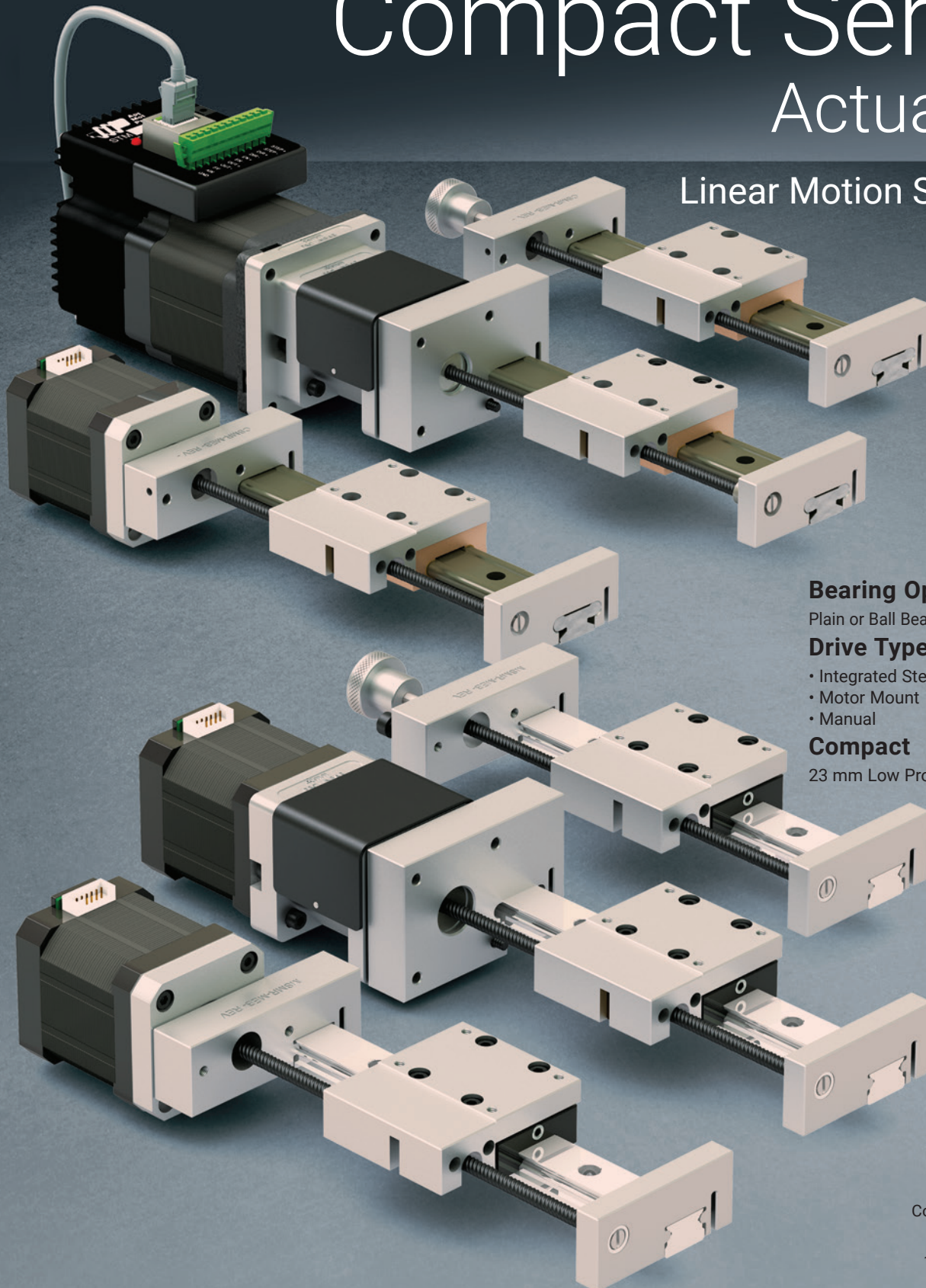




Compact Series Actuators

Linear Motion Solutions



Bearing Options

Plain or Ball Bearing Linear Guides

Drive Type Flexibility

- Integrated Stepper Motor
- Motor Mount
- Manual

Compact

23 mm Low Profile



Configure Online at
pbclinear.com

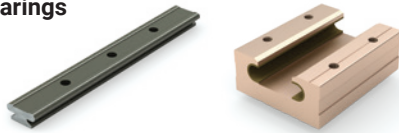
1-800-962-8979

Three Steps to Design Your Actuator

Step 1: Bearing System

Page 5

Gliding Surface Technology
Plain Bearings



Profile Rail Technology
Ball Bearings



Step 1

What performance
do I expect
from the
bearing system?

Step 2: Drive Options

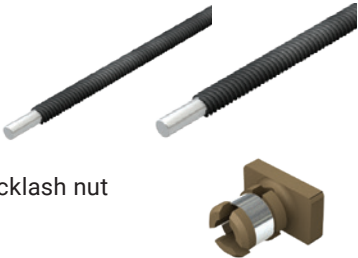
Page 6

Screw Diameters

- 6 mm
- 10 mm

Nut:

- Constant Force™ anti-backlash nut
- Ball screw also available



CONSTANT
Force Technology

Step 2

What lead screw
best fits
my application?

Step 3: Motor & Drive Type - NEMA 17 or NEMA 23

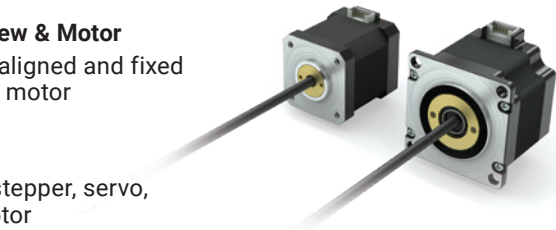
Page 7

Integrated Screw & Motor

- Lead screw aligned and fixed directly with motor

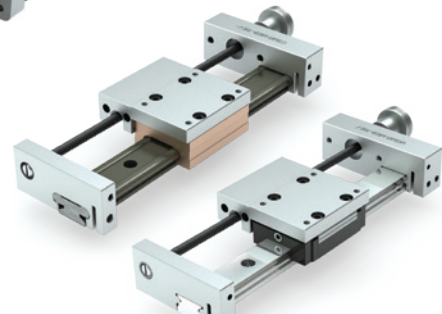
Motor Mount

- Attach any stepper, servo, or smart motor



Manual Hand Knob

- Hand knob for manually adjusting screw driven system



Step 3

What motor
and drive type
do I need?

Design It Your Way	4
Step 1: Bearing System Selection	5
Step 2: Lead Screw & Nut	6
Step 3: Drive Type Selection	7
Bearing Features & Benefits	
GST – Plain Bearings	8
PRT – Ball Bearings	9
System Specifications	
Performance Charts	10
Ordering	11
Motor Mounts	
Specifications and Ordering	13
Dimensions	14
User Manual	16

If you are utilizing our digital Compact Series catalog, you can click these icons, throughout the publication, to get more information. *Hyperlinks go to English language website.*



Bearing System Selection

Step 1

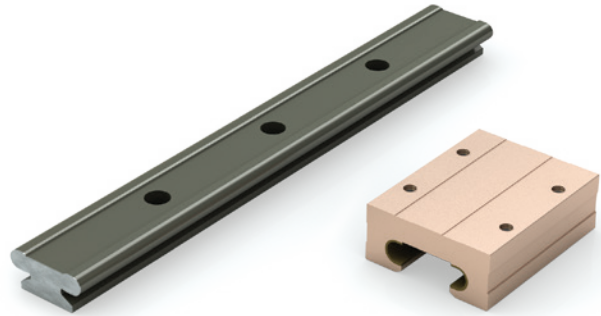
Step 2

Step 3

Gliding Surface Technology

Plain Bearing

- Low cost
- Utilizes bonded **FrelonGOLD®** bearing surfaces
- Self-lubricating and maintenance free
- No catastrophic failure
- No metal-to-metal contact, vibration damping
- Wide temperature range
- Resists contamination
- 510 mm maximum length



Note: Plain bearings should comply with the 2:1 ratio rule.



System Ordering Information—
Page 11

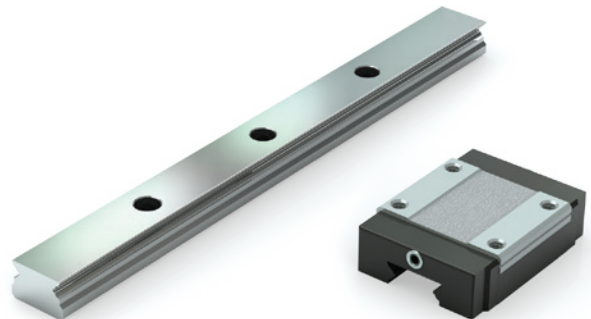


White Paper Link:
Demystifying the 2:1 Ratio

Profile Rail Technology

Ball bearing linear guides

- High precision and high speeds
- Size 15 mm bearing block
- Rigid and precise recirculating ball design
- Increased stiffness and preloaded bearing performance
- Supports cantilevered loads
- Low coefficient of friction
- 1,000 mm maximum length



System Ordering Information
Page 11

**Uniform dimensioning
provides design flexibility.**

Step 1

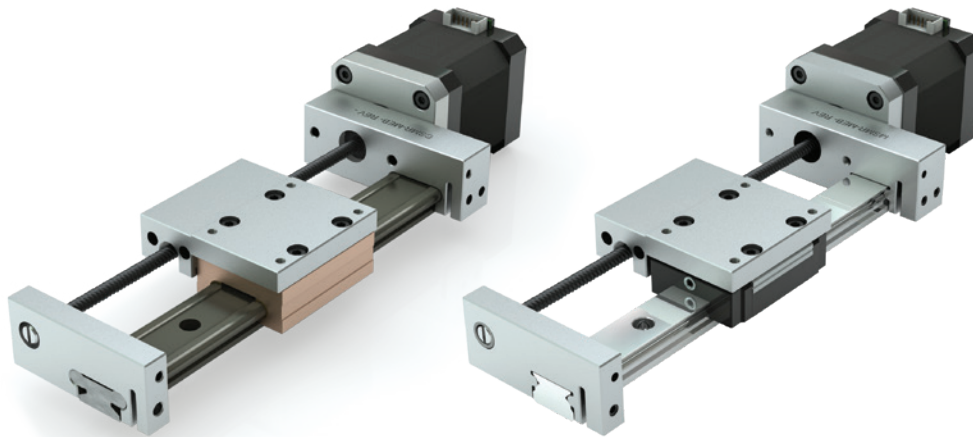
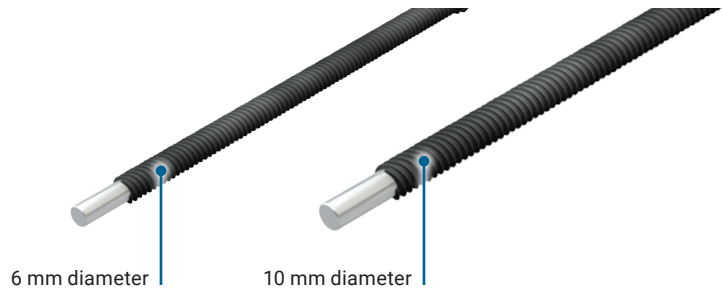
Step 2

Step 3

Lead Screw and Nut Options

Lead Screw Options

- 6 mm and 10 mm diameter lead screw
- Self-lubricating PTFE coated
- 1, 2, 5, 10 mm leads most common
- Other leads available—consult factory

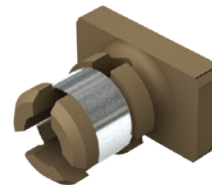


Nut

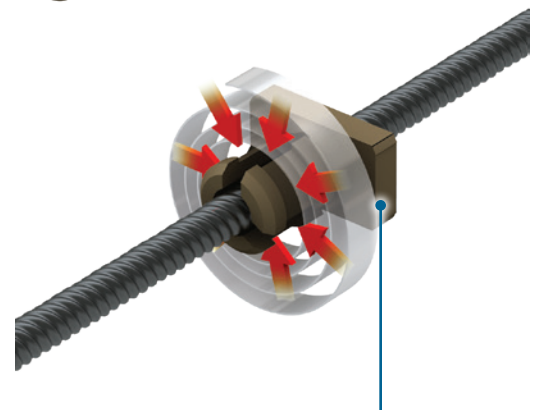
Constant Force™ Anti-Backlash Nut

An intuitive leap forward in nut design for lead screw applications, Constant Force Technology utilizes a constant force spring to apply a uniform pressure to the nut at all stages of the motion profile.

- Greater consistency and resistance to backlash
- Configurable for various torque requirements
- Patent pending self-adjusting anti-backlash feature
- Polymer nuts are self-lubricating and maintenance free



CONSTANT
Force Technology



Patent pending Constant Force Technology nut provides consistent anti-backlash operation



Video Link:
[Screws, Nuts, and Hybrid Linear Actuators](#)

Motor Type Selection

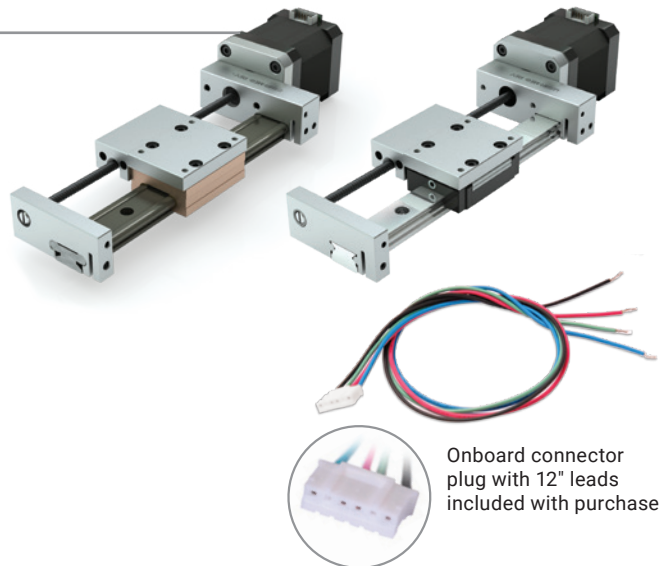
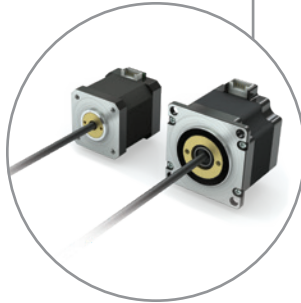
Step 1

Step 2

Step 3

Integrated stepper motor

- Lead screw aligned and fixed directly with motor
- Fewer components means greater accuracy, increased rigidity, and less cost
- 6 mm and 10 mm diameter lead screw driven
- NEMA 17 and NEMA 23 motors
- Single and double stack
- Standard wire connection is onboard plug—included connector plug with 12" leads
- Longer leads available, consult factory



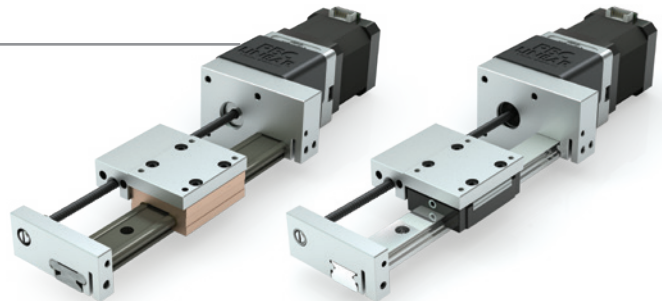
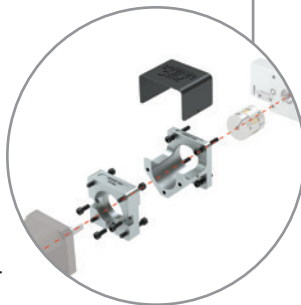
Onboard connector plug with 12" leads included with purchase



[System Ordering Information](#)
Page 11

Motor mount

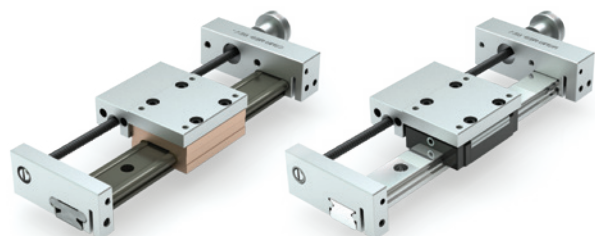
- One-piece main frame holds shaft-to-shaft centerline
- Extends motor and coupler life
- Increases accuracy and repeatability
- Attach NEMA 17 or NEMA 23 stepper, servo, or smart motor
- 6 mm and 10 mm diameter lead screw driven
- Easy to assemble
- Easily attached with adapter plate and coupler
- Assembled system available with motor and motor mount, consult factory



[Motor Mount Details](#)
Page 13

Manual Hand Knob

- Hand adjustment knob is used for manually adjusting screw driven systems



Bearing System Overview

Gliding Surface Technology

Plain Bearing

Overview

- Low—23 mm—profile design
- 510 mm maximum length
- Size 15 mm bearing block
- Utilizes the bonded **FrelonGOLD®** self-lubricating and maintenance free bearing surfaces
- Smooth and quiet operation
- Vibration damping and shock resistant

Lead Screw & Nut

- Lead screw 6 mm
- 300 series stainless steel with PTFE coating
- 1, 2, 5, 10 mm leads most common
- Other leads available—consult factory
- Constant Force™ anti-backlash nut

Motor and Drive Type

Integrated Stepper Motor

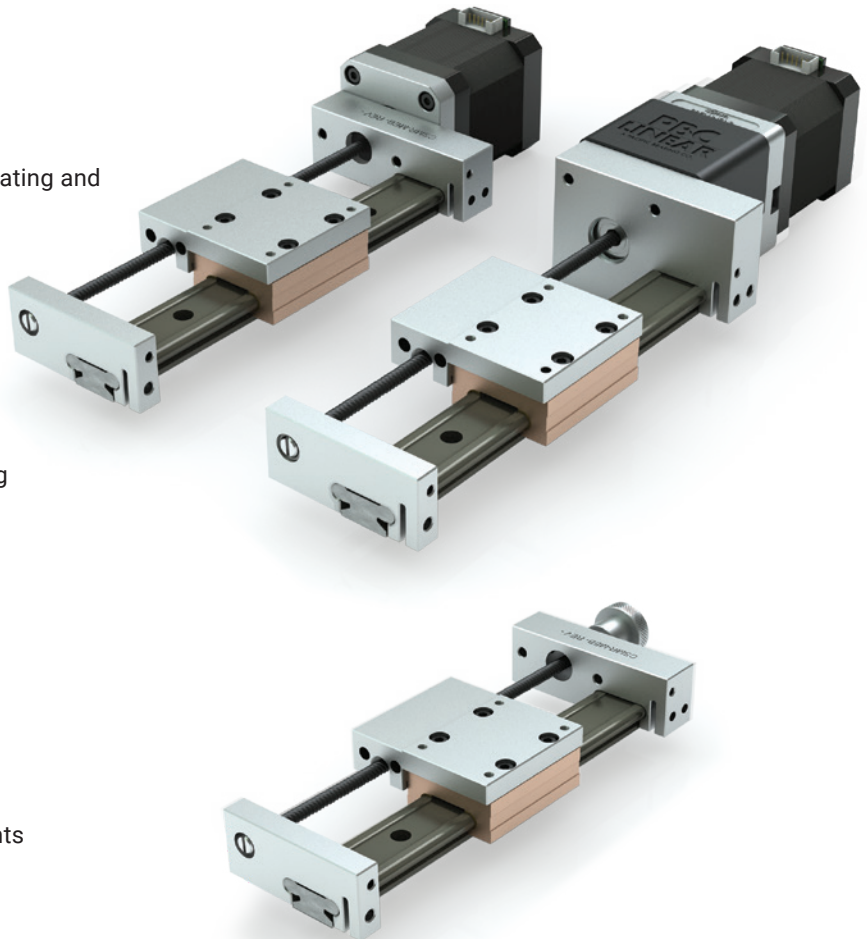
- Integrated lead screw eliminates components and tolerance stack-ups
- Improved rigidity and performance
- Reduced system costs
- Connector with 12" flying leads included

Motor Mount

- Designed to work optimally with R+W EKL2 coupler

Manual Hand knobs

- Hand adjustment knob is used for manually adjusting screw driven systems



System Ordering Information
Page 11



Motor Mount Details
Page 13

Profile Rail Technology

Ball Bearing Linear Guides

Overview

- Three profile choices
- 1,000 mm maximum length
- Size 15 mm bearing block
- High precision, rigidity, and speeds
- Increased stiffness and preloaded bearing performance
- Supports cantilevered loads
- Low coefficient of friction

Lead Screw and Nut

- Lead screw 6 mm and 10 mm diameter
- 300 series stainless steel with PTFE coating
- Variety of leads
- Other leads available—consult factory
- Constant Force™ anti-backlash nut
- 8 mm ball screw also available

Motor and Drive Type

Integrated Stepper Motor

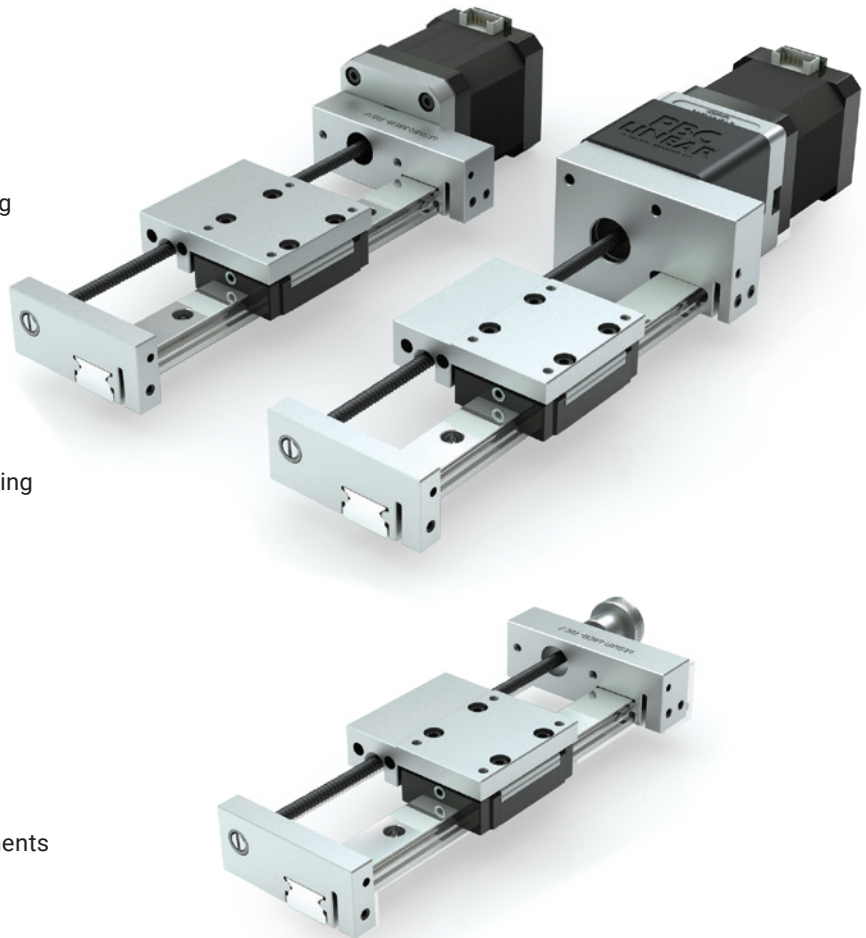
- Integrated lead screw eliminates components and tolerance stack-ups
- Improved rigidity and performance
- Reduced system costs
- Connector with 12" flying leads included

Motor Mount

- Designed to work optimally with R+W EKL2 coupler

Manual Hand knobs

- Hand adjustment knob is used for manually adjusting screw driven systems

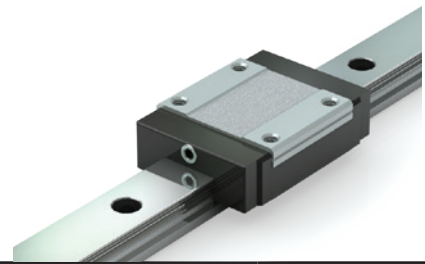
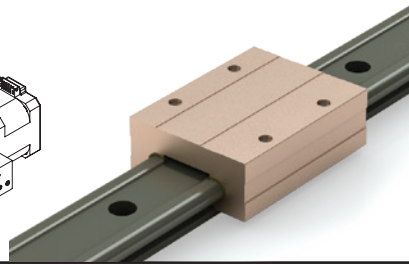
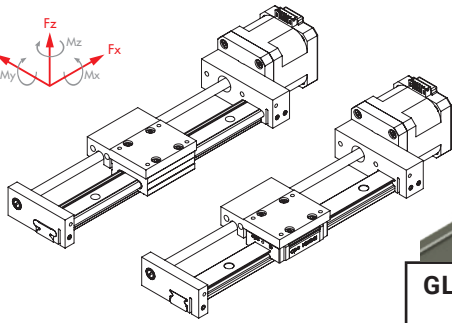
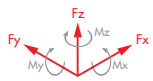


System Ordering Information
Page 11



Motor Mount Details
Page 13

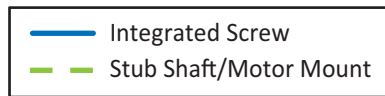
Basic System Properties



			GLIDING SURFACE TECHNOLOGY Plain Bearing	PROFILE RAIL TECHNOLOGY Ball Bearing Linear Guides	
				Lead Screw	Ball Screw
Speed mm/s			4,200	4,200	5,500
Acceleration mm/s/s			50,000	50,000	250,000
Stroke mm			5-440	1,000	1,000
Repeatability (+/- mm)			0.02 Anti-Backlash	0.02 Anti-Backlash	0.03
MAX Drive (Input) Speed rpm			2,000	3,000	3,000
Screw Diameter mm			6	6 or 10	8
Lead mm			1, 2, 4, 5, 6, 8, 10, 12, 16, or 25	1, 2, 4, 5, 6, 8, 10, 12, 16, or 25	2, 5 or 8
MAX Load	Fx	N	25	333	386
	Fy		240	2,500	
	Fz (Normal)		240	2,500	
	Fz (Inverted)		240	2,500	
Max Moments	Mx	Nm	9	43.6	
	My		9	27	
	Mz		15.1	27	

Buckling column load curve

6 mm diameter lead screw



Note: Based on 500 mm stroke, GST version with .125 C.O.F. and .3G acceleration. Based on 24 volt, but higher voltage amplifiers may produce higher speeds.

Profile Rail Ordering Information

Compact Series	Type	Diameter	Lead	Thread Dir.	Drive End Option	Motor Option	Nut	Carriage Length	Cover	Rail Length	QTY of Carriages
CS	LS	M10	AGX	R	1	00	1	L	L	XXXX	0

Screw Type

LS	Lead Screw
BS	Ball Screw

Screw Diameter

M06	6mm Lead screw
M10	10mm Lead screw
M08	8mm Ball screw

Screw Lead

AHX	1mm (M06 & M10)
AGX	2mm
ARX	4mm (M06 & M10)
AXX	5mm
BGX	6mm (M06 & M10)
BHX	8mm
AJX	10mm (M06 & M10)
BDX	12mm (M06 & M10)
AFX	16mm (M10 only)
AWX	25mm

Nut

1 - Standard (Ball screw only)

2 - Anti-Backlash (Lead screw only)

Carriage

S - Short (6 mm only)

L - Long (10 mm and 8 mm only)

Cover

N - No

L - Low


T - Tail

Rail Length

Lengths of 130 mm to 1,000mm (Consult maximum speed data)

Quantity of Carriages

0	1 driven carriage
1	2 carriages, 1st from drive end driven
2	2 carriages, 2nd from drive end driven
3	3 carriages, 1st from drive end driven
4	3 carriages, 2nd from drive end driven
5	3 carriages, 3rd from drive end driven



Configure Online

Ordering example:

CSBSM08AXXR10Z-1:M-0300-5

Drive End Option	Motor Option	Drive End Option	Motor Option
1. Shaft (Includes referenced mount with no motor or coupling)	00 Stub Shaft	3. PBC Integrated Motor Screw (cont.)	B4 NEMA23 Single Stack
	0Z Motor Mount Adapter Plate		B5 NEMA23 Double Stack
	ZE 40 mm Motor Mount		B6 NEMA23 Power Plus
	ZF NEMA17 Motor Mount	4. Complete System (Motor, Mount, Coupling, Shipped as 1 Unit)	A1 NEMA17 Single Stack
	ZG NEMA23 Motor Mount		A2 NEMA17 Double Stack
	ZH 60 mm Motor Mount		A3 NEMA17 Triple Stack
Z0 Blank Plate (Customer Machined)	B4 NEMA23 Single Stack		
2. Knob	00 Stub Shaft	B5 NEMA23 Double Stack	
	00 Stub Shaft	B6 NEMA23 Power Plus	
3. PBC Integrated Motor Screw	A1 NEMA17 Single Stack		
	A2 NEMA17 Double Stack		

Gliding Surface Rail Ordering Information

Compact Series	Type	Rail Length	Drive Option	Lead	Nut	QTY of Carriages
CS	MR15D	000	100	AWX	R2	X

Rail Length

Lengths from 80 mm to 510 mm (Consult maximum speed data)

Drive Type

100	None-Stub Shaft
200	Hand Knob
3A1	NEMA17 Single Stack
1ZE	40 mm Motor Mount
1ZF	NEMA17 Motor Mount
1ZG	NEMA23 Motor Mount
1ZH	60 mm Motor Mount
1Z0	Blank Plate

Nut

Anti-Backlash


Lead

M06 (6 mm lead screw)

AHX	1 mm
AGX	2 mm
AXX	5 mm
AJX	10 mm

Quantity of Carriages

0	1 driven carriage
1	2 carriages, 1st from drive end driven
2	2 carriages, 2nd from drive end driven
3	3 carriages, 1st from drive end driven
4	3 carriages, 2nd from drive end driven
5	3 carriages, 3rd from drive end driven



Configure Online

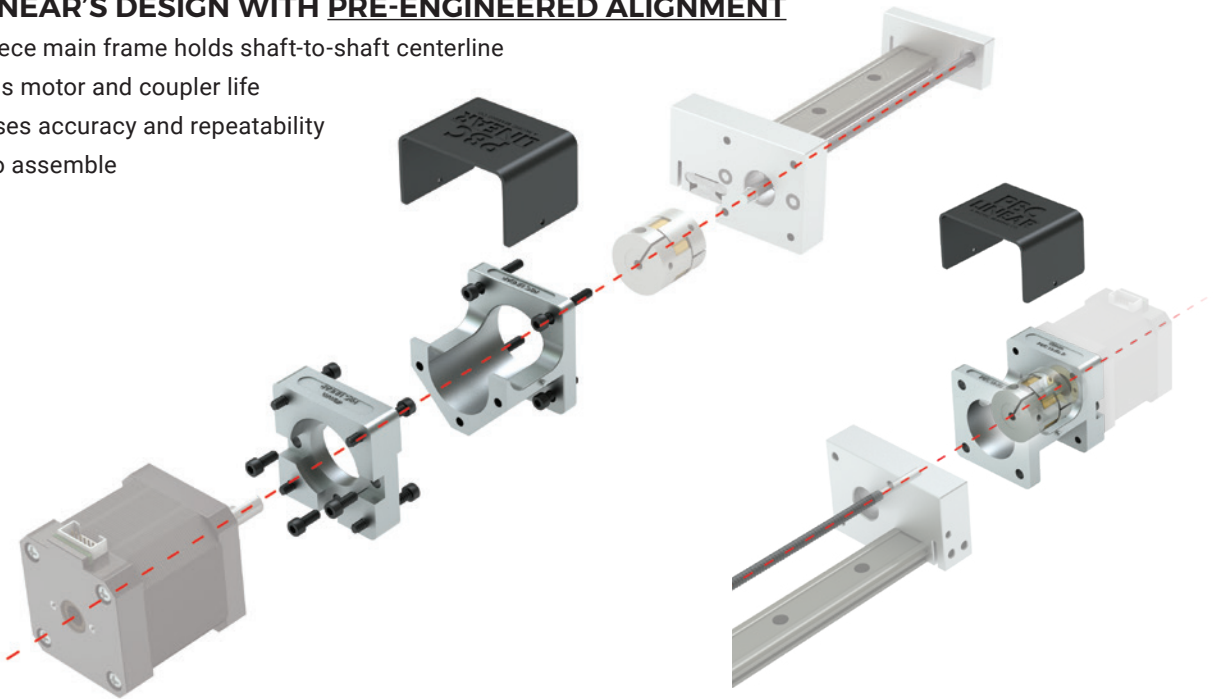
Ordering example:

CSMR15D-000-0425-3A1-AXXR2-2

Motor Mount Option Benefits

PBC LINEAR'S DESIGN WITH PRE-ENGINEERED ALIGNMENT

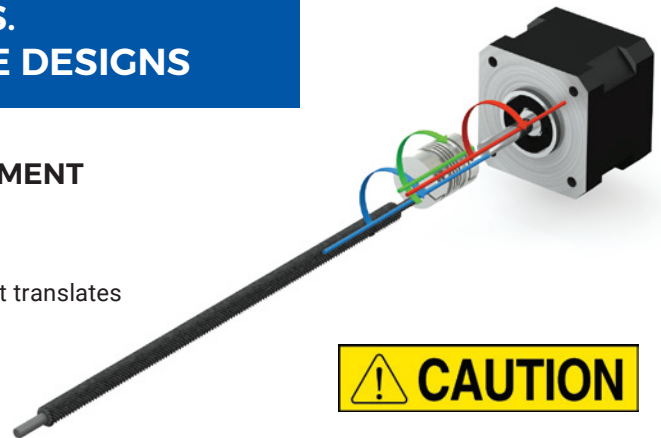
- One-piece main frame holds shaft-to-shaft centerline
- Extends motor and coupler life
- Increases accuracy and repeatability
- Easy to assemble



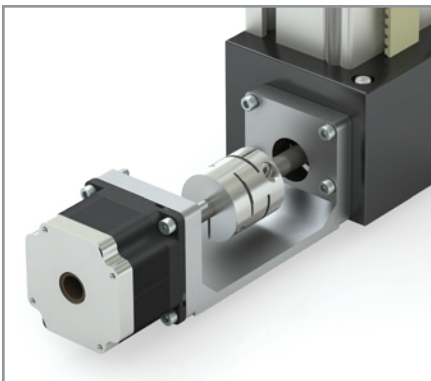
PBC LINEAR'S DESIGN VS. ALTERNATE DESIGNS

PROBLEMATIC DESIGNS CAUSE MIS-ALIGNMENT

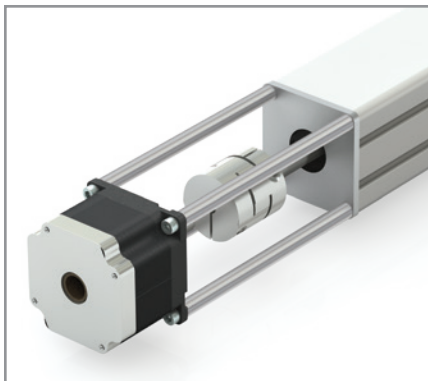
- Mis-alignment between motor shaft, coupler, and screw shortens life and affects motion quality
- Mis-alignment results in camming or lobbing motion that translates to inconsistent linear movement
- Difficult to align and prone to deflection
- Over-torque of coupler causes accuracy loss



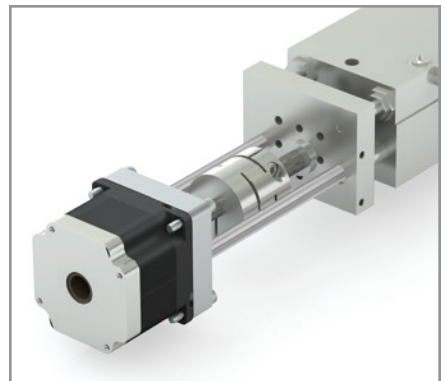
PROBLEM #1: DEFLECTION



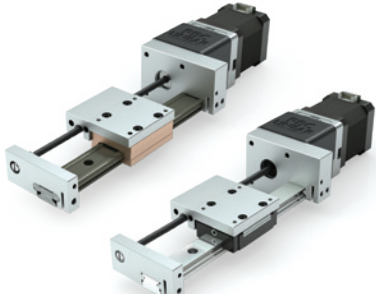
PROBLEM #2: TWIST



PROBLEM #3: OFF CENTERLINE



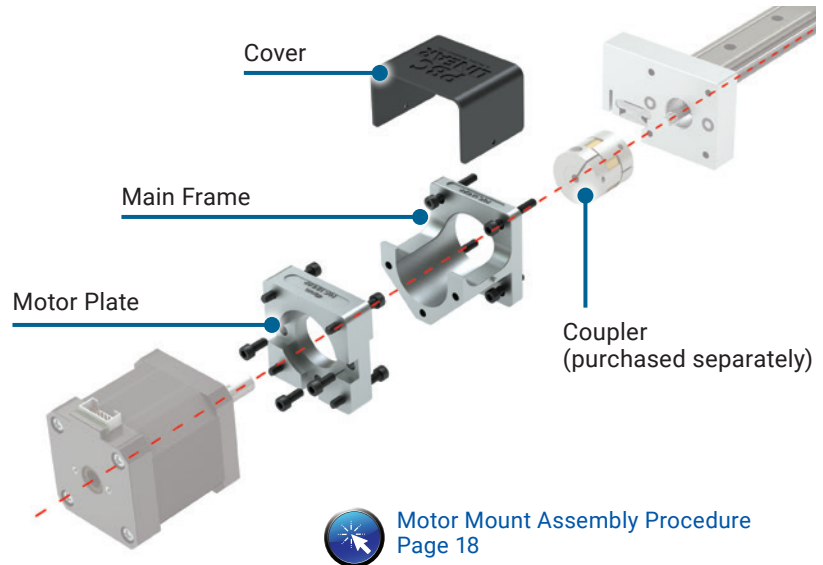
Ordering Motor Mount Option

Compact Series System Gliding Surface Technology – Plain Bearing Profile Rail Technology – Ball Bearings	Motor Size	Part Number	Recommended Coupler Ordered Separately or Customer Supplied	Included with Motor Mount Purchase
	NEMA 17 42 mm	UGA040A-3PMM-HF	R + W EKL2 Maximum coupler dimensions: 25 mm O.D. x 26 mm length	(1) Main frame with 4 SBHCS (Socket Button Head Cap Screw) (1) Motor plate with 3 SBHCS for attaching to frame* (1) Cover (plastic) * Customer supplies motor screws
	NEMA 23 56 mm	UGA040A-3PMM-HG		
	Blank Plate (customer machined)	UGA040A-3PMM-H0		



STUB SHAFT DIMENSIONS

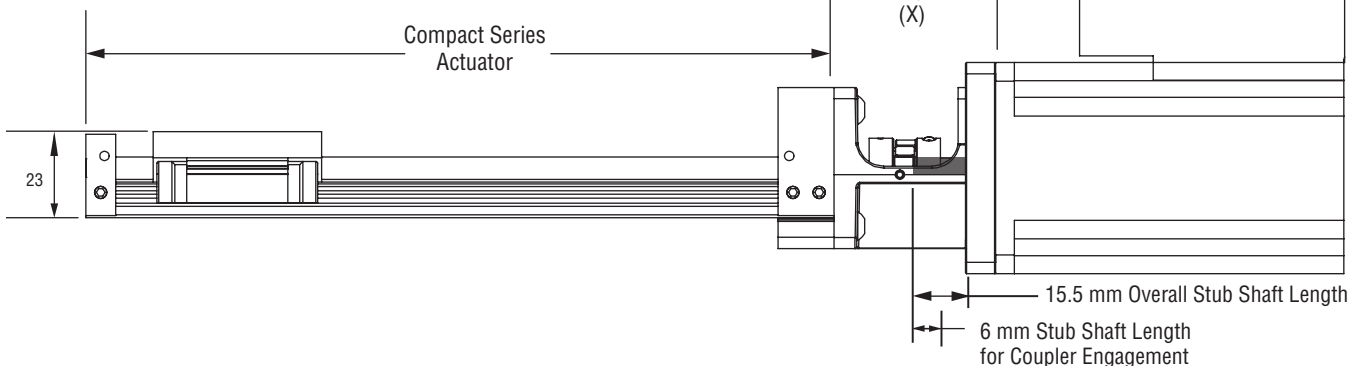
Stub Shaft Diameter	3.5 mm
Overall Stub Shaft Length	20 mm
Stub Shaft Length for Coupler Engagement	6 mm



Motor Mount Assembly Procedure
Page 18

MOTOR MOUNT LENGTH (X)

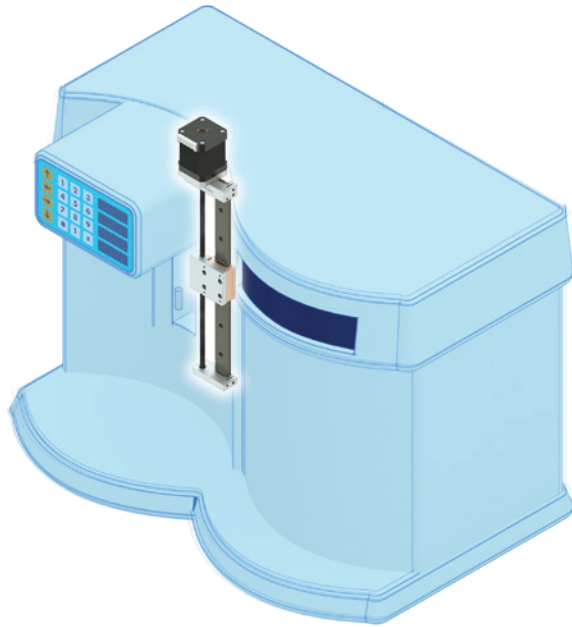
Compact Series System	X	
	NEMA 17 42 mm	NEMA 23 56 mm
	53.7 mm	54.3 mm



Applications

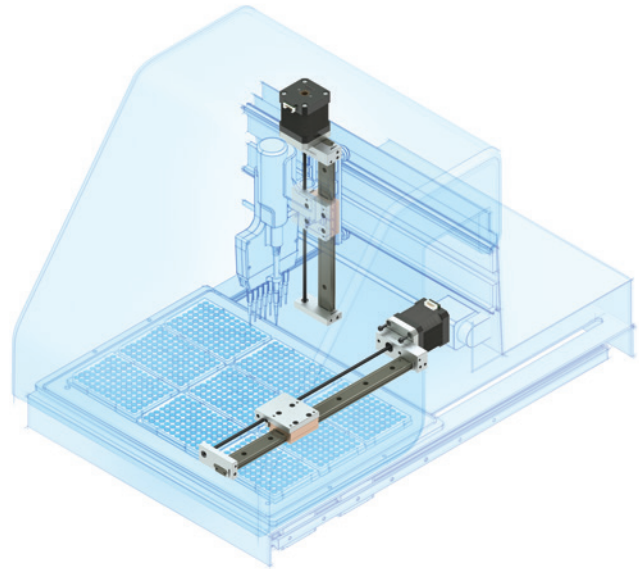
Medical and Laboratory Equipment:

The self-lubricating FrelonGOLD® bearing liner, in the plain bearing option of the Compact Series, is ideal for environments where no grease or lubrication can be present.



Well Plate Handling:

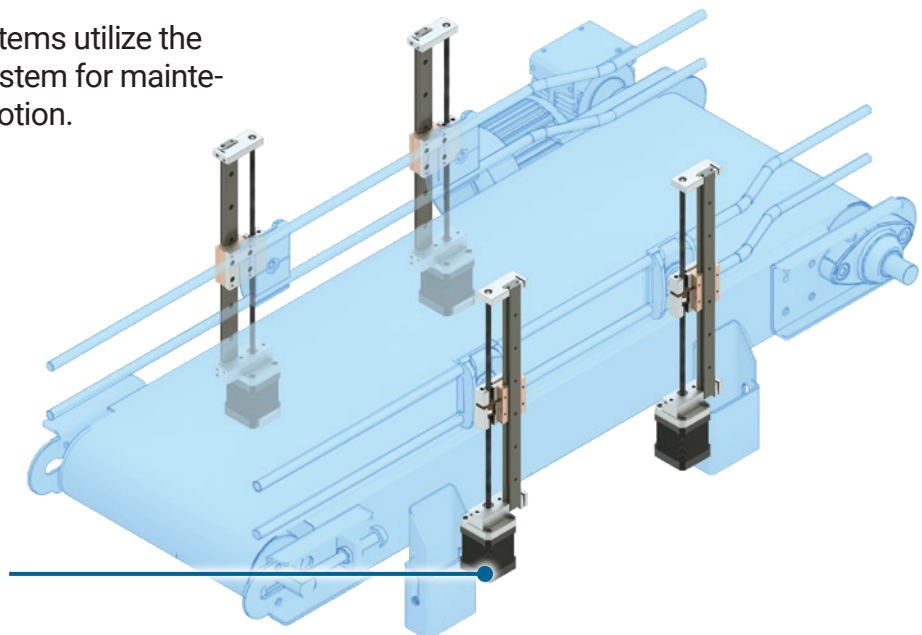
Compact Series installed in an intricate well plate handler—providing accurate and reliable linear motion.



Automated Conveyor:

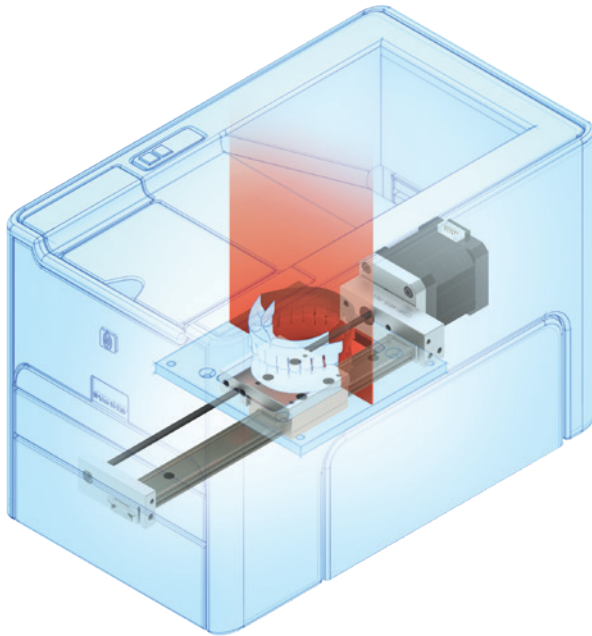
Material handling conveyor systems utilize the Compact Series linear guide system for maintenance free, repeatable linear motion.

Integrated stepper motor reduces the number of components and improves rigidity in the system

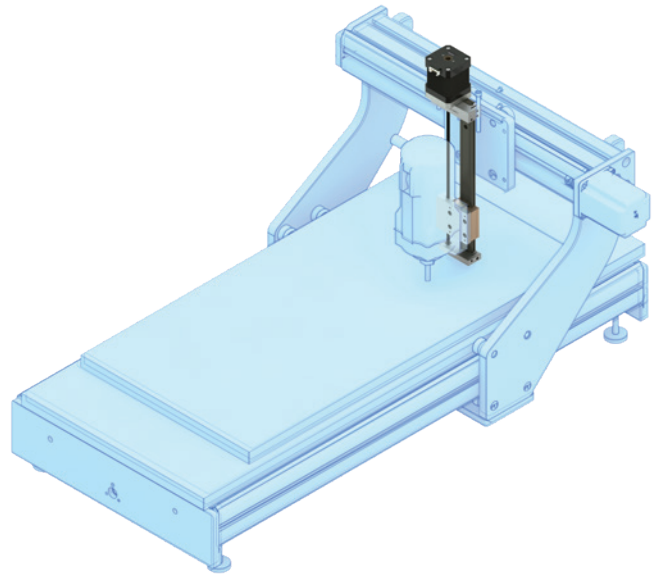


Scanning Equipment:

High precision and smooth operation are required when designing linear motion for laboratory scanning equipment. The plain bearing system utilizes FrelonGOLD®—a self-lubricating, maintenance free surface that does not require oil.

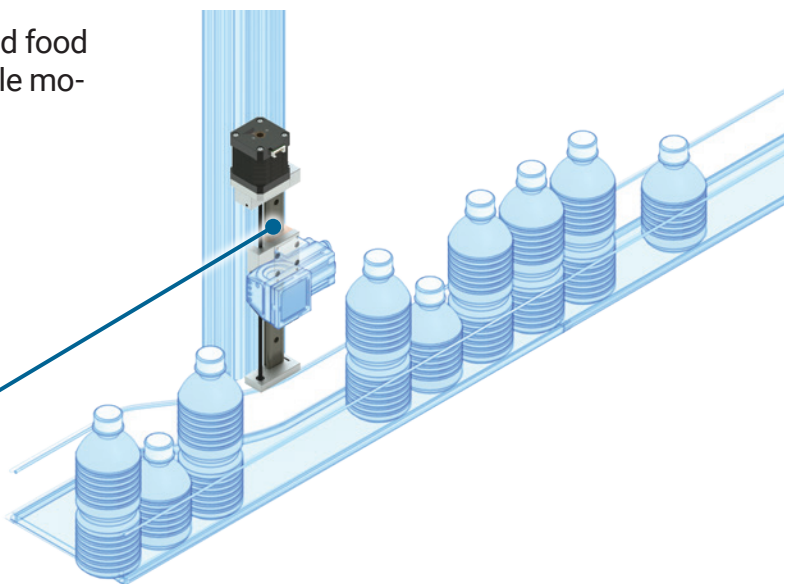
**CNC Router:**

The plain bearing version of the Compact Series is ideal for harsh, dirty environments such as a CNC router. The carriage acts as a wiper as it clears away contamination such as dust and debris from the rail.

**Bottling:**

The Compact Series is ideal in bottling and food service applications that require repeatable motion and involve various load capacities.

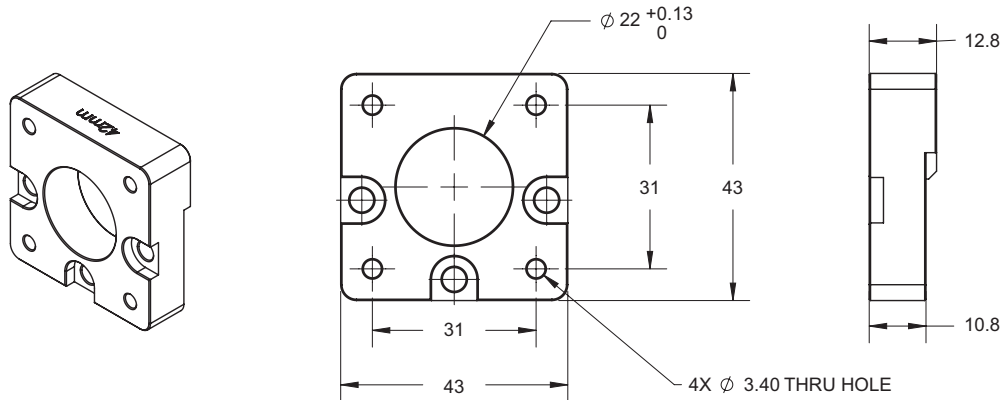
Plain bearings utilize the bonded FrelonGold® self-lubricating maintenance-free surface



Motor Mount Plate Dimensions

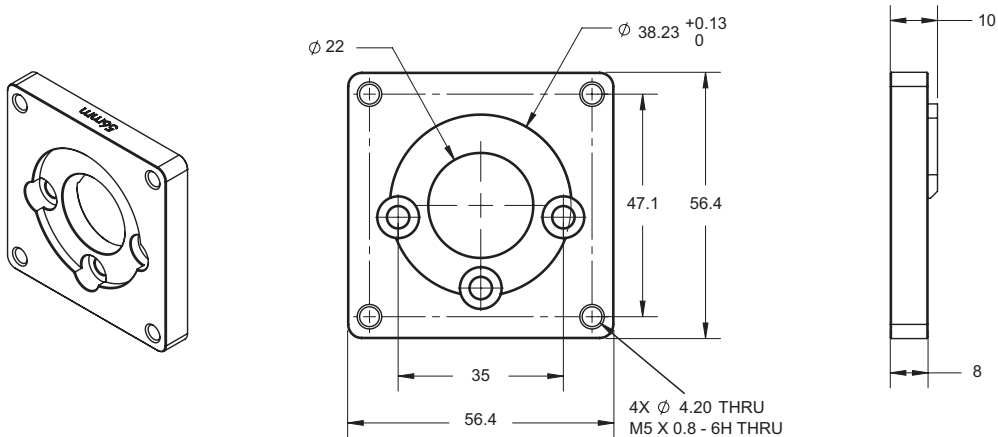
MOTOR SIZE: NEMA 17 (42 MM)

- Material: Anodized aluminum



MOTOR SIZE: NEMA 23 (56 MM)

- Material: Anodized aluminum



System Ordering Information
Page 11

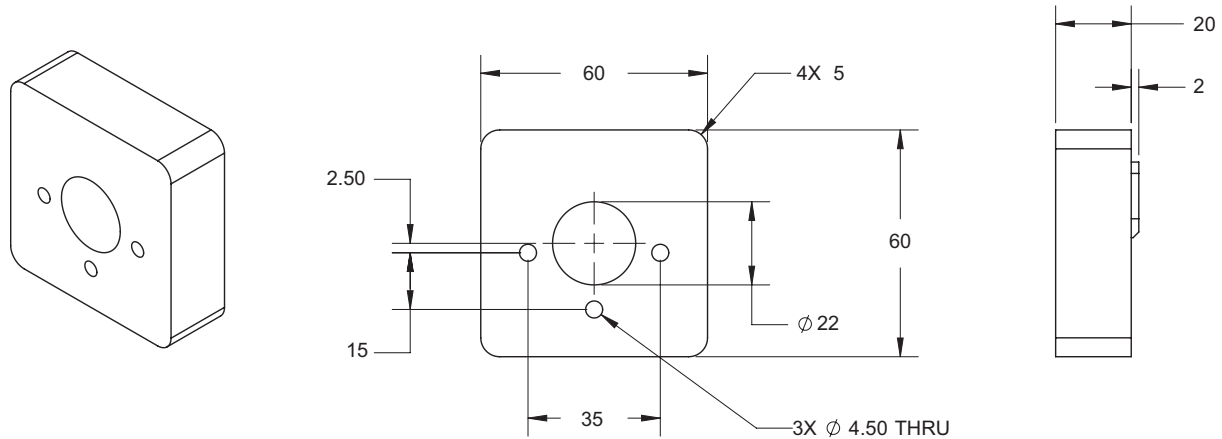


Motor Mount Details
Page 13

Blank Plate and Main Frame Dimensions

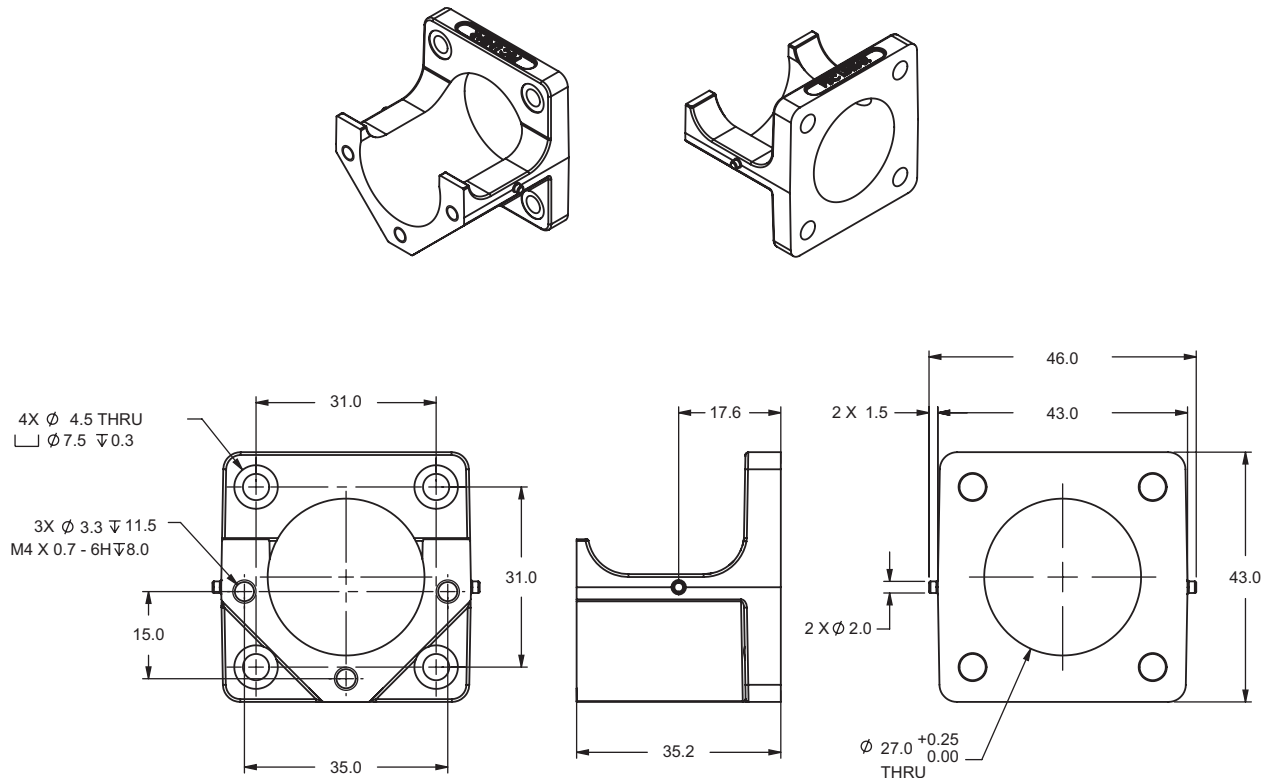
• BLANK PLATE

- Intended use: To give customers the ability to machine the plate to match non-standard motor configurations
- Material: Anodized aluminum
- Tip: It is best to locate from the center hole when machining hole pattern for motor attachment.



MAIN FRAME

- Material: Die cast aluminum, clear chromate



User Manual

Table of Contents

Safety

Tips for Safe Installation and Operation 18

Motor Mount Option

Coupler 19

Assembly. 20

Maintenance

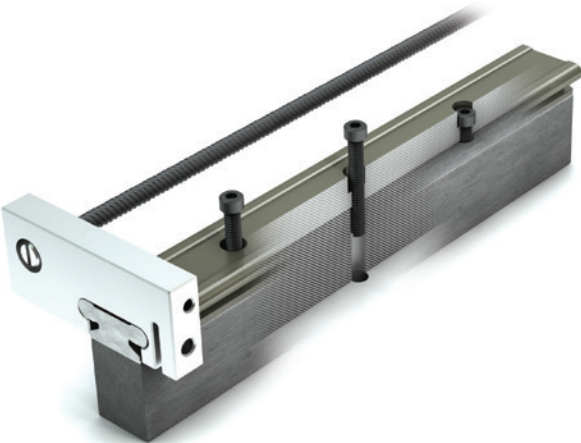
Lubrication 21

Tips for Safe Installation and Operation

- Only qualified personnel should transport, assemble, operate, and maintain this equipment.
- Always wear appropriate personal protection equipment, such as safety glasses and hearing protection.
- Read and observe the installation, operating, and safety instructions provided by the manufacturer. Incorrect handling and operation may result in damage to equipment and personal injury.
- Comply with all installation specifications and requirements to ensure proper setup.
- Provide a flat and stable mounting surface.
- Be sure sufficient space is provided to permit full carriage travel with no hard stops.
- Be sure power is OFF before performing actuator maintenance.
- The unit should be checked regularly for worn or damaged components. Follow recommended service intervals and replace defective parts immediately. Always replace parts with the same make and model as the original.
- Be aware that most actuator configurations are not self-braking. A load can move if the drive force is disconnected, or if drive train components are detached. This is particularly true for vertical applications. The load should be secured prior to service. Consider installing an electromechanical power-off brake in vertical configurations to prevent potential damage or personal injury.
- Actuators should be wiped down occasionally to keep them clean. Use fluids sparingly and be sure none seeps inside. Do not use strong or harsh cleaning agents.
- Always test run actuators after maintenance work is completed.
- Do not back-drive the lead screw by moving the carriage by hand.

Mounting tips

- Mount the Compact Series through the holes in the rail
- Counter bores accommodate M3 SHCS
- The number of counter bores varies with the length of rail



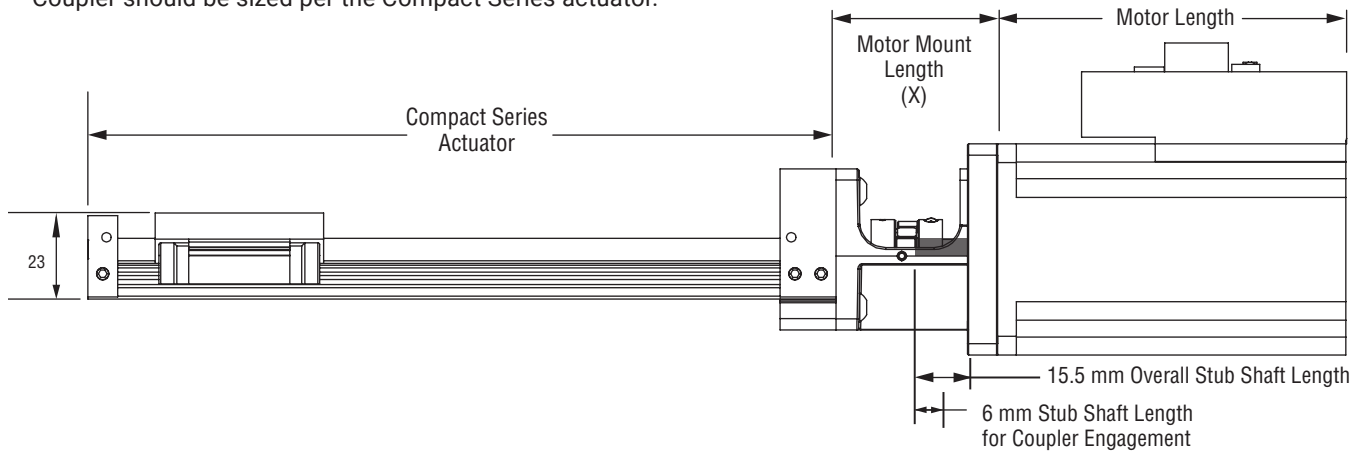
Motor Mount and Coupler Information

COUPLER

- Compact Series motor mounts are designed to work optimally with the R+W EKL2 coupler
- Other couplers can be used under the following conditions:
 - Maximum O.D. = 25 mm
 - Maximum length = 26 mm
- Coupler should be sized per the Compact Series actuator.

CAUTION

Verify coupler bore diameters and depths will accept both actuator stub shaft and motor shaft.



STUB SHAFT DIMENSIONS

Stub Shaft Diameter	3.5 mm
Overall Stub Shaft Length	15.5 mm
Stub Shaft Length for Coupler Engagement	6 mm

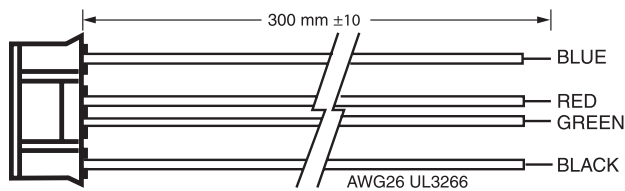
MOTOR MOUNT LENGTH (X)

Compact Series System	X	
	NEMA 17 42 mm	NEMA 23 56 mm
	53.7 mm	54.3 mm

ONBOARD connector PLUG

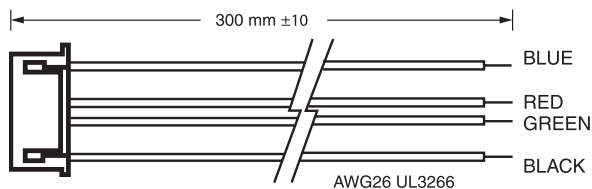
With 12" Leads Included with Purchase

NEMA 17 Connector
PBC Part Number: 6200490



Housing: JST PHR-6
Terminal: JST SPH-002T-P0.5

NEMA 23 Connector
PBC Part Number: 6200491



Housing: JST XHP-6
Terminal: JST SXH-001T-P0.6



Onboard connector plug with 12" leads included with purchase

User Manual Motor Mount Assembly

MOTOR MOUNT ASSEMBLY

Components:

- Base actuator unit
- Motor (customer supplied)
- Motor Mount Kit
 - Motor Plate
 - Main Frame
 - Cover
- Coupler (customer supplied) R + W EKL2 recommended

Fasteners: (9) M4 x 12 mm SBHCS (supplied by PBC Linear),
(4) Customer supplied motor fasteners (See Table 2)

Tools Required: Hex Key (See Table 1)

Suggested Thread Locker: Blue Loctite® 242 or equivalent

TABLE 1

Hex Key Size Needed:

M3 SHCS	= 2.5 mm Driver
M4 SBHCS	= 2.5 mm Driver
M5 SHCS	= 4 mm Driver

TABLE 2

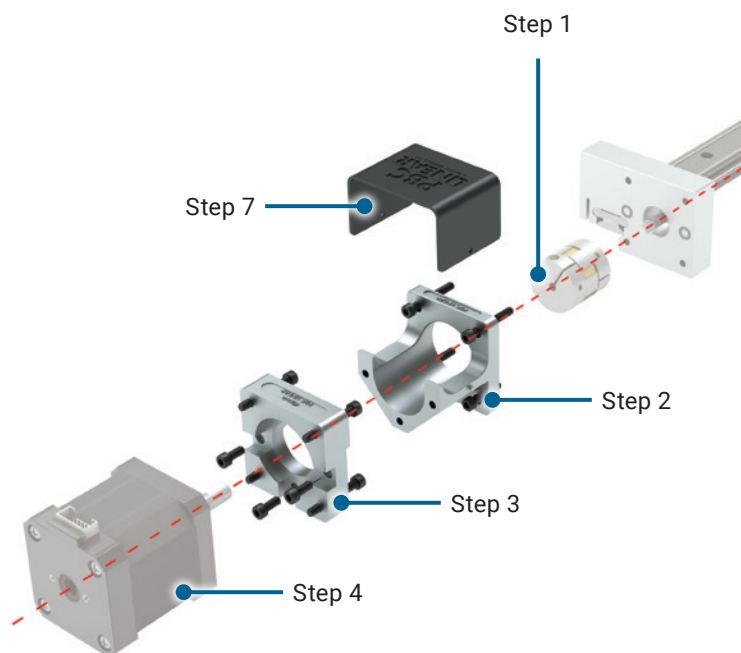
Customer Supplied Fasteners:

NEMA 17 Motor	= M3 x 0.5 SHCS
NEMA 23 Motor	= M5 x 0.8 SHCS
60 mm Servo Motor	= M5 x 0.8 SHCS

TABLE 3

Fastener Torque Values:

M3 SHCS	= 8-10 in/lb [1.0-1.2 Nm]
M4 SBHCS	= 17-21 in/lb [2.0-2.4 Nm]
M5 SHCS	= 37-45 in/lb [4.2-5.1 Nm]



ASSEMBLY STEPS

1. Slide coupling onto shaft and leave loose.
2. Install main frame to actuator end block using (4) M4 x 12 mm SBHCS. Snug fasteners, but do not tighten.
3. Install motor plate to main frame using (3) M4 x 12 mm SBHCS. Apply blue Loctite® 242 or equivalent threadlocker and torque to 17-21 in/lb [2.0-2.4 Nm] (See Table 3).
4. Install motor to motor plate with customer supplied fasteners (See Table 2) and install shaft into coupling. Snug fasteners, but do not tighten.
5. Check for proper shaft engagement on both sides (per coupler manufacturer specs).
6. Once system is aligned, final torque all fasteners appropriately (See Table 3).
7. Install cover on pins in casting (snaps in place).

Lubrication User Manual

Initial Lubrication During Installation

Some PBC Linear systems are shipped with a preservative lubrication applied to the raceways. If so, additional lubrication should be applied during installation. Proper lubrication dissipates heat, increases service life, and reduces friction, wear, and corrosion. Recommended lubricants are listed where applicable, but there are some lubricants which **SHOULD NOT** be used on any configuration.

DO NOT USE: WD40; motor oil; oils with additives; moly or other filled greases; PTFE sprays, oils, or greases; or sprays containing fluorocarbons or silicone.

Recommended Lubricants

Plain Bearing (GST - Gliding Surface Technology)

Recommended Lubricants: way lube oils, lightweight oils, 3-IN-ONE® oils, and lightweight petroleum-based greases. The PTFE coated lead screw and polymer nut require no lubrication during normal operation, but should be routinely inspected for damage and wear. In certain applications, however, an external lubricant may be desirable. Contact a PBC Linear applications engineer for guidance regarding additional lubrication.

Profile Rail (PRT - Profile Rail Technology)

Recommended Grease: Synthetic oil based lithium-soap grease with an ISO VG32-100 viscosity.

Recommended Oil: Synthetic oil CLP or CGLP based on DIN 51517, or HLP based on DIN51524.

Viscosity range should be ISO VG32-100.

RELUBRICATION

Linear guide raceways should be relubricated periodically with oil or grease. Recommended lubricants are listed where applicable, but there are some lubricants which **SHOULD NOT** be used on any Compact Series configuration.

DO NOT USE: WD40; motor oil; oils with additives; moly or other filled greases; PTFE sprays, oils, or greases; or sprays containing fluorocarbons or silicone.

The relubrication interval is dependent on many operating and environmental conditions, such as load, stroke, velocity, acceleration, lubrication type, mounting position/orientation, UV exposure, temperature, and humidity. The actual lubrication interval should be determined by tests conducted under actual application conditions.

While the actual relubrication intervals are application specific and determined only through testing, the following “first check” guidelines can typically be used as a starting reference point under “normal” conditions:

Relubrication every 1000 km; 50000 cycles; or six months (whichever occurs first)

Extended Lubrication Interval

Relubrication every 2500 km; 100000 cycles; or one year (whichever comes first)



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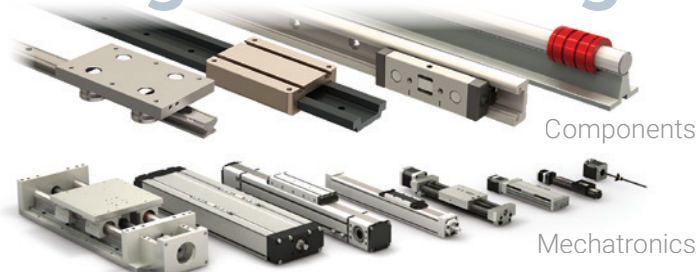


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