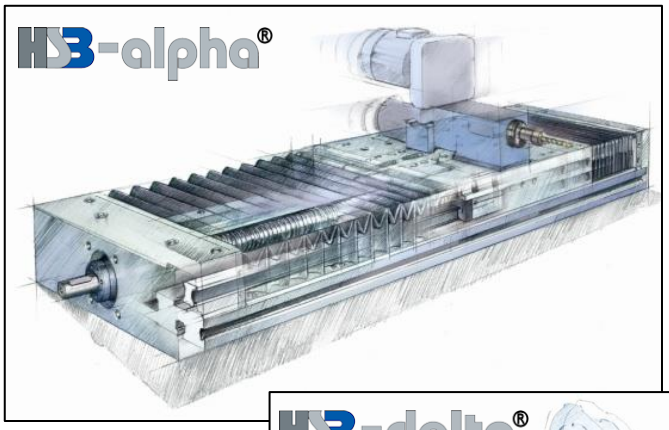
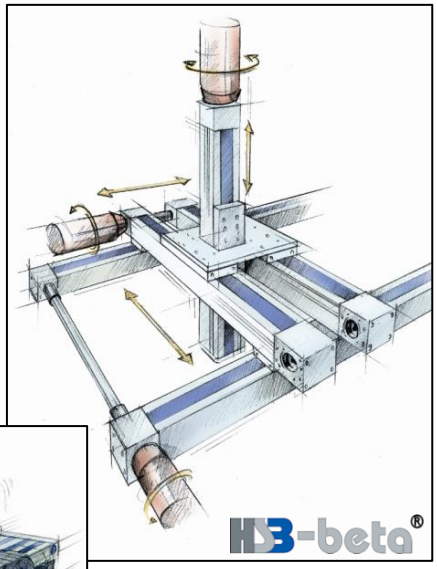
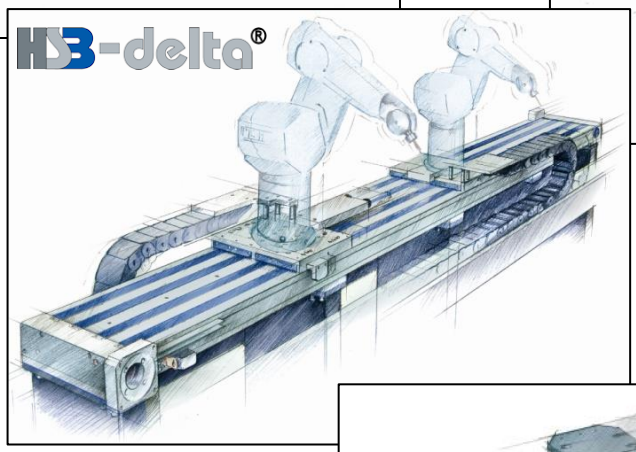
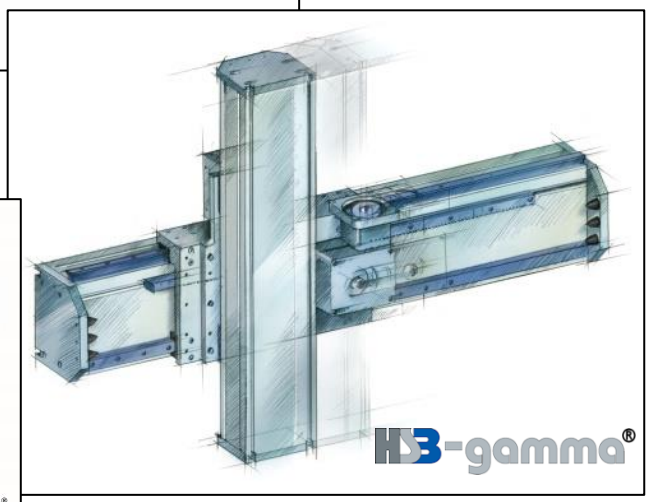
HSB AUTOMATION

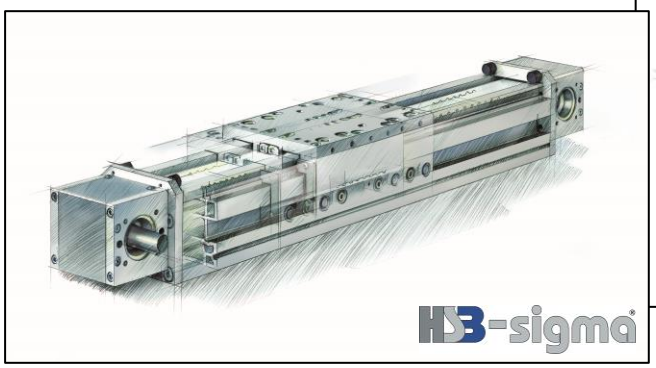
2015











- Linear Tables
  - Mechanical Linear Drives
    - Handling-Systems
      - Portal Linear Drives

Performance Overview of Mechanical Linear Drives and Compact Modules with Toothed Belt Drive or Rack-and-Pinion Drive (AZSS)

HSB-beta®
HSB-delta®

Description	Toothed belt	F_X [N]	F_Y [N]	F_Z [N]	$-F_Z$ [N]	M_X [Nm]	M_Y [Nm]	M_Z [Nm]	M_{idle} [Nm]	d_s [mm]	s_{max} [mm]	L_{max} [mm]
Beta 40-ZGS	16 AT5-E	500	80	150	75	6	6	8	0.30	0.08	2780	3000
Beta 40-ZSS	16 AT5-E	500	500	600	300	12	30	30	0.30	0.08	850	1070
Beta 50-C-ZRS	20 AT5-E	700	300	600	400	30	50	50	0.40	0.08	7710	8000
Beta 50-C-ARS	20 AT5-E	700	300	600	400	30	50	50	1.50	0.08	7710	8000
Beta 60-ZSS	25 AT5-E	850	500	1400	800	50	160	100	1.10	0.08	7620	8000
Beta 70-A-ZRS	25 AT5-E	800	300	1000	400	35	120	50	1.00	0.08	7770	8000
Beta 70-C-ZRS	32 AT5-E	1100	300	1000	400	35	120	50	1.20	0.08	7640	8000
Beta 70-C-ZSS	32 AT5-E	1100	600	1800	1200	60	180	120	1.20	0.08	6840	7200
Beta 70-C-ARS	32 AT5-E	900	300	1000	400	35	120	50	1.00	0.08	7640	8000
Beta 70-C-ASS	32 AT5-E	900	600	1800	1200	60	180	120	1.00	0.08	7640	8000
Beta 80-ZRS	32 AT5-E	1350	500	1500	800	50	180	100	1.50	0.08	7600	8000
Beta 80-ZSS	32 AT5-E	1350	800	3000	2000	100	250	250	1.50	0.08	7600	8000
Beta 80-C-ZRS	32 AT10	2200	1000	2500	1500	100	300	180	1.80	0.08	7600	8000
Beta 80-C-ZSS	32 AT10	2200	1600	4000	3000	300	500	500	1.80	0.08	7600	8000
Beta 80-ARS	32 AT10	1000	500	1500	800	50	180	100	1.50	0.08	7590	8000
Beta 80-ASS	32 AT10	1000	800	3000	2000	100	250	250	1.50	0.08	7590	8000
Beta 100-ZRS	40 AT10	2800	1000	2500	1200	200	250	200	2.50	0.08	7420	7900
Beta 100-ZSS	40 AT10	2800	1000	3000	2000	200	250	250	2.50	0.08	7420	7900
Beta 100-D-ZSS	40 AT10-E	1500	1800	4000	3000	350	750	750	5.00	0.08	7720	8100
Beta 100-D-ASS	40 AT10-E	2200	1800	4000	3000	350	950	950	2.50	0.08	7680	8100
Beta 110-ZRS	50 ATL10	4000	2000	5000	2500	300	600	450	3.50	0.08	7520	8100
Beta 110-ZSS	50 ATL10	4000	3000	8000	4000	400	800	600	3.50	0.08	7520	8100
Beta 110-ARS	50 ATL10	2000	2000	5000	2500	300	600	450	3.50	0.08	7440	8100
Beta 110-ASS	50 ATL10	2000	3000	8000	4000	400	800	600	3.50	0.08	7440	8100
Beta 120-ZRS	50 ATL10	4000	2500	5000	3000	350	700	500	3.20	0.08	7520	8100
Beta 120-ZSS	50 ATL10	4000	3000	8000	4000	400	800	600	3.20	0.08	7520	8100
Beta 120-C-ZSS	60ATL10	4800	4000	12000	6000	600	1500	1000	4.50	0.08	7500	8100
Beta 140-ZRS	50 AT10-E	4000	2500	5000	3000	350	700	500	3.50	0.08	7540	8100
Beta 140-ZSS	50 AT10-E	4000	2500	6000	4000	500	1000	1000	3.50	0.08	7540	8100
Beta 140-ARS	50 AT10-E	2500	2500	5000	3000	350	700	500	3.50	0.08	7470	8100
Beta 140-ASS	50 AT10-E	2500	2500	6000	4000	500	1000	1000	3.50	0.08	7470	8100
Beta 140-C-ZSS	50 AT10-E	4000	3200	7500	5000	600	1200	1200	3.50	0.08	7470	8100
Beta 140-C-ASS	50 AT10-E	2500	3200	7500	5000	600	1200	1200	3.50	0.08	7470	8100
Beta 165-ZSS	75 ATS15	10000	5000	15000	8000	700	1400	1100	12.00	0.08	6920	7700
Beta 180-ZSS	75 AT10	6000	6000	12000	6000	1500	3000	1500	8.00	0.08	5500	6200
Beta 180-ASS	75 AT10	3500	6000	12000	6000	1500	3000	1500	8.00	0.08	5470	6200
Beta 180-AZSS	Rack and pinion	4500	8000	16000	8000	2000	4000	2000	10.00	0.05	5400	6000
Beta 180-C-ZSS	75 AT10	6000	8000	15000	8000	1800	3600	1800	8.00	0.08	5500	6200
Beta 180-C-ASS	75 AT10	3500	8000	15000	8000	1800	3600	1800	8.00	0.08	5470	6200
Delta 90-ZRS	32 AT5-E	800	500	1000	1000	60	80	80	1.50	0.08	3720	4000
Delta 110-ZSS	25 AT5-E	750	1200	3000	1500	500	650	650	1.60	0.08	1020	1300
Delta 145-ZSS	50 AT5-E	1900	2500	5000	3000	800	1000	1000	2.20	0.08	1160	1500
Delta 145-C-ZSS	60 AT5-E	2000	2500	5000	3000	800	1000	1000	3,00	0,08	7700	8100
Delta 200-ZSS	75 AT10	6000	5000	8000	5000	3500	4300	3200	3.80	0.08	1520	2000
Delta 240-ZSS	50 AT10-E	2500	6000	12000	8000	4500	6000	4500	5.50	0.08	2550	3000
Delta 240-C-ZSS	60 ATL10	3800	6000	12000	8000	4500	6000	4500	5.50	0.08	7340	8000

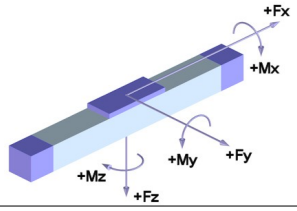
For mechanical linear drives with roller guides, the static load rating (C_{stat}) applies for static loads.

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)



HSB-beta® HSB-delta® HSB-alpha®

Performance Overview of Mechanical Linear Drives, Compact Modules and Linear Tables with Ball Screw

Description	Screw Drive	F_x [N]	F_y [N]	F_z [N]	$-F_z$ [N]	M_x [Nm]	M_y [Nm]	M_z [Nm]	M_{idle} [Nm]	$d_{pn/ps}$ [mm]	d_s [mm]	SA	s_{max} [mm]	L_{max} [mm]
Beta 40-SGS	1205 / 1210	1000	80	150	75	6	6	8	0,30	0,08 / 0,03	0,03	2	890	1090
Beta 40-SSS		1000	500	600	300	12	30	30	0,30	0,08 / 0,03	0,03	2	890	1090
Beta50-C-SRS	1205 / 1210	1000	300	600	400	30	60	50	0,30	0,08 / 0,03	0,03	-	860	1090
Beta 60-SSS	2005 / 2010	4000	600	1800	1200	60	180	120	0,70	0,08 / 0,03	0,03	8	5220	5500
Beta 60-SGV	2020 / 2050	4000	-	-	-	-	-	-	0,70	0,08 / 0,03	0,03	8	5220	5500
Beta 70-C-SRS	1605 / 1610 1620 / 1640	2000	300	1000	400	35	120	60	0,35	0,08 / 0,03	0,03	8	3725	4000
Beta 70-C-SSS		2000	600	1800	1200	60	180	120	0,40	0,08 / 0,03	0,03	8	3725	4000
Beta 70-A-SRS		1500	300	1000	400	35	120	60	0,30	0,08 / 0,03	0,03	8	3755	4000
Beta 80-SRS	2005 / 2010	4000	500	1500	800	50	180	100	0,60	0,08 / 0,03	0,03	8	5220	5600
Beta 80-SSS	2020 / 2050	4000	800	3000	2000	100	250	250	0,80	0,08 / 0,03	0,03	8	5220	5600
Beta 80-SGV	2505 / 2510 2525 / 2550	6000	-	-	-	-	-	-	1,00	0,1 / 0,04	0,03	8	5220	5600
Beta 100-D-SSS	2005 / 2010 2020 / 2050	4000	1800	4000	3000	350	750	750	1,30	0,08 / 0,03	0,03	8	5260	5600
Beta 110-SRS	2505 / 2510	6000	3000	5000	2500	400	800	600	1,00	0,1 / 0,04	0,03	10	5120	5600
Beta 110-SSS	2525 / 2550	6000	2000	8000	4000	300	600	450	1,50	0,1 / 0,04	0,03	10	5120	5600
Beta 110-C-SGV	4005 / 4010 4020 / 4040	16000	-	-	-	-	-	-	1,50	0,1 / 0,04	0,03	6	5120	5600
Beta 120-C-SSS	3205 / 3210 3220 / 3240 3260	12000	4000	12000	6000	600	1500	1000	2,00	0,1 / 0,04	0,03	10	5120	5600
Beta 140-SRS	2505 / 2510 2525 / 2550	6000	2500	5000	3000	350	700	500	1,00	0,1 / 0,04	0,03	10	5120	5600
Beta 140-SSS		6000	2500	6000	4000	500	1000	1000	1,50	0,1 / 0,04	0,03	10	5120	5600
Beta 140-C-SSS		6000	3200	7500	5000	600	1200	1200	1,50	0,1 / 0,04	0,03	10	5120	5600
Beta 165-SSS	4005 / 4010	18000	5000	15000	8000	700	1400	1100	3,00	0,1 / 0,04	0,03	8	5010	5600
Beta 165-SGV	4020 / 4040	18000	-	-	-	-	-	-	3,00	0,1 / 0,04	0,03	8	5020	5600
Beta 165-C-SGV	5010 / 5020	25000	-	-	-	-	-	-	3,20	0,1 / 0,04	0,03	6	5020	5600
Beta 165-C-SSF	5010 / 5020	25000	5000	15000	8000	800	1800	1400	3,20	0,1 / 0,04	0,03	6	5010	5600
Beta 180-SSS	3205 / 3210 3220/ 3240 3260	12000	6000	12000	6000	1500	3000	1500	2,50	0,1 / 0,04	0,03	8	5030	5600
Beta 180-C-SSS		12000	8000	15000	8000	1800	3600	1800	2,50	0,1 / 0,04	0,03	8	5030	5600
Delta 90-SRS	1205 / 1210	1000	500	1000	1000	60	80	80	0,80	0,08 / 0,03	0,03	2	1185	1500
Delta 110-SSS	1605 / 1610 1620 / 1640	2000	1200	3000	1500	500	650	650	0,90	0,08 / 0,03	0,03	4	1070	1300
Delta 145-SSS	2505 / 2510 2525 / 2550	6000	2500	5000	3000	800	1000	1000	1,10	0,1 / 0,04	0,03	4	1200	1500
Delta 145-C-SSS	2005 / 2010 2020 / 2050	4000	2500	5000	3000	800	1000	1000	1,00	0,08 / 0,03	0,03	8	5275	5600
Delta 200-SSS	3205 / 3210	10000	5000	8000	5000	3500	4300	3200	2,80	0,1 / 0,04	0,03	4	1620	2000
Delta 240-SSS	3220 / 3240	12000	6000	12000	8000	4500	6000	4500	2,80	0,1 / 0,04	0,03	4	2600	3000
Delta 240-C-SSS	3260	12000	6000	12000	8000	4500	6000	4500	2,80	0,1 / 0,04	0,03	4	5400	5800
Alpha 15-B-155	2005 / 2010 2020 / 2050	4000	2000	20000	15000	1000	900	400	0,35	0,08 / 0,03	0,03	4	1235	1500
Alpha 20-B-225	2505 / 2510 2525 / 2550	6000	5000	58000	40000	4000	3000	1200	1,20	0,1 / 0,04	0,03	4	1645	2000
Alpha 30-B-325	3205 / 3210 3220 / 3240	12000	8000	75000	50000	5000	4000	2000	1,60	0,1 / 0,04	0,03	4	2540	3000
Alpha 35-B-455	4005 / 4010 4020 / 4040	18000	14000	120000	80000	12000	10000	5000	2,50	0,1 / 0,04	0,03	4	2420	3000

For mechanical linear drives with roller guides, the static load rating (C_{stat}) applies for static loads.

M_{idle} = Idle torque ± 30%

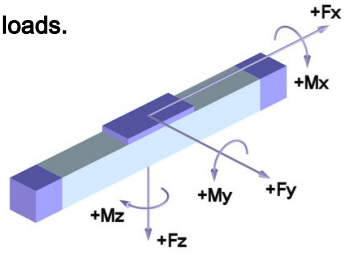
$d_{pn/ps}$ = Axial clearance (normal / low backlash)

d_s = Repeat accuracy ±

SA = Maximum number of spindle supports

s_{max} = Maximum standard stroke length without spindle support (longer on request)

L_{max} = Maximum standard length (longer on request)



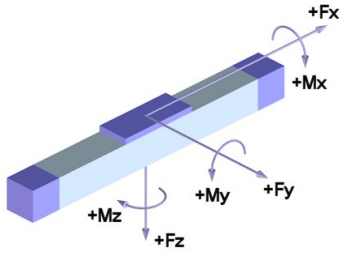
Release: 21.11.2014

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

HSB-gamma®
HSB-sigma®

Description	Toothd 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	32AT10	2300	2500	3000	3000	500	1200	1000	3,20	0,08	7650	8100
Gamma 90-ZSSD	16AT10	1150	2500	3000	500	800	700	700	2,90	0,08	7560	8100
Gamma 90-ASH	32AT10	2300	2500	3000	3000	500	2300	1900	3,20	0,08	7560	8000
Gamma 90-AZ..	M2	1300 - 1800	3000	3000	3000	600	1800	1800	2,50	0,08	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	2800	6000	8000	8000	1200	5000	4200	3,60	0,08	7450	8000
Gamma 120-AZ..	M 2	1500 - 2200	8000	8000	8000	1500	4000	4000	4,80	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	7240	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	5,80	0,05	7370	8000
Gamma 220-ZSS	75 ATL10	6000	12000	20000	20000	2500	8000	6500	7,00	0,08	11520	12200
Gamma 220-ZSSD	2 x 40 AT10	2800	12000	20000	20000	2500	8000	6500	5,25	0,08	11200	12200
Gamma 220-ASS	75 AT10-E	6000	12000	20000	20000	2500	12000	10000	7,00	0,08	11380	12000
Gamma 220-AZ..	M 2	3000 - 6000	20000	20000	20000	4000	8000	8000	7,20	0,05	11320	12000
Gamma 220-AZ..	M 3	3000 - 7500	20000	20000	20000	4000	8000	8000	7,20	0,05	11320	12000
Gamma 280-ZSS	75 ATS15	10000	20000	30000	30000	4000	15000	12000	11,00	0,08	9280	10200
Gamma 280-ZSSD	2 x 50 ATL10	4000	20000	30000	30000	4000	15000	12000	11,00	0,08	8940	10200
Gamma 280-AZ..	M 3	3000 - 7500	25000	25000	25000	8000	16000	16000	8,60	0,05	9220	10000
Sigma 90-ZRS	32 AT5-E	1300	2000	2500	1500	120	160	150	3,20	0,08	7760	8100
Sigma 90-ZRSD	2 x 16 AT5-E	650	2000	2500	1500	120	160	150	3,20	0,08	7595	8100
Sigma 90-ARH	32 AT5-E	1300	2000	2500	1500	120	230	200	2,30	0,08	7745	8000
Sigma 90-ARS	32 AT5-E	1300	2000	2500	1500	120	160	150	2,30	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	3,80	0,08	7510	8000
Sigma 120-ARS	40 AT10-E	3200	2300	3000	1800	170	270	270	3,80	0,08	7600	8000
Sigma 160-ZRS	50 ATL10	4000	4500	6000	4000	500	700	700	4,00	0,08	5670	6200
Sigma 160-ZRSD	2 x 32 AT10	2300	4500	6000	4000	500	700	700	3,50	0,08	5390	6200
Sigma 160-ARH	50 AT10-E	4000	4500	6000	4000	500	1000	1000	4,20	0,08	5430	6000
Sigma 160-ARS	50 AT10-E	4000	4500	6000	4000	500	700	700	4,20	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)



Our **Products**

Mechanical Linear Drives HSB-beta®

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

Compact Modules HSB-delta®

with spindle drive or toothed belt drive
with rail guide

Linear Tables HSB-alpha®

with spindle drive
with rail guide

Portal Linear Drive HSB-gamma®

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

Portal Linear Drive HSB-sigma®

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 class ISO6 and ISO5 (toothed belt linear drive right/left, etc.)

Handling systems

For the most varied of industries

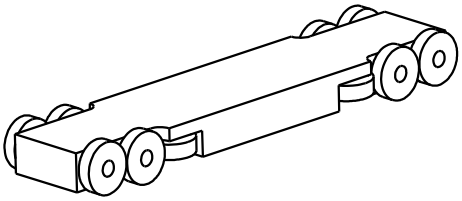
Accessories

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

Selection criteria for the guide system

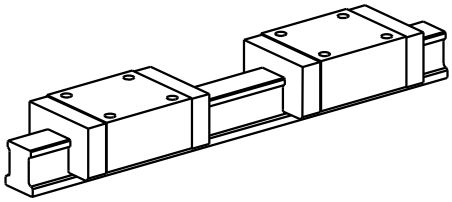
Roller guide

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 (≈ 0 min^{-1}). Production and assembly tolerances vary by ± 20 %.
The permissible deflection of the linear axis is 0.2 mm/m (1 mm maximum).
For special applications trapezodial 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 (≈ 0 min^{-1}). Production and assembly tolerances vary by ± 20%.
The specification for load Fx 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).

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.

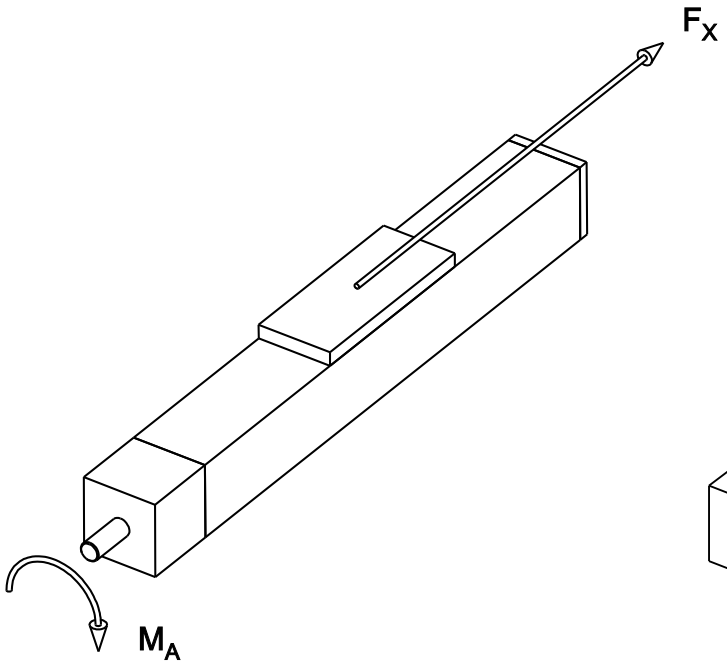
Stroke length

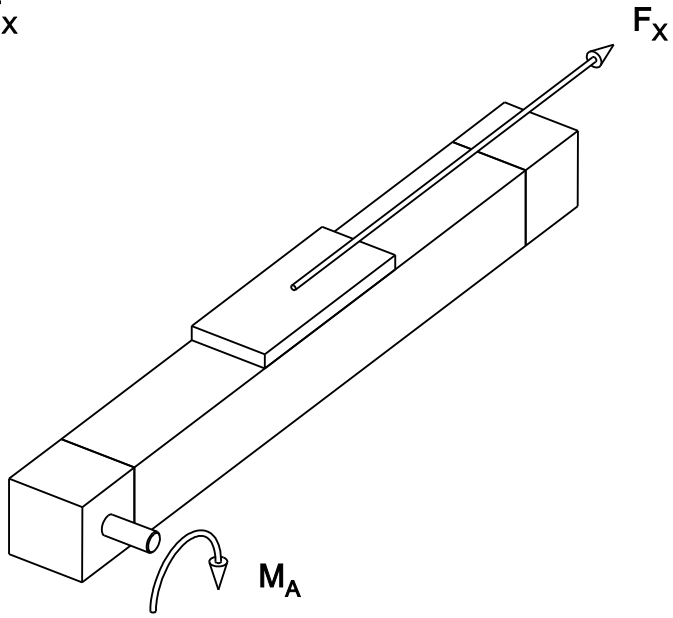
The stroke length specified in the ordering code refers to the maximum permissible stroke.
Acceleration-, braking distances or possible overrun must be taken into consideration here.

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	μ = 0.05
		Friction coefficient for roller guide	μ = 0.02
		Friction coefficient for sliding guide	μ = 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**).

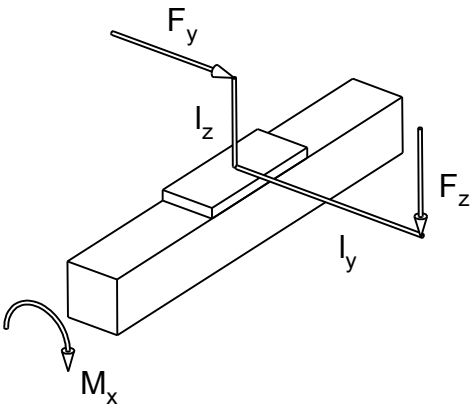
This means:

$$F_x , F_y = m \cdot a$$

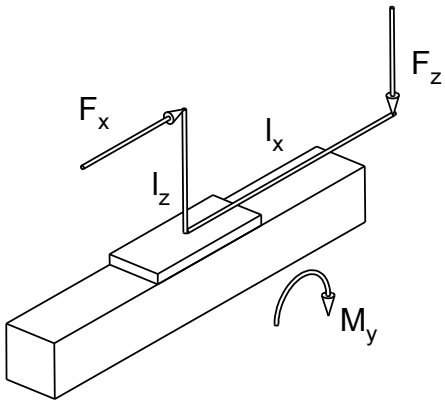
$$F_z = m \cdot (g + a)$$ (vertical applications)

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

This means a force is acting off-centre.

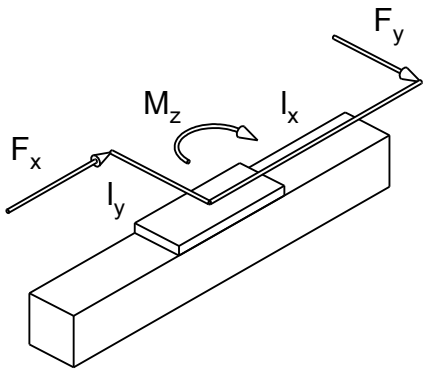


$$M_x = F_y \cdot l_z \text{ or } F_z \cdot l_y$$



$$M_y = F_x \cdot l_z$$

$$M_y = F_z \cdot l_x$$

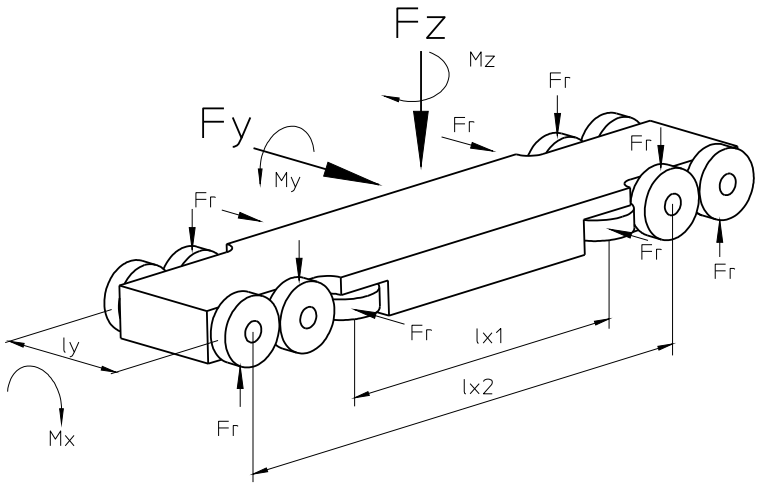


$$M_z = F_x \cdot l_y$$

$$M_z = F_y \cdot l_x$$

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 T11)
l_{x1}	:	Guiding distance in x direction (see Table on page T11)
l_{x2}	:	Guiding distance in x direction (see Table on page T11)

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

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

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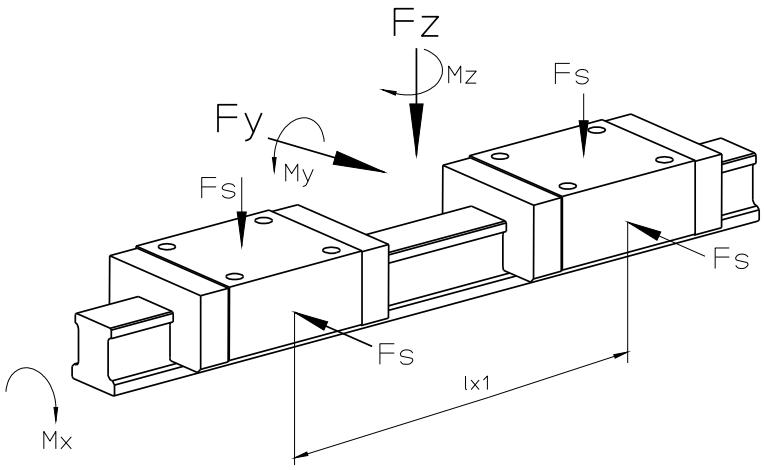


F_x : Force in feed direction
F_y : Force in Y direction
F_z : Force in Z direction
M_x : Moment for longitudinal axis (X)
M_y : Moment for lateral axis (Y)
M_z : Moment for vertical axis (Z)
M_t : Permissible dynamic moment for the guide carriage
(see Table on page T12)
C : Dynamic load rating (C_{dyn}) for the guide carriage
(see Table on page T12)
F_s : Force on a carriage
l_{x1} : Guiding distance in x direction
(see Table on page T12)

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)

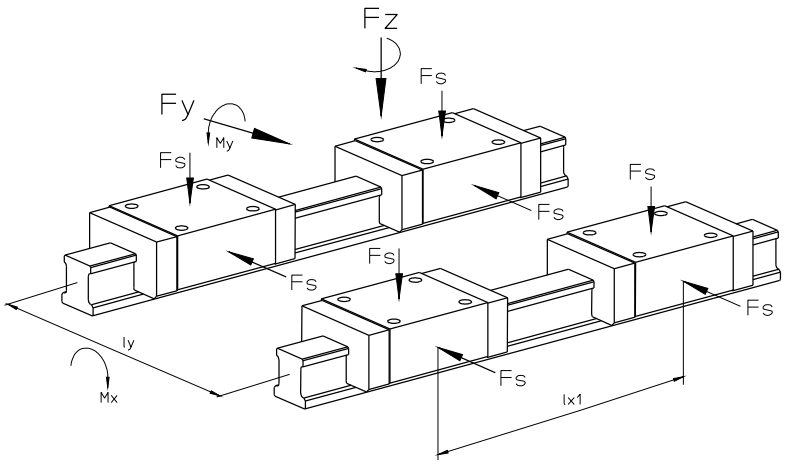
$$F_s = M_y / l_{x1} \cdot 1$$

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 T12)
l_{x1}	:	Guiding distance in x direction (see Table on page T12)

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)

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

Release: 13.09.2011

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

$$F_m = (F_1^3 \cdot q1 / 100 + F_2^3 \cdot q2 /100 + F_n^3 \cdot q_n /100)^{1/3}$$

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

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

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

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 T11 and T12)

R : Factor for roller guide size
Beta 50 ... Beta 80: 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 T11 and T12)

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 T13)

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	ly
Beta 50-C	20	4	2	600	1500	86 (136)	86 (136)	30.5
Beta 70-A	20	4	2	600	1500	63	126	41
Beta 70-C	20	4	2	600	1500	74 (124)	138.5 (188)	41
Beta 80	20	4	2	600	1500	95 (155)	156.5 (216)	41.5
Beta 80-C	24	4	-	1240	2750	-	148.5	42
		-	2	2300	4200	75	-	-
Delta 90	20	4	-	790	1830	-	100 (180)	54.5
	19	-	2	1370	2700	100 (180)	-	-
Beta 100	28	4	2	1300	3200	136 (256)	223 (343)	47
Beta 110	28	4	2	1300	3200	175 (355)	262 (424)	66
Beta 120	35	4	2	3000	6800	148 (328)	148 (328)	70
Beta 140	35	4	2	3000	6800	202 (352)	202 (389)	98
Beta 140-ARS	35	4	2	3000	6800	272	272	98
Sigma 90	24	4	4	1240	2750	76 (126)	99 (149)	77
Sigma 120	28	4	4	1300	3200	130 (260)	160 (290)	99
Sigma 160	35	4	4	3000	6800	145 (295)	177 (327)	135

The pretensioning per roller is approx. 5 %.

( ) = Data for long entire carriage and Sigma ARH

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

Unit size	Size	Number of rails	Number Of carriages	Load rating Per carriage C_{dyn} [N] THK / Rex	Pre-tensioning F_v THK / Rex	M_t [Nm] THK / Rex	Guide distance* in direction x [mm] lx1	Guide distance in direction y [mm] ly
Beta 40	12	1	2	3175 / 2310	-	25 / 14	83 (163)	-
Beta 60	15	1	2	11271 / 7800	5% / 8%	60 / 74	106 (156)	-
Beta 70-C	15	1	2	11271 / 7800	5% / 8%	60 / 74	124 (174)	-
Beta 80	20	1	2	17700 / 18800	5% / 8%	210 / 240	128 (188)	-
Beta 80-C	25	1	2	25160 / 22800	5% / 8%	340 / 320	122 (182)	-
Beta 100	20	1	2	17700 / 18800	5% / 8%	210 / 240	152 (272)	-
Beta 100-D-ZSS	15	2	4	11271 / 7800	5% / 8%	-	150 (210)	56
Beta 100-D-ASS	15	2	4	11271 / 7800	5% / 8%	-	192	56
Beta 100-D-SSS	15	2	4	11271 / 7800	5% / 8%	-	150 (210)	56
Beta 110	25	1	2	25160 / 22800	5% / 8%	340 / 320	203 (383)	-
Beta 120	25	1	2	25160 / 22800	5% / 8%	340 / 320	144 (324)	-
Beta 120-C	30	1	2	35558 / 31700	5% / 8%	580 / 540	184 (364)	-
Beta 140	15	2	4	11271 / 7800	5% / 8%	-	180 (330)	72
Beta 140-ASS	15	2	4	11667 / 7800	5% / 8%	-	242 (322)	72
Beta 140-C-ZSS	20	2	4	17700 / 18800	5% / 8%	-	220 (400)	76
Beta 140-C-ASS	20	2	4	17700 / 18800	5% / 8%	-	220 (300)	76
Beta 140-C-SSS	20	2	4	17700 / 18800	5% / 8%	-	210 (360)	76
Beta 165-ZSS	35	1	2	49448 / 41900	5% / 8%	985 / 890	198 (398)	-
Beta 165-SSS	35	1	2	49448 / 41900	5% / 8%	985 / 890	219 (329)	-
Beta 165-C-SSF	30	2	4	43018 / 40000	5% / 8%	-	280	128
Beta 180-ZSS	20	2	4	17700 / 18800	5% / 8%	-	172 (392)	84
Beta 180-AZSS	20	2	8	17700 / 18800	5% / 8%	-	430	84
Beta 180-ASS	20	2	4	17700 / 18800	5% / 8%	-	306	84
Beta 180-SSS	20	2	4	17700 / 18800	5% / 8%	-	247 (467)	84
Beta 180-C-ZSS	25	2	4	25160 / 22800	5% / 8%	-	272 (492)	84
Beta 180-C-ASS	25	2	4	25160 / 22800	5% / 8%	-	307	84
Beta 180-C-SSS	25	2	4	25160 / 22800	5% / 8%	-	233 (453)	84
Delta 110	15	2	4	11271 / 7800	5% / 8%	-	90 (210)	66
Delta 145	20	2	4	17700 / 18800	5% / 8%	-	114 (234)	87
Delta 145-C	20	2	4	17700 / 18800	5% / 8%	-	87 (207)	87
Delta 200	25	2	4	25160 / 22800	5% / 8%	-	144 (294)	126
Delta 240(-C)	25	2	4	25160 / 22800	5% / 8%	-	200 (320)	150
Alpha 15B	15	2	4	11271 / 7800	5% / 8%	-	94 (164)	105
Alpha 20B	20	2	4	17700 / 18800	5% / 8%	-	143 (243)	160
Alpha 30B	30	2	4	35558 / 31700	5% / 8%	-	205 (335)	240
Alpha 35B	35	2	4	49448 / 55600	5% / 8%	-	286 (436)	340
Gamma 90-ZSS	15	2	4	11271 / 7800	5% / 8%	-	135 (285)	73
Gamma 90-ZSSD	15	2	4	11271 / 7800	5% / 8%	-	75	73
Gamma 90-ASH	15	2	4	11271 / 7800	5% / 8%	-	265	73
Gamma 120-ZSS	15	2	4	11271 / 7800	5% / 8%	-	255	90
Gamma 120-ZSS	20	2	4	17700 / 18800	5% / 8%	-	170 (320)	90
Gamma 120-ZSSD	20	2	4	17700 / 18800	5% / 8%	-	76	90
Gamma 120-ASH	20	2	4	17700 / 18800	5% / 8%	-	320	90
Gamma 120-AZS.	20	2	4	17700 / 18800	5% / 8%	-	320	115
Gamma 160-ZSS	25	2	4	25160 / 22800	5% / 8%	-	208 (408)	120
Gamma 160-ZSSD	25	2	4	25160 / 22800	5% / 8%	-	208 (408)	120
Gamma 160-ASH	25	2	4	25160 / 22800	5% / 8%	-	408	120
Gamma 160-AZS.	25	2	4	25160 / 22800	5% / 8%	-	369	151
Gamma 220-ZSS	25L	2	4	29208 / 30400	5% / 8%	-	210 (390)	180
Gamma 220-ZSSD	25L	2	4	29208 / 30400	5% / 8%	-	210 (390)	180
Gamma 220-ASS	25L	2	4	29208 / 30400	5% / 8%	-	390	180
Gamma 220-AZS.	25L	2	4	29208 / 30400	5% / 8%	-	440	196
Gamma 280-ZSS	35	2	4	49448 / 41900	5% / 8%	-	275 (475)	236
Gamma 280-ZSSD	35	2	4	49448 / 41900	5% / 8%	-	275 (475)	236
Gamma 280-AZSS	35	2	4	49448 / 41900	5% / 8%	-	480	253

* Data in () refers to long standard carriage

Technical Data for Mounted **Ball Screws**

Dynamic load ratings for ball screw

Unit size		Nominal ∅ in [mm]	Pitch in [mm]	C_{dyn} [N]
Beta 40 Beta 50-C	Delta 90	12	5 10	3800 4300
Beta 70 Beta 70-C	Delta 110	16	5 10 20 40	12800 14300 8100 8500
Beta 60 Beta 80 Beta 100-D	Delta 145-C	20	5 10 20 50	14600 13500 11500 12300
Beta 80-SGV Beta 110 Beta 140(-C)	Delta 145	25	5 10 25 50	16100 15100 15800 14500
Beta 110-C-SGV Beta 120-C Beta 180(-C)	Delta 200 Delta 240(-C)	32	5 10 20 40 60	26200 33100 30200 15200 14100
Beta 165 Beta 110-C-SGV		40	5 10 20 40	23800 38000 33300 35000
Beta 165-C-SGV Beta 165-C-SSF		50	10 20	68700 60000
Alpha 15B		20	5 20	14600 13500 11500 12300
Alpha 20B		25	5 10 25	16100 15100 15800 14500
Alpha 30B		32	5 10 20 40	26200 33100 30200 15200
Alpha 35B		40	5 10 20 40	29100 50000 37900 37000

(Dynamic load rating for ball screw nut in accordance with DIN 69051, 1989)

HSB Automation GmbH

In Laisen 74
72766 Reutlingen
Germany

Tel. +49 7121 14498-0
Fax +49 7121 14498-10

info@hsb-automation.de
www.hsb-automation.de