Gliding Surface Technology
Linear Guide Components & Systems

For the Most Accurate Ordering Information, Access Our Online Configurator at pbclinear.com

PBC Linear
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Product Comparison

Uni-Guide’s self lubricating Frelon® liner allows it to excel in the most demanding surroundings.

UNI-GUIDE™

Two-piece assembly facilitates quick and easy integration into new or existing systems.

LOW PROFILE UNI-GUIDE™

Uni-Guide | D125, D100, D075

Link to Uni-Guide Product Overview

Link to Low Profile Uni-Guide Product Overview
The Low Profile Mini-Rail is a great option for small spaces with standard sizes as small as 6 mm thick.

Mini-Rail features two design configurations: Precision & Compensated Precision Series. The Compensated Series includes additional clearance to tolerate misalignment.
Contents

Applications
Product Information
Technical Information

Frelon Liner Overview
Load Capacity & Ratings
Installation Process

Types & Effects of Lubrication
Cantilevered Loads
Chemical Reaction Chart

COMPONENTS

Mini-Rail
Low Profile Mini-Rail
Low Profile Uni-Guide™

Uni-Guide™

DRIVEN SYSTEMS

Mini-Rail LS & MS - Lead Screw Driven
Uni-Guide™ - Driven
SIMO SERIES - Low Profile Uni-Guide™

If you are utilizing our digital GST catalog, you can click these icons throughout the publication, to get more information.

Note: Hyperlinks go to English language website.

COMMON BUTTONS & LINKS

Link to product information
Consult Factory • 800-962-8979
Email an Application Engineer

Ordering Information
Watch Product Video
Online Configurator Link
Applications

HEAVY DUTY VISE: With static load capacities up to 1000 lbs (453 kg) and the multiple-carriage option, Uni-Guide™ is an ideal drop-in solution for heavy duty applications.

MEDICAL AND LABORATORY EQUIPMENT: The self-lubricating Frelon® bearing materials are ideal for environments where no grease or lubrication can be present.
Applications

AUTOMATION & ASSEMBLY LINE GRIPPER:
The two-piece, aluminum designed Uni-Guide, is a unique assembly that eliminates tolerance stack up and can be easily integrated into existing applications.

MEDICAL AND LABORATORY EQUIPMENT:
Uni-Guide™ provides smooth and quiet linear motion in a simple, compact assembly that is ideal for the medical and laboratory industry.
Applications

VISION, SENSORS, AND SCANNING: GST rail and carriages provide consistent smooth performance in vision applications due to not having any metal-to-metal contact.

AUDIO/VISUAL DISPLAY MOUNTS: Uni-Guide™ provides a versatile solution for display mounts. Features such as hand cranks, hand brakes and motors are available.
Mini-Rail

PRODUCT OVERVIEW

An economical alternative to conventional miniature linear guides, Mini-Rail requires little maintenance, is dimensionally interchangeable with industry standard sizes and is maintained in stock for quick delivery.

Mini-Rail miniature linear guides are available in lengths up to 3600mm, meaning no cumbersome butt joints. These guides are precision manufactured out of lightweight aluminum alloys to ensure long life and corrosion resistance.

- Ceramic coated aluminum rail and anodized aluminum carriage
- Self-lubricating FrelonGOLD® Liner
- Compact design leaves a small footprint
- Corrosion resistance makes Mini-Rail ideal in harsh environment
- No rolling elements eliminates possibility of catastrophic failure
- Withstands vibration and shock
- Available in five sizes: 7, 9, 12, 15, and 20 mm

CARRIAGE CONFIGURATIONS

Precision Series: Ceramic coated rails and anodized carriages are corrosion resistant. FrelonGOLD self-lubricating liner delivers the best overall performance, the highest loads, the best wear life, and speeds. Most precise running clearance for high precision applications.

Compensated Series: Same as Precision Series except with additional clearance provided to tolerate misalignment.

APPLICATIONS

- Medical Precision
- Mobile Home Components
- Packaging
- Food Processing
- Product Movement
- Automation
- Semi-conductor
- Printing
- Electronics
Components

**DIMENSIONS**

**Mini-Rail**

Maximum Length: 3600 mm  
Materials: 6061-T6 aluminum rail and carriage, FrelonGOLD®

Max V: 300 sfm for FrelonGOLD (1.524 m/s)  
Max P: 3000 psi for FrelonGOLD (20.68 N/mm²)

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>RUNNING CLEARANCE</th>
<th>A</th>
<th>B</th>
<th>B1</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H1</th>
<th>H2</th>
<th>K</th>
<th>M</th>
<th>Y</th>
<th>X</th>
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<td>.025 - .051</td>
<td>7</td>
<td>8</td>
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<td>24</td>
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<td>12</td>
<td>4.2</td>
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<td>6.2</td>
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<td>5</td>
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<td>M3 x 0.5</td>
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<td>15</td>
<td>4.5</td>
<td>2.6</td>
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<td>10</td>
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<td>34</td>
<td>M3 x 0.5</td>
<td>15</td>
<td>20</td>
<td>6</td>
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<td>20</td>
<td>6</td>
<td>3.5</td>
<td>10.7</td>
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<td>10</td>
<td>25</td>
<td>0.22</td>
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<td>9.2</td>
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<td>42</td>
<td>M4 x 0.7</td>
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<td>25</td>
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<td>62</td>
<td>M4 x 0.7</td>
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<td>38</td>
<td>9.5</td>
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<td>21.2</td>
<td>10</td>
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<td>60</td>
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<td>MR20-XXX</td>
<td>.025 - .051</td>
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<td>25</td>
<td>13.4</td>
<td>46</td>
<td>62</td>
<td>M4 x 0.7</td>
<td>22</td>
<td>38</td>
<td>9.5</td>
<td>8.5</td>
<td>21.2</td>
<td>10</td>
<td>20</td>
<td>60</td>
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<td>3.5</td>
<td>10.7</td>
<td>6</td>
<td>10</td>
<td>25</td>
<td>0.22</td>
<td>20.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:**  
Cut-to-length rails are available up to 3600 mm.  
Standard and cut-to-length rail ends are NOT coated. Fully coated rails are available upon request for high volume quantity requirements.  
All carriage mounting holes are through tapped except MR20 12.5mm of thread.  
The “Y” dimension will remain constant at one end unless requested otherwise.  
Add the overall length of the rail to the part number (EX: “MR12-0220” for a Precision Series assembly with a 220mm rail).
Mini-Rail

STATIC LOAD DATA
The numbers below are for rails in a static condition. Refer to the calculations below to establish dynamic parameters.

<table>
<thead>
<tr>
<th>SIZE</th>
<th>MSL N*</th>
<th>MY N-M</th>
<th>MX N-M</th>
<th>MZ N-M</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>734</td>
<td>2.3</td>
<td>1.8</td>
<td>1.8</td>
</tr>
<tr>
<td>9</td>
<td>1557</td>
<td>5.0</td>
<td>3.2</td>
<td>3.2</td>
</tr>
<tr>
<td>12</td>
<td>1957</td>
<td>9.0</td>
<td>5.6</td>
<td>5.6</td>
</tr>
<tr>
<td>15</td>
<td>3114</td>
<td>15.1</td>
<td>9.0</td>
<td>9.0</td>
</tr>
<tr>
<td>20</td>
<td>6005</td>
<td>24.9</td>
<td>14.7</td>
<td>14.7</td>
</tr>
</tbody>
</table>

*Max static load in Newtons.

LOAD/MOMENT CONVERSION

\[ N = 4.45 \times (\text{lbs.}) \]
\[ N\text{-m} = 0.113 \times (\text{in.}-\text{lbes.}) \]

PERFORMANCE RATINGS FOR LINEAR MOTION
Plain bearings are rated by their limiting PV, which is a combination of load over a given surface area and the velocity.

\[ PV = P \times V, \text{ where } P = \text{pressure (load) in psi (kgf/cm2)} \]
\[ V = \text{velocity (speed) in sfm (m/min.)} \]

**PV Example:**
Load = 85 psi
Speed = 180 ft./min.
\[ PV = 85 \times 180 = 15,300 \text{ PV} \]

Note: All three parameters must be met by an application for the bearing to perform properly.

Note: FrelonGOLD® bearing material coefficient of friction is 0.125.

CANTILEVERED LOADS
Binding of the carriage will occur if the 2:1 ratio for cantilevered loads and drive forces is exceeded. This principle is not load or force dependent. It is a product of the coefficient of frictions associated with plain bearings. Contact factory or website for additional information.
Components

ORDERING INFORMATION

CARRIAGE

MR  XX  C

Mini-Rail  Miniature Linear Guide
Series
No Entry = Precision Series
C= Compensated Precision Series
Nominal Sizes
07 mm  15 mm
09 mm  20 mm
12 mm

Example: MRC20C

Note: Mini-Rail carriages are matched to the rails at the time of the order. Adding carriages at a later date may result in an unsatisfactory fit between carriage and rail.

CARRIAGE AND RAIL ASSEMBLY

MR  XX  0100  2

Mini-Rail  Miniature Linear Guide
Series
No Entry = Precision Series
C= Compensated Precision Series
Nominal Sizes
07 mm  15 mm
09 mm  20 mm
12 mm

Rail Length  3600 mm MAX
Number of Carriages
1, 2, 3, or 4

Example: MR20R-0200

Configure Online
Low Profile Mini-Rail

PRODUCT OVERVIEW
Low Profile Mini-Rail is the perfect low cost solution for compact, low friction linear motion applications. The anodized aluminum rails offer a unit that is resistant to lubricants, fuels, dyes and weak acids. Being an industry standard interchangeable component, the LPM series is a fool-proof polymer slider.

FEATURES & BENEFITS
- Low cost
- Molded polymer slider with molded-in stainless steel threaded inserts
- Anodized aluminum rails
- Industry standard interchangeable
- Compact, low friction solution
- Resistant to contaminants, dyes, and weak acids
- Temperatures range: -35°C to +65°C
- Available in four sizes: 17, 27, 40, and 80 mm

APPLICATIONS
- Medical Equipment
- Packaging Precision
- Automation Industry
Components

Low Profile Mini-Rail

DIMENSIONS

Materials: Polymer slider (UL 94 HB flammability rating)
Molded-in stainless steel thread inserts
Anodized aluminum rails

Running Clearance: Less than or equal to 0.5 mm

Maximum Velocity: 10 m/s

Load Reduction Factor: 0.7-1.0 for low speed application;
0.4-0.7 for medium speed application; 0.1-0.4 for high speed application

ORDERING INFORMATION

EXAMPLE: LPM17-1000-1

Nominal Size
17mm, 40 mm, 27mm, 80 mm

Length of Rail in mm

Number of Carriages
Low Profile Uni-Guide™

PRODUCT OVERVIEW

The Low Profile Uni-Guide is a solution that maintains the proven advantages of the standard Uni-Guide in a simple, low cost and compact assembly. This two-piece assembly equipped with FrelonGOLD® liner creates a maintenance-free, smooth and quiet linear motion solution.

PBC Linear’s patent pending SIMO milling operation creates a precision-machined rail and carriage surface providing tight tolerances and alignment accuracy. The Low Profile Uni-Guide is available in both the precision and compensated series, allowing varying amount of running clearance to tolerate misalignment for a given application.

FEATURES & BENEFITS

• Low cost
• Ceramic coated aluminum rail, standard anodized carriage with FrelonGOLD liner
• Low wear, high load capacities, and maintenance-free operation
• Two-piece assembly facilitates a quick and easy integration into new or existing systems
• No metal-to-metal contact, which eliminates catastrophic failure
• Vibration damping and shock resistant
• Ideal for contaminated environments and clean rooms - hard anodized aluminum prevents contaminants from sticking
• Angled rail design ensures optimum washdown
• Operates well in a wide temperature range
• Suitable for an extremely short stroke

CARRIAGE CONFIGURATIONS

Precision Series: Ceramic coated rails and carriages are corrosion resistant. FrelonGOLD self-lubricating liner delivers the best overall performance, the highest loads, the best wear life, and speeds. Most precise running clearance for high precision applications.

Compensated Series: Same as Precision Series except with additional clearance provided to tolerate misalignment.

ACCESSORIES

• Hand Brake
• Felt Wick Lubrication - there are no lube port holes in the carriage, but you may add lubrication to the wick by removing the carriage from the rail

APPLICATIONS

• Medical equipment
• Laboratory equipment

Precision Series

.025 - .051 mm Running Clearance (CERAMIC COATED)

Compensated Series

.064 - .089 mm Running Clearance (CERAMIC COATED)

Note: Does not apply to Standard Uni-Guide products.
Plain bearings should comply with the 2:1 ratio rule.
Components

Low Profile Uni-Guide™

DIMENSIONS

![Low Profile Uni-Guide Diagram]

Notes:
1. Default end to first hole is 20 mm
2. 60 mm hole spacing provided for higher moment capacity. For low moment applications, every other hole may be used.

DIMENSIONAL DATA

<table>
<thead>
<tr>
<th>CARRIAGE PART#</th>
<th>STANDARD CARRIAGE</th>
<th>EXTENDED CARRIAGE</th>
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<tbody>
<tr>
<td></td>
<td>C1</td>
<td>C2</td>
</tr>
<tr>
<td>UGAD40C-0x1xxx</td>
<td>100</td>
<td>87</td>
</tr>
<tr>
<td>UGAD40C-1x1xxx</td>
<td>150</td>
<td>137</td>
</tr>
<tr>
<td>UGAD40C-2x1xxx</td>
<td>200</td>
<td>187</td>
</tr>
</tbody>
</table>

1 N = 0.2248 lbf  1 N-m = 0.7376 ft.-lbf.

ACCESSORIES

- Hand Brake
- Felt Wick
Low Profile Uni-Guide™

STATIC LOADS DATA
The numbers below are for guides only in a static condition. The drive mechanism selected (lead screw, ball screw, cylinder, etc.) becomes the limiting factor when calculating maximum load and speed capacities. The user is responsible for determining the maximum capacity for the complete system based on the manufacturer’s data for their drive configuration.

<table>
<thead>
<tr>
<th>SIZE</th>
<th>FZ MAX LOAD LBS.</th>
<th>FZ MAX LOAD N</th>
<th>FZ INVERTED MAX LOAD LBS.</th>
<th>FZ INVERTED MAX LOAD N</th>
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<td>UGA040C-0x1xxx</td>
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<td>8,200</td>
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<td>2,700</td>
</tr>
</tbody>
</table>

LOAD/MOMENT CONVERSION

\[ N = 4.45 \times \text{(lbs.)} \]

\[ N \cdot \text{m} = 0.113 \times \text{(in.-lbs.)} \]

PV = The performance measurement of plain bearings.

\[ PV = P \times V, \text{ where } P = \text{pressure (load) in psi (kgf/cm²)} \]

\[ V = \text{velocity (speed) in sfm (m/min.)} \]

PV Example: Load = 85 psi

\[ \text{Speed} = 180 \text{ ft./min.} \]

\[ PV = 85 \times 180 = 15,300 \text{ PV} \]

Note: All three parameters must be met by an application for the bearing to perform properly.

Note: FrelonGOLD® bearing material coefficient of friction is 0.125

CANTILEVERED LOADS

Binding of the carriage will occur if the 2:1 ratio for cantilevered loads and drive forces is exceeded. This principle is not load or force dependent. It is a product of the coefficient of frictions associated with plain bearings. Contact factory or website for additional information.
Components

Low Profile Uni-Guide™

ORDERING INFORMATION

RAIL

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<th>R</th>
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<th>0</th>
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<tbody>
<tr>
<td>Uni-Guide</td>
<td>Series</td>
<td>Internal/External Size</td>
<td>Identifier</td>
<td>Rail Length</td>
<td>Version</td>
<td>Hole Pattern</td>
<td>Anodizing</td>
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<td>A = Low Profile</td>
<td>A = Low Profile</td>
<td>040 = 40 mm</td>
<td>R = Rail</td>
<td>XXXX = Enter Length of Rail in Millimeters (2750 mm maximum)</td>
<td>0 = Standard</td>
<td>0 = Standard (60 mm) (UGA only)</td>
<td>0 = Standard</td>
</tr>
</tbody>
</table>

Ex: UGA040R-0300-000

CARRIAGE

<table>
<thead>
<tr>
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<th>C</th>
<th>X</th>
<th>X</th>
<th>1</th>
<th>G</th>
<th>X</th>
<th>0</th>
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</thead>
<tbody>
<tr>
<td>Uni-Guide</td>
<td>Series</td>
<td>Internal/External Size</td>
<td>Identifier</td>
<td>Carriage Length</td>
<td>Version</td>
<td>Carriage Options</td>
<td>Running Clearance</td>
<td>Carriage Height</td>
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</tr>
<tr>
<td>A = Standard (used with both low profile &amp; tall rail)</td>
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<td>C = Carriage</td>
<td>0 = 100 mm</td>
<td>0 = Standard</td>
<td>0 = None</td>
<td>G = GOLD</td>
<td>P = Precision (.025 - .051 mm)</td>
<td>1 = Standard carriage w/ t-slots</td>
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Ex: UGA040C-0P1G00

RAIL AND CARRIAGE ASSEMBLY

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<thead>
<tr>
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<th>P</th>
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<tbody>
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<td>Uni-Guide</td>
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<td>Frelon Type</td>
<td>Number of Carriages</td>
<td>Running Clearance</td>
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<tr>
<td>A = Low Profile</td>
<td>T = Tall Profile</td>
<td>040 = 40 mm</td>
<td>XXXX = Enter Length of Rail in Millimeters 2750 mm MAX</td>
<td>0 = 100 mm</td>
<td>00 = None</td>
<td>G = GOLD</td>
<td>1, 2, 3, 4, or 5</td>
<td>P = Precision (.025 - .051 mm)</td>
</tr>
</tbody>
</table>

Ex: UGA040T-0100P0G00

Note: 1 - Default end to first hole is 20 mm
2 - 60 mm hole spacing provided for higher moment capacity.
   For low moment applications, every other hole may be used.
3 - FrelonGOLD® must be paired with standard anodized rail.
4 - "None" carriage option is ready to accept both CHB and JKM options for after market addition.

Configure Online

Link to driven version of Low Profil Uni-Guide

pblinear.com | LINEAR MOTION SOLUTIONS 15
Uni-Guide™

PRODUCT OVERVIEW

FEATURES & BENEFITS
- Ceramic coated, aluminum rail and anodized carriage
- Self-lubricating, maintenance-free FrelonGOLD Liner
- The two-piece assembly makes for a quick and easy integration while also eliminating the need for alignment in both new and existing applications
- Excels in demanding extremes including temperature, heavy particulates, wash-down and extreme vibration
- No rolling elements, eliminating possibility of catastrophic failure
- Easy drop-in unit - no alignment necessary
- Slide sizes ranging from 75, 100, and 125 mm
- Continuous lengths up to 10 feet (3,048 m)
- Standard cut-to-length rails and carriage assemblies

ACCESSORIES
- Hand brake
- Hand crank
- NEMA 17, 23, and 34 motor mount (driven systems)

APPLICATIONS
- Automation & assembly line gripper
- Medical & laboratory equipment
- Heavy duty vise
- Audio/visual display mounts
Components

DIMENSIONS

STANDARD INCH SERIES WITH NO DRIVE MECHANISM  INCHES

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>R</th>
<th>R1</th>
<th>R2</th>
<th>X</th>
<th>R4</th>
<th>Y</th>
<th>H</th>
<th>C1</th>
<th>C2</th>
<th>C1</th>
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<th>C3</th>
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<td>1/4-20</td>
<td>3.5</td>
<td>1.02</td>
<td>10</td>
</tr>
<tr>
<td>D125</td>
<td>4.92</td>
<td>3.3</td>
<td>1.25</td>
<td>3/8</td>
<td>3</td>
<td>2.625</td>
<td>7.6</td>
<td>6</td>
<td>5.25</td>
<td>7.5</td>
<td>6.75</td>
<td>6.75</td>
<td>1/4-18</td>
<td>4.33</td>
<td>1.30</td>
<td>10</td>
</tr>
</tbody>
</table>

CARRIAGE TYPES

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>DRILL</th>
<th>DEPTH</th>
<th>TAP</th>
<th>DEPTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>D075-xxx</td>
<td>.159</td>
<td>.534</td>
<td>10-32</td>
<td>.440</td>
</tr>
<tr>
<td>D100-xxx</td>
<td>.201</td>
<td>.750</td>
<td>1/4-20</td>
<td>.500</td>
</tr>
<tr>
<td>D125-xxx</td>
<td>.257</td>
<td></td>
<td>5/16-18</td>
<td>.625</td>
</tr>
</tbody>
</table>

RAIL Φ APPROXIMATE

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>Φ</th>
</tr>
</thead>
<tbody>
<tr>
<td>D075</td>
<td>470 = 12 mm</td>
</tr>
<tr>
<td>D100</td>
<td>630 = 16 mm</td>
</tr>
<tr>
<td>D125</td>
<td>820 = 22 mm</td>
</tr>
</tbody>
</table>

RAIL STRAIGHTNESS

<table>
<thead>
<tr>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>±0.002°/ft</td>
</tr>
</tbody>
</table>

T-SLOT INFORMATION  INCHES

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>T</th>
<th>T1</th>
<th>T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>D075-xxx</td>
<td>.590</td>
<td>.256</td>
<td>.236</td>
</tr>
<tr>
<td>D100-xxx</td>
<td>.661</td>
<td>.319</td>
<td>.268</td>
</tr>
<tr>
<td>D125-xxx</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

WEIGHT

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>RAIL PER INCH</th>
<th>STANDARD CARRIAGE</th>
<th>EXTENDED CARRIAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>D075-xxx</td>
<td>0.19</td>
<td>0.98</td>
<td>1.26</td>
</tr>
<tr>
<td>D100-xxx</td>
<td>0.32</td>
<td>2.12</td>
<td>2.82</td>
</tr>
<tr>
<td>D125-xxx</td>
<td>0.48</td>
<td>4.56</td>
<td>5.7</td>
</tr>
</tbody>
</table>
Uni-Guide™

STATIC LOADS - STANDARD UNI-GUIDE

The numbers below are for guides only in a static condition. The drive mechanism selected (lead screw, ball screw, cylinder, etc.) becomes the limiting factor when calculating maximum load and speed capacities. The user is responsible for determining the maximum capacity for the complete system based on the manufacturer’s data for their drive configuration.

<table>
<thead>
<tr>
<th>SIZE</th>
<th>FZ MAX LOAD LBS.</th>
<th>FZ MAX LOAD N</th>
<th>FZ INVERTED MAX LOAD LBS.</th>
<th>FZ INVERTED MAX LOAD N</th>
</tr>
</thead>
<tbody>
<tr>
<td>D075</td>
<td>500</td>
<td>2224</td>
<td>125</td>
<td>556</td>
</tr>
<tr>
<td>D100</td>
<td>750</td>
<td>3336</td>
<td>190</td>
<td>845</td>
</tr>
<tr>
<td>D125</td>
<td>1000</td>
<td>4448</td>
<td>250</td>
<td>1112</td>
</tr>
</tbody>
</table>

LOAD/MOMENT CONVERSION

\[ N = 4.45 \times (\text{lbs.}) \]
\[ N \cdot m = 0.113 \times (\text{in.-lbs.}) \]

PERFORMANCE RATINGS FOR LINEAR MOTION

Plain bearings are rated by their limiting PV, which is a combination of load over a given surface area and the velocity.

\[ PV = P \times V, \text{ where } P = \text{pressure (load) in psi (kgf/cm}^2\text{)} \]
\[ V = \text{velocity (speed) in sfm (m/min.)} \]

**PV Example:**

\[ \text{Load} = 85 \text{ psi} \]
\[ \text{Speed} = 180 \text{ ft./min.} \]
\[ PV = 85 \times 180 = 15,300 \text{ PV} \]

Note: All three parameters must be met by an application for the bearing to perform properly.

Note: FrelonGOLD® bearing material coefficient of friction is 0.125.

CANTILEVERED LOADS

Binding of the carriage will occur if the 2:1 ratio for cantilevered loads and drive forces is exceeded. This principle is not load or force dependent. It is a product of the coefficient of frictions associated with plain bearings.

Contact factory or website for additional information.
Components

ORDERING INFORMATION

D
XXX
XXX.XXX
X

Series
D - Standard Uni-Guide

Carriage Options
No Entry - Standard Carriage
L - Extended Length Carriage

Nominal Size
075 mm, 100 mm, 125 mm
Based on mm from shaft center-to-center

Overall Rail Length
Length of Rail in Inches xxx.xxx
(EX: 6’ = 006.000)
Max Rail Length = 10 feet (120”)

Carriage Options
No Entry = None
CHB = Hand Brake

Number of Carriages

Note: Specify Y-dimension (hole to end) at time of order.
Mini-Rail

PRODUCT OVERVIEW
The lead screw driven Mini-Rail (MR-LS) system maintains all of the great features and benefits of Mini-Rail. The system is a fully interchangeable and economical solution to industry standard linear guides, and contains no rolling elements which avoids catastrophic failure.

FEATURES & BENEFITS
• Right hand rolled thread
• 304 stainless steel screw with PTFE coating
• Self-lubricating Polyacetal, anti-backlash nut
• Lengths up to 640 mm
• Eight (8) leads available - see page 22

ACCESSORIES
• NEMA 17 motor mount kit
• Hand brake
• Knob

DIMENSIONS

Note: Maximum length for lead screw driven MR is 640 mm.
**Driven**

**PRODUCT OVERVIEW**

The Lead Screw Driven Mini-Rail with the attached motor brings another great feature forward in linear motion. Also equipped with all the great features of Mini-Rail, this low cost option is equipped with a high torque stepper motor (NEMA 17).

**FEATURES & BENEFITS**

- Low cost
- High torque single stack stepper motor 42 mm (NEMA 17)
- Robust design - outstanding reliability
- 304 stainless steel screw with PTFE coating
- Fewer parts - less maintenance
- Integral screw for MR20 (coupling used for MR15)
- Ball bearing supports in the end blocks
- Preloaded Polycetal, anti-backlash nut
- Lengths up to 640 mm
- Eight (8) leads available - see page 22

**DIMENSIONS**

Note: Maximum length for lead screw driven MR is 640 mm.
Mini-Rail

STATIC LOAD DATA

The numbers below are for rails in a static condition. Refer to the calculations below to establish dynamic parameters.

<table>
<thead>
<tr>
<th>F1</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size 15</td>
<td>3114</td>
</tr>
<tr>
<td>Size 20</td>
<td>6005</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>F2</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size 15</td>
<td>356</td>
</tr>
<tr>
<td>Size 20</td>
<td>578</td>
</tr>
</tbody>
</table>

PERFORMANCE RATINGS FOR LINEAR MOTION

Plain bearings are rated by their limiting PV, which is a combination of load over a given surface area and the velocity.

<table>
<thead>
<tr>
<th>BEARING MATERIAL</th>
<th>MAX. PV</th>
<th>MAX. P</th>
<th>MAX. V</th>
</tr>
</thead>
<tbody>
<tr>
<td>FrelonGOLD®</td>
<td>20,000 (psi x ft./min.) or 0.7 N/mm² x m/s</td>
<td>3000 psi or 20.68 N/mm²</td>
<td>300 sfm or 1.524 m/s</td>
</tr>
</tbody>
</table>

PV = The performance measurement of plain bearings
PV = P x V where P = pressure (load) in psi (kgf/cm²)
V = velocity (speed) in sfm (m/min.)

Note: All three parameters must be met by an application for the bearing to perform properly.

CANTILEVERED LOADS

Binding of the carriage will occur if the 2:1 ratio for cantilevered loads and drive forces is exceeded. This principle is not load or force dependent. It is a product of the coefficient of frictions associated with plain bearings. Contact factory or website for additional information.

LOAD/MOMENT CONVERSION

N = 4.45 x (lbs.)
N-inch = 0.113 x (in-lbs.)

LOAD LIMITS

Recommended Load Limit

Note: 1.8° = 200 steps per revolution
**ORDERING INFORMATION**

**LEAD SCREW DRIVEN**

- **Mini-Rail**
- **Lead Screw**
- **Length of Rail in mm**
  - Cut to length (Max. of 640 mm)
- **Nominal Size of Base in mm**
  - 15 mm
  - 20 mm

**Screw Lead Option**
- AH = 01 mm (0.039 in.)
- AG = 02 mm (0.079 in.)
- AR = 04 mm (0.157 in.)
- AX = 05 mm (0.197 in.)
- BG = 06 mm (0.236 in.)
- BH = 08 mm (0.315 in.)
- AJ = 10 mm (0.394 in.)
- BD = 12 mm (0.472 in.)

**Driving Mechanism**
- ØØ = No knob
- SK = With screw knob
  - 17 = NEMA 17 motor mount*

**Number of Carriages**
- 1 = One carriage
* Contact an application engineer before ordering, if more than one (1) carriage is needed

**Mechanical Brake**
- ØØ = No brake
- BL = With brake lever mounted on carriage

**LEAD SCREW DRIVEN WITH MOTOR**

- **Mini-Rail**
- **Lead Screw**
- **Nominal Size of Base in mm**
  - 15 mm
  - 20 mm

**Length of Rail in mm**
- Cut to length (Max. of 640 mm)

**Nominal Size of Stepper Motor**
- M42 = 42 mm (NEMA 17)

**Screw Lead Option**
- AH = 01 mm (0.039 in.)
- AG = 02 mm (0.079 in.)
- AR = 04 mm (0.157 in.)
- AX = 05 mm (0.197 in.)
- BG = 06 mm (0.236 in.)
- BH = 08 mm (0.315 in.)
- AJ = 10 mm (0.394 in.)
- BD = 12 mm (0.472 in.)

**Number of Carriages**
- 1 = One carriage
* Contact an application engineer before ordering, if more than one (1) carriage is needed

Note: Coupling not included; PBC Recommends R+W EKL2 Coupling or equivalent. Actuator requires 3.18 mm (.125") bore.

pbclinear.com | LINEAR MOTION SOLUTIONS 23
**Uni-Guide™**

**PRODUCT OVERVIEW**

The Uni-Guide driven system offers all the same best-in-class linear motion performance advantages as the standard Uni-Guide. The reduced part count will continue to simplify assembly and integration, and will facilitate smooth, maintenance-free travel throughout the life of the system.

**FEATURES & BENEFITS**

- Thrives in the most challenging environments
- Self lubricating FrelonGOLD® liner
- Offers three (3) slide sizes: 75, 100, 125 mm
- Standard cut-to-length rail & carriage assemblies
- Easy drop-in unit - no alignment necessary

**ACCESSORIES**

- NEMA 17, 23 and 34 motor mount kit
- Hand brake (components)
- Hand crank (components)

**DIMENSIONS**

[Diagram showing dimensions and lead options]
### Uni-Guide™

#### DIMENSIONAL DATA

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>NOMINAL SCREW DIA.</th>
<th>M</th>
<th>M1</th>
<th>C1</th>
<th>C2</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>S</th>
<th>Y</th>
<th>R3</th>
<th>R4</th>
<th>W</th>
<th>X</th>
<th>Z</th>
<th>H1</th>
<th>H2</th>
</tr>
</thead>
<tbody>
<tr>
<td>D075</td>
<td>10 mm</td>
<td>6 mm 12 mm</td>
<td>3.5</td>
<td>3</td>
<td>4.5</td>
<td>4</td>
<td>4</td>
<td>0.187</td>
<td>2 4</td>
<td>1/4</td>
<td>0.375</td>
<td>0.625</td>
<td>3.42</td>
<td>1.75</td>
<td>1.625</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D100</td>
<td>12 mm</td>
<td>6 mm 12 mm</td>
<td>4.5</td>
<td>3.75</td>
<td>6</td>
<td>5.25</td>
<td>5.25</td>
<td>0.314</td>
<td>3 6</td>
<td>5/16</td>
<td>0.5</td>
<td>0.625</td>
<td>3.42</td>
<td>1.75</td>
<td>1.625</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D125</td>
<td>16 mm</td>
<td>5 mm 12 mm</td>
<td>6</td>
<td>5.25</td>
<td>7.5</td>
<td>6.75</td>
<td>6.75</td>
<td>0.314</td>
<td>3 6</td>
<td>3/8</td>
<td>0.5</td>
<td>1</td>
<td>5.78</td>
<td>3.5</td>
<td>2.500</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Optional leads may be available - consult factory. Specify Y dimension (hole to end) at time of order.

Stroke = Rail Length - Carriage Length - Overtravel Idle End - Over Travel Drive End.

### HAND BRAKE INCHES

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>W</th>
<th>D</th>
<th>H2</th>
</tr>
</thead>
<tbody>
<tr>
<td>D075HB</td>
<td>3.42</td>
<td>1.74</td>
<td>3.4</td>
</tr>
<tr>
<td>D100HB</td>
<td>4.57</td>
<td>2.50</td>
<td>4.3</td>
</tr>
<tr>
<td>D125HB</td>
<td>5.79</td>
<td>3.47</td>
<td>4.7</td>
</tr>
</tbody>
</table>

### HAND CRANK

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>P</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>D075HC</td>
<td>2.31</td>
<td>1.75</td>
</tr>
<tr>
<td>D100HC</td>
<td>2.31</td>
<td>2.25</td>
</tr>
<tr>
<td>D125HC</td>
<td>2.31</td>
<td>3.25</td>
</tr>
</tbody>
</table>

### MOTOR MOUNT ATTACHMENT

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>NEMA MOTOR</th>
<th>B</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>D075MMP</td>
<td>NEMA 17</td>
<td>2.0</td>
<td>3.25</td>
<td>1.81</td>
<td>0.868</td>
<td>1.73</td>
</tr>
<tr>
<td>D100MMP</td>
<td>NEMA 23</td>
<td>2.5</td>
<td>3.25</td>
<td>1.81</td>
<td>1.504</td>
<td>2.62</td>
</tr>
<tr>
<td>D125MMP</td>
<td>NEMA 34</td>
<td>3.5</td>
<td>4.25</td>
<td>2.30</td>
<td>2.880</td>
<td>3.87</td>
</tr>
</tbody>
</table>
**Uni-Guide™**

**STATIC LOAD DATA**

The numbers below are for guides only in a static condition. The drive mechanism selected (lead screw, ball screw, cylinder, etc.) becomes the limiting factor when calculating maximum load and speed capacities. The user is responsible for determining the maximum capacity for the complete system based on the manufacturer’s data for their drive configuration.

<table>
<thead>
<tr>
<th>SIZE</th>
<th>FZ MAX LOAD LBS.</th>
<th>FZ MAX LOAD N</th>
<th>FZ INVERTED MAX LOAD LBS.</th>
<th>FZ INVERTED MAX LOAD N</th>
</tr>
</thead>
<tbody>
<tr>
<td>D075</td>
<td>500</td>
<td>2224</td>
<td>125</td>
<td>556</td>
</tr>
<tr>
<td>D100</td>
<td>750</td>
<td>3336</td>
<td>190</td>
<td>845</td>
</tr>
<tr>
<td>D125</td>
<td>1000</td>
<td>4448</td>
<td>250</td>
<td>1112</td>
</tr>
</tbody>
</table>

**LOAD/MOMENT CONVERSION**

\[ N = 4.45 \times (\text{lbs.}) \]
\[ N - \text{m} = 0.113 \times (\text{in.-lbs.}) \]

**PERFORMANCE RATINGS FOR LINEAR MOTION**

Plain bearings are rated by their limiting PV, which is a combination of load over a given surface area and the velocity.

<table>
<thead>
<tr>
<th>BEARING MATERIAL</th>
<th>MAX. PV</th>
<th>MAX. P</th>
<th>MAX. V</th>
</tr>
</thead>
<tbody>
<tr>
<td>FrelonGOLD®</td>
<td>20000 (psi x ft./min.) or 0.7 N/mm² x m/s</td>
<td>3000 psi or 20.68 N/mm²</td>
<td>300 sfm or 1.524 m/s</td>
</tr>
</tbody>
</table>

PV = The performance measurement of plain bearings.
PV = \( P \times V \), where \( P \) = pressure (load) in psi (kgf/cm²)
\( V \) = velocity (speed) in sfm (m/min.)

**PV Example:**

\[ \text{Load} = 85 \text{ psi} \]
\[ \text{Speed} = 180 \text{ ft./min.} \]
\[ \text{PV} = 85 \times 180 = 15,300 \text{ PV} \]

Note: All three parameters must be met by an application for the bearing to perform properly.

Note: FrelonGOLD® bearing material coefficient of friction is 0.125.

**CANTILEVERED LOADS**

Binding of the carriage will occur if the 2:1 ratio for cantilevered loads and drive forces is exceeded. This principle is not load or force dependent. It is a product of the coefficient of frictions associated with plain bearings. Contact factory or website for additional information.
Driven

ORDERING INFORMATION

Series
D - Standard Uni-Guide

Carriage Options
No Entry - Standard Carriage
L - Extended Length Carriage

Nominal Size
075mm, 100mm, 125mm
Based on mm from shaft center-to-center

Drive Options
M - Right Hand Lead Screw with Standard Pitch
M1 - Right Hand Lead Screw with Optional Pitch
Notes: Screw options require attaching collar.
Call the factory for other optional drive mechanisms.

Number of Carriages

Overall Rail Length
Length of Rail in Inches \( xxx.xxx \) (EX: 6" = 006.000)
Max Rail Length = 5 feet (60")

Drive Mounting Options
No Entry - No Drive Mounting Options
H - Hand Crank
N - NEMA Standard Motor Mount
HB - Handbrake (requires handcrank and screw)
HCHB - Hand Crank & Carriage Brake
CHB - Carriage Handbrake
H2CHB - CHB option with two brakes

Note: Specify Y dimension (hole to end) at time of order.
Low Profile Uni-Guide™

PBC Linear offers a Low Profile Uni-Guide driven system through the SIMO Series line of products. This process has revolutionized traditional machining. The SIMO process uses synchronized cutters, eliminating built-in extrusion variances by machining all critical edges concurrently. This ensures tight tolerances, limited variance and a remarkably straight and repeatable surface at negligible additional cost.

PRODUCT OVERVIEW

- Utilizes a self-lubricating and maintenance free nut
- Standard fixed nut or Constant Force anti-backlash nut available
- Lead screw material:
  - 10 mm diameter
  - 300 series stainless steel with PTFE coating
  - 1, 2, 5, 10, 16 mm leads most common
  - Other leads available – consult factory
- Ideal for a broad range of applications such as kiosks, assembly, automation, medical, and laboratory

FEATURES & BENEFITS

- Standard integrated screw stepper motors
  - 42 mm (NEMA 17)
  - 56 mm (NEMA 23)
- Integrated lead screw eliminates components and tolerance stack-ups
- Improves rigidity and performance
- Reduces system cost

ACCESSORIES

- Hand knobs – for manual positioning or applications that require precision adjustment
- Riser blocks
- Toe clamps and t-nuts
- Brake knobs
- Optional motor mounts

See other bearing and drive options in the full SIMO Series Catalog.

See other motor options in the SIMO Series Motor Mount Catalog.
Low Profile Uni-Guide™

SYSTEM DIMENSIONS

TOP VIEW

SIDE VIEW

UGA Low Profile Rail

ORDERING INFORMATION

Configure Online

Motor Options
00 = No Motor/Stub Shaft Only
A1 = 42 mm (N17) Single Stack
A2 = 42 mm (N17) Double Stack
A3 = 42 mm (N17) Triple Stack
B4 = 56 mm (N23) Single Stack
B5 = 56 mm (N23) Double Stack
B6 = 56 mm (N23) Triple Stack
ZZ = No Motor/Stub Shaft with Assembled Motor Mount

Motor Option
00 = No Motor/Stub Shaft Only
A1 = 42 mm (N17) Single Stack
A2 = 42 mm (N17) Double Stack
A3 = 42 mm (N17) Triple Stack
B4 = 56 mm (N23) Single Stack
B5 = 56 mm (N23) Double Stack
B6 = 56 mm (N23) Triple Stack
ZZ = No Motor/Stub Shaft with Assembled Motor Mount

Drive End Option
1 = Shaft
2 = Knob
3 = PBC Integrated Motor Screw

Drive Type
LS = Lead Screw

Nut
1 = Standard
2 = Anti-Backlash

Other Options
Accuracy
1 = Class 10

Lead (mm)
AF = 16
AJ = 10
AX = 5
A6 = 3
All = 2
*Consult Factory for Other Leads

Riser Plate
- NEMA 17 = 10 mm
- NEMA 23 = 20 mm

Overall Length (See Formula in SIMO Catalog p.24)
100

Carriage Detail Shown on Next Page

Carriage Width
40 mm

Rail Length
1500 mm max Consult Factory for Longer Lengths

Order Type
D = Driven

Carriage Type
A1 = GST with FrelonGOLD
*See More Drive Options in SIMO Series Catalog

Rail Type
A = Low Profile

Rail Width
40 mm

Options
0 = No Options
1 = Carriage Break
2 = Lube
3 = Both

Configure Online

Ordering Information

Simo Series
UG
A
040
D
A1
XXXX
LS
X
XX
X
1
0

Other Options

UG
A
040
D
A1
XXXX
LS
X
XX
X
1
0

Other Options

UG
A
040
D
A1
XXXX
LS
X
XX
X
1
0

Other Options

UG
A
040
D
A1
XXXX
LS
X
XX
X
1
0

Other Options

UG
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D
A1
XXXX
LS
X
XX
X
1
0

Other Options

UG
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040
D
A1
XXXX
LS
X
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X
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Other Options

UG
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040
D
A1
XXXX
LS
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Other Options

UG
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A1
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LS
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Other Options

UG
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A1
XXXX
LS
X
XX
X
1
0

Other Options

UG
A
040
D
A1
XXXX
LS
X
XX
X
1
0

Other Options

UG
A
040
D
A1
XXXX
LS
X
XX
X
1
0

Other Options
Plain Bearings

PRODUCT OVERVIEW
- Frelon liner is bonded to the carriage at the molecular level, which transfers the load and dissipates heat buildup
- No metal-to-metal contact provides a smoother, quieter running assembly
- Anodized aluminum prevents rust and corrosion
- Maintenance free, smooth and quiet operation - plus long life
- No rolling elements, no catastrophic failure

FRELON LINER MATERIALS
Frelon liners are compounds of PTFE and fillers developed for improved performance over other bearings. They provide low wear, low friction, self-lubrication, and high strength.

PTFE FEATURES:
- Self-lubricating, runs without added lubricant
- Embeddability of hard particulate
- Wide temperature range (-400°F/+400°F) (-240°C/+204°C)
- Chemically inert
- Vibration damping and shock resistant

FILLER BENEFITS:
- High load capacity
- High strength
- Low wear rate versus other materials

LOAD CAPACITY OF LINER
- Frelon liner can carry from 4 to 20 times the load capacity of a ball bearing
- Allows the engineer to maintain performance in a smaller designed package
- Shock loads and vibration are absorbed

SPEED CHARACTERISTICS
Exceeding these speeds causes frictional heat and accelerates liner wear.
* Depending on the lubrication used, loads, and frequency of continuous or intermittent motion, speeds can be in excess of the numbers shown.

PERFORMANCE RATINGS (for Linear Motion)
Plain bearings are rated by their limiting PV which is a combination of load over a given surface area and the velocity.

\[
PV = \frac{P \times V}{A}
\]

Where:
- \(P\) = pressure (load) in psi (kgf/cm²)
- \(V\) = velocity (speed) in sfm (m/min.)

PV CHART (Dry Running)

Note: All 3 parameters must be met by an application for the bearing to perform properly.
Frelon® Material

TRANSFER PROCESS OF LINER TO RAIL

The interaction of Frelon® material and the rail creates a natural, microscopic transfer of Frelon to the running surface. A thin film is deposited on the rail, and the valleys in the surface finish are filled in with Frelon material during the initial break-in period. This transfer creates the self-lubricating condition of Frelon riding on Frelon.

This break-in period will vary depending on several criteria:

1. Preparation of the rail prior to installation - it is best to clean the rail with a 3-in-1 type oil before installing the carriages. This ensures that the surface will receive a full transfer of material.
2. Speed, load, and length of stroke specific to the application - typically the initial transfer process will take approximately 50-100 strokes of continuous operation. The running clearance on the bearing will increase an average of .0002" to .0005", depending on the length of the stroke and surface requiring the transfer.
3. How often the rail is cleaned - if the rail is cleaned regularly, increased wear will be seen in the carriage. This is due to the transfer process being performed over and over again.

⚠️ CAUTION Do not repeatedly clean the rail with alcohol! This will remove the previously transferred material entirely and increase the wear to the carriage liner.

LUBRICATION

- Reduce friction up to 50%.
- Minimize wear of liner.
- Reduce heat buildup allowing greater speeds. Actual speeds achieved are dependent on type of lubricant and frequency of application.
- Aid in cleaning the rail for a proper transfer process. Initial lubrication is strongly recommended.

CHEMICAL RESISTANCE

The bearing surface of the rail can stand up to harsh environments and will provide excellent performance in a submerged condition.

FrelonGOLD® – the fillers in the material can be attacked by deionized water and other harsh chemicals.

Anodized Aluminum (Standard) – good chemical resistance in most industrial applications.

Plain Bearings

RECOMMENDED LUBRICATION

- Waylube Oil
- Light Weight Oils
- Petroleum Based Grease
- 3-in-1 oils

NOT RECOMMENDED

- WD-40
- PTFE Sprays
- Fluorocarbons
- Silicon Oils, Grease or Spray

WD40® is a registered trademark of the WD40 company

More Information about Chemical Resistance
Plain Bearings

TEMPERATURE

GST linear guides can operate in a wide range of temperatures (-400°F/+400°F) (-240°C/+204°C).

- Maintains the same performance characteristics
- The thin liner allows heat to dissipate through the carriage

THERMAL EXPANSION

The standard bearing clearance options are designed for use in most industrial applications.

For temperatures below 0°F, the Standard I.D. is recommended.

For extreme high temperatures, Mini-Rail offers the Compensated I.D. which is recommended for the increased running clearance.

CAUTION: It is always best to inspect actual size at extreme temperatures to insure proper running clearance.

VACUUMS/OUTGASSING/CLEANROOMS

Due to self-lubrication, low outgassing, and a minimum of particulate (buildup), the carriages are excellent in clean rooms and vacuums.

Testing has been done on the Frelon® materials in accordance with ASTM E-595-90 with acceptable maximums of 1.00% TML and .10% CVCM.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>%TML</th>
<th>%CVCM</th>
</tr>
</thead>
<tbody>
<tr>
<td>FrelonGOLD®</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

TML = Total Mass Loss
CVCM = Collected Volatile Condensable Materials

WASHDOWN & SUBMERGED APPLICATIONS

GST linear guides will provide excellent performance in a washdown or submerged condition.

The linear guide will employ the fluid as a lubricant showing increased velocities and wear life. Oils and non-salt water are especially effective.

Note: Please contact manufacturer before utilizing units with the FrelonGOLD liner for submerged applications.
Types & Effects of Lubrication

**TYPES AND EFFECTS OF LUBRICATION**

Lubrication is any outside technique used for reducing the friction, wear, or both of a bearing. **Proper lubrication of carriages is critical.** Evaluate lubrication needs on an application by application basis to determine whether or not it should be used at all, what type is needed, and how it is applied. Below are some criteria on which to base the lubricant decision:

Do not use WD40™, PTFE sprays, or other oils, greases, or sprays that contain fluorocarbons or silicone. In testing, these lubricants have proven to cause long-term stick-slip problems with the Frelon lined carriages. They tend to become a gummy substance that ultimately increases friction.

WD40™ is a registered trademark of the WD40 Corporation.

**Recommended Lubricants:**

- Way lube oils
- Lightweight oils
- 3-in-1 type oils
- Lightweight petroleum based greases

**USING OILS WITH GST UNITS**

**DO NOT USE ANY TYPE OF MOTOR OIL OR OILS WITH ADDITIVES!** These types of oils work well short term, but quickly become ineffective, and will cause stick-slip reactions. As a rule of thumb, the less additives in the oil, the better the performance. Recommended oils are Mobil Vactra #2 (a way lube oil) and any standard 3-in-1 oil. The 3-in-1 oils are tremendous cleaning oils and are the best in preparing for a proper transfer of teflon to the rail.

**Plain Bearings**

**GREASE PRODUCTS**

**DO NOT USE A MOLY FILLED OR OTHER TYPE FILLED GREASES!** They become like a lapping compound and increase wear dramatically.

**PROPER USE OF GREASES**

Proper use of grease is critical for trouble-free operation.

If a felt wick is present, be sure it is removed because grease inserted into the carriage will cause the wick to act like a brake.

**Do not fill all of the running clearance with grease!**

The temptation is to treat it like a rolling element and fill it until it weeps from the end. This will cause greater friction and binding.

The rule of thumb for the carriage liner that “thin is better” applies to the use of grease also.

If grease is used and does not work in the application, it is possible to salvage the carriage with minimal work and to continue to operate. Follow the steps below:

1. If possible, remove the carriage from the rail, wipe the grease from the liner, use a 3-in-1 type oil to clean the excess remaining grease, and reinstall.
2. If it is not possible to remove the carriage, wipe as much grease as possible away from the ends, then start to add a 3-in-1 type oil for cleaning the liner. If there is a Zerk hole, apply forced air to the carriage to speed the cleaning process and continue using oil lubrication.
Plain Bearings

CANTILEVERED LOADS

- Maximum 2:1 ratio
- 1x = carriage separation on same rail
- 2x = distance from rail to load or force

Example: If 2x equals 10” then 1x must be at least 5”

Binding will occur if the 2:1 ratio is exceeded!!

This principle is NOT load dependent! It is NOT due to edge loading. It is also NOT dependent on the driving force used! The carriages will bind whether hand or mechanically driven. This principle is a product of friction.

Working through the following equation will explain why this is a product of friction:

\[
P = \text{force being applied}
\]

\[
L = \text{distance out from rail that } P \text{ is being applied}
\]

\[
s = \text{center to center spacing of carriage}
\]

\[
f = \text{resultant force on carriage by rail}
\]

\[
F = \text{friction force on each carriage}
\]

\[
\mu = \text{coefficient of friction (about .25 when not moving)}
\]

Balance the moments:

\[
f \cdot s = L \cdot P
\]

\[
L / s = f / P
\]

Compute friction force:

\[
F = f \cdot \mu
\]

Note: Total friction force pushing up is 2 * F. To lock up the slide, the total friction force must be equal to (or greater than) P.

\[
P = 2 \cdot F = 2 \cdot f \cdot \mu
\]

Substitute for P:

\[
L / s = f / (2 \cdot f \cdot \mu) = 1 / (2 \cdot \mu) = L / s = 1 / (2 \cdot \mu)
\]

Note: The forces drop out of the equation

Assume static coefficient of friction is .25 (\(\mu = .25\)) then

\[
L / s = 2 \text{ That is the 2:1 ratio.}
\]

There may be other factors that add to the braking effect, but the coefficient of friction is the main cause.

Note: Proper lubrication can help to drop friction and extend the 2:1 ratio.
Cantilevered Loads

**COUNTERBALANCE**

If holding the 2:1 ratio is not possible, one method of preventing binding problems is using a counter balance.

Use the number of bearing pads or surfaces within a carriage and determine spacing based on the length of the carriage.

For efficient counter balances in horizontal applications, use this formula: \( M \times Y = W \times Z \)

Note: To avoid problems when running without mass: \( (M) \frac{Z}{2} = 1 \frac{1}{2} \times s \)

- \( W \) can be calculated. Load on bearing will be: \( M + W \)

\# of carriage

**Example:**

\[
50 \times 24 = W \times Z (Z = 1-1/2 \times 6 = 9)
\]

\[
W = 50 \times 24 = 133 \text{ lbs.}
\]

Load per bearing: \( 50 + 133 = 45.75 \text{ lbs. / bearing} \)

**General Rules:**

1. Drive Force Ratio (D) should never be larger than 2. A Drive Force Ratio (D) larger than 2 can cause the slide to lock up.

2. Load Force Ratio (L) can be larger than 2, but as this ratio increases, the drive force required to move the slide increases dramatically. A Load Force Ratio (L) larger than 4 is not recommended.

3. If the slide is occasionally operated unloaded, use the distance to the slide’s center of gravity as the distance to the load (L).

**Vertical Applications:**

1. If L is between 0 and 2, the lowest drive forces occur when the value of D is about 90% of L (D = .9 x L). However, D values between 0 and L will work fine.

2. If L is between 2 and 4, use this equation: D = 4 - L

**Horizontal Applications:**

For best results, the drive force should be applied as close to the shaft as possible no matter what the value of the Load Force Ratio (L) is.
## Plain Bearing

FrelonGOLD® material is a composite of PTFE and a bearing filler. The PTFE is chemically inert. The chemical resistance shown in the chart below is defined by the compatibility of the filler with the various chemicals.

The table is provided as a reference only. The data given will be affected by factors such as temperature, PV, degree of contact, strength of solution, etc. In each specific application, it is always advisable to conduct specific testing to determine suitability of use. This table only addresses general corrosion, NOT galvanic, SCC, or other types of corrosion. Corrosion rates are at room temperature unless otherwise noted.

Standard and hard coat data only apply when the coating is intact. If the coating is worn through or damaged, an area of galvanic and pitting corrosion will be created. Then use the bare aluminum data.

Gliding Surface Technology products use aluminum alloy, which is known to have the best corrosion resistance of the high strength aluminum alloys. The sulfuric bath anodizing and nickel acetate sealing provide the best corrosion resistance available in anodized coatings. They can withstand a rigorous 14-day exposure in a 5% salt spray solution at 96°F per military specifications without significant damage. With the coating intact, it is considered to be inert in most fluids with a pH value between 5 and 8. Hard coat anodizing provides the same chemical resistance but is applied to a .002” thickness, providing a more durable surface that will stand up to greater abuse. However, if the coating is penetrated, the resistance is reduced.

Special stainless steel components use AISI 316 stainless, which has superior resistance over 303, 304, 420, 440, 17-4PH, and most other common stainless grades. 316 is generally considered to be the most corrosion resistant of conventional stainless steels.

Note: This information was compiled for Pacific Bearing® Company by Materials Engineering, Inc. of Virgil, IL. This specification information is believed to be accurate and reliable, however, no liability is assumed. Information is for reference only. User must test specific applications.

### Chemical Reaction Chart

<table>
<thead>
<tr>
<th>CHEMICAL</th>
<th>FrelonGOLD</th>
<th>BARE ALUMINUM</th>
<th>STANDARD &amp; HARD COAT ANODIZED ALUMINUM</th>
<th>CHEMICAL</th>
<th>FrelonGOLD</th>
<th>BARE ALUMINUM</th>
<th>STANDARD &amp; HARD COAT ANODIZED ALUMINUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic Acid, 20%</td>
<td>U</td>
<td>G</td>
<td>G</td>
<td>Hydrogen sulfide, dry</td>
<td>U</td>
<td>G</td>
<td>E</td>
</tr>
<tr>
<td>Acetone</td>
<td>G</td>
<td>E</td>
<td>E</td>
<td>JP-4</td>
<td>G</td>
<td>G</td>
<td>G</td>
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<tr>
<td>Ammonia, anhydrous</td>
<td>G</td>
<td>E</td>
<td>E</td>
<td>Kerosene</td>
<td>G</td>
<td>G</td>
<td>G</td>
</tr>
<tr>
<td>Ammonium hydroxide, 10%</td>
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<td>U</td>
<td>U</td>
<td>Lacitic acid, 10%</td>
<td>G</td>
<td>G</td>
<td>G</td>
</tr>
<tr>
<td>Ammonium chloride, 10%</td>
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<td>U</td>
<td>U</td>
<td>Magnesium chloride, 50%</td>
<td>G</td>
<td>U</td>
<td>U</td>
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<tr>
<td>Ammyl acetate (122°F / 50°C)</td>
<td>G</td>
<td>E</td>
<td>E</td>
<td>Mercy</td>
<td>U</td>
<td>U</td>
<td>U</td>
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<td>Barium hydroxide</td>
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<td>U</td>
<td>Methyl alcohol</td>
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<td>G</td>
<td>G</td>
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<td>E</td>
<td>Methyl ethyl ketone</td>
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<td>Boric acid solutions</td>
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<td>E</td>
<td>Methylene chloride</td>
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<td>G</td>
<td>G</td>
<td>Mineral oil</td>
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<td>G</td>
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<td>Calcium chloride, 20%</td>
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<td>G</td>
<td>G</td>
<td>Naphtha</td>
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<tr>
<td>Calcium hydroxide, 10%</td>
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<td>G</td>
<td>G</td>
<td>Nitric acid, 70%</td>
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<td>U</td>
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<td>Carbon dioxide</td>
<td>G</td>
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<td>E</td>
<td>Phosphoric acid, 10%</td>
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<td>U</td>
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<tr>
<td>Carbon monoxide</td>
<td>G</td>
<td>E</td>
<td>E</td>
<td>Sodium chloride</td>
<td>G</td>
<td>U</td>
<td>U</td>
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<tr>
<td>Chlorine gas, dry</td>
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<td>G</td>
<td>G</td>
<td>Sodium hydroxide, 20%</td>
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<td>G</td>
<td>U</td>
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<tr>
<td>Chlorine gas, wet</td>
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<td>U</td>
<td>U</td>
<td>Sodium hypochlorite, 20%</td>
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<td>G</td>
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<td>Chromic acid, 10%</td>
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<td>G</td>
<td>E</td>
<td>Sodium peroxide, 10%</td>
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<td>G</td>
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<td>Citric acid, 5%</td>
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<td>E</td>
<td>E</td>
<td>Steam (see water)</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>Ethyl acetate</td>
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<td>E</td>
<td>Sulfur dioxide, wet</td>
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<td>U</td>
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<tr>
<td>Ethyl alcohol</td>
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<td>E</td>
<td>E</td>
<td>Sulfur dioxide, dry</td>
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<td>G</td>
<td>G</td>
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<td>Ethylene glycol</td>
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<td>E</td>
<td>E</td>
<td>Sulfur trioxide</td>
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<td>G</td>
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<tr>
<td>Ferric chloride, 50%</td>
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<td>U</td>
<td>U</td>
<td>Sulfuric acid, 50%</td>
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<td>Formic acid - Anhydrous</td>
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<td>E</td>
<td>Sulfuric acid</td>
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<td>G</td>
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<td>G</td>
<td>Toluene (122°F / 50°C)</td>
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<td>Turpentine</td>
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<td>Water, demineralized</td>
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<td>Hydrocyanic acid, 10%</td>
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<td>Water, distilled</td>
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<td>S</td>
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<tr>
<td>Hydrofluoric acid - dilute</td>
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<td>U</td>
<td>Sea Water</td>
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<td>Hydrofluoric acid, 48%</td>
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<td>U</td>
<td>U</td>
<td>Water, sewage</td>
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<td>U</td>
<td>S</td>
</tr>
<tr>
<td>Hydrogen</td>
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<td>E</td>
<td>Xylene</td>
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<td>G</td>
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<td>Hydrogen peroxide - dilute</td>
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<td>E</td>
<td>Zinc chloride solutions</td>
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<td>U</td>
<td>U</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHEMICAL</th>
<th>FrelonGOLD</th>
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</thead>
<tbody>
<tr>
<td>Hydrogen peroxide - dilute</td>
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<td>E</td>
<td>E</td>
<td>Zinc chloride solutions</td>
<td>U</td>
<td>U</td>
<td>U</td>
</tr>
</tbody>
</table>
Optimized Solution
PBC Linear’s Design on a Diet with GST

APPLICATION PROBLEM:
Material handling and positioning of samples on a blood chemistry analyzer.

PROBLEMS WITH INITIAL DESIGN:
• Numerous Parts
• Multiple Machining Operations
• Complex Assembly
• Several Part/Machine Vendors

DESIGN ON A DIET SOLUTION:
• Compact, zero maintenance design with GST’s FrelonGOLD® Liner
• Significantly reduced part count
• Simplified assembly and improved aesthetics
• Complete solution from one vendor: PBC Linear

40% SAVED IN ASSEMBLY COSTS

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PBC Linear’s Design on a Diet allows customers to work directly with our very own Application Engineers. It is this communication between customer and engineer that allows PBC Linear to eliminate large part counts and lowers cost of time and installation. To start working on your engineered design, e-mail one of our application engineers now!

Watch the Case Study Video

Email an Application Engineer

Put our Design on a Diet mantra to the test and e-mail one of our application engineers to get started on your optimized solution today!