Table deflection

Table deflection by pitch moment
Table pitch deflection owing to static pitch moment applied at arrow for fully extended stroke of slide table

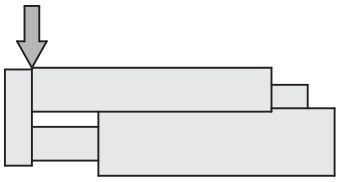


Table deflection by yaw moment
Table yaw deflection owing to static yaw moment applied at arrow for fully extended stroke of slide table.

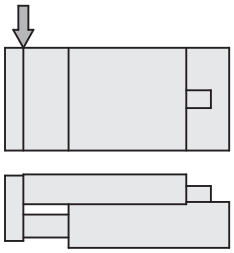
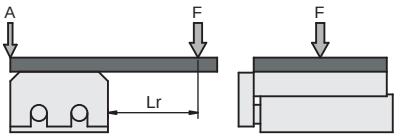


Table deflection by roll moment
Table roll deflection arrow A owing to static roll moment applied at arrow F when Lr=(see table) and table is retracted.



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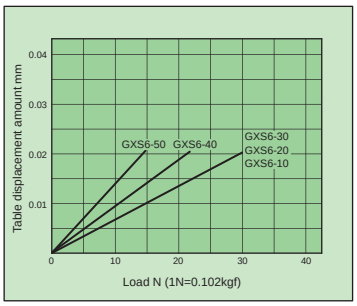

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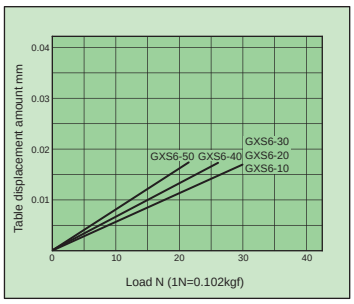
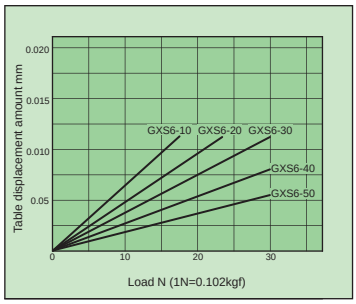


Ø6 Lr = 24mm



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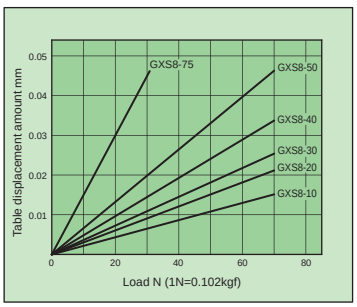

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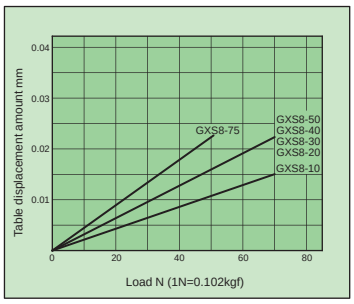
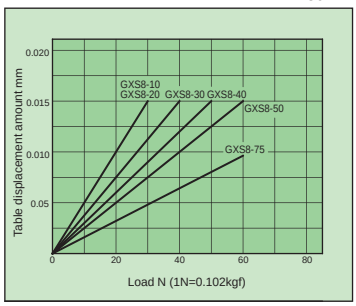


Ø8 Lr = 50mm



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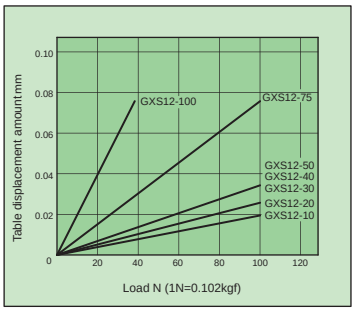

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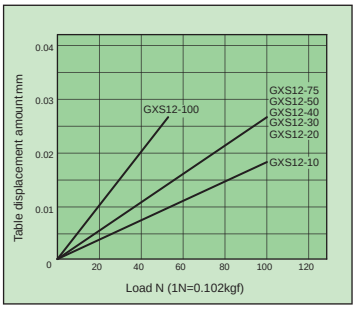


Ø12 Lr = 65mm

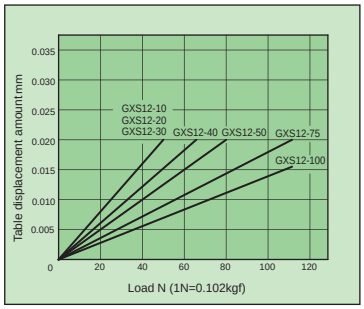


Table deflection

Table deflection by pitch moment
Table pitch deflection owing to static pitch moment applied at arrow for fully extended stroke of slide table

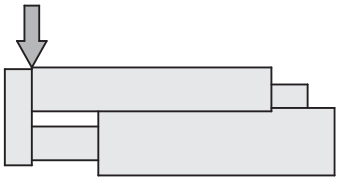


Table deflection by yaw moment
Table yaw deflection owing to static yaw moment applied at arrow for fully extended stroke of slide table.

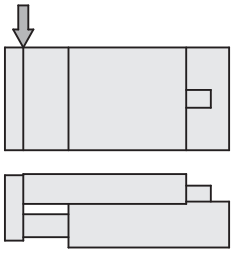
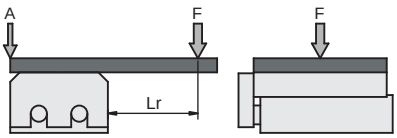


Table deflection by roll moment
Table roll deflection arrow A owing to static roll moment applied at arrow F when Lr=(see table) and table is retracted.



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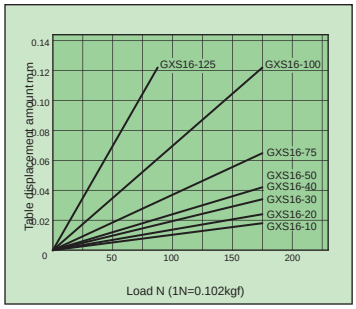

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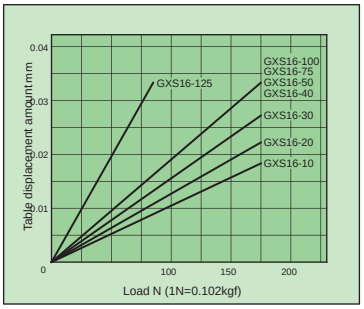
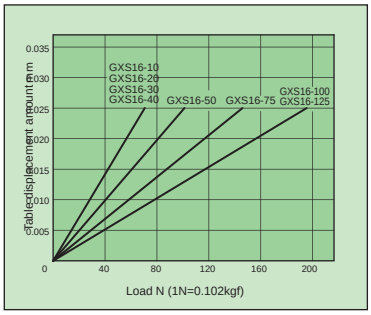


Ø16

Lr = 89mm



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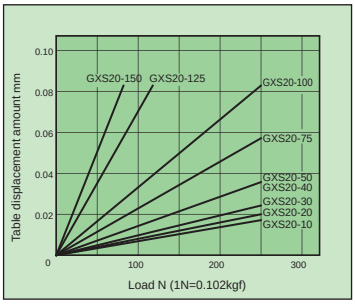

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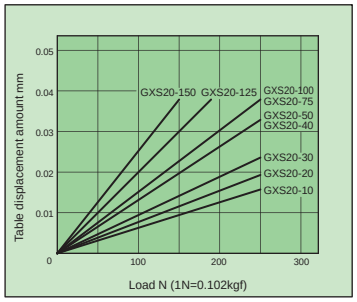
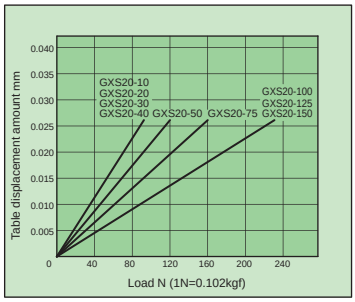


Ø20

Lr = 122mm



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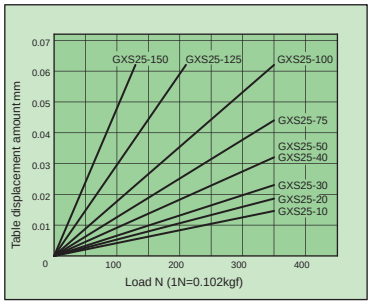

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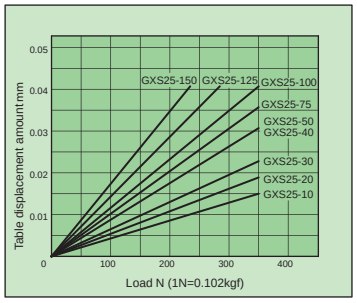
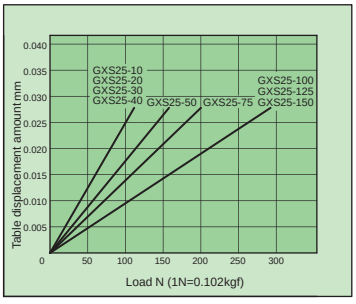


Ø25

Lr = 154mm



How to select

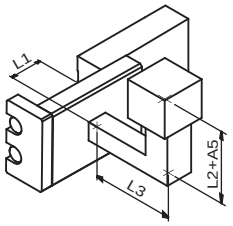
Model Selection Steps	Formula and Data	Selection Examples
1 Operating Conditions		
List the operating conditions considering the mounting position and workpiece configuration.	• Model to be used • Type of cushion • Mounting position of workpiece • Mounting direction • Average speed Va (mm/s) • Load mass W (kg) : Fig.1 • Overhang Ln (mm) : Fig.2	 Cylinder : GXS16X50 Cushion : Rubber cushion Work table mounting Mounting : Horizontal Average speed: Va = 300(mm/s) Load W = 1(kg) L1 = 10mm L2 = 30mm L3 = 30mm
2 Kinetic Energy		
Calculate kinetic energy E (J) of work. Calculate allwable kinetic energy Ea (J). Make sure that kinetic energy of work does not exceed allowable kinetic energy.	$E=\frac{1}{2}\cdot\frac{w}{9.8}\left(\frac{V}{1000}\right)^2$ Collision speed $V=\frac{1.4\cdot Va}{*)\text{Corrected coeficient}}$ Ea = K • E max Workpiece mounting coefficient K : Fig.3 Max. allowable kinetic energy Emax : Table 1 Kinetic energy (E) ≤ Allowable kinetic energy (Ea)	$E=\frac{1}{2}\cdot 1\left(\frac{420}{1000}\right)=0.088$ V = 1.4 X 300 = 420 Ea=1 • 0.11 = 0.11 Possible to use by E=0.088 ≤ Ea=0.11
3 Load Rate		
3-1 Load rate of work		
Calculate static work Wa(kg)	Wa = K • β • Wmax Workpiece mounting coefficient K : Fig.3 Allowable load mass coefficient β : Graph 1 Max. allowable moment Wmax : Table 2	Wa = 1X1X4 = 4 K = 1 β = 1 Wmax = 4
Calculate load rate α1 of static work.	α1 = W / Wa	$\alpha 1=\frac{1}{4}=0.25$
3-2 Load factor of static moment		
Calculate static moment M(N • m)	M=WX9.8(Ln+An) /1000 Correction value for center position Distance of moment An : Table 3	**Yawing** Examine My My =1X9.8(10+30)/1000 =0.39 A3=30
Calculate allowable static moment Ma(N • m)	Ma=K • γ • Mmax Work mounting coefficient K : Fig.3 Allowable moment coefficient γ : Graph 2 Max. allowable moment Mmax : Table 4	May =1X1X15.9=15.9 Mymax=15.9 K=1 γ=1
Calculate load tate α2 of the static moment.	α2 = M / Ma	α2 = 0.39 /15.9 = 0.025
		Rolling Examine Mr Mr =1X9.8(30+10)/1000 =0.39 A6=10 Mar =15.9(Same value as May) α'2 = 0.39 /15.9 = 0.025
3-3 Load rate of kinetic moment		
Calculate kinetic moment Me(N • m)	$Me=\frac{1}{3}\text{ X We X }9.8\frac{(Ln+An)}{1000}$ Collision equivalent load We = δ • W • V δ : Dumper coefficient With urethane bumper (Standard) = 4/100 With shock absorber = 1/100 Corrected value for center position distance of moment An:Table3	**Pitching** Examine Mep $Mep=\frac{1}{3}\text{ X 16.8 X 9.8 X }\frac{(30+10)}{1000}=2.2$ We = 4/100X1X420 = 16.8 A2 = 10 Meap = 1 X 0.7 X 15.9 = 11.1 K = 1 γ = 0.7 Mpmax = 15.9 α3 = 2.2 / 11.1 = 0.20
Calculate allowable kinetic moment Mea(N • m)	Mea = K • γ • Mmax Work mounting coefficient K:Fig.3 Allowable moment coefficient γ : Graph 2 Max. allowable moment Mmax:Table 4	**Yawing** Examine Mey $Mep=\frac{1}{3}\text{ X 16.8 X 9.8 X }\frac{(30+31)}{1000}=3.3$ We =168 A4 = 31 Meay = 11.1(Same value as Meap) α'3 = 3.3/11.1 = 0.30
Calculate load tate α2 of kinetic moment	α3 = Me / Mea	
3-4 Sum of load rate		
Possible to use if the sum of the load factors does not exceed 1.	Σαn = α1+α2+α3 ≤ 1	Σαn=α1+α2+α'2+α3+α'3 =0.25+0.025+0.025+0.20+0.30=0.80 ≤ 1 And it is possible to use.

Fig.1 Load mass : W (kg)

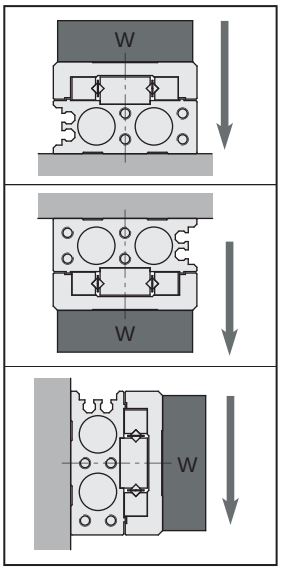
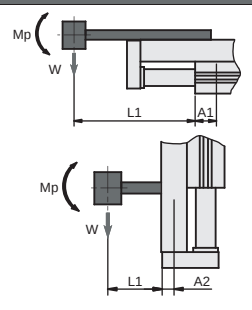
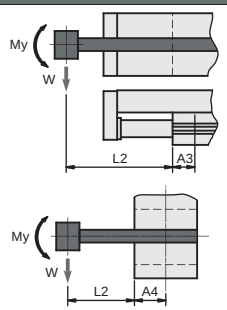
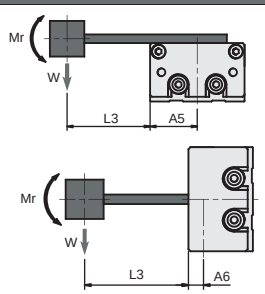
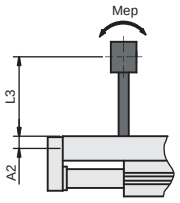
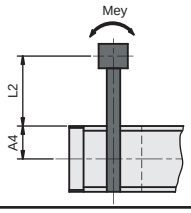


Fig. 2 Overhang : Ln (mm), correction value of moment center position distance : An (mm)

	Pitch moment	Yaw moment	Roll moment
Static moment			
Dynamic moment			—

Static moment : Moment by gravity Kinetic moment : Moment by stopper collision

Fig.3 Work Mounting Coefficient: K

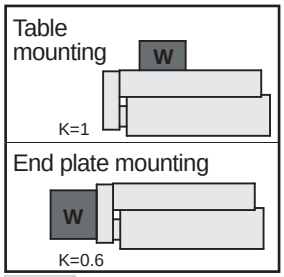


Table 1 Max. allowable kinetic energy : Emax (J)

Model	Allowable kinetic energy	
	Rubber cushion	shock absorber
GXS6	0.018	—
GXS8	0.027	0.045
GXS12	0.055	0.11
GXS16	0.11	0.22
GXS20	0.16	0.32
GXS25	0.24	0.48

Graph 1
Allowable static load Coefficient: β

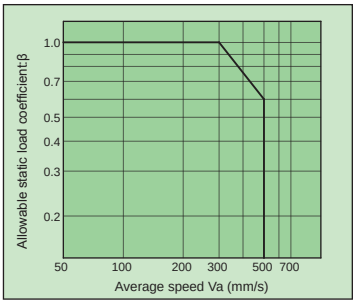


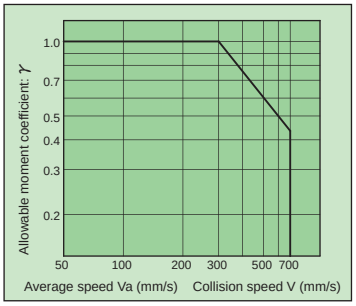
Table 2
Max. allowable static load : Wmax (kg)

Model	Max. allowable static load
GXS6	0.6
GXS8	1
GXS12	2
GXS16	4
GXS20	6
GXS25	9

Table 3 Correction value for moment center distance : An (mm)

Model	Correction value for moment center distance (Refer to Fig. 2)					
	A1	A2	A3	A4	A5	A6
GXS6	11	6	13	16	16	6
GXS8	11	7.5	13	20	20	7.5
GXS12	24	8.5	26	25	25	8.5
GXS16	27	10	30	31	31	10
GXS20	34	14.5	36	38	38	14.5
GXS25	42	19	44	46	46	19

Graph 2
Allowable Moment Coefficient: γ



Average speed for static moment
Collision speed for kinetic moment

Table 4
Max. allowable moment: Mmax (N·m)

Model	Stroke (mm)								
	10	20	30	40	50	75	100	125	150
GXS6	0.7	1.0	1.2	1.2	1.2	—	—	—	—
GXS8	2.0	2.0	2.8	3.6	4.2	4.2	—	—	—
GXS12	4.2	4.2	4.2	5.8	7.0	10.0	10.0	—	—
GXS16	11.3	11.3	11.3	11.3	15.9	25.0	34.1	34.1	—
GXS20	19.4	19.4	19.4	19.4	27.2	35.0	50.5	50.5	50.5
GXS25	30.6	30.6	30.6	30.6	42.8	55.1	67.3	67.3	67.3

Symbol

Symbol	Definition	Unit
An(n=1 ~ 6)	Correction value of moment center distance	mm
E	Kinetic energy	J
Ea	Allowable kinetic energy	J
Emax	Max. allowable kinetic energy	J
Ln(n=1 ~ 3)	Overhang	mm
M(Mp,My,Mr)	Static moment (Pitch, Yaw, Roll)	N·m
Ma(Map,May,Mar)	Allowable static moment (Pitch, Yaw, Roll)	N·m
Me(Mep,Mey)	kinetic moment (Pitch, Yaw)	N·m
Mea(Meap,Meay)	Allowable kinetic moment (Pitch, Yaw)	N·m
Mmax(Mpmax,Mymax, Mrmax)	Max. allowable kinetic moment (Pitch, Yaw, Roll)	N·m
V	Collision speed	mm/s

Symbol	Definition	Unit
Va	Average speed	mm/s
W	Static load	kg
Wa	Allowable static load	kg
We	Load equivalent to collision	kg
Wmax	Max. allowable static load	kg
α	Load rate	—
β	Allowable static load coefficient	—
γ	Allowable moment coefficient	—
δ	Damper coefficient	—
K	Work mounting coefficient	—