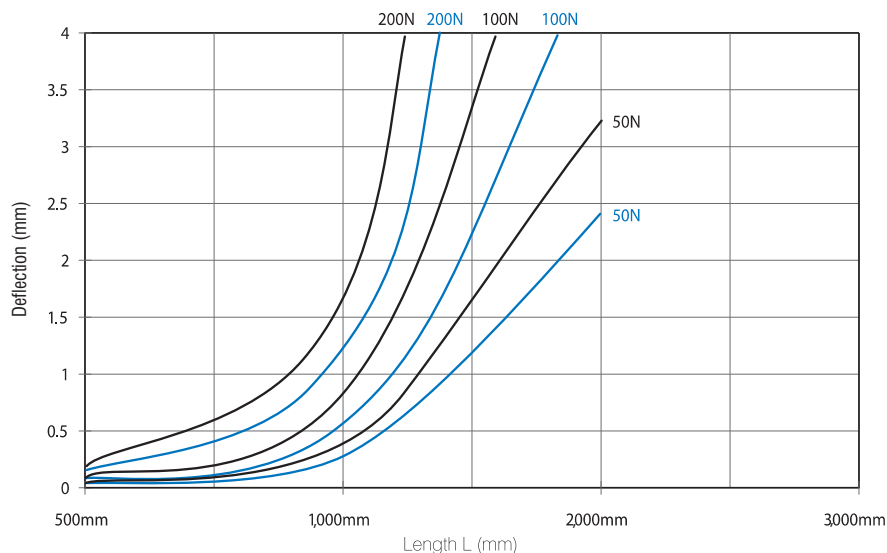
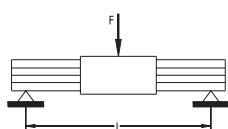
Deflection

Deflection Timing Belt Feed Axis LEZ 1

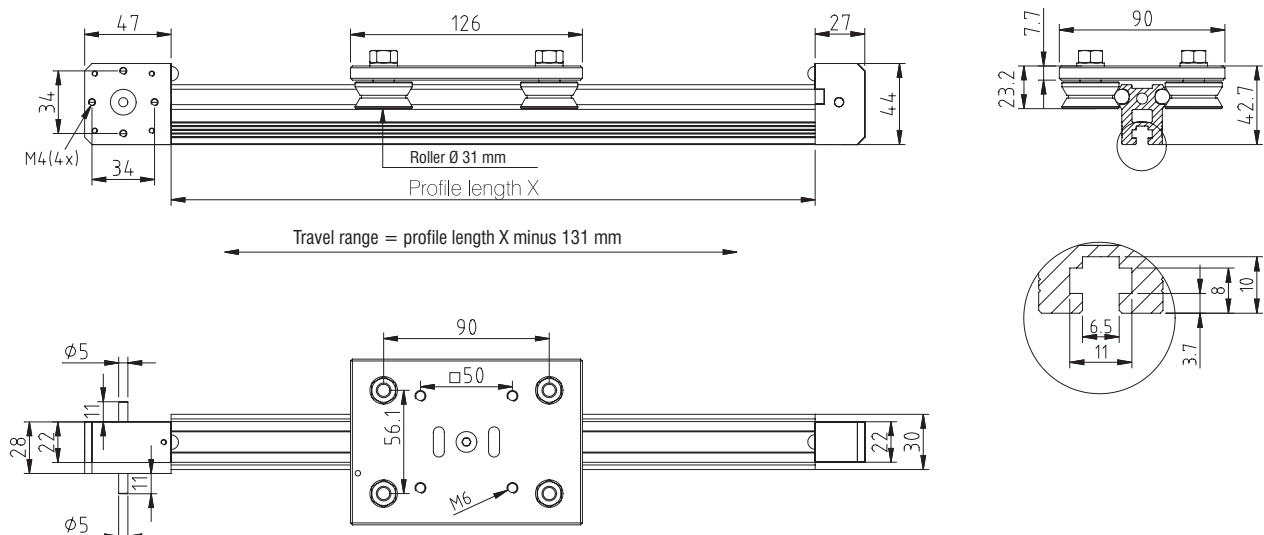
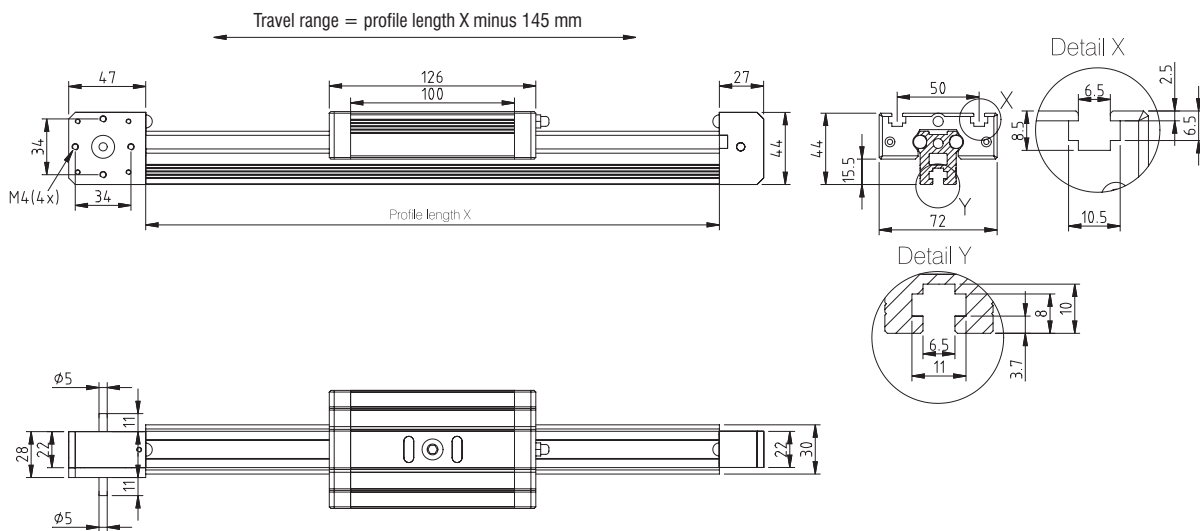
Load - example 1



Load - example 2



LEZ 1



Timing Belt Feed Axis

LEZ 1 (ZF 1)

Drive Modules

Stepping Motor MS 050 HT

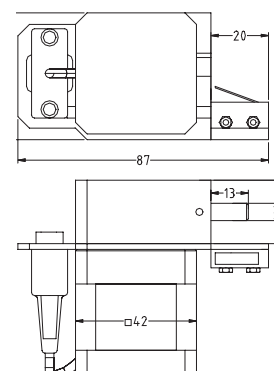
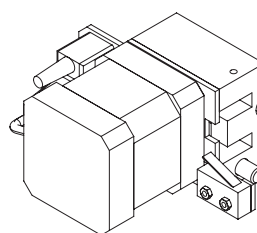
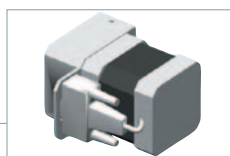
Holding torque - bipolar..... 50 Ncm
Stepping angle, full step..... 1.8 deg
Stepping angle, half step..... 0.9 deg
Nominal voltage – bipolar 3.2 V
Resistance of winding..... 1.1 Ω
Inductance of winding..... 1.85 mH
Current of winding - bipolar..... 1.8 A

Stepping Motor MS 160

Holding torque – bipolar..... 160 Ncm
Stepping angle, full step..... 1.8 deg
Stepping angle, half step..... 0.9 deg
Nominal voltage – bipolar..... 1.7 V
Resistance of winding..... 1.2 Ω
Inductance of winding..... 2.2 mH
Current of winding - bipolar..... 4.1 A

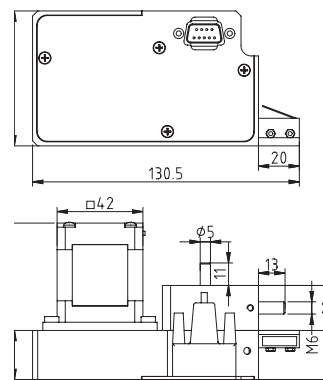
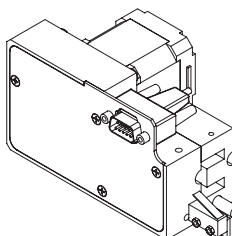
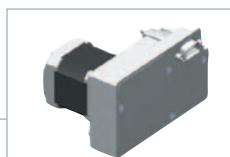
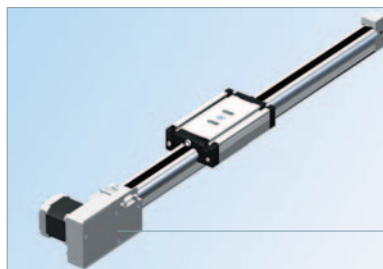
Drive Module with Stepping Motor MS 050 HT (Ratio 1:1)

Feed: 60 mm/Revolution



Drive Module with Stepping Motor MS 050 HT (Ratio 2:1)

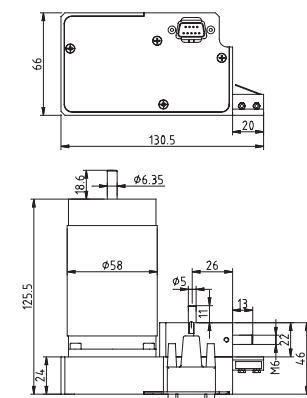
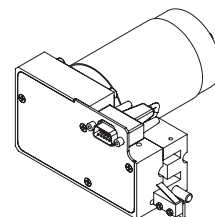
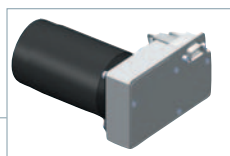
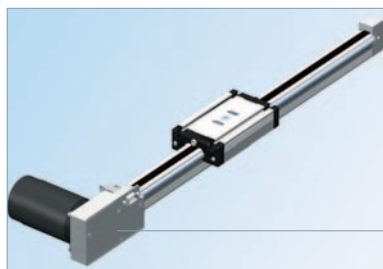
Feed: 30 mm/Revolution



Drive Module with Stepping Motor MS 160 (Ratio 2:1)

Feed: 30 mm/Revolution *

* Upon Request: Gear Ratio 1:1, 60 mm/Revolution



Timing Belt Feed Axis

LEZ 1

(ZF 1)

Order Key

232 005 XXXX

Drives, Slides, Carriages

0 = stepping motor MS 050 HT	(ratio 1:1)	with shaft slide
1 = stepping motor MS 050 HT	(ratio 1:1)	with carriage
2 = stepping motor MS 050 HT	(ratio 2:1)	with shaft slide
3 = stepping motor MS 050 HT	(ratio 2:1)	with carriage
4 = stepping motor MS 160	(ratio 2:1)	with shaft slide
5 = stepping motor MS 160	(ratio 2:1)	with carriage
6 = DC servo motor MV 120	(ratio 1:1)	with shaft slide
7 = stepping motor MS 135 HT	(ratio 2:1)	with shaft slide
8 = without motor		with shaft slide
9 = without motor		with carriage
Y = stepping motor MS 160, motor on the right side	(ratio 1:1)	with shaft slide
Z = stepping motor MS 160 motor on the left side	(ratio 1:1)	with shaft slide

Profile Lengths MLF 2 (mm)

298, 398, 498, 598, 675,
698, 798, 998, 1498, 1798,
1998, 2498, 2998

(e. g. 398 mm = 040

675 mm = 068)

Options: up to 6,000 mm

Order Samples



- with stepping motor MS 050 HT*
- ratio 1:1
- with shaft slide
- profile length 675 mm

Item no.: 232005 0068



- with stepping motor MS 050 HT*
- ratio 2:1
- with shaft slide
- profile length 675 mm

Item no.: 232005 2068

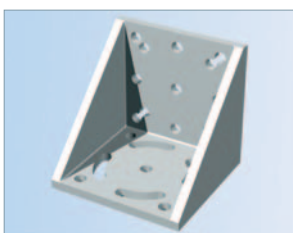


- with stepping motor MS 160*
- ratio 2:1
- with shaft slide
- profile length 675 mm

Item no.: 232005 4068

* Set-up of motor according to picture

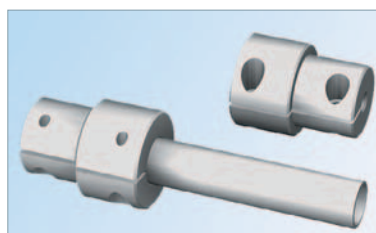
Accessory



Angle Brackets

- for LEZ 1

Item no.: 209110 0010



Coupling 20/30

- for LEZ 1
- 1 packaging unit = 1 coupling

Item no.: 218001 5080

Aluminum Bearing Carriage WS 1/70

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

Item no.: 223 100 0070

stainless: 223 101 0070

Limit switch set

- Option: second limit switch
- for LEZ 1

Item no.: 632 125 0002

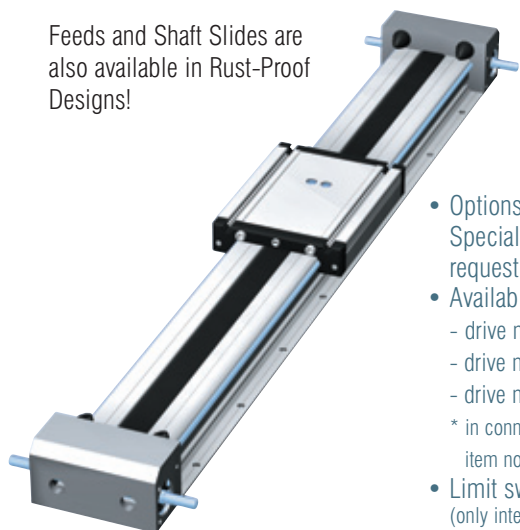
Timing Belt Feed Axis

(Open Timing Belt Feed Axis)

LEZ 2

(ZF 2)

Feeds and Shaft Slides are also available in Rust-Proof Designs!



- Options:
Special lengths (100 1/mm raster) upon request, max. 6,000 mm
- Available also as direct drive with
 - drive module with stepping motor MS 430 HT*
 - drive module with DC servo motor MV 300*
 - drive module with AC servo motor MY 073*
- * in connection with motor mounting plate, item no.: 232199 0004
- Limit switch with connecting cable (only integrated in connection with drive module)

Features

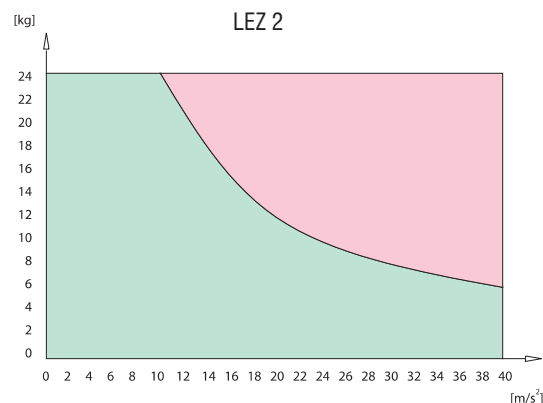
- Aluminium profile with midjet linear guide LFS-8-5
- Clearance-free feed with timing belt feed axis
 - timing belt with 5 mm pitch, width 25 mm
- Feed 5 m/s, at the most
- Shaft slide WS 3, L 176 x W 130 mm
- Feed per revolution: 70 mm
- Repeatability less or equal ± 0.2 mm
- Limit and/or reference switch, accuracy < 0.1 mm
- available in lengths up to 6,000 mm
- at direct drives, motor modules can be flange-mounted on the right or left side

Technical Data

Belt version.....	HTD 5M, width 25 mm
Weight of slide.....	0.430 kg
Weight without drive module.....	1,000 mm $\cong$ 7.9 kg
Nominal mass of timing belt.....	0.09 kg/m
Weight of slide.....	2.03 kg
Nominal weight of guide.....	0.472 kg/100 mm
Effective diameter of the synchronized pulleys..	$\varnothing$ 22.28 mm
Moment of inertia of the synchronized pulleys..	$5.58 \cdot 10^{-6}$ kgm ²
Feed per revolution.....	70 mm

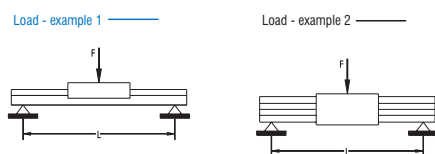
Load Diagramm

Permissible accelerated masses related to belt strength*

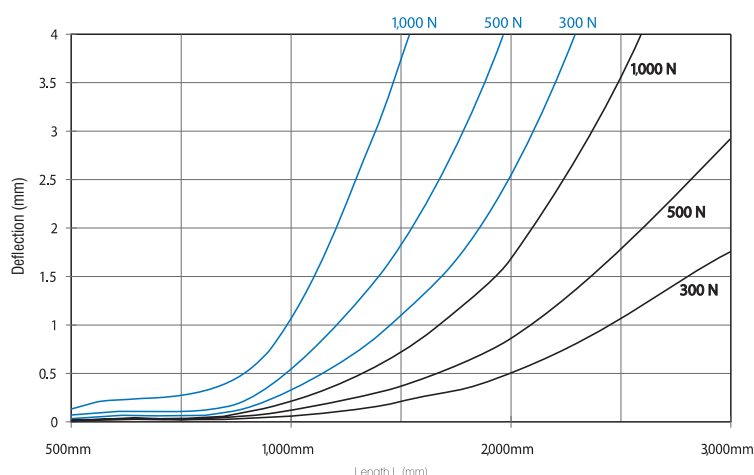


* At vertical assembly, the acceleration due to gravity ($g = 9.81 \text{ m/s}^2$) has to be taken into account

Deflection



Deflection Timing Belt Feed Axis LEZ 2



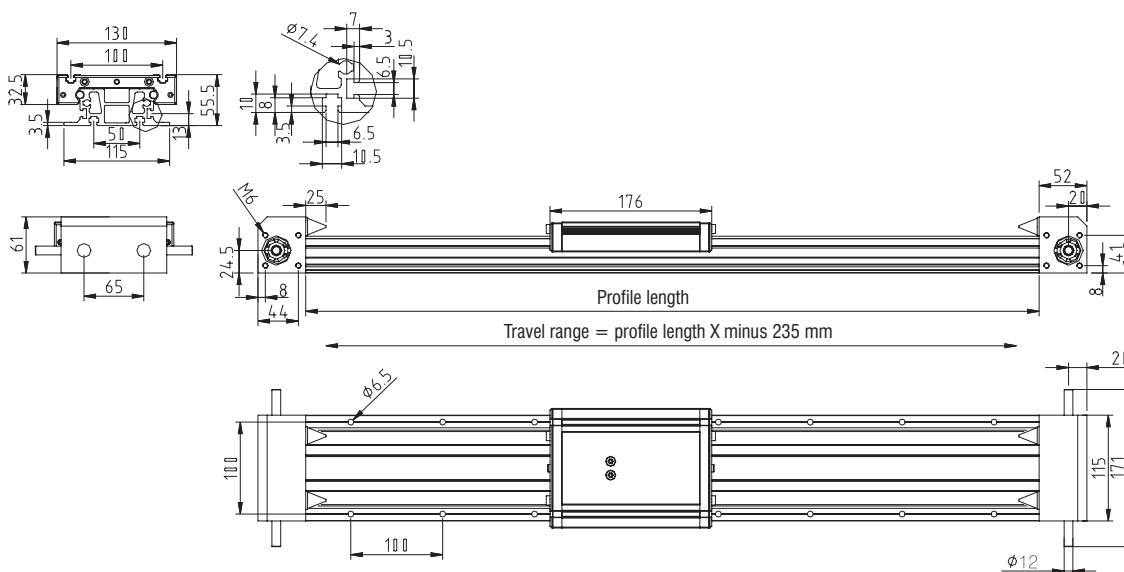
Idle Torques

Speed [1/min]	Idle torque [Nm]
500	0.16
1,500	0.24
3,000	0.36

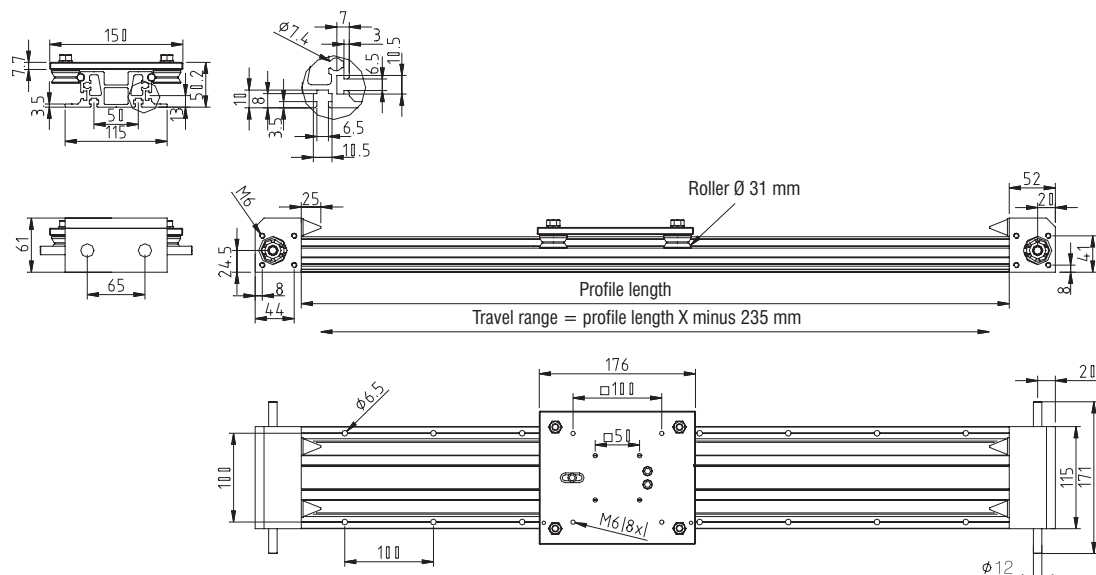
LEZ 2

(ZF 2)

without Motor
with Shaft Slide

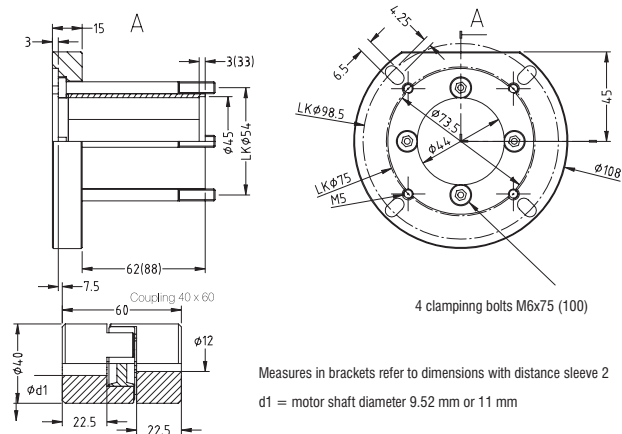
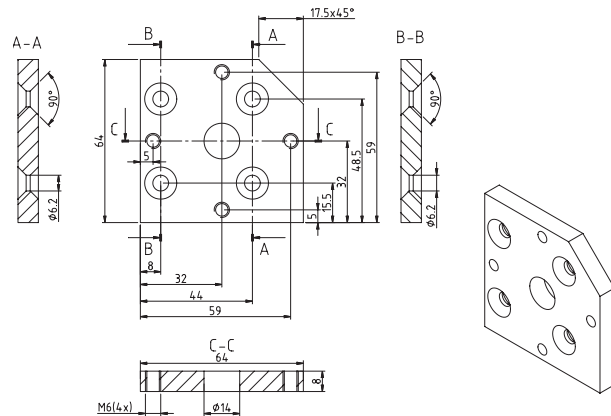
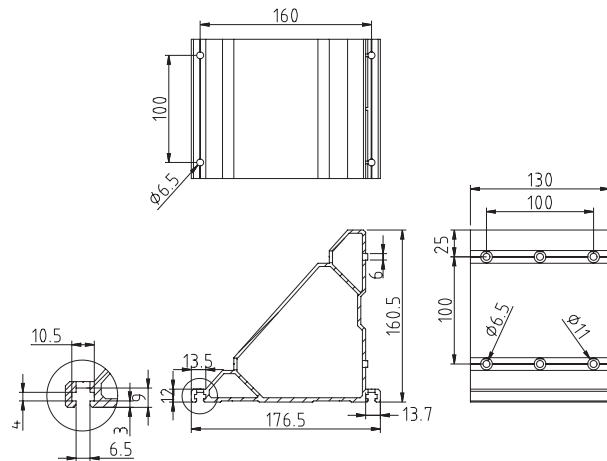
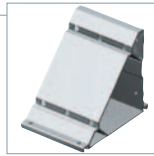


without Motor
with Carriage



LEZ 2

(ZF 2)



Measures in brackets refer to dimensions with distance sleeve 2
d1 = motor shaft diameter 9.52 mm or 11 mm

Nominal power.....	500 W
Nominal speed.....	6,000 rpm
Nominal permanent torque.....	100 Ncm
Nominal permanent current.....	3.2 A
Voltage constant.....	20.0 V/1,000
Moment of inertia of rotor.....	0.45 kgcm ²

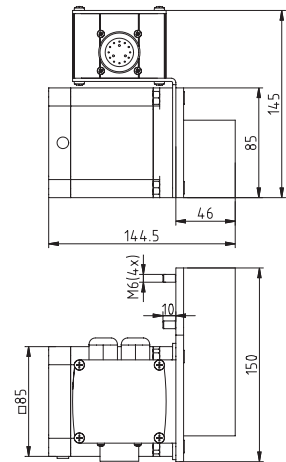
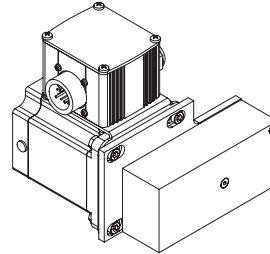
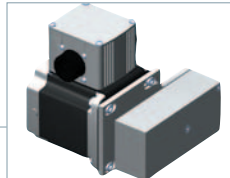
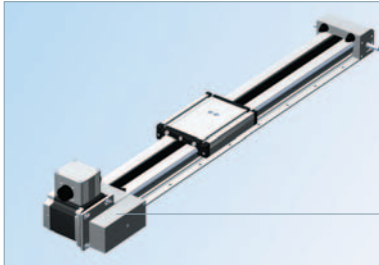
Timing Belt Feed Axis

LEZ 2 (ZF 2)

Drive Module with Stepping Motor MS 430 HT

(Reduction 2:1)

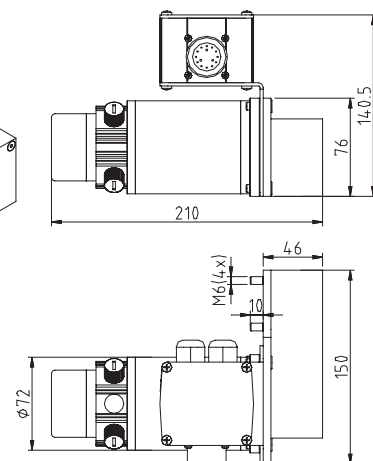
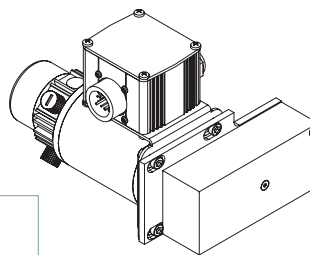
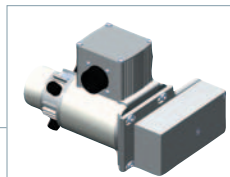
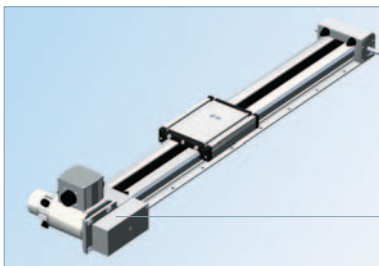
Feed: 35 mm/Revolution



Drive Module with DC Servo Motor MV 300

(Reduction 2:1)

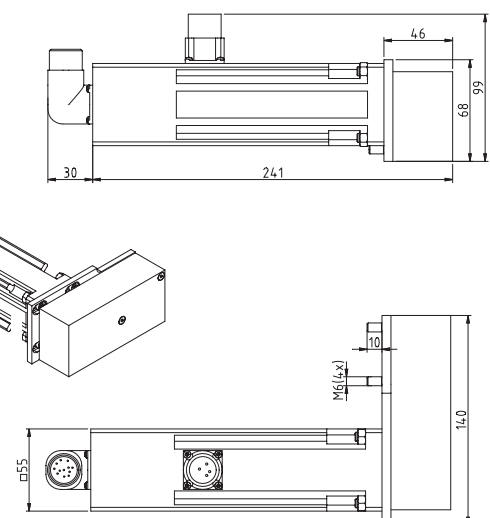
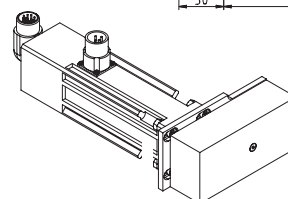
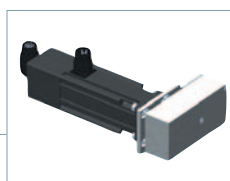
Feed: 35 mm/Revolution



Drive Module with AC Servo Motor MY 054

(Reduction 2:1)

Feed: 35 mm/Revolution



Timing Belt Feed Axis

LEZ 2

(ZF 2)

Order Key

232 002 XXXX

Drives/slides, carriage

0 = Stepping motor MS 430 HT	(ratio 2:1)	with shaft slide
1 = Stepping motor MS 430 HT	(ratio 2:1)	with carriage
2 = DC servo motor MV 330	(ratio 2:1)	with shaft slide
3 = DC servo motor MV 330	(ratio 2:1)	with carriage
4 = DC servo motor MY 054	(ratio 2:1)	with shaft slide
5 = AC servo motor MY 054	(ratio 2:1)	with carriage
8 = Without motor		with shaft slide
9 = Without motor		with carriage

Profile Lengths (mm)

698, 998, 1,498, 1,998,
2,498, 2,998
(e. g. 698 mm = 070
1,498 mm = 150)

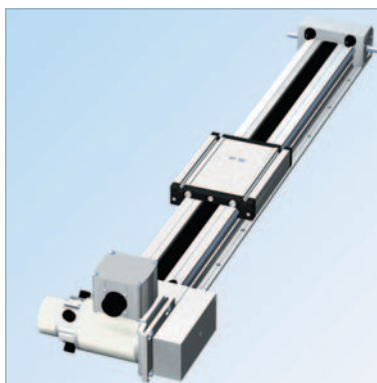
Option: up to 6,000 mm

Order Samples



- With stepping motor MS 430 HT
- Ratio 2:1
- With shaft slide
- Profile length 698 mm

Item no.: **232002 0070**



- With DC servo motor MV 330
- Ratio 2:1
- With shaft slide
- Profile length 698 mm

Item no.: **232002 2070**



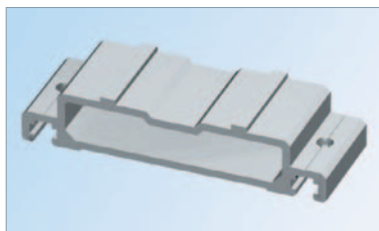
- with AC servo motor MY 054
- Ratio 2:1
- With shaft slide
- Profile length 698 mm

Item no.: **232000 4070**

Timing Belt Feed Axis

LEZ 2 (ZF 2)

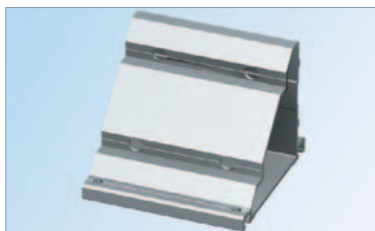
Accessory



Motor Mounting Plate

- for ZF 2
- incl. fastening
- for direct drive, see drive modules

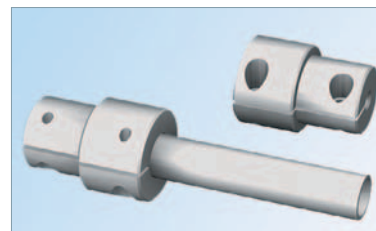
Item no.: **232199 0004**



Angle Brackets

- for ZF 2
- incl. fastening

Item no.: **232199 0005**



Coupling for Transmission Shaft

- for ZF 2
- packaging unit = 2 couplings

Item no.: **218050 0002**

Transmission Shaft Ø 25 mm

- for ZF 2

Length 1 m, item no.: **219001 0125**

Length 2 m, item no.: **219001 0225**

Timing Belt Feed Axis

(Open Timing Belt Feed Axis)

LEZ 3

(ZF 3)

Feeds and Shaft Slides are also available in Rust-Proof Designs!



- Option:
 - special lengths (100 1/mm raster) upon request, max. 6,000 mm
 - limit switch with connecting cable (only integrated in connection with drive module)

Features

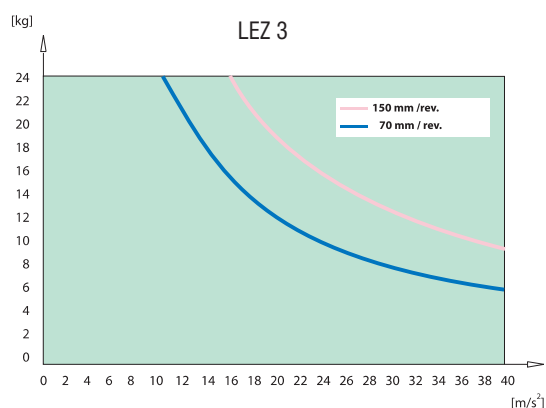
- Aluminium profile with midjet linear guide LFS-8-4
- Clearance-free feed with timing belt feed axis
 - timing belt with 5 mm pitch, width 25 mm
- Feed 5 m/s, at the most
- Shaft slide WS 3, L 176 x W 130 mm
- Feed per revolution: 70 mm or 150 mm
- Repeatability lower or equal ± 0.2 mm
- Limit and/or reference switch, accuracy < 0.1 mm
- Available in lengths up to 6,000 mm
- Motor modules can be flange-mounted on the right or left side

Technical Data

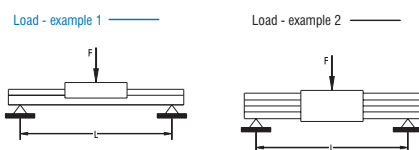
Belt version.....	HTD 5M, width 25 mm
Weight of slide.....	0.940 kg
Weight without drive module.....	1,000 mm $\cong$ 10.5 kg
Nominal mass of timing belt.....	0.09 kg/m
Weight of slide.....	2.03 kg
Nominal weight of guide.....	0.472 kg/100 mm
Feed per revolution.....	70 mm
Effective diameter of the synchronized pulleys	
Feed 70 mm/revolution.....	22.28 mm
Feed 150 mm/revolution.....	47.75 mm
Moment of inertia of the synchronized pulleys	
Feed 70 mm/revolution.....	$5.58 \times 10^{-6} \text{ kgm}^2$
Feed 150 mm/revolution.....	$1.796 \times 10^{-4} \text{ kgm}^2$

Load Diagram

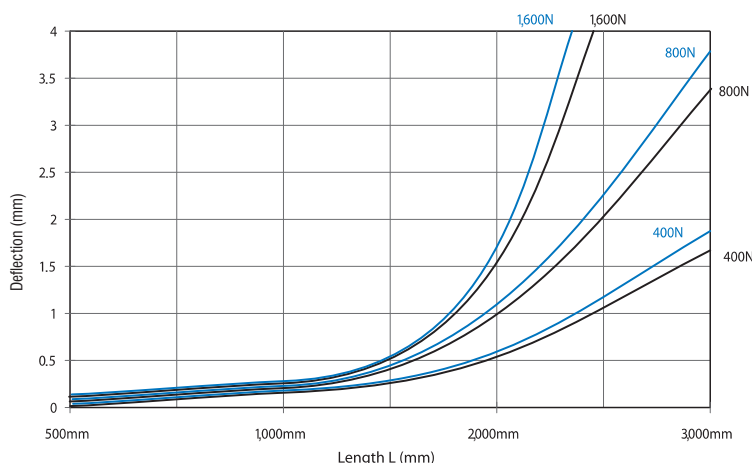
Permissible accelerated masses related to belt strength*



Deflection



Deflection Timing Belt Feed Axis LEZ 3



Idle Torques

70 mm/revolution

Revolution [1/min]	Idle torque [Nm]
500	0.16
1,500	0.24
3,000	0.36

150 mm / Revolution

Revolution [1/min]	No-load torque [Nm]
500	0.60
1,500	0.70
3,000	0.80

Timing Belt Feed Axis

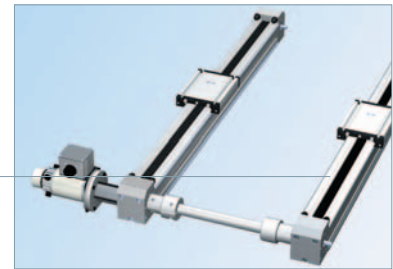
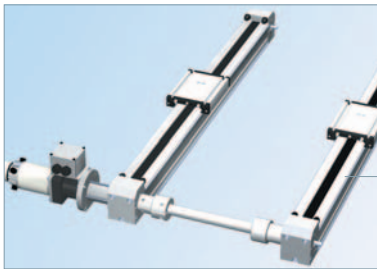
(Open Timing Belt Feed Axis)

LEZ 3

(ZF 3)

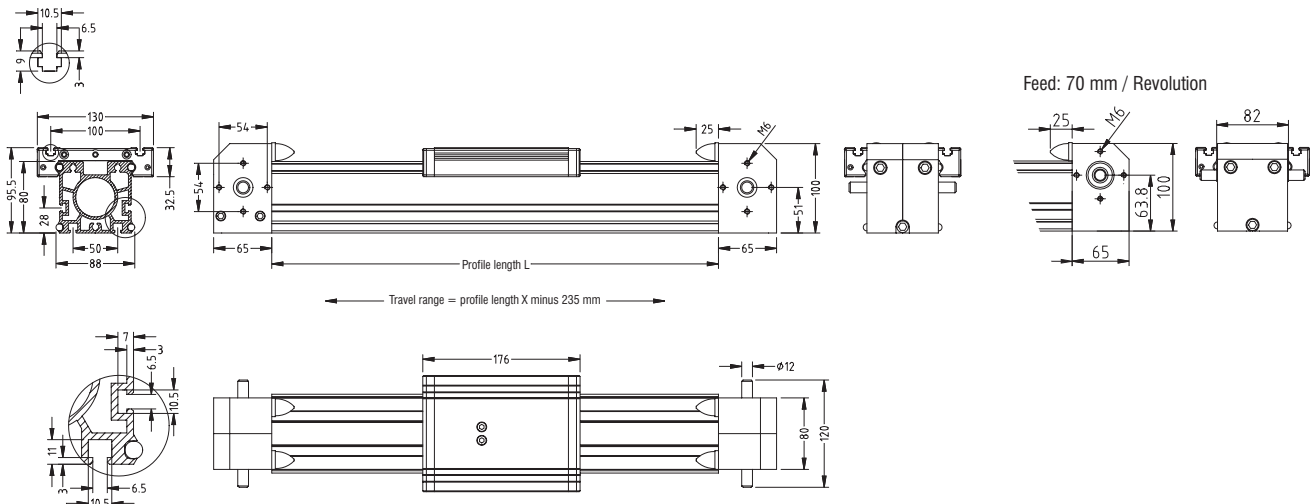
mechanics

Timing Belt Feed Axis with Shaft Slide

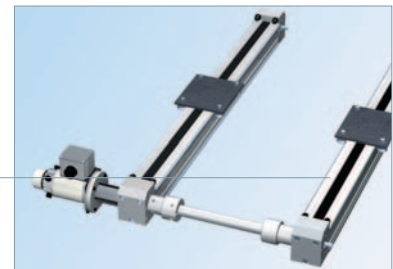
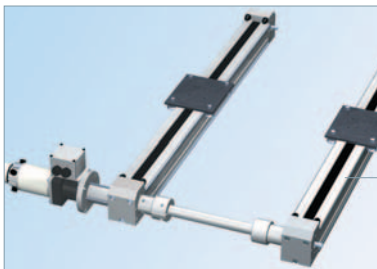


Feed: 150 mm / Revolution
70 mm / Revolution

Feed: 70 mm / Revolution

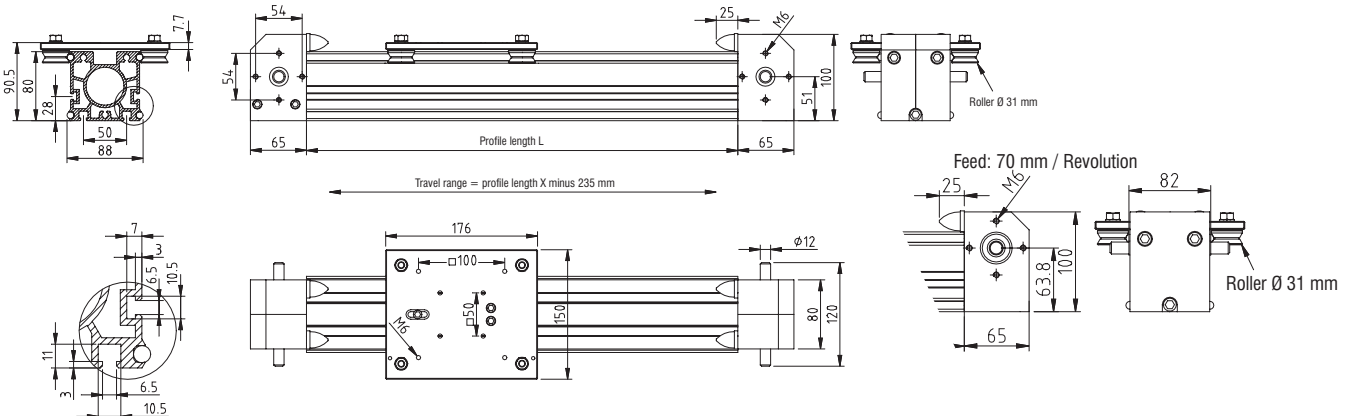


Timing Belt Feed Axis with Carriage



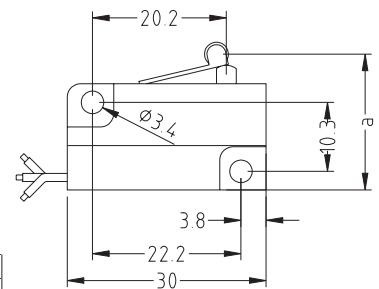
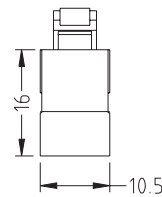
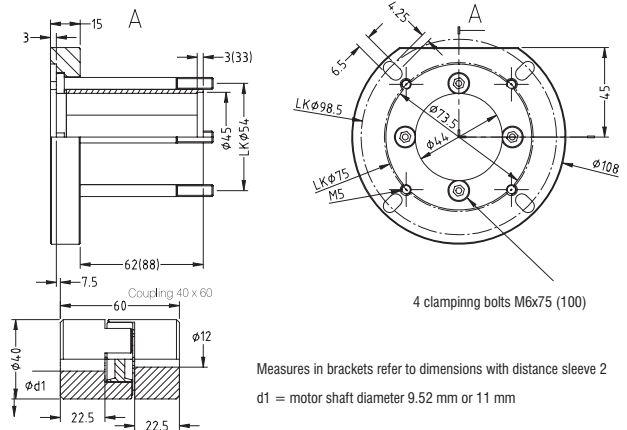
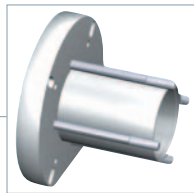
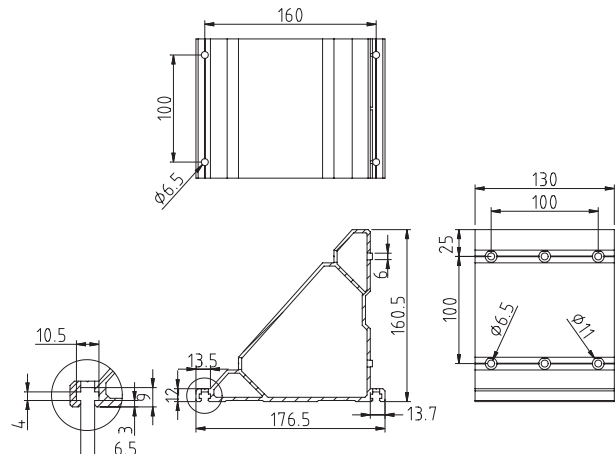
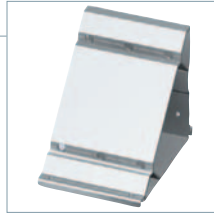
Feed: 150 mm / Revolution
70 mm / Revolution

Feed: 70 mm / Revolution

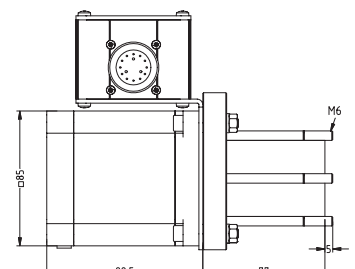
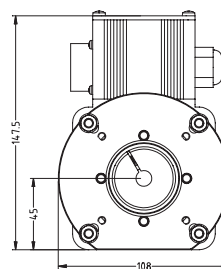
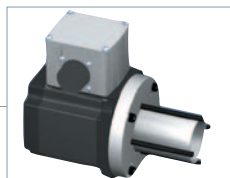


LEZ 3

(ZF 3)



A 3D CAD model of a parallel robot mechanism. It features two vertical linear actuators (cylinders) connected to a horizontal beam. The beam is supported by two vertical links, each with a sliding block on the actuator's guide rail. The entire assembly is shown in a perspective view against a light blue background.

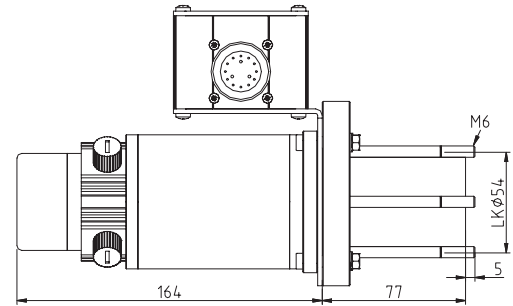
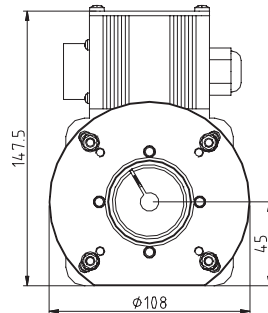
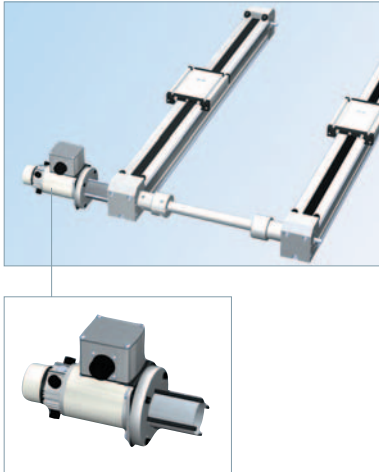


Timing Belt Feed Axis

LEZ 3 (ZF 3)

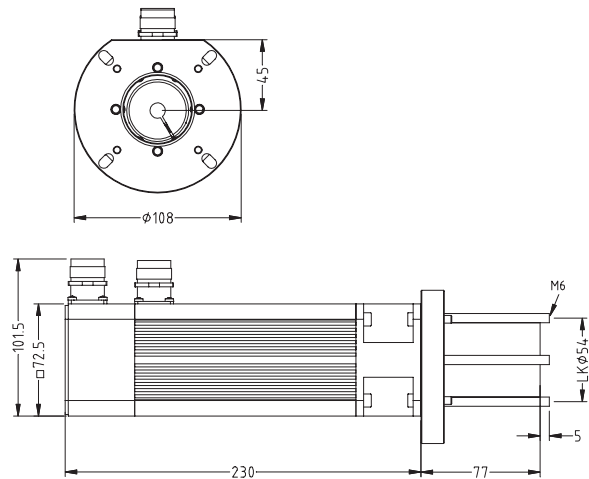
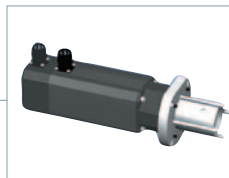
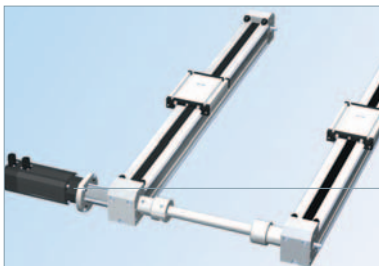
Drive Module with DC Servo Motor MV 300

Feed: 70 mm/Revolution



Drive Module with AC Servo Motor MY 073

Feed: 70 mm/Revolution



Drive Modules

Stepping Motor MS 430 HT

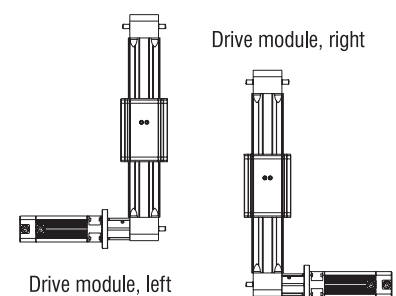
Holding torque – bipolar..... 600 Ncm
Stepping angle, full step..... 1.8 degree
Stepping angle, half-step..... 0.9 degree
Nominal voltage – bipolar..... 2.8 V
Resistance of winding..... 0.66 Ω
Winding inductivity..... 2.5 mH
Current of winding – bipolar..... 5.9 A

DC Servo Motor MV 300

Nominal power..... 300 W
Nominal speed..... 2,500 rpm
Nominal torque..... 1,20 Nm
Nominal Current..... 5.1 A
Nominal voltage..... 75 V
Peak torque..... 3,60 Nm
Current at peak torque..... 15,3 A
Ambient temperature..... 0 - 40 °C

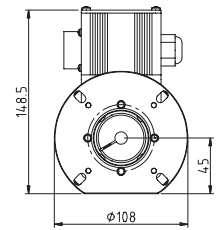
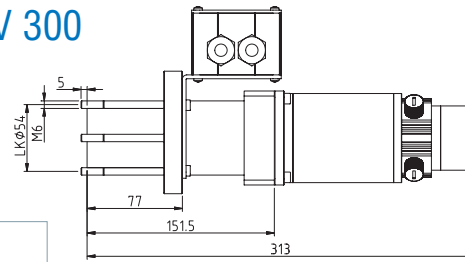
AC Servo Motor MY 073

Nominal power..... 830 W
Nominal speed..... 4,000 rpm
Nominal permanent torque..... 200 Ncm
Nominal permanent current..... 4.7 A
Voltage constant..... 26.3 V/1,000
Moment of inertia of rotor..... 0.57 kgcm²

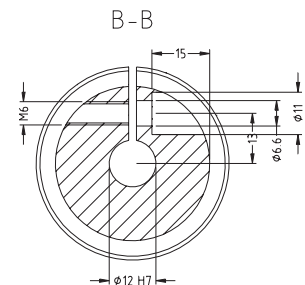
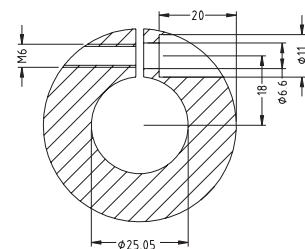
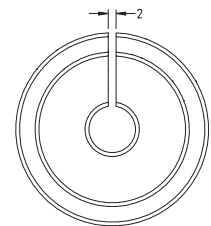
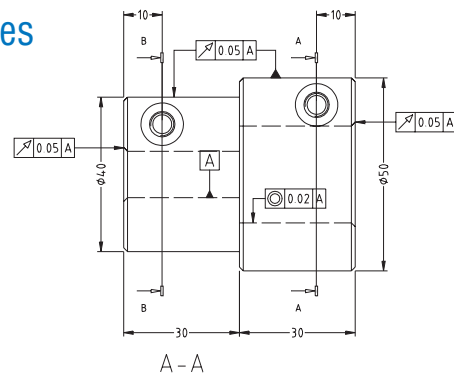


LEZ 3

(ZF 3)



A 3D model of a shaft-hub assembly. The shaft is a single cylinder with a keyway. The hub is a larger cylinder with a central bore and a keyway. A single key is shown inserted into the keyway of the shaft, which is seated within the hub's bore.



Timing Belt Feed Axis

LEZ 3

(ZF 3)

Order Key

23200 X X XXX

Feed

6 = 150 mm/revolution

7 = 70 mm/revolution

Slide, Carriages

0 = with shaft slide

1 = with carriage

Profile Lengths (mm)

698; 998; 1,498; 1,998; 2,498; 2,998

(e. g. 698 mm = 070

1,498 mm = 150)

Drives *

Stepping motor	MS 430 HT
DC servo motor	MV 300
DC servo motor	MV 300 (ratio 3:1)
AC servo motor	MY 073

Drive on the right side

Item no.

396085 0193

396104 0093

396134 0093

396573 0020

Drive on the left side

Item no.

396085 0020

396104 0020

396134 0020

396573 0020

* Please, order the drive modules separately; use the above-stated item numbers for this purpose. Do not forget to specify whether the delivery should take place with or without extension. Regarding the AC servo motor MY 073, the driving side has to be stated separately.

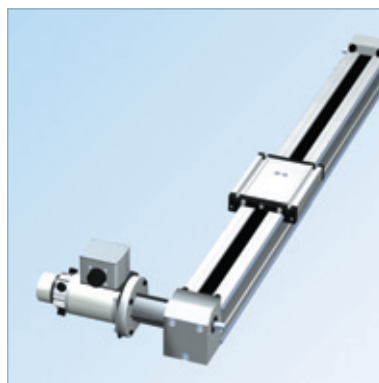
Order Samples



- with stepping motor MS 430 HT
- feed 70 mm/revolution
- motor connection, left
- with shaft slide
- basic profile length 698 mm

Item no.: **232007 0070** (feed)

item no.: **396085 0093** (drive)



- with DC servo motor MV 300
- feed 70 mm/revolution
- motor connection, left
- with shaft slide
- basic profile length 698 mm

Item no.: **232007 0070** (feed)

item no.: **396104 0020** (drive)

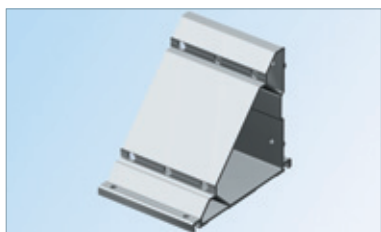


- with AC servo motor MY 073
- feed 70 mm/revolution
- motor connection, left
- with shaft slide
- basic profile length 698 mm

Item no.: **232007 0070** (feed)

item no.: **396573 0020** (drive)

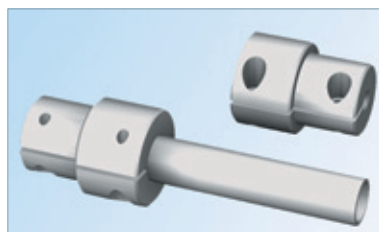
Accessory



Angle Brackets

- for LEZ 3
- incl. fastening

Item no.: **232199 0005**



Coupling for Transmission shaft

- for LEZ 3
- packaging unit: 2 couplings

Item no.: **218050 0002**

Transmission shaft Ø 25 mm

- for LEZ 3

Length 1 m, item no.: **219001 0125**

Length 2 m, item no.: **219001 0225**

Limit Switch set

Motor side

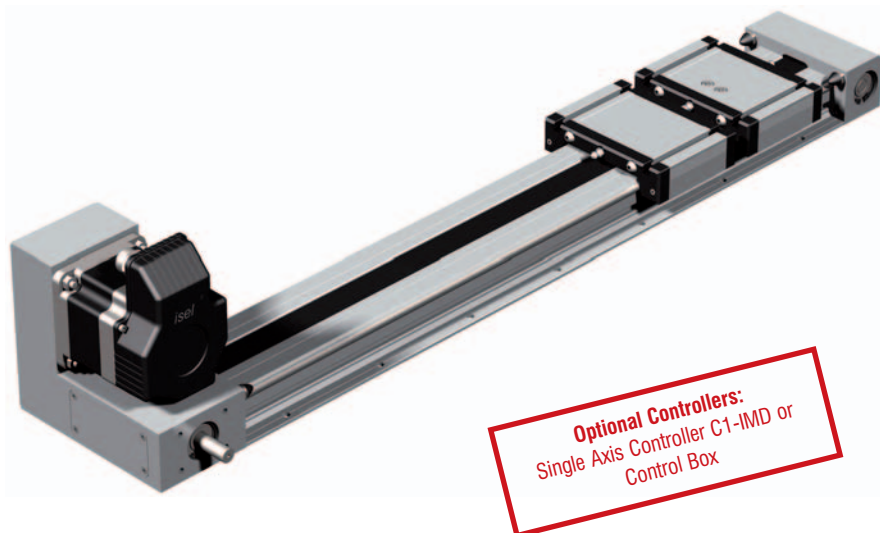
Item no. **397201 0000**

to turn round side

Item no. **397201 XXXX**

Timing Belt Feed Axis

LEZ 6 (LUT 2)



Features

- Aluminium profile with midjet linear guide LFS-8-5
 - Clearance-free feed with timing belt feed axis
 - timing belt with 5 mm toothing, width 25 mm
 - Feed max. 2 m/s
 - Bearing carriage WS 3 L 96 x W 130 mm
 - Feed per revolution: 70 mm
 - Repeatability less or equal ± 0.2 mm
 - Limit and/or reference switch, accuracy < 0.1 mm
 - Stepping motor
- Options:
- Special lengths in steps of 100 mm upon request, max. 6,000 mm
 - Drive modules attachable on both sides
 - Overtravel limit switch with connection cable (only in combination with drive module)
 - Servo motor

Technical Data

Belt version	HTD 5M, width 25 mm
Weight of slide	0.500 kg
Weight without drive module	1,000 mm $\cong$ 7.9 kg
Nominal mass of timing belt	0.09 kg/m

Nominal weight of guide	0.472 kg/100 mm
Effective diameter of the synchronized pulleys	$\varnothing 22.28$ mm
Moment of inertia of the synchronized pulleys	$5.58 \cdot 10^{-6}$ kgm ²
Feed per revolution	70 mm

Order Data (without drive motor)

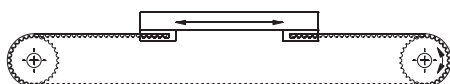
Item no.: 232 011 0050	L = 496 mm
Item no.: 232 011 0100	L = 996 mm
Item no.: 232 011 0150	L = 1496 mm
Item no.: 232 011 0200	L = 1996 mm
Item no.: 232 011 0250	L = 2496 mm
Item no.: 232 011 0300	L = 2996 mm

Idle Torques

Speed [1/min]	Idle torque [Nm]
500	0.16
1,500	0.25
3,000	0.36

Functional principle

Standard - Two pulley drive

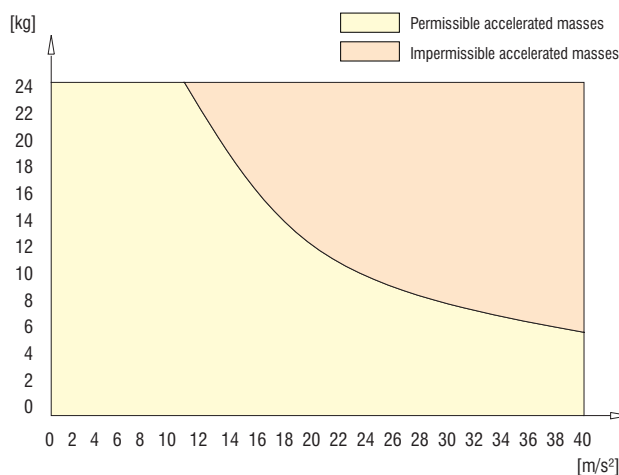


Deflection

Force sketch see Page 37

Load Diagramm

Permissible accelerated masses related to belt strength*



* At vertical assembly, the acceleration due to gravity ($g = 9.81$ m/s²) has to be taken into account

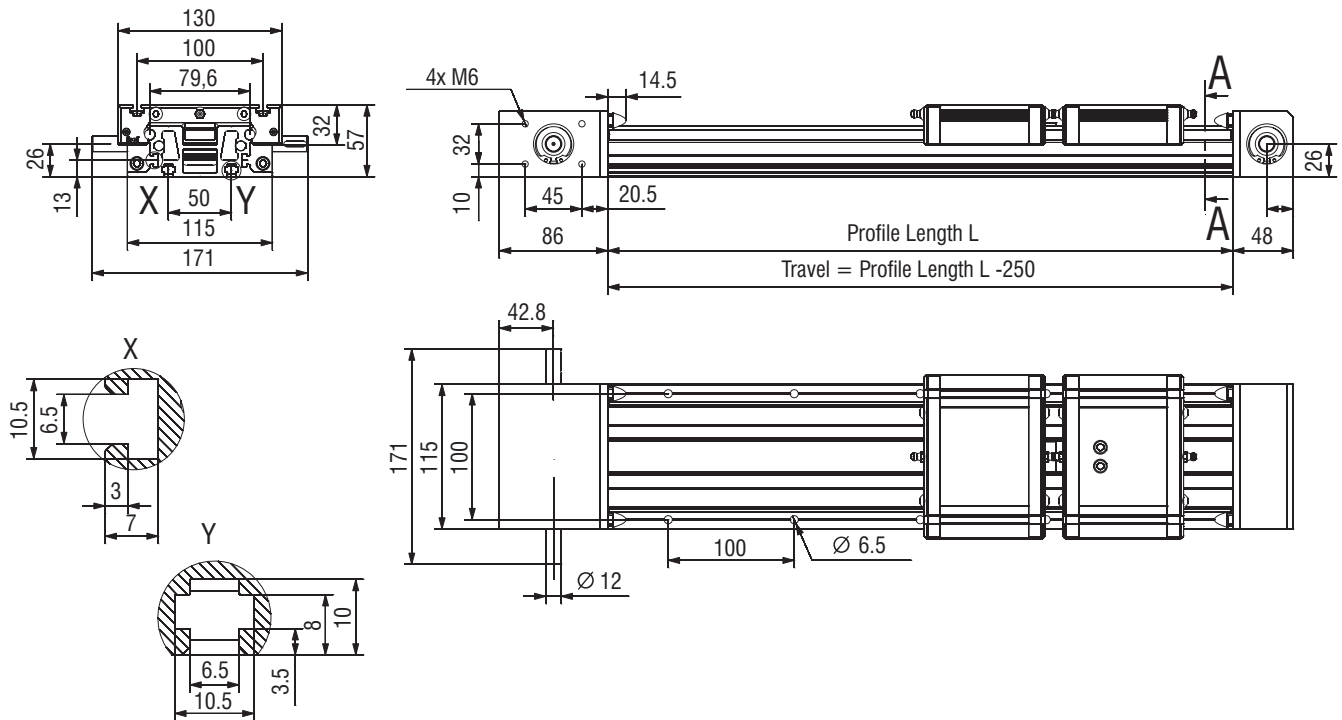
Timing Belt Feed Axis

LEZ 6 (LUT 2)

Timing Belt Feed Axis

Without Motor

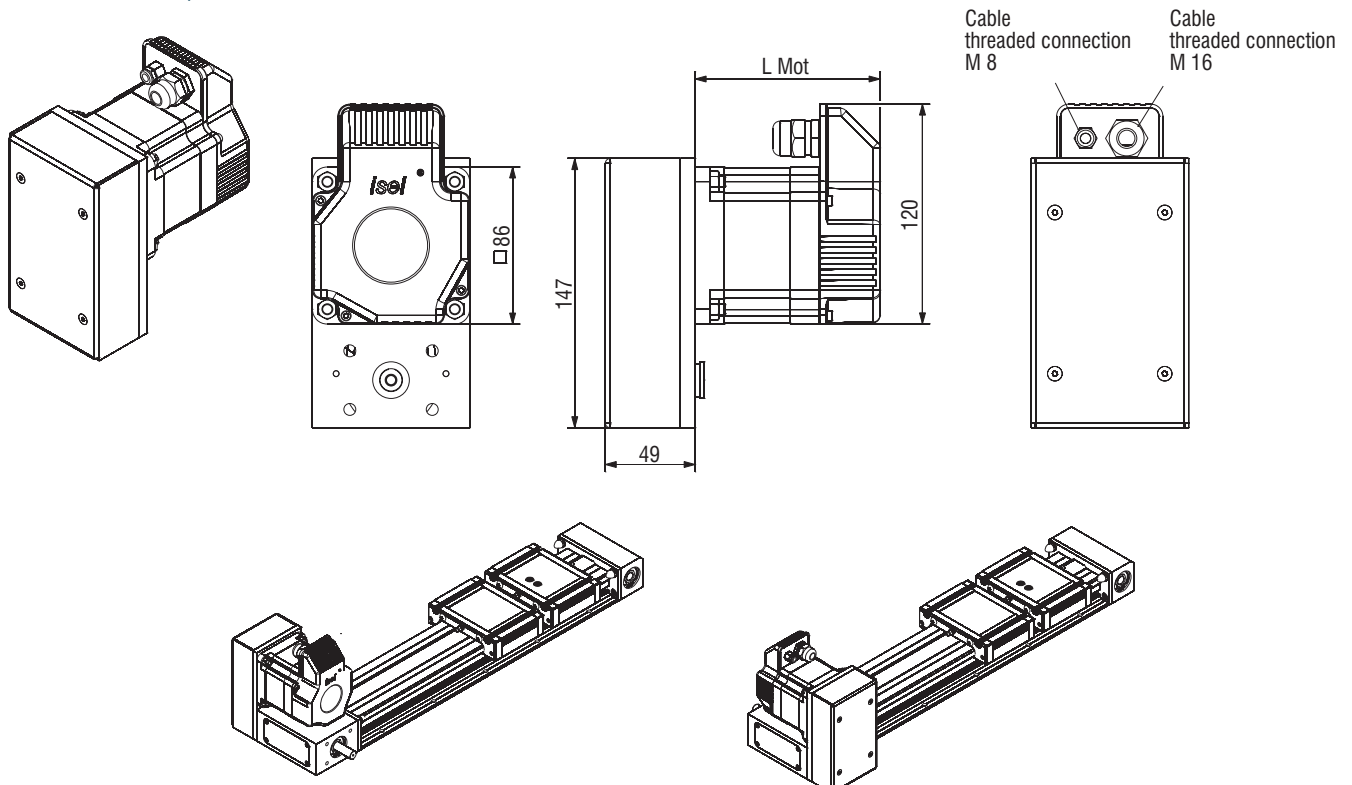
With Bearing Carriages



Drive Module

(Reduction 2:1)

Infeed: 35 mm/Revolutions



Timing Belt Feed Axis

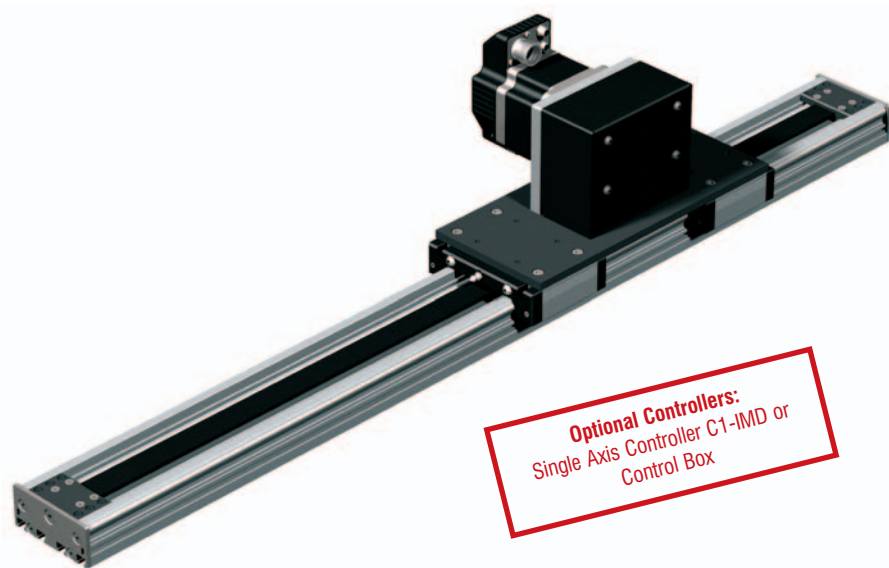
LEZ 7 (LUT 4)

Features

- Fixed timing belt
- Aluminium profile with midjet linear guide LFS-8
- Clearance-free feed with timing belt feed axis
 - timing belt with 5 mm toothing, width 25 mm
- Feed max. 1 m/s
- 2 x bearing carriage WS 3 L 96 x W 130 mm
- Feed per revolution: 70 mm
- Repeatability less or equal ± 0.2 mm
- Limit and/or reference switch, accuracy < 0.1 mm
- Stepping motor

Options:

- Special lengths in steps of 100 mm upon request
- Overtravel limit switch with connection cable
- Servo motor



Technical Data

Belt version	HTD 5M, width 25 mm
Weight of slide (without motor)	2.5 kg
Weight of guide	3.95 kg/m

Specific masses of the timing belt	0.09 kg/m
Feed per revolution	70 mm

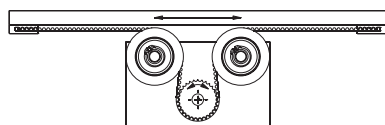
Order Data (without drive motor)

Item no.: 232 008 0050	L = 496 mm
Item no.: 232 008 0060	L = 596 mm
Item no.: 232 008 0070	L = 696 mm
Item no.: 232 008 0080	L = 796 mm

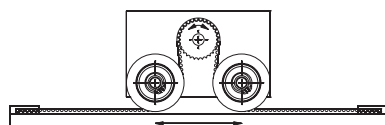
Idle Torques

Speed [1/min]	Idle torque [Nm]
500	0.16
1,500	0.25

Functional principle



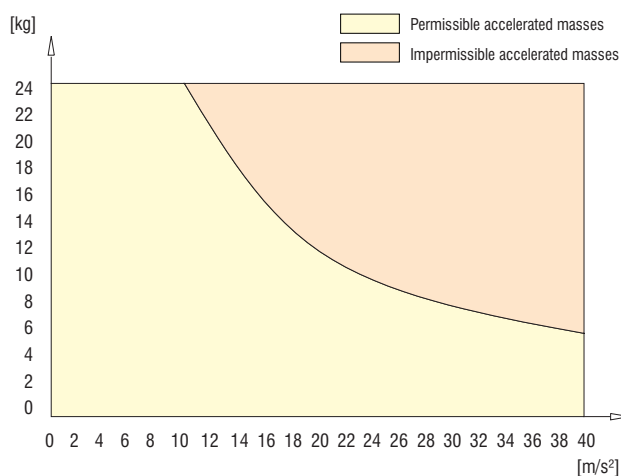
Fixed drive



Travelling drive (for big distances)

Load Diagramm

Permissible accelerated masses related to belt strength*



* At vertical assembly, the acceleration due to gravity ($g = 9.81 \text{ m/s}^2$) has to be taken into account

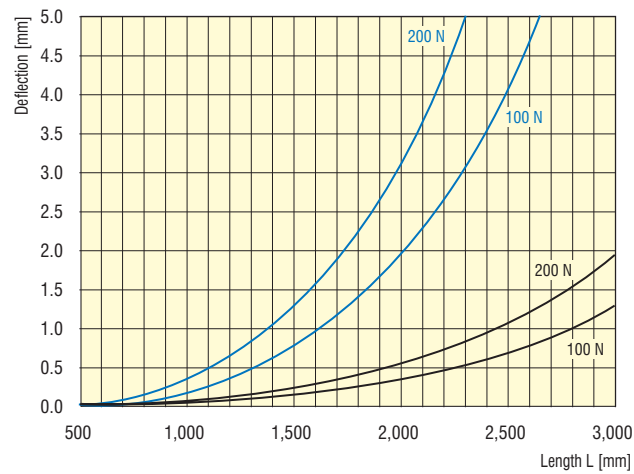
Timing Belt Feed Axis

LEZ 7

(LUT 4)

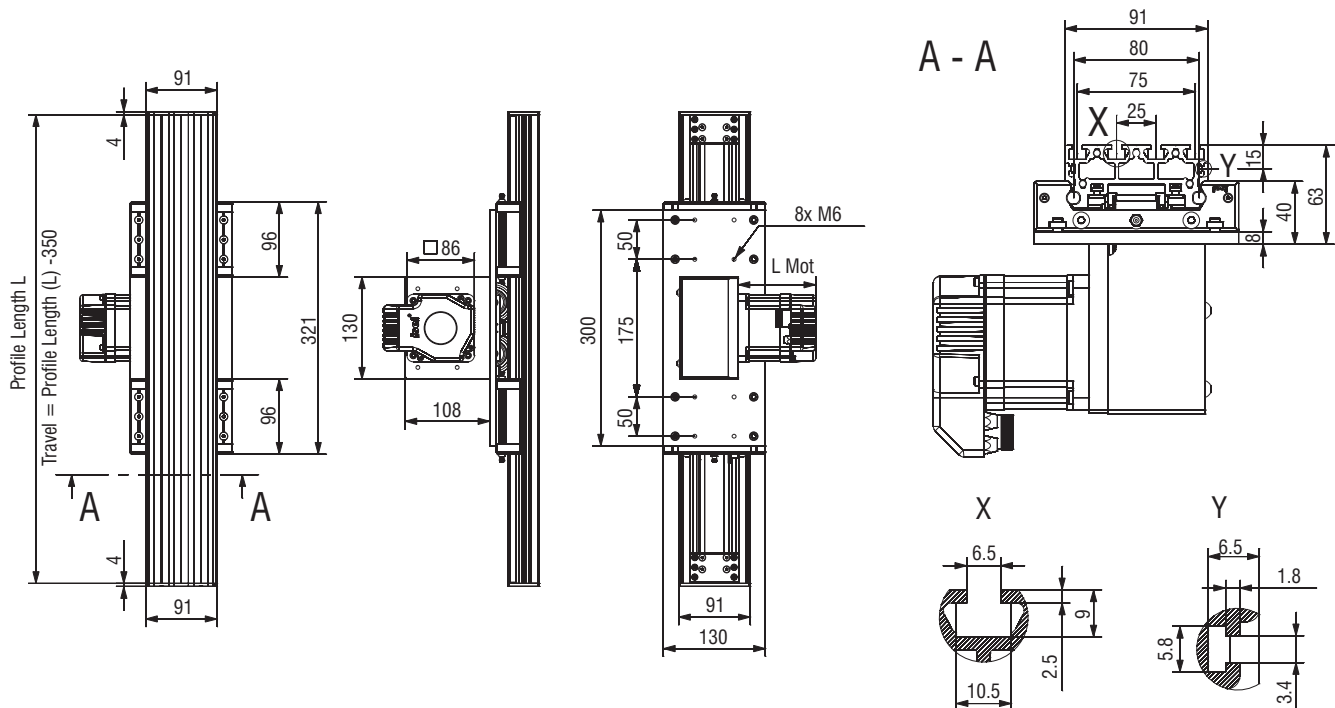
mechanics

Deflection



Force sketch of the deflection diagrams see Page 37

Scale Drawing



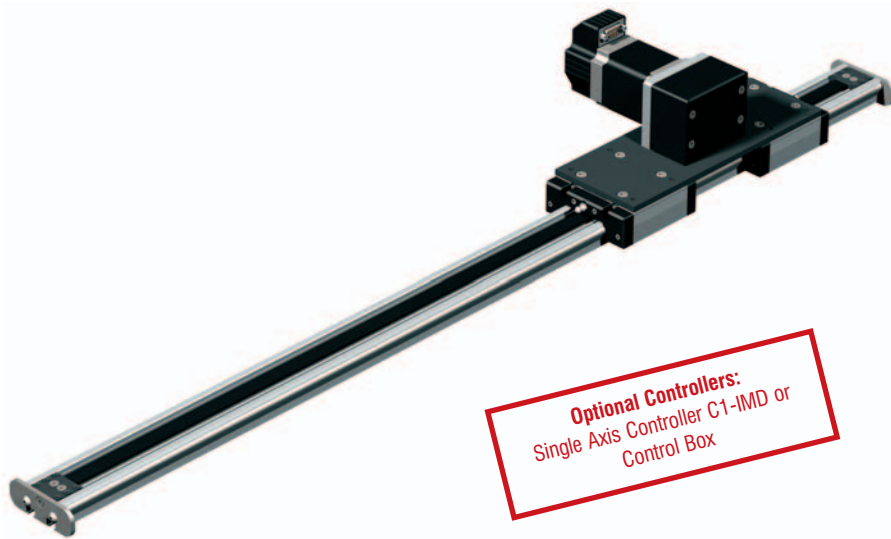
Timing Belt Feed Axis

LEZ 8

(LUT 5)

Features

- Stationärer timing belt
 - Aluminium profile with midjet linear guide LFS-8
 - Clearance-free feed with timing belt feed axis
 - timing belt with 3 mm pitch, width 15 mm
 - Feed 1 m/s, at the most
 - 2 x bearing carriage WS 11 L 96 x W 95 mm
 - Feed per revolution: 48 mm
 - Repeatability less or equal ± 0.2 mm
 - Limit and/or reference switch, accuracy < 0.1 mm
 - Stepping motor
- Options:
- Special lengths in steps of 100 mm upon request
 - Overdrive limit switch with connection cable
 - Servo motor



Technical Data

Belt version	HTD 3M, width 15 mm
Weight of slide (without motor)	2.0 kg
Weight of guide	1.95 kg/m

Specific masses of the timing belt	0.04 kg/m
Feed per revolution	48 mm

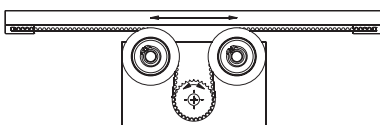
Order Data (without drive motor)

Item no.: **232 009 0040** L = 396 mm
 Item no.: **232 009 0050** L = 496 mm
 Item no.: **232 009 0060** L = 596 mm
 Item no.: **232 009 0070** L = 696 mm

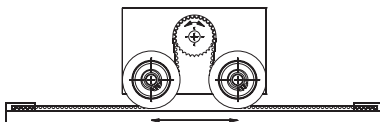
Idle Torques

Speed [1/min]	Idle torque [Nm]
500	0.16
1,500	0.25

Functional principle



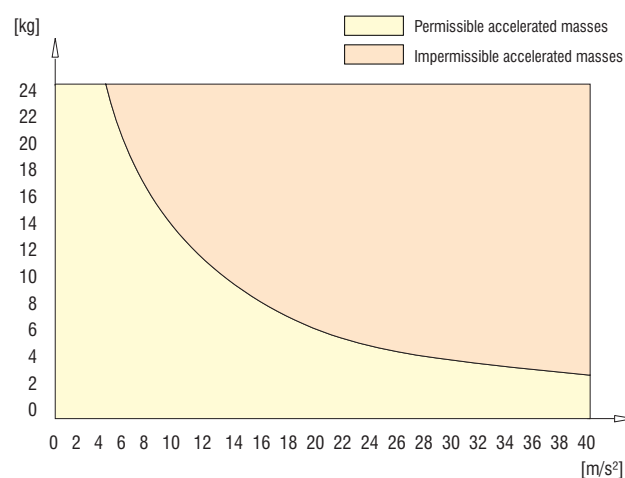
Fixed drive



Travelling drive (for big distances)

Load Diagramm

Permissible accelerated masses related to belt strength*



* At vertical assembly, the acceleration due to gravity ($g = 9.81 \text{ m/s}^2$) has to be taken into account

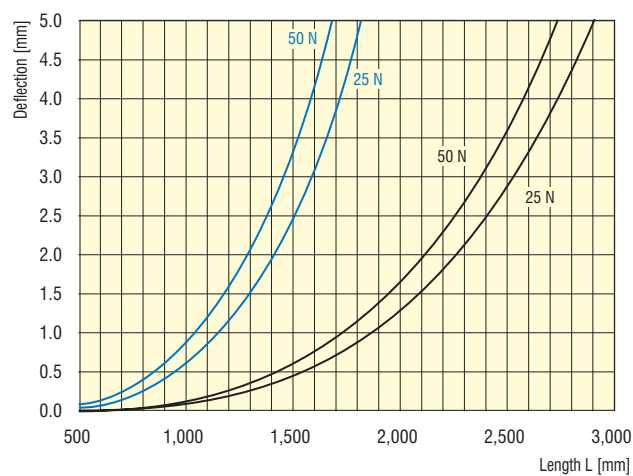
Timing Belt Feed Axis

LEZ 8

(LUT 5)

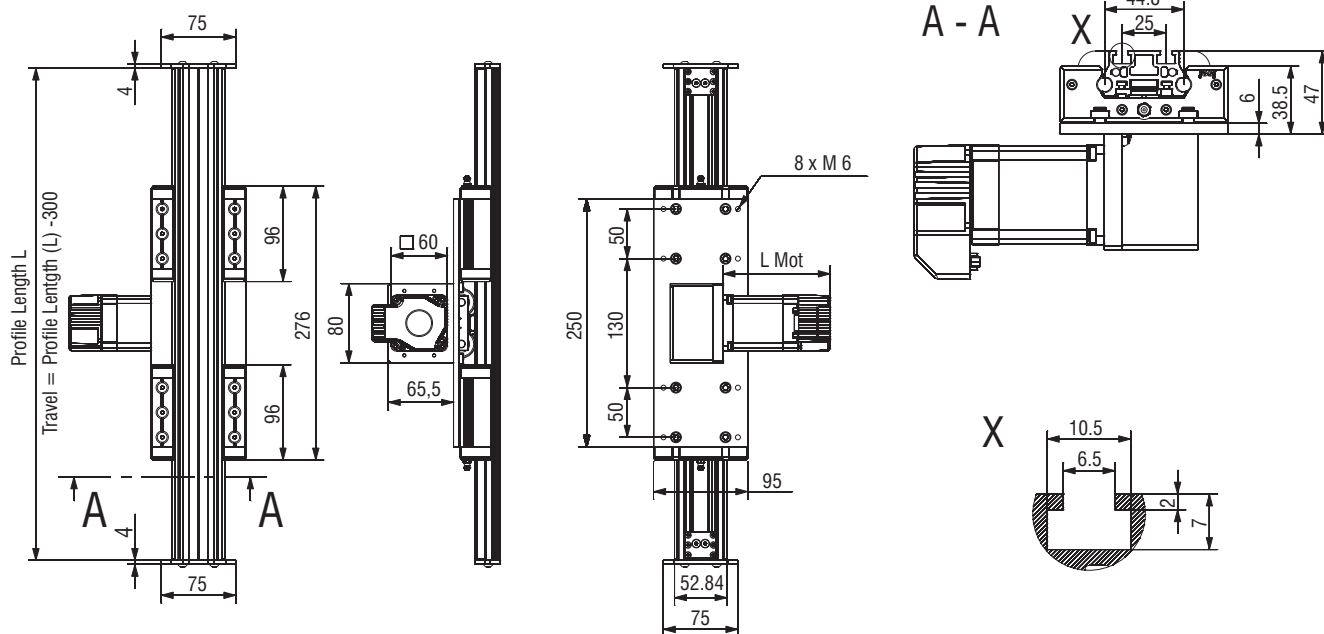
mechanics

Deflection



Force sketch of the
deflection diagrams
see Page 37

Scale Drawing



Timing Belt Feed Axis

LEZ 9

(LUT 6)



Features

- Aluminium profile, linear guide LFS-8-7
- Clearance-free feed with timing belt feed axis
 - timing belt with 3 mm toothing, width 15 mm
- Feed max. 2 m/s
- Bearing carriage WS 11 L 96 x W 95 mm
- Feed per revolution: 60 mm
- Repeatability less or equal ± 0.2 mm
- Limit and/or reference switch, accuracy < 0.1 mm
- Stepping motor

Options:

- Special lengths in steps of 100 mm upon request
- Servo motor

Technical Data

Belt version	HTD 3M, width 15 mm
Weight of slide	0.4 kg
Weight without drive module	1,000 mm $\cong$ 4.4 kg
Nominal mass of timing belt	0.04 kg/m

Nominal weight of guide	0.29 kg/100 mm
Effective diameter of the synchronized pulleys	$\varnothing 19.1$ mm
Moment of inertia of the synchronized pulleys	$5.86 \cdot 10^{-6}$ kgm ²
Feed per revolution	60 mm

Order Data (without drive motor)

Item no.: 232 010 0050	L = 496 mm
Item no.: 232 010 0100	L = 996 mm
Item no.: 232 010 0150	L = 1496 mm
Item no.: 232 010 0200	L = 1996 mm
Item no.: 232 010 0250	L = 2496 mm
Item no.: 232 010 0300	L = 2996 mm

Idle Torques

Speed [1/min]	Idle torque [Nm]
500	0.06
1,500	0.09

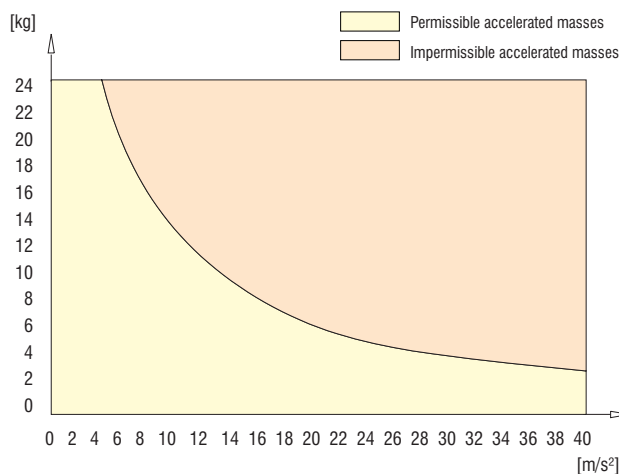
Functional principle

Standard - Two pulley drive



Load Diagramm

Permissible accelerated masses related to belt strength*



* At vertical assembly, the acceleration due to gravity ($g = 9.81$ m/s²) has to be taken into account

Timing Belt Feed Axis

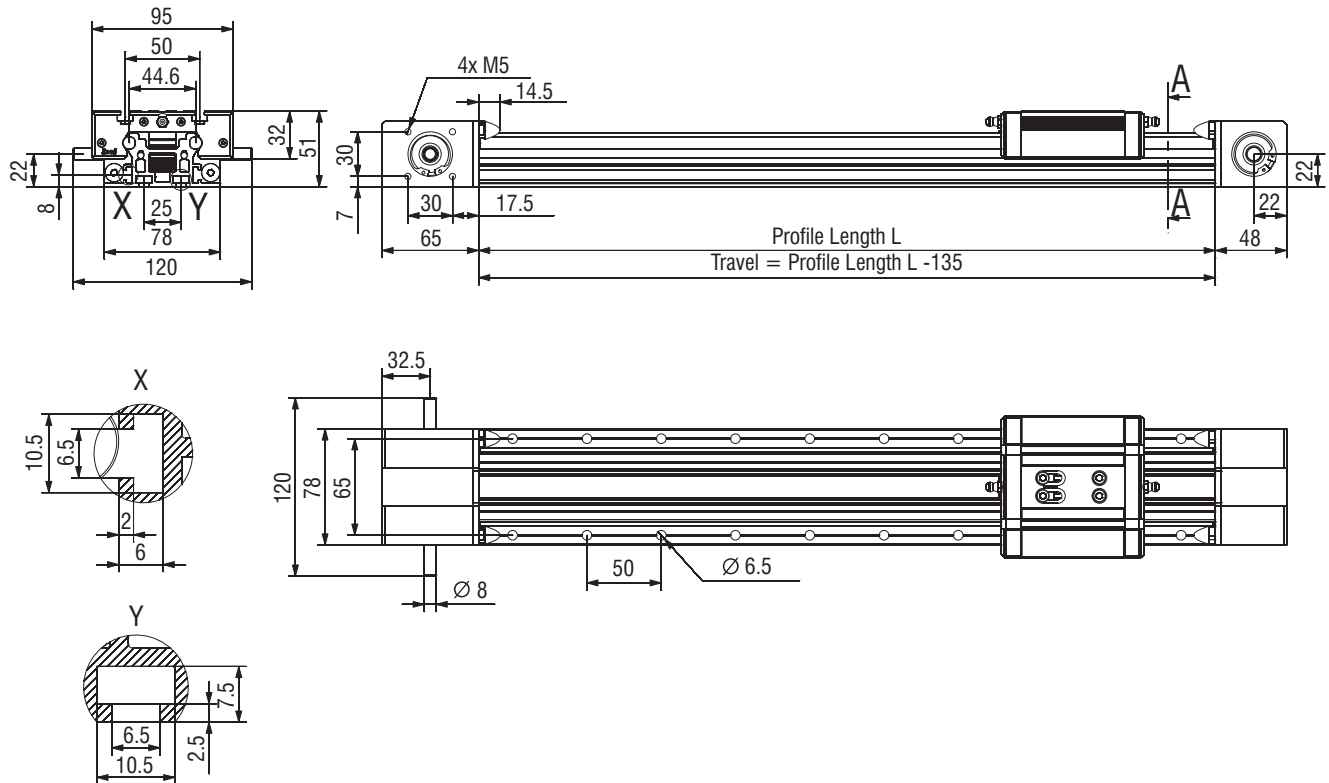
LEZ 9

(LUT 6)

Timing Belt Feed Axis

Without Motor

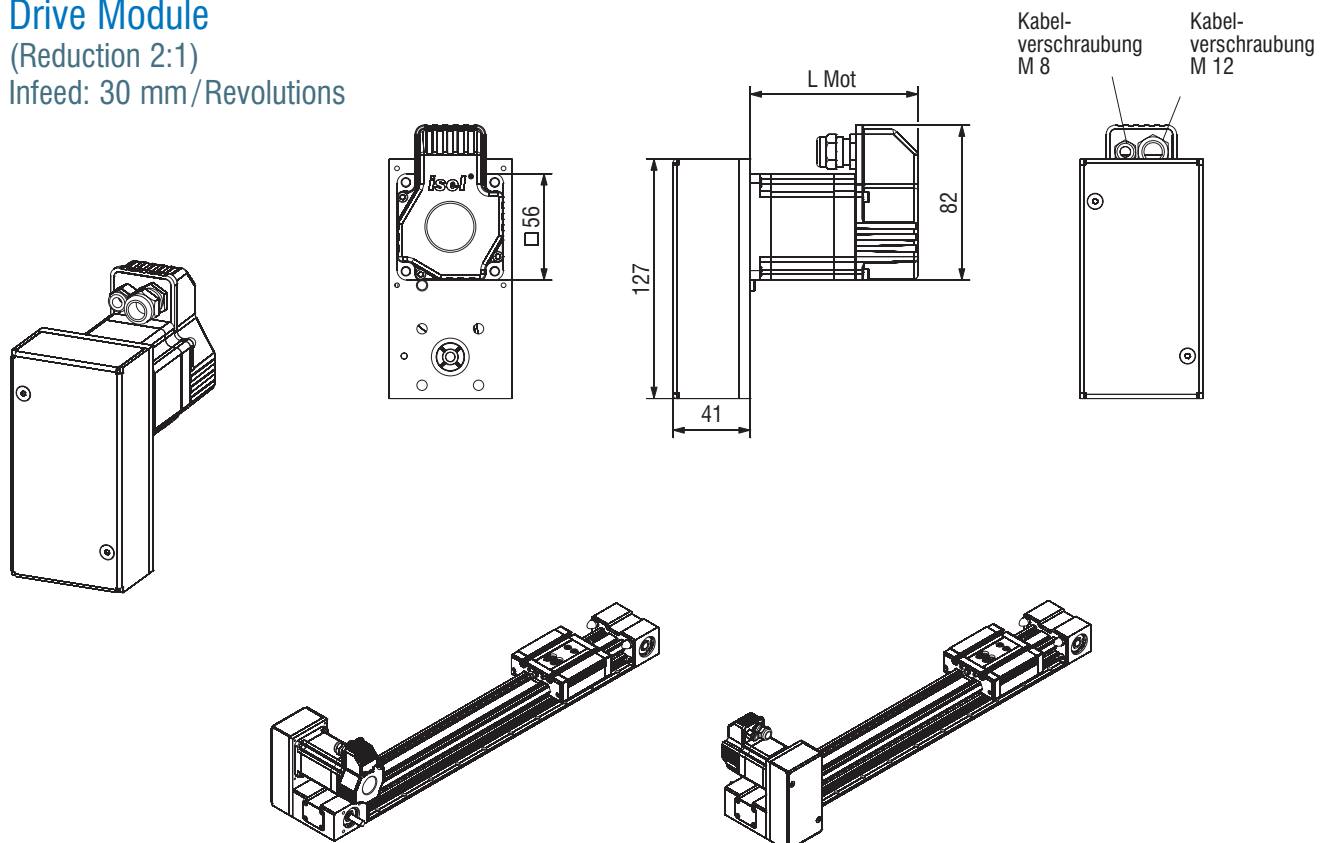
With Bearing Carriages



Drive Module

(Reduction 2:1)

Infeed: 30 mm/Revolutions



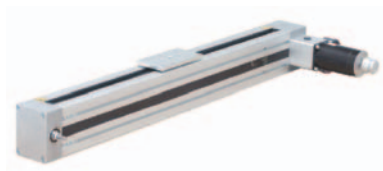
Double-Track Timing Belt Feed Axis **LEZ 4**



Features

- Aluminium profile H 92 x W 70 mm with double-track guide
- Clearance-free feed with timing belt feed axis
- Feed 2 m/s, at the most, with stepping motor 160 Ncm at full-step operation
- Double-track set L 125 x W 85 mm with two flange bearings 2
- Repeatability ± 0.05 mm (reproducibility)
- Lip seal with teflon coat
- Limit and/or reference switch, accuracy < 0.1 mm

Order Information



Track Timing Belt Feed Axis
with Stepping Motor 160 Ncm

Item no.	Length (mm)
232 003 0300	300
232 003 0400	400
232 003 0500	500
232 003 0600	600
232 003 0700	700
232 003 0850	850
232 003 1000	1000
232 003 1100	1100
232 003 1250	1250
232 003 1350	1350
232 003 1500	1500
232 003 1750	1750
232 003 2000	2000
232 003 2250	2250
232 003 2500	2500
232 003 2750	2750
232 003 3000	3000

Feed = length (L) minus 150 mm



Double-Track Timing Belt Feed
Axis

Item no.	Length (mm)
232 004 0300	300
232 004 0400	400
232 004 0500	500
232 004 0600	600
232 004 0700	700
232 004 0850	850
232 004 1000	1000
232 004 1100	1100
232 004 1250	1250
232 004 1350	1350
232 004 1500	1500
232 004 1750	1750
232 004 2000	2000
232 004 2250	2250
232 004 2500	2500
232 004 2750	2750
232 004 3000	3000

Feed = length (L) minus 150 mm



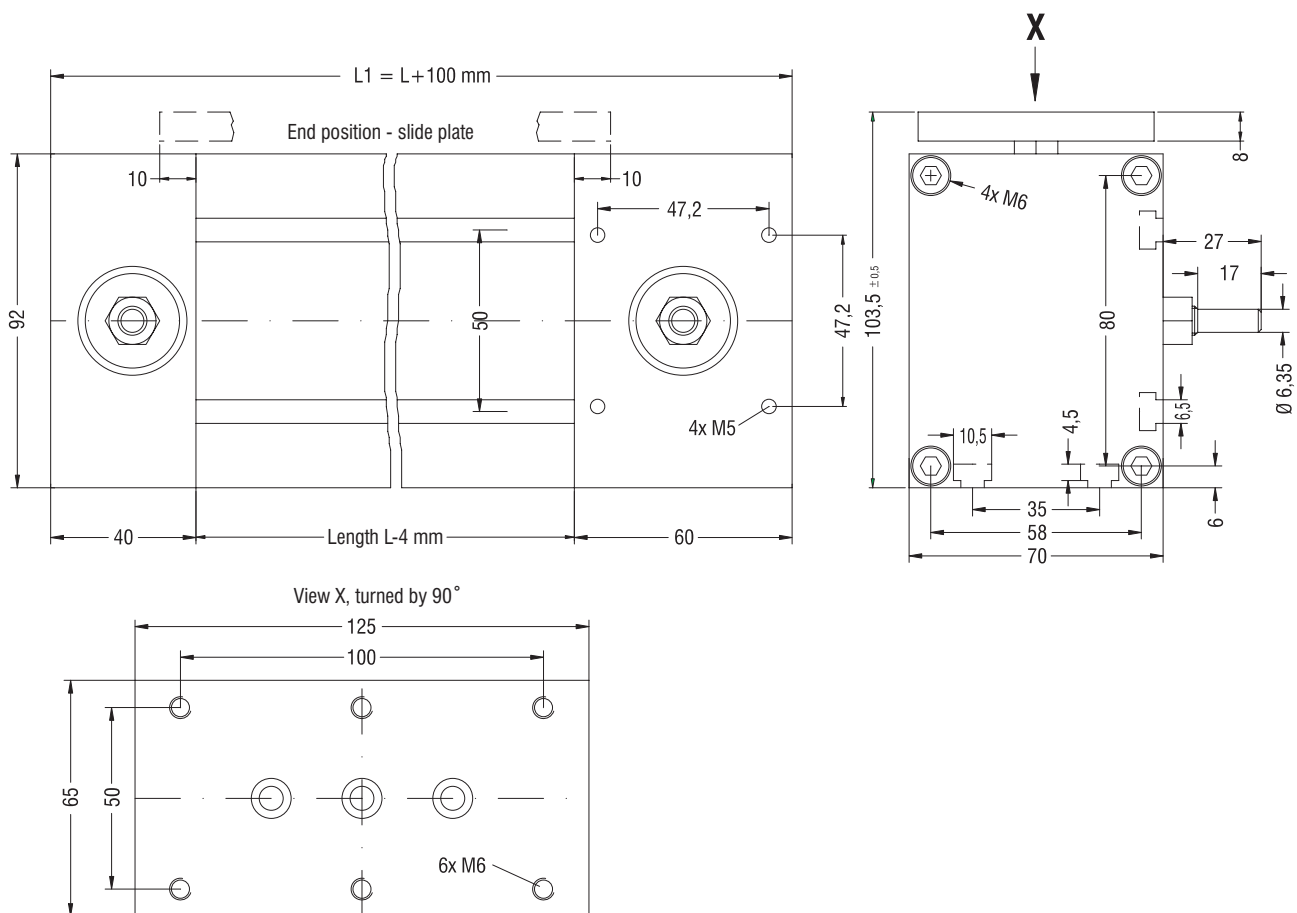
Stepping Motor Drive Module
Stepping motor 160 Ncm

Item no.: **396341 3100**

Servo Motor Drive Module
DC-Servo motor 120 W

Item no.: **396102 3000**

Scaled Drawings



Drive Dimensioning

Calculation of the Drive Torques

Basically, the necessary drive torque consists of "load moment", "acceleration torque" and "idle torque".

Definitions

M_A [Nm]	Necessary drive torque
M_{Last} [Nm]	Moment resulting from the different loads
M_{Leer} [Nm]*	Idle torque
M_{rot} [Nm]	Rotatory acceleration torque
M_{trans} [Nm]	Translatory acceleration torque
F_x [N]	Feed force
F_a [N]	G force
g [m/s ²]	Gravity = 9.81
V_{max} [m/s]*	Maximum traverse speed
m [kg]	Total mass to be moved
a [m/s ²]	Acceleration
d_0 [mm]*	Effective diameter of the synchronized pulley
P [kW]	Drive capacity
J_{syn} [kgm ²]*	Moment of inertia of the synchronized pulleys
n_{max} [1/min]	Maximum speed
μ	Friction factor = 0.1
[kg/m]*	Specific mass of timing belt
i	Transmission ratio

$m =$ transport mass
 + mass of the slide
 + mass of the timing belt

Mass of the timing belt =

$$\frac{\text{Specific mass} \cdot 2 \cdot \text{Length of feed profile}}{1000}$$

* The particulars are stated on the respective data sheets.

Feed Force F_x

$$F_x = m \cdot g \cdot \mu$$

G Force F_a

$$F_a = m \cdot a$$

At vertical operation, the gravity g has to be added to the mass acceleration a . ($g = 9,81 \text{ m/s}^2$).

Drive Capacity P

$$P = \frac{M_A \cdot n_{max} \cdot 2 \cdot \pi}{2 \cdot 1000}$$

Resulting Moment M_{Last}

$$M_{Last} = \frac{F_x \cdot d_0}{2 \cdot 1000}$$

Translatory Acceleration Torque M_{trans}

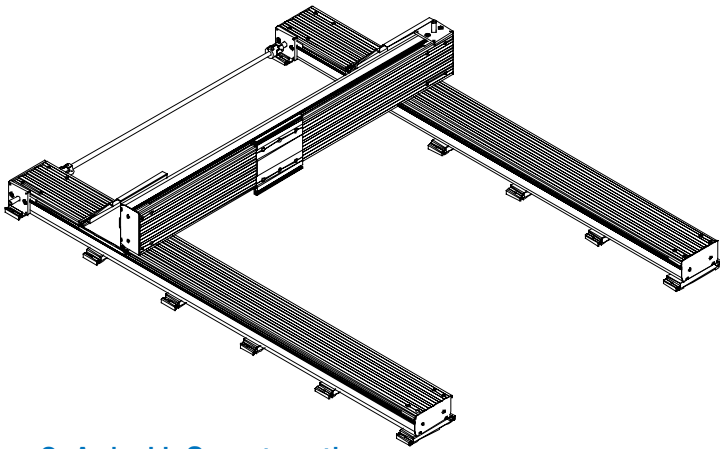
$$M_{Trans} = \frac{F_a \cdot d_0}{2 \cdot 1000}$$

Rotary Acceleration Torque M_{rot}

$$M_{rot} = J_{syn} \cdot \frac{n_{max} \cdot 2 \cdot \pi \cdot a}{60 \cdot V_{max}}$$

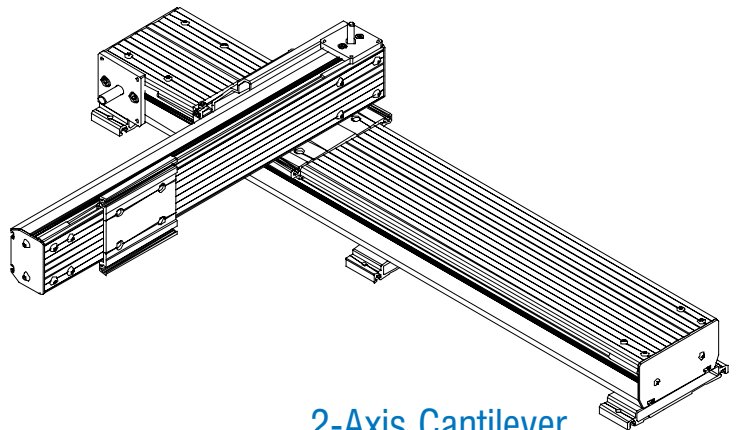
$$M_A = M_{Last} + M_{trans} + M_{rot} + M_{leer}$$

Application Samples



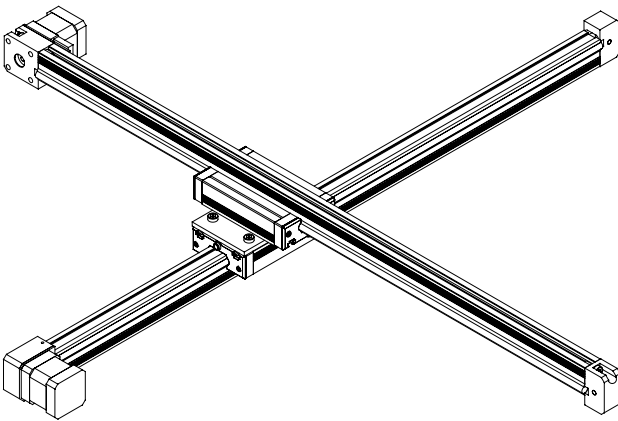
2-Axis H-Construction

- 3 x LEZ 1 G
- Angle Slide
- Transmission Shaft
- Foot mounting



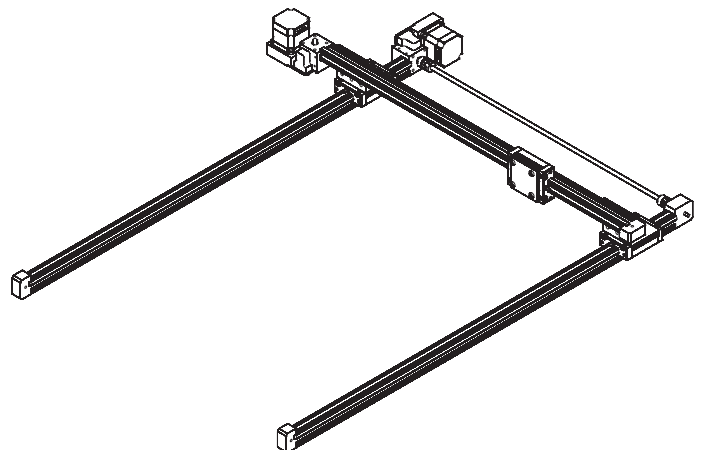
2-Axis Cantilever

- 1 x LEZ 1 G
- 1 x LEZ 3 G
- Angle Slide
- Foot Mounting



Compound Table LEZ 1

- 2 x LEZ 1



LEZ 1

- 2-Axis Flat Bed Unit