PBC Linear®

# Gliding Surface Technology

## Linear Guide Components & Systems


Configure Online at
pbclinear.com

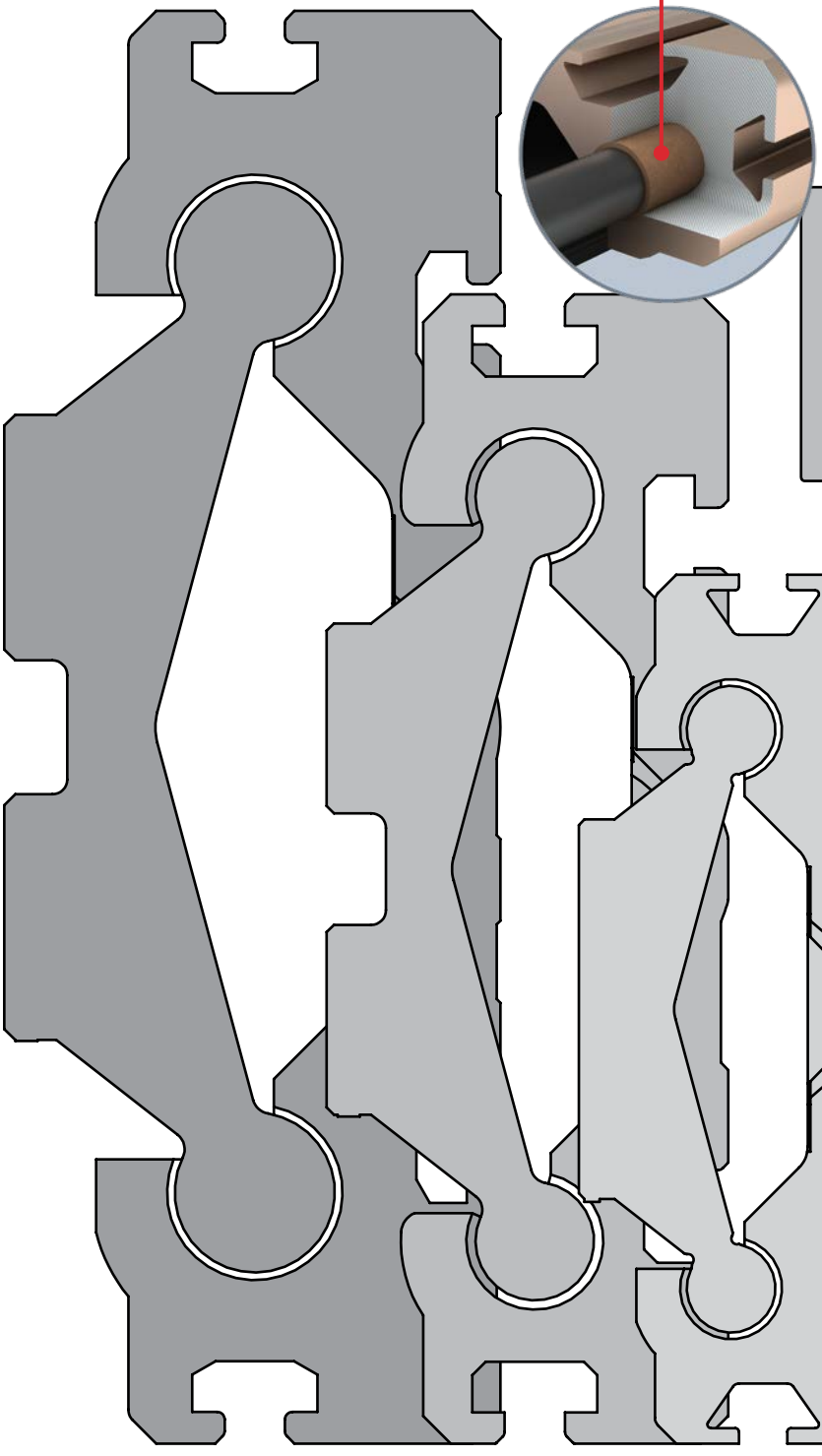
1-800-962-8979

# Product Comparison

Line drawings shown at 1:1 scale.

## Uni-Guide™

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



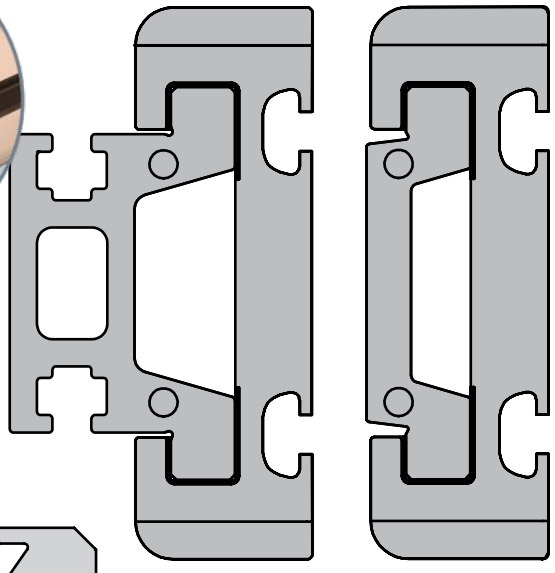


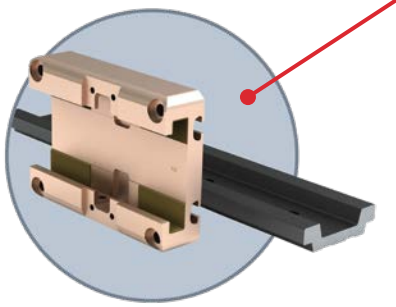
Uni-Guide | D125, D100, D075

Link to Uni-Guide Product Overview

## Low & Tall Profile Uni-Guide™

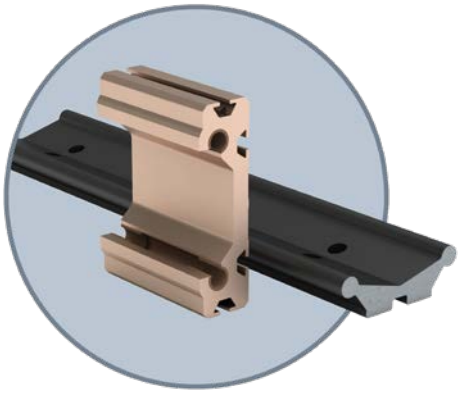
Low Profile Uni-Guide | UGA040, TallProfile Uni-Guide | UGT040





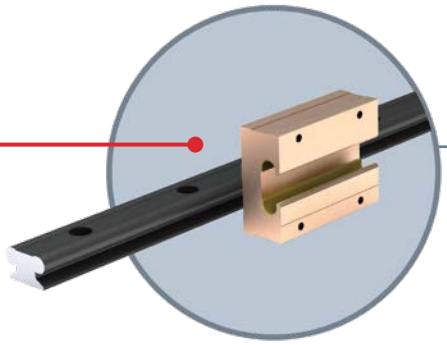
Link to Low Profile Uni-Guide Product Overview

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

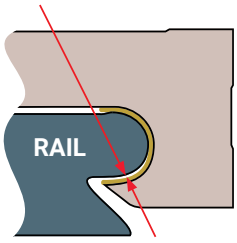


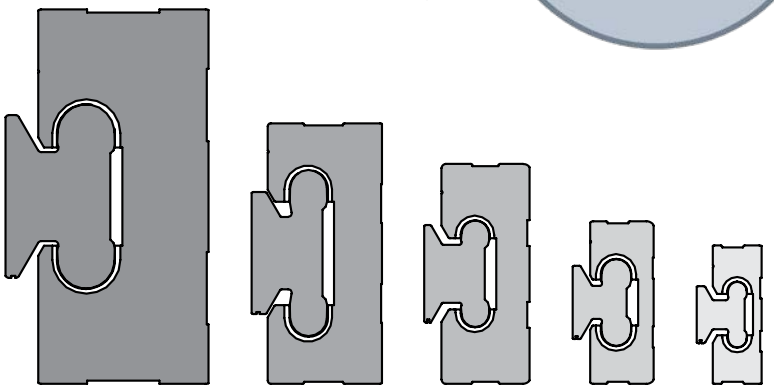
# Product Comparison

## Mini-Rail



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

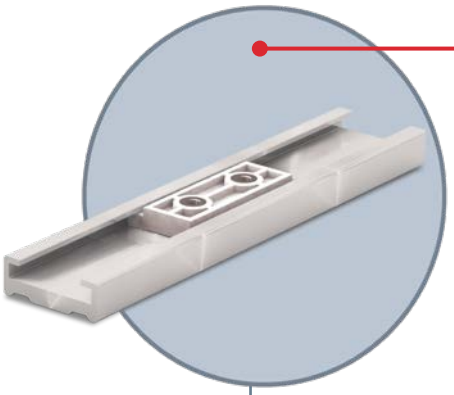


Mini-Rail | MR20, MR15, MR12, MR9, MR7

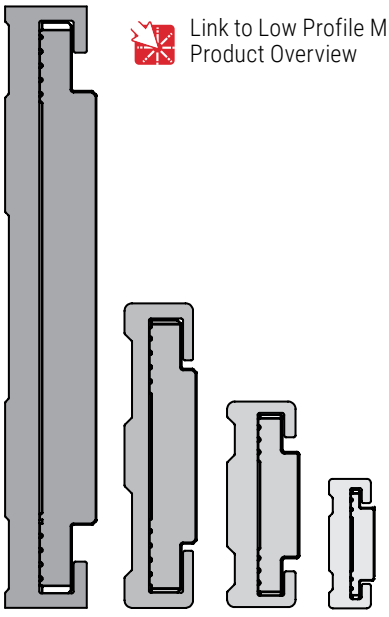
Link to Mini-Rail Product Overview

## Low Profile Mini-Rail



The Low Profile Mini-Rail is a great option for small spaces with standard sizes as small as 6 mm thick.

Link to Low Profile Mini-Rail Product Overview

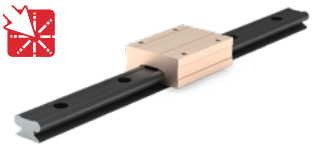


Low Profile Mini=Rail | LPM80, LPM40, LPM27, LPM17

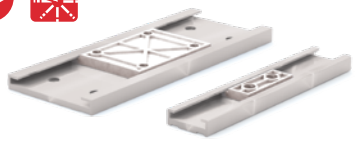
# Contents

## Components







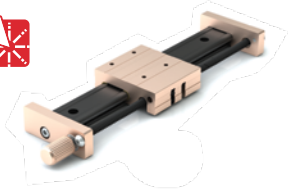




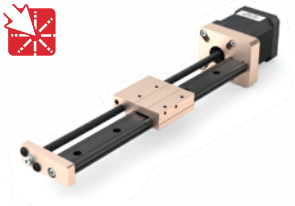


## Driven Systems

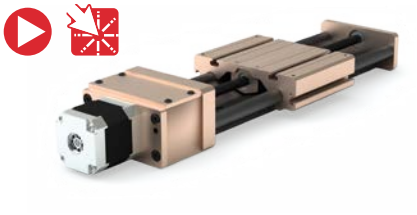




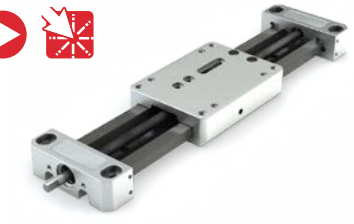












## Applications/Technical



## Common Buttons and Links

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

Hyperlinks go to English language website.

**Link to product information**

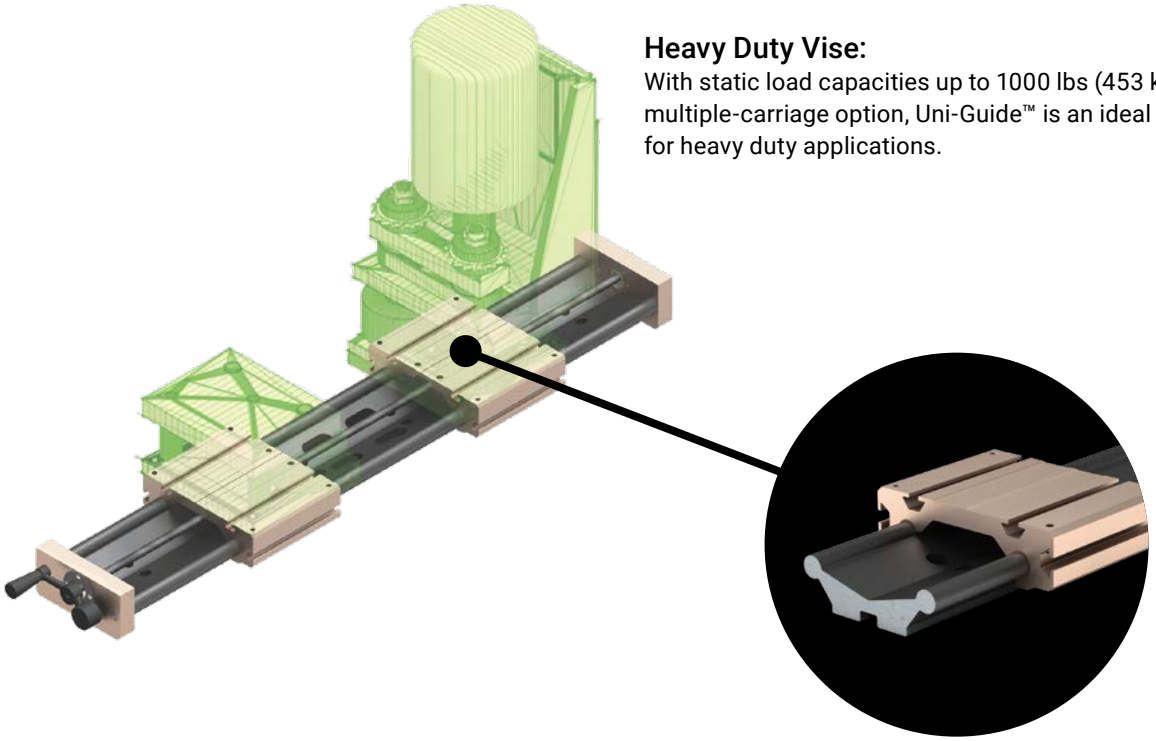
**Configure and download CAD**

**Consult Factory • 800-962-8979**

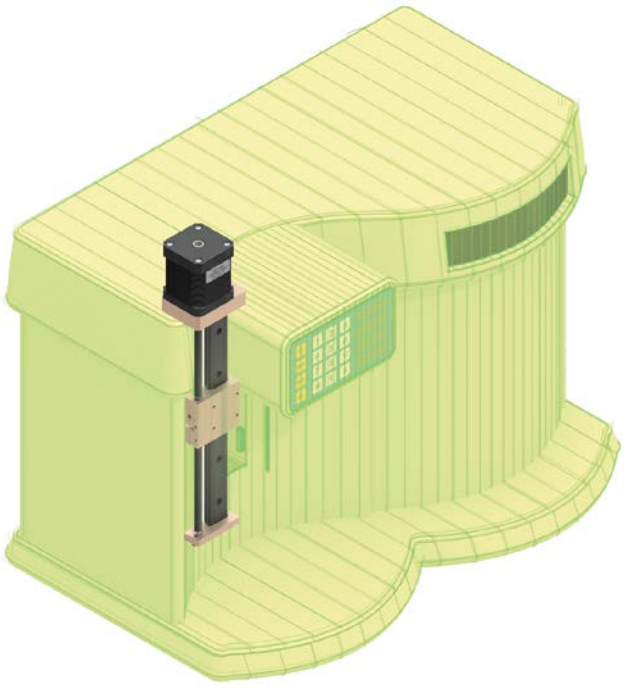
**Watch Product Video**

**Email an Application Engineer**

# Applications



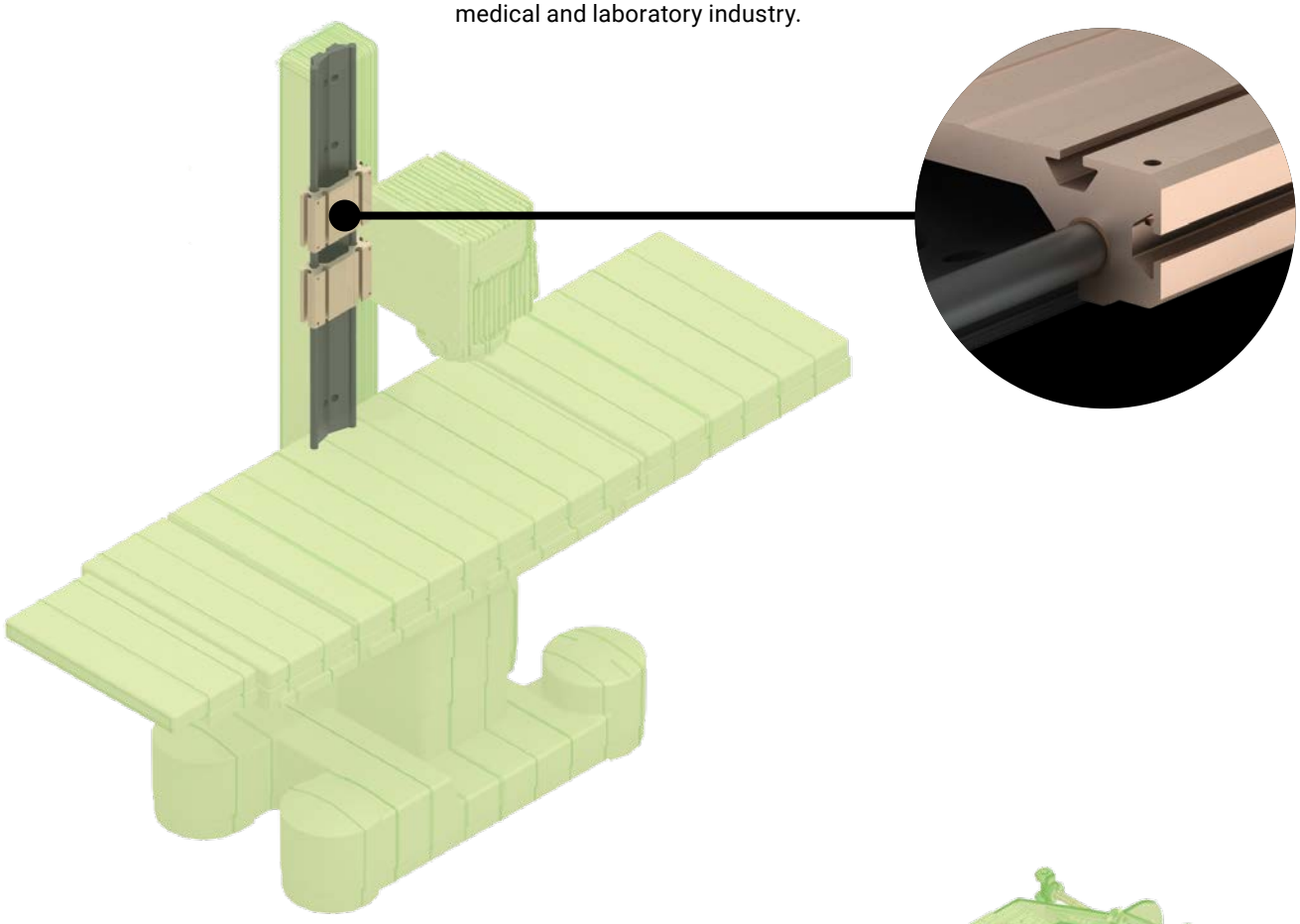
**Heavy Duty Vise:**
With static load capacities up to 1000 lbs (453 kg) and the multiple-carriage option, Uni-Guide™ is an ideal drop-in solution for heavy duty applications.



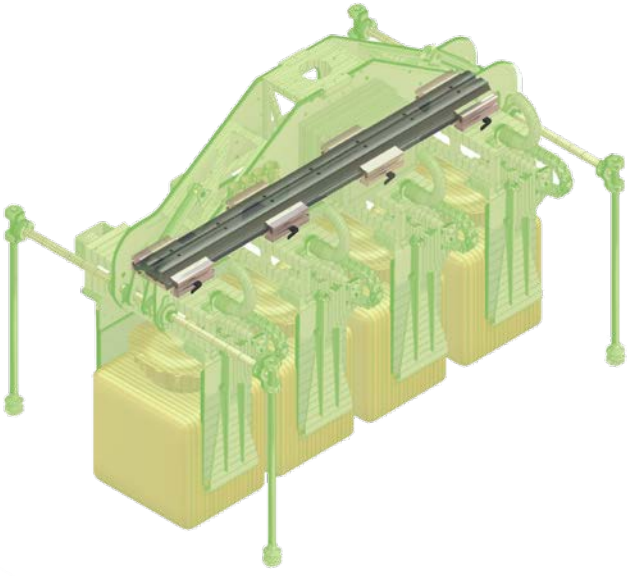
**Medical and Laboratory Equipment:**
The self-lubricating Frelon® bearing materials are ideal for environments where no grease or lubrication can be present.

# Applications

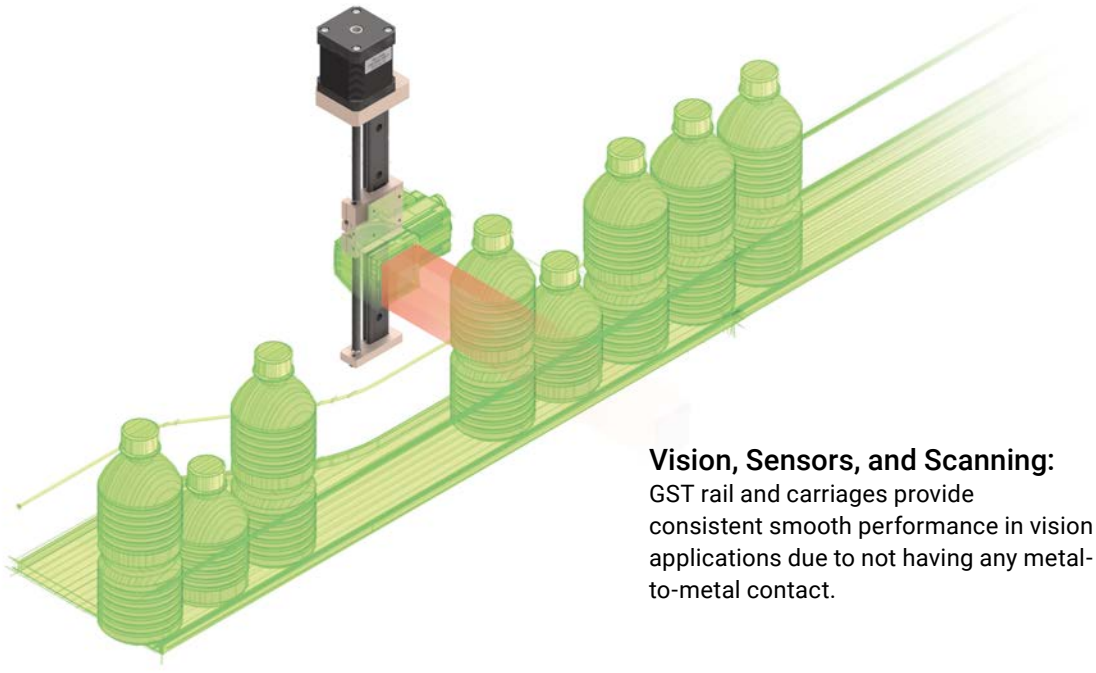
**Medical and Laboratory Equipment:**
Uni-Guide™ provides smooth and quiet linear motion in a simple, compact assembly that is ideal for the medical and laboratory industry.



**Automation and 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.

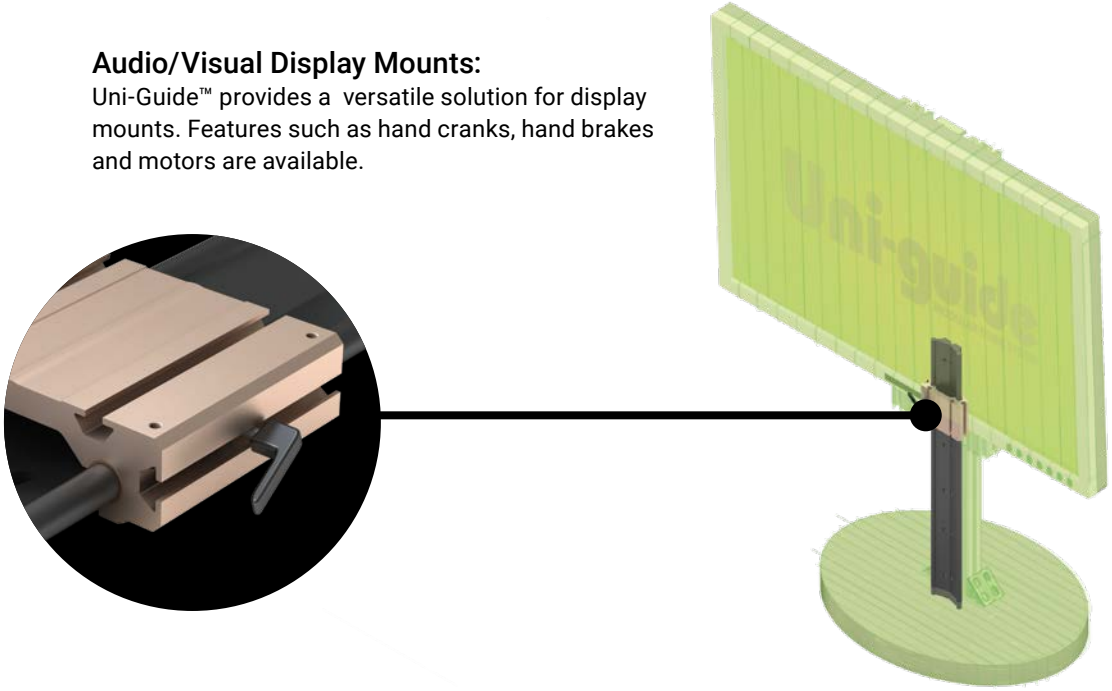


# Applications



**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

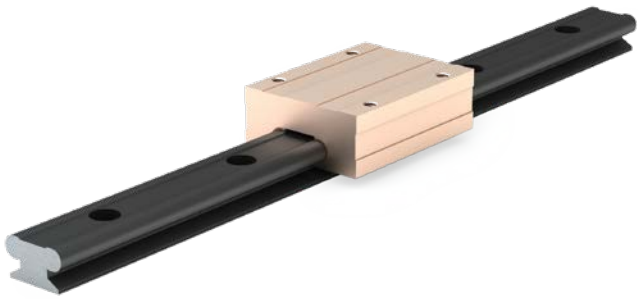


## PRODUCT OVERVIEW

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

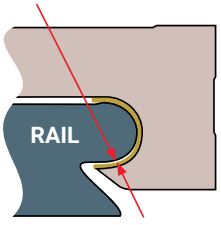


## Carriage Configurations

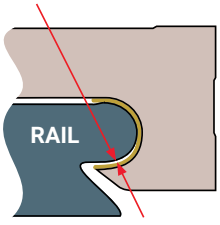
**Precision Series:** Ceramic coated rails and anodized carriages are corrosion resistant. FrelonGOLD self-lubricating liner delivers the best overall performance, the highest loads, the best wear life, and speeds. Most precise running clearance for high precision applications.

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

**Precision Series**
0.025–0.051 mm
Running Clearance
(Ceramic Coated)




**Compensated Series**
0.064–0.089 mm
Running Clearance
(Ceramic Coated)



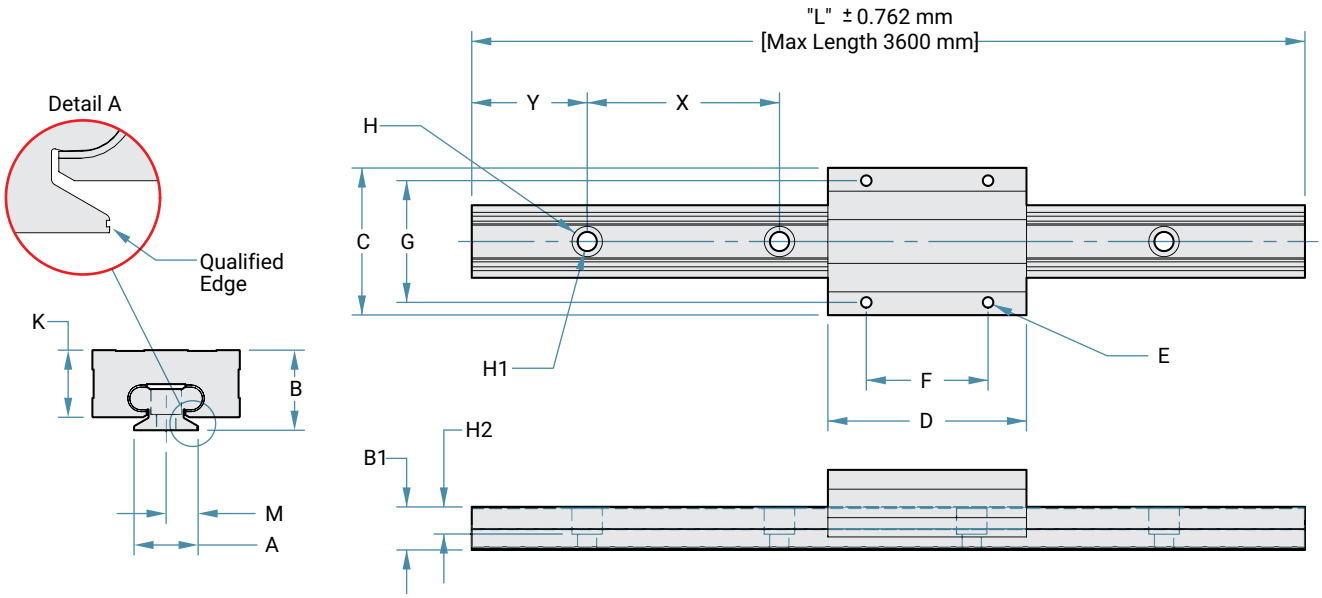

## Applications

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

## Accessories

- Hand Brake

## DIMENSIONS




**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)

| Part Number | Running Clearance | A Base Width mm | B Overall Height | $B_1$ Rail Height | C Carriage Width | D Carriage Length | E Carriage Mtg. Hole Size | E Carriage Mtg. Hole Depth | F Carriage Mtg. Hole Ctr. to Ctr. | G Carriage Mtg. Hole Ctr. to Ctr. | H Rail Hole Size | $H_1$ Rail Hole Size | $H_2$ Rail Hole Size | K Carriage Height | M Rail Mtg. Hole to Qualified Edge | y Rail Hole to End | x Rail Hole Ctr. to Ctr. | Rail Wt. Gram/ mm | Carriage Wt. Gram |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **MR7-xxx** | 0.025–0.051 | 7 | 8 | 6.1 | 17 | 24 | M2 x 0.4 | THRU | 8 | 12 | 4.2 | 2.4 | 2.3 | 6.2 | 3.5 | 5.0 | 15 | 0.10 | 5.7 |
| **MRC7-xxx** | 0.064–0.089 | | | | | | | | | | | | | | | | | | |
| **MR9-xxx** | 0.025–0.051 | 9 | 10 | 7.1 | 20 | 30 | M3 x 0.5 | | 13 | 15 | 4.5 | 2.6 | 3 | 8.0 | 4.5 | 7.5 | 20 | 0.16 | 8.5 |
| **MRC9-xxx** | 0.064–0.089 | | | | | | | | | | | | | | | | | | |
| **MR12-xxx** | 0.025–0.051 | 12 | 13 | 8.0 | 27 | 34 | | | 15 | 20 | 6 | 3.5 | 3.5 | 10.7 | 6.0 | 10 | 25 | 0.22 | 20.0 |
| **MRC12-xxx** | 0.064–0.089 | | | | | | | | | | | | | | | | | | |
| **MR15-xxx** | 0.025–0.051 | 15 | 16 | 9.2 | 32 | 42 | | | 20 | 25 | | | 4.5 | 14.1 | 7.5 | 15 | 40 | 0.38 | 34.0 |
| **MRC15-xxx** | 0.064–0.089 | | | | | | | | | | | | | | | | | | |
| **MR20-xxx** | 0.025–0.051 | 20 | 25 | 13.4 | 46 | 62 | M4 x 0.7 | 12.5 | 38 | 38 | 9.5 | 6 | 8.5 | 21.2 | 10 | 20 | 60 | 0.48 | 127.9 |
| **MRC20-xxx** | 0.064–0.089 | | | | | | | | | | | | | | | | | | |

**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

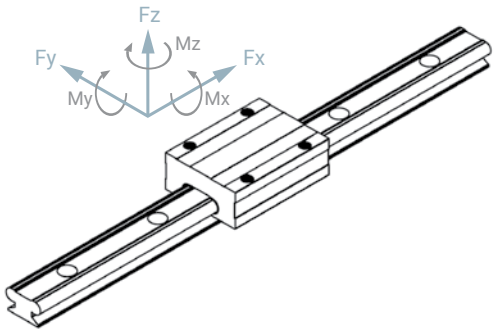
The numbers below are for rails in a static condition. Refer to the calculations below to establish dynamic parameters.

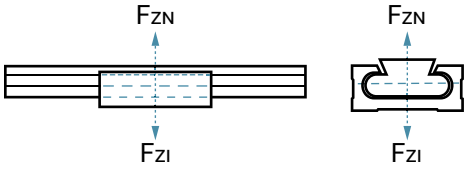
| Size | $F_{ZN}$ N | $F_{ZI}$ N | $F_Y$ N | $M_X$ N-m | $M_Y$ N-m | $M_Z$ N-m |
|---|---|---|---|---|---|---|
| **7** | 445 | 89 | 133 | 1.8 | 1.8 | 2.3 |
| **9** | 667 | 125 | 222 | 3.2 | 3.2 | 5.0 |
| **12** | 1334 | 222 | 400 | 5.6 | 5.6 | 9.0 |
| **15** | 2224 | 356 | 667 | 9.0 | 9.0 | 15.1 |
| **20** | 3559 | 578 | 1112 | 14.7 | 14.7 | 24.9 |

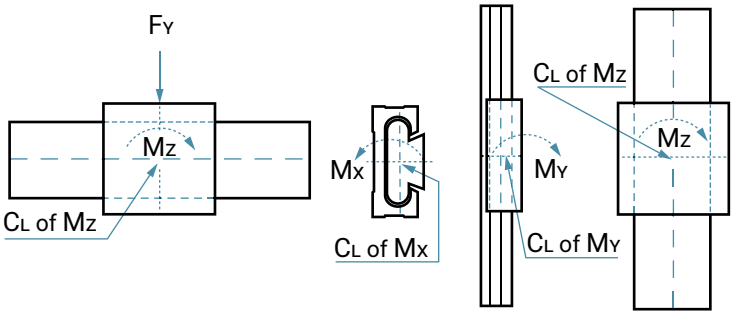
## Load/Moment Conversion

**N** = 4.45 x (lbs.)

**N-m** = 0.113 x (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.

| Bearing Material | MAX. PV | MAX. P | MAX. V No Lubrication |
|---|---|---|---|
| **Frelon GOLD®** | 20,000 (psi x ft./min.) or 0.7 N/mm2 x m/s | 3000 psi or 20.68 N/mm2 | 300 sfm or 1.524 m/s |

**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.)

**PV** Example: **Load** = 85 psi

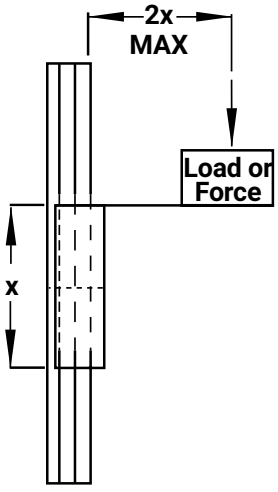
**Speed** = 180 ft./min.

**PV** = 85 x 180 = 15,300 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.



## Ordering information

Configure Online

### CARRIAGE

MR | | XX | C | BL

**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

**Carriage**

**Carriage Option**
**No Entry** = None
**BL** = Hand Brake
Only available on 15 & 20 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.

### RAIL

MR | XX | R | – | 0100

**Mini-Rail**
Miniature Linear Guide

**Nominal Sizes**
07 mm 15 mm
09 mm 20 mm
12 mm

**Rail**

**Rail Length**
3600 mm MAX

Example: MR20R

### CARRIAGE & RAIL ASSEMBLY

MR | | XX | – | 0100 | – | BL | – | X

**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

**Carriage Option**
**No Entry** = None
**BL** = Hand Brake
Only available on 15 & 20 mm

**Number of Carriages***
**1** = One carriage
**2** = Two carriages
**3** = Three carriages
**4** = Four carriages
* Contact an application engineer before ordering, if more than one (1) carriage is needed

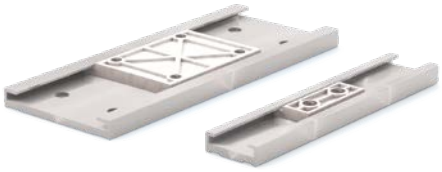
Example: MR15-1500-BL-1

# 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.

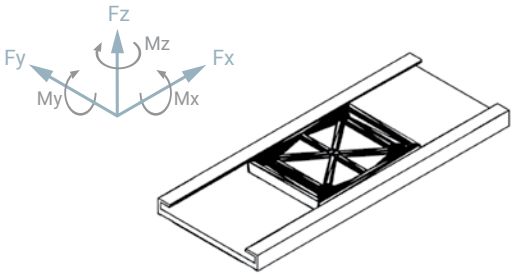


### Features & Benefits

- 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
- Running clearance is ≤ 0.5 mm

### Applications

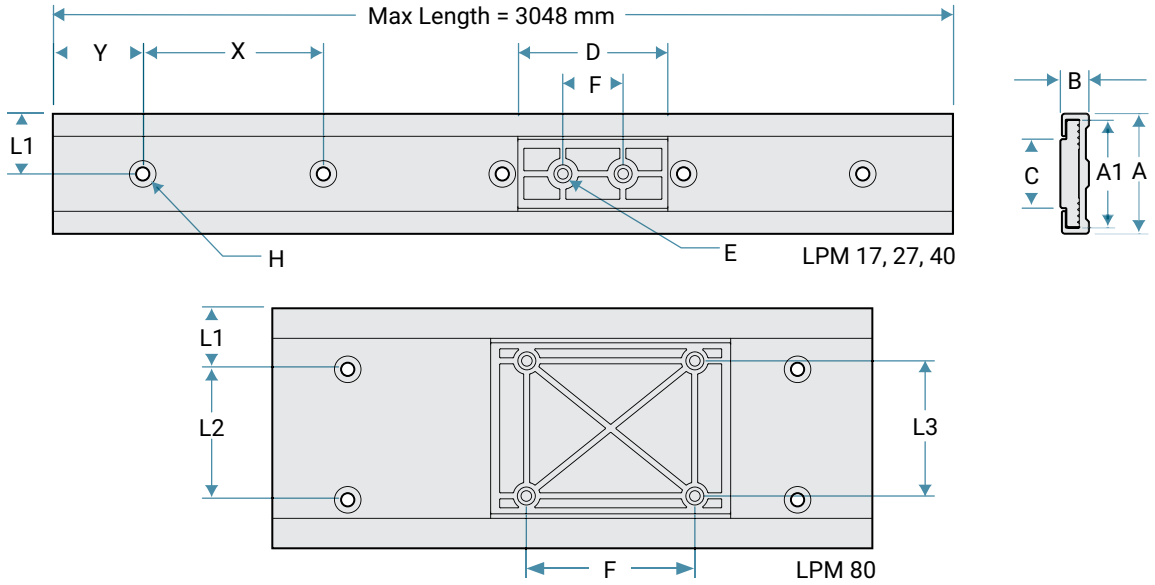
- Medical Equipment
- Packaging Precision
- Automation Industry



# 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

| Part Number | A1 | A | B | C | D | E | F | H C'Bore | L1 | L2 | L3 | Y | X | Carriage Wt. | Rail Unit Wt. | Load Capacity | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | Fy | | Fz | | Mx | | My | | Mz | |
| | mm | mm | mm | mm | mm | mm | mm | | mm | mm | mm | mm | mm | g | g/mm | N | lb. | N | lb. | N-m | lb.-in | N-m | lb.-in | N-m | lb.-in |
| **LPM17** | 14.6 | 17 | 6.0 | 9.6 | 25 | M3 x 0.5 | 14 | M3 SBHCS | 8.5 | N/A | N/A | 20 | 60 | 1.1 | 0.15 | 35 | 8 | 10 | 2.5 | 0.2 | 1.5 | 0.3 | 2.5 | 0.2 | 1.5 |
| **LPM27** | 24 | 27 | 9.5 | 14 | 40 | M4 x 0.7 | 20 | M4 SBHCS | 13.5 | N/A | N/A | 20 | 60 | 4.8 | 0.33 | 130 | 30 | 85 | 20 | 1.0 | 10 | 2.5 | 20 | 1.0 | 10 |
| **LPM40** | 36 | 40 | 9.5 | 23 | 50 | M4 x 0.7 | 20 | M4 SBHCS | 20 | N/A | N/A | 20 | 60 | 9.8 | 0.38 | 270 | 60 | 150 | 35 | 2.5 | 25 | 5.0 | 50 | 2.5 | 25 |
| **LPM80** | 75.2 | 80 | 12.0 | 57 | 80 | M4 x 0.7 | 56 | M4 SBHCS | 20 | 40 | 45 | 25 | 150 | 32.3 | 1.07 | 515 | 120 | 250 | 55 | 7.0 | 60 | 14 | 125 | 7.0 | 60 |

**Note:** Apply a load reduction factor 0.25 on Fy rating if the system is used inverted.

## Ordering information

### CARRIAGE & RAIL ASSEMBLY

**Configure Online**

**LPM** **XX** – **XXXX** – **X**

- **LPM** — Low Profile Mini-Rail
- **XX** — Nominal Size: 17 mm, 40 mm, 27 mm, 80 mm
- **XXXX** — Length of Rail in mm
- **X** — Number of Carriages

EXAMPLE: LPM17-1000-1

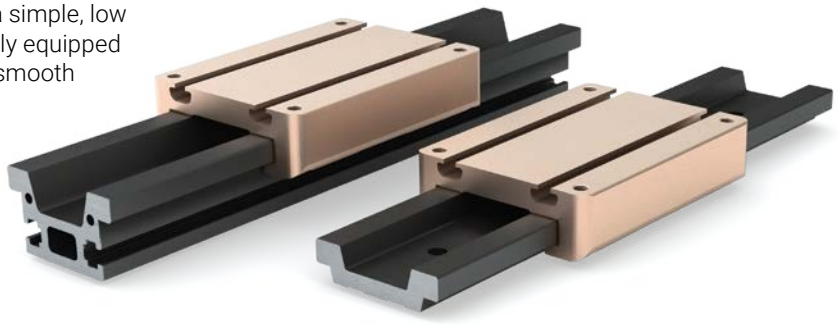
# Low & Tall Profile Uni-Guide™



## PRODUCT OVERVIEW

The Low and Tall Profile Uni-Guides are solutions that maintain 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.

The PBC Linear patented SIMO milling operation creates a precision-machined rail and carriage surface providing tight tolerances and alignment accuracy. The Low and Tall Profile Uni-Guides are 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

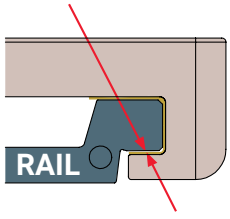
- Hand Brake
- Felt Wick Lubrication - You will have to add lubrication to the felt wick. If felt wick is installed in the carriage, remove carriage from rail and add lubrication. If wick is shipped separate from carriage, add lubrication to felt wick and install into carriage before operation.

### Applications

- Medical equipment
- Laboratory equipment

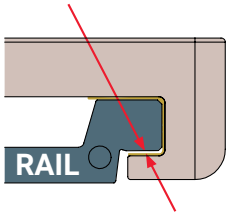
**Precision Series**

0.025–0.051 mm
Running Clearance
(Ceramic Coated)



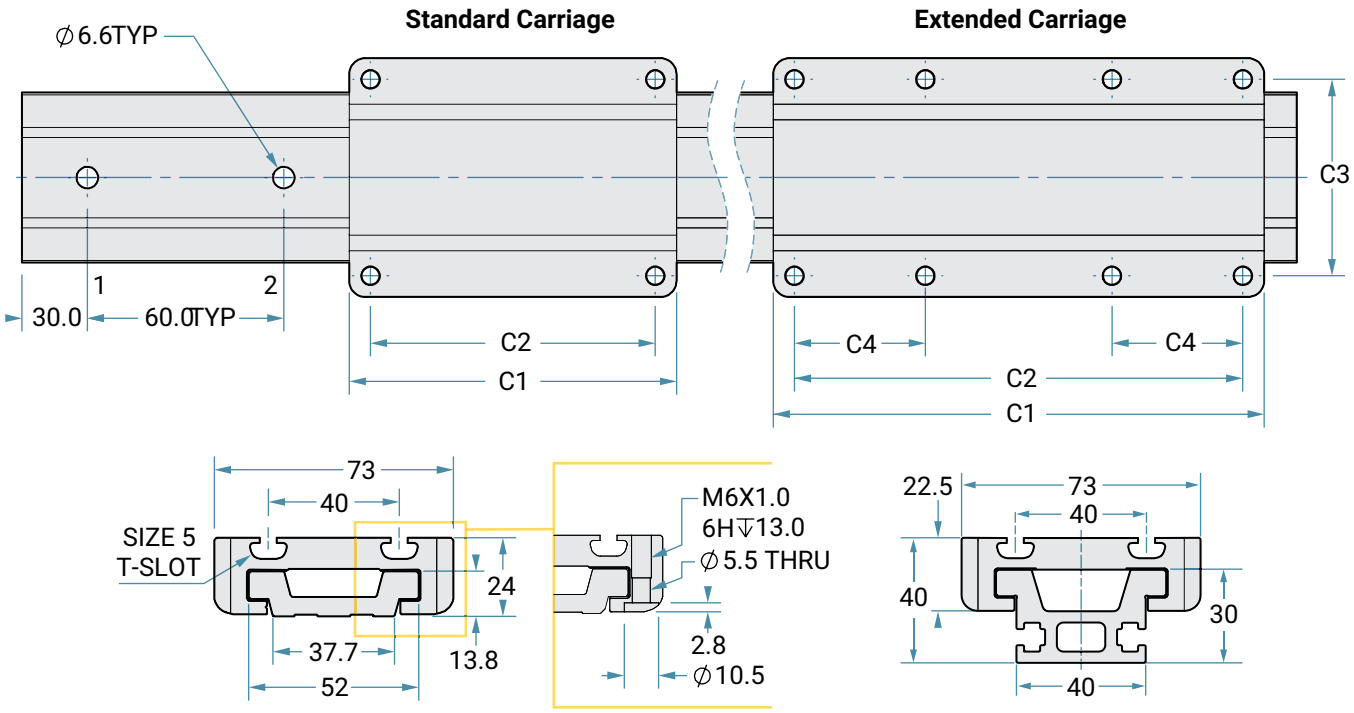

**Compensated Series**

0.064–0.089 mm
Running Clearance
(Ceramic Coated)




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

## DIMENSIONS




**Notes:** 1 - Default end to first hole is 30 mm
2 - 60 mm hole spacing provided for higher moment capacity. For low moment applications, every other hole may be used.

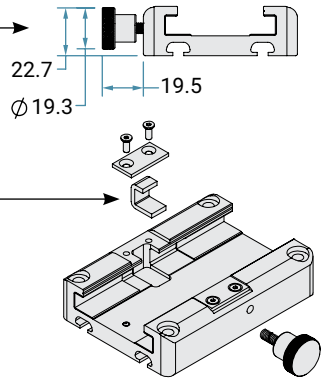
## Dimensional Data

| Carriage Part# | Standard Carriage mm | | | | |
|---|---|---|---|---|---|
| | C1 | C2 | C3 | C4 | lb (kg) |
| UGA040C-0x1xxx | 100 | 87 | 60 | N/A | 0.504 (0.23) |
| **Extended Carriage** | | | | | |
| UGA040C-1x1xxx | 150 | 137 | 60 | 40 | 0.750 (0.34) |
| UGA040C-2x1xxx | 200 | 187 | 60 | 60 | 1.014 (0.46) |

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

## Accessories

- Hand Brake
- Felt Wick*




## T-Nut Info

| Part No. | Part No. • Size |
|---|---|
| UGA and UGT | 6100443 • M5 x 0.8 |

***Warning:** Felt wick is shipped without lubrication and requires the customer to add lubrication prior to opperation of the carriage and rail. See page 31 for recommended lubrications.

# Low & Tall 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.

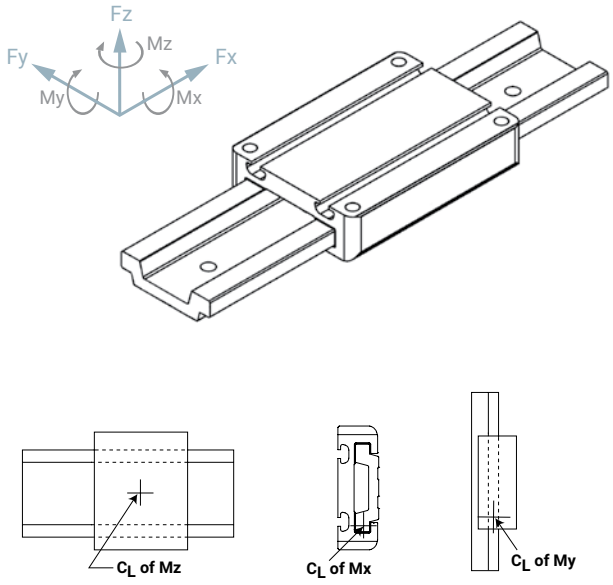
| Size | Fz MAX Load lb. | Fz MAX Load N | Fz Inverted MAX Load lb. | Fz Inverted MAX Load N |
|---|---|---|---|---|
| UGA040C-0x1xxx | 1,843 | 8,200 | 607 | 2,700 |
| UGA040C-1x1xxx | 1,483 | 6,600 | 607 | 2,700 |
| UGA040C-2x1xxx | 1,101 | 4,900 | 607 | 2,700 |

| Size | Fy lb | Mx in/lb | My in/lb | Mz in/lb | Fy N | Mx Nm | My Nm | Mz Nm |
|---|---|---|---|---|---|---|---|---|
| UGA040C-0x1xxx | 1,101 | 1,062 | 1,505 | 1,505 | 4,900 | 120 | 170 | 170 |
| UGA040C-1x1xxx | 1,281 | 1,062 | 2,567 | 2,567 | 5,700 | 120 | 290 | 290 |
| UGA040C-2x1xxx | 1,371 | 1,062 | 2,567 | 2,567 | 6,100 | 120 | 290 | 290 |

## Load/Moment Conversion

**N** = 4.45 x (lbs.)

**N-m** = 0.113 x (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.

| Bearing Material | MAX. PV | MAX. P | MAX. V No Lubrication |
|---|---|---|---|
| FrelonGOLD® | 20,000 (psi x ft./min.) or 0.7 N/mm2 x m/s | 3000 psi or 20.68 N/mm2 | 300 sfm or 1.524 m/s |

**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.)

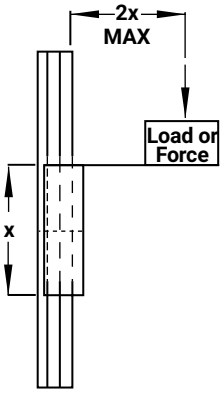
**PV** Example: **Load** = 85 psi
**Speed** = 180 ft./min.
**PV** = 85 x 180 = 15,300 PV

**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.



# Low & Tall Profile Uni-Guide™

## Ordering information

Configure Online

### RAIL

UG A 040 R — XXXX — 0 0 0

- **Uni-Guide**
- **Series**
  - **A** = Low Profile
  - **T** = Tall Profile
- **Internal/External Size**
  - **040** = 40 mm
- **Identifier**
  - **R** = Rail
- **Rail Length**
  - **XXXX** = Enter Length of Rail in Millimeters (2750 mm maximum)
- **Anodizing**
  - **0** = Standard
- **Hole Pattern**
  - **0** = Standard (60 mm) (UGA only)
  - **1** = No holes (UGT only)
- **Version**
  - **0** = Standard

**Ex: UGA040R-0300-000**

### CARRIAGE

UG A 040 C — X X 1 G X 0

- **Uni-Guide**
- **Series**
  - **A** = Standard (used with both low profile & tall rail)
- **Internal/External Size**
  - **040** = 40 mm
- **Identifier**
  - **C** = Carriage
- **Carriage Length**
  - **0** = 100 mm
  - **1** = 150 mm
  - **2** = 200 mm
- **Running Clearance**
  - **P** = Precision (0.025–0.051 mm)
  - **C** = Compensated 0(.064–0.089)
- **Carriage Height**
  - **1** = Standard carriage w/ t-slots
- **Frelon Type**
  - **G** = GOLD
- **Carriage Options**
  - **0** = None
  - **1** = CHB (hand brake)
  - **2** = JKM (lube option)
  - **3** = Both
- **Version**
  - **0** = Standard

**Ex: UGA040C-0P1G00**

### CARRIAGE & RAIL ASSEMBLY

UG – T 040 – 0100 – 0 P G 00 – 1

- **Uni-Guide**
- **Series**
  - **A** = Low Profile
  - **T** = Tall Profile
- **Internal/External Size**
  - **040** = 40 mm
- **Rail Length**
  - **XXXX** = Enter Length of Rail in Millimeters 2750 mm MAX
- **Carriage Length**
  - **0** = 100 mm
  - **1** = 150 mm
  - **2** = 200 mm
- **Running Clearance**
  - **P** = Precision (0.025 - 0.051 mm)
  - **C** = Compensated (0.064 - 0.089)
- **Frelon Type**
  - **G** = GOLD
- **Carriage Options**
  - **00** = None
  - **10** = CHB (hand brake)
  - **20** = JKM (lube option)
  - **30** = Both 10 and 20
- **Number of Carriages**
  - **1**, **2**, **3**, **4**, or **5**

**Ex: UGA040-0550-0PG10-1**

**Note:** 1 - Specify Y dimension (hole to end) at time of order. Default end to first hole is 30 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.
5 - JKM option is a felt wick without lubrication and requires the customer to add lubrication prior to opperation. See page 31 for recommended lubrications.

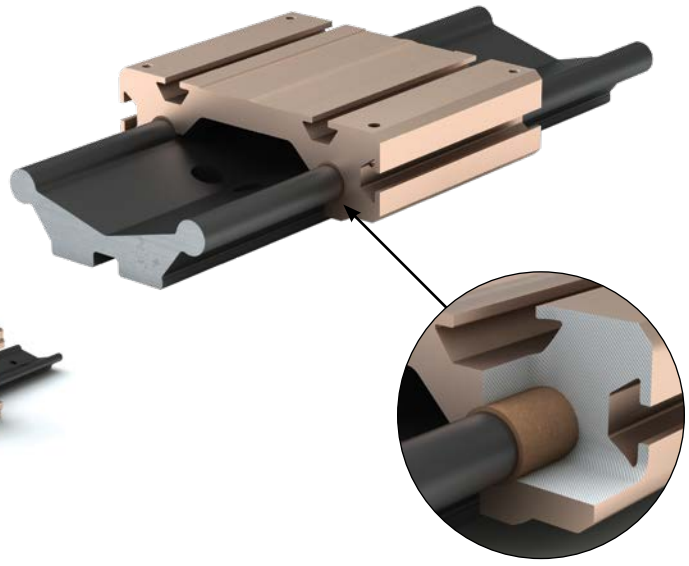
Link to driven version of Low Profil Uni-Guide

# Uni-Guide™



## PRODUCT OVERVIEW

Uni-Guide reduces bulky part count with its two-piece assembly, simplifying integration into both new and existing applications. Accompanied by PBC Linear's FrelonGOLD® liner, Uni-Guide facilitates smooth, maintenance-free travel throughout the life of the system. Designed to thrive in challenging environments, Uni-Guide offers best-in-class linear motion performance.



### Features & Benefits

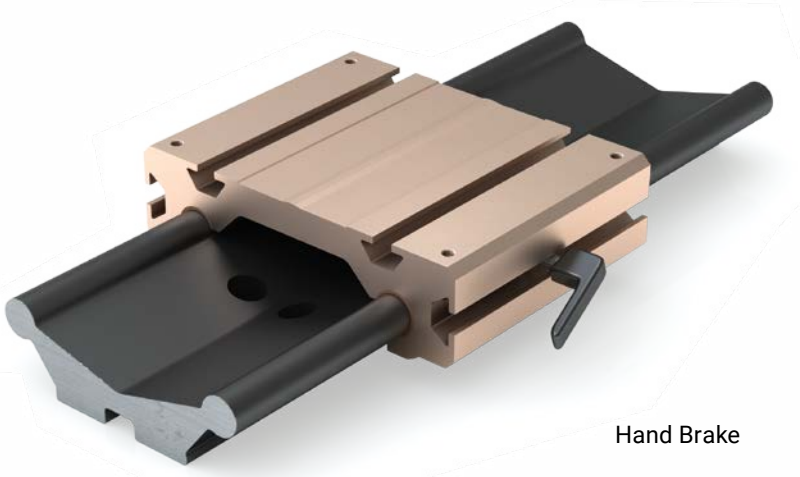
- Ceramic coated, aluminum rail and anodized carriage
- Self-lubricating, maintenance-free FrelonGOLD Liner
- The two-piece assembly makes for a quick and easy integration while also eliminating the need for alignment in both new and existing applications
- Excels in demanding extremes including temperature, 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)

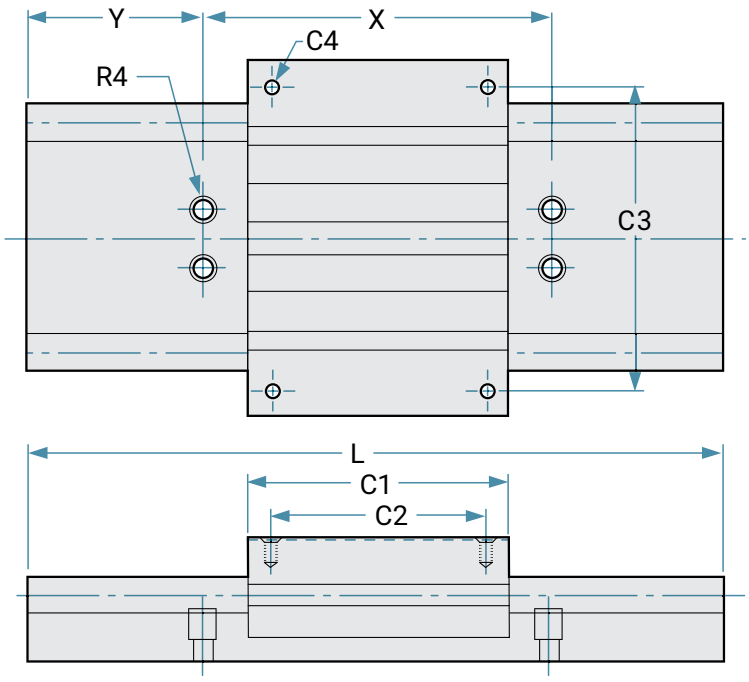
### Applications

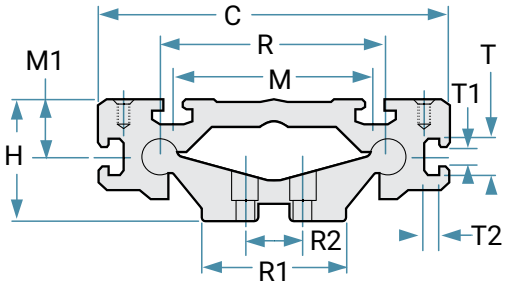
- Automation & assembly line gripper
- Medical & laboratory equipment
- Heavy duty vise
- Audio/visual display mounts



Hand Brake

## DIMENSIONS




### Standard Inch Series With No Drive Mechanism Inches

| Part Number | R | R1 | R2 | X | R4 Bolt Size | Y | H | C | C1 Standard | C2 Standard | C1 Extended | C2 Extended | C3 | C4 Bolt Size | M | M1 | l Max-feet |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D075 | 2.95 | 2.0 | 0.75 | 4 | 1/4 | 2 | 1.625 | 4.6 | 3.5 | 3.00 | 4.5 | 4.00 | 4.00 | 10-32 | 2.60 | 0.819 | |
| D100 | 3.94 | 2.6 | 1.00 | 6 | 5/16 | 3 | 2.125 | 6.1 | 4.5 | 3.75 | 6.0 | 5.25 | 5.25 | 1/4-20 | 3.50 | 1.020 | 10 |
| D125 | 4.92 | 3.3 | 1.25 | | 3/8 | 3 | 2.625 | 7.6 | 6.0 | 5.25 | 7.5 | 6.75 | 6.75 | 5/16-18 | 4.33 | 1.300 | |

### Carriage Types

| Part No. | Drill | Depth | Tap | Depth |
|---|---|---|---|---|
| D075-xxx | 0.159 | 0.534 | 10-32 | 0.440 |
| D100-xxx | 0.201 | 0.750 | 1/4-20 | 0.500 |
| D125-xxx | 0.257 | | 5/16-18 | 0.625 |

### T-Slot Information Inches

| Part No. | T | T1 | T2 | Part No. • Size |
|---|---|---|---|---|
| D075-xxx | 0.590 | 0.256 | 0.236 | 6100435 • M6 x 1.0 |
| D100-xxx | 0.661 | 0.319 | 0.268 | 6100436 • M8 x 1.25 |
| D125-xxx | | | | |

### Rail Φ Approximate

| | |
|---|---|
| D075 | 0.470 = 12 mm |
| D100 | 0.630 = 16 mm |
| D125 | 0.820 = 22 mm |

### Rail Straightness

| |
|---|
| ±.002"/ft |

### Weight

| Part No. | Rail Per Inch lb. | Standard Carriage lb. | Extended Carriage lb. |
|---|---|---|---|
| D075-xxx | 0.19 | 0.98 | 1.26 |
| D100-xxx | 0.32 | 2.12 | 2.82 |
| D125-xxx | 0.48 | 4.56 | 5.70 |

# 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.

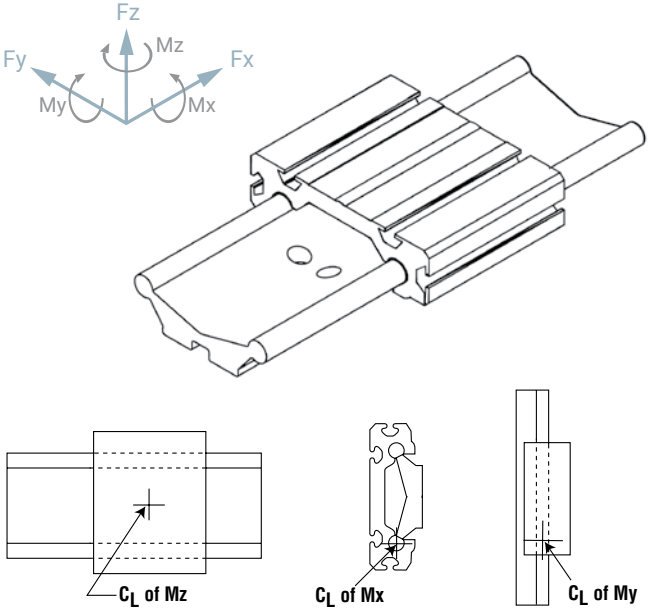
| Size | Fz MAX Load lb | Fz MAX Load N | Fz Inverted MAX Load lb | Fz Inverted MAX Load N |
|---|---|---|---|---|
| D075 | 500 | 2224 | 125 | 556 |
| D100 | 750 | 3336 | 190 | 845 |
| D125 | 1000 | 4448 | 250 | 1112 |

| Size | Fy lb | Mx in./lb | My in/lb | Mz in/lb | Fy N | Mx Nm | My Nm | Mz Nm |
|---|---|---|---|---|---|---|---|---|
| D075 | 250 | 340 | 340 | 350 | 1,112 | 38 | 38 | 40 |
| D100 | 375 | 650 | 650 | 730 | 1,668 | 73 | 73 | 82 |
| D125 | 500 | 1,200 | 1,200 | 1,225 | 2,224 | 136 | 136 | 138 |

## Load/Moment Conversion

**N** = 4.45 x (lb.)

**N-m** = 0.113 x (in.-lb.)




## 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.

| Bearing Material | MAX. PV | MAX. P | MAX. V No Lubrication |
|---|---|---|---|
| FrelonGOLD® | 20,000 (psi x ft./min.) or 0.7 N/mm2 x m/s | 3000 psi or 20.68 N/mm2 | 300 sfm or 1.524 m/s |

**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.)

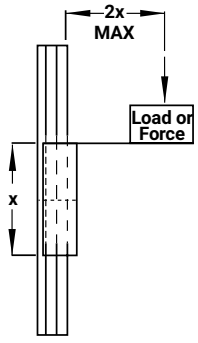
**PV** Example: **Load** = 85 psi
**Speed** = 180 ft./min.
**PV** = 85 x 180 = 15,300 PV

**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.



## Ordering Information

Configure Online

### CARRIAGE & RAIL ASSEMBLY

| 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

**Carriage Options**
**No Entry** = None
**CHB** = Hand Brake

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

**Number of Carriages**

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

# Mini-Rail



## PRODUCT OVERVIEW

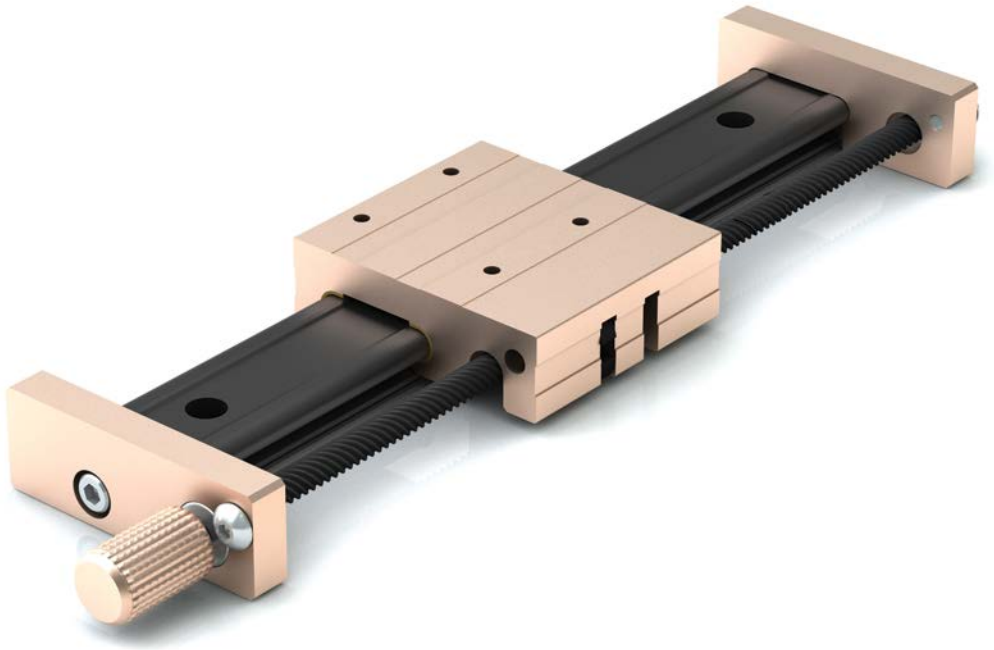
The lead screw driven Mini-Rail (MR-LS) system maintains all of the great features and benefits of Mini-Rail. The system is a fully interchangeable and economical solution to industry standard linear guides, and contains no rolling elements which avoids catastrophic failure.

### 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

### Accessories

- NEMA 17 motor mount kit
- Hand brake
- Knob

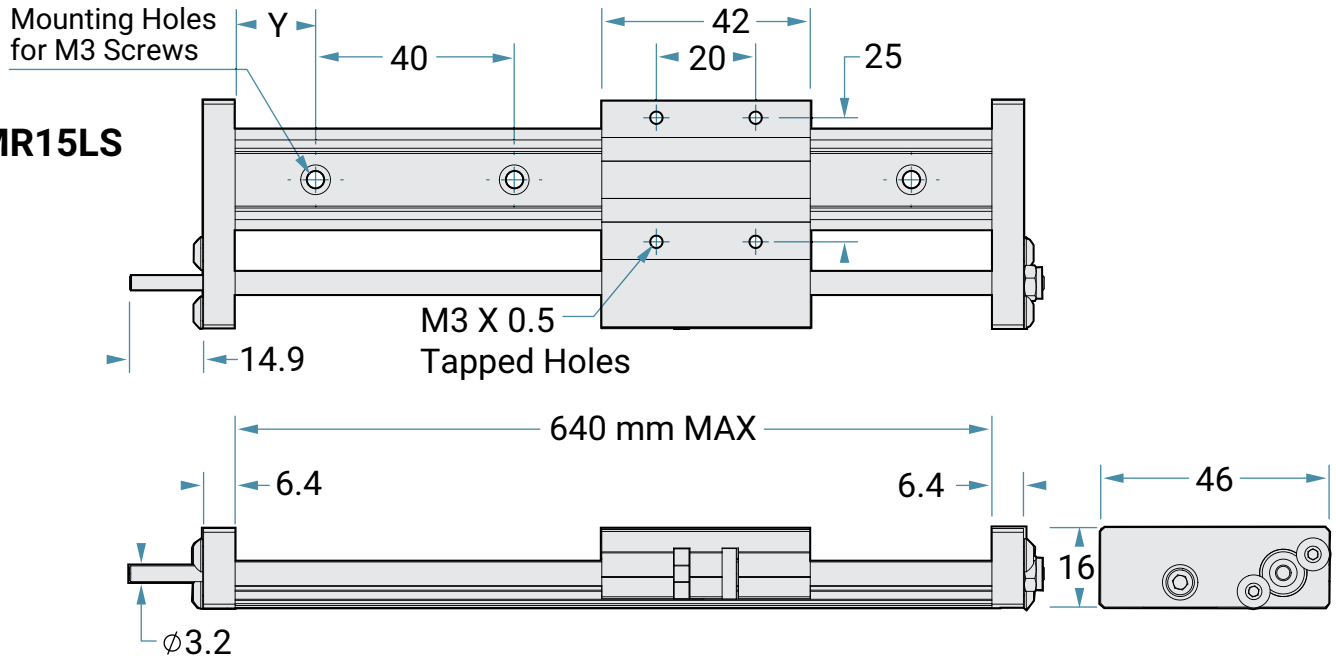


Link to Mini-Rail Lead Options

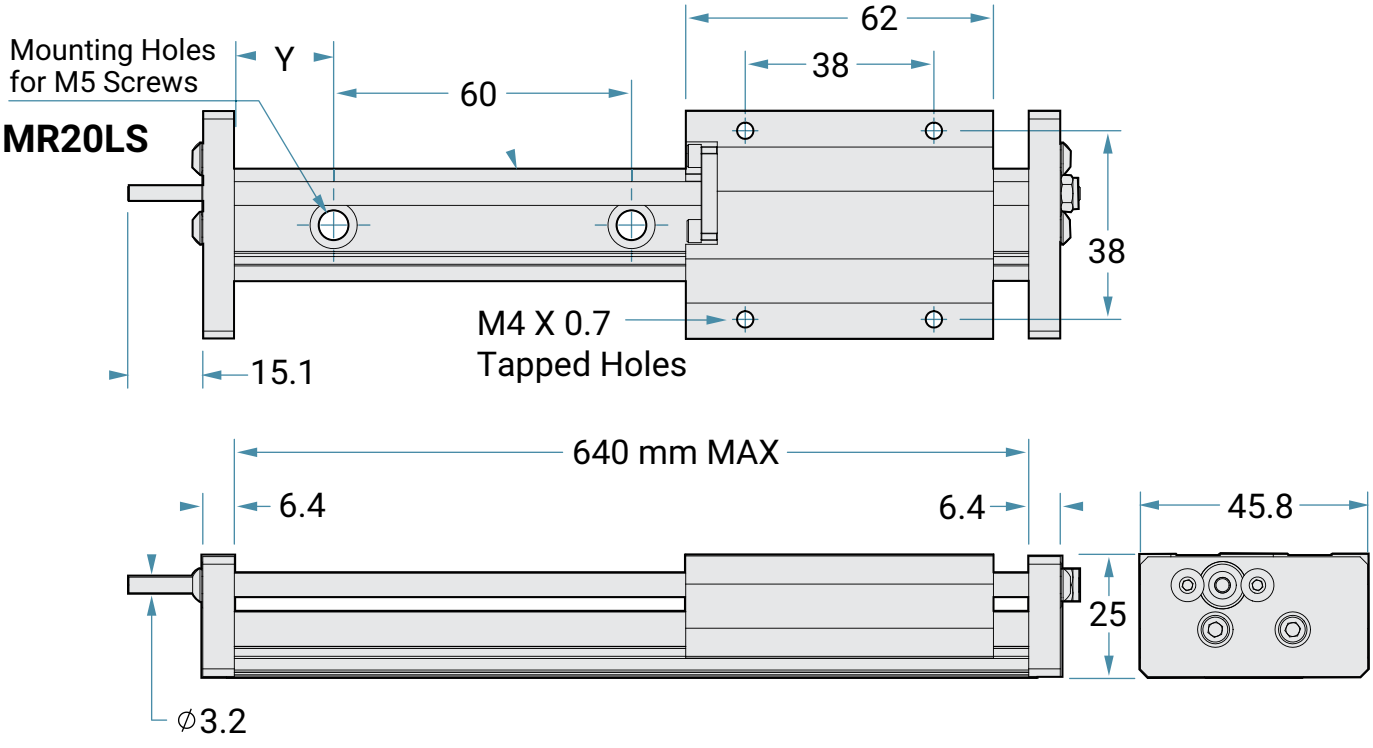
Email an Application Engineer

## DIMENSIONS

**MR15LS**




**MR20LS**




**Note:** Maximum length for lead screw driven MR is 640 mm
**Note:** Specify Y dimension (First Hole Offset - FHO) at time of order

# Mini-Rail

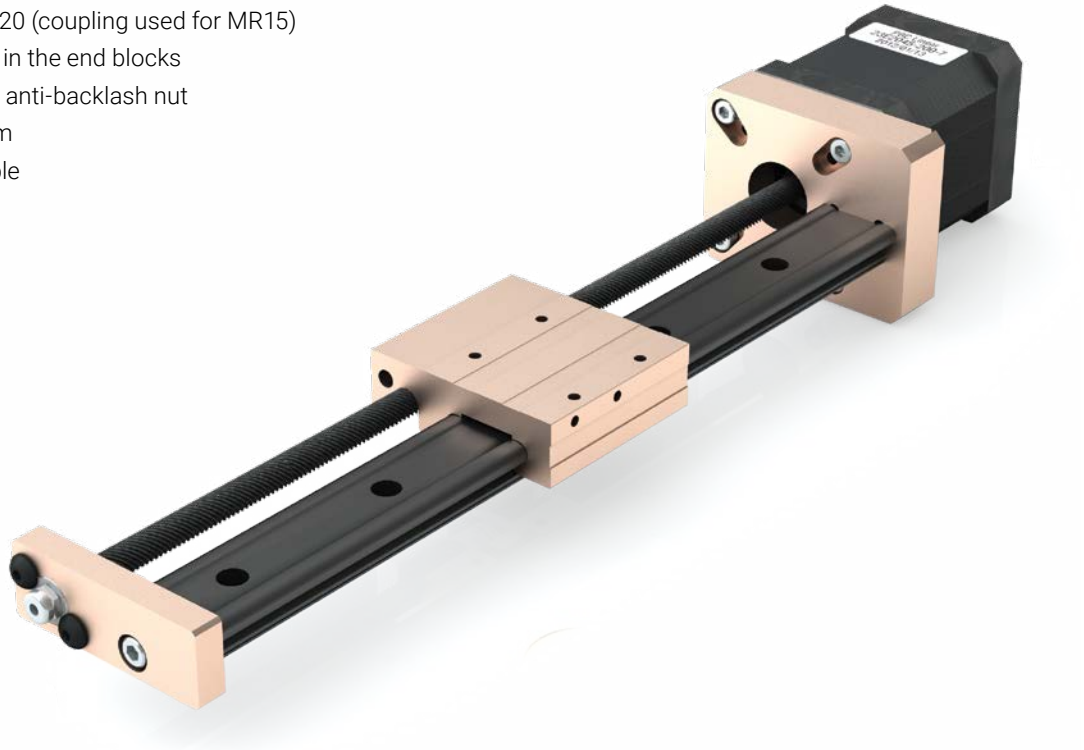


## PRODUCT OVERVIEW

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 equpped 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 Polyacetal, anti-backlash nut
- Lengths up to 640 mm
- Eight (8) leads available

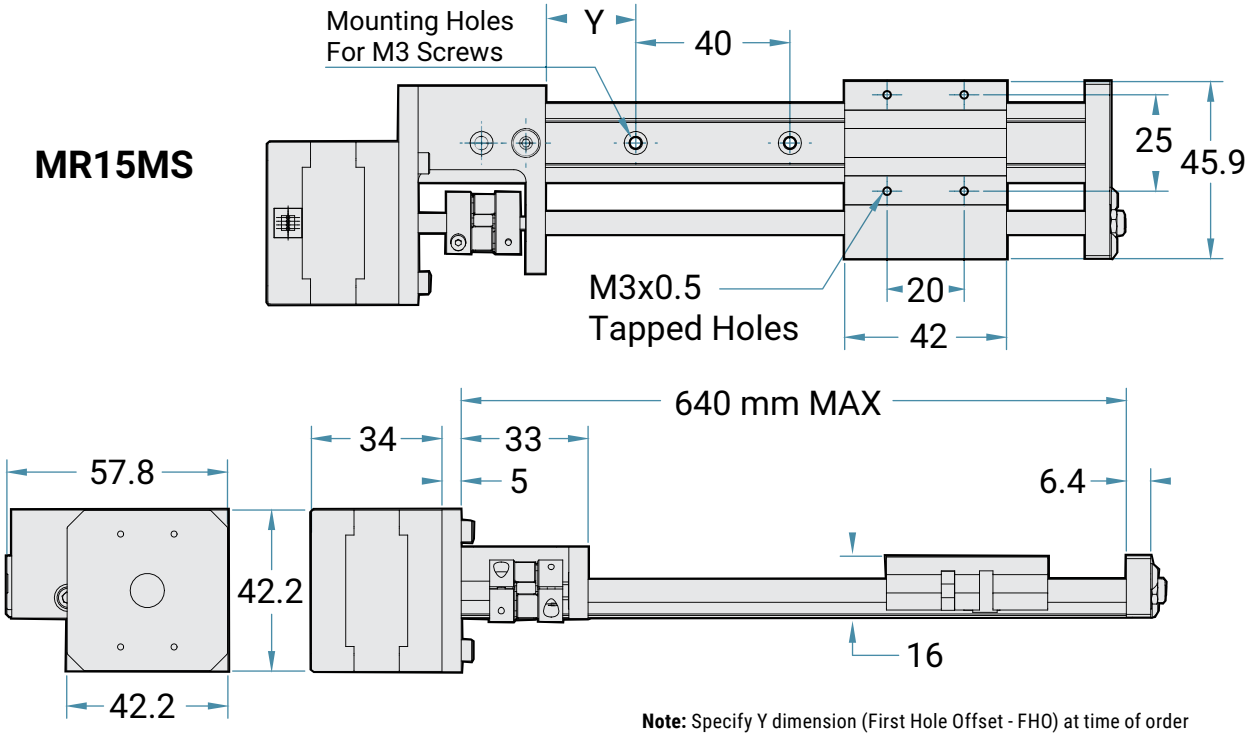


Link to Mini-Rail Lead Options

Email an Application Engineer

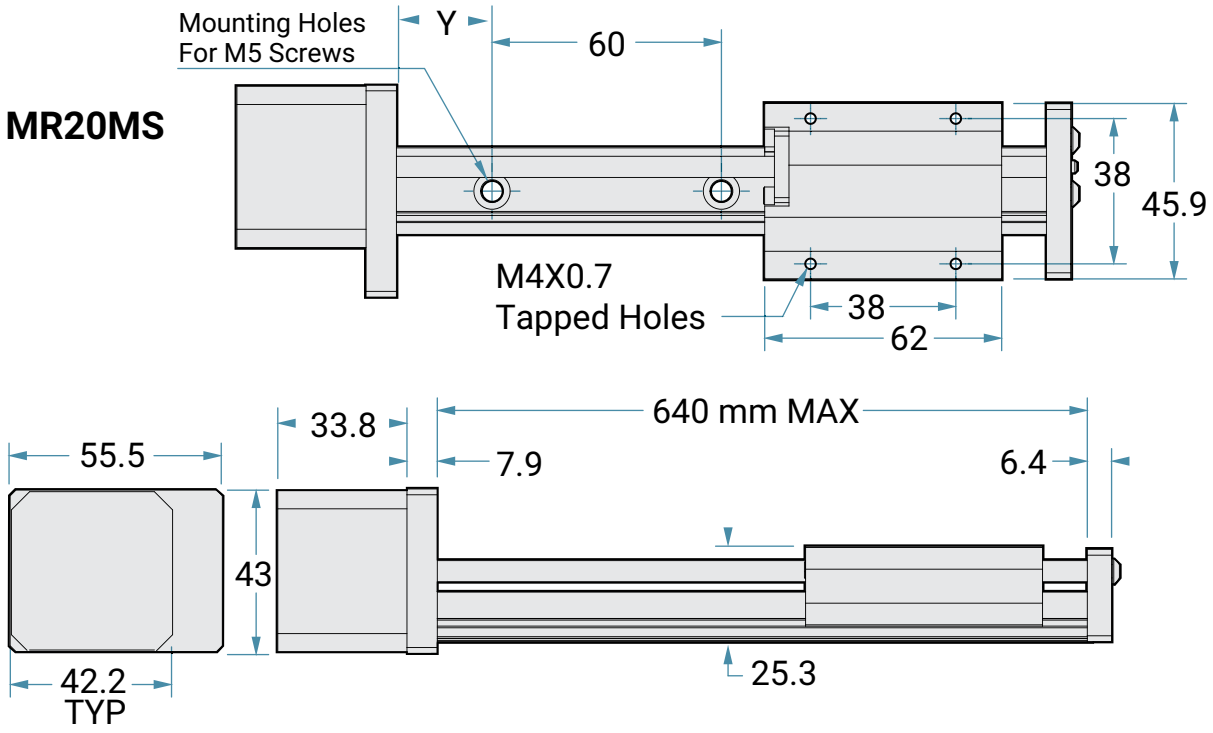
## DIMENSIONS

### MR15MS




**Note:** Specify Y dimension (First Hole Offset - FHO) at time of order

### MR20MS




**Note:** Maximum length for lead screw driven MR is 640 mm
Specify Y dimension (First Hole Offset - FHO) at time of order

## Ordering information

Configure Online

### LEAD SCREW DRIVEN

**MR XX LS XXX XX XX XX X**

- **Mini-Rail**
- **Nominal Size of Base in mm**
  - 15 mm
  - 20 mm
- **Lead Screw**
- **Length of Rail in mm**
  - Cut to length (Max. of 64Ø 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*
- **Mechanical Brake**
  - ØØ = No brake
  - BL = With brake lever mounted on carriage
- **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 Linear Recommends R+W EKL2 Coupling or equivalent. Actuator requires 3.18 mm (0.125") bore)

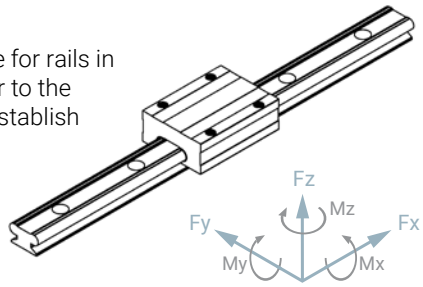
### LEAD SCREW DRIVEN WITH MOTOR

**MR XX MS XXX XX M42 00 X**

- **Mini-Rail**
- **Nominal Size of Base in mm**
  - 15 mm
  - 20 mm
- **Lead Screw**
- **Length of Rail in mm**
  - Cut to length (Max. of 64Ø 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.)
- **Nominal Size of Stepper Motor**
  - **M42** = 42 mm (NEMA 17)
- **Number of Carriages**
  - **1** = One carriage
  - * Contact an application engineer before ordering, if more than one (1) carriage is needed

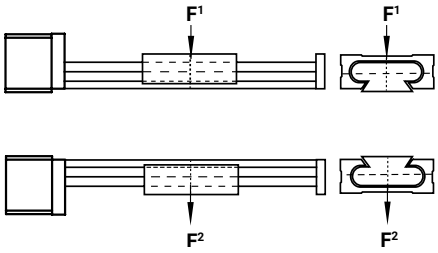
## Static Load Data

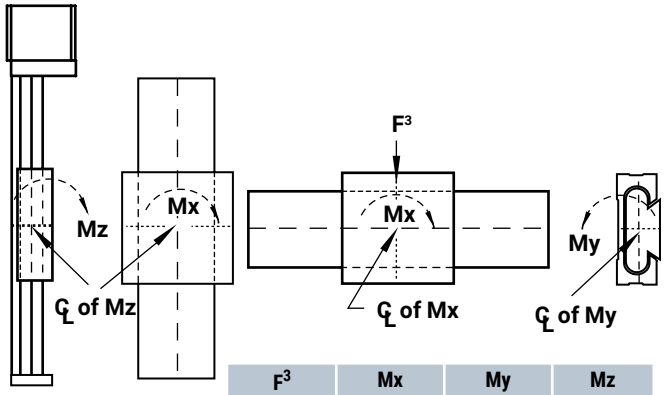
The numbers below are for rails in a static condition. Refer to the calculations below to establish dynamic parameters.




| $F^1$ N | |
|---|---|
| Size 15 | Size 20 |
| 3114 | 6005 |

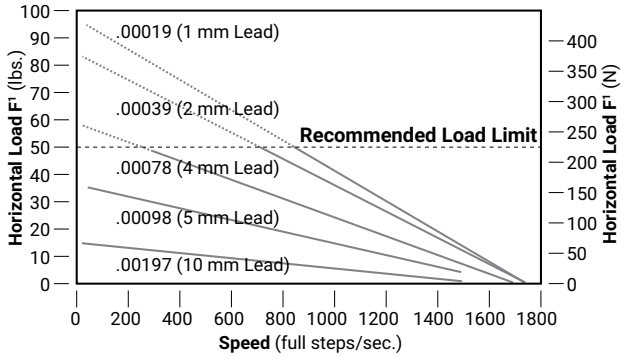
| $F^2$ N | |
|---|---|
| Size 15 | Size 20 |
| 356 | 578 |




| $F^3$ N | Mx N-m | My N-m | Mz N-m |
|---|---|---|---|
| 1112 | 24.9 | 14.7 | 14.7 |

## Size 17 stepper motor with 6 mm (0.236") screw




## 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.

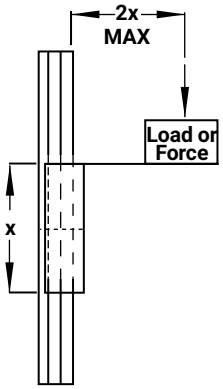
| Bearing Material | MAX. PV | MAX. P | MAX. V No Lubrication |
|---|---|---|---|
| FrelonGOLD® | 20,000 (psi x ft./min.) or 0.7 N/mm² x m/s | 3000 psi or 20.68 N/mm² | 300 sfm or 1.524 m/s |

**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 (lb.)
**N-m** = 0.113 x (in-lb.)

| Lead | Lead Code | Linear Travel per Step | |
|---|---|---|---|
| | | mm | Inch |
| 1 mm | AH | 0.005 | 0.000197 |
| 2 mm | AG | 0.010 | 0.000394 |
| 4 mm | AR | 0.020 | 0.000787 |
| 5 mm | AX | 0.025 | 0.000984 |
| 6 mm | BG | 0.030 | 0.001181 |
| 8 mm | BH | 0.040 | 0.001575 |
| 10 mm | AJ | 0.050 | 0.001969 |
| 12 mm | BD | 0.060 | 0.002362 |

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

# Uni-Guide™

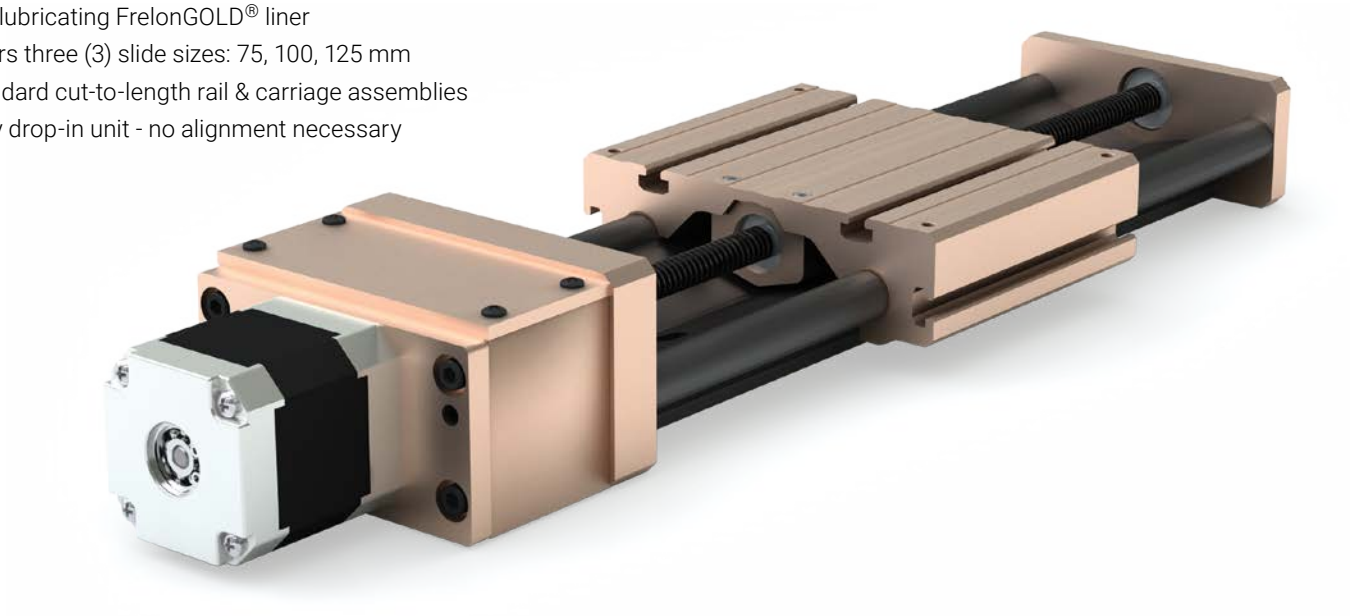


## PRODUCT OVERVIEW

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

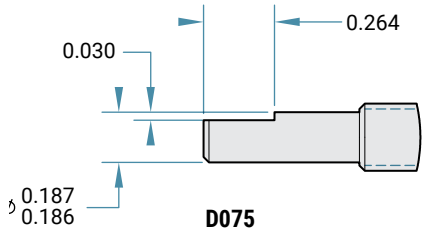
- Thrives in the most challenging environments
- Self lubricating FrelonGOLD® liner
- Offers three (3) slide sizes: 75, 100, 125 mm
- Standard cut-to-length rail & carriage assemblies
- Easy drop-in unit - no alignment necessary



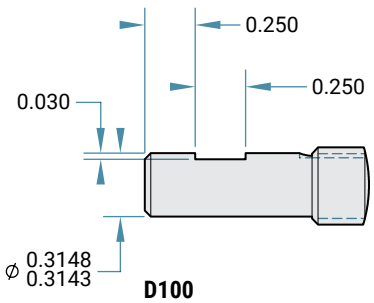
### Accessories

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

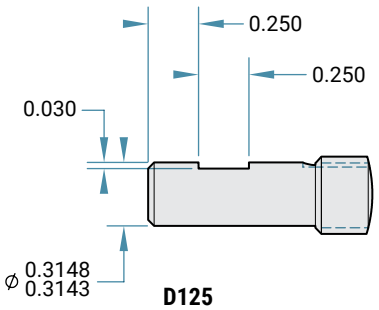
## DRIVE SHAFTS




D075

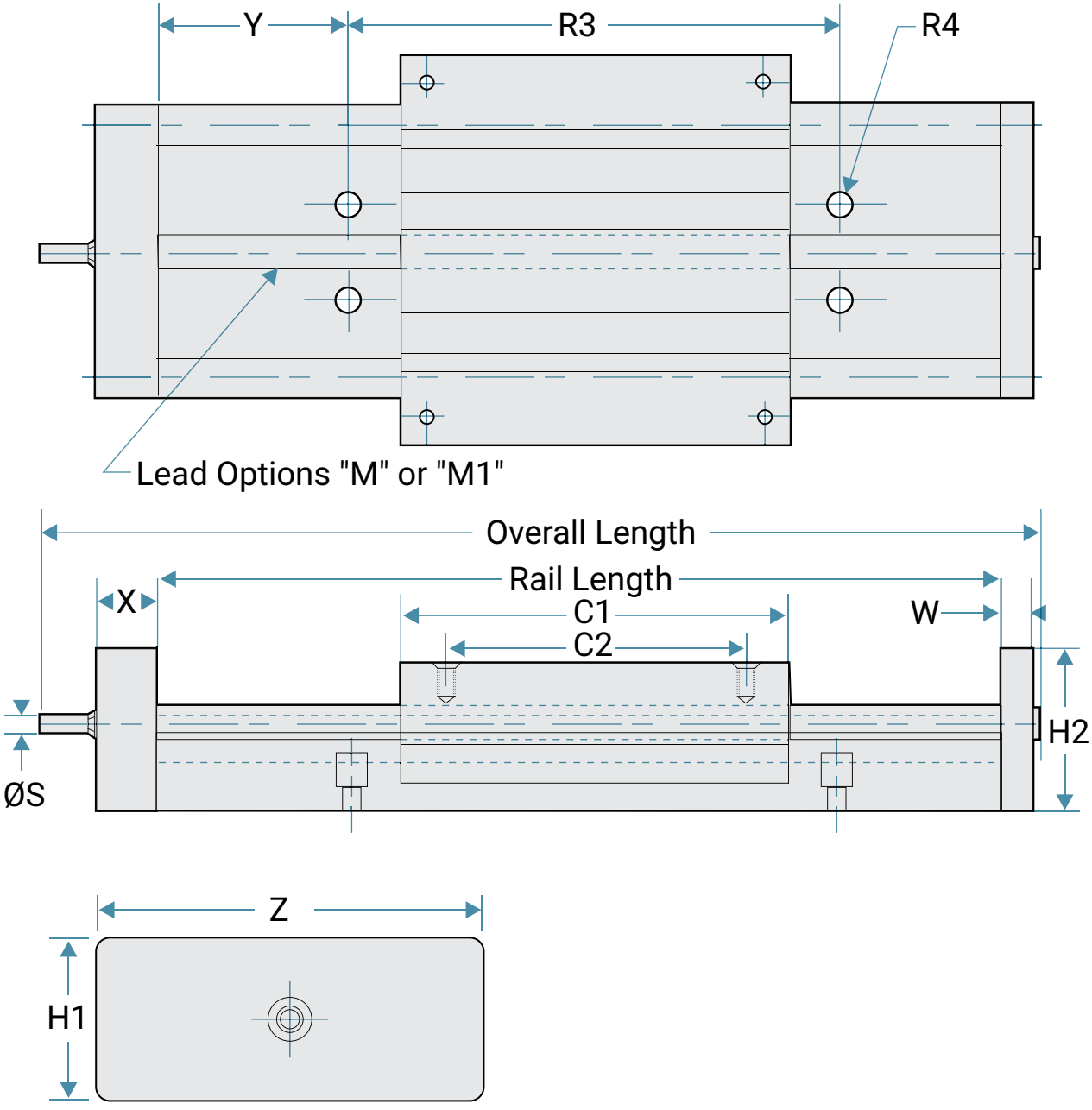



D100




D125

## DIMENSIONS




**Note:** Specify Y dimension (First Hole Offset - FHO) at time of order

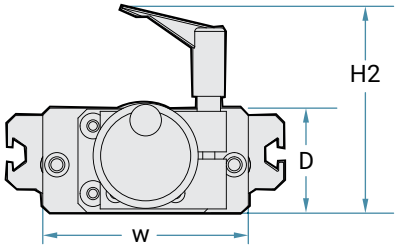
## Dimensional Data

| Part No. | Nominal Screw Dia. | M Standard Lead | M1 Optional Lead | C1 Standard | C2 Standard | C1 Extended | C2 Extended | C3 | S in | Y in | R3 in | R4 in | W in | X in | Z in | H1 in | H2 in |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D075 | 10 mm | 6 mm | 12 mm | 3.5 | 3.00 | 4.5 | 4.00 | 4.00 | 0.187 | 2 | 4 | 1/4 | 0.375 | 0.625 | 3.42 | 1.75 | 1.625 |
| D100 | 12 mm | 6 mm | 12 mm | 4.5 | 3.75 | 6.0 | 5.25 | 5.25 | 0.314 | 3 | 6 | 5/16 | 0.500 | 0.625 | 3.42 | 1.75 | 1.625 |
| D125 | 16 mm | 5 mm | 12 mm | 6.0 | 5.25 | 7.5 | 6.75 | 6.75 | 0.314 | 3 | 6 | 3/8 | 0.500 | 1.000 | 5.78 | 3.5 | 2.500 |

**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.

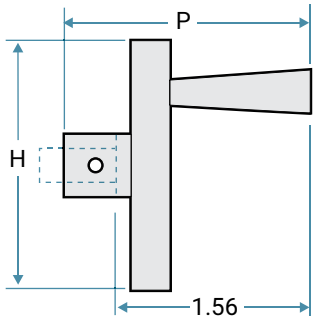
## Hand Brake Inches

| Part No. | W | D | H2 |
|---|---|---|---|
| D075HB | 3.42 | 1.74 | 3.4 |
| D100HB | 4.57 | 2.50 | 4.3 |
| D125HB | 5.79 | 3.47 | 4.7 |



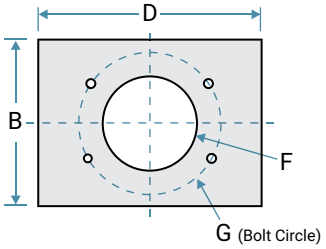

## Hand Crank

| Part No. | P | H |
|---|---|---|
| D075XH | 2.31 | 1.75 |
| D100XH | 2.31 | 2.25 |
| D125XH | 2.31 | 3.25 |




## Motor Mount Attachment

| Part No. | NEMA Motor | B | E | D |
|---|---|---|---|---|
| D075XN | NEMA 17 | 2.0 | 1.81 | 3.25 |
| D100XN | NEMA 23 | 2.5 | 1.81 | 3.25 |
| D125XN | NEMA 34 | 3.5 | 2.3 | 4.25 |



## Static Load Data

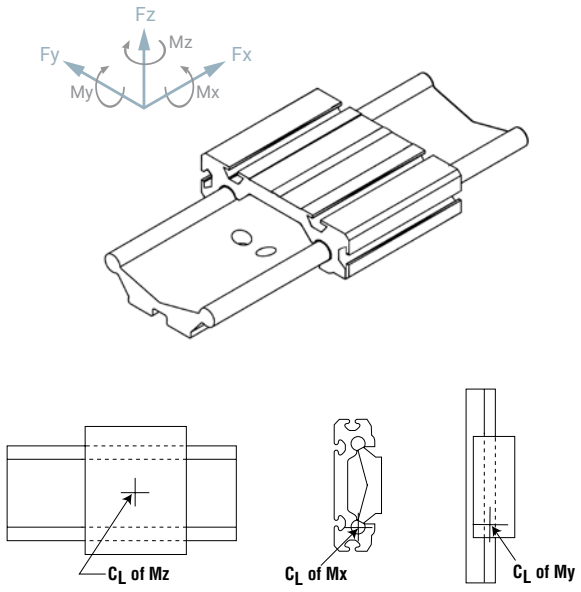
The numbers below are for guides only in a static condition. The drive mechanism selected (lead screw, ball screw, cylinder, etc.) becomes the limiting factor when calculating maximum load and speed capacities. The user is responsible for determining the maximum capacity for the complete system based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

| Size | Fz MAX Load lbs | Fz MAX Load N | Fz Inverted MAX Load lbs | Fz Inverted MAX Load N |
|---|---|---|---|---|
| **D075** | 500 | 2224 | 125 | 556 |
| **D100** | 750 | 3336 | 190 | 845 |
| **D125** | 1000 | 4448 | 250 | 1112 |

## Load/Moment Conversion

**N** = 4.45 x (lbs.)

**N-m** = 0.113 x (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.

| Bearing Material | MAX. PV | MAX. P | MAX. V No Lubrication |
|---|---|---|---|
| FrelonGOLD® | 20000 (psi x ft./min.) or 0.7 N/mm$^2$ x m/s | 3000 psi or 20.68 N/mm$^2$ | 300 sfm or 1.524 m/s |

**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.)

**PV** Example: **Load** = 85 psi

**Speed** = 180 ft./min.

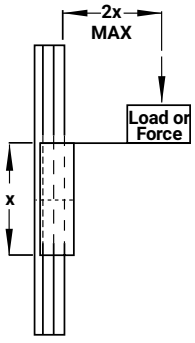
**PV** = 85 x 180 = 15,300 PV

**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.



# Uni-Guide™



## ORDERING INFORMATION

Configure Online

| D | | XXX | M | | – | 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

**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.

**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

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

**Number of Carriages**

**Note:** Specify Y dimension (hole to end) at time of order.

# Low Profile Uni-Guide™

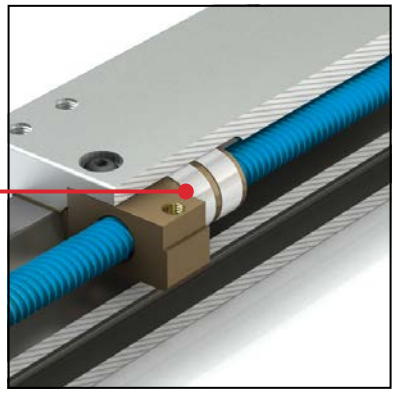
PBC Linear offers a Low Profile Uni-Guide driven system through the SIMO Series line of products. This process has revolutionized traditional machining. The SIMO process uses synchronized cutters, eliminating built-in extrusion variances by machining all critical edges concurrently. This ensures tight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

SIMO SERIES

## 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

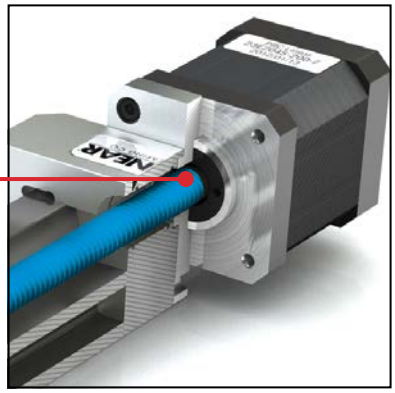
Patented Constant Force Technology nuts provide consistent anti-backlash operation



## 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

Drive end screw support bearings are integrated into the stepper motor



## Accessories

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

SIMO SERIES

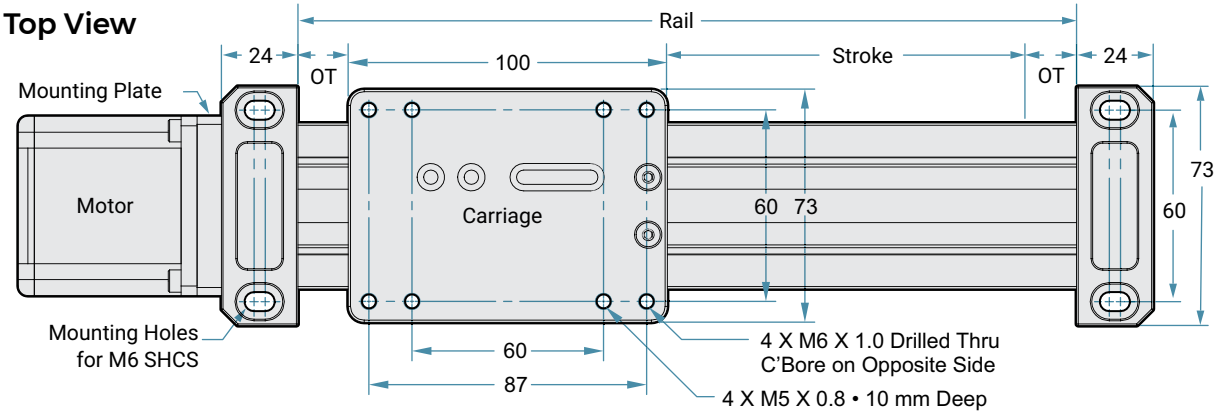
See other bearing and drive options in the full UG Series - SIMO Series Catalog.

# Low Profile Uni-Guide™

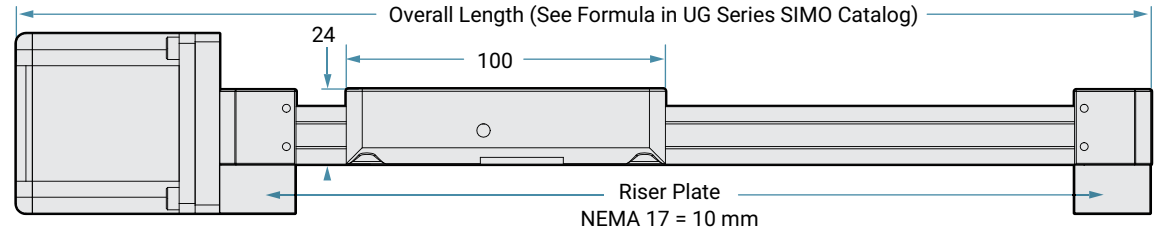


## SYSTEM DIMENSIONS

### Top View




### Side View




UGA Low Profile Rail

## ORDERING INFORMATION

Configure Online

| UG | A | 040 | D | – | A1 | X | – | XXXX | – | LS | X | XX | – | XX | X | 1 | – | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

**SIMO Series**

**Rail Type**
**A** = Low Profile

**Rail Width**
40 mm

**Order Type**
**D** = Driven

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

**Options**
**0** = No Options
**1** = Carriage Brake
**2** = Lube
**3** = Both

**Rail Length**
1500 mm max
Consult Factory for Longer Lengths

**Drive Type**
**LS** = Lead Screw

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

**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*

**Lead (mm)**
**AF** = 16
**AJ** = 10
**AX** = 5
**AG** = 2
**AH** = 1
*Consult Factory for Other Leads

**Nut**
**1** = Standard
**2** = Anti-Backlash

**Accuracy**
**1** = Class 10

**Other Options**

# Plain Bearings • Frelon® Material

## 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

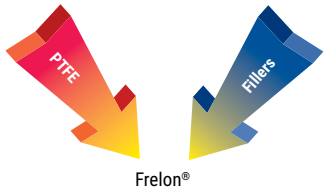
Frelon liners are compounds of PTFE and fillers developed for improved performance over other bearings. They provide low wear, low friction, self-lubrication, and high strength.

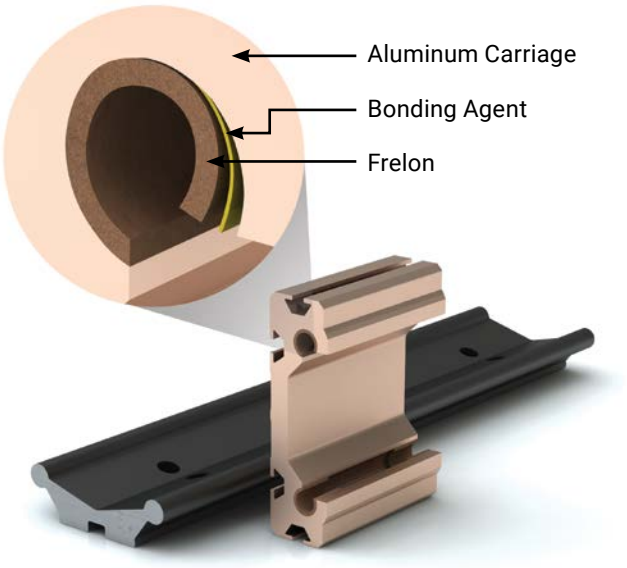
## PTFE Features:

- 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

| Bearing Material | Static Load Capacity |
|---|---|
| FrelonGOLD® | 3000 psi or 210.9 kgf/cm$^2$ |

- 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

| Bearing Material | No Lube Continuous Motion | No Lube Intermittent Motion | With Lubrication* |
|---|---|---|---|
| FrelonGOLD | 300 sfm<br>60 in/sec.<br>1.524 m/sec. | 825 sfm<br>165 in./sec.<br>4.19 m/sec. | 825 sfm<br>165 in./sec.<br>4.19 m/sec. |

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.

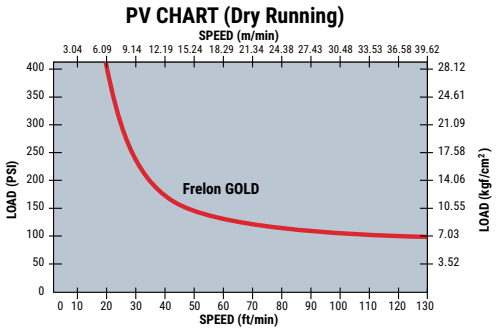
**PV** = The performance measurement of plain bearings

**PV** = P x V where P = pressure (load) in psi (kgf/cm2)

**V** = velocity (speed) in sfm (m/min.)

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

| Bearing Material | MAX. "PV" | MAX. "P" | MAX. "V" No Lubrication |
|---|---|---|---|
| FrelonGOLD | 20,000 (psi) x ft./min.)<br>or<br>430 (kgf/cm2 x m/min.) | 3000 psi<br>or<br>210.9 kgf/cm2 | 300 sfm<br>or<br>91.44 m/min. |




TECHNICAL

## 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:

- **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.
- **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 0.0002" to 0.0005", depending on the length of the stroke and surface requiring the transfer.
- **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.

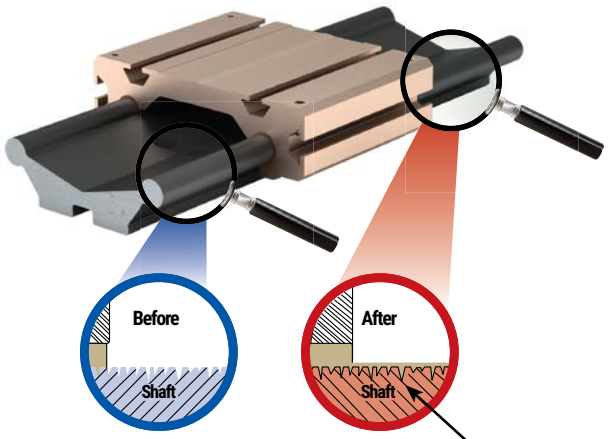
## Chemical Resistance

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.

## Frelon Transfer Process




At break-in, Frelon deposits a microscopic film on the shaft and fills the valleys in the surface finish creating a Frelon-on-Frelon running condition that is true self-lubrication.

**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

TECHNICAL

## 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.

| Material | %TML | %CVCM |
|---|---|---|
| FrelonGOLD | 0.00 | 0.00 |

**TML** = Total Mass Loss
**CVCM** = Collected Volatile Condensable Materials

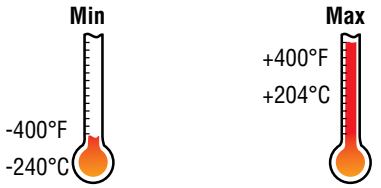
## Washdown and Submerged Applications

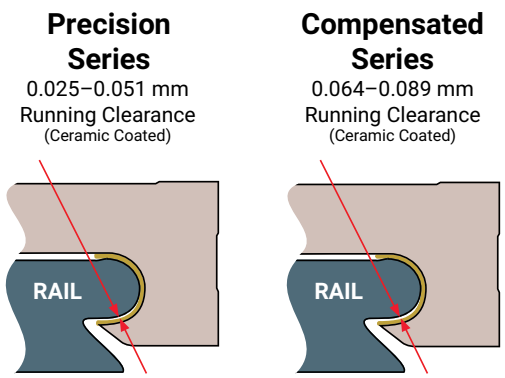
GST linear guides will provide excellent performance in a washdown or submerged condition.

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.

## Temperature Extremes




**Note:** The only GST product that offers the Compensated I.D. is Mini-Rail.

## 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.

## 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.

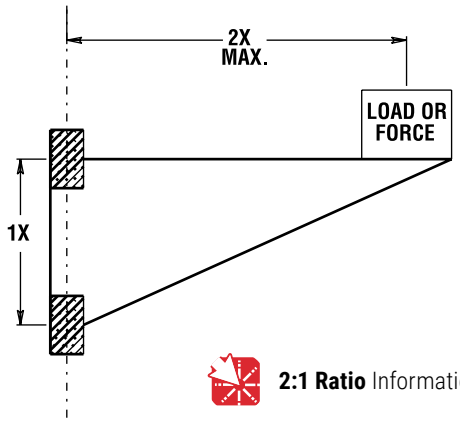
## Cantilevered Loads

- 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!**

**CAUTION** 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.




**2:1 Ratio** Information

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

P = force being applied

L = distance out from rail that P is being applied

s = center to center spacing of carriage

f = resultant force on carriage by rail

F = friction force on each carriage

μ = coefficient of friction (about .25 when not moving)

**Balance the moments:** $f * s = L * P$

$L / s = f / P$

**Compute friction force:** $F = f * \mu$

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.

$$P = 2 * F = 2 * f * \mu$$

**Substitute for P:**

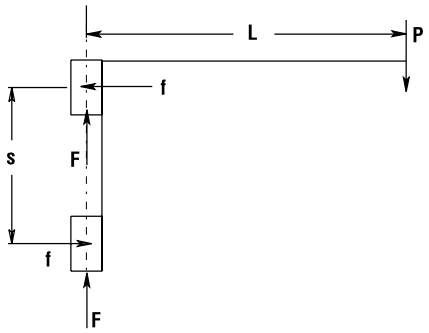
$L / s = f / ( 2 * f * \mu) = 1 / ( 2 * \mu ) = > L / s = 1 / ( 2 * \mu )$

Note: The forces drop out of the equation

Assume static coefficient of friction is .25 (μ = .25) then
L / s = 2 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.




TECHNICAL

## 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 * Y = W * Z

Note: To avoid problems when running without mass:

(M) Z = 1-1/2 s

W can be calculated. Load on bearing will be:

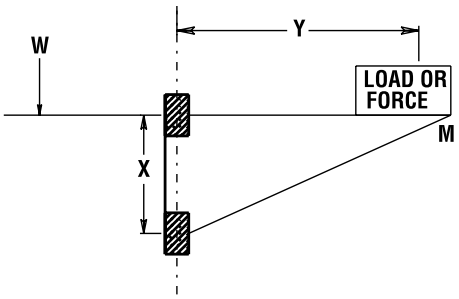
M + W

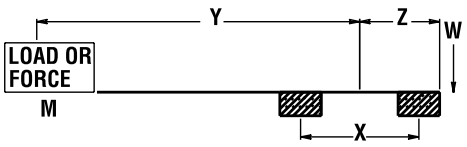
# of carriage

Example: 50 * 24 = W * Z (Z = 1-1/2 * 6 = 9)

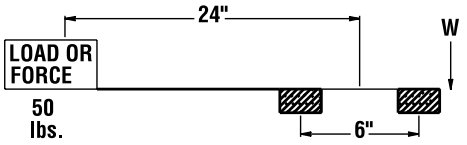
$$W = \frac{50 * 24}{9} = 133 \text{ lb.}$$

Load per bearing: $\frac{50 + 133}{4} = 45.75$ lb. / bearing




**EXAMPLE:**




### Cantilever Loads and Drive Force Location without Counterbalance

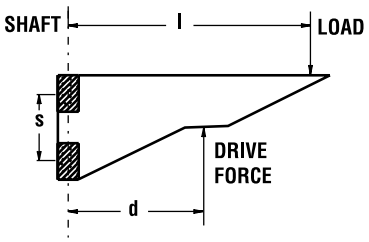
d = distance from shaft to Drive Force

l = distance from shaft to the load center of gravity

s = center to center spacing of the carriage on the rail (If non-self-aligning, then outside to outside distance should be used.)

L = l / s = Load Force Ratio

D = d / s = Drive Force Ratio




### General Rules:

- 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.
- 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.
- 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:

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

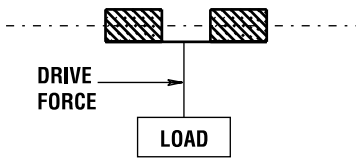
### Horizontal Applications:

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.

### Hanging or "Top Heavy" Horizontal Applications with High Acceleration Rates:

If your application will have high acceleration forces, use this formula for the value of the Drive Force Ratio:

$D = 0.8 \times L \times \sqrt{a}$ where a is acceleration in g's.



# Plain Bearing • Chemical Reaction Information

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.

See Next Page for Chart

# Plain Bearing • Chemical Reaction Chart

| Chemical | Frelon GOLD® | Bare Aluminum | Standard & Hard Coat Anodized Aluminum | 316 Stainless Steel |
|---|---|---|---|---|
| Acetic Acid, 20% | U | G | G | E |
| Acetone | G | E | E | E |
| Ammonia, Anhydrous | G | E | E | E |
| Ammonium Hydroxide, 10% | U | U | U | E |
| Ammonium Chloride, 10% | U | U | U | G |
| Ammyl Acetate (122°F / 50°C) | G | E | E | E |
| Barium Hydroxide | U | U | U | G |
| Beer | G | E | E | E |
| Boric Acid Solutions | G | E | E | G |
| Butane | G | G | G | G |
| Calcium Chloride, 20% | G | G | G | G |
| Calcium Hydroxide, 10% | G | G | G | G |
| Carbon Dioxide | G | E | E | G |
| Carbon Monoxide | G | E | E | E |
| Chlorine Gas, Dry | G | G | G | G |
| Chlorine Gas, Wet | U | U | U | U |
| Chromic Acid, 10% | U | G | E | E |
| Citric Acid, 5% | G | E | E | E |
| Ethyl Acetate | G | E | E | G |
| Ethyl Alcohol | G | E | E | G |
| Ethylene Glycol | G | E | E | G |
| Ferric Chloride, 50% | U | U | U | U |
| Formic Acid - Anhydrous | U | E | E | E |
| Gasoline, Unleaded | G | G | G | G |
| Hydrochloric Acid, 20% | U | U | U | U |
| Hydrochloric Acid, 35% | U | U | U | U |
| Hydrocyanic Acid, 10% | U | G | G | G |
| Hydrofluoric Acid - Dilute | U | U | U | U |
| Hydrofluoric Acid, 48% | U | U | U | U |
| Hydrogen | G | E | E | E |
| Hydrogen Peroxide - Dilute | U | E | E | G |

| Chemical | Frelon GOLD® | Bare Aluminum | Standard & Hard Coat Anodized Aluminum | 316 Stainless Steel |
|---|---|---|---|---|
| Hydrogen Sulfide, Dry | U | G | E | E |
| JP-4 | G | G | G | G |
| Kerosene | G | G | G | G |
| Lacitic Acid, 10% | G | G | G | E |
| Magnesium Chloride, 50% | G | U | U | G |
| Mercury | U | U | U | E |
| Methyl Alcohol | G | G | G | G |
| Methyl Ethyl Ketone | G | G | G | G |
| Methylene Chloride | G | E | E | G |
| Mineral Oil | G | G | G | G |
| Naptha | G | G | G | G |
| Nitric Acid, 70% | U | U | U | E |
| Phosphoric Acid, 10% | U | U | U | E |
| Sodium Chloride | G | U | U | E |
| Sodium Hydroxide, 20% | G | U | U | G |
| Sodium Hypochlorite, 20% | U | G | G | U |
| Sodium Peroxide, 10% | U | G | G | G |
| Steam (see water) | - | - | - | - |
| Sulfur Dioxide, Wet | U | U | U | G |
| Sulfur Dioxide, Dry | G | G | G | G |
| Sulfur Trioxide | U | G | G | G |
| Sulfuric Acid, 50% | U | U | U | U |
| Sulfurous Acid | U | G | G | E |
| Toluene (122°F / 50°C) | G | E | E | E |
| Turpentine | G | G | E | E |
| Water, Demineralized | U | G | E | E |
| Water, Distilled | G | U | S | G |
| Sea Water | G | G | E | G |
| Water, Sewage | G | U | S | G |
| Xylene | G | G | G | G |
| Zinc Chloride Solutions | U | U | U | G |

| Performance | Wear |
|---|---|
| E = Excellent | < .002" per year |
| G = Good | < .020" per year |
| S = Satisfactory | < .050" per year |
| U = Unsatisfactory | > .040" per year |

TECHNICAL

# Optimized Solution
## with Gliding Surface Technology

### Application PROBLEM:

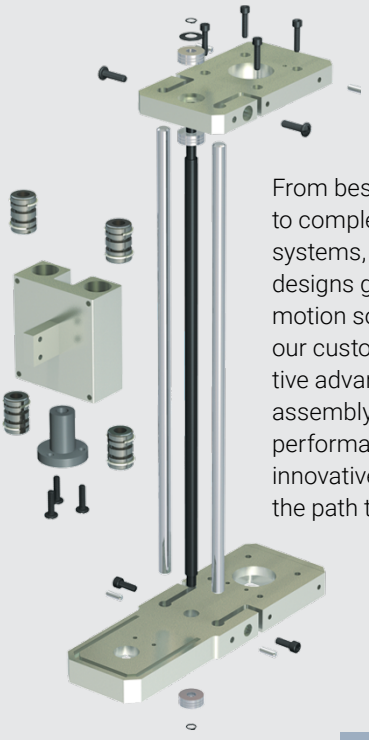
Material handling and positioning of samples on a blood chemistry analyzer.

### Problems with Intial Design:

- Numerous Parts
- Multiple Machining Operations
- Complex Assembly
- Several Part/Machine Vendors

| Component Solution | |
|---|---|
| 2 | End Blocks |
| 3 | Screw Support Bearings |
| 2 | Shafts |
| 1 | Lead Screw |
| 4 | Shaft Bearings |
| 1 | Lead Screw Nut |
| 20 | Fasteners & Dowels |
| 3 | Complex Machined Parts |
| ! | SEVERAL VENDORS |

= **33** **COMPONENTS**



From best-in-class components to complete concept-to-creation systems, PBC Linear actively designs game-changing, linear motion solutions that provide our customers with the competitive advantage by streamlining assembly, improving application performance and implementing innovative ideas that put you on the path to success.

Improve Life & Reliability
Faster Time To Market
Improve Performance
Reduce Risk
Reduce Total Costs
Streamline Assembly

### PBC Linear Solution:

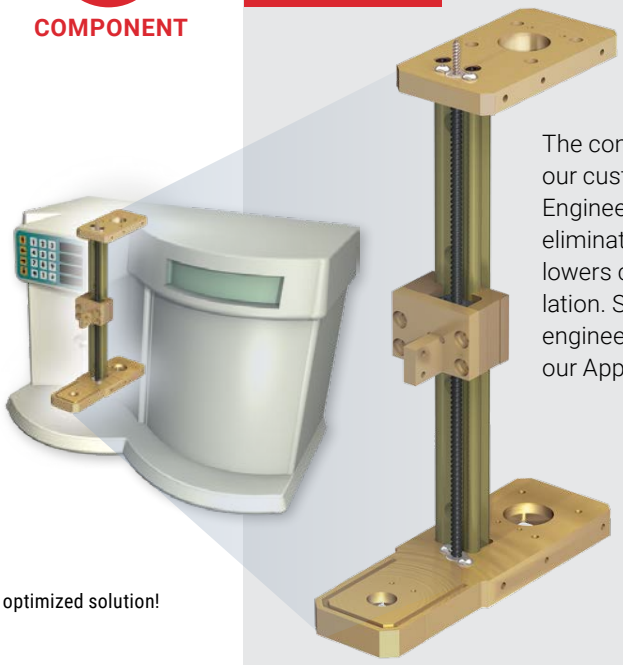
- Compact, zero maintenance design with GST's FrelonGOLD® Liner
- Significantly reduced part count
- Simplified assembly and improved aesthetics
- Complete solution from one vendor

= **1** **COMPONENT**

**PBC LINEAR ENGINEERED SOLUTION**

**40% SAVED IN ASSEMBLY COSTS**

Watch the Case Study Video



The communication between our customers and Application Engineers allows PBC Linear to eliminate large part counts and lowers cost of time and installation. Start working on your engineered design, e-mail one of our Application Engineers now!

E-mail our application engineers to get started on your optimized solution!

Email an Application Engineer

PBC Linear®

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# Engineering Your Linear Motion Solutions

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## Range of Offerings

Components

Mechatronics

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D075, 9.5" Rail

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Mini-Rail Linear Guide
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