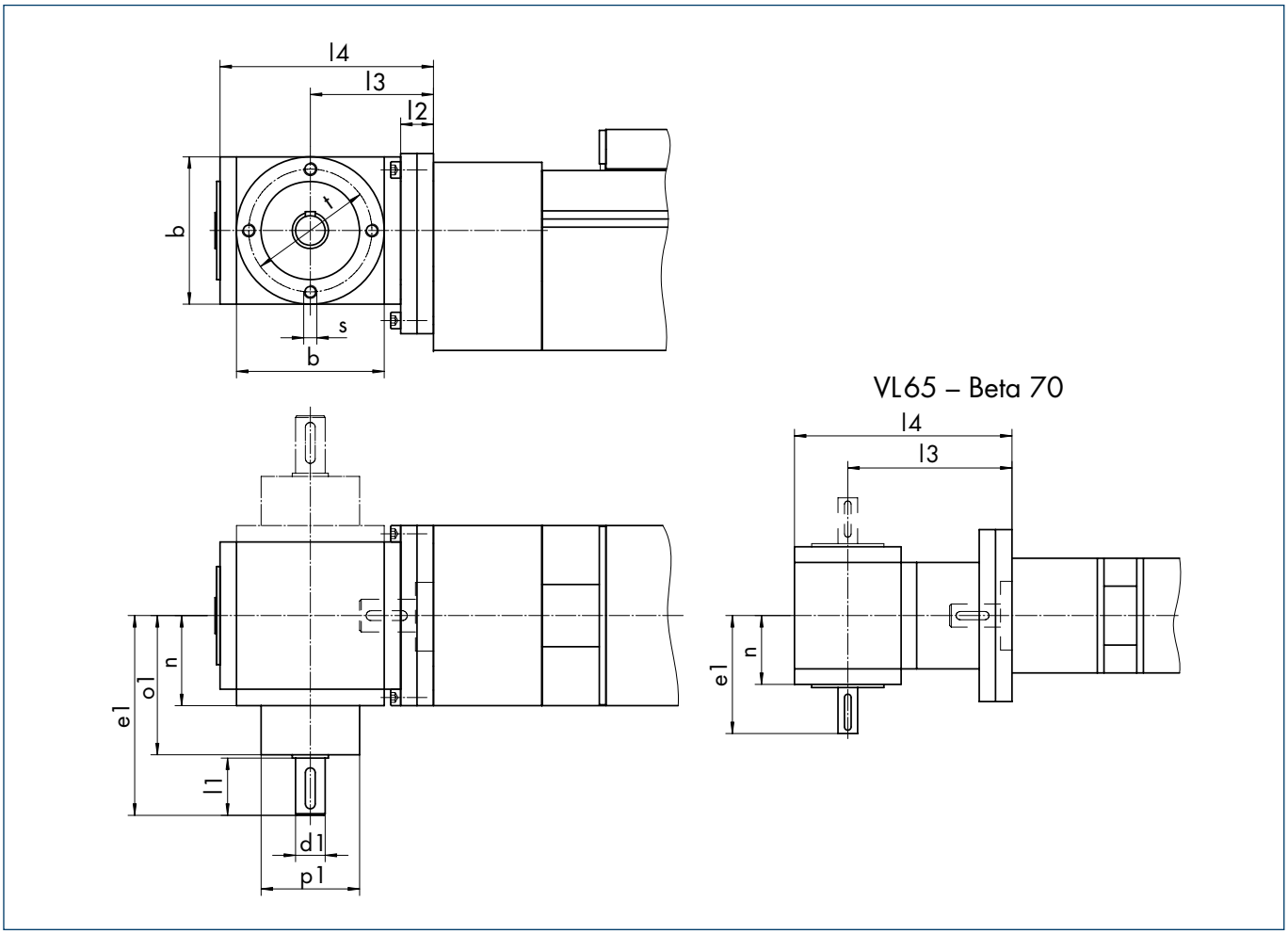
Options for System HSB

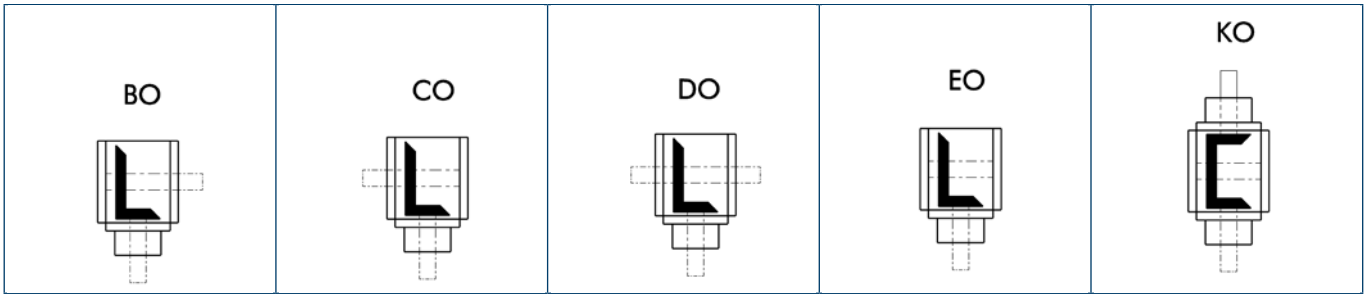
Attachment of bevel gears (KRG) for thread spindle drive



Size	Gear type	Version	Transmission	b [mm]	l2 [mm]	l3 [mm]	l4 [mm]	n [mm]	s	t [mm]
B 40	V065	E0, K0	1:1 ... 3:1	65	11	53	95	42	M6	54
B 50C	V065	E0, K0	1:1 ... 3:1	65	11	53	95	42	M6	54
B 60	V065	E0, K0	1:1 ... 3:1	65	16	58	100	42	M6	54
B 70C	V065	E0, K0	1:1 ... 3:1	65	16	58	100	42	M6	54
B 80	V090	E0, K0	1:1 ... 6:1	90	20	75	130	55	M8	75
B 100D	V090	E0, K0	1:1 ... 6:1	90	20	75	130	55	M8	75
B 110	V090	E0, K0	1:1 ... 6:1	90	20	75	130	55	M8	75
B 140(C)	V090	E0, K0	1:1 ... 6:1	90	20	75	130	55	M8	75
B 165	V120	E0, K0	1:1 ... 6:1	120	30	102	174	75	M10	100
B 180(C)	V120	E0, K0	1:1 ... 6:1	120	30	102	174	75	M10	100
D 110	V065	E0, K0	1:1 ... 3:1	65	16	58	100	42	M6	54
D 145	V090	B0, C0, H0	1:1 ... 6:1	90	94	149	204	55	M8	75
D 200	V120	B0, C0, H0	1:1 ... 6:1	120	112	184	256	75	M10	100
D 240	V120	B0, C0, H0	1:1 ... 6:1	120	112	184	256	75	M10	100
A 15B-155	V065	E0, K0	1:1 ... 3:1	65	16	58	100	42	M6	54
A 20B-225	V090	E0, K0	1:1 ... 6:1	90	20	75	130	55	M8	75
A 30B-325	V090	E0, K0	1:1 ... 6:1	90	20	75	130	55	M8	75
A 35B-455	V120	E0, K0	1:1 ... 6:1	120	30	102	174	75	M10	100

All bevel gears are life-time lubricated with synthetic oil (lubrication B0). Maximum on time 40 %. For a longer on time, please specify lubrication B1 and installation position. Angular clearance < 20 minutes.

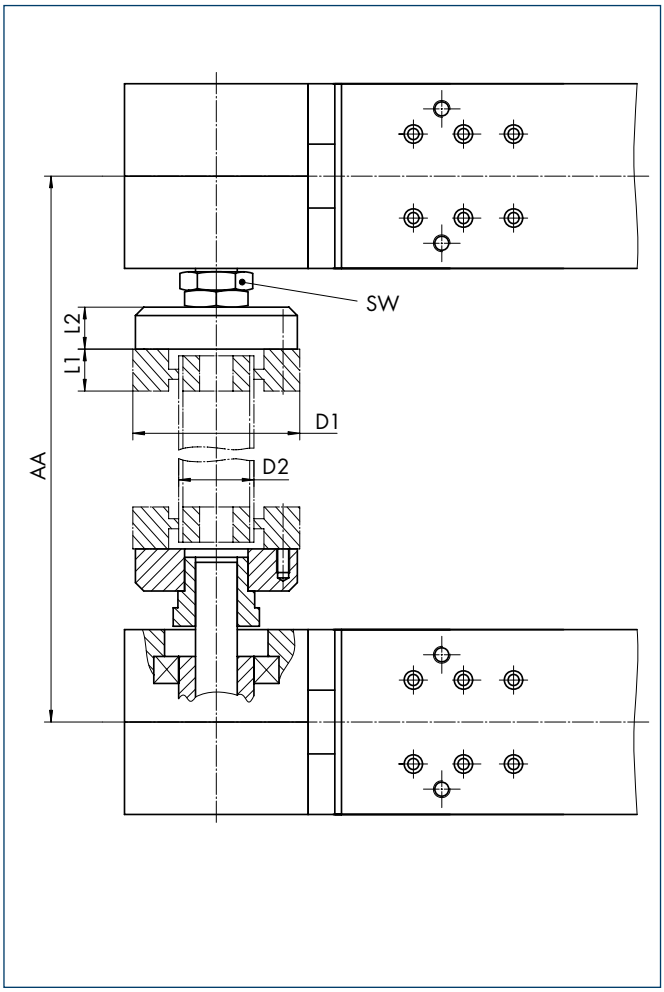
Versions



Transmission	1:1 - 2:1					3:1					4:1					5:1 - 6:1				
Size	d1	l1	e1	o1	p1	d1	l1	e1	o1	p1	d1	l1	e1	o1	p1	d1	l1	e1	o1	p1
B 40	12	26	100	72	44	12	26	100	72	44										
B 50C	12	26	100	72	44	12	26	100	72	44										
B 60	12	26	100	72	44	12	26	100	72	44										
B 70C	12	26	100	72	44	12	26	100	72	44										
B 80	18	35	122	85	60	12	35	122	85	60	12	35	132	95	60	12	35	132	95	60
B 100D	18	35	122	85	60	12	35	122	85	60	12	35	132	95	60	12	35	132	95	60
B 110	18	35	122	85	60	12	35	122	85	60	12	35	132	95	60	12	35	132	95	60
B 140(C)	18	35	122	85	60	12	35	122	85	60	12	35	132	95	60	12	35	132	95	60
B 165	25	45	162	115	80	20	45	162	115	80	20	45	172	125	80	15	35	162	125	70
B 180(C)	25	45	162	115	80	20	45	162	115	80	20	45	172	125	80	15	35	162	125	70
D 110	12	26	100	72	44	12	26	100	72	44										
D 145	18	35	122	85	60	12	35	122	85	60	12	35	132	95	60	12	35	132	95	60
D 200	25	45	162	115	80	20	45	162	115	80	20	45	172	125	80	15	35	162	125	70
D 240	25	45	162	115	80	20	45	162	115	80	20	45	172	125	80	15	35	162	125	70
A 15B-155	12	26	100	72	44	12	26	100	72	44										
A 20B-225	18	35	122	85	60	12	35	122	85	60	12	35	132	95	60	12	35	132	95	60
A 30B-325	18	35	122	85	60	12	35	122	85	60	12	35	132	95	60	12	35	132	95	60
A 35B-455	25	45	162	115	80	20	45	162	115	80	20	45	172	125	80	15	35	162	125	70

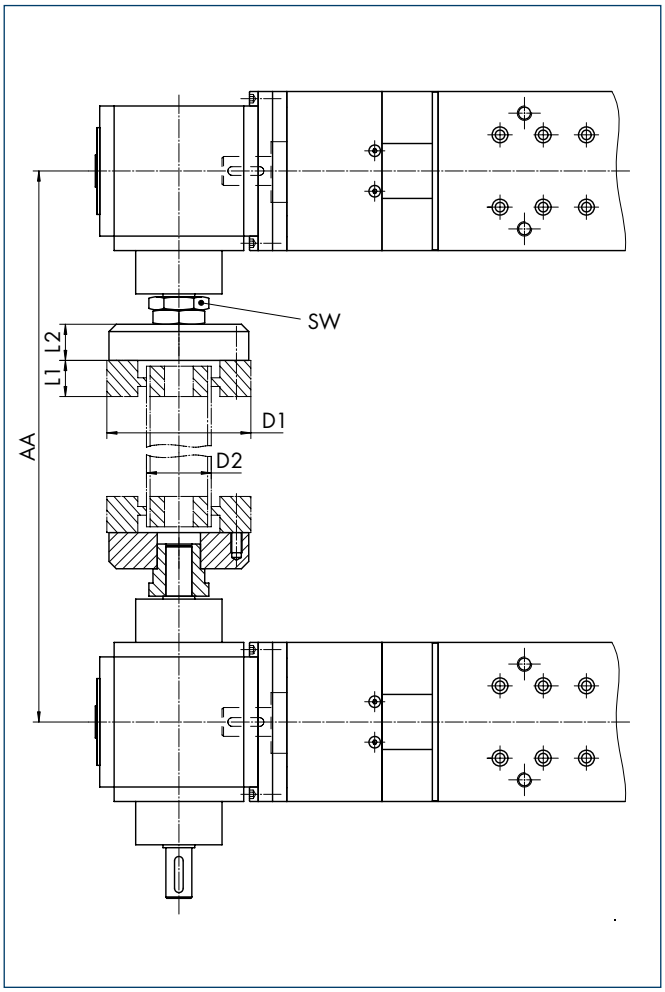
All bevel gears are life-time lubricated with synthetic oil (lubrication B0). Maximum on time 40%. For a longer on time, please specify lubrication B1 and installation position. Angular clearance < 20 minutes.

Attachment of connection shaft (GX) for Beta linear axes



Toothed belt drive

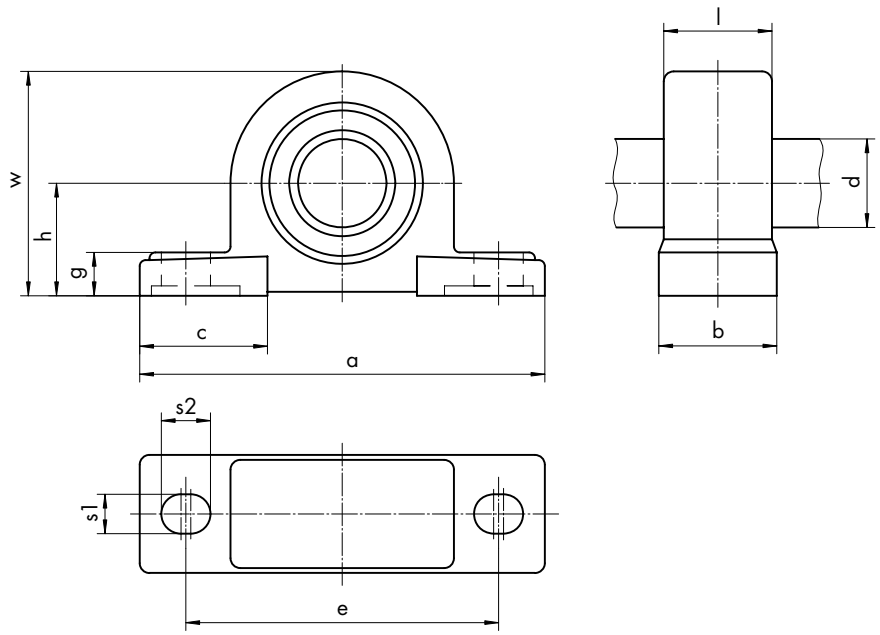
Dimension AA = Center distance (axis spacing) of mechanical linear units



Thread spindle drive

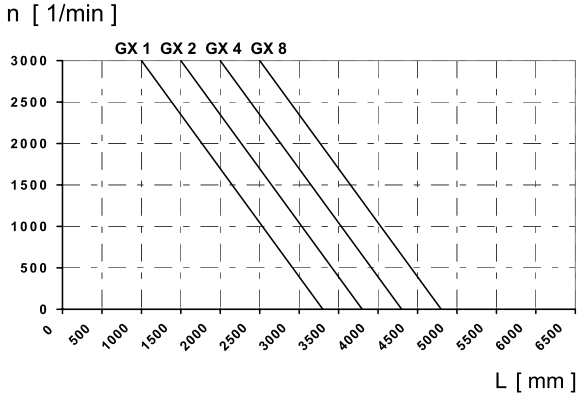
Size	Designation	AA min. [mm]	D1 [mm]	D2 [mm]	L1 [mm]	L2 [mm]	SW [mm]
B 40-ZSS	GX1	170	56	30x2	20	24	22
B 50C-ZRS	GX1	190	56	30x2	20	24	22
B 60-ZSS	GX2	205	85	40x1.5	20	24	27
B 60-SSS	GX2	320	85	40x1.5	20	24	22
B 70C-ZRS/ZSS	GX2	215	85	40x1.5	20	24	27
B 70C-SRS/SSS	GX2	330	85	40x1.5	20	24	27
B 80-ZRS/ZSS	GX2	225	85	40x1.5	20	24	27
B 80-SRS/SSS	GX2	330	85	40x1.5	20	24	27
B 80C-ZSS	GX4	270	100	45x2.5	25	28	36
B 100-ZRS/ZSS	GX4	270	100	45x2.5	25	28	36
B 100D-ZSS	GX4	270	100	45x2.5	25	28	36
B 100D-SSS	GX4	290	100	45x2.5	25	28	36
B 110-ZRS/ZSS	GX4	320	100	45x2.5	25	28	46
B 110-SRS/SSS	GX4	350	100	45x2.5	25	28	46
B 120-ZRS/ZSS	GX4	300	100	45x2.5	25	28	46
B 140-ZRS/ZSS	GX4	310	100	45x2.5	25	28	46
B 140-SRS/SSS	GX4	350	100	45x2.5	25	28	36
B 140C-ZSS	GX4	310	100	45x2.5	25	28	46
B 140C-SSS	GX4	350	100	45x2.5	25	28	36
B 165-ZSS	GX8	350	120	60x2.5	30	32	55
B 165-SSS	GX8	430	120	60x2.5	30	32	46
B 180-ZRS/ZSS	GX8	370	120	60x2.5	30	32	55
B 180-AZS	GX8	370	120	60x2.5	30	32	55
B 180-SRS/SSS	GX8	430	120	60x2.5	30	32	46
B 180C-ZRS/ZSS	GX8	370	120	60x2.5	30	32	55
B 180C-SRS/SSS	GX8	430	120	60x2.5	30	32	46
B 180C-ARS/ASS	GX8	370	120	60x2.5	30	32	55

Pedestal bearing SL



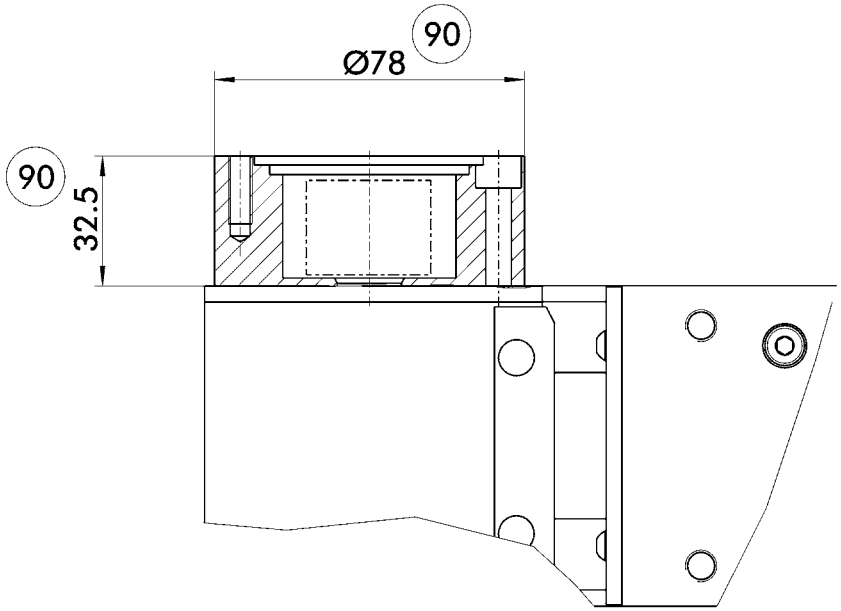
Size	For drive shaft	a [mm]	b [mm]	c [mm]	d [mm]	e [mm]	g [mm]	h [mm]	l [mm]	s1 [mm]	s2 [mm]	w [mm]
B 40	GX1	167	48	54	30	127	19	47,6	43	17	21	92
B 50C	GX1	167	48	54	30	127	19	47,6	43	17	21	92
B 60	GX2	190	54	60	40	146	20	54	50	17	22	106
B 70C	GX2	190	54	60	40	146	20	54	50	17	22	106
B 80	GX2	190	54	60	40	146	20	54	50	17	22	106
B 80C	GX4	206	60	65	45	159	22	57,2	55	20	25	114
B 100	GX4	206	60	65	45	159	22	57,2	55	20	25	114
B 100D	GX4	206	60	65	45	159	22	57,2	55	20	25	114
B 110	GX4	206	60	65	45	159	22	57,2	55	20	25	114
B 120	GX4	206	60	65	45	159	22	57,2	55	20	25	114
B 140(C)	GX4	206	60	65	45	159	22	57,2	55	20	25	114
B 165	GX8	265	70	77	60	203	27	76,2	65	25	29	150
B 180(C)	GX8	265	70	77	60	203	27	76,2	65	25	29	150

Drive shaft diagram



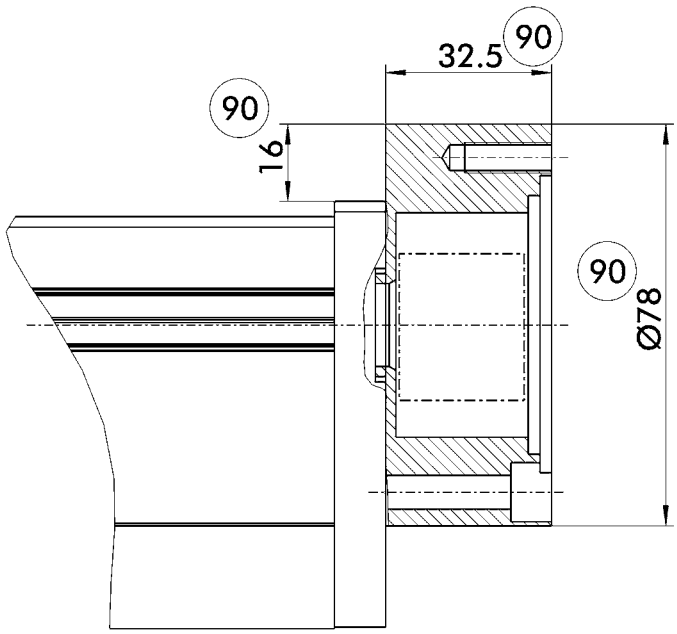
Depending on length and speed

DGK shaft encoder for toothed belt axes



(90) Dimensions depend on shaft encoder type

DGK shaft encoder for spindle axes



(90) Dimensions depend on shaft encoder type

General technical information

Explanations for performance overview

· All specifications relate to the relevant standard versions. The values for special designs may differ considerably in some cases.
· The permissible loads are the maximum possible individual loads on the entire system. For mixed loads (several different force or moment directions), the individual permissible forces are lower. It is important to note that some elastic deformation occurs, which influences the accuracy. For linear units with roller guides, with static loads the static basic load rating (Cstat) must be taken into account.
· The repeat accuracy is defined as the linear access returning to an actual position previously attained under identical conditions within the specified tolerance limit. Note that various factors including temperature, load, speed, delay, and travel direction influence the repeat accuracy.

Linear axes with thread drive

· The basic load ratings for the guide and the thread drive are used to calculate the total lifetime. Please consult us for details.
· The idle torques relate to the relevant standard designs (not double nut or individual nut set with no play) and are measured at a very low speed (= 0 rpm). Production and assembly tolerances result in a spread of ± 20 %.
· The values for linear axes with trapezoid threaded drive differ significantly from this performance data in some cases. Please consult us for details.
- The permissible bending of the linear axis is 0.2 mm/m (maximum 1 mm).

Linear axes with toothed belt drive

· The idle torques relate to the relevant standard designs and are measured at a very low speed (= 0 rpm). Production and assembly tolerances result in a spread of ± 20 %.
· The specified force Fx is the maximum value that is permissible for low speeds. For higher speeds, please contact us for details of the maximum value.
- The permissible bending of the linear axis is 0.5 mm/m (maximum 2.5 mm).

Running characteristics and noise

Due to production tolerances in the components used (e.g. threaded or toothed belt drive, guide, bearings, etc.), the running characteristics and noise emissions for linear axes and linear tables can be very different even on identical units.

Straightness and warping

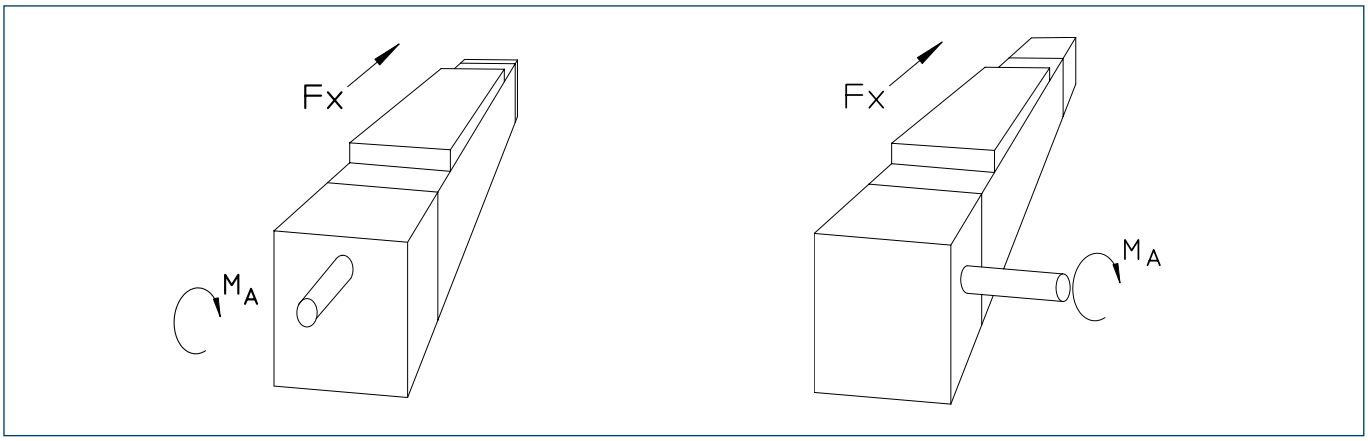
All aluminum sections used for linear axes and linear tables are press-drawn sections. Because of the manufacturing process, these differ in respect of their straightness and warping. However, they are normally well below the permissible variations set out in DIN 17615.
Nevertheless, it may be necessary to align the linear axes using appropriate leveling elements or to mount them on a sufficiently precisely finished mounting surface in order to achieve the required guide accuracy. This enables tolerances of better than 0.1 mm / 1000 mm to be achieved.

Stroke length

The stroke length specified in the ordering code corresponds to the maximum possible travel. The design must take account of acceleration and braking distances or any over stroke.

We reserve the right to make technical modifications to all products.

Drive dimensioning for linear axes with ball screw or toothed belt drive



Required input torque* MA [Nm]

$$M_A = M_{Load} + M_{Idle}$$

$$M_{Load} = \frac{Fx \times p}{2 \times \check{s} \times 1000}$$

$$F_{XH} = m \times g \times \mu + m \times a$$

$$F_{XV} = m \times (g + a)$$

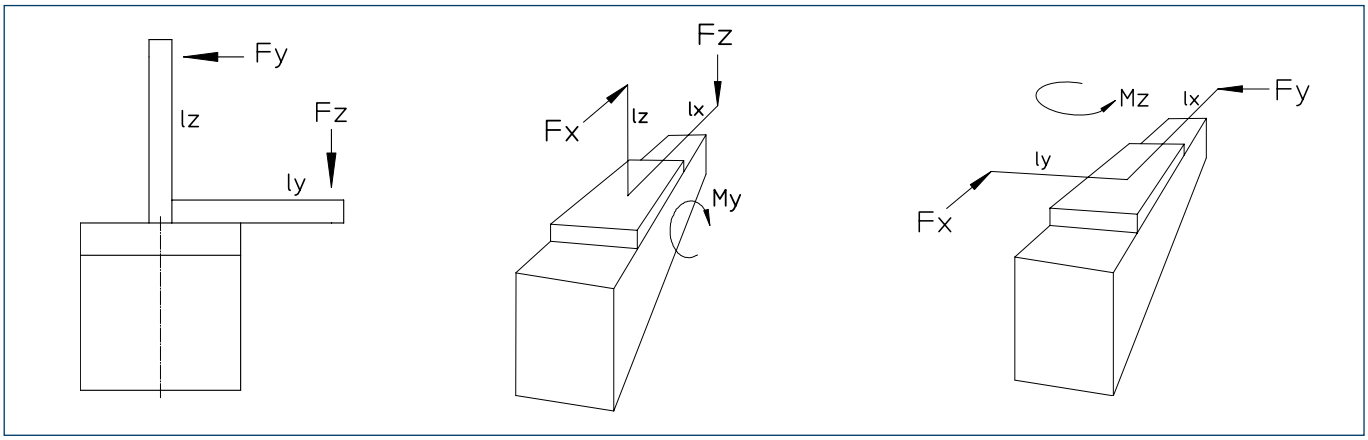
μ_S = 0.05
μ_R = 0.02
μ_G = 0,1
g = 9.81 m/s²

* approximate

Definitions

M_A	Required input torque [Nm]
M_{Load}	Load torque [Nm]
M_{Idle}	See data sheets [Nm]
F_{XH}	Horizontal application feeding force [N]
F_{XV}	Vertical application feeding force [N]
μ_S	Coefficient of friction for rail guide
μ_R	Coefficient of friction for roller guide
μ_G	Coefficient of friction for sliding guide
g	Acceleration due to gravity [m/s²]
a	Acceleration [m/s²]
m	Transport mass [kg]
p	Spindle pitch [mm] (Ball screw drive) or stroke per revolution [mm] (toothed belt drive)

Basic principles of force and moment determination



Mx = Fy x lz or Fz x ly	My = Fx x lz or Fz x lx	Mz = Fx x ly or Fy x lx

Explanations

Forces (**F**) occur if
- a mass (**m**) is acted on by an acceleration (**a**).
- a mass (**m**) is acted on by acceleration due to gravity (**g**).

This results in:

Fz = m x (g + a) (horizontal applications)

Fz = m x (g + a) (vertical applications)

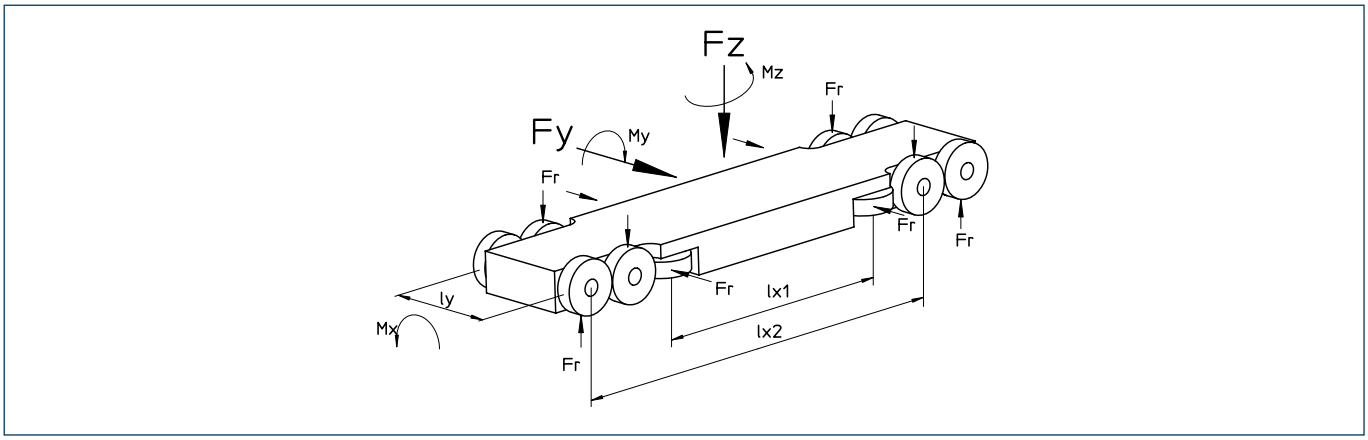
Moments occur when a force (**F**) acts on a lever arm (**l**); i.e. a force acts eccentrically.

In most applications, combinations of these possible forces occur.

The resulting total forces must always be less than the relevant permissible values.

The actual forces are used for the lifetime calculation.

Force determination on the roller guide



Force direction F_y
F_y is absorbed by two rollers

Force direction F_z
F_z+ and F_z- is absorbed by four rollers
(Beta 50: two rollers for F_z)

Moment M_x
M_x is absorbed by two rollers in each case

Moment M_y
M_y is absorbed by two rollers in each case

Moment M_z
M_z is absorbed by two rollers in each case

$F_r = F_y \times 0.5$

$F_r = F_z \times 0.25$

$F_r = M_x / l_y \times 0.5$

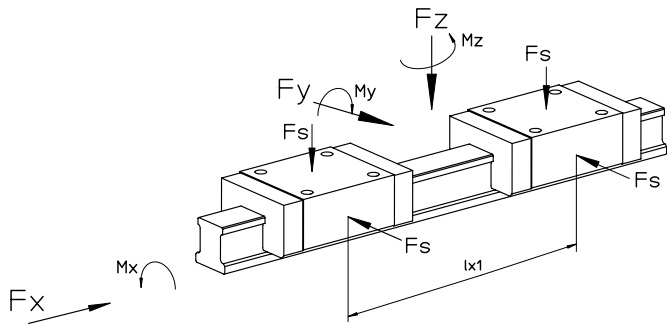
$F_r = M_y / l_{x2} \times 0.5$

$F_r = M_z / l_{x1} \cdot x\ 1$

Definitions:

F_x	Force in feed direction
F_y	Force in Y direction
F_z	Force in Z direction
M_x	Moment about longitudinal axis (X)
M_y	Moment about transverse axis (Y)
M_z	Moment about vertical axis (Z)
F_r	Force on the roller
l_y	Guide distance in y direction (see "Technical data" table for installed guide)
l_{x1}	Side roller guide distance in x direction (see "Technical data" table for installed guide)
l_{x2}	Vertical roller guide distance in x direction (see "Technical data" table for installed guide)

Force determination on the single rail guide



Force direction F_y
F_y is absorbed by two slides

$F_s = F_y \times 0.5$

Force direction F_z
F_z is absorbed by two slides

$F_s = F_z \times 0.5$

Moment M_x
M_x is absorbed by two slides
with combined external load (F_z and F_y)
in conjunction with a torsion moment

$F_s = |F_z| + |F_y| + C \times (|M_x| / M_t) \times 0.5$

Moment M_y
M_y is absorbed by two slides
(with opposing force direction)

$F_s = M_y / lx1 \times 1$

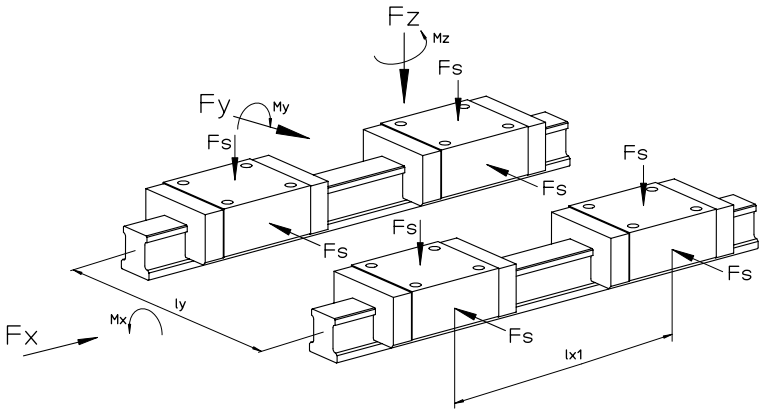
Moment M_z
M_z is absorbed by two slides
(with opposing force direction)

$F_s = M_z / lx1 \times 1$

Definitions:

- F_x Force in feed direction
- F_y Force in Y direction
- F_z Force in Z direction
- M_x Moment about longitudinal axis (X)
- M_y Moment about transverse axis (Y)
- M_t Permissible dynamic moment of carriage on guide (see "Technical data" table for installed guide)
- C Dynamic basic load rating (C_{dyn}) of carriage on guide (see "Technical data" table for installed guide)
- F_s Force on a slide
- l_{x1} Guide distance in x direction (see "Technical data" table for installed guide)

Force determination on the double rail guide



Force direction F_y
F_y is absorbed by four slides

$F_s = F_y \times 0.25$

Force direction F_z
F_z is absorbed by four slides

$F_s = F_z \times 0.25$

Moment M_x
M_x is absorbed by four slides
(two sets of two with opposing force direction)

$F_s = M_x / l_y \times 0.5$

Moment M_y
M_y is absorbed by four slides
(two sets of two with opposing force direction)

$F_s = M_y / l_{x1} \times 0.5$

Moment M_z
M_z is absorbed by four slides
(two sets of two with opposing force direction)

$F_s = M_z / l_{x1} \times 0.5$

Definitions:

- F_x Force in feed direction
- F_y Force in Y direction
- F_z Force in Z direction
- M_x Moment about longitudinal axis (X)
- M_y Moment about transverse axis (Y)
- M_z Moment about vertical axis (Z)
- F_s Force on a slide
- l_y Guide distance in y direction (see "Technical data" table for installed guide)
- l_{x1} Guide distance in x direction (see "Technical data" table for installed guide)

Life-time calculation for roller, profiled rail guide and ball-screw spindle drive

The estimated nominal lifetime is primarily based on the linear axis guide calculation. For drives with a ball screw spindle, the ball-screw spindle drive must also be calculated.

Because of the number of parameters that have an influence on the lifetime of the overall linear axis (forces and moments taking into account directions and any combinations lead to an average load (Fm); ambient conditions, on time, etc.), the following simplified formulae can only be used to obtain an initial estimate.

1. Average load on guide or ball-screw spindle drive

$$F_m = (F_1^3 \times q_1 / 100 + F_2^3 \times q_2 / 100 + F_n^{3\,2} q_n / 100)^{1/3}$$

2. Nominal lifetime of roller guide

$$L = (C / F)^3 \times 10^5 \times R$$

$$F = F_m + F_V$$

3. Nominal lifetime of rail guide

$$L = (C / F)^3 \times 10^5$$

$$F = F_m + F_V$$

4. Nominal lifetime of ball-screw spindle drive

$$L_{KGT} = (C_{KGT} / F)^3 \times 10^6$$

$$F = F_m + F_V \text{ } (F_V \text{ for double nut (MM) only; approx. 10 \%})$$

Definitions

F_m	Average load **[N]** on guide or ball-screw spindle drive
F_1, F_2, F_n	Graduated individual load **[N]**
q_1, q_2, q_n	Proportion of travel forF_1, F_2, F_n [%]
L	Nominal lifetime of guide **[m]**
C	Dynamic basic load rating of guide **[N]** (C_{dyn}) (see "Technical data" table for installed guide)
R	Factor for roller guide size: Beta 50 ... Beta 80: R = 0.625 Beta 100 + 110: R = 0.87 Beta 140 + 180: R = 1.1
F	Equivalent load **[N]** on guide or ball-screw spindle drive
F_V	Initial tension **[N]** (8 % or 2 % of C_{dyn}, (see "Technical data" table for installed guide) 5 % for roller guide)
L_{KGT}	Nominal lifetime of ball-screw spindle drive [revolutions]
C_{KGT}	Dynamic basic load rating of ball-screw spindle drive **(C_{dyn}) [N]** (see "Technical data" table for installed guide)

Maintenance information

Maintenance information for profiled rail guide

The recirculating ball-bearing slide should be lubricated with a rolling contact bearing grease every 5000 km. The initial lubrication is carried out with Klüberplex BE 31-102.
Refer to our relevant assembly and maintenance instructions.

Maintenance information for roller guide

The tracks of the roller guide should be oiled every 2000 km. This is done in the factory using Febis K68 or INTERFLOW fin super oil.
Refer to our relevant assembly and maintenance instructions.

Maintenance information for ball-screw spindle drive

The ball-screw spindle drive should be lubricated with a standard rolling contact bearing grease every 5000 km. The initial lubrication is carried out with Klüberplex BE 31-102.
Ball-screw spindles should generally be protected against contamination. This can either be done using a cover tape or a bellow.
Refer to our relevant assembly and maintenance instructions.

Other maintenance information

The lubrication interval depends on many factors, such as the degree of contamination, operating temperature, load, etc. Therefore, the specifications here are only intended as guidelines.
Caution: Basic lubrication by the customer is essential after commissioning.
All installed ball bearings are sealed and maintenance free.
The toothed belt is also maintenance free and only needs to be replaced if an excessive load has led to a breakage or to expansion outside the elastic range.
Excessive dust and dirt on the toothed belt and cover tape should be removed regularly.

Technical data for installed guides

Static and dynamic basic load ratings for roller guides

Size	Size	Number of supporting rollers for	Number of supporting rollers for	Basic load rating per roller	Basic load rating per roller	Guide spacing* in x direction		Guide spacing in y direction
	[mm]	F_z	F_y	C_{stat} [N]	C_{dyn} [N]	l_{x1} [mm]	l_{x2} [mm]	l_y [mm]
Beta								
B 50C	20	4	2	600	1500	86 (136)	86 (136)	30.5
B 70C	20	4	2	600	1500	74 (124)	138.5 (188)	41
B 80	20	4	2	600	1500	95 (155)	156.5 (216)	41.5
B 100	28	4	2	1300	3200	136 (256)	223 (343)	47
B 110	28	4	2	1300	3200	175 (355)	262 (424)	66
B 120	35	4	2	3000	6800	148 (328)	148 (328)	70
B 140	35	4	2	3000	6800	202 (352)	202 (389)	98
B 180	35	4	2	3000	6800	272 (492)	272 (492)	121
B 180C	47	4	2	6550	13500	224 (444)	224 (444)	125

ⓘ The initial tension for each roller is approx. 5 %.

* Values in brackets () relate to the long standard slide plate

Dynamic basic load ratings for profiled rail guides

Size	Size	Number of rails	Number of carriages	Basic load rating per carriage	Initial tension	Maximum moment over longitudinal axis x	Carriage spacing* in x direction	Guide spacing in y direction
Beta				C_{dyn} [N]	F_V [%]	M_t [Nm]	l_{x1} [mm]	l_y [mm]
B 40	12	1	2	1205	-	14	83 (163)	-
B 60	15	1	2	7800	8	74	106 (156)	-
B 70	15	1	2	7800	8	74	124 (174)	-
B 80	20	1	2	18800	8	240	128 (188)	-
B 80C	25	1	2	22800	8	320	122 (182)	-
B 100	20	1	2	18800	8	240	152 (272)	-
B 100D-ZSS	15	2	4	7800	8	-	150 (210)	56
B 100D-ASS	15	2	4	7800	8	-	192	56
B 100D-SSS	15	2	4	7800	8	-	150 (210)	56
B 110	25	1	2	22800	8	320	203 (383)	-
B 120	25	1	2	22800	8	320	144 (324)	-
B 140	15	2	4	7800	8	-	180 (330)	72
B 140C-ZSS	20	2	4	18800	8	-	220 (400)	76
B 140C-ASS	20	2	4	18800	8	-	300	76
B 140C-SSS	20	2	4	18800	8	-	210 (360)	76
B 165-ZSS	35	1	2	41900	8	890	198 (398)	-
B 165-SSS	35	1	2	41900	8	890	219 (329)	-
B 180-ZSS	20	2	4	18800	8	-	172 (392)	84
B 180-AZS	20	2	8	18800	8	-	430	84
B 180-ASS	20	2	4	18800	8	-	306	84
B 180-SSS	20	2	4	18800	8	-	247 (467)	84
B 180C-ZSS	25	2	4	22800	8	-	272 (492)	84
B 180C-ASS	25	2	4	22800	8	-	307	84
B 180C-SSS	25	2	4	22800	8	-	233 (453)	84
Delta								
D 110	15	2	4	7800	8	-	90 (210)	66
D 145	20	2	4	18800	8	-	114 (234)	87
D 200	25	2	4	22800	8	-	144 (294)	126
D 240	25	2	4	22800	8	-	200 (320)	150
Alpha								
A 15B	15	2	4	7800	8	-	94 (164)	105
A 20B	20	2	4	18800	8	-	143 (243)	160
A 30B	30	2	4	31700	8	-	205 (335)	240
A 35B	35	2	4	55600	8	-	286 (436)	340

* Values in brackets () relate to the long standard slide plate

Technical data for installed ball-screw spindle drives

Dynamic basic load ratings for ball-screw spindle drives

Size			Nominal diameter [mm]	Pitch [mm]	Basic load rating per guide carriage C_{dyn} [N]
B 40			12	4	3400
B 50C				5	4400
B 70	D 110		16	5	9300
B 70C				10	15400
				20	7450
B 60		A 15B	20	5	10500
B 80				20	11600
B 100D				50	13000
B 110	D 145	A 20B	25	5	12300
B 140				10	13200
B 140C				25	16700
				50	15400
B 180	D 200	A 30B	32	5	21500
				10	26000
B 180C	D240			20	29700
				32 (A 30B only)	19500
				40	14900
B 165		A 35B	40	5	23800
				10	38000
				20	33300
				40	35000

(Dynamic basic load rating for ball-screw spindle nut complies with DIN 69051, 1989)