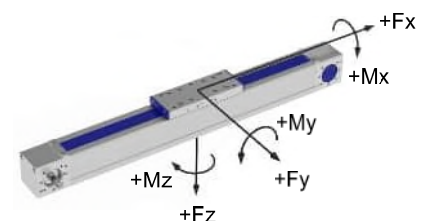


Performance Overview of Portal Linear Drives with Toothed Belt Drive or Rack-and-Pinion Drive

HS-gamma®
HS-sigma®

Description	Toothed belt/ Rack and pinion	F _x [N]	F _y [N]	F _z [N]	-F _z [N]	M _x [Nm]	M _y [Nm]	M _z [Nm]	M _{leer} [Nm]	d _s [mm]	S _{max} [mm]	L _{max} [mm]
Gamma 90-ZSS	32 AT10	2300	2500	3000	3000	500	1200	1000	3.2	0.08	7650	8100
Gamma 90-ZSSD	2 x 16 AT10	1150	2500	3000	3000	500	800	700	2.9	0.08	7560	8100
Gamma 90-ASH	32 AT10-E	2300	2500	3000	3000	500	2300	1900	3.2	0.08	7560	8000
Gamma 90-AZ..	M2	1300 - 1800	3000	3000	3000	600	1800	1800	2.5	0.05	7600	8000
Gamma 120-ZSS	40 AT10-E	2800	6000	8000	8000	1200	3000	2500	3.00	0.08	7685	8200
Gamma 120-ZSSD	2 x 25 ATL10	1800	6000	8000	8000	1200	1300	1100	3.00	0.08	7638	8200
Gamma 120-ASH	40 AT10-E	3200	6000	8000	8000	1200	5000	4200	3.6	0.08	7450	8000
Gamma 120-AZ..	M 2	1500 - 2200	8000	8000	8000	1500	4000	4000	4.8	0.05	7470	8000
Gamma 160-ZSS	50 ATL10	4000	10000	16000	16000	1800	5000	4000	4.00	0.08	7580	8200
Gamma 160-ZSSD	2 x 32 AT10	2200	10000	16000	16000	1800	5000	4000	4.00	0.08	7250	8200
Gamma 160-ASH	50 AT10-E	4000	10000	16000	16000	1800	8000	7000	4.00	0.08	7350	8000
Gamma 160-AZ..	M 2	1500 - 4000	12000	12000	12000	2500	7000	7000	5.8	0.05	7370	8000
Gamma 220-ZSS	75 ATL10	6000	12000	20000	20000	2500	8000	6500	7.00	0.08	7580	8260
Gamma 220-ZSSD	2 x 40 AT10	2800	12000	20000	20000	2500	8000	6500	5.25	0.08	7220	8220
Gamma 220-ASS	75 AT10-E	6000	12000	20000	20000	2500	12000	10000	7.00	0.08	7400	8020
Gamma 220-AZ..	M 2	3000 - 6000	20000	20000	20000	4000	8000	8000	7.2	0.05	7340	8020
Gamma 220-AZ..	M 3	3000 - 7500	20000	20000	20000	4000	8000	8000	7.2	0.05	7340	8020
Gamma 280-ZSS	75 ATS15	10000	20000	30000	30000	4000	15000	12000	11.00	0.08	7450	8370
Gamma 280-ZSSD	2 x 50 ATL10	4000	20000	30000	30000	4000	15000	12000	11.00	0.08	7010	8270
Gamma 280-AZ..	M 3	3000 - 7500	25000	25000	25000	8000	16000	16000	8.6	0.05	7250	8030
Sigma 70-ZRS	25 AT5-E	1050	1350	1850	1200	50	70	80	0.85	0.08	7805	8100
Sigma 70-ARH	25 AT5-E	1050	1350	1850	1200	50	120	110	0.85	0.08	7700	8000
Sigma 70-ARS	25 AT5-E	1050	1350	1850	1200	50	70	80	0.85	0.08	7775	8000
Sigma 90-ZRS	32 AT5-E	1300	2000	2500	1500	120	160	150	3.2	0.08	7760	8100
Sigma 90-ZRSD	2 x 16 AT5-E	650	2000	2500	1500	120	160	150	3.2	0.08	7595	8100
Sigma 90-ARH	32 AT5-E	1300	2000	2500	1500	120	230	200	2.3	0.08	7745	8000
Sigma 90-ARS	32 AT5-E	1300	2000	2500	1500	120	160	150	2.3	0.08	7740	8000
Sigma 120-ZRS	40 AT10-E	2800	2300	3000	1800	170	270	270	3.00	0.08	7660	8100
Sigma 120-ZRSD	2 x 25 ATL10	1800	2300	3000	1800	170	270	270	3.00	0.08	7420	8100
Sigma 120-ARH	40 AT10-E	3200	2300	3000	1800	170	400	400	3.8	0.08	7510	8000
Sigma 120-ARS	40 AT10-E	3200	2300	3000	1800	170	270	270	3.8	0.08	7600	8000
Sigma 160-ZRS	50 ATL10	4000	4500	6000	4000	500	700	700	4.00	0.08	5570	6100
Sigma 160-ZRSD	2 x 32 AT10	2300	4500	6000	4000	500	700	700	3.5	0.08	5300	6100
Sigma 160-ARH	50 AT10-E	4000	4500	6000	4000	500	1000	1000	4.2	0.08	5430	6000
Sigma 160-ARS	50 AT10-E	4000	4500	6000	4000	500	700	700	4.2	0.08	5580	6000

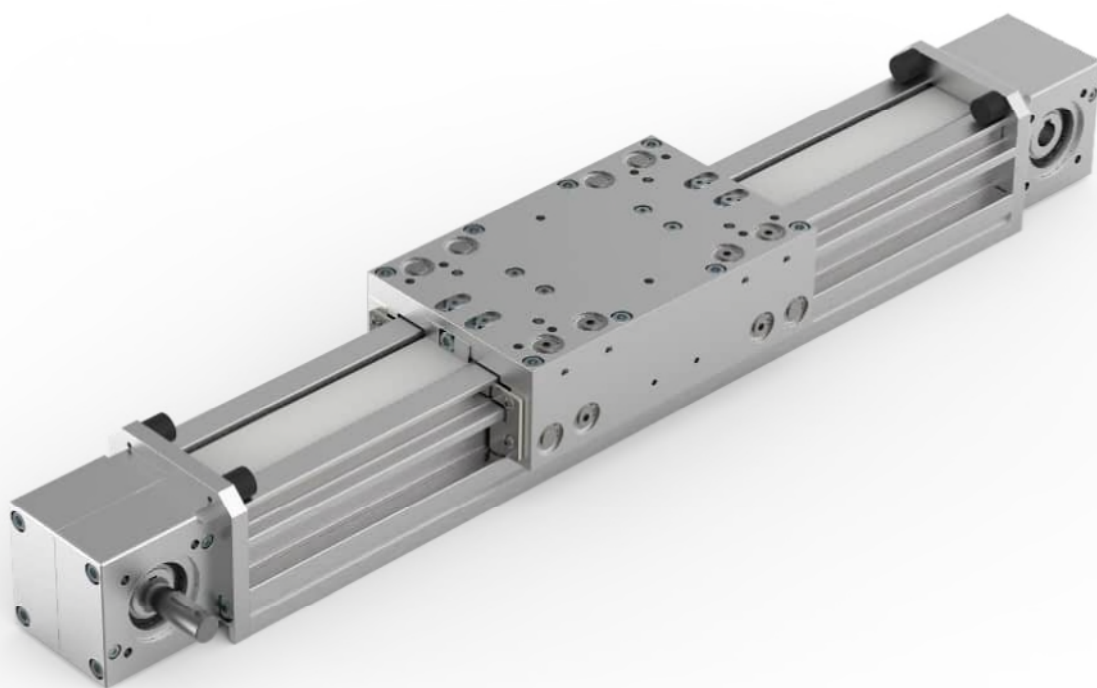
- M_{idle} = Idle torque ±30 %
d_s = Repeat accuracy ±
S_{max} = Maximum standard stroke length (longer on request)
L_{max} = Maximum standard length (longer on request)



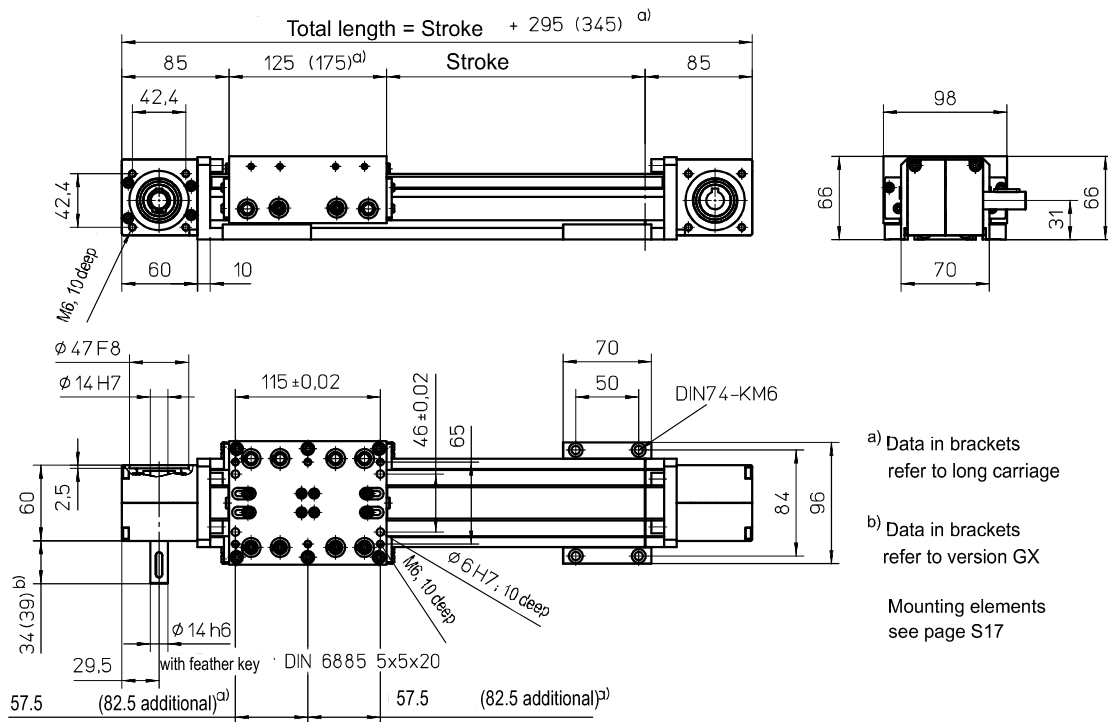
Chapter S

Portal Linear Drive

HSB-sigma[®]



with toothed belt drive and roller guide (ZRS)



Weights

ZRS

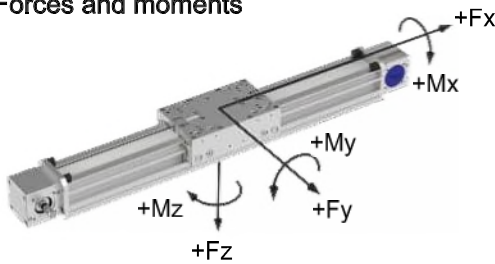
Basic length without stroke:	3.05 kg
100 mm stroke:	0.40 kg
Entire carriage 125 mm:	1.20 kg
Entire carriage 175 mm:	1.35 kg
Max. total length: (longer on request)	8100 mm

Technical Data

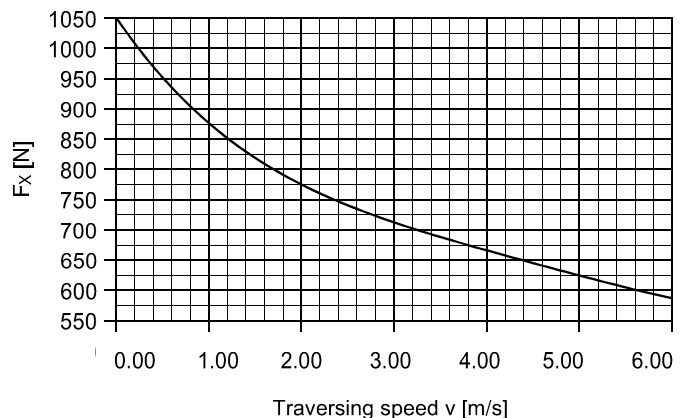
ZRS

Max. speed:	6.25 m/s
Max. acceleration:	60 m/s ²
Repeat accuracy:	± 0.08 mm
Idle torque:	0.85 Nm
Moment of inertia:	6.70 · 10 ⁻⁴ kgm ²
Drive element:	Toothed belt 25 AT5-E
Stroke per revolution:	125 mm

Forces and moments



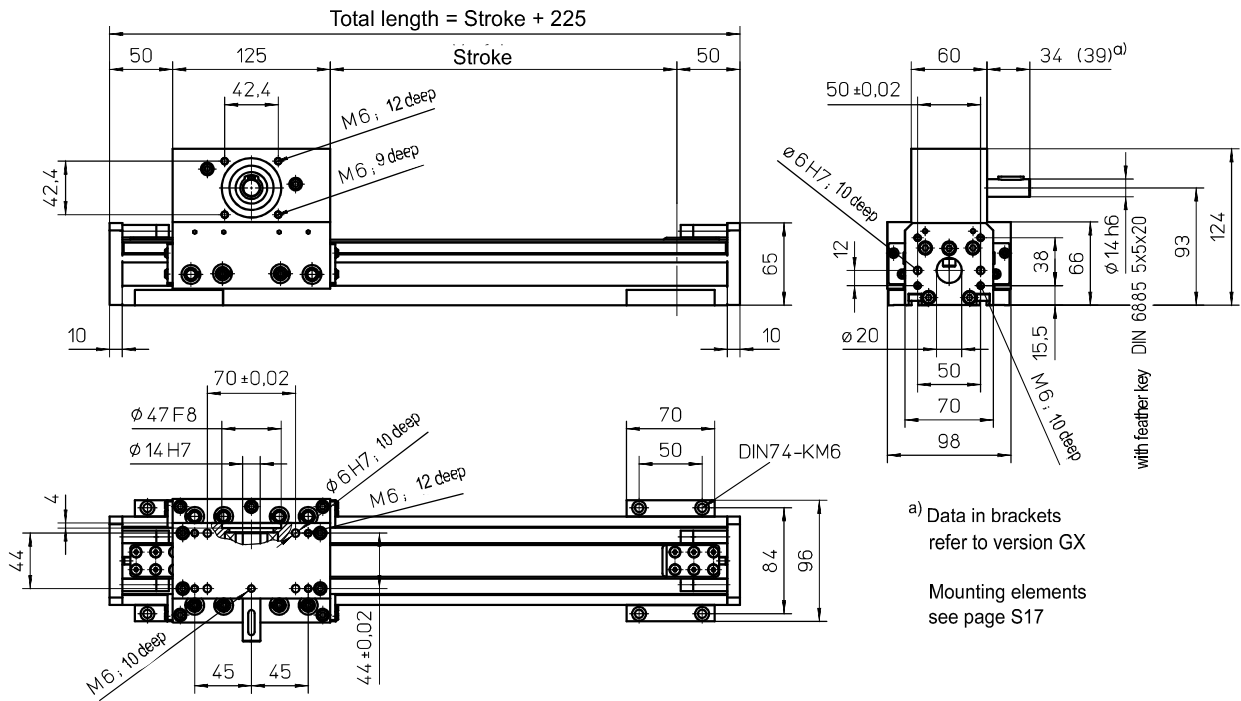
F_x - v - Diagram



ZRS	
Forces	Dynamic [N]
F _x ^{c)}	1050
F _y	1350
F _z	1850
-F _z	1200
Moments	Dynamic [Nm]
M _x	50
M _y	70 (120)
M _z	80 (110)

c) Maximum value (see diagram „F_x-v-Diagram“)
Data in brackets refer to long carriage (175)

with toothed belt drive and roller guide (ARS)



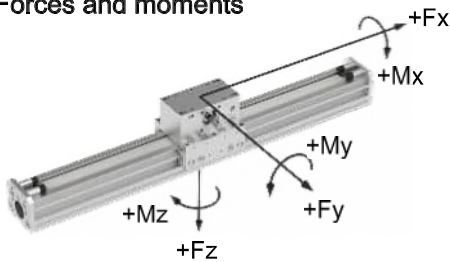
Weights ARS

Basic length without stroke:	3.50 kg
100 mm stroke:	0.40 kg
Entire carriage 125 mm:	2.30 kg
Max. total length:	8000 mm
(longer on request)	

Technical Data ARS

Max. speed:	6.25 m/s
Max. acceleration:	60 m/s ²
Repeat accuracy:	± 0.08 mm
Idle torque:	0.85 Nm
Moment of inertia:	5.37 • 10 ⁻⁵ kgm ²
(rotatory)	
Drive element:	Toothed belt 25 AT5-E
Stroke per revolution:	125 mm

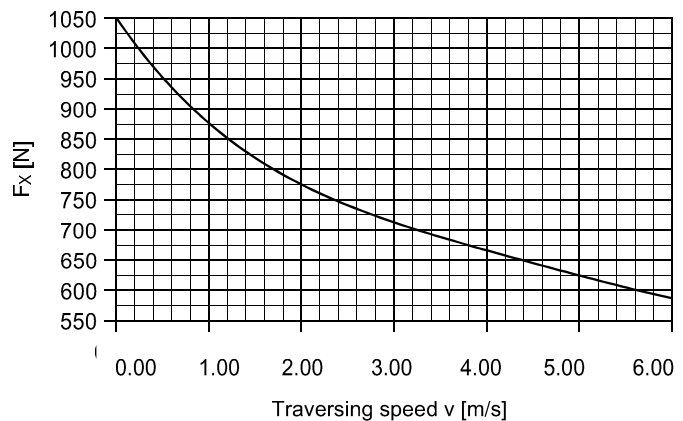
Forces and moments



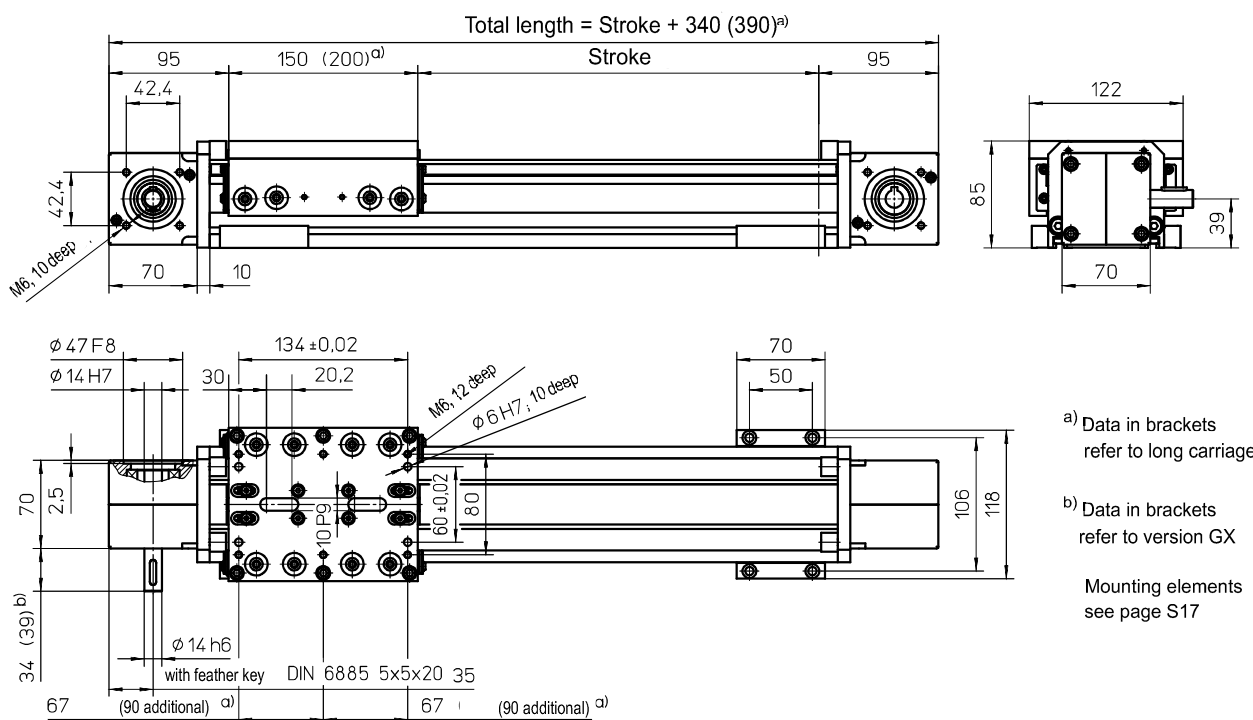
ARS	
Forces	Dynamic [N]
F _x ^{c)}	1050
F _y	1350
F _z	1850
-F _z	1200
Moments	Dynamic [Nm]
M _x	50
M _y	70
M _z	80

^{c)} Maximum value (see diagram „FX-v-Diagram“)

FX - v - Diagram



with toothed belt drive and roller guide (ZRS)



Weights

ZRS

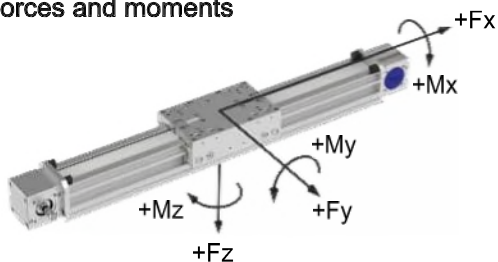
Basic length without stroke:	5.10 kg
100 mm stroke:	0.65 kg
Entire carriage 150 mm:	2.00 kg
Entire carriage 200 mm:	2.40 kg
Max. total length: (longer on request)	8100 mm

Technical Data

ZRS

Max. speed:	8.00 m/s
Max. acceleration:	60 m/s ²
Repeat accuracy:	±0.08 mm
Idle torque:	3.20 Nm
Moment of inertia:	2.10 · 10 ⁻³ kgm ²
Drive element:	Toothed belt 32 AT5-E
Stroke per revolution:	175 mm

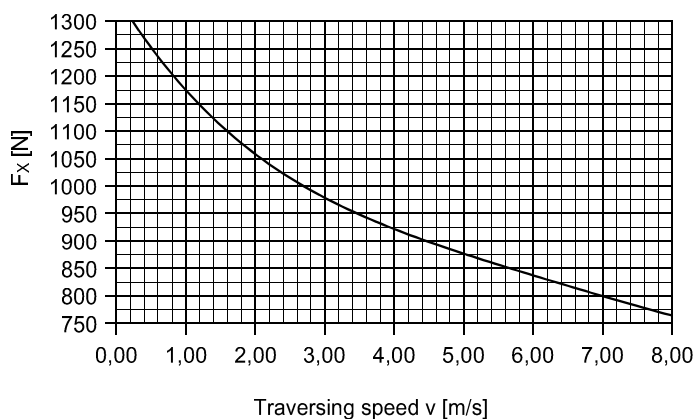
Forces and moments



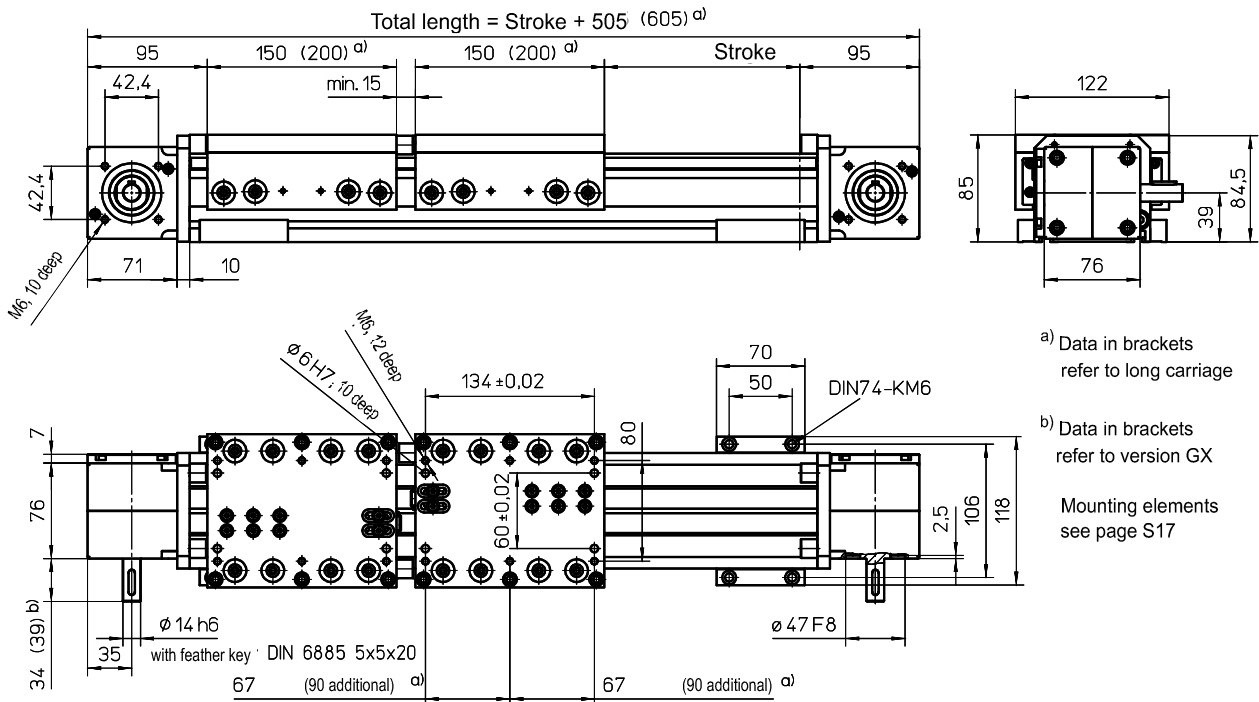
ZRS	
Forces	Dynamic [N]
$F_x^{c)}$	1300
F_y	2000
F_z	2500
$-F_z$	1500
Moments	Dynamic [Nm]
M_x	120
M_y	160 (230)
M_z	150 (200)

^{c)} Maximum value (see diagram „ F_x -v-Diagram“)
Data in brackets refer to long carriage (200)

F_x - v - Diagram



with toothed belt drive and roller guide and a second independently travelling carriage (ZRSD)



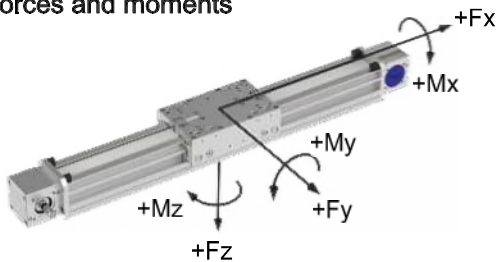
Weights

	ZRSD
Basic length without stroke:	8.40 kg
100 mm stroke:	0.65 kg
Entire carriage 150 mm:	1.80 kg
Entire carriage 200 mm:	2.15 kg
Max. total length: (longer on request)	8100 mm

Technical Data

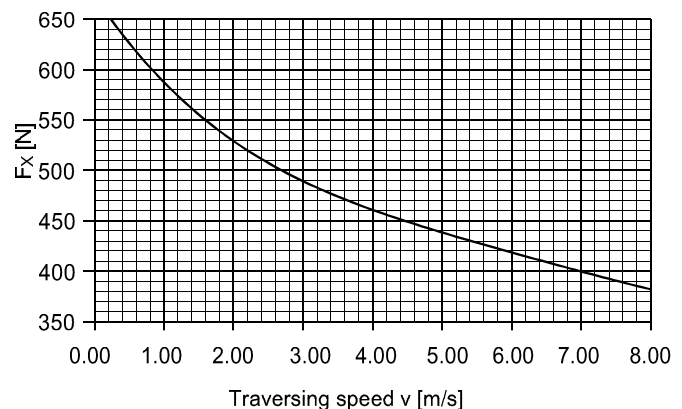
	ZRSD
Max. speed:	8.00 m/s
Max. acceleration:	60 m/s ²
Repeat accuracy:	±0.08 mm
Idle torque:	3.20 Nm
Moment of inertia:	1.70 · 10 ⁻³ kgm ²
Drive element:	2 x Toothed belt 16 AT5-E
Stroke per revolution:	175 mm

Forces and moments



ZRSD	
Forces	Dynamic [N]
$F_x^c)$	650
F_y	2000
F_z	2500
$-F_z$	1500
Moments	Dynamic [Nm]
M_x	120
M_y	160 (230)
M_z	150 (200)

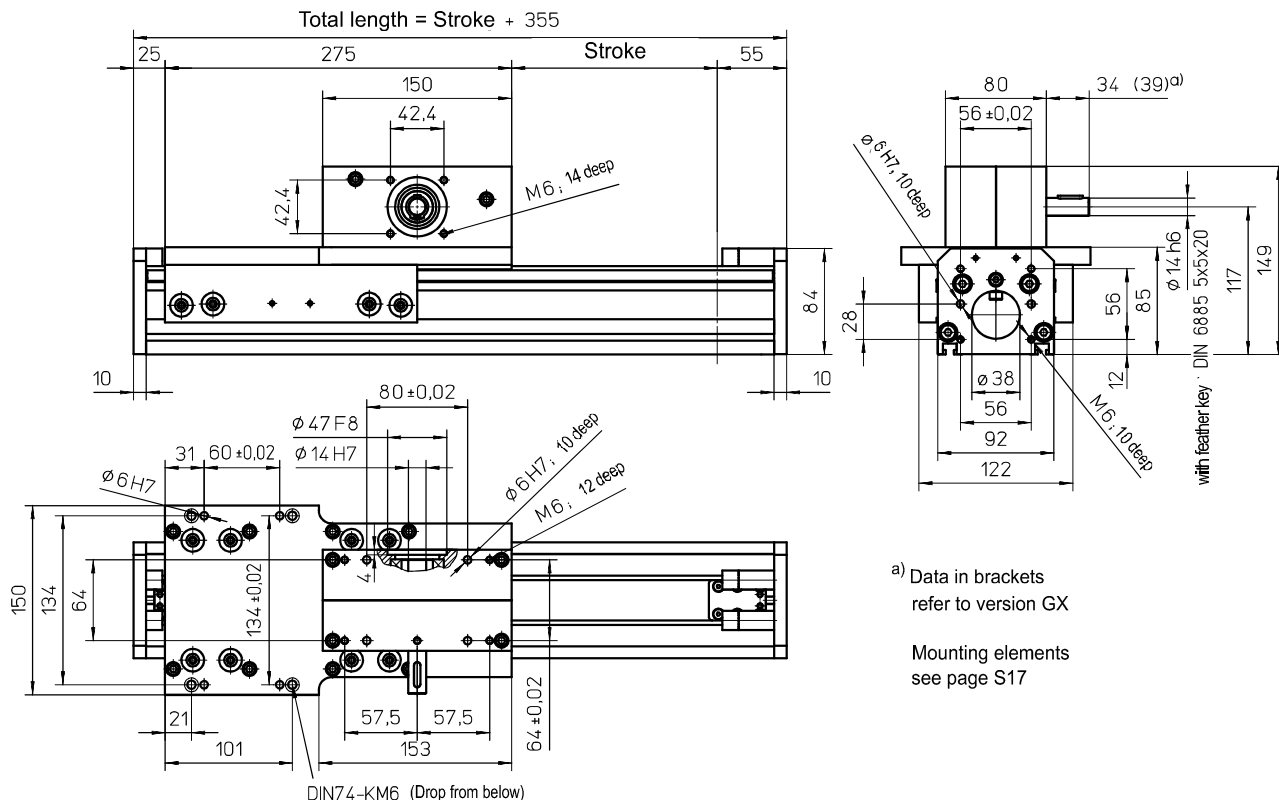
$F_x - v$ - Diagram



c) Maximum value (see diagram „ $F_x - v$ -Diagram“)
Data in brackets refer to long carriage (200)

These data apply to each carriage.

with toothed belt drive and roller guide (ARH)



a) Data in brackets refer to version GX

Mounting elements see page S17

Weights

ARH

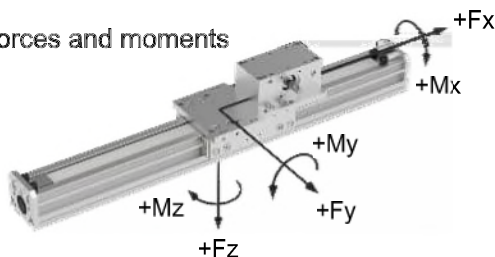
Basic length without stroke:	7.20 kg
100 mm stroke:	0.64 kg
Entire carriage 275 mm:	4.45 kg
Max. total length: (longer on request)	8000 mm

Technical Data

ARH

Max. speed:	7.0 m/s
Max. acceleration:	60 m/s ²
Repeat accuracy:	±0.08 mm
Idle torque:	2.30 Nm
Moment of inertia: (rotatory)	1.27 · 10 ⁻⁴ kgm ²
Drive element:	Toothed belt 32 AT5-E
Stroke per revolution:	150 mm

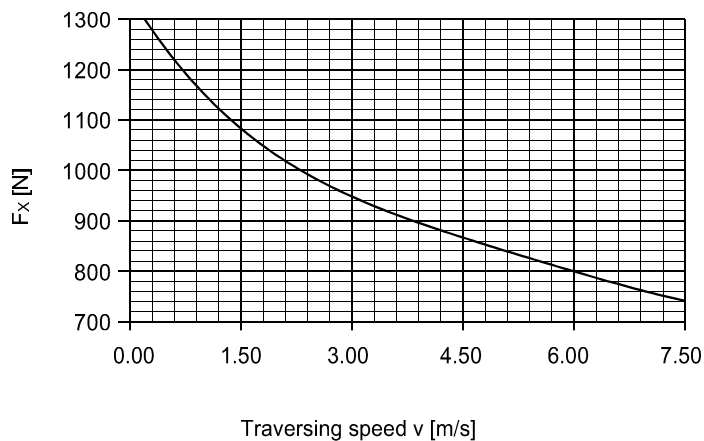
Forces and moments



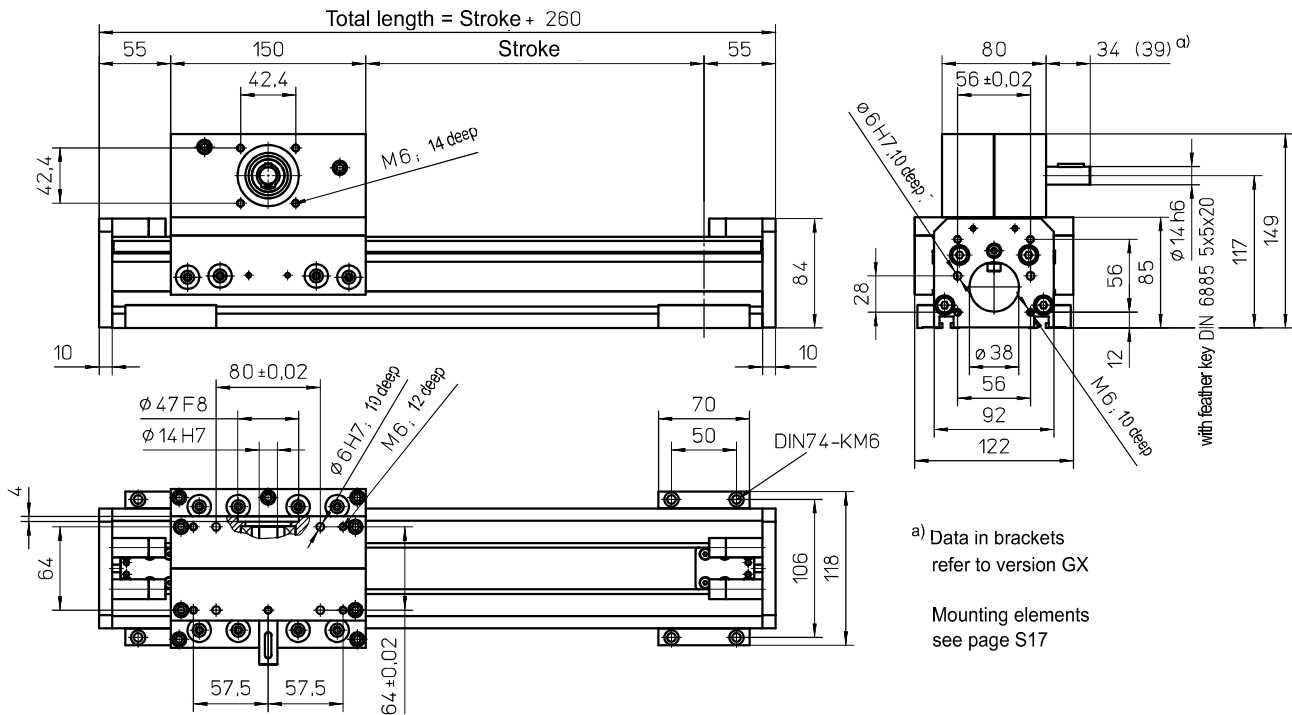
ARH	
Forces	Dynamic [N]
$F_x^{b)}$	1300
F_y	2000
F_z	2500
$-F_z$	1500
Moments	Dynamic [Nm]
M_x	120
M_y	230
M_z	200

b) Maximum value (see diagram „Fx-v-Diagram“)

F_x - v - Diagram



with toothed belt drive and roller guide (ARS)



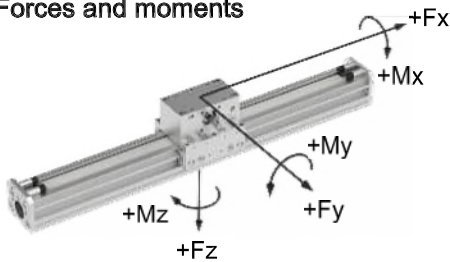
Weights ARS

Basic length without stroke:	5.75 kg
100 mm stroke:	0.64 kg
Entire carriage 150 mm:	3.60 kg
Max. total length: (longer on request)	8000 mm

Technical Data ARS

Max. speed:	7.50 m/s
Max. acceleration:	60 m/s ²
Repeat accuracy:	±0.08 mm
Idle torque:	2.30 Nm
Moment of inertia: (rotatory)	1.27 · 10 ⁻⁴ kgm ²
Drive element:	Toothed belt 32 AT5-E
Stroke per revolution:	150 mm

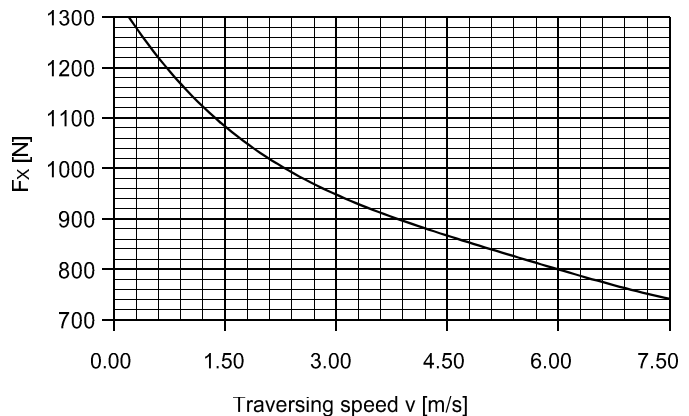
Forces and moments



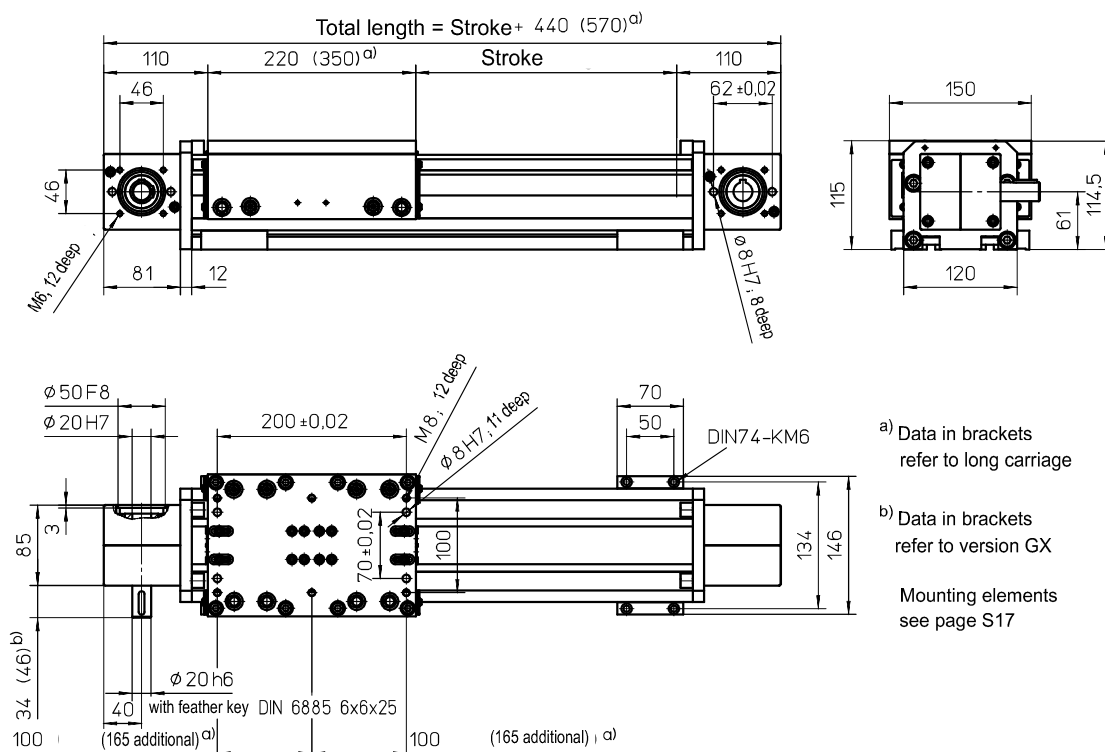
ARS	
Forces	Dynamic [N]
F _x ^{c)}	1300
F _y	2000
F _z	2500
-F _z	1500
Moments	Dynamic [Nm]
M _x	120
M _y	160
M _z	150

c) Maximum value (see diagram „F_x-v-Diagram“)

F_x - v - Diagram



with toothed belt drive and roller guide (ZRS)



a) Data in brackets refer to long carriage
 b) Data in brackets refer to version GX
 Mounting elements see page S17

Weights

ZRS

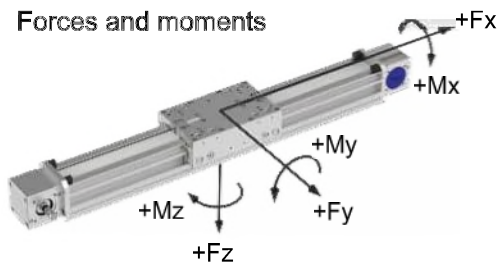
Basic length without stroke:	10.90 kg
100 mm stroke:	1.20 kg
Entire carriage 220 mm:	3.85 kg
Entire carriage 350 mm:	5.40 kg
Max. total length: (longer on request)	8100 mm

Technical Data

ZRS

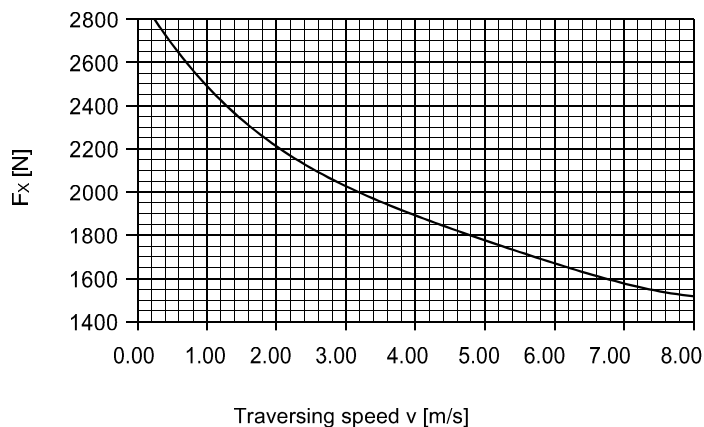
Max. speed:	8.00 m/s
Max. acceleration:	60 m/s ²
Repeat accuracy:	±0.08 mm
Idle torque:	3.00 Nm
Moment of inertia:	7.50 · 10 ⁻³ kgm ²
Drive element:	Toothed belt 40 AT10-E
Stroke per revolution:	200 mm

Forces and moments



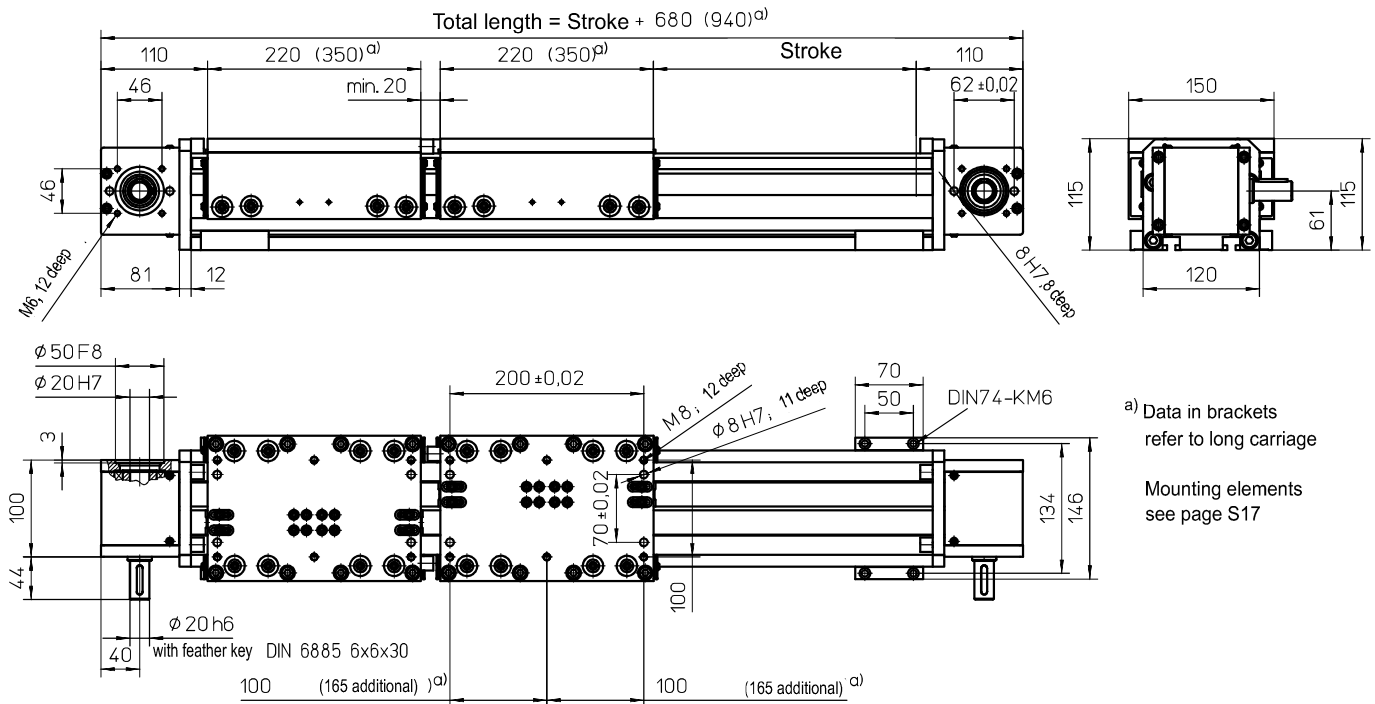
ZRS	
Forces	Dynamic [N]
$F_x^c)$	2800
F_y	2300
F_z	3000
$-F_z$	1800
Moments	Dynamic [Nm]
M_x	170
M_y	270 (400)
M_z	270 (400)

$F_x - v$ - Diagram



c) Maximum value (see diagram „ F_x-v -Diagram“)
 Data in brackets refer to long carriage (350)

with toothed belt drive and roller guide and a second independently travelling carriage (ZRSD)



Weights

ZRSD

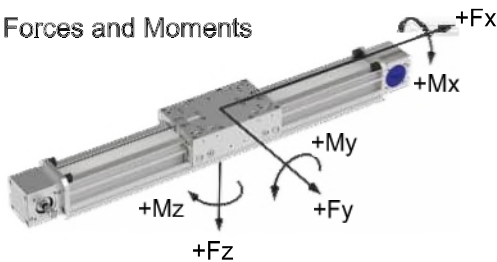
Basic length without stroke:	24.85 kg
100 mm stroke:	1.20 kg
Entire carriage 220 mm:	3.70 kg
Entire carriage 350 mm:	5.55 kg
Max. total length: (longer on request)	8100 mm

Technical Data

ZRSD

Max. speed:	8.00 m/s
Max. acceleration:	60 m/s ²
Repeat accuracy:	±0.08 mm
Idle torque:	3.00 Nm
Moment of inertia:	4.92 · 10 ⁻³ kgm ²
Drive element:	2 x Toothed belt 25 ATL10
Stroke per revolution:	200 mm

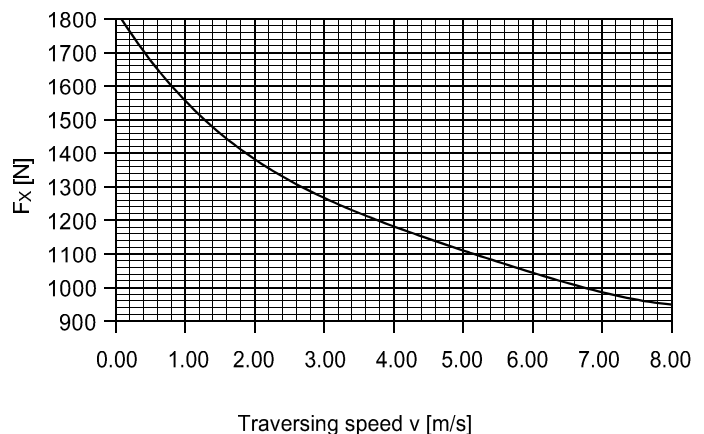
Forces and Moments



Forces	Dynamic [N]
$F_x^{b)}$	1800
F_y	2300
F_z	3000
$-F_z$	1800
Moments	Dynamic [Nm]
M_x	170
M_y	270 (400)
M_z	270 (400)

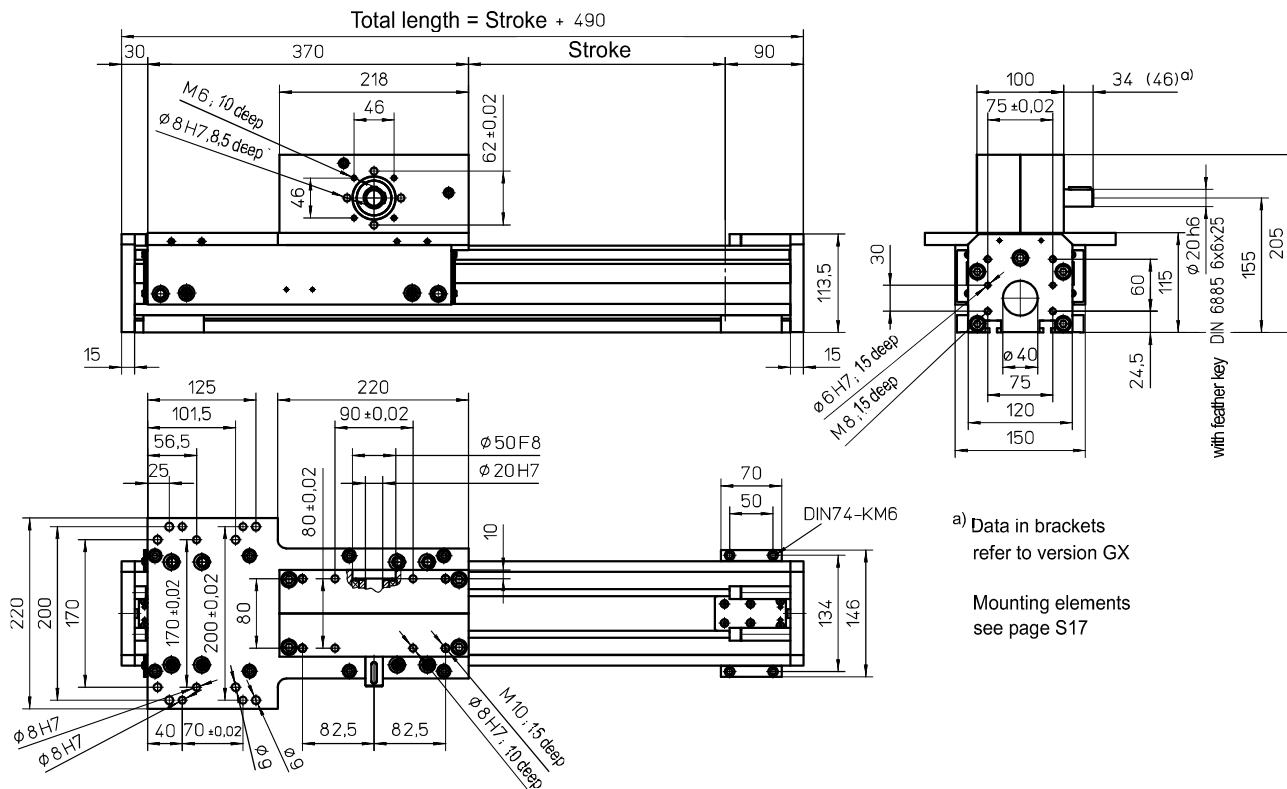
b) Maximum value (see diagram „Fx-v-Diagram“)
Data in brackets refer to long carriage (350)

F_x - v - Diagram



These data apply to each carriage.

with toothed belt drive and roller guide (ARH)



Weights

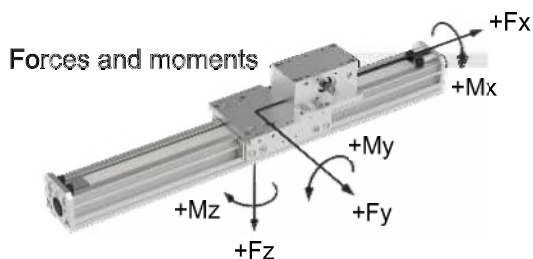
ARH

Basic length without stroke:	17.00 kg
100 mm stroke:	1.20 kg
Entire carriage 370 mm:	9.90 kg
Max. total length: (longer on request)	8000 mm

Technical Data

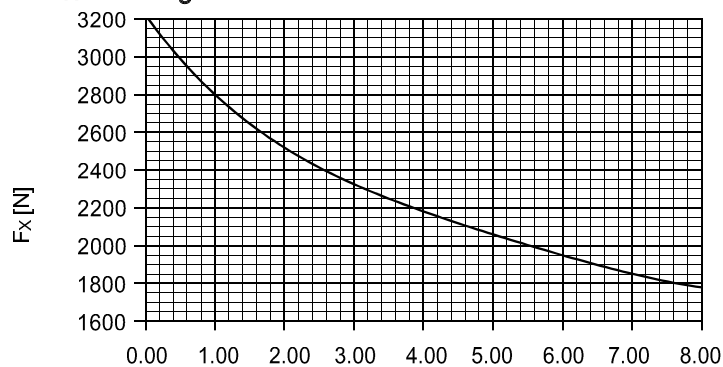
ARH

Max. speed:	8.00 m/s
Max. acceleration:	60 m/s ²
Repeat accuracy:	±0.08 mm
Idle torque:	3.80 Nm
Moment of inertia: (rotatory)	7.90 · 10 ⁻⁴ kgm ²
Drive element:	Toothed belt 40 AT10-E
Stroke per revolution:	240 mm



ARH	
Forces	Dynamic [N]
F _x ^{b)}	3200
F _y	2300
F _z	3000
-F _z	1800
Moments	Dynamic [Nm]
M _x	170
M _y	400
M _z	400

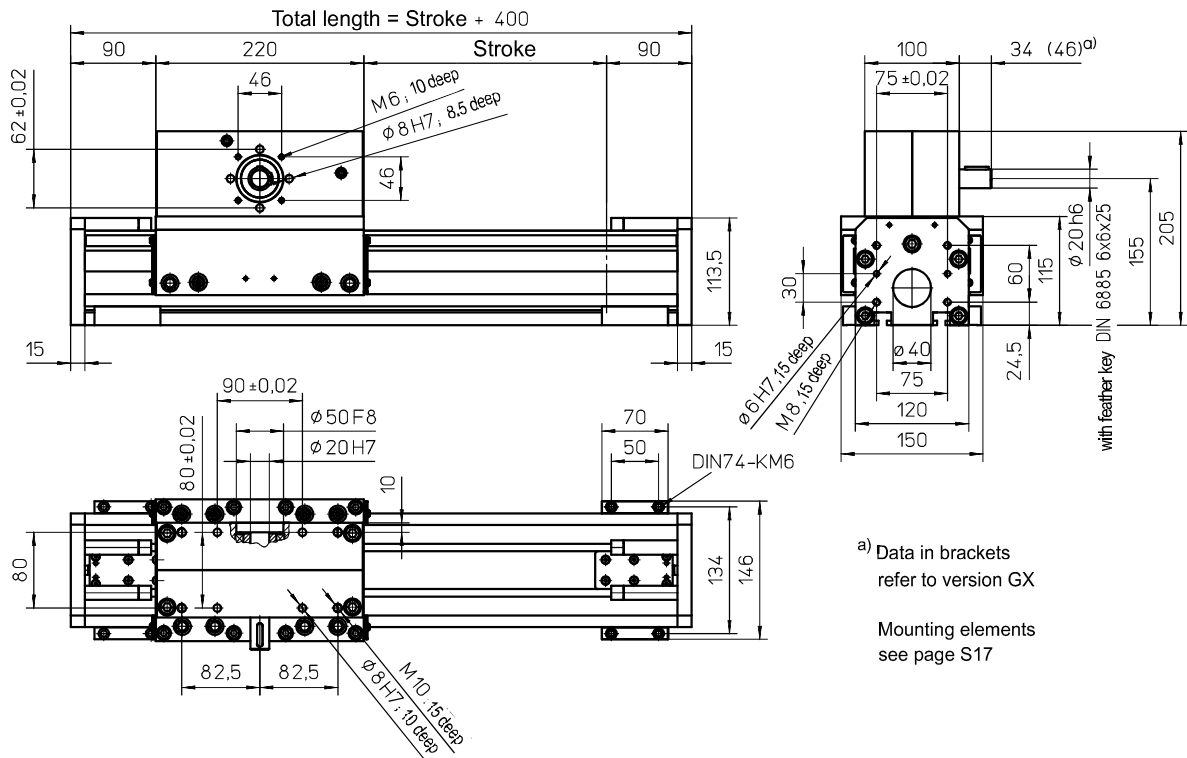
F_x - v - Diagram



^{b)} Maximum value (see diagram „F_x-v-Diagram“)

Traversing speed v [m/s]

with toothed belt drive and roller guide (ARS)



a) Data in brackets refer to version GX

Mounting elements see page S17

Weights

ARS

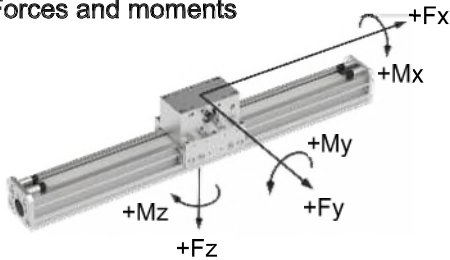
Basic length without stroke:	14.00 kg
100 mm stroke:	1.20 kg
Entire carriage 220 mm:	7.90 kg
Max. total length: (longer on request)	8000 mm

Technical Data

ARS

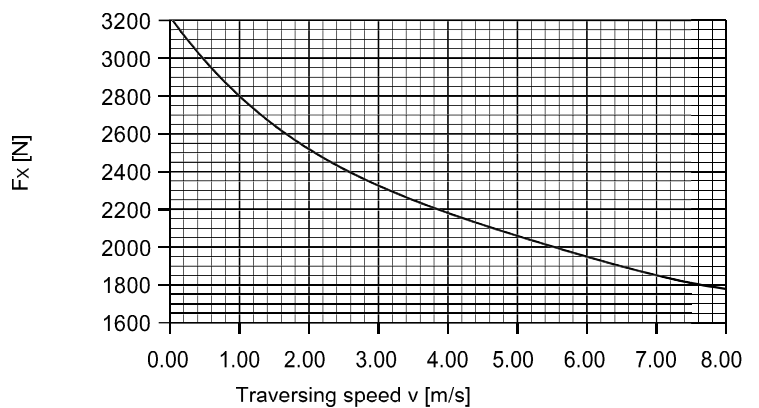
Max. speed:	8.00 m/s
Max. acceleration:	60 m/s ²
Repeat accuracy:	±0.08 mm
Idle torque:	3.80 Nm
Moment of inertia: (rotatory)	7.90 · 10 ⁻⁴ kgm ²
Drive element:	Toothed belt 40 AT10-E
Stroke per revolution:	240 mm

Forces and moments



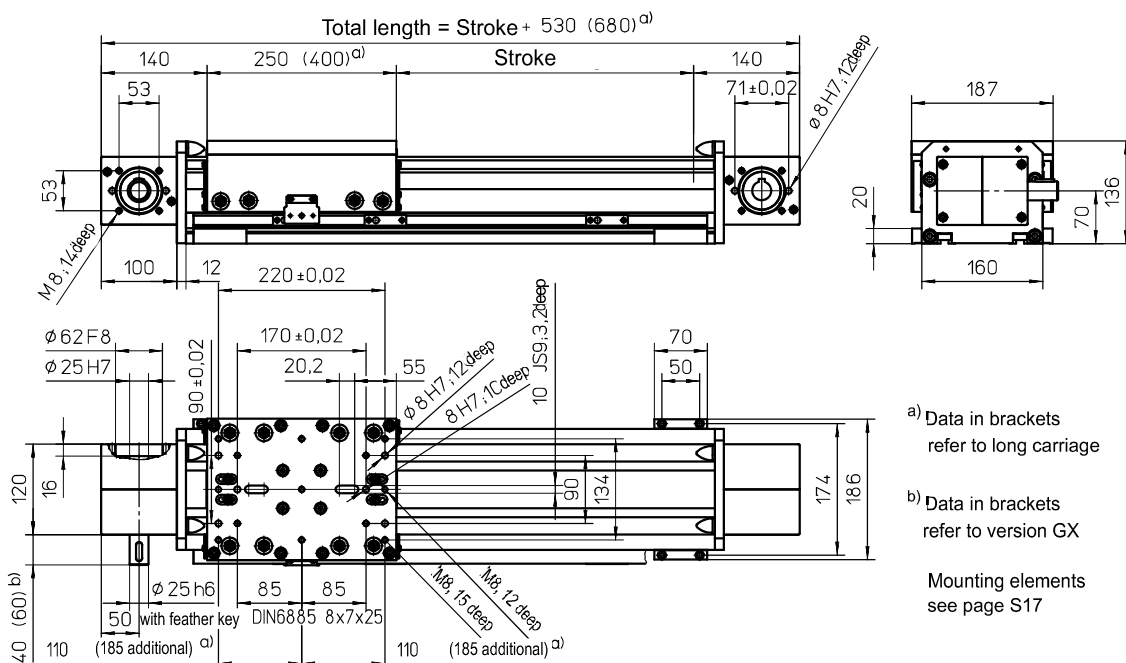
ARS	
Forces	Dynamic [N]
$F_x^{b)}$	3200
F_y	2300
F_z	3000
$-F_z$	1800
Moments	Dynamic [Nm]
M_x	170
M_y	270
M_z	270

$F_x - v$ - Diagram



b) Maximum value (see diagram „ F_x-v -Diagram“)

with toothed belt drive and roller guide (ZRS)



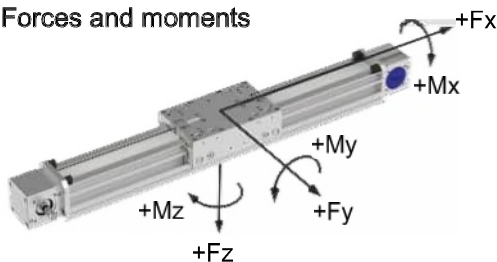
Weights ZRS

Basic length without stroke:	17.65 kg
100 mm stroke:	1.67 kg
Entire carriage 250:	5.95 kg
Entire carriage 400 mm:	8.75 kg
Max. total length: (longer on request)	6100 mm

Technical Data ZRS

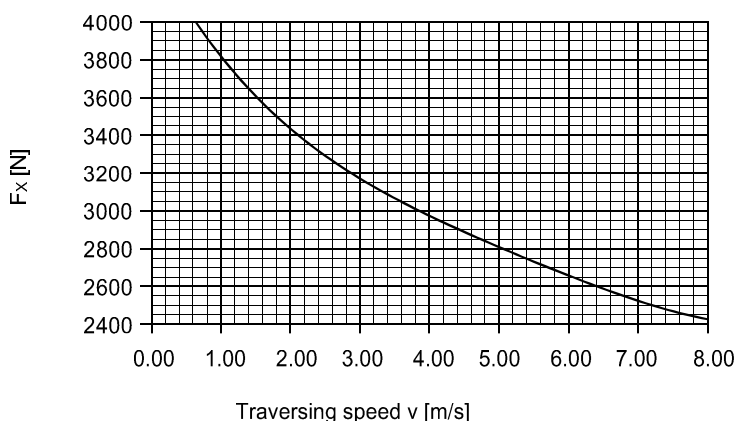
Max. speed:	8.00 m/s
Max. acceleration:	60 m/s ²
Repeat accuracy:	±0.08 mm
Idle torque:	4.00 Nm
Moment of inertia:	1.23 · 10 ⁻² kgm ²
Drive element:	Toothed belt 50 ATL10
Stroke per revolution:	240 mm

Forces and moments



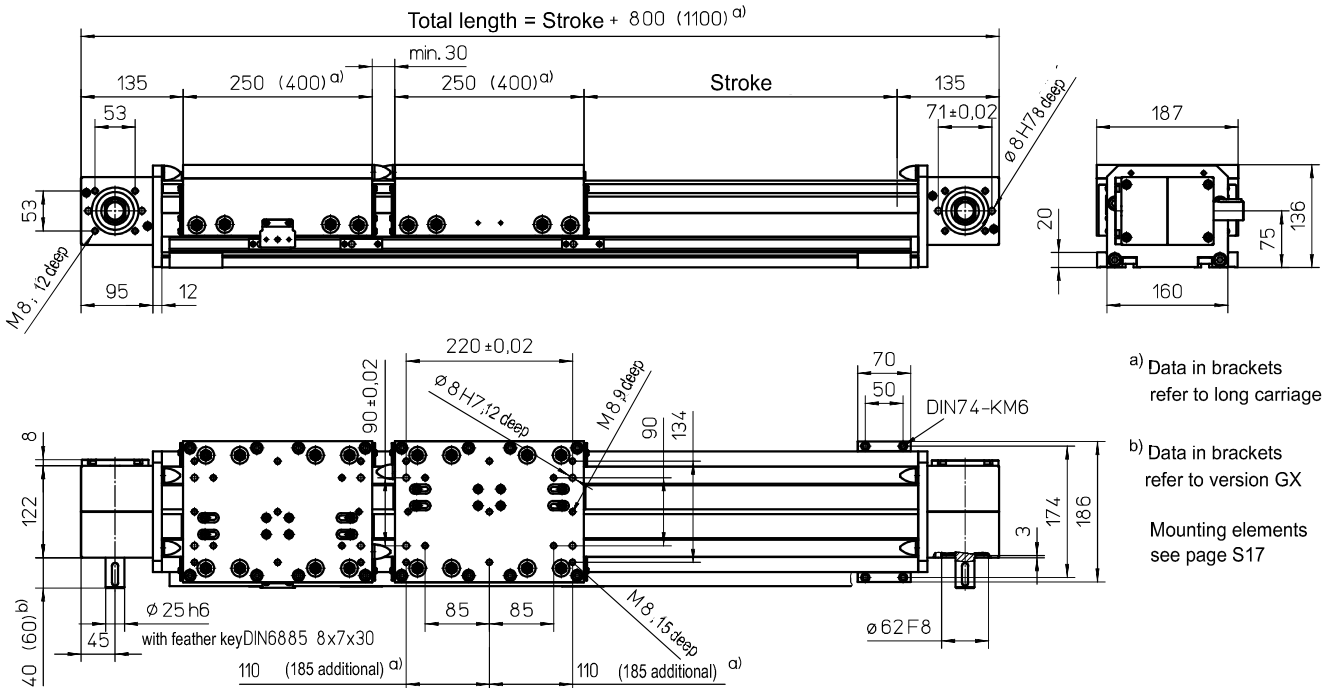
ZRS	
Forces	Dynamic [N]
$F_x^c)$	4000
F_y	4500
F_z	6000
$-F_z$	4000
Moments	Dynamic [Nm]
M_x	500
M_y	700 (1000)
M_z	700 (1000)

$F_x - v$ - Diagram



c) Maximum value (see diagram „ F_x -v-Diagram“)
Data in brackets refer to long carriage (400)

with toothed belt drive and roller guide and a second independently travelling carriage (ZRSD)



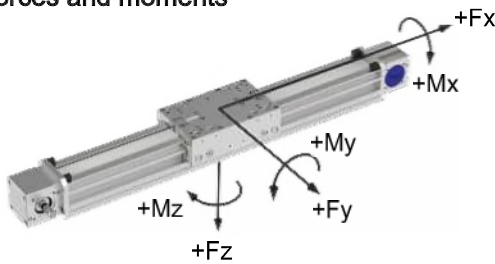
Weights ZRSD

Basic length without stroke:	28.10 kg
100 mm stroke:	1.68 kg
Entire carriage 250 mm:	5.75 kg
Entire carriage 400 mm:	8.30 kg
Max. total length: (longer on request)	6100 mm

Technical data ZRSD

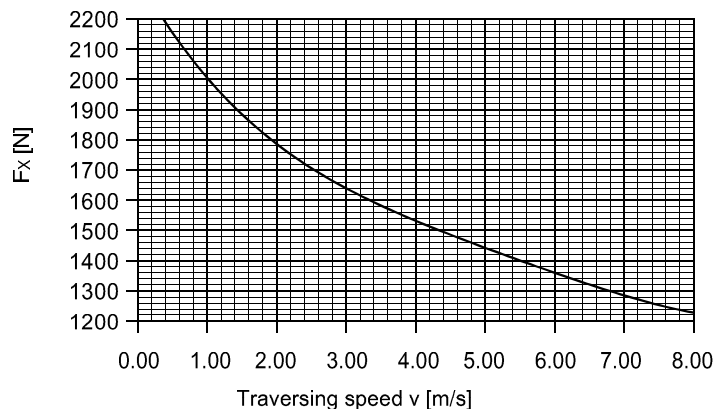
Max. speed:	8.00 m/s
Max. acceleration:	60 m/s ²
Repeat accuracy:	±0.08 mm
Idle torque:	3.50 Nm
Moment of inertia:	7.16 • 10 ⁻³ kgm ²
Drive element:	2 x Toothed belt 32 AT10
Stroke per revolution:	210 mm

Forces and moments



ZRSD	
Forces	Dynamic [N]
F _x ^{c)}	2300
F _y	4500
F _z	6000
-F _z	4000
Moments	Dynamic [Nm]
M _x	500
M _y	700 (1000)
M _z	700 (1000)

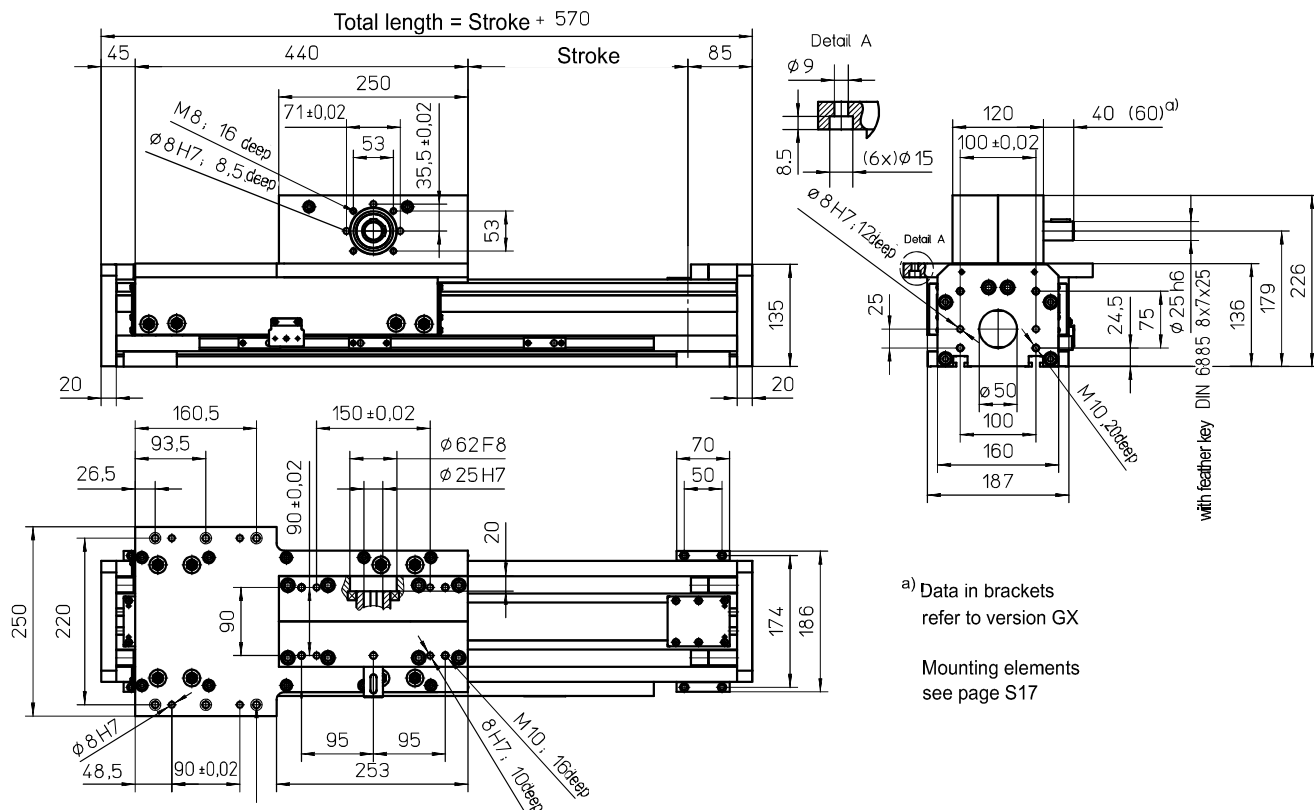
F_x - v - Diagram



^{c)} Maximum value (see diagram „F_x-v-Diagram“)
Data in brackets refer to long carriage (400)

These data apply to each carriage.

with toothed belt drive an roller guide (ARH)



ᵃ) Data in brackets refer to version GX
Mounting elements see page S17

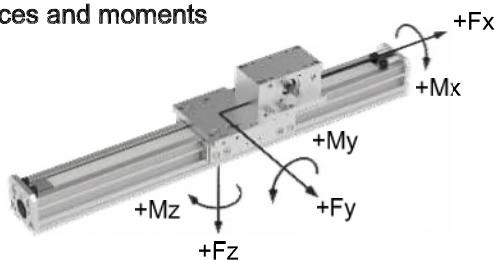
Weights ARH

Basic length without stroke:	27.30 kg
100 mm stroke:	1.63 kg
Entire carriage 440 mm:	14.65 kg
Max. total length: (longer on request)	6000 mm

Technical Data ARH

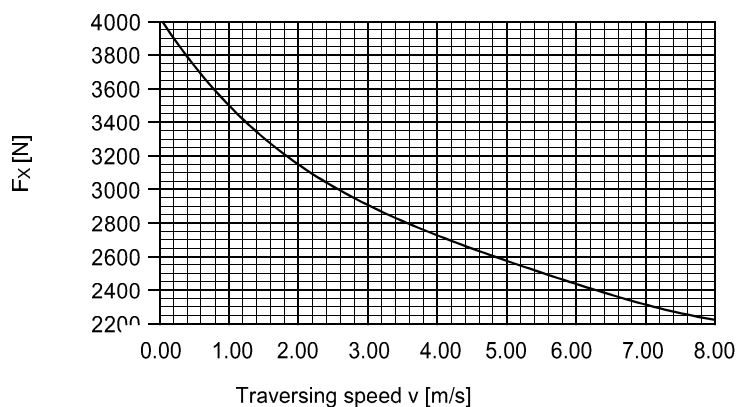
Max. speed:	8.00 m/s
Max. acceleration:	60 m/s ²
Repeat accuracy:	±0.08 mm
Idle torque:	4.20 Nm
Moment of inertia: (rotatory)	1.50 • 10 ⁻³ kgm ²
Drive element:	Toothed belt 50 AT10-E
Stroke per revolution:	240 mm

Forces and moments



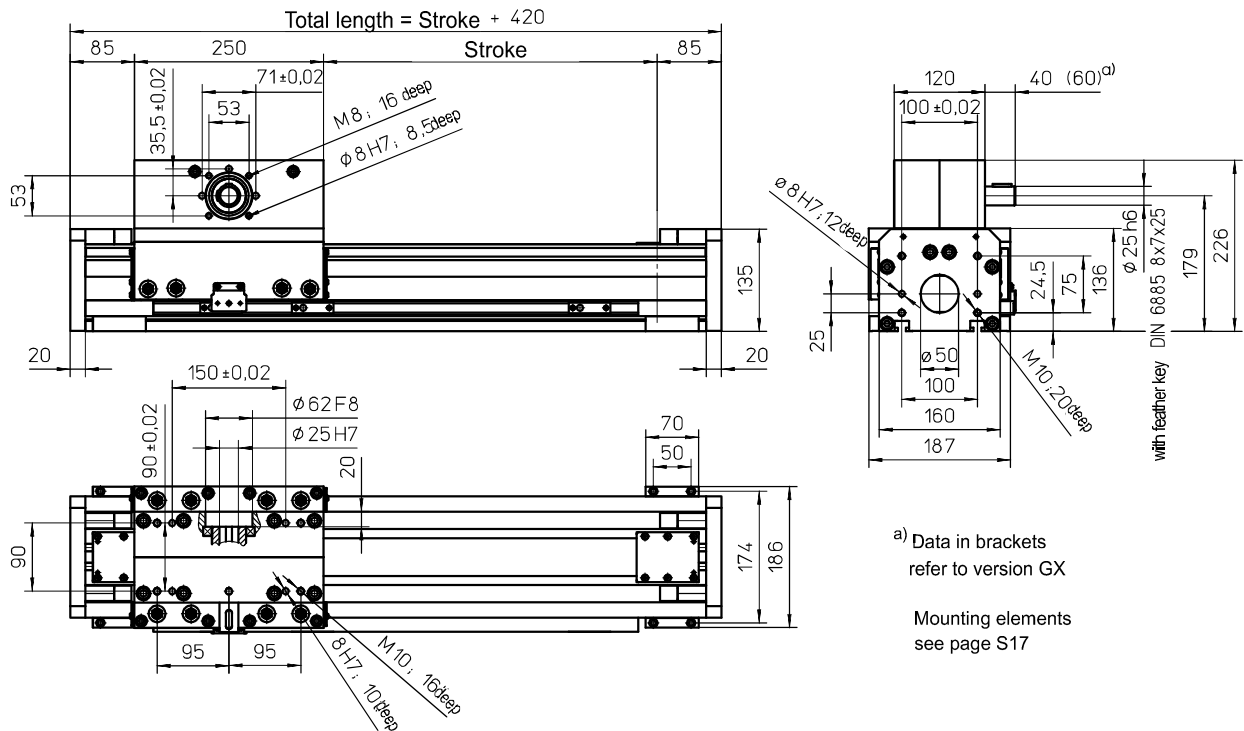
ARH	
Forces	Dynamic [N]
F _x ^{b)}	4000
F _y	4500
F _z	6000
-F _z	4000
Moments	Dynamic [Nm]
M _x	500
M _y	1000
M _z	1000

F_x - v - Diagram



^{b)} Maximum value (see diagram „F_x-v-Diagram“)

with toothed belt drive and roller guide (ARS)



Weights

ARS

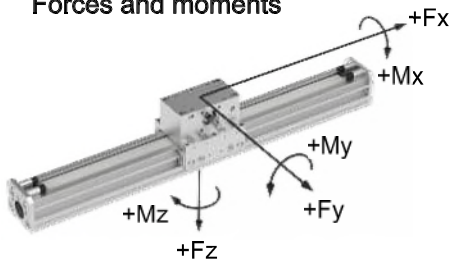
Basic length without stroke:	21.25 kg
100 mm stroke:	1.63 kg
Entire carriage 250 mm:	11.20 kg
Max. total length: (longer on request)	6000 mm

Technical Data

ARS

Max. speed:	8.00 m/s
Max. acceleration:	60 m/s ²
Repeat accuracy:	±0.08 mm
Idle torque:	4.20 Nm
Moment of inertia: (rotatory)	1.50 · 10 ⁻³ kgm ²
Drive element:	Toothed belt 50 AT10-E
Stroke per revolution:	240 mm

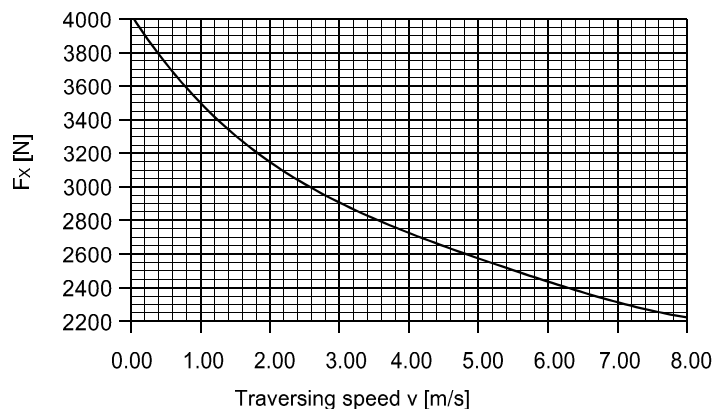
Forces and moments

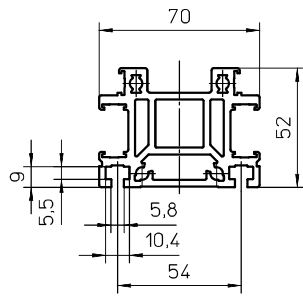


ARS	
Forces	Dynamic [N]
F _x ^{c)}	4000
F _y	4500
F _z	6000
-F _z	4000
Moments	Dynamic [Nm]
M _x	500
M _y	700
M _z	700

c) Maximum value (see diagram „Fx-v-Diagram“)

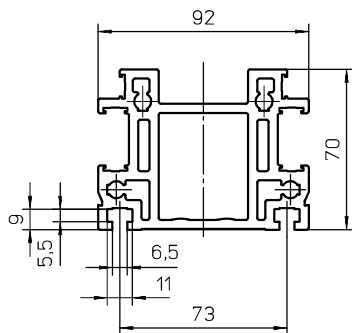
Fx - v - Diagram





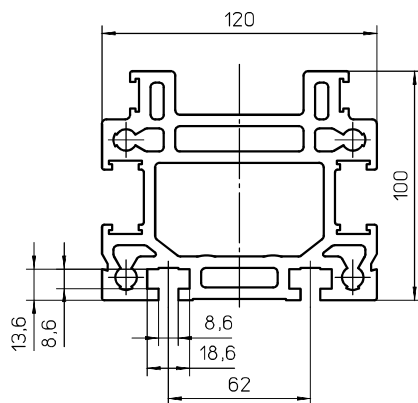
Profile Sigma 70

Specific mass [kg/m]	3.31
Surface measure [mm ²]	1227
Geometrical moment of inertia I _y [mm ⁴]	311463
Geometrical moment of inertia I _z [mm ⁴]	506501
Section modulus W _y [mm ³]	11006
Section modulus W _z [mm ³]	14471



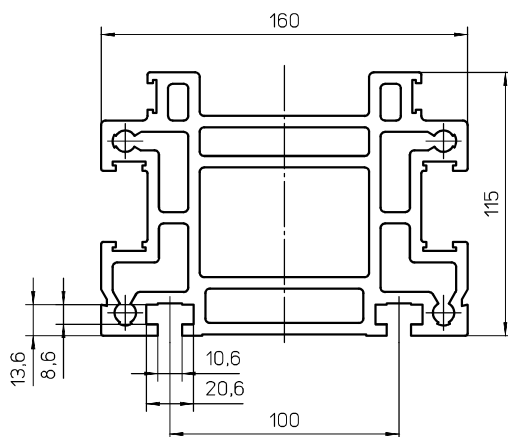
Profile Sigma 90

Specific mass [kg/m]	5.69
Surface measure [mm ²]	2108
Geometrical moment of inertia I _y [mm ⁴]	1011977
Geometrical moment of inertia I _z [mm ⁴]	1806496
Section modulus W _y [mm ³]	26583
Section modulus W _z [mm ³]	39272



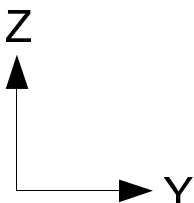
Profile Sigma 120

Specific mass [kg/m]	10.92
Surface measure [mm ²]	4044
Geometrical moment of inertia I _y [mm ⁴]	4001551
Geometrical moment of inertia I _z [mm ⁴]	5857612
Section modulus W _y [mm ³]	74232
Section modulus W _z [mm ³]	97627

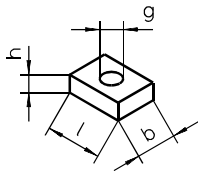


Profile Sigma 160

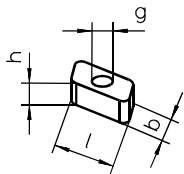
Specific mass [kg/m]	15.08
Surface measure [mm ²]	5583
Geometrical moment of inertia I _y [mm ⁴]	7080449
Geometrical moment of inertia I _z [mm ⁴]	14157096
Section modulus W _y [mm ³]	114660
Section modulus W _z [mm ³]	176964



NS 2..21

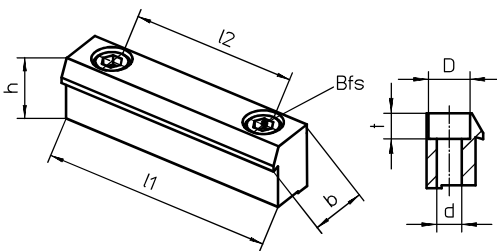


RM 2 / 6



Linear drive	Page *	NS	ID No.	l [mm]	b [mm]	h [mm]	g
Sigma 70	E	2	10557	16	10	4	M5
Sigma 90	E	2	10557	16	10	4	M5
		21	22955	20	10	5	M6
		RM2	15370	10	6	4	M4
Sigma 120	E	19	10559	18	14	6	M8
		20	10560	20	14	8	M8
		10	16499	20	13	6	M6
Sigma 160	E	6	10561	25	18	8	M10
		20	23949	20	16	8	M8
		RM6	15372	18	10	8	M6

BL 1 / 2



Linear drive	BL	ID No.	l1 [mm]	l2 [mm]	b [mm]	h [mm]	Bfs	D [mm]	d [mm]	t [mm]
Sigma 70	11	25267	70	50	13	12	M6	11	6,6	6,8
Sigma 90	1	10552	70	50	15	17,5	M6	11	6,6	6,8
Sigma 120	2	10553	70	50	15	20	M6	11	6,6	6,8
Sigma 160	2	10553	70	50	15	20	M6	11	6,6	6,8

* For further information on pages C – E, see page Z1
 Bfs = Mounting screw DIN 912 / ISO 4762

Example: Sigma 120-ZRS-40 AT10-200-1000-1440 AZ1-6NS5-1

Product _____

Size _____

Drive _____

Z = Toothed belt drive

0 = Without drive

A = Powered carriage

Guide system _____

R = Roller guide

Model _____

ZRS = Standard (Horizontal)

ZRSD = Standard double (Horizontal)

ARH = Lifting axis (Vertical)

ARS = Standard (Horizontal)

Drive specifications _____

Width of toothed belt and tooth pitch

Stroke per revolution _____

Stroke _____

Total length _____

Accessories _____

AZ1 = Drive shaft short, mounting side **C**

AZ2 = Drive shaft short, mounting side **D**

AZ6 = Drive shaft long, mounting side **C** and **D**

Further arrangements for drive shaft, see **page Z1**

EO2 / EO10 = Inductive limit switch with 2 m/10 m cabel fitted

ES2 / ES10 = Inductive limit switch with 2 m/10 m cabel fitted

EMS / EMB = Mechanical limit switch (S = Siemens, B = Balluff) fitted

BL = Mounting bracket

NS / RM = Sliding block 2 .. 10 / Rhomb nut 2 .. 6 (See Table on **page S17**)

Special design _____

0 = Standard

1 = Special (add specification description)

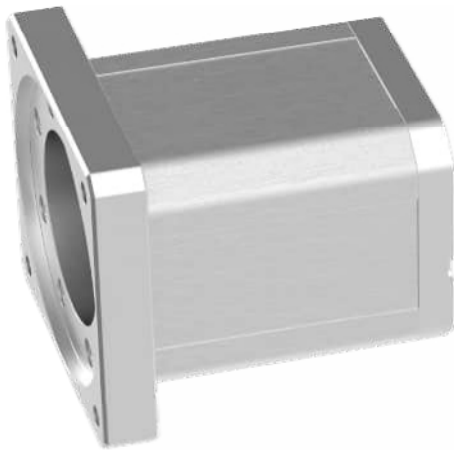
Further accessories (separate position)

MGK = Motor mounting and coupling (according to dimension sheet)

Notes and drawing

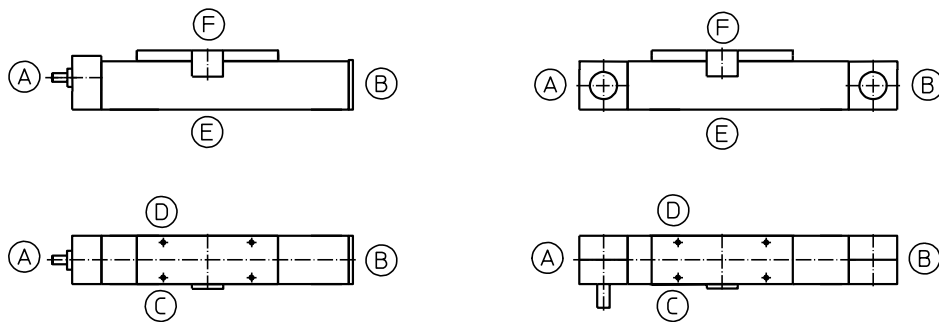
Chapter Z

Accessories



Ordering code for limit switch positions, limit switch type (EN),
lubrication ports and drive shafts (AZ) and wiper versions

Limit switch position



Limit switch types (EN)

- EO2 = Inductive proximity switch “Normally Closed” with 2 m cable (33003)
- EO10 = Inductive proximity switch “Normally Closed” with 10 m cable (10401)
- ES2 = Inductive proximity switch “Normally Open” with 10 m cable (10402)
- ES10 = Inductive proximity switch “Normally Open” with 2 m cable (10403)
- EMS / EMB = Mechanical limit switch “normally closed” (S = Siemens, B = Balluff; without cable)

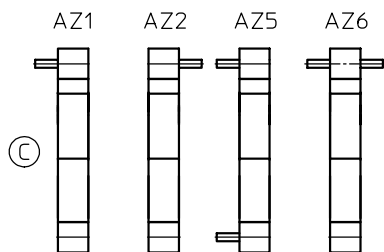
Insofar as there are no other specifications provided, the limit switches are fitted as follows (standard):

1. Switch: **EO2 NC** with 2 m cable on page C, pos. A, cable exit at A
Switching point = Mechanical end position
2. Switch: **EO2 NC** with 2 m cable on page C, pos. B, cable exit at B
Switching point = Mechanical end position
3. Switch: **ES2 NO** with 2 m cable on page C, pos. A, cable exit at A
Switching point = Directly beside first switch (as reference)

Lubrication ports

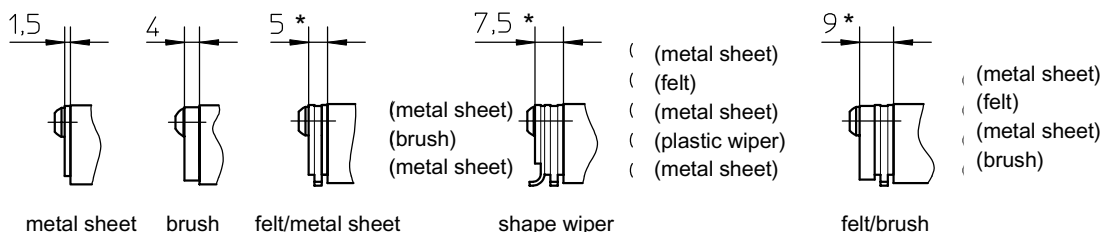
Standard Beta, Delta-C and Alpha: Lubricating nipple M8x1, page C + D
(exception: Delta = M6; Beta 40, Beta 70-C-ARS-ASS = drive in lubrication nipple)

Drive shafts (AZ)



Wiper versions

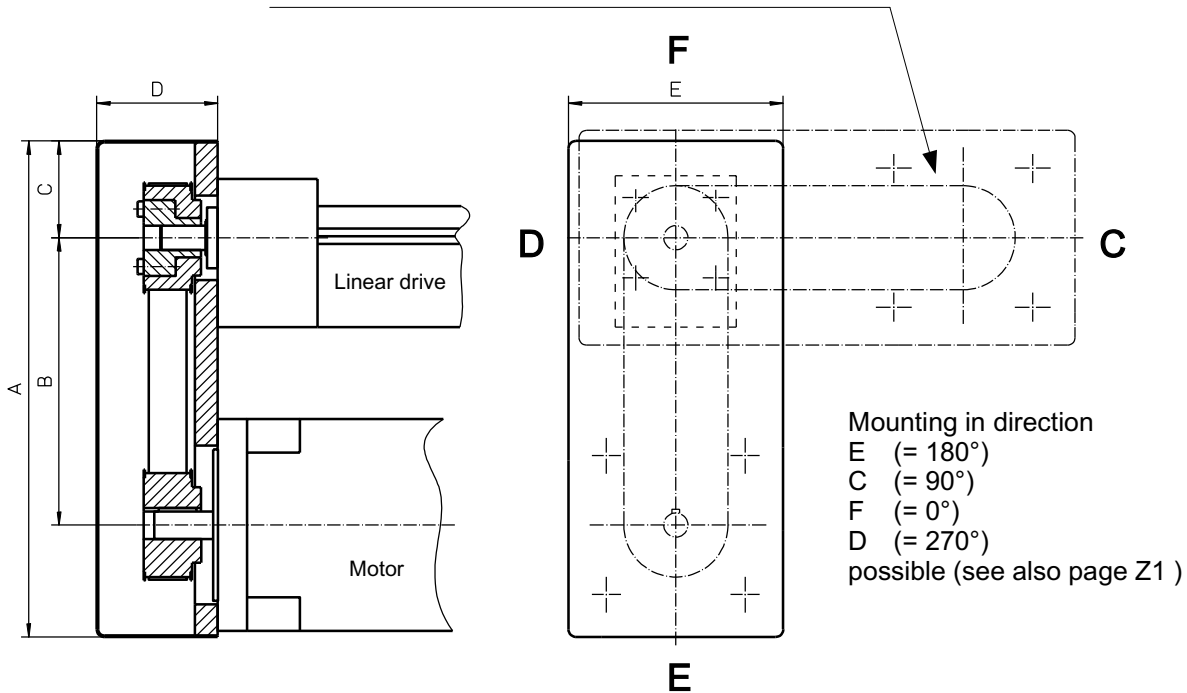
(Design is based on carriage plate)



* Bei Beta 165(-C) und Beta 180(-C) + 2 mm

Deflection belt drive mounting (URT)

URT can be turned 90° when mounted



Linear drive version			URT version	A	B*	C	D	E
Beta 40 Beta 50-C	Delta 90 Delta 110		URT 1	195	105 ±10	41	45	90
Beta 60 Beta 70-C	Delta 145-C	Alpha 15-B	URT 2	238	120 ±10	46	52	102
Beta 80(-C) Beta 100-D Beta 110 Beta 120-C Beta 140(-C) Beta 165(-C) Beta 180(-C)	Delta 200 Delta 240	Alpha 20-B Alpha 30-B Alpha 35-B	URT 3	328	190 ±10	64	80	142

* Centre distance B: depending on ratio and toothed belt

Possible gear ratios:

$i = 1:1$
 $i = 2:1$
 $i = 3:1^{**}$

Note: Depending on the motor shaft diameter and necessary drive moment, all ratios may not be possible

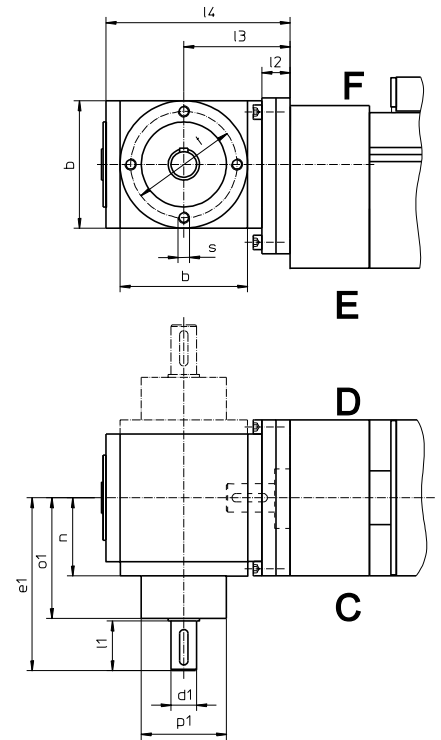
** maximum possible motor shaft diameter with shaft without feather key:

URT 1: not possible
 URT 2: 11
 URT 3: 15

Motor mounting shown in direction E (= 180°) (dashed C (= 90°))

Bevel gear mounting (KRG)

Unit size	Gear types	Version	Ratio	b	l2	l3	l4	n	s	t
Beta 40	V065	E0N0, K0N0	1:1 ... 3:1	65	11	53	95	42	M6	54
Beta 50-C	V065	E0N0, K0N0	1:1 ... 3:1	65	11	53	95	42	M6	54
Beta 60	V065	E0N0, K0N0	1:1 ... 3:1	65	16	58	100	42	M6	54
Beta 60-SGV	V065	E0N0, K0N0	1:1 ... 3:1	65	16	58	100	42	M6	54
Beta 70-C	V065	E0N0, K0N0	1:1 ... 3:1	65	16	58	100	42	M6	54
Beta 80	V090	E0N0, K0N0	1:1 ... 6:1	90	20	75	130	55	M8	75
Beta 100-D	V090	E0N0, K0N0	1:1 ... 6:1	90	20	75	130	55	M8	75
Beta 110	V090	E0N0, K0N0	1:1 ... 6:1	90	20	75	130	55	M8	75
Beta 110-C-SGV	V120	E0N0, K0N0	1:1 ... 6:1	120	30	102	174	75	M10	100
Beta 120-C	V120	E0N0, K0N0	1:1 ... 6:1	120	30	102	174	75	M10	100
Beta 140(-C)	V090	E0N0, K0N0	1:1 ... 6:1	90	20	75	130	55	M8	75
Beta 165(-C)	V120	E0N0, K0N0	1:1 ... 6:1	120	30	102	174	75	M10	100
Beta 180(-C)	V120	E0N0, K0N0	1:1 ... 6:1	120	30	102	174	75	M10	100
Delta 90	V065	E0N0, K0N0	1:1 ... 3:1	65	16	58	100	42	M6	54
Delta 110-C	V065	E0N0, K0N0	1:1 ... 3:1	65	18	58	100	42	M6	54
Delta 145-C	V090	B0,C0,G0,H0	1:1 ... 6:1	90	94	149	204	55	M8	75
Delta 200	V120	B0,C0,G0,H0	1:1 ... 6:1	120	112	184	256	75	M10	100
Delta 240(-C)	V120	B0,C0,G0,H0	1:1 ... 6:1	120	112	184	256	75	M10	100
Alpha 15-B-155	V065	E0N0, K0N0	1:1 ... 3:1	65	16	58	100	42	M6	54
Alpha 20-B-225	V090	E0N0, K0N0	1:1 ... 6:1	90	20	75	130	55	M8	75
Alpha 30-B-325	V090	E0N0, K0N0	1:1 ... 6:1	90	20	75	130	55	M8	75
Alpha 35-B-455	V120	E0N0, K0N0	1:1 ... 6:1	120	30	102	174	75	M10	100

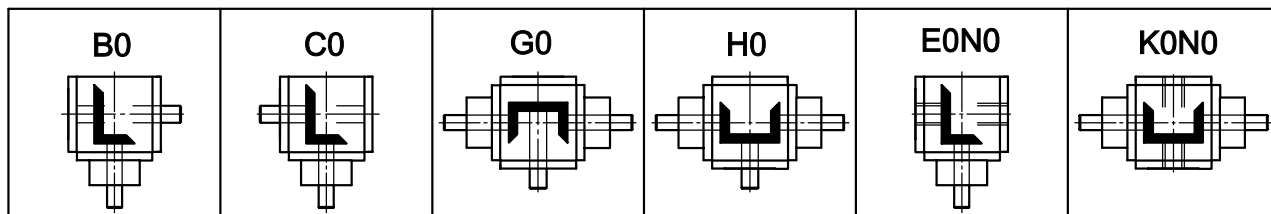


Motor mounting side "C", "D", "E" or "F" (see also page Z1)

Ratio	1:1 – 2:1					3:1					4:1					5:1 – 6:1					
	d1	l1	e1	o1	p1	d1	l1	e1	o1	p1	d1	l1	e1	o1	p1	d1	l1	e1	o1	p1	
Beta 40	12	26	100	72	44	12	26	100	72	44											
Beta 50-C	12	26	100	72	44	12	26	100	72	44											
Beta 60	12	26	100	72	44	12	26	100	72	44											
Beta 60-SGV	12	26	100	72	44	12	26	100	72	44											
Beta 70-C	12	26	100	72	44	12	26	100	72	44											
Beta 80	18	35	122	85	60	12	35	122	85	60	12	35	132	95	60	12	35	132	95	60	60
Beta 100-D	18	35	122	85	60	12	35	122	85	60	12	35	132	95	60	12	35	132	95	60	60
Beta 110	18	35	122	85	60	12	35	122	85	60	12	35	132	95	60	12	35	132	95	60	60
Beta 110-C-SGV	25	45	162	115	80	20	45	162	115	80	20	45	172	125	80	15	35	162	125	70	70
Beta 120-C	25	45	162	115	80	20	45	162	115	80	20	45	172	125	80	15	35	162	125	70	70
Beta 140(-C)	18	35	122	85	60	12	35	122	85	60	12	35	132	95	60	12	35	132	95	60	60
Beta 165(-C)	25	45	162	115	80	20	45	162	115	80	20	45	172	125	80	15	35	162	125	70	70
Beta 180(-C)	25	45	162	115	80	20	45	162	115	80	20	45	172	125	80	15	35	162	125	70	70
Delta 90	12	26	100	72	44	12	26	100	72	44											
Delta 110-C	12	26	100	72	44	12	26	100	72	44											
Delta 145-C	18	35	122	85	60	12	35	122	85	60	12	35	132	95	60	12	35	132	95	60	60
Delta 200	25	45	162	115	80	20	45	162	115	80	20	45	172	125	80	15	35	162	125	70	70
Delta 240(-C)	25	45	162	115	80	20	45	162	115	80	20	45	172	125	80	15	35	162	125	70	70
Alpha 15-B-155	12	26	100	72	44	12	26	100	72	44											
Alpha 20-B-225	18	35	122	85	60	12	35	122	85	60	12	35	132	95	60	12	35	132	95	60	60
Alpha 30-B-325	18	35	122	85	60	12	35	122	85	60	12	35	132	95	60	12	35	132	95	60	60
Alpha 35-B-455	25	45	162	115	80	20	45	162	115	80	20	45	172	125	80	15	35	162	125	70	70

All bevel gears are lubricated for life with synthetic oil (lubrication B0). Maximum duty cycle 40 %.
 For a longer duty cycle, please order "lubrication B1" and specify mounting position. Angular play <20 minutes.

Versions:



(Pay attention to diameter of sleeve shaft of version E0N0 / K0N0.)

Allowed output nominal torque (Nm) at input rotation speed 3000 min⁻¹

Atek-Gears

Gear	Ratio i							Ø Sleeve shafts of Version E0N0 / K0N0
	1:1	1,5:1	2:1	3:1	4:1	5:1	6:1	
065	10	10	10	10	-	-	-	12
090	27	25	23	23	23	23	23	18
120	66	61	56	58	60	60	54	25

Nidec Graessner-Gears

Power Gear	Ratio i					
	1:1	1,5:1	2:1	3:1	4:1	5:1
P54	15	15	12	12	-	-
P75	45	45	42	33	28	25
P90	78	78	68	54	52	40
P110	150	150	150	120	100	85

At allowed values there are only limited** thermal limiting performances considered.
This applies to both producers.
Details see documentation of producers (Atek and Nidec Graessner).

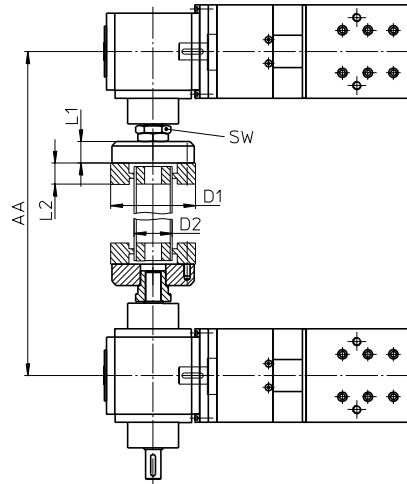
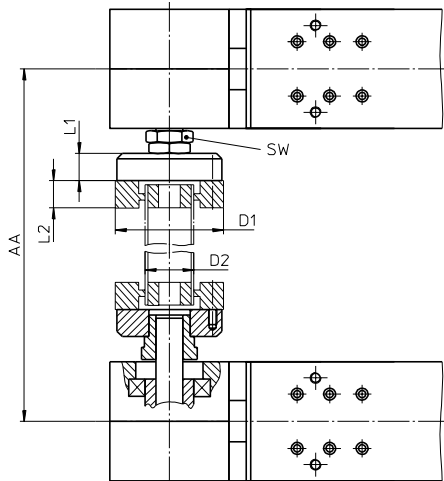
** switch-on time ED = 40 %, rotation speed 3000 U/min, ambient temperature 20 °C

Joint shaft mounting (GX)

Toothed belt drive

Threaded spindle drive

Dimension AA = Centre distance between mechanical linear drives



Linear Drive	Size	Moment max. [Nm]	AA min.	SW
Beta 40-ZSS	GX1	8	159	22
Beta 50-C-ZRS	GX1	12	169	22
Beta 60-ZSS	GX2	22	201	27
Beta 60-SSS	GX2		281	22
Beta 60-SGV	GX2		281	22
Beta 70-C-ZRS-ZSS	GX2	31	211	27
Beta 70-C-SRS-SSS	GX2		281	27
Beta 80-ZRS-ZSS	GX2	47	231	27
Beta 80-SRS-SSS	GX2		325	36
Beta 80-C-ZRS-ZSS	GX4	74	241	36
Beta 100-ZRS-ZSS	GX4	89	261	36
Beta 100-D-ZSS	GX4	38	261	36
Beta 100-D-SSS	GX4		331	36
Beta 110-ZRS-ZSS	GX4 / GX8*	191	293 / 323	46
Beta 110-SRS-SSS	GX4		331	36
Beta 120-ZRS-ZSS	GX4 / GX8*	153	303 / 333	46
Beta 120-C-ZSS	GX4 / GX8*	229	303 / 333	46
Beta 120-C-SSS	GX4		395	46
Beta 140-ZRS-ZSS	GX4 / GX8*	140	323 / 353	46
Beta 140-SRS-SSS	GX4		331	36
Beta 140-C-ZSS	GX4 / GX8*	140	323 / 353	46
Beta 140-C-SSS	GX4		331	36
Beta 165-ZSS	GX16	700	398	55
Beta 165(-C)-SGV / -SSF	GX8		435	46
Beta 165-SSS	GX8		435	46
Beta 180-ZSS	GX8 / GX16*	306	393 / 413	55
Beta 180-SSS	GX8		435	46
Beta 180-C-ZSS	GX8 / GX16*	370	393 / 413	55
Beta 180-C-SSS	GX8		435	46

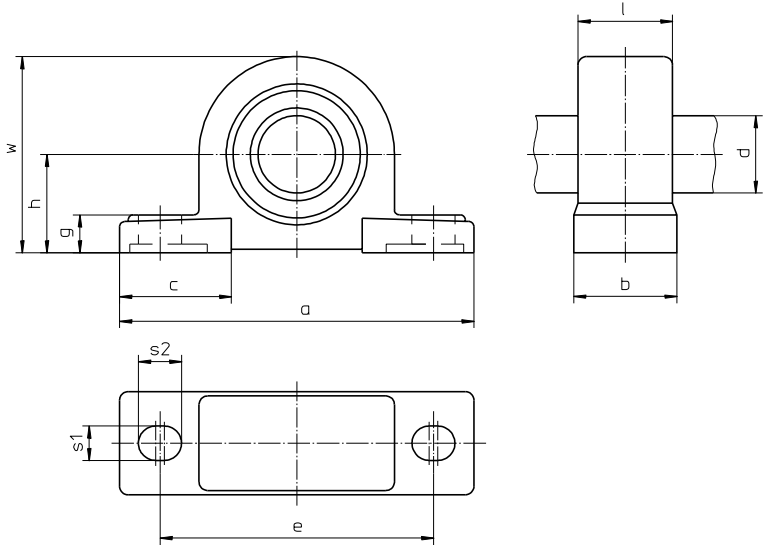
Linear Drive	Size	Moment max. [Nm]	AA min.	SW
Gamma 90-ZSS	GX4	77	241	36
Gamma 90-ZSSD	GX2	37	235	36
Gamma 120-ZSS	GX4	90	261	36
Gamma 120-ZSSD	GX4	57	264	36
Gamma 160-ZSS	GX4 / GX8*	153	303 / 333	46
Gamma 160-ZSSD	GX4	74	305	46
Gamma 220-ZSS	GX8 / GX16*	306	393 / 413	55
Gamma 220-ZSSD	GX4 / GX8*	107	325 / 377	46
Gamma 280-ZSS	GX16	450	398	55
Gamma 280-ZSSD	GX8 / GX16*	300	393 / 409	50
Sigma 70-ZRS	GX2	22	201	27
Sigma 90-ZRS	GX2	36	211	27
Sigma 90-ZRSD	GX2	18	217	27
Sigma 120-ZRS	GX4	89	246	36
Sigma 120-ZRSD	GX4	57	264	36
Sigma 160-ZRS	GX4 / GX8*	153	303 / 333	46
Sigma 160-ZRSD	GX4	77	303 / 333	46

Size	D1	D2		L1	L2
		St	VA		
GX1	57	30x2	30x2.0	20	24
GX2	88	40x2,5	40x2.5	20	24
GX4	100	45x2,5	44,5x1.5	25	28
GX8	125	60x2,5	60,3x1.6	30	32
GX16	155	70x1,5	70,0x2.0	50	35

* The larger version is to be selected where necessary.

This table is a selection. More sizes and combinations on request.

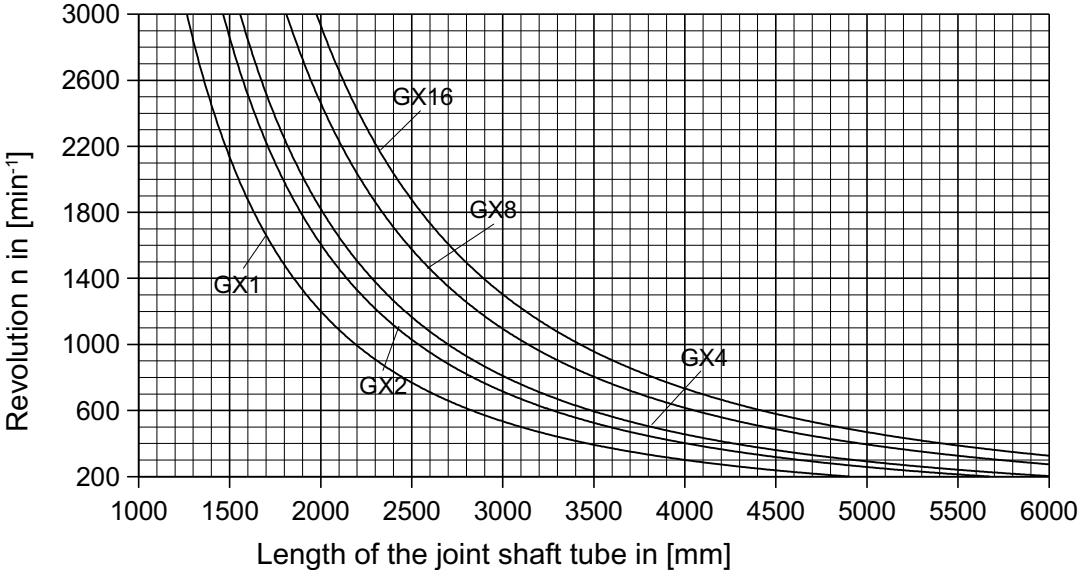
Pillow bearing drawing



For Joint shaft	a	b	c	d	e	g	h	l	s1	s2	w	Weight GX-shaft in kg			
												Length 500 mm complete		100 mm tube	
												St	VA	St	VA
GX1	167	48	54	30	127	19	47,6	43	17	21	92	1.20	1.21	0.14	0.14
GX2	190	54	60	40	146	20	54	50	17	22	106	2.37	2.42	0.23	0.23
GX4	206	60	65	45	159	22	57,2	55	20	25	114	3.56	3.11	0.26	0.16
GX8	265	70	77	60	203	27	76,2	65	25	29	150	6.08	5.55	0.35	0.23
GX16	292	78	85	70	232	30	88,9	64	25	31	175	11.03	11.37	0.26	0.34

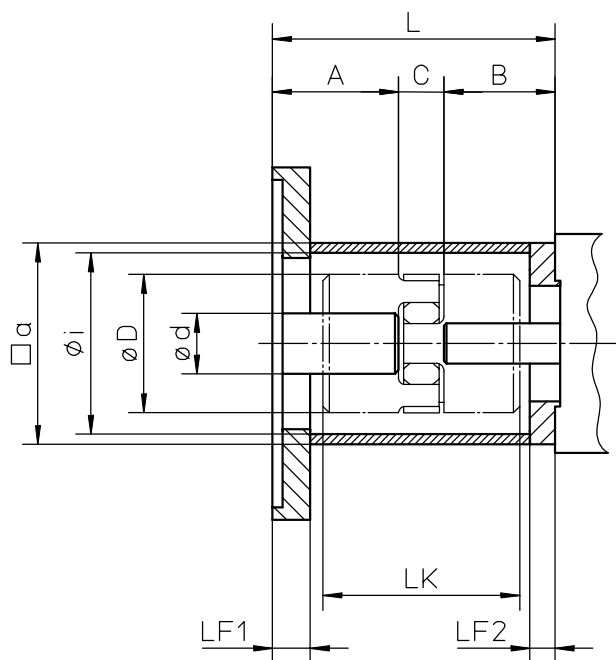
Joint shaft diagram

Depends on length and revolution



Motor mounting, coupling (MGK)

Standard motor mounting (3-part)



Gr.	□ α	øi	LF1	LF2
55	55	46	15	8
80	80	69	15	10
110	110	88	20	15

$$L = A + B + C$$

- A = Length of drive shaft of motor/gear
- B = Length of drive journal of mechanical linear drive
- C = See Table for Coupling Sizes

Size of coupling

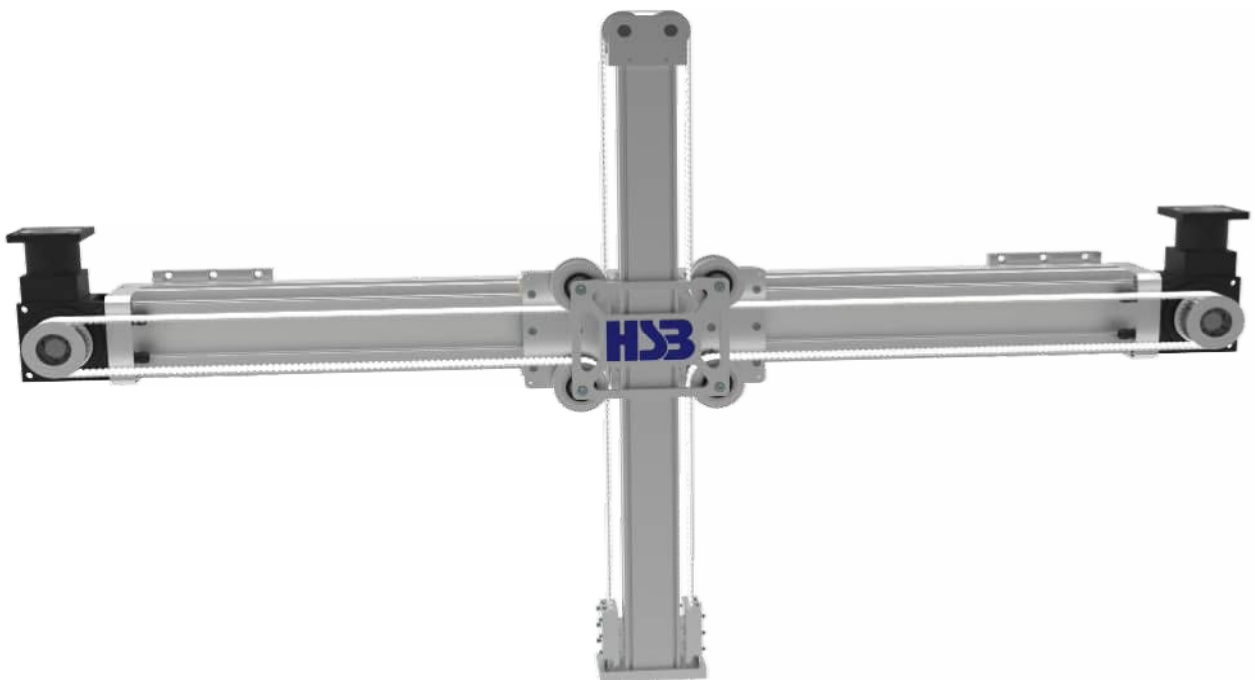
	9	12	14	19	24	28
C	10	12	13	16	18	20
ø d_{max}	11	12	16 (14)	20	28	38
ø D	20	25	30	40	55	65
LK	30	34	35 (50)	66	78	90

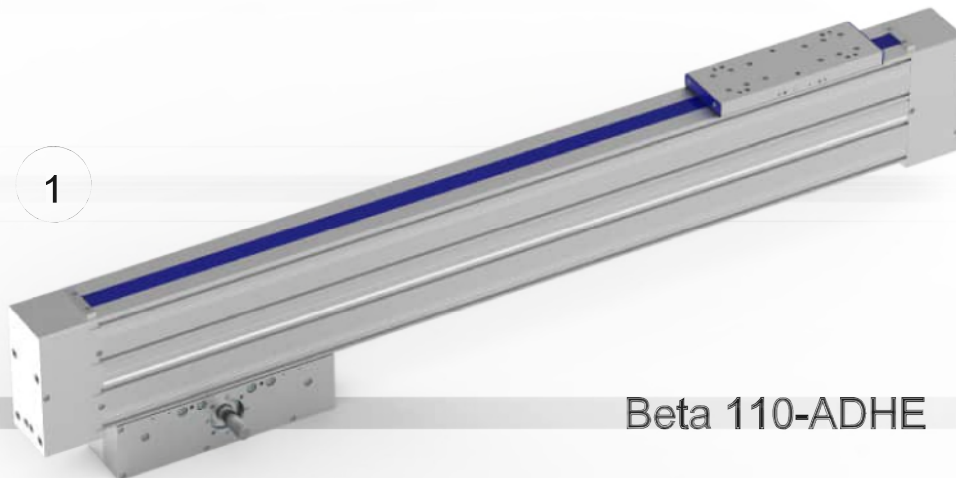
Clamping hub and clamping ring (from size 14) possible.
Dimensions in brackets apply for clamping ring.

Chapter X

Custom

Designs



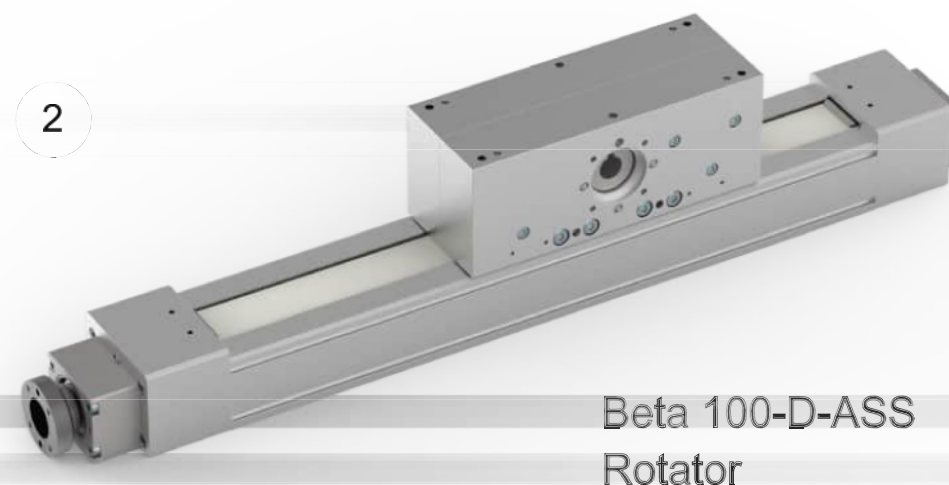


Beta 110-ADHE

The ADHE design (driven carriage, duplex unit) is currently available in sizes 50 and 110 but can in principle be supplied in the HSB-beta® series sizes.

The lower carriage with the gearbox/motor detects that the profile tube and the top carriage are travelling. There is therefore a relative/ double stroke action. An outrigger can be attached to the upper carriage and thereby e.g. a spray lance with a single profile length of the linear unit can be immersed into a tool by the doubled stroke.

The upper linear unit with the single carriage is enclosed by the covering strip.



Beta 100-D-ASS
Rotator

The HSB-beta®-ARS-ASS versions are often used with a vertical axis.

The carriage and drive are upright and the profile tube runs vertically.

The gripper/attachments often also need to rotate.

This can be implemented very simply with the HSB rotator.

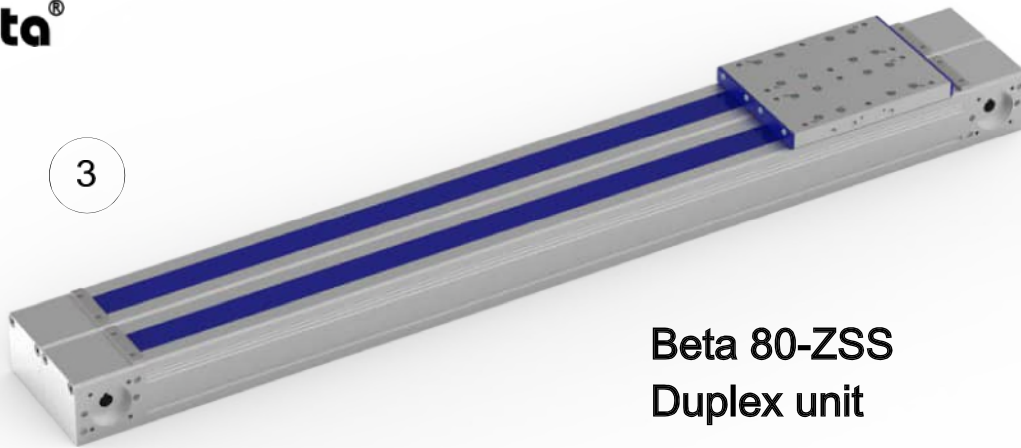
A top and bottom-mounted tube is fed through the rear cavity of the profile.

A servo motor is attached at the top by a timing belt drive (or motor mounting)

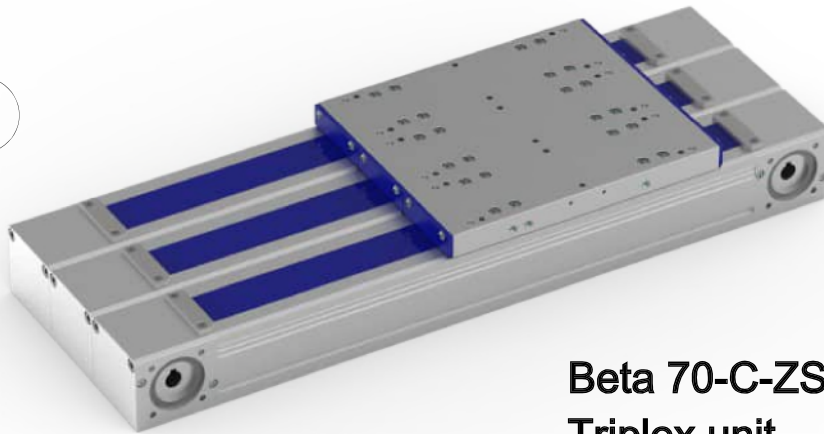
while the gripper or attachment can be attached to the adapter plate on the bottom.

HSB-beta®

3

**Beta 80-ZSS
Duplex unit**

4

**Beta 70-C-ZSS
Triplex unit**

With a spindle or toothed belt drive, all HSB-beta® series sizes can be converted into duplex/triplex or multiple units.

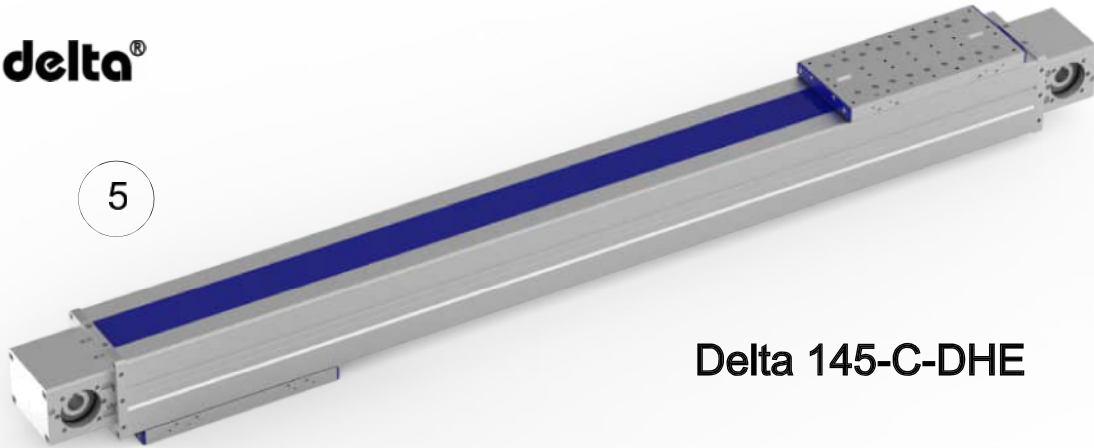
Profiles are screwed/glued together. The result is a broad, flat linear unit. A shared carriage plate allows large torques to be accommodated in the M_x direction. With a shared drive (toothed belt units) it is possible to generate greater thrust forces.

Counter-acting movements can be implemented with single carriage plates.

If different spindle pitches are used it is possible to realise different speeds from the same engine speed.

HSB-delta®

5



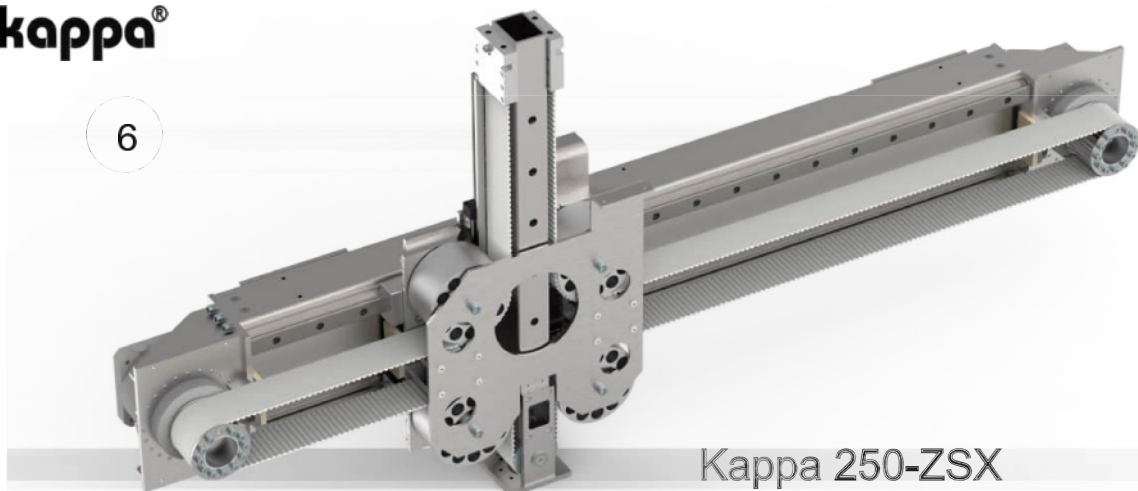
Delta 145-C-DHE

The DHE (double stroke unit) is currently available for the 145 size but other HSB-delta® series sizes are possible in principle.

In this case, along with the flat design and large transferable torques, an optimum ratio of stroke to overall length was required due to the duplex design of the HSB-delta® series.

HSB-kappa®

6



Kappa 250-ZSX

The linear units of the HSB-kappa® series are a particular highlight of HSB Automation GmbH.

The function principle is well known and some of our competitors supply and build this concept as a small system. The challenge for HSB Automation GmbH lay not in the system itself but in the parameters to be achieved:

it needed to move a mass of up to 100 kg horizontally by 2000 mm and vertically by 600 mm with 30 strokes/ minute. All components had to be non-rusting since it was for the food industry.

To save mass and weight in the vertical axis conventional linear units were out of the question. The drive which had to be co-transported (gearbox and servomotor with brake) overstressed every system. We therefore opted for the system with two vertical motors and a toothed belt.

Chapter TL

Technology

Linear

Linear Tables

HSB-alpha®

Mechanical Linear Drive

HSB-beta®

Compact Module

HSB-delta®

Portal Linear Drive

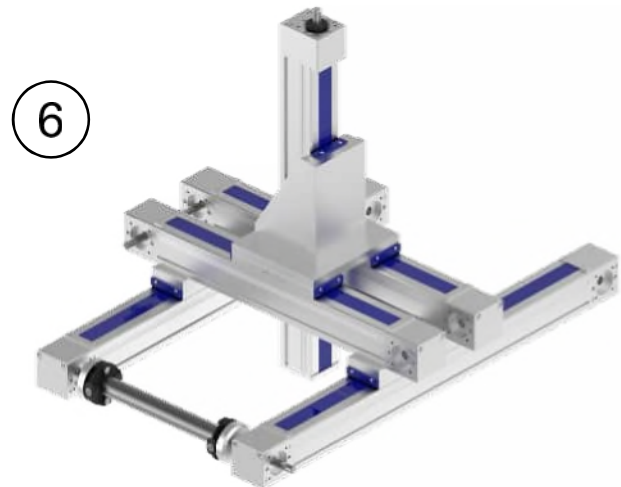
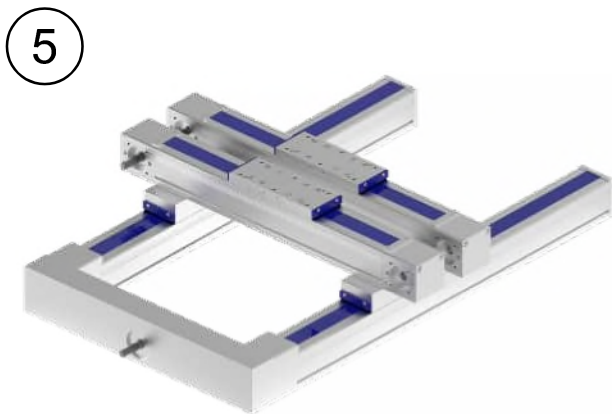
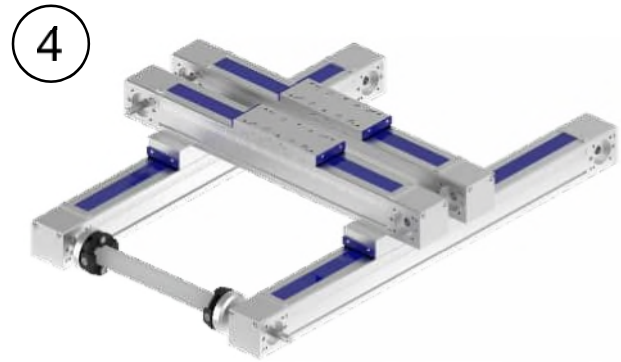
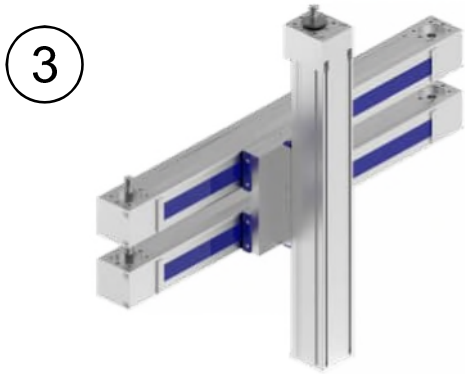
HSB-gamma®

Portal Linear Drive

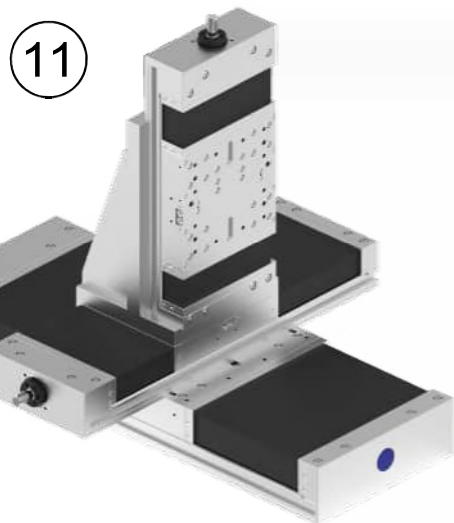
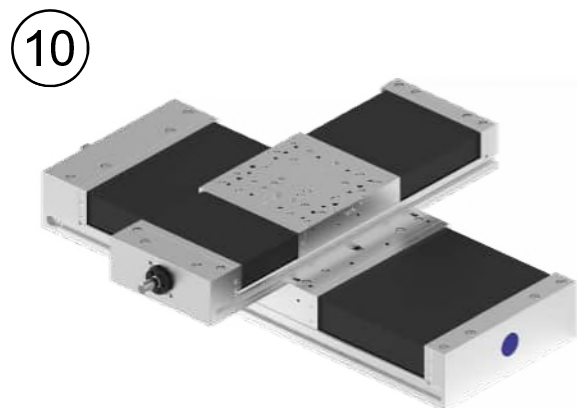
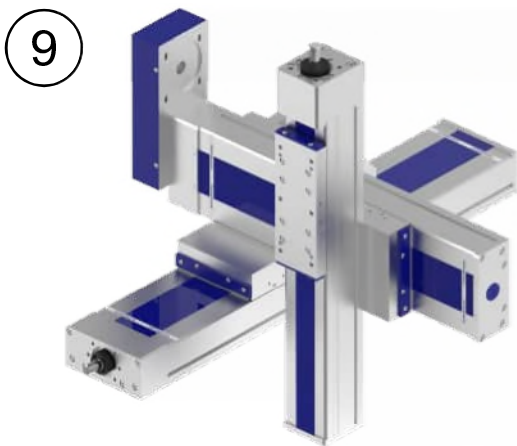
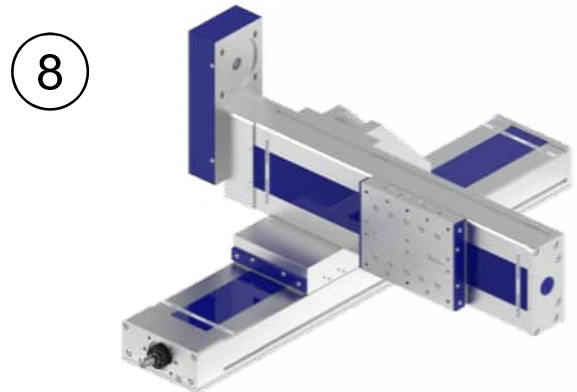
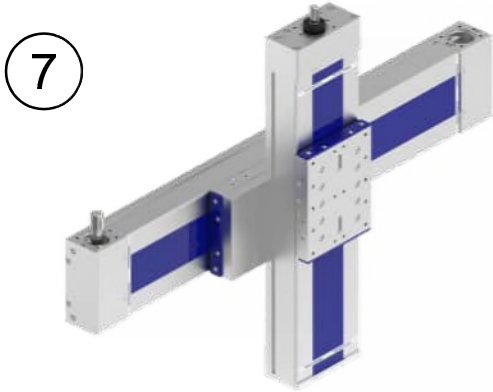
HSB-sigma®

Examples of multi-axis systems

Type **HB-beta**[®]



Types **HS-delta**[®] and **HS-alpha**[®]



Mechanical Linear Drives



with spindle drive or toothed belt drive
with rail guide or roller guide

Compact Modules



with spindle drive or toothed belt drive
with rail guide

Linear Tables



with spindle drive
with rail guide

Portal Linear Drive



with rack-and-pinion drive or toothed belt drive
with rail guide

Portal Linear Drive



with toothed belt drive
with roller guide

Customised solutions

In accordance with customer requirements (e.g.: ex-protection according to Atex, corrosion-resistant, clean room compatible, toothed belt linear drive right/left, etc.) .

Handling systems

For the most varied of industries

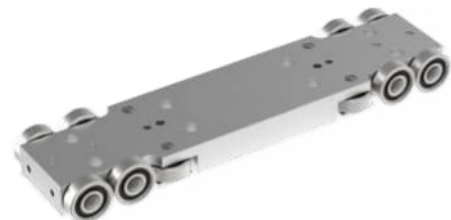
Accessories

Fixing parts, proximity switches, gears, motor mountings, couplings, belt drives with various gear ratios

Selection criteria for the guide system

Roller guide

Smooth travel thanks to optimum rolling characteristics
Low noise thanks to quiet rolling
High moment acceptance thanks to optimum load transmission into profile
Large stroke lengths possible without a problem
Low maintenance due to long-life lubrication of rollers
Low-cost alternative to rail guide



Rail guide

High load capacity of guide
Longer service life
High level of guiding accuracy



Further information regarding the performance overview

All specifications refer to the standard configuration. The values given for special designs may deviate considerably. The loads specified are the maximum single loads possible for the entire system. If there are different loads (several different forces or moments), the single permissible loads are lower. There may be elastic deformations which will influence the level of accuracy. For mechanical linear drives with roller guides, the static load rating (C_{stat}) applies for static loads.

Repeat accuracy is defined as the ability of the mechanical linear drive to once again return to the same actual position under the same conditions. Conditions such as temperature, load, speed, deceleration and direction of travel may influence the repeat accuracy.

Mechanical Linear Drives with Screw Drive

For calculating service life, the guide and screw drive load ratings are used. Please contact us for further information. The idle torques refer to the respective standard configurations (not double nut or low-backlash single nut) and are measured at a very low speed ($\approx 0 \text{ min}^{-1}$). Production and assembly tolerances vary by $\pm 20 \%$.

The permissible deflection of the linear axis is 0.2 mm/m (1 mm maximum).

For special applications trapezoidal screw drives optional stand for disposal. When used, please ask our technical sales specialists and clarify the exact use.

Mechanical Linear Drives with Toothed Belt Drive

For calculating service life, the guide load ratings are used. Please contact us for further information.

The idle torques refer to the respective standard configurations and are measured at a very low speed ($\approx 0 \text{ min}^{-1}$). Production and assembly tolerances vary by $\pm 20\%$.

The specification for load F_x is the maximum value permitted for low speeds. Please contact us for the maximum value at higher speeds.

The permissible deflection of the linear axis is 0.5 mm/m (2.5 mm maximum).

It is generally recommended to change the toothed belt after 5 to 7 years, as the base material (PU) ages. A theoretical service life calculation is not possible.

Running performance and noise

Contingent on the production tolerances in the used components (e.g. screw or toothed belt drive, guide, mounting, etc.), the running behaviour and noise development for linear drives and linear tables can vary enormously even with the same units. Using customised solutions, such as for example longer spindle supports or damping, the running behaviour can be changed for the better.

Straightness and torsion

All aluminium profiles used for the linear devices and the linear tables are extruded profiles.

The straightness and torsion of these profiles may deviate as a result of the manufacturing process.

The permissible deviations in accordance with DIN 17615 are, however, generally far from exceeded.

However, it may be necessary to align the linear drives using suitable levelling elements or

fix them to a mounting surface machined with sufficient accuracy in order to achieve the desired guiding accuracy. Better tolerances of 0.1 mm / 1000 mm can thus be achieved.

Stroke length

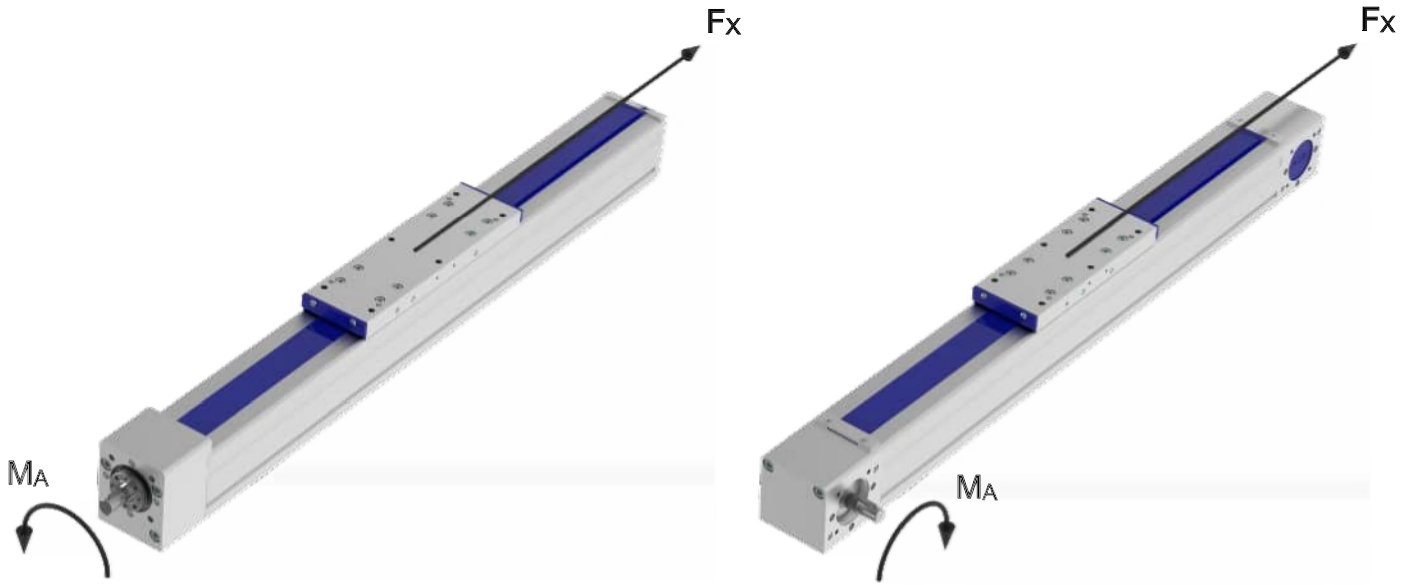
The stroke length specified in the ordering code refers to the maximum permissible stroke.

Acceleration-, braking distances or possible overrun must be taken into consideration here.

We reserve the right to make technical changes to all products!

Drive Dimensions for Mechanical Linear Drives

with screw drive or toothed belt drive



Required drive torque* M_A [Nm]:

$$M_A = M_{load} + M_{idle}$$

Definitions:

- M_A : Required drive torque [Nm]
 M_{load} : Load torque [Nm]
 M_{idle} : See data sheets [Nm]
 F_x : Feed force in horizontal application [N]
 Feed force in vertical application [N]

$$M_{load} = \frac{F_x \cdot p}{2 \cdot \pi \cdot 1000}$$

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

$$F_x = m \cdot (g + a)$$

- μ : Friction coefficient for linear guide $\mu = 0.006$
 Friction coefficient for roller guide $\mu = 0.002$
 Friction coefficient for sliding guide $\mu = 0.1$
 g : Gravitational acceleration [m/s^2] $g = 9.81 m/s^2$
 a : Acceleration [m/s^2]
 m : Transport weight [kg]
 p : Spindle pitch [mm] (screw drive) or stroke per revolution [mm] (toothed belt drive)

* (rough estimate)

Forces (**F**) result if

a mass (**m**) being accelerated (**a**).

a mass (**m**) being accelerated due to gravity (**a**).

This means:

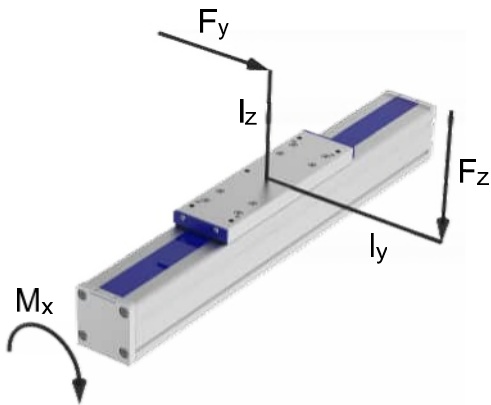
$$\mathbf{F_x , F_y = m \cdot a}$$

$$\mathbf{F_z = m \cdot (g + a)}$$

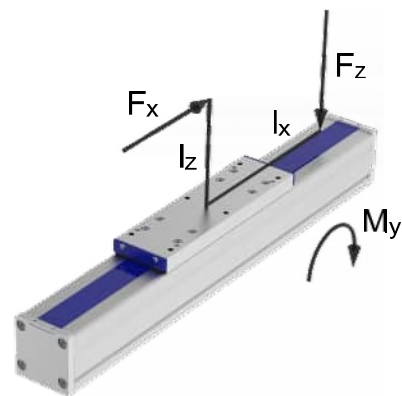
(vertical applications)

A moment is caused by a force (**F**) acting upon a lever arm (**l**).

This means a force is acting off-centre.

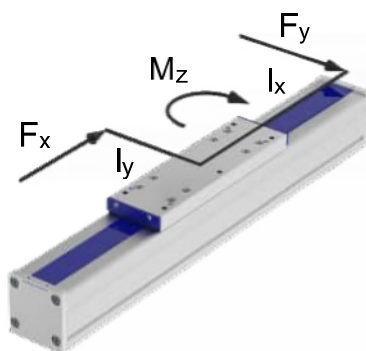


$$\mathbf{M_x = F_y \cdot l_z \text{ oder } F_z \cdot l_y}$$



$$\mathbf{M_y = F_x \cdot l_z}$$

$$\mathbf{M_y = F_z \cdot l_x}$$



$$\mathbf{M_z = F_x \cdot l_y}$$

$$\mathbf{M_z = F_y \cdot l_x}$$

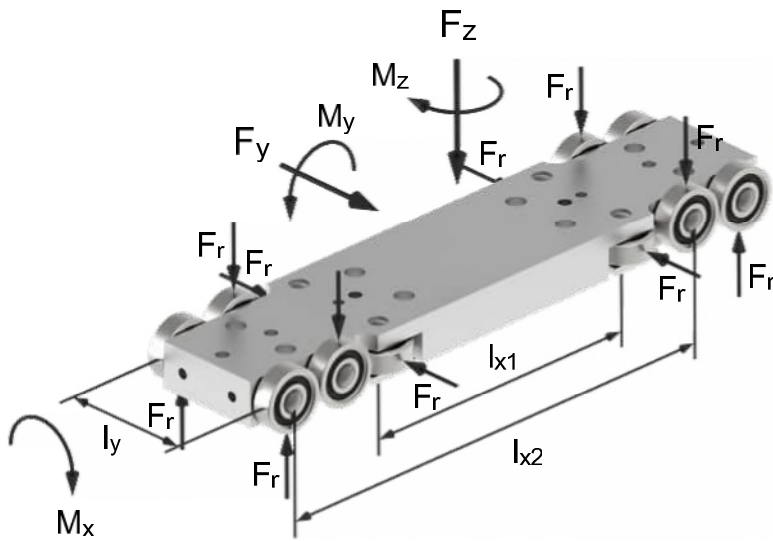
In most of the applications, there are combinations of these forces.

The resulting end forces must always be smaller than the permitted values.

For calculating service life, the actual forces are used.

(See following pages)

Forces at the roller guide



- F_x : Force in feed direction
- F_y : Force in Y direction
- F_z : Force in Z direction
- M_x : Moment for longitudinal axis (X)
- M_y : Moment for lateral axis (Y)
- M_z : Moment for vertical axis (Z)
- F_r : Force on the roller
- l_y : Guiding distance in y direction (see Table on page TL11)
- l_{x1} : Guiding distance in x direction (see Table on page TL11)
- l_{x2} : Guiding distance in x direction (see Table on page TL11)

Direction of force F_y

F_y shared by 2 rollers

$$F_r = F_y \cdot 0.5$$

Direction of force F_z

$+F_z$ and $-F_z$ shared by 4 rollers

$$F_r = F_z \cdot 0.25$$

Moment M_x

M_x shared by 2 rollers

$$F_r = M_x / l_y \cdot 0.5$$

Moment M_y

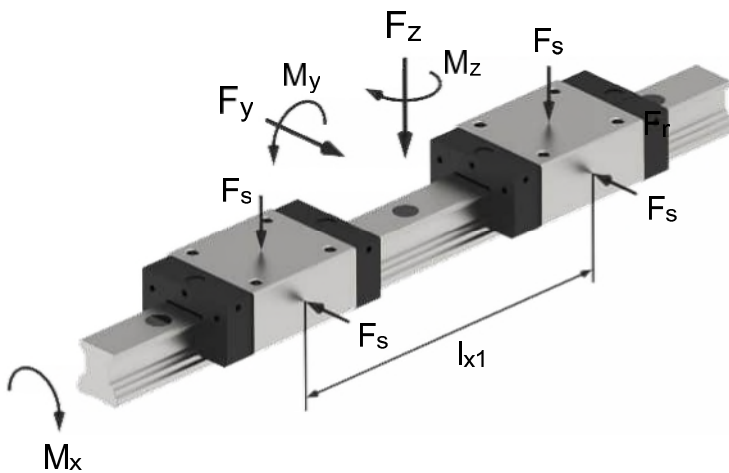
M_y shared by 2 rollers

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

Moment M_z

M_z shared by 1 roller

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



- F_x : Force in feed direction
- F_y : Force in Y direction
- F_z : Force in Z direction
- M_x : Moment for longitudinal axis (X)
- M_y : Moment for lateral axis (Y)
- M_z : Moment for vertical axis (Z)
- M_t : Permissible dynamic moment for the guide carriage
(see Table on page TL12)
- C : Dynamic load rating (C_{dyn}) for the guide carriage
(see Table on page TL12)
- F_s : Force on a carriage
- l_{x1} : Guiding distance in x direction
(see Table on page TL12)

Direction of force F_y

F_y shared by 2 carriages

$$F_s = F_y \cdot 0.5$$

Direction of force F_z

F_z shared by 2 carriages

$$F_s = F_z \cdot 0.5$$

Moment M_x

M_x shared by 2 carriages
With combined external load (F_z and F_y)
in combination with a torsional moment

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

Moment M_y

M_y shared by 2 carriages
(with opposite direction of force)

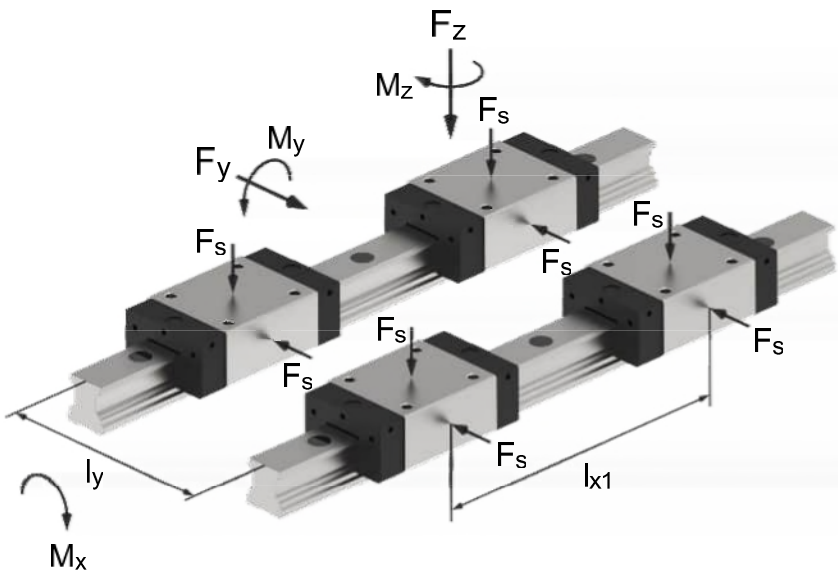
$$F_s = M_y / l_{x1} \cdot 1$$

Moment M_z

M_z shared by 2 carriages
(with opposite direction of force)

$$F_s = M_z / l_{x1} \cdot 1$$

Forces at the double rail guide



- F_x : Force in feed direction
- F_y : Force in Y direction
- F_z : Force in Z direction
- M_x : Moment for longitudinal axis (X)
- M_y : Moment for lateral axis (Y)
- M_z : Moment for vertical axis (Z)
- F_s : Force on a carriage
- l_y : Guiding distance in y direction (see Table on page TL12)
- l_{x1} : Guiding distance in x direction (see Table on page TL12)

Direction of force F_y

F_y shared by 4 carriages

$$F_s = F_y \cdot 0.25$$

Direction of force F_z

F_z shared by 4 carriages

$$F_s = F_z \cdot 0.25$$

Moment M_x

M_x shared by 4 carriages
(2 per opposite direction of force)

$$F_s = M_x / l_y \cdot 0.5$$

Moment M_y

M_y shared by 4 carriages
(2 per opposite direction of force)

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

Moment M_z

M_z shared by 4 carriages
(2 per opposite direction of force)

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

Service Life of Roller, Rail Guide and Ball Screw

It is primarily the guide values for the mechanical linear drive that are used when calculating nominal service life. The ball screw must also be taken into consideration for the drive with ball screw spindle. With the multitude of parameters crucial for the service life of the entire mechanical linear drive (forces and moments, taking into consideration directions and possible combinations, lead to a moderate load (F_m); ambient conditions, duty cycle...), the following simplified formulae only serve as an initial estimate.

1. Moderate load of the guide or ball screw

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

2. Nominal service life of the roller guide

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

$$F = F_m + F_v$$

3. Nominal service life of the sliding guide

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

$$F = F_m + F_v$$

4. Nominal service life of the ball screw

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

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

Definitions

F_m : Moderate load [N] of guide or ball screw

F_1, F_2, F_n : Stepped single load [N]

q_1, q_2, q_n : Stroke rate for F_1, F_2, F_n [%]

L : Nominal service life of guide [m]

C : Dynamic load rating of guide (C_{dyn}) [N] (see Table on pages TL11 and TL12)

R : Factor for roller guide size

Beta 50 ... Beta 80 + Sigma 70: $R = 0,625$; Beta 80-C + Sigma 90: $R = 0,75$;

Beta 100 + 110 + Sigma 120: $R = 0,87$;

Beta 120 + 140 + Sigma 160: $R = 1,1$;

Delta 90: $R = 0,595$ (Y) und $R = 0,625$ (Z)

F : Equivalent load [N] for guide or ball screw

F_v : Pretensioning [N] (3 % of C_{dyn} , 5 % for roller guide (see Table on pages TL11 and TL12)

L_{KGT} : Nominal service life of the ball screw [revolutions]

C_{KGT} : Dynamic load rating of the ball screw (C_{dyn}) [N] (see Table on page TL13)

Technical Data for Mounted Guides

Static and dynamic load ratings of the roller guides

Unit size	Size (∅) [mm]	Number of supporting rollers for Fz	Number of supporting rollers for Fy	Load rating per roller C _{stat} [N]	Load rating per roller C _{dyn} [N]	Guide distance* in direction x [mm]		Guide distance in direction y [mm]
						lx1	lx2	
Beta 50-C	20	4	2	850	1500	86 (136)	86 (136)	30.5
Beta 50-C-ARS						82	81	
Beta 70-C	20	4	2	850	1500	74 (124)	138.5 (188.5)	41.5
Beta 70-C-ARS						120	182	
Beta 80	20	4	2	850	1500	95 (155)	156.5 (216.5)	42.5
Beta 80-ARS						155	216.5	
Beta 80-C	24	4	-	1240	2750	-	148.5 (208.5)	42.4
		-	2	2300	4200	75 (135)	-	-
Beta 80-C-ARS	24	4	-	1240	2750	-	208.5	42.4
		-	2	2300	4200	135	-	-
Beta 100	28	4	2	1850	3200	136 (256)	223 (343)	47
Beta 110	28	4	2	1850	3200	175 (355)	262 (442)	66
Beta 110-ARS						253	340	
Beta 120	35	4	2	2590	5280	148 (328)	148 (328)	70
Beta 140	35	4	2	2590	5280	202 (382)	202 (382)	98
Beta 140-ARS						192 (272)	192 (272)	
Delta 90	20	4	-	790	1830	-	100 (180)	54.4
	19	-	2	1370	2700	100 (180)	-	-
Sigma 70	20	4	4	850	1500	67 (117)	71 (121.5)	57
Sigma 90	24	4	4	1240	2750	76 (126)	99 (149)	77
Sigma 120	28	4	4	1850	3200	130 (260)	160.5 (290)	99
Sigma 160	35	4	4	2590	5280	145 (295)	177.5 (327.5)	135

The pretensioning per roller is approx. 5 %.

* () = Data for long entire carriage, Beta ARS and Sigma ARH

Dynamic load ratings of the rail guides (THK and Rex = Rexroth)

Unit size	Size	Number of rails	Number of guiding carriages per carriage	Load rating per carriage C _{dyn} [N] THK / Rex	Pretensioning F _v [N] THK / Rex	M _t [Nm] THK / Rex	Guide distance* in direction x [mm]		Guide distance in direction y [mm]
							lx1	ly	
Beta 40	12	1	2	3175 / 2310	-	18,3 / 13,7	83 (163)	-	
Beta 60-ZSS	15	1	2	11270 / 9860	564 / 620	127 / 95	102 (152)	-	
Beta 60-SSS	15	1	2	11270 / 9860	564 / 620	127 / 95	118 (168)	-	
Beta 70-C-ZSS	15	1	2	11270 / 9860	564 / 620	127 / 95	120 (170)	-	
Beta 70-C-SSS	15	1	2	11270 / 9860	564 / 620	127 / 95	124 (174)	-	
Beta 70-C-ASS	15	1	2	11270 / 9860	564 / 620	127 / 95	164	-	
Beta 80-ZSS	20	1	2	17700 / 23400	885 / 1500	286 / 300	131 (191)	-	
Beta 80-SSS	20	1	2	17700 / 23400	885 / 1500	286 / 300	128 (188)	-	
Beta 80-C	25	1	2	25160 / 28600	1258 / 1820	447 / 410	122 (182)	-	
Beta 80-C-ASS	25	1	2	25160 / 28600	1258 / 1820	447 / 410	172	-	
Beta 100	20	1	2	17700 / 23400	885 / 1500	286 / 300	152 (272)	-	
Beta 100-D-ZSS	15	2	4	11270 / 9860	564 / 620	-	150 (210)	56	
Beta 100-D-ASS	15	2	4	11270 / 9860	564 / 620	-	192	56	
Beta 100-D-SSS	15	2	4	11270 / 9860	564 / 620	-	141 (201)	56	

Unit size	F_{Max} [N]	Stroke/revol. [mm]	M_{load} [Nm]	M_{idle} [Nm]	M_{total} [Nm]
Sigma 70-ZRS	1050	125	20.89	0.85	21.74
Sigma 70-AR.	1050	125	20.89	0.85	21.74
Sigma 90-ZRS	1300	175	36.21	3.20	39.41
Sigma 90-ZRSD	650	175	18.10	3.20	21.30
Sigma 90-AR.	1300	150	31.04	2.30	33.34
Sigma 120-ZRS	2800	200	89.13	3.00	92.13
Sigma 120-ZRSD	1800	200	57.30	3.00	60.30
Sigma 120-AR.	3200	240	122.23	3.80	126.03
Sigma 160-ZRS	4000	240	152.79	4.00	156.79
Sigma 160-ZRSD	2300	210	76.87	3.50	80.37
Sigma 160-AR.	4000	240	152.79	4.20	156.99

Maintenance instructions for THK and Rexroth rail guide

For all guide carriage sizes, the relubrication interval is approx. 5000 km for the carriage with ball chain or approx. 2000 km for the carriage without (Rexroth without ball chain / standard). It is dependent on several factors, i.e. operating temperature, load, degree of pollution, etc. Grease quantity depends on the guide carriage (see Table).

Size		12	15	20	25	30	35
Guide		THK					
Quantity	[cm ³]	0.14	0.4	0.6	1.2	1.5	1.7
Guide		Rexroth					
Quantity	[cm ³]	0.15	0.8	1.4	2.8	4.4	4.4

Klüberplex BE 31-102 is used for the initial lubrication. (When using other roller bearing greases, please take note of the manufacturer's instructions!) Roller bearing greases with a solid lubricant percentage (e.g. graphite or MoS₂) is not to be used.

Please refer here to our assembly and maintenance instructions.

Maintenance instructions for roller guide

Under normal operating conditions (dry environment, no dust, etc.), the roller guide is lubricated for life by integrated lubricating felts.

Maintenance instructions for ball screw

For ball screws, relubrication intervals depend on the pitch and the spindle diameter:

KGT 12xx to 32xx after approx. 2.5×10^7 overrolling movements

KGT 40xx and 50xx after approx. 1.5×10^7 overrolling movements

KGT-Type	[Size]	1205	1210	1605	1610	1620	1640	2005	2010	2020	2050	2505	2510	2525	2550
Quantity	[cm ³]	0,55	0,55	1,70	1,80	1,70	1,80	2,00	2,10	2,30	4,50	2,60	3,40	3,10	4,80

KGT-Type	[Size]	3205	3210	3220	3232	3240	3260	4005	4010	4020	4040	5010	5020
Quantity	[cm ³]	4,20	5,60	4,60	5,30	3,00	4,60	5,30	15,40	10,20	14,30	25,90	26,50

Klüberplex BE 31-102 is used for the initial lubrication. (When using other roller bearing greases, please take note of the manufacturer's instructions!) Roller bearing greases with a solid lubricant percentage (e.g. graphite or MoS₂) is not to be used.

In general, ball screw spindles should be protected against contamination. A cover band (standard) or a bellows can be used here.

Please refer here to our assembly and maintenance instructions.

Note: PRESSOL 12226 (125 cm³) one-hand grease gun with spout and corresponding coupler can be ordered from us.

Other maintenance instructions

The relubrication interval and the relubrication amount are generally influenced by many factors (e.g. speed, temperature, ambient conditions, etc.). For this reason, only reference values have been given here. Relubrication should take place at least every two years.

The relubrication should take place "in motion".

Note: The customer is required to carry out a basic lubrication after commissioning!

All mounted ball bearings are sealed and maintenance-free.

The toothed belt is also maintenance-free and must only be replaced if an excess load leads to the breakage or elongation of the elastic area.

Excessive dust and contamination on the toothed belt and at the cover band should be regularly removed.