

Compact Series Linear Actuators



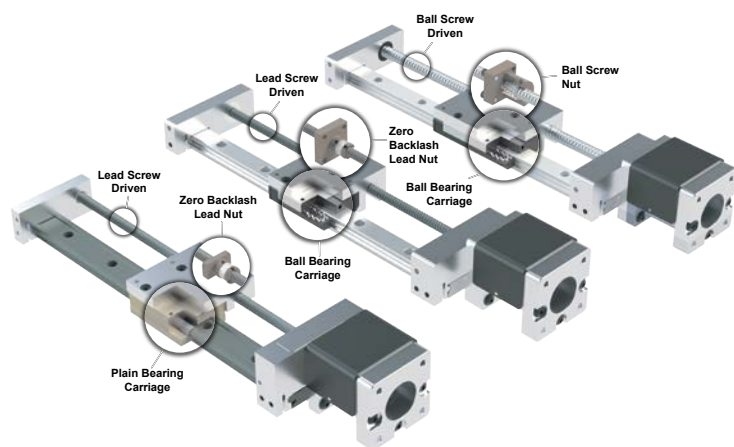
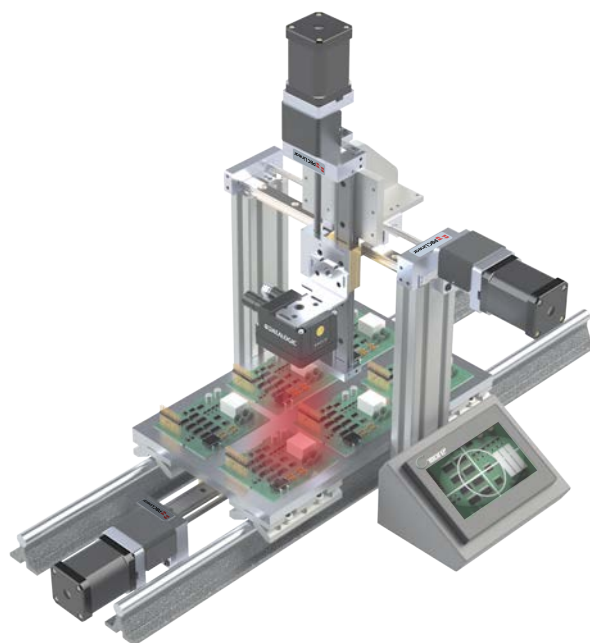
The Compact Series delivers smooth, accurate, repeatable linear motion in a low-profile package — a standard system height of just 23mm. Two bearing technologies — profile-rail ball bearing or FrelonGOLD® gliding-surface plain bearing — combine with lead- or ball-screw drives. One platform covers everything from medical and lab automation to automated delivery, robotic dispensing, and electronics manufacturing. All CS linear actuators include a motor mount for a 42mm (NEMA 17) frame motor; 40mm (servo) and 56mm (NEMA 23) motor adapters are available separately — see tLMN-7.

Features

- Low 23mm profile fits tight spaces and multi-axis stacks.
- Two bearing options — profile rail (ball) for rigidity, precision, and cantilevered loads; FrelonGOLD plain bearing for maintenance-free, self-lubricating motion in clean or dirty environments.
- Lead- or ball-screw drive — lead screws for dirty environments; ball screws for high-thrust, high-duty-cycle work.
- Constant Force™ anti-backlash nut — uniform preload and consistent low backlash over the life of the nut; self-lubricating and maintenance-free.
- Precision lead screws CNC-rolled to 0.003in/ft [76µm/300mm]; 300-series stainless with PTFE coating.
- Low friction — profile rail < 0.010 dynamic coefficient of friction; plain bearing < 0.125.
- Flexible drive — stub shaft provides options for stepper motors, servo motors, or hand knobs.

Applications

- Product positioning
- Tool positioning
- Pick and place
- 2D and 3D plotting
- XYZ Cartesian robot
- Transfer products in and out of work cells
- End-of-line packaging
- Machine tending
- Adhesive and sealant application



Compact Series Selection Guide

Part number	CSMxxxxAx-AD	CSL06Ax2Sxxxx-AD	CSL10Ax2Sxxxx-AD	CSB08xx1Sxxxx-AD
Bearing type	Plain (FrelonGOLD)	Profile rail (ball)	Profile rail (ball)	Profile rail (ball)
Drive	6mm lead screw	6mm lead screw	10mm lead screw	8mm ball screw
Stroke	55–465mm	157–467mm	140–595mm	140–595mm
Max velocity	0.17–0.33 m/s	0.25–0.50 m/s	0.25–0.50 m/s	0.25–0.40 m/s
Max acceleration	50 m/s ²	50 m/s ²	50 m/s ²	250 m/s ²
Repeatability	≤ ±0.02mm	≤ ±0.02mm	≤ ±0.02mm	≤ ±0.03mm
Max drive (input) speed	2,000 rpm	3,000 rpm	3,000 rpm	3,000 rpm
Static Load, Co	200N [45 lbf]	950N [214 lbf]	1,425N [320 lbf]	1,425N [320 lbf]

Compact Series 6mm Lead Screw with Plain Bearing Rail



Features

- Included motor mount: NEMA 17 motor mount
- Drive type: lead screw
- Rail type: plain bearing rail
- Rail material: ceramic-coated aluminum
- Carriage type: plain bearing
- Carriage bearing material: FrelonGOLD
- Input shaft diameter: 3.5mm
- Screw diameter: 6mm
- Carriage mass: 0.063 kg
- Lubrication: self-lubricating; none required



Performance Ratings

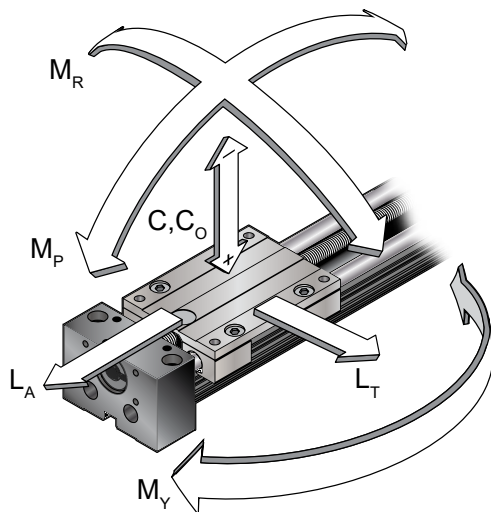
- Lead accuracy: 76µm/300mm
- Repeatability: ±0.02mm
- Max acceleration: 50 m/s²
- Max drive speed: 2,000 rpm (see tLMN-8)
- Operating temperature: 0–80 °C [32–176 °F]

CSM0100AX-AD

Compact Series 6mm Lead Screw with Plain Bearing Rail								
Part number	Price	Stroke	Lead	Max velocity	Rail length	Linear actuator mass	Buckling column load	Drawing link
<u>CSM0100AX-AD</u>	\$545.00	55mm	5 mm/rev	0.17 m/s	100mm	0.371 kg	2,500N	<u>PDF</u>
<u>CSM0100AJ-AD</u>	\$545.00	55mm	10 mm/rev	0.33 m/s	100mm	0.379 kg	2,500N	<u>PDF</u>
<u>CSM0200AX-AD</u>	\$576.00	155mm	5 mm/rev	0.17 m/s	200mm	0.440 kg	1,500N	<u>PDF</u>
<u>CSM0200AJ-AD</u>	\$576.00	155mm	10 mm/rev	0.33 m/s	200mm	0.429 kg	1,500N	<u>PDF</u>
<u>CSM0350AX-AD</u>	\$622.00	305mm	5 mm/rev	0.17 m/s	350mm	0.527 kg	500N	<u>PDF</u>
<u>CSM0350AJ-AD</u>	\$622.00	305mm	10 mm/rev	0.33 m/s	350mm	0.528 kg	500N	<u>PDF</u>
<u>CSM0510AX-AD</u>	\$671.00	465mm	5 mm/rev	0.17 m/s	510mm	0.613 kg	300N	<u>PDF</u>
<u>CSM0510AJ-AD</u>	\$671.00	465mm	10 mm/rev	0.33 m/s	510mm	0.619 kg	300N	<u>PDF</u>



NOTE: This actuator type uses plain bearings and must comply with the 2:1 cantilever rule — see 2:1 Cantilever Rule on tLMN-9.



Load Ratings

Static Load, Co (N [lbf])	200 [45]
Reverse Static, -Co (N [lbf])	200 [45]
Lateral Load, Lt (N [lbf])	200 [45]
Axial Load, La (N [lbf])	25 [6]
Pitch Moment, Mp (N·m [lb·ft])	9 [7]
Yaw Moment, My (N·m [lb·ft])	15.1 [11.1]
Roll Moment, Mr (N·m [lb·ft])	9 [7]

Additional Information

Product Manual	Interactive Instructions
<u>PDF</u>	

Compact Series 6mm Lead Screw with Ball Bearing Profile Rail



Features

- Included motor mount: NEMA 17 motor mount
- Drive type: lead screw
- Rail type: ball bearing profile rail
- Rail material: hardened steel
- Carriage type: ball bearing
- Carriage bearing material: hardened steel balls
- Input shaft diameter: 3.5mm
- Screw diameter: 6mm
- Carriage mass: 0.08 kg
- Lubrication: periodic relubrication required

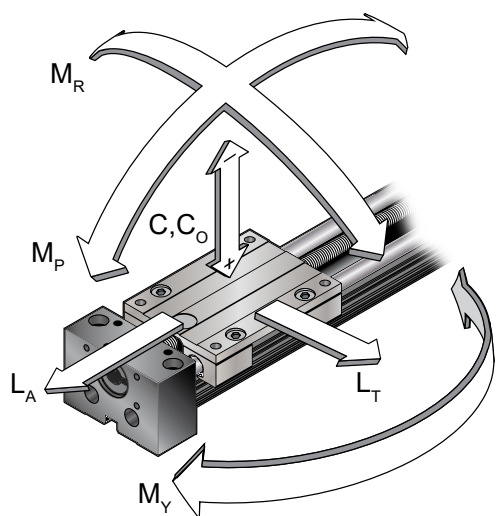


Performance Ratings

- Lead accuracy: 76µm/300mm
- Repeatability: ±0.02mm
- Max acceleration: 50 m/s²
- Max drive speed: 3,000 rpm (see tLMN-8)
- Operating temperature: 0–80 °C [32–176 °F]

CSL06AX2S0200-AD

Compact Series 6mm Lead Screw with Ball Bearing Profile Rail								
Part number	Price	Stroke	Lead	Max velocity	Rail length	Linear actuator mass	Buckling column load	Drawing link
<u>CSL06AX2S0200-AD</u>	\$640.00	157mm	5 mm/rev	0.25 m/s	200mm	0.608 kg	1,500N	<u>PDF</u>
<u>CSL06AJ2S0200-AD</u>	\$640.00	157mm	10 mm/rev	0.50 m/s	200mm	0.608 kg	1,500N	<u>PDF</u>
<u>CSL06AX2S0350-AD</u>	\$711.00	307mm	5 mm/rev	0.25 m/s	350mm	0.785 kg	500N	<u>PDF</u>
<u>CSL06AJ2S0350-AD</u>	\$711.00	307mm	10 mm/rev	0.50 m/s	350mm	0.784 kg	500N	<u>PDF</u>
<u>CSL06AX2S0510-AD</u>	\$788.00	467mm	5 mm/rev	0.25 m/s	510mm	0.977 kg	300N	<u>PDF</u>
<u>CSL06AJ2S0510-AD</u>	\$788.00	467mm	10 mm/rev	0.50 m/s	510mm	0.978 kg	300N	<u>PDF</u>



Load Ratings

Static Load, Co (N [lbf])	950 [214]
Reverse Static, -Co (N [lbf])	950 [214]
Lateral Load, Lt (N [lbf])	950 [214]
Axial Load, La (N [lbf])	25 [6]
Pitch Moment, Mp (N·m [lb·ft])	13.1 [9.7]
Yaw Moment, My (N·m [lb·ft])	13.1 [9.7]
Roll Moment, Mr (N·m [lb·ft])	20.2 [14.9]

Additional Information

Product Manual	Interactive Instructions
<u>PDF</u>	

Compact Series 10mm Lead Screw with Ball Bearing Profile Rail



Features

- Included motor mount: NEMA 17 motor mount
- Drive type: lead screw
- Rail type: ball bearing profile rail
- Rail material: hardened steel
- Carriage type: ball bearing
- Carriage bearing material: hardened steel balls
- Input shaft diameter: 4mm
- Screw diameter: 10mm
- Carriage mass: 0.088 kg
- Lubrication: periodic relubrication required

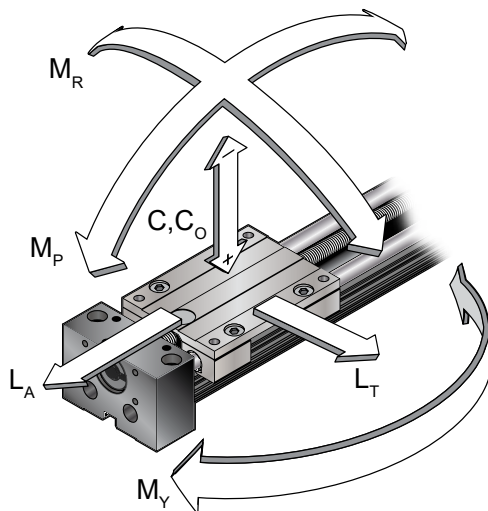


Performance Ratings

- Lead accuracy: 76µm/300mm
- Repeatability: ±0.02mm
- Max acceleration: 50 m/s²
- Max drive speed: 3,000 rpm (see tLMN-8)
- Operating temperature: 0–80 °C [32–176 °F]

CSL10AX2S0200-AD

Compact Series 10mm Lead Screw with Ball Bearing Profile Rail								
Part number	Price	Stroke	Lead	Max velocity	Rail length	Linear actuator mass	Buckling column load	Drawing link
<u>CSL10AX2S0200-AD</u>	\$697.00	140mm	5 mm/rev	0.25 m/s	200mm	0.740 kg	8,000N	<u>PDF</u>
<u>CSL10AJ2S0200-AD</u>	\$697.00	140mm	10 mm/rev	0.50 m/s	200mm	0.744 kg	8,000N	<u>PDF</u>
<u>CSL10AX2S0350-AD</u>	\$794.00	290mm	5 mm/rev	0.25 m/s	350mm	0.954 kg	3,000N	<u>PDF</u>
<u>CSL10AJ2S0350-AD</u>	\$794.00	290mm	10 mm/rev	0.50 m/s	350mm	0.965 kg	3,000N	<u>PDF</u>
<u>CSL10AX2S0510-AD</u>	\$899.00	450mm	5 mm/rev	0.25 m/s	510mm	1.178 kg	1,200N	<u>PDF</u>
<u>CSL10AJ2S0510-AD</u>	\$899.00	450mm	10 mm/rev	0.50 m/s	510mm	1.195 kg	1,200N	<u>PDF</u>
<u>CSL10AX2S0655-AD</u>	\$993.00	595mm	5 mm/rev	0.25 m/s	655mm	1.386 kg	1,000N	<u>PDF</u>
<u>CSL10AJ2S0655-AD</u>	\$993.00	595mm	10 mm/rev	0.50 m/s	655mm	1.405 kg	1,000N	<u>PDF</u>



Load Ratings

Static Load, Co (N [lbf])	1,425 [320]
Reverse Static, -Co (N [lbf])	1,425 [320]
Lateral Load, Lt (N [lbf])	1,425 [320]
Axial Load, La (N [lbf])	222 [50]
Pitch Moment, Mp (N·m [lb·ft])	29.8 [22.0]
Yaw Moment, My (N·m [lb·ft])	29.8 [22.0]
Roll Moment, Mr (N·m [lb·ft])	30.4 [22.4]

Additional Information

Product Manual	Interactive Instructions
<u>PDF</u>	

Compact Series 8mm Ball Screw with Ball Bearing Profile Rail



Features

- Included motor mount: NEMA 17 motor mount
- Drive type: ball screw
- Rail type: ball bearing profile rail
- Rail material: hardened steel
- Carriage type: ball bearing
- Carriage bearing material: hardened steel balls
- Input shaft diameter: 4mm
- Screw diameter: 8mm
- Carriage mass: 0.088 kg
- Lubrication: periodic relubrication required

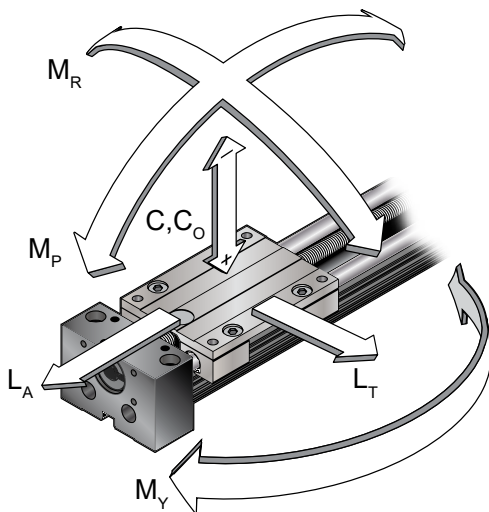


Performance Ratings

- Lead accuracy: 50µm/300mm
- Repeatability: ±0.03mm
- Max acceleration: 250 m/s²
- Max drive speed: 3,000 rpm (see tLMN-8)
- Operating temperature: 0–80 °C [32–176 °F]

CSB08AX1S0200-AD

Compact Series 8mm Ball Screw with Ball Bearing Profile Rail								
Part number	Price	Stroke	Lead	Max velocity	Rail length	Linear actuator mass	Buckling column load	Drawing link
<u>CSB08AX1S0200-AD</u>	\$967.00	140mm	5 mm/rev	0.25 m/s	200mm	0.739 kg	5,000N	<u>PDF</u>
<u>CSB08BH1S0200-AD</u>	\$967.00	140mm	8 mm/rev	0.40 m/s	200mm	0.745 kg	5,000N	<u>PDF</u>
<u>CSB08AX1S0350-AD</u>	\$1,245.00	290mm	5 mm/rev	0.25 m/s	350mm	0.932 kg	2,000N	<u>PDF</u>
<u>CSB08BH1S0350-AD</u>	\$1,245.00	290mm	8 mm/rev	0.40 m/s	350mm	0.918 kg	2,000N	<u>PDF</u>
<u>CSB08AX1S0510-AD</u>	\$1,542.00	450mm	5 mm/rev	0.25 m/s	510mm	1.139 kg	900N	<u>PDF</u>
<u>CSB08BH1S0510-AD</u>	\$1,542.00	450mm	8 mm/rev	0.40 m/s	510mm	1.142 kg	900N	<u>PDF</u>
<u>CSB08AX1S0655-AD</u>	\$1,812.00	595mm	5 mm/rev	0.25 m/s	655mm	1.334 kg	600N	<u>PDF</u>
<u>CSB08BH1S0655-AD</u>	\$1,812.00	595mm	8 mm/rev	0.40 m/s	655mm	1.318 kg	600N	<u>PDF</u>



Load Ratings	
Static Load, Co (N [lbf])	1,425 [320]
Reverse Static, -Co (N [lbf])	1,425 [320]
Lateral Load, Lt (N [lbf])	1,425 [320]
Axial Load, La (N [lbf])	386 [87]
Pitch Moment, Mp (N·m [lb·ft])	29.8 [22.0]
Yaw Moment, My (N·m [lb·ft])	29.8 [22.0]
Roll Moment, Mr (N·m [lb·ft])	30.4 [22.4]

Additional Information	
Product Manual	Interactive Instructions
<u>PDF</u>	

Compact Series Mounting Brackets

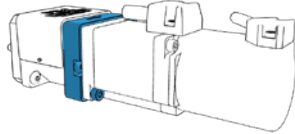
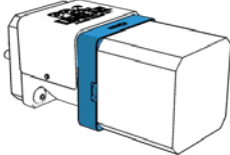
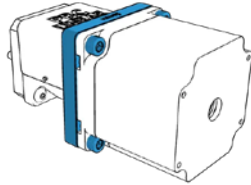


Compact Series Mounting Brackets							
Part number	Price	Description	Fits Carriage	Fits Rail	Assembly Illustration	Image	Drawing link
<u>CS-SP-S-KIT-CH</u>	\$95.00	PBC Compact series short saddle plate, anodized aluminum, XY bracket.	CSM-xxx CSL06-xxx	all PBC Compact series actuators			<u>PDF</u>
<u>CS-SP-L-KIT-CH</u>	\$128.00	PBC Compact series long saddle plate, anodized aluminum, XY bracket.	CSL10-xxx CSB-xxx	all PBC Compact series actuators			<u>PDF</u>
<u>CS-SP-LTC-KIT-CH</u>	\$177.00	PBC Compact series angle bracket, anodized aluminum, XZ bracket.	CSL10-xxx CSB-xxx	all PBC Compact series actuators			<u>PDF</u>
<u>CS-90-LLC-KIT-CH</u>	\$154.00	PBC Compact series long angle bracket, anodized aluminum, XY bracket.	CSL10-xxx CSB-xxx	all PBC Compact series actuators			<u>PDF</u>
<u>CS-90-SLC-KIT-CH</u>	\$154.00	PBC Compact series short angle bracket, anodized aluminum, XY bracket.	CSM-xxx CSL06-xxx	all PBC Compact series actuators			<u>PDF</u>

All brackets include the required mounting hardware.

Compact Series Motor Adapters and Couplings



Compact Series Motor Adapters						
Part number	Price	Description	Fits	Assembly Illustration	Image	Drawing link
<u>3PMM-40A-KIT-CH</u>	\$74.00	PBC motor adapter, anodized aluminum, axial, 40mm frame.	all PBC Compact and UG series actuators			<u>PDF</u>
<u>3PMM-42A-KIT-CH</u>	\$74.00	PBC motor adapter, anodized aluminum, axial, NEMA 17 frame.	all PBC Compact and UG series actuators			<u>PDF</u>
<u>3PMM-56A-KIT-CH</u>	\$74.00	PBC motor adapter, anodized aluminum, axial, NEMA 23 frame.	all PBC Compact and UG series actuators			<u>PDF</u>

All motor adapter plates include the required mounting hardware.

Compact Series Drive Couplings				
Part number	Price	Description	Fits	Drawing link
<u>RW-EKL-2-C-3.5-5</u>	\$92.00	PBC Compact drive coupling, jaw type, aluminum, clamp, size 16, 3.5 x 5mm bore.	CSM, CSL06 (3.5mm stub shaft); 42mm NEMA 17 motor (5mm shaft)	<u>PDF</u>
<u>RW-EKL-2-C-3.5-6.35</u>	\$89.00	PBC Compact drive coupling, jaw type, aluminum, clamp, size 16, 3.5 x 6.35mm bore.	CSM, CSL06 (3.5mm stub shaft); 56mm NEMA 23 motor (6.35mm shaft)	<u>PDF</u>
<u>RW-EKL-2-C-3.5-8</u>	\$81.00	PBC Compact drive coupling, jaw type, aluminum, clamp, size 16, 3.5 x 8mm bore.	CSM, CSL06 (3.5mm stub shaft); 40mm servo motor (8mm shaft)	<u>PDF</u>
<u>SRB-16C-4-5</u>	\$29.50	Sung-II Machinery drive coupling, servo-beam, 7075-T6 aluminum alloy, clamp, size 16, 4 x 5mm bore.	CSL10, CSB08 (4mm stub shaft); 42mm NEMA 17 motor (5mm shaft)	<u>PDF</u>
<u>SRB-19C-4-6.35</u>	\$26.00	Sung-II Machinery drive coupling, servo-beam, 7075-T6 aluminum alloy, clamp, size 19, 4mm x 1/4in bore.	CSL10, CSB08 (4mm stub shaft); 56mm NEMA 23 motor (6.35mm shaft)	<u>PDF</u>
<u>SHR-18C-4-8</u>	\$52.00	Sung-II Machinery drive coupling, servo high gain, aluminum alloy, clamp, size 18, 4 x 8mm bore.	CSL10, CSB08 (4mm stub shaft); 40mm servo motor (8mm shaft)	<u>PDF</u>

Any coupling used must fit inside the motor mount main frame: 25mm maximum outside diameter and 26mm maximum length.



[RW-EKL-2-C-3.5-5](#)



[SRB-16C-4-5](#)



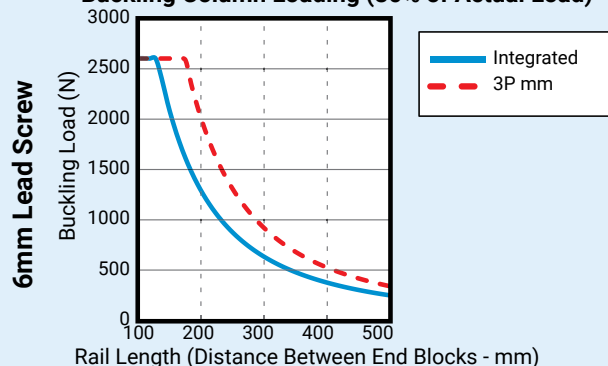
[SHR-18C-4-8](#)

Compact Series Buckling and Critical Speed Curves

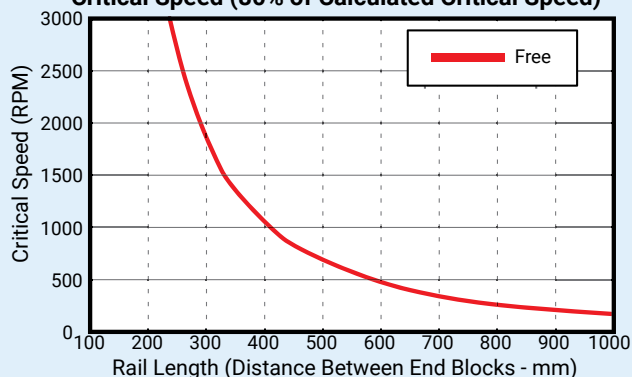


6mm Lead Screw

Buckling Column Loading (80% of Actual Load)

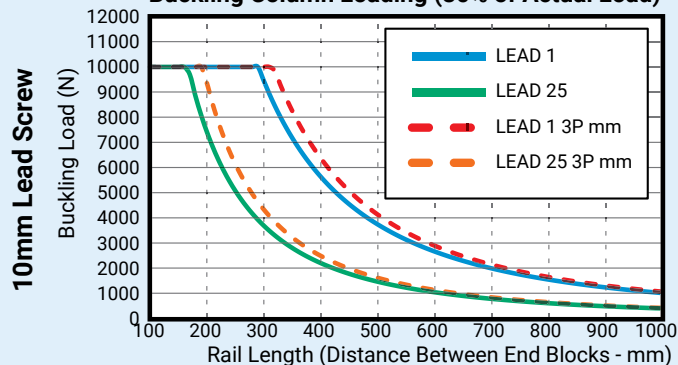


Critical Speed (80% of Calculated Critical Speed)

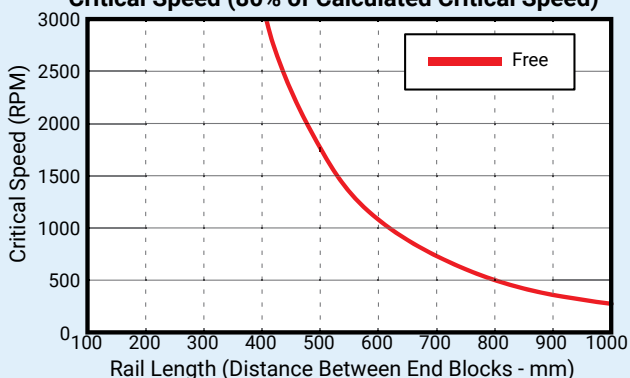


10mm Lead Screw

Buckling Column Loading (80% of Actual Load)

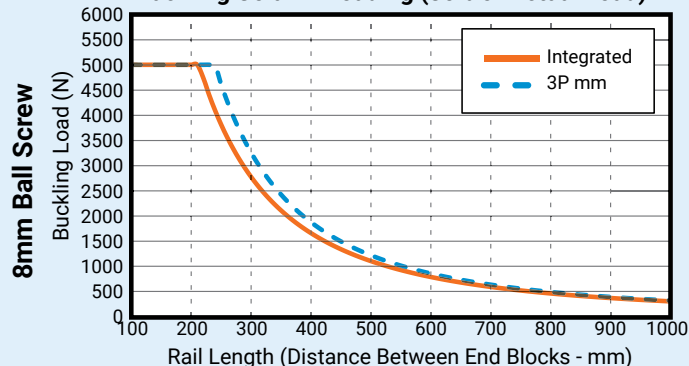


Critical Speed (80% of Calculated Critical Speed)

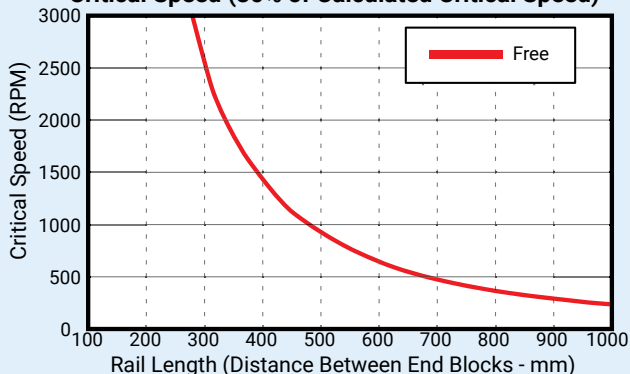


8mm Ball Screw

Buckling Column Loading (80% of Actual Load)



Critical Speed (80% of Calculated Critical Speed)

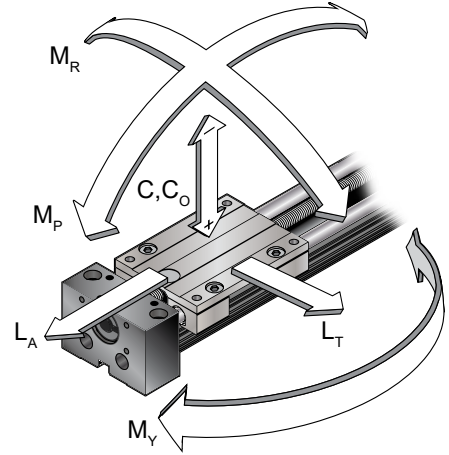


Compact Series Definitions



Load, moment and screw rating definitions for the Compact Series. Values are shown in N [lbf] and N·m [lb·ft].

Load, Moment and Screw Ratings		
Symbol	Rating	Description
Co	Static load — N [lbf]	Maximum normal load at rest.
-Co	Reverse static load — N [lbf]	Maximum normal load in inverted mounting.
Lt	Lateral load — N [lbf]	Side load, perpendicular to the direction of travel.
La	Axial load — N [lbf]	Thrust load along the direction of travel.
Mp	Pitch moment — N·m [lb·ft]	Rotation about the lateral axis (nose up / down).
My	Yaw moment — N·m [lb·ft]	Rotation about the vertical axis.
Mr	Roll moment — N·m [lb·ft]	Rotation about the travel axis.
ncr	Critical speed — rpm	Maximum screw speed before resonance; falls as rail length grows — see the curves on tLMN-8.
Pcr	Buckling column load — N	Maximum screw thrust before buckling; falls as rail length grows — see the curves on tLMN-8.



Applying the Load Ratings

Verify an application by dividing each applied load and moment by its rating. Each individual ratio — and the combined sum below — must be $\leq 1/Z$:

$$\frac{F_{na}}{C_o} + \frac{F_{ta}}{L_t} + \frac{M_{pa}}{M_p} + \frac{M_{ya}}{M_y} + \frac{M_{ra}}{M_r} \leq \frac{1}{Z}$$

where the subscript a denotes an applied load or moment: F_{na} normal, F_{ta} lateral, M_{pa} pitch, M_{ya} yaw, M_{ra} roll. Axial thrust (L_a) is reacted by the drive and is checked separately against the drive's thrust rating.

Safety Factor (Z)	
Application condition	Z
Smooth motion, infrequent reversal, slow speed (< 30% max), no shock or vibration, clean environment	1.0–1.5
Normal shop-floor conditions, moderate speed (30–75% max), normal shock and vibration	>1.5–2.0
Frequent travel reversal, high speed (> 75% max), shock and vibration, heavy dirt and dust	>2.0–3.5

- Rated loads and moments are maximum values; consult PBC Linear for edge cases.
- Plain-bearing (Gliding Surface) values shown are for dry operation; lubrication can reduce them by up to 50%.
- Plain-bearing configurations must comply with the 2:1 cantilever rule — see below.
- Lead-screw accuracy: ISO Class 10 (± 0.0007 mm/mm). Operating temperature 0–80 °C [32–176 °F]. Conversions: N $\times$ 0.2248 = lbf; N·m $\times$ 0.7376 = lb·ft.

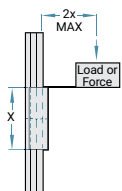
Worked Example — Compact Series 6mm Lead Screw with Plain Bearing Rail

A 4 kg payload is carried 70mm from the carriage center along the direction of travel. Duty is normal shop-floor (moderate speed, normal shock and vibration), so Z = 1.75. Ratings used are the plain-bearing lead screw values from this series: C_o = 200N, L_t = 200N, M_p = 9 N·m, M_y = 15.1 N·m, M_r = 9 N·m.

$$\frac{39.2}{200} + \frac{0}{200} + \frac{2.7}{9} + \frac{0}{15.1} + \frac{0}{9} = 0.50 \leq 0.57$$

Applied values: F_{na} = 39.2N · F_{ta} = 0N · M_{pa} = 2.7 N·m · M_{ya} = 0 N·m · M_{ra} = 0 N·m. Largest single-axis ratio 0.31 and the combined sum 0.50 are both within the 1/Z limit of 0.57, so this application is within rating.

2:1 Cantilever Rule



A cantilevered load or drive force must act no farther than 2× the bearing length from the bearing face, or the carriage will bind — regardless of load size. Profile-rail bearings are exempt. If 2:1 is exceeded, add a carriage or move the load closer to the rail.

Lubrication

Plain-bearing rails and Constant Force™ nuts are self-lubricating — no lubrication required. Relubricate profile-rail raceways every 1,000km, 50,000 cycles, or 6 months. Use way lube or lightweight oils, or ISO VG32–100 lithium-soap grease. Never use WD-40, motor oil, oils with additives, moly or filled greases, PTFE sprays, or silicone.