Product Comparison

Line drawings shown at 1:2 scale

Redi-Rail® Metric Series
Radial capacities from 1000 N to 5950 N

Patented side adjustable preload makes fine-tuning easy for the optimal fit

Industrial strength rail and slider are sealed against contamination

Redi-Rail® Inch Series
Radial capacities from 340 lb. to 850 lb.

Heavy duty bearing system handles extremely high loads and is cost effective

Hevi-Rail®
Bearing and rail system static radial capacities from 5.23 kN to 59.2 kN

Watch the Cam Roller Technology product video
Low Profile Redi-Rail®
Radial capacity to 1220 N

Low 19 mm profile is lightweight and thrives in tight spaces
Roll formed rails and machined aluminum slider body with preload adjustability

Commercial Rail
Radial capacities from 210 N to 1330 N

Low cost, strong, long-lasting solution

Hardened Crown Roller
Loads to 300 lb.

Industry standard v-wheels and rails are a versatile linear motion solution

V-Guide™
Radial capacities from 1260 N to 9991 N

Link to whitepaper "Lubrication for Roller Bearings and Raceways"
## CAM Roller Technology Product Selection Guide

### Redi-Rail® & Low Profile Redi-Rail

<table>
<thead>
<tr>
<th>Usage Criteria</th>
<th>Precision</th>
<th>Moment Load</th>
<th>Structural Element</th>
<th>Harsh Environments</th>
<th>Found on page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precision straight rails and hardened gothic arch rollers are ideal for high speed and moderate load linear motion. Rollers are equipped with double-row sealed bearings. Rails are integrated with hardened steel races to ensure strength within a lightweight design.</td>
<td>Good</td>
<td>Better</td>
<td>Best</td>
<td>Good</td>
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</table>

### Commercial Rail

<table>
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<th>Structural Element</th>
<th>Harsh Environments</th>
<th>Found on page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roll formed rails made of zinc plated steel provide a low cost and corrosion resistant solution. Machined aluminum slider body with steel wheels comes with standard adjustable preload.</td>
<td>Good</td>
<td>Better</td>
<td>Best</td>
<td>Good</td>
<td>16</td>
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</table>

### Hardened Crown Roller

<table>
<thead>
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<th>Precision</th>
<th>Moment Load</th>
<th>Structural Element</th>
<th>Harsh Environments</th>
<th>Found on page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-assembled rollers are self-aligning for easy installation. Roller bearings combined with rails in steel or powder coated finish are an inexpensive choice for long lasting linear motion.</td>
<td>Good</td>
<td>Better</td>
<td>Best</td>
<td>Good</td>
<td>16</td>
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### V-Guide

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<th>Structural Element</th>
<th>Harsh Environments</th>
<th>Found on page</th>
</tr>
</thead>
<tbody>
<tr>
<td>V-Guide components offer an excellent solution for linear applications ranging from very clean to the harshest environments. Industry standard V-Guide wheels and rails are a versatile linear motion solution.</td>
<td>Good</td>
<td>Better</td>
<td>Best</td>
<td>Good</td>
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</table>

### Hevi-Rail®

<table>
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<th>Moment Load</th>
<th>Structural Element</th>
<th>Harsh Environments</th>
<th>Found on page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hevi-Rail is a heavy-duty linear bearing system that is cost effective for medium to low precision applications. The system is easy to mount, align, and use. High radial and axial load capacities ensure a long and productive life under continuous use.</td>
<td>Good</td>
<td>Better</td>
<td>Best</td>
<td>Good</td>
<td>28</td>
</tr>
</tbody>
</table>
Contents

M Redi-Rail® Metric Series

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I Redi-Rail Inch Series

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M Commercial Rail

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M Hevi-Rail®

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Common Buttons and Links

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

Watch product videos
Email an application engineer
Link to specific product information
Applications

Ergonomic & Mobile Seat Adjustment:
Commercial Rail roller bearings, Redi-Rail®, and Hardened Crown Roller each offer reliable mechanical roller systems for seat adjustment in clean and dirty environments.

Rack Systems & Mobile Command Centers:
Hevi-Rail® combined roller systems handle extremely high loads in industrial strength applications. Systems can be optimized to provide telescopic sliding solutions.

Sliding Doors:
V-Guide wheels and rails are ideal for sliding door mechanisms. They provide smooth and quiet travel in a wide range of environments.

Depalletizers & Heavy duty lift systems:
Cam Roller products from PBC Linear, such as Hevi-Rail, provide the industrial strength and cantilever load capabilities required in heavy duty lift systems.
Applications

**Mobile Equipment:**
PBC Linear’s Hevi-Rail® and Commercial Rail provide top quality motion control and thrive in harsh environments: extreme temperatures, heavy vibration, high loads, and contaminants.

**Kiosk & Automated Retail:**
A motion control solution, such as Redi-Rail®, has many benefits including reduced part count, decreased installation costs, and improved performance.

**Medical & Laboratory Equipment:**
Redi-Rail provides smooth and consistent rolling performance for medical applications such as tables, carts, and chairs.

**Material Handling & Heavy Duty Industrial Systems:**
Hevi-Rail bearings provide smooth linear guidance in the toughest applications. Hevi-Rail is an economical solution in the harshest industrial environments, handling loads up to 6.6 tons per bearing.
Redi-Rail® Linear Guides

**METRIC SERIES**

**Product overview**
- Patented side adjustment feature makes setting preload easy
- Integral seals to wipe raceway
- Bearings sealed against contamination
- Gothic arch rollers
- Operating temperature range from -20°C to 80°C (-4°F to 176°F)
- Oil-filled plastic or UHMW spring loaded wipers
- Custom carriages can be designed, engineered, and manufactured to meet your specific requirements

<table>
<thead>
<tr>
<th>Series</th>
<th># of Rollers</th>
<th>Fd N</th>
<th>Fy N</th>
<th>Fz N</th>
<th>Mx N-M</th>
<th>My N-M</th>
<th>Mz N-M</th>
<th>MAX Speed M/min</th>
<th>MAX Speed M/S</th>
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<tbody>
<tr>
<td>RR30</td>
<td>3</td>
<td>1440</td>
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<td>38</td>
<td>175</td>
<td>464</td>
<td>480</td>
<td>8</td>
</tr>
</tbody>
</table>

Fd = Dynamic capacity (LC)
Fz = Axial capacity
Fy = Radial capacity
Mx, My, Mz = Moment capacities

Conversions
newton (N) • 0.2248 = lb.
(lbf) meter • 0.0397 = inch
newton - meter (N-m) • 8.851 = in.-lb.

1:1 Scale  Dimensions shown in mm

Link to video "How to Adjust Redi-Rail Carriages"
### INCH SERIES

<table>
<thead>
<tr>
<th>Series</th>
<th># of Rollers</th>
<th>Fd</th>
<th>Fy</th>
<th>Fz</th>
<th>Mx</th>
<th>My</th>
<th>Mz</th>
<th>MAX Speed</th>
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</thead>
<tbody>
<tr>
<td>RR14</td>
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<td>340</td>
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<td>54</td>
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<td>800 9600</td>
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### LOW PROFILE

<table>
<thead>
<tr>
<th>Series</th>
<th># of Rollers</th>
<th>Fd</th>
<th>Fy</th>
<th>Fz</th>
<th>Mx</th>
<th>My</th>
<th>Mz</th>
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<td>110</td>
<td>31</td>
<td>14 120 31 270 13 110 500 6000</td>
</tr>
</tbody>
</table>

Fd = Dynamic capacity (LC)  
Fz = Axial capacity  
Fy = Radial capacity  
Mx, My, Mz = Moment capacities

**Conversions**

newton (N) • 0.2248 = lb.
(lbf) meter • 0.0397 = inch
newton - meter (N-m) • 8.851 = in.-lb.

**1:1 Scale** Dimensions shown in inches for RR14 & RR18; mm for RRL34

Link to video "Adjusting Pre-Load on Low Profile Redi-Rail Carriages"
### Redi-Rail® Linear Guides • ISO Metric Series

#### SLIDE DIMENSIONS

![Diagram of slide dimensions]

- **Double Row Bearing**: High speed & acceleration
- **Sealed Roller**: Ideal around contaminants
- **Wiper**: Molded plastic casing spring-load for even pressure
- **Pre-Load Adjustment**: Patented side adjustable preload

#### Dimensional Information mm

<table>
<thead>
<tr>
<th>Part No.</th>
<th># of Rollers</th>
<th>A1</th>
<th>A</th>
<th>G</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>Mounting Holes</th>
<th>Weight kg</th>
</tr>
</thead>
<tbody>
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<td>RRS30</td>
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<td>4</td>
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<td>28</td>
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<td>30</td>
<td>15.9</td>
<td>112</td>
<td>26</td>
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<td></td>
<td>5</td>
<td>22.6</td>
<td>28</td>
<td>25.4</td>
<td>30</td>
<td>15.9</td>
<td>137</td>
<td>26</td>
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<td>0.17</td>
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<td>33</td>
<td>38.1</td>
<td>45</td>
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<td>117</td>
<td>36</td>
<td>M8 x 1.25</td>
<td>0.23</td>
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<tr>
<td></td>
<td>4</td>
<td>25.8</td>
<td>33</td>
<td>38.1</td>
<td>45</td>
<td>20.4</td>
<td>152</td>
<td>35</td>
<td>M8 x 1.25</td>
<td>0.28</td>
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<td>5</td>
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<td>38.1</td>
<td>45</td>
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<td>65</td>
<td>28.6</td>
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<td>32.3</td>
<td>42</td>
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<td>65</td>
<td>28.6</td>
<td>215.35</td>
<td>52</td>
<td>M8 x 1.25</td>
<td>0.54</td>
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<td>32.3</td>
<td>42</td>
<td>50.8</td>
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<td>28.6</td>
<td>268.7</td>
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#### Load Ratings

<table>
<thead>
<tr>
<th>Part No.</th>
<th># of Rollers</th>
<th>Fd</th>
<th>Fy</th>
<th>Fz</th>
<th>Mx</th>
<th>My</th>
<th>Mz</th>
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<tr>
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<td>8925</td>
<td>2796</td>
<td>38</td>
<td>175</td>
<td>464</td>
</tr>
</tbody>
</table>

#### Conversions

- Newton (N) • 0.2248 = lb. (lbf)
- Meter • 0.0397 = inch
- Newton - meter (N-m) • 8.851 = in.-lb.

#### Slide Ordering Information

**Steel Roller Version**

- **Redi-Rail Slide**
  - Nominal Size
    - 30 = Dimension
    - 45 = Dimension
    - 65 = Dimension
  - **Wiper Options**
    - No Entry = Oil filled plastic (standard)
    - U = UHMW wipers

**Stainless Steel Roller Version**

- **Corrosion Resistance**
  - SS = 440 SST Rollers

**Number of Rollers**

- 3 = 3 Rollers
- 4 = 4 Rollers
- 5 = 5 Rollers

**Adjustable Pre-Load**

Ordering example:

- RRS65U for steel roller and
- RRS30A-3R-SS for stainless steel roller

*4 and 5 wheel carriages not available in stainless steel option*
Linear Guides Redi-Rail® • ISO Metric Series

RAIL DIMENSIONS

Dimensional Information mm

<table>
<thead>
<tr>
<th>Part No.</th>
<th>X</th>
<th>B</th>
<th>Mounting Fasteners</th>
<th>Weight kg/m</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR30</td>
<td>60</td>
<td>30</td>
<td>M5 BHCS</td>
<td>0.868</td>
</tr>
<tr>
<td>RR45</td>
<td>60</td>
<td>45</td>
<td>M6 BHCS</td>
<td>1.718</td>
</tr>
<tr>
<td>RR65</td>
<td>80</td>
<td>65</td>
<td>M6 BHCS</td>
<td>3.758</td>
</tr>
</tbody>
</table>

Note: Rail lengths are available up to 6 m. Y dimension is specified by customer at time of order. If Y is not specified, holes are centered on length of rail. BHCS - Button Head Cap Screw.

Roller/Shaft Interface

- Gothic Arch Contact for smooth, high speed performance

Rail Ordering Information

Example: RR65-1200; Y = 20 mm
Specify Y dimension (hole to end) at time of order
Redi-Rail® Linear Guides • Inch Series

SLIDE DIMENSIONS

Sealed Roller
Ideal around contaminants

Double Row Bearing
High speed & acceleration

Dimensional Information inches

<table>
<thead>
<tr>
<th>Part No.</th>
<th>A1</th>
<th>A</th>
<th>G</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>Mounting Holes</th>
<th>Weight lb.</th>
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</thead>
<tbody>
<tr>
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<td>0.938</td>
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<td>4.13</td>
<td>1/4-28</td>
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<tr>
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<td>0.938</td>
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<td>1.33</td>
<td>0.62</td>
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<td>5.36</td>
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<td>1.50</td>
<td>1.921</td>
<td>0.76</td>
<td>4.50</td>
<td>5.36</td>
<td>5/16-24</td>
<td>0.50</td>
</tr>
<tr>
<td>RRS18PW</td>
<td>0.823</td>
<td>1.125</td>
<td>1.50</td>
<td>1.921</td>
<td>0.76</td>
<td>5.62</td>
<td>7.08</td>
<td>5/16-24</td>
<td>0.50</td>
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Load Ratings

<table>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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<td>RRS14/PW</td>
<td>421</td>
<td>340</td>
<td>79</td>
<td>21</td>
<td>54</td>
<td>201</td>
</tr>
<tr>
<td>RRS18/PW</td>
<td>1032</td>
<td>850</td>
<td>168</td>
<td>67</td>
<td>153</td>
<td>677</td>
</tr>
</tbody>
</table>

Conversions

newton (N) • 0.2248 = lb.
(lbf) meter • 0.0397 = inch
newton - meter (N-m) • 8.851 = in.-lb.

Slide Ordering Information

Ordering example: RRS18 for steel roller and RRS14F-3R-SS for stainless steel roller
Linear Guides Redi-Rail® • Inch Series

RAIL DIMENSIONS

Dimensional Information inches

<table>
<thead>
<tr>
<th>Part No.</th>
<th>X</th>
<th>B</th>
<th>Mounting Fasteners</th>
<th>Weight lb./ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR14</td>
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<td>0.56</td>
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<td>1.91</td>
<td>1/4&quot; BHCS</td>
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</tr>
</tbody>
</table>

Note: Rail lengths are available up to 19’ (6 m). Y dimension is specified by customer at time of order. If Y is not specified, holes are centered on length of rail. BHCS - Button Head Cap Screw.

Roller/Shaft Interface

Gothic Arch Contact for smooth, high speed performance

Rail Ordering Information

Example: RR18-072.000; Y = 2 inches
Specify Y dimension (hole to end) at time of order

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Redi-Rail® Linear Guides • Low Profile

SLIDE DIMENSIONS

M5 x 0.8 THRU x 6 Mounting Holes

Sealed Roller
Ideal around contaminants

Double Row Bearing
High speed & acceleration

Pre-Load Adjustment
Patented side adjustable preload

Dimensional Information mm

<table>
<thead>
<tr>
<th>Part No.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>C1</th>
<th>C2</th>
<th>D</th>
<th>D1</th>
<th>E</th>
<th>F</th>
<th>Mounting Holes</th>
<th>Weight lb.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RRL34C</td>
<td>76.2</td>
<td>36.8</td>
<td>13.9</td>
<td>19</td>
<td>7.9</td>
<td>38</td>
<td>55</td>
<td>90</td>
<td>76</td>
<td>M5 x 0.8 Thru x 6</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Load Ratings

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Fy</th>
<th>Fz</th>
<th>Mx</th>
<th>My</th>
<th>Mz</th>
</tr>
</thead>
<tbody>
<tr>
<td>RRL34C</td>
<td>1220</td>
<td>270</td>
<td>510</td>
<td>14</td>
<td>120</td>
</tr>
</tbody>
</table>

Conversions

newton (N) • 0.2248 = lb. (lbf)
Meter • 0.0397 = inch
newton-meter (N-m) • 8.851 = in.-lb.

Slide Ordering Information

Ordering example:
RRL34C-A2-19A-CO
**RAIL DIMENSIONS**

**Dimensional Information mm**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>X</th>
<th>Mounting Fasteners</th>
<th>Weight kg/m</th>
</tr>
</thead>
<tbody>
<tr>
<td>RRL34</td>
<td>36.8</td>
<td>33.5</td>
<td>10.2</td>
<td>16.8</td>
<td>80</td>
<td>M5 BHCS</td>
<td>0.7559</td>
</tr>
</tbody>
</table>

Note: Rail lengths are available up to 10 ft (3048 mm). Y dimension is specified by customer at time of order. If Y is not specified, holes are centered on length of rail. BHCS - Button Head Cap Screw.

**Roller/Shaft Interface**

Gothic Arch Contact for smooth, high speed performance

**Rail Ordering Information**

Ordering example: RRL34R-RO-1200; Y = 20 mm
Specify Y dimension (hole to end) at time of order
Adjusting Slide Preload

ON Metric Series

Slide preload is initially set by the factory. If further adjustments are needed, here are some simple steps to follow:

1. To loosen the eccentric (center) roller, use an allen wrench to loosen the screw that is on the side of the mounting block. Be sure to loosen the screw that is on the side of the direction you want the roller to move.

2. When it is loose, tighten the set screw on the opposite side of the block. This will move the roller and mounting stud.

3. Make a very small change, retighten the first set screw, and try it out. If the preload is too loose, you will feel the slider rock and you will hear a slight “clunk.” If it is too tight, the slider will roll rough, like riding a bicycle on a gravel road.

4. Move the slide along the length of the rail by hand. Adjust it so that it does not feel loose anywhere. It may take you several times to get the proper adjustment.

5. Make sure the rollers are tightened with the proper adjustment prior to operation. It is recommended to lock the set screws in place with a breakable threadlocker so they will hold position and minimize any effects of vibration.

Lubrication – Rails & Bearings

Redi-Rail rollers are internally lubricated for life, but the rails must always have a layer of grease. As a guideline, reapply fresh grease every 50000 cycles. PBC Linear recommends white lithium based grease.

Slider Orientation

The 3-roller slide should be installed in the rail so the load is shared on the two outside rollers. The orientation marks indicate how to align the slider with the load direction.

Mounting Slider body & Max Capacity

The table shows recommended bolt tightening torques for mounting to the slide body. Be sure to use bolts that are long enough to obtain full thread engagement.

<table>
<thead>
<tr>
<th>Part No.</th>
<th>in.-lb. Torque</th>
<th>Nm Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>RRS14, RRS30</td>
<td>25</td>
<td>3</td>
</tr>
<tr>
<td>RRS18, RRS45</td>
<td>70</td>
<td>8</td>
</tr>
<tr>
<td>RRS65</td>
<td>150</td>
<td>24</td>
</tr>
</tbody>
</table>
Load Comparison

Part No. | Fy (lb.) | Fz (lb.) | Mx (lb.-in.) | My (lb.-in.) | Mz (lb.-in.)
--- | --- | --- | --- | --- | ---
RRS14 | 336 | 79 | 21 | 54 | 201
RRS18 | 847 | 168 | 67 | 153 | 677
RRS30 | N | N | Nm | Nm | Nm
RRS45 | 1002 | 330 | 1.8 | 5.5 | 12.5
RRS65 | 2660 | 827 | 6.6 | 19.9 | 47.9
RRS95 | 5950 | 1,678 | 19.0 | 58.2 | 154.7

Load Comparison

Part No. | Fy (N) | Fz (N) | Mx (Nm) | My (Nm) | Mz (Nm)
--- | --- | --- | --- | --- | ---
RRS30 | 220 lbs. | 1000 N | 5950 N | 1340 lbs. | 5950 N
RRS45 | 598 lbs. | 2660 N | 1340 lbs. | 5950 N | 340 lbs.
RRS65 | 337 lbs. | 1678 N | 168 lbs. | 747 N | 168 lbs.
RRS95 | 79 lbs. | 351 N | 74 lbs. | 330 N | 74 lbs.

L = 10^7 • (Fd/(Load_Equiv • RF))^3.0 (inches)

Fd = Slider Life Capacity which is found in the table

Load_Equiv = Equivalent Radial Load found from the following equation:

Load_Equiv = Fy • (LoadAxial/Fz) + Mx/Mx_MAX + My/My_MAX + Mz/Mz_MAX + Load_Radial

To calculate an approximate life for Redi-Rail sliders, use the following equation:

Inch Series

L = 10^7 • (Fd/(Load_Equiv • RF))^3.0 (inches)

Fd = Slider Life Capacity which is found in the table

Load_Equiv = Equivalent Radial Load found from the following equation:

Load_Equiv = Fy • (LoadAxial/Fz) + Mx/Mx_MAX + My/My_MAX + Mz/Mz_MAX + Load_Radial

Metric Series

L = (Fd/(Load_Equiv • RF))^3.0 • 100,000 (meters)

Fd = Slider Life Capacity which is found in the table

Load_Equiv = Equivalent Radial Load found from the following equation:

Load_Equiv = Fy • (LoadAxial/Fz) + Mx/Mx_MAX + My/My_MAX + Mz/Mz_MAX + Load_Radial

Conversions

- newton (N) • 0.2248 = lb.
- (lbf) meter • 0.0397 = inch
- newton - meter (N-m) • 8.851 = in.-lb.

Note:

- Reduction factors apply to both inch and metric series
- RF = Reduction Factor of the application or environment
  - 1.0 to 1.5 for very clean, low speed (<30% MAX), low shocks
  - 1.5 to 2.0 or some dirt, moderate speed (30% MAX to 75% MAX), medium shocks and vibration
  - 2.0 to 3.0 for heavy dirt and dust, high speeds (>75% MAX) and heavy shocks and vibration

Conversions

newton (N) • 0.2248 = lb.
(lbf) meter • 0.0397 = inch
newton - meter (N-m) • 8.851 = in.-lb.
Commercial Rail Linear Guides

<table>
<thead>
<tr>
<th>Steel</th>
<th>No. of Rollers</th>
<th>Fd N</th>
<th>Fy N</th>
<th>Fz N</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR20</td>
<td>3</td>
<td>280</td>
<td>210</td>
<td>160</td>
</tr>
<tr>
<td>CR30</td>
<td>3</td>
<td>800</td>
<td>610</td>
<td>420</td>
</tr>
<tr>
<td>CR45</td>
<td>3</td>
<td>1740</td>
<td>1330</td>
<td>930</td>
</tr>
</tbody>
</table>

**Features & Benefits**

Commercial Rail is a simple and cost effective linear motion solution with high load capacity and corrosion resistance.

- Precision formed rails available in zinc plated carbon steel
- Speeds up to 1.5 m/s (59 in./s)
- Withstands temperatures up to 100°C (212°F)
- Load capability up to 1330 N (298 lb.)
- Open-end wrench available for preload adjustment

**Roll Formed Rail**
- Is corrosion resistant

**Sealed Roller**
- Ideal around contaminants

**Conversions**

newton (N) • 0.2248 = lb.
(lbf) meter • 0.0397 = inch
newton - meter (N-m) • 8.851 = in.-lb.

**1:1 Scale** Dimensions shown in mm
Linear Guides Commercial Rail

Product Overview
- Roll formed rails made of steel sheet for low cost and corrosion resistance application
- Zinc plated rail length up to 6000 mm
- Machined slider body made of aluminum alloy and anodized for corrosion resistance
- Steel rollers are made of 52100 chrome steel, hardened and ground, lubricated for life, and sealed against contamination
- Rollers made with thread integrated inner ring for ease of assembly and adjustment of preload
- Custom polymer wipers can be designed and manufactured to improve the smoothness of motion and service life
- Maximum operating temperature of 100°C (212°F)
- Consult with factory for special hole spacing
- Speed up to 1.5 m/s
- Moment loads should be carried by two slides or two parallel rollers

Material & Finish Specifications

<table>
<thead>
<tr>
<th>Material</th>
<th>CR Series Rail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail</td>
<td>Carbon steel sheet, Zinc plated</td>
</tr>
<tr>
<td>Slide</td>
<td>Aluminum alloy anodized</td>
</tr>
<tr>
<td>Rollers</td>
<td>Chrome steel</td>
</tr>
<tr>
<td>Hardware</td>
<td>Steel zinc plated</td>
</tr>
</tbody>
</table>

Lubrication – Rails & Bearings
The rollers are internally lubricated for life, but the rails must always have a layer of grease. As a guideline, reapply fresh grease every 50000 cycles.

Preload Adjustment
- To loosen the center roller, use an Allen wrench to untighten the screw while holding the roller still with an open-end wrench
- Turn the center roller to a position to achieve the desired preload
- Move the slide along the length of the rail by hand, and adjust it so that it does not feel loose anywhere
- Tighten the screw while holding the roller flat with an open-end wrench

<table>
<thead>
<tr>
<th>Preload Adjustment</th>
<th>CR20/CRSS20</th>
<th>CR30/CRSS30</th>
<th>CR45</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open-End Wrench</td>
<td>6 mm</td>
<td>10 mm</td>
<td>14 mm</td>
</tr>
<tr>
<td>PBC Linear Part Number</td>
<td>6101227</td>
<td>6101226</td>
<td>6101225</td>
</tr>
</tbody>
</table>

Mounting

| Slide Orientation | The 3-roller slide should be installed in the rail so that the load is shared among the two outside rollers. The orientation marks indicate how to align the slider with the load direction. |

<table>
<thead>
<tr>
<th>Mounting Specifications</th>
<th>CR20/CRSS20</th>
<th>CR30/CRSS30</th>
<th>CR45</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slide mount screws (Socket head cap)</td>
<td>M5</td>
<td>M6</td>
<td>M8</td>
</tr>
<tr>
<td>Tightening torque (IN/Lb.)</td>
<td>25</td>
<td>43</td>
<td>103</td>
</tr>
<tr>
<td>Tightening torque (N-m)</td>
<td>3</td>
<td>5</td>
<td>12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Clearance Suggested Fastener (Button head cap)</th>
<th>CR20</th>
<th>CR30</th>
<th>CR45</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size (Clearance)</td>
<td>0.115</td>
<td>0.158</td>
<td>0.256</td>
</tr>
<tr>
<td>Rail (Button head cap)</td>
<td>M4</td>
<td>M5</td>
<td>M8</td>
</tr>
<tr>
<td>Rail (Button head cap)</td>
<td>2.921</td>
<td>4.0132</td>
<td>6.5024</td>
</tr>
<tr>
<td>Head Height*</td>
<td>0.087</td>
<td>0.108</td>
<td>0.433</td>
</tr>
<tr>
<td>Head Height*</td>
<td>2.2</td>
<td>2.75</td>
<td>11</td>
</tr>
</tbody>
</table>

*Head height dimensions meet ISO 7380

Link to temperature information – page 65

Email an Application Engineer

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Commercial Rail Linear Guides

SLIDE DIMENSIONS

Sealed Roller
Ideal around contaminants

Machined Body
Anodized aluminum alloy

Dimensional Information mm

<table>
<thead>
<tr>
<th>Part No.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G1</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
<th>Ø ref</th>
<th>Y1</th>
<th>Thread Pitch</th>
<th>Weight KG</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR20</td>
<td>17.8</td>
<td>20</td>
<td>6.9</td>
<td>60</td>
<td>12.7</td>
<td>10.25</td>
<td>20</td>
<td>20</td>
<td>12.9</td>
<td>10.9</td>
<td>14</td>
<td>2x Ø 4.2 thru all</td>
<td>M5 x 0.8</td>
<td>0.4990</td>
<td></td>
</tr>
<tr>
<td>CR30</td>
<td>26.5</td>
<td>30</td>
<td>10</td>
<td>80</td>
<td>19.1</td>
<td>15</td>
<td>35</td>
<td>22.5</td>
<td>20</td>
<td>16.5</td>
<td>22.8</td>
<td>2x Ø 5.0 thru all</td>
<td>M6 x 1.0</td>
<td>0.1134</td>
<td></td>
</tr>
<tr>
<td>CR45</td>
<td>41.5</td>
<td>45.7</td>
<td>15.5</td>
<td>120</td>
<td>31.8</td>
<td>24</td>
<td>50</td>
<td>35</td>
<td>31.5</td>
<td>26</td>
<td>35.5</td>
<td>2x Ø 6.8 thru all</td>
<td>M8 x 1.25</td>
<td>0.4082</td>
<td></td>
</tr>
</tbody>
</table>

Fd = Dynamic capacity (LC)
Fz = Axial capacity
Fy = Radial capacity

Conversions
newton (N) • 0.2248 = lb.
(lbf) meter • 0.0397 = inch
newton · meter (N-m) • 8.851 = in.-lb.

Load Ratings

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Fd</th>
<th>Fy</th>
<th>Fz</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR20</td>
<td>280</td>
<td>210</td>
<td>160</td>
</tr>
<tr>
<td>CR30</td>
<td>800</td>
<td>610</td>
<td>420</td>
</tr>
<tr>
<td>CR45</td>
<td>1740</td>
<td>1330</td>
<td>930</td>
</tr>
</tbody>
</table>

Slide Ordering Information

Configure Online

Ordering example: CR20MCA

18 CAM Roller Technology • pbclinear.com
Linear Guides **Commercial Rail**

**RAIL DIMENSIONS**

**Dimensional Information** mm

<table>
<thead>
<tr>
<th>Part No.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>F</th>
<th>H</th>
<th>HC</th>
<th>HD</th>
<th>X</th>
<th>Y</th>
<th>Rail Wt. KG/M</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR20</td>
<td>17.8</td>
<td>20</td>
<td>6.9</td>
<td>10.25</td>
<td>10.0</td>
<td>2</td>
<td>4.5</td>
<td>80</td>
<td>40</td>
<td>0.46</td>
</tr>
<tr>
<td>CR30</td>
<td>26.5</td>
<td>30</td>
<td>10</td>
<td>15</td>
<td>15.0</td>
<td>2</td>
<td>5.5</td>
<td>80</td>
<td>40</td>
<td>0.95</td>
</tr>
<tr>
<td>CR45</td>
<td>41.5</td>
<td>45.7</td>
<td>15.5</td>
<td>24</td>
<td>22.9</td>
<td>2</td>
<td>9.0</td>
<td>80</td>
<td>40</td>
<td>1.95</td>
</tr>
</tbody>
</table>

**Rail Ordering Information**

Configure Online

Ordering example: CR20R-1500
Hardened Crown Rollers

Features & Benefits
Hardened crown rollers are a superb choice for low-cost linear motion. The rollers come pre-assembled and are self-aligning for simple installation. Hardened crown rollers are great for point-to-point applications, and ensure strong, sturdy, and long-lasting linear motion.

- Precision rolling element bearing with polymide 6/6 seals riding in a Cooper B-Line Series rail
- 9/16" Hex head for easier mounting
- Available with either a 5/16-18 or M8 thread
- Maximum wheel bearing load up to 1334 N (300 lb.)
- Maximum speed up to 762 mm/s (30 in./s)
- Rails available up to 3 m (10 ft) in steel or powder coated finish
- Contact manufacturer for longer lengths

Accessories Available:
- Angle brackets (for welding to mounting rail)
- End stops

Ordering Information

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAC3016</td>
<td>Hardened Crown Roller Bearing</td>
</tr>
<tr>
<td>PAC3016M</td>
<td>Hardened Crown Roller Bearing with metric thread</td>
</tr>
<tr>
<td>PAC2245</td>
<td>Rail System - unpainted (specify length - priced per foot)</td>
</tr>
<tr>
<td>PAC2247</td>
<td>Rail System - black powder coat finish (specify length - price per foot)</td>
</tr>
<tr>
<td>PAC2244</td>
<td>Angle Brackets - 1&quot; Steel</td>
</tr>
<tr>
<td>PAC2246</td>
<td>End Stops for Rail System (bolt included)</td>
</tr>
</tbody>
</table>

Note: PAC2247 dimensions will vary according to coating thickness.
Hardened Crown Rollers

1:1 Scale

Bearings

Rails

Angle Bracket

End Stop

Note: All metric dimensions are conversions from inch dimensions. All parts are manufactured to inch standards. See ordering information on the previous page.
V-Guide Wheels, Rails & Bushings

### FEATURES & BENEFITS

V-Guide systems are an industry standard for linear motion, and offer features that make them an ideal solution for a wide range of motion control applications.

- Radial loads up to 9.9 N (2246 lb.) per wheel
- Axial loads up to 2.3 N (520 lb.) per wheel
- Precision dual row angular contact design
- Operating temperature range from -20°C to 80°C (-4°F to 176°F)
- Concentric or eccentric wheel bushings in inch and metric sizing

### V-Guide Wheels

V-Guide wheels are precision ground, dual row angular contact ball bearings with hardened outer way surfaces that provide low friction guidance for linear motion applications. They can be used with internal or external 90-degree ways – or used with round shafts.

- Four sizes
- Permanently sealed and lubricated
- Precision dual row bearing construction
- Available in 52100 bearing steel or 420 stainless steel construction
- 304 stainless steel shields or nitrile rubber seals

### V-Guide Rail

Rails are induction hardened, ground, and polished. The track body is left soft for easy drilling of mounting holes. Four sizes are designed to correspond with wheel sizes.

- Has shoulder for simple mounting and alignment
- Induction hardened way surface
- 1045 carbon steel or 400 series stainless steel
- Optional black oxide finish
- Rails are cut to length, MAX length up to 6 m (19 ft)

### V-Guide Wheels, Rails & Bushings

<table>
<thead>
<tr>
<th>Size</th>
<th>V Guide Wheel</th>
<th>Weight</th>
<th>Per Wheel Radial Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>in.</td>
<td>G</td>
<td>n lb.</td>
</tr>
<tr>
<td></td>
<td>oz.</td>
<td>Radial Load</td>
<td>n lb.</td>
</tr>
<tr>
<td>1</td>
<td>VW1</td>
<td>0.42</td>
<td>1260</td>
</tr>
<tr>
<td>2</td>
<td>VW2</td>
<td>1.41</td>
<td>2730</td>
</tr>
<tr>
<td>3</td>
<td>VW3</td>
<td>4.79</td>
<td>6166</td>
</tr>
<tr>
<td>4</td>
<td>VW4</td>
<td>10</td>
<td>9991</td>
</tr>
</tbody>
</table>

**Per Wheel Axial Load**

<table>
<thead>
<tr>
<th>Size</th>
<th>V Guide Wheel</th>
<th>Weight</th>
<th>Per Wheel Axial Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>in.</td>
<td>n lb.</td>
<td>Radial Load</td>
</tr>
<tr>
<td></td>
<td>oz.</td>
<td>n lb.</td>
<td>n lb.</td>
</tr>
<tr>
<td>1</td>
<td>VW1</td>
<td>297</td>
<td>67</td>
</tr>
<tr>
<td>2</td>
<td>VW2</td>
<td>632</td>
<td>142</td>
</tr>
<tr>
<td>3</td>
<td>VW3</td>
<td>1448</td>
<td>326</td>
</tr>
<tr>
<td>4</td>
<td>VW4</td>
<td>2313</td>
<td>520</td>
</tr>
</tbody>
</table>

**Link to technical information—page 51**
Wheels, Rails & Bushings **V-Guide**

**1:1 Scale**

Size 1: VW1

- Ø 4.76 mm
- Ø .188"
- 7.86 mm
- .309"

Size 2: VW2

- Ø 9.53 mm
- Ø .375"
- 11.08 mm
- .439"

Size 3: VW3

- Ø 12.0 mm
- Ø .472"
- 15.90 mm
- .626"

Size 4: VW4

- Ø 15.0 mm
- Ø .591"
- 19.05 mm
- .750"
**V-Guide Size 1 • 20 mm (3/4")**

**Radial loads** up to 283 lb. (1260 N) per wheel  
**Axial loads** up to 67 lb. (297 N) per wheel  
**Wheel weight:** .42 oz. (12 g)  
**Speed rating:** 16000 rpm MAX (13.23 m/s MAX)

**V-Guide Wheels**

<table>
<thead>
<tr>
<th>VW1</th>
<th>Shielded Bearing</th>
</tr>
</thead>
<tbody>
<tr>
<td>VWS1</td>
<td>Sealed Bearing</td>
</tr>
<tr>
<td>VWS1</td>
<td>Sealed Stainless Bearing</td>
</tr>
</tbody>
</table>

**Wheel Bushings**

<table>
<thead>
<tr>
<th></th>
<th>Inch Series</th>
<th>Metric Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>VW1</td>
<td>Concentric Fixed Bushing</td>
<td>MVB1</td>
</tr>
<tr>
<td>VBA1</td>
<td>Eccentric Adjustable Bushing</td>
<td>MVBA1</td>
</tr>
</tbody>
</table>

**V-Guide Rail**

<table>
<thead>
<tr>
<th>Carbon Steel</th>
<th>Stainless Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>VR1-xxx</td>
<td>undrilled rail MAX length 21’ (6400 mm)</td>
</tr>
<tr>
<td>VRD1-xxx</td>
<td>drilled rail</td>
</tr>
</tbody>
</table>

Note: Non-heat treated rails available in all sizes, contact factory.  
POI = Point of intersection

Specify Y dimension (hole to end) at time of order
**V-Guide Size 2 • 30 mm (1-1/4”)**

**Radial loads** up to 614 lb. (2730 N) per wheel  
**Axial loads** up to 142 lb. (632 N) per wheel  
**Wheel weight**: 1.3 oz. (38 g)  
**Speed rating**: 9600 rpm MAX (12.76 m/s MAX)

### V-Guide Wheels

<table>
<thead>
<tr>
<th></th>
<th>VW2</th>
<th>Shielded Bearing</th>
</tr>
</thead>
<tbody>
<tr>
<td>VWS2</td>
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</tr>
<tr>
<td>VWSS2</td>
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<td>Sealed Stainless Bearing</td>
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### Wheel bushings

<table>
<thead>
<tr>
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<th>Inch Series</th>
<th>Metric Series</th>
</tr>
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<tbody>
<tr>
<td>VW2</td>
<td>Concentric Fixed Bushing</td>
<td>MVB2</td>
</tr>
<tr>
<td>VBA2</td>
<td>Eccentric Adjustable Bushing</td>
<td>MVBA2</td>
</tr>
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</table>

### V-Guide Rail

<table>
<thead>
<tr>
<th></th>
<th>Carbon Steel</th>
<th>Stainless Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>VR2-xxx</td>
<td>undrilled rail MAX length 21’ (6400 mm)</td>
<td>VRS2-xxx undrilled rail, MAX length 21’ (6400 mm)</td>
</tr>
<tr>
<td>VRD2-xxx</td>
<td>drilled rail</td>
<td>VRSD2-xxx drilled rail</td>
</tr>
</tbody>
</table>

**Note**: Non-heat treated rails available in all sizes, contact factory.  
POI = Point of intersection

Specify Y dimension (hole to end) at time of order
**V-Guide Size 3 • 45 mm (1-3/4")**

Radial loads: up to 1386 lb. (6166 N) per wheel
Axial loads: up to 326 lb. (1448 N) per wheel
Wheel weight: 4.6 oz. (131 g)
Speed rating: 8000 rpm MAX (16.00 m/s MAX)

### V-Guide Wheels

<table>
<thead>
<tr>
<th>VW3</th>
<th>Shielded Bearing</th>
</tr>
</thead>
<tbody>
<tr>
<td>VWS3</td>
<td>Sealed Bearing</td>
</tr>
<tr>
<td>VWSS3</td>
<td>Sealed Stainless Bearing</td>
</tr>
</tbody>
</table>

### Wheel bushings

<table>
<thead>
<tr>
<th>Inch Series</th>
<th>Metric Series</th>
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<tbody>
<tr>
<td>VB3</td>
<td>Concentric Fixed Bushing</td>
</tr>
<tr>
<td>VBA3</td>
<td>Eccentric Adjustable Bushing</td>
</tr>
<tr>
<td>MVB3</td>
<td>Concentric Metric Fixed Bushing</td>
</tr>
<tr>
<td>MVBA3</td>
<td>Eccentric Metric Adjustable Bushing</td>
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### V-Guide Rail

<table>
<thead>
<tr>
<th>Carbon Steel</th>
<th>Stainless Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>VR3-xxx</td>
<td>undrilled rail MAX length 21' (6400 mm)</td>
</tr>
<tr>
<td>VRD3-xxx</td>
<td>drilled rail</td>
</tr>
<tr>
<td>VRS3-xxx</td>
<td>undrilled rail, MAX length 21' (6400 mm)</td>
</tr>
<tr>
<td>VRSD3-xxx</td>
<td>drilled rail</td>
</tr>
</tbody>
</table>

Note: Non-heat treated rails available in all sizes, contact factory.
POI = Point of intersection

Specify Y dimension (hole to end) at time of order
**V-Guide Size 4 • 60 mm (2-1/4”)**

**Radial loads** up to 2246 lb. (9991 N) per wheel  
**Axial loads** up to 520 lb. (2313 N) per wheel  
**Wheel weight**: 10 oz. (281 g)  
**Speed rating**: 5,000 rpm MAX (13.30 m/s MAX)

### V-Guide Wheels

<table>
<thead>
<tr>
<th></th>
<th>VW4</th>
<th>VWS4</th>
<th>VWSS4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
<tr>
<td><strong>Shielded Bearing</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Wheel bushings

<table>
<thead>
<tr>
<th></th>
<th>Inch Series</th>
<th>Metric Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>VB4</td>
<td>Concentric Fixed Bushing</td>
<td>MVB4</td>
</tr>
<tr>
<td>VBA4</td>
<td>Eccentric Adjustable Bushing</td>
<td>MVBA4</td>
</tr>
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</table>

### V-Guide Rail

<table>
<thead>
<tr>
<th></th>
<th>Carbon Steel</th>
<th>Stainless Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VR4-xxx</td>
<td>undrilled rail MAX length 21’ (6400 mm)</td>
</tr>
<tr>
<td></td>
<td>VRD4-xxx</td>
<td>drilled rail</td>
</tr>
</tbody>
</table>

**Note:** Non-heat treated rails available in all sizes, contact factory.  
**POI = Point of intersection**

Specify Y dimension (hole to end) at time of order

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Hevi-Rail®

FEATURES & BENEFITS
The economical Hevi-Rail® guide systems offer a lifetime of durability under continuous use. The easily interchangeable bearing components provide even dispersion of forces in the rails for longer system life and stability.

Linear Bearings
- Outer ring made of case-hardened steel
- Handles very high axial and radial loads
- Easily interchangeable components for less down-time
- Fixed and adjustable combined bearings available

Rails
- Standard length up to 6 meters
- Sand blasted or lightly oiled options available
- U-channel or I-channel available

Clamp Flanges
- Eliminates need for welding and straightening
- Easily adjustable parallelism

Flange Plates
- Simple mounting for bearings
- Can be ordered pre-welded to bearing
Ordering example: HVB-054/HVPO-1

Sample Hevi-Rail Configurations

<table>
<thead>
<tr>
<th>Combined Hevi-Rail Bearing</th>
<th>Rail</th>
<th>Flange Plate</th>
<th>Clamp Flange</th>
<th>Bearing with welded flange plate*</th>
<th>System MAX Static Load**</th>
<th>General Dimensions***</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed</td>
<td>Adjustable</td>
<td>U-Channel</td>
<td>I-channel</td>
<td>fixed</td>
<td>adjustable</td>
<td>Radial</td>
</tr>
<tr>
<td>HVB-053</td>
<td>-</td>
<td>HVR-5</td>
<td>-</td>
<td>HVP5-1</td>
<td>HVB-053/HVPS</td>
<td>5.23</td>
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<tr>
<td>HVB-054</td>
<td>HVEA-454</td>
<td>HVR-0</td>
<td>-</td>
<td>HVP0-1</td>
<td>HVB-054/HVPS</td>
<td>10.3</td>
</tr>
<tr>
<td>HVB-055</td>
<td>HVEA-455</td>
<td>HVR-1</td>
<td>HVRI-07</td>
<td>HVP1-1</td>
<td>HVB-055/HVPS</td>
<td>12.4</td>
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<tr>
<td>HVB-056</td>
<td>HVEA-456</td>
<td>HVR-2</td>
<td>-</td>
<td>HVP2-1</td>
<td>HVB-056/HVPS</td>
<td>12.9</td>
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<tr>
<td>HVB-057</td>
<td>HVEA-457</td>
<td>-</td>
<td>HVRI-08</td>
<td>HVP2-1</td>
<td>HVB-057/HVPS</td>
<td>12.9</td>
</tr>
<tr>
<td>HVB-058</td>
<td>HVEA-458</td>
<td>HVR-3</td>
<td>HVRI-09</td>
<td>HVP3-1</td>
<td>HVB-058/HVPS</td>
<td>22.4</td>
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<tr>
<td>HVB-059</td>
<td>HVEA-459</td>
<td>-</td>
<td>HVRI-10</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>HVB-060</td>
<td>HVEA-460</td>
<td>-</td>
<td>HVRI-11</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>HVB-061</td>
<td>HVEA-461</td>
<td>HVR-4</td>
<td>-</td>
<td>HVP4-1</td>
<td>HVB-061/HVPS</td>
<td>23.8</td>
</tr>
<tr>
<td>HVB-062</td>
<td>HVEA-462</td>
<td>HVR-5</td>
<td>-</td>
<td>HVP4-1</td>
<td>HVB-062/HVPS</td>
<td>33.9</td>
</tr>
<tr>
<td>HVB-063</td>
<td>HVEA-463</td>
<td>HVR-6</td>
<td>-</td>
<td>HVP6-1</td>
<td>HVB-063/HVPS</td>
<td>59.2</td>
</tr>
</tbody>
</table>

*For flange plate oriented 90 degrees to either fixed or adjustable, add -90 to the end of the part number (ex. HVB-053/HVPS-90).
**System MAX static loads are achievable when used with shown rails.
***Detailed dimensions can be found on each product page.
**Hevi-Rail® HVB-053 • 0.58 US Ton-Force**

**Axial Bearing – Fixed HVB-053**
- **Weight**: 0.36 Kg
- **Maximum Bearing Loads**:
  - **Radial**: Dynamic = 24.50 kN; Static = 32.50 kN
  - **Axial**: Dynamic = 7.50 kN; Static = 7.50 kN
- **Note**: Above loads achievable when used with a hardened rail HRC 55 minimum 2.54 mm deep.

**System Maximum Static Loads**:
- **Radial**: 5.23 kN / 0.58 US Ton-Force
- **Axial**: 1.68 kN / 0.18 US Ton-Force
- **Note**: Above loads are achievable when used with shown rails.

**Flange Plate HVPS-1**
For ordering separate flange plate only

**Rail – U Channel HVR-S**
- **Weight**: 5.3 Kg/m
- **Moment of Inertia**: Ix = 5.2 cm², Iy = 38.8 cm⁴
- **Moment of Resistance**: Wx = 2.50 cm³; Wy = 11.90 cm³
- **Radius of Inertia**: ix = 0.80 cm; iy = 2.40 cm
- **Distance to Center of Gravity**: ey = 0.94 cm; ex = 32.50 cm

**Ordering Information**

<table>
<thead>
<tr>
<th>Part NO.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVB-053</td>
<td>Fixed axial bearing</td>
</tr>
<tr>
<td>HVB-053/HVPS</td>
<td>Fixed axial bearing with welded flange plate</td>
</tr>
<tr>
<td>HVPS-1</td>
<td>Flange plate</td>
</tr>
<tr>
<td>HVR-S</td>
<td>U-channel profile rail for -53 bearings</td>
</tr>
</tbody>
</table>

**Note**: Above values do not include stack up tolerances for flange plate and bearing assembly.
Hevi-Rail® HVB-054 • 1.15 US Ton-Force

Axial Bearing – Fixed HVB-054

Weight = 0.53 Kg

Maximum Bearing Loads:
Radial: Dynamic = 31 kN; Static = 35.5 kN
Axial: Dynamic = 11.50 kN; Static = 11.50 kN

Note: Above loads achievable when used with a hardened rail HRC 55 minimum 2.54 mm deep.

System Maximum Static Loads:
Radial: 10.3 kN / 1.15 US Ton-Force
Axial: 3.2 kN / 0.35 US Ton-Force

Note: Above loads are achievable when used with shown rails.

Eccentric Adjustable HVBEA-454

Weight = 0.53 Kg

Maximum Bearing Loads:
Radial: Dynamic = 31 kN; Static = 35.5 kN
Axial: Dynamic = 11 kN; Static = 11 kN

Note: Above loads achievable when used with a hardened rail HRC 55 minimum 2.54 mm deep.

Note: Above values do not include stack up tolerances for flange plate and bearing assembly.

Note: Above values do not include stack up tolerances for flange plate and bearing assembly.

Note: Above values do not include stack up tolerances for flange plate and bearing assembly.
Hevi-Rail® HVB-054 • 1.15 US Ton-Force

Rail – U Channel HVR-0

Weight = 10.5 Kg/m

Moment of Inertia: \( I_x = 15.35 \, \text{cm}^4; I_y = 137.05 \, \text{cm}^4 \)

Moment of Resistance: \( W_{x \text{min}} = 6.64 \, \text{cm}^3; W_{x \text{max}} = 11.93 \, \text{cm}^3; W_y = 31.69 \, \text{cm}^3 \)

Radius of Inertia: \( r_x = 1.07 \, \text{cm}; r_y = 3.20 \, \text{cm} \)

Distance to Center of Gravity: \( e_y = 1.29 \, \text{cm}; e_x = 4.33 \, \text{cm} \)

Flange Plate HVP0-1
For ordering separate flange plate only

Clamp Flange HVC-0

Ordering Information

<table>
<thead>
<tr>
<th>Part NO.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVB-054</td>
<td>Fixed axial bearing</td>
</tr>
<tr>
<td>HVB-054/HVP0</td>
<td>Fixed axial bearing with welded flange plate</td>
</tr>
<tr>
<td>HVBEA-454</td>
<td>Eccentric adjustable axial bearing</td>
</tr>
<tr>
<td>HVBEA-454/HVP0</td>
<td>Eccentric adjustable axial bearing with welded flange plate</td>
</tr>
<tr>
<td>HVP0-1</td>
<td>Flange plate</td>
</tr>
<tr>
<td>HVR-0</td>
<td>U-channel rail for -54 bearings</td>
</tr>
<tr>
<td>HVC-0</td>
<td>Clamp flange</td>
</tr>
</tbody>
</table>

*Note: "h" refers to the depth of the axial bearing. This dimension depends on the choice of fixed axial bearing (HVB-054) or eccentric adjustable bearing (HVBEA-454).
**Hevi-Rail® HVB-055 • 1.39 US Ton-Force**

**Axial Bearing Fixed – HVB-055**
- Weight = 0.80 Kg
- Maximum Bearing Loads:
  - Radial: Dynamic = 56 kN; Static = 93 kN
  - Axial: Dynamic = 17 kN; Static = 25 kN
- Note: Above loads achievable when used with a hardened rail HRC 58-62 minimum 2.54 mm deep.

**System Maximum Static Loads:**
- Radial: 12.4 kN / 1.39 US Ton-Force
- Axial: 3.87 kN / 0.43 US Ton-Force
- Note: Above loads are achievable when used with shown rails.

**Eccentric Adjustable HVBEA-455**
- Weight = 0.80 Kg
- Maximum Bearing Loads:
  - Radial: Dynamic = 45.5 kN; Static = 51 kN
  - Axial: Dynamic = 13 kN; Static = 14 kN
- Note: Above loads achievable when used with a hardened rail HRC 58-62 minimum 2.54 mm deep.

**Eccentric Adjustable HVBEA-455/HVP1 with welded Flange plate**
- Note: Above values do not include stack up tolerances for flange plate and bearing assembly.
Hevi-Rail® HVB-055 • 1.39 US Ton-Force

Rail – U Channel HVR-1
Weight = 14.8 Kg/m
Moment of Inertia: $I_x = 27.29$ cm$^4$; $I_y = 273.50$ cm$^4$
Moment of Resistance: $W_{x_{\text{min}}} = 10.91$ cm$^3$;
$W_{x_{\text{max}}} = 18.20$ cm$^3$; $W_y = 53.00$ cm$^3$
Radius of Inertia: $i_x = 1.20$ cm; $i_y = 3.81$ cm
Distance to Center of Gravity: $e_y = 1.50$ cm; $e_x = 5.16$ cm

Flange Plate HVP1-1
For ordering separate flange plate only

*Note: “h” refers to the depth of the axial bearing. This dimension depends on the choice of fixed axial bearing (HVB-055) or eccentric adjustable bearing (HVBEA-455).

Rail – I Channel HVRI-07
Weight = 19.4 Kg/m
Moment of Inertia: $I_x = 344.29$ cm$^4$; $I_y = 57.63$ cm$^4$
Moment of Resistance: $W_x = 70.26$ cm$^3$; $W_y = 17.73$ cm$^3$
Radius of Inertia: $i_x = 3.73$ cm; $i_y = 1.52$ cm
Distance to Center of Gravity: $e_y = 4.90$ cm; $e_x = 3.25$ cm

Clamp Flange HVC-1

Ordering Information

<table>
<thead>
<tr>
<th>Part NO.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVB-055</td>
<td>Fixed axial bearing</td>
</tr>
<tr>
<td>HVB-055/HVP1</td>
<td>Fixed axial bearing with welded flange plate</td>
</tr>
<tr>
<td>HVBEA-455</td>
<td>Eccentric adjustable axial bearing</td>
</tr>
<tr>
<td>HVBEA-455/HVP1</td>
<td>Eccentric adjustable axial bearing with welded flange plate</td>
</tr>
<tr>
<td>HVP1-1</td>
<td>Flange plate</td>
</tr>
<tr>
<td>HVR-1</td>
<td>U-channel rail for -55 bearings</td>
</tr>
<tr>
<td>HVRI-07</td>
<td>I-channel rail for -55 bearings</td>
</tr>
<tr>
<td>HVC-1</td>
<td>Clamp flange</td>
</tr>
</tbody>
</table>

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Hevi-Rail® HVB-056 • 1.45 US Ton-Force

Axial Bearing – Fixed HVB-056

Weight = 1.00 Kg

Maximum Bearing Loads:
Radial: Dynamic = 48 kN; Static = 60.8 kN
Axial: Dynamic = 16 kN; Static = 18 kN

Note: Above loads achievable when used with a hardened rail HRC 55 minimum 2.54 mm deep.

System Maximum Static Loads:
Radial: 12.9 kN / 1.45 US Ton-Force
Axial: 4.0 kN / 0.44 US Ton-Force

Note: Above loads are achievable when used with shown rails.

Eccentric Adjustable HVBEA-456

Weight = 1.00 Kg

Maximum Bearing Loads:
Radial: Dynamic = 48 kN; Static = 56.8 kN
Axial: Dynamic = 18 kN; Static = 18 kN

Note: Above loads achievable when used with a Hardened Rail HRC 55 minimum 2.54 mm deep.

Eccentric Adjustable HVBEA-456/HVP2

With Welded Flange Plate

Note: Above values do not include stack up tolerances for flange plate and bearing assembly.

Rubber Seals

Note: Above values do not include stack up tolerances for flange plate and bearing assembly.
Hevi-Rail® HVB-056 • 1.45 US Ton-Force

Rail – U Channel HVR-2

Weight = 20.9 Kg/m

Moment of Inertia: \( I_x = 37.92 \text{ cm}^4; \ I_y = 493.58 \text{ cm}^4 \)

Moment of Resistance: \( W_{\text{min}} = 14.83 \text{ cm}^3; \ W_{\text{max}} = 24.58 \text{ cm}^3; \ W_y = 81.38 \text{ cm}^3 \)

Radius of Inertia: \( i_x = 1.19 \text{ cm}; \ i_y = 4.30 \text{ cm} \)

Distance to Center of Gravity: \( e_y = 1.54 \text{ cm}; \ e_x = 6.07 \text{ cm} \)

Flange Plate HVP2-1

For Ordering Separate Flange Plate Only

*Note: “h” refers to the depth of the axial bearing. This dimension depends on the choice of fixed axial bearing (HVB-056) or eccentric adjustable bearing (HVBEA-456).

Clamp Flange HVC-2

Ordering Information

<table>
<thead>
<tr>
<th>Part NO.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVB-056</td>
<td>Fixed axial bearing</td>
</tr>
<tr>
<td>HVB-056/HVP2</td>
<td>Fixed axial bearing with welded flange plate</td>
</tr>
<tr>
<td>HVBEA-456</td>
<td>Eccentric adjustable axial bearing</td>
</tr>
<tr>
<td>HVBEA-456/HVP2</td>
<td>Eccentric adjustable axial bearing with welded flange plate</td>
</tr>
<tr>
<td>HVP2-1</td>
<td>Flange plate</td>
</tr>
<tr>
<td>HVR-2</td>
<td>U-channel rail for -56 bearings</td>
</tr>
<tr>
<td>HVC-2</td>
<td>Clamp flange</td>
</tr>
</tbody>
</table>

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**Hevi-Rail® HVB-057 • 1.45 US Ton-Force**

**Axial Bearing – Fixed HVB-057**

**Weight** = 0.90 Kg  

**Maximum Bearing Loads:**  
**Radial:** Dynamic = 58 kN; Static = 102 kN  
**Axial:** Dynamic = 21 kN; Static = 32 kN  
**Note:** Above loads achievable when used with a hardened rail HRC 55 minimum 2.54 mm deep.

---

**Eccentric Adjustable HVBEA-457**

**Weight** = 0.87 Kg  

**Maximum Bearing Loads:**  
**Radial:** Dynamic = 48 kN; Static = 56.8 kN  
**Axial:** Dynamic = 18 kN; Static = 18 kN  
**Note:** Above loads achievable when used with a hardened rail HRC 55 minimum 2.54 mm deep.

---

**System Maximum Static Loads:**

**Radial:** 12.9 kN / 1.45 US Ton-Force  
**Axial:** 4.0 kN / 0.44 US Ton-Force  
**Note:** Above loads are achievable when used with shown rails.

---

**Eccentric Adjustable HVBEA-457/HVP2 With Welded Flange Plate**

**Note:** Above values do not include stack up tolerances for flange plate and bearing assembly.

---

**Eccentric Adjustable HVBEA-457/HVP2 With Welded Flange Plate**

**Note:** Above values do not include stack up tolerances for flange plate and bearing assembly.
Hevi-Rail® HVB-057 • 1.0 US Ton-Force

Rail – I Channel HVRI-08

- **Weight**: 25.3 Kg/m
- **Moment of Inertia**: \(I_x = 597.54\, \text{cm}^4; I_y = 76.79\, \text{cm}^4\)
- **Moment of Resistance**: \(W_x = 104.92\, \text{cm}^3; W_y = 23.27\, \text{cm}^3\)
- **Radius of Inertia**: \(i_x = 4.24\, \text{cm}; i_y = 1.54\, \text{cm}\)
- **Distance to Center of Gravity**: \(e_y = 5.70\, \text{cm}; e_x = 3.30\, \text{cm}\)

Flange Plate HVP2-1

For Ordering Separate Flange Plate Only

<table>
<thead>
<tr>
<th>Part NO.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVB-057</td>
<td>Fixed axial bearing</td>
</tr>
<tr>
<td>HVB-057/HVP2</td>
<td>Fixed axial bearing with welded flange plate</td>
</tr>
<tr>
<td>HVBEA-457</td>
<td>Eccentric adjustable axial bearing</td>
</tr>
<tr>
<td>HVBEA-457/HVP2</td>
<td>Eccentric adjustable axial bearing with welded flange plate</td>
</tr>
<tr>
<td>HVP2-1</td>
<td>Flange plate</td>
</tr>
<tr>
<td>HVRI-08</td>
<td>I-channel rail for -57 bearings</td>
</tr>
</tbody>
</table>

*Note: “h” refers to the depth of the axial bearing. This dimension depends on the choice of fixed axial bearing (HVB-057) or eccentric adjustable bearing (HVBEA-457).*
Hevi-Rail® HVB-058 • 2.51 US Ton-Force

Axial Bearing – Fixed HVB-058
Weight = 1.62 Kg
Maximum Bearing Loads:
Radial: Dynamic = 60 kN; Static = 72 kN
Axial: Dynamic = 23 kN; Static = 40 kN
Note: Above loads achievable when used with a hardened rail HRC 55 minimum 2.54 mm deep.

System Maximum Static Loads:
Radial: 22.4 kN / 2.51 US Ton-Force
Axial: 7.0 kN / 0.78 US Ton-Force
Note: Above loads are achievable when used with shown rails.

Eccentric Adjustable HVBEA-458
Weight = 1.62 Kg
Maximum Bearing Loads:
Radial: Dynamic = 68 kN; Static = 72 kN
Axial: Dynamic = 23 kN; Static = 23 kN
Note: Above loads achievable when used with a hardened rail HRC 55 minimum 2.54 mm deep.

Note: Above values do not include stack up tolerances for flange plate and bearing assembly.

Eccentric Adjustable HVBEA-458/HVP3 With Welded Flange Plate

Note: Above values do not include stack up tolerances for flange plate and bearing assembly.
Hevi-Rail® HVB-058 • 2.51 US Ton-Force

Rail – U Channel HVR-3
- Weight: 28.6 Kg/m
- Moment of Inertia: $I_x = 89.47 \text{ cm}^4$; $I_y = 865.23 \text{ cm}^4$
- Moment of Resistance: $W_{x\text{min}} = 27.03 \text{ cm}^3$; $W_{x\text{max}} = 44.96 \text{ cm}^3$; $W_y = 127.80 \text{ cm}^3$
- Radius of Inertia: $i_x = 1.57 \text{ cm}$; $i_y = 4.87 \text{ cm}$
- Distance to Center of Gravity: $e_y = 1.99 \text{ cm}$; $e_x = 6.77 \text{ cm}$

Flange Plate HVP3-1
For Ordering Separate Flange Plate Only

*Note: “h” refers to the depth of the axial bearing. This dimension depends on the choice of fixed axial bearing (HVB-058) or eccentric adjustable bearing (HVBEA-458).

Rail – I Channel HVRI-09
- Weight: 34.1 Kg/m
- Moment of Inertia: $I_x = 1037.22 \text{ cm}^4$; $I_y = 161.89 \text{ cm}^4$
- Moment of Resistance: $W_x = 160.07 \text{ cm}^3$; $W_y = 39.97 \text{ cm}^3$
- Radius of Inertia: $i_x = 4.89 \text{ cm}$; $i_y = 1.93 \text{ cm}$
- Distance to Center of Gravity: $e_y = 6.48 \text{ cm}$; $e_x = 4.05 \text{ cm}$

Clamp Flange HVC-3

Ordering Information

<table>
<thead>
<tr>
<th>Part NO.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVB-058</td>
<td>Fixed axial bearing</td>
</tr>
<tr>
<td>HVB-058/HVP3</td>
<td>Fixed axial bearing with welded flange plate</td>
</tr>
<tr>
<td>HVBEA-458</td>
<td>Eccentric adjustable axial bearing</td>
</tr>
<tr>
<td>HVBEA-458/HVP3</td>
<td>Eccentric adjustable axial bearing with welded flange plate</td>
</tr>
<tr>
<td>HVP3-1</td>
<td>Flange plate</td>
</tr>
<tr>
<td>HVR-3</td>
<td>U-channel rail for -58 bearings</td>
</tr>
<tr>
<td>HVRI-09</td>
<td>I-channel rail for -58 bearings</td>
</tr>
<tr>
<td>HVC-3</td>
<td>Clamp flange</td>
</tr>
</tbody>
</table>
Hevi-Rail® HVB-059 • 2.47 US Ton-Force

Axial Bearing – Fixed HVB-059
Weight = 1.80 Kg
Maximum Bearing Loads:
Radial: Dynamic = 73 kN; Static = 82 kN
Axial: Dynamic = 25 kN; Static = 27 kN
Note: Above loads achievable when used with a hardened rail HRC 55 minimum 2.54 mm deep.

System Maximum Static Loads:
Radial: 22 kN / 2.47 US Ton-Force
Axial: 7.0 kN / 0.78 US Ton-Force
Note: Above loads are achievable when used with shown rails.

Rail – I Channel HVRI-10
Weight = 30.9 Kg/m
Moment of Inertia: \( I_x = 1078.01 \text{ cm}^4; I_y = 104.38 \text{ cm}^4 \)
Moment of Resistance: \( W_x = 154.33 \text{ cm}^3; W_y = 29.89 \text{ cm}^3 \)
Distance to Center of Gravity: \( e_y = 6.99 \text{ cm}; e_x = 3.49 \text{ cm} \)

Eccentric Adjustable HVBEA-459
Weight = 1.74 Kg
Maximum Bearing Loads:
Radial: Dynamic = 73 kN; Static = 82 kN
Axial: Dynamic = 25 kN; Static = 27 kN
Note: Above loads achievable when used with a hardened rail HRC 55 minimum 2.54 mm deep.

Ordering Information

<table>
<thead>
<tr>
<th>Part NO.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVB-059</td>
<td>Fixed axial bearing</td>
</tr>
<tr>
<td>HVBEA-459</td>
<td>Eccentric adjustable axial bearing</td>
</tr>
<tr>
<td>HVRI-10</td>
<td>I-channel profile rail</td>
</tr>
</tbody>
</table>
**HVB-060 Hevi-Rail® • 2.67 US Ton-Force**

**Axial Bearing – Fixed HVB-060**

*Weight* = 2.30 Kg

**Maximum Bearing Loads:**

- **Radial**: Dynamic = 81 kN; Static = 95 kN
- **Axial**: Dynamic = 31 kN; Static = 36 kN

*Note*: Above loads achievable when used with a hardened rail HRC 55 minimum 2.54 mm deep.

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**Eccentric Adjustable HVBEA-460**

*Weight* = 2.27 Kg

**Maximum Bearing Loads:**

- **Radial**: Dynamic = 81 kN; Static = 95 kN
- **Axial**: Dynamic = 31 kN; Static = 36 kN

*Note*: Above loads achievable when used with a hardened rail HRC 55 minimum 2.54 mm deep.

---

**System Maximum Static Loads:**

- **Radial**: 23.8 kN / 2.67 US Ton-Force
- **Axial**: 7.44 kN / 0.83 US Ton-Force

*Note*: Above loads are achievable when used with shown rails.

**Rail – I Channel HVRI-11**

*Weight* = 40.5 Kg/m

- **Moment of Inertia**: $I_x = 1670.08 \text{ cm}^4$; $I_y = 184.52 \text{ cm}^4$
- **Moment of Resistance**: $W_x = 219.17 \text{ cm}^3$; $W_y = 44.46 \text{ cm}^3$
- **Radius of Inertia**: $i_x = 5.69 \text{ cm}$; $i_y = 1.91 \text{ cm}$
- **Distance to Center of Gravity**: $e_y = 7.62 \text{ cm}$; $e_x = 4.15 \text{ cm}$

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**Ordering Information**

<table>
<thead>
<tr>
<th>Part NO.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVB-060</td>
<td>Fixed axial bearing</td>
</tr>
<tr>
<td>HVBEA-460</td>
<td>Eccentric adjustable axial bearing</td>
</tr>
<tr>
<td>HVRI-11</td>
<td>I-channel profile rail</td>
</tr>
</tbody>
</table>
Hevi-Rail® HVB-061 • 2.67 US Ton-Force

Axial Bearing – Fixed HVB-061

Weight = 2.82 Kg

Maximum Bearing Loads:
Radial: Dynamic = 81 kN; Static = 95 kN
Axial: Dynamic = 31 kN; Static = 36 kN

Note: Above loads achievable when used with a hardened rail HRC 55 minimum 2.54 mm deep.

System Maximum Static Loads:
Radial: 23.8 kN / 2.67 US Ton-Force
Axial: 7.44 kN / 0.83 US Ton-Force

Note: Above loads achievable when used with shown rails.

Axial Bearing – Fixed HVB-061/HVP4 with Welded Flange Plate

Eccentric Adjustable HVBEA-461

Weight = 2.82 Kg

Maximum Bearing Loads:
Radial: Dynamic = 81 kN; Static = 95 kN
Axial: Dynamic = 31 kN; Static = 36 kN

Note: Above loads achievable when used with a hardened rail HRC 55 minimum 2.54 mm deep.

Eccentric Adjustable HVBEA-461/HVP4 with Welded Flange Plate

Note: Above values do not include stack up tolerances for flange plate and bearing assembly.

Rubber Seals

Note: Above values do not include stack up tolerances for flange plate and bearing assembly.
Hevi-Rail® HVB-061 • 2.67 US Ton-Force

Rail – U Channel HVR-4

Weight = 35.9 Kg/m
Moment of Inertia: \( I_x = 150.98 \, \text{cm}^4; I_y = 1494.32 \, \text{cm}^4 \)
Moment of Resistance: \( W_{x_{\text{min}}} = 39.00 \, \text{cm}^3; \)
\( W_{x_{\text{max}}} = 67.13 \, \text{cm}^3; W_y = 190.12 \, \text{cm}^3 \)
Radius of Inertia: \( i_x = 1.82 \, \text{cm}; i_y = 5.72 \, \text{cm} \)
Distance to Center of Gravity: \( e_y = 2.25 \, \text{cm}; e_x = 7.86 \, \text{cm} \)

Flange Plate HVP4-1

For Ordering Separate Flange Plate Only

*Note: “h” refers to the depth of the axial bearing. This dimension depends on the choice of fixed axial bearing (HVB-061) or eccentric adjustable bearing (HVBEA-461).

Clamp Flange HVC-4

Ordering Information

<table>
<thead>
<tr>
<th>Part NO.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVB-061</td>
<td>Fixed axial bearing</td>
</tr>
<tr>
<td>HVB-061/HVP4</td>
<td>Fixed axial bearing with welded flange plate</td>
</tr>
<tr>
<td>HVBEA-461</td>
<td>Eccentric adjustable axial bearing</td>
</tr>
<tr>
<td>HVBEA-461/HVP4</td>
<td>Eccentric adjustable axial bearing with welded flange plate</td>
</tr>
<tr>
<td>HVP4-1</td>
<td>Flange plate</td>
</tr>
<tr>
<td>HVR-4</td>
<td>U-channel rail for -61 bearings</td>
</tr>
<tr>
<td>HVC-4</td>
<td>Clamp flange</td>
</tr>
</tbody>
</table>

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**Hevi-Rail® HVB-062 • 3.81 US Ton-Force**

**Axial Bearing – Fixed HVB-062**
- Weight = 4.50 Kg
- Maximum Bearing Loads:
  - Radial: Dynamic = 134.5 kN; Static = 242 kN
  - Axial: Dynamic = 44.7 kN; Static = 74.2 kN
- Note: Above loads achievable when used with a hardened rail HRC 55 minimum 2.54 mm deep.

**System Maximum Static Loads:**
- Radial: 33.9 kN / 3.81 US Ton-Force
- Axial: 10.6 kN / 1.19 US Ton-Force
- Note: Above loads are achievable when used with shown rails.

**Eccentric Adjustable HVBEA-462**
- Weight = 3.90 Kg
- Maximum Bearing Loads:
  - Radial: Dynamic = 110 kN; Static = 132 kN
  - Axial: Dynamic = 43 kN; Static = 50 kN
- Note: Above loads achievable when used with a hardened rail HRC 55 minimum 2.54 mm deep.

**Eccentric Adjustable HVBEA-462/HVP4**
- With Welded Flange Plate
- Note: Above values do not include stack up tolerances for flange plate and bearing assembly.
Hevi-Rail® HVB-062 • 3.81 US Ton-Force

Rail – U Channel HVR-5

Weight = 42.9 Kg/m
Moment of Inertia: $I_x = 205.84 \text{ cm}^4$, $I_y = 2185.32 \text{ cm}^4$
Moment of Resistance: $W_{x\min} = 48.42 \text{ cm}^3$; $W_{x\max} = 86.89 \text{ cm}^3$, $W_y = 249.75 \text{ cm}^3$
Radius of Inertia: $i_x = 1.94 \text{ cm}$; $i_y = 6.32 \text{ cm}$
Distance to Center of Gravity: $e_y = 2.37 \text{ cm}$; $e_x = 8.75 \text{ cm}$

Flange Plate HVP4-1

For Ordering Separate Flange Plate Only

*Note: “h” refers to the depth of the axial bearing. This dimension depends on the choice of fixed axial bearing (HVB-062) or eccentric adjustable bearing (HVBEA-462).

Ordering Information

<table>
<thead>
<tr>
<th>Part NO.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVB-062</td>
<td>Fixed axial bearing</td>
</tr>
<tr>
<td>HVB-062/HVP4</td>
<td>Fixed axial bearing with welded flange plate</td>
</tr>
<tr>
<td>HVBEA-462</td>
<td>Eccentric adjustable axial bearing</td>
</tr>
<tr>
<td>HVBEA-462/HVP4</td>
<td>Eccentric adjustable axial bearing with welded flange plate</td>
</tr>
<tr>
<td>HVP4-1</td>
<td>Flange plate</td>
</tr>
<tr>
<td>HVR-5</td>
<td>U-channel rail for -62 bearings</td>
</tr>
</tbody>
</table>

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Hevi-Rail® HVB-063 • 6.65 US Ton-Force

Axial Bearing – Fixed HVB-063

Weight = 6.52 Kg

Maximum Bearing Loads:
- Radial: Dynamic = 188 kN; Static = 370 kN
- Axial: Dynamic = 68 kN; Static = 71 kN

Note: Above loads achievable when used with a hardened rail HRC 55 minimum 2.54 mm deep.

System Maximum Static Loads:
- Radial: 59.2 kN / 6.65 US Ton-Force
- Axial: 18.5 kN / 2.07 US Ton-Force

Note: Above loads are achievable when used with shown rails.

Eccentric Adjustable HVBEA-463

Weight = 6.50 Kg

Maximum Bearing Loads:
- Radial: Dynamic = 151 kN; Static = 192 kN
- Axial: Dynamic = 68 kN; Static = 71 kN

Note: Above loads achievable when used with a hardened rail HRC 55 minimum 2.54 mm deep.

Note: Above values do not include stack up tolerances for flange plate and bearing assembly.
Hevi-Rail® HVB-063 • 6.65 US Ton-Force

Rail – U Channel HVR-6

Weight = 52.3 Kg/m

Moment of Inertia: $I_x = 269.52 \, \text{cm}^4$, $I_y = 3423.08 \, \text{cm}^4$

Moment of Resistance: $W_{x_{\min}} = 57.15 \, \text{cm}^3$; $W_{x_{\max}} = 112.11 \, \text{cm}^3$, $W_y = 339.76 \, \text{cm}^3$

Radius of Inertia: $i_x = 2.01 \, \text{cm}$; $i_y = 7.17 \, \text{cm}$

Distance to Center of Gravity: $e_y = 2.40 \, \text{cm}$; $e_x = 10.08 \, \text{cm}$

Flange Plate HVP6-1

For Ordering Separate Flange Plate Only

*Note*: “h” refers to the depth of the axial bearing. This dimension depends on the choice of fixed axial bearing (HVB-063) or eccentric adjustable bearing (HVBEA-463).

Hevi-Rail Bearings

Can be ordered with pre-welded flange plate

Ordering Information

<table>
<thead>
<tr>
<th>Part NO.</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>HVB-063</td>
<td>Fixed axial bearing</td>
</tr>
<tr>
<td>HVB-063/HVP6</td>
<td>Fixed axial bearing with welded flange plate</td>
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<tr>
<td>HVBEA-463</td>
<td>Eccentric adjustable axial bearing</td>
</tr>
<tr>
<td>HVBEA-463/HVP6</td>
<td>Eccentric adjustable axial bearing with welded flange plate</td>
</tr>
<tr>
<td>HVP6-1</td>
<td>Flange plate</td>
</tr>
<tr>
<td>HVR-6</td>
<td>U-channel rail for -63 bearings</td>
</tr>
</tbody>
</table>
Horizontal Motion – Single Rail

Load on the sliders:

\[ P_1 = P_2 + F \quad P_2 = \frac{F \cdot a}{b} \]

Vertical Motion – Single Rail

\[ P_1 = P_2 = \frac{F \cdot a}{b} \]

Explanation of the calculation formula

- \( F \) = effective force (N)
- \( F_g \) = weight-force (N)
- \( P_1, P_2, P_3, P_4 \) = effective load on the slider (N)
- \( M_1, M_2 \) = effective moment (N-m)
- \( m \) = mass (kg)
- \( a \) = acceleration (m/s\(^2\))

Inertial force

\[ F = m \cdot a \]

Slider load at time of reverse

\[ P_1 = \frac{F \cdot l}{d} + \frac{F_g}{2} \quad P_2 = \frac{F_g}{2} - \frac{F \cdot l}{d} \]
Technical • Static Loading Calculations

Horizontal Motion – Parallel Rails / 2 Sliders

Load on the sliders:
\[ P_1 = F \cdot \frac{b}{a+b} \]
\[ P_2 = F \cdot P_1 \]

Additional moment load on slider:
\[ M_1 = \frac{F}{2} \cdot c \]

Horizontal Motion – Parallel Rails / 4 Sliders

\[ P_1 = \frac{F}{4} \cdot \left( \frac{F}{2} \cdot \frac{b}{c} \right) \cdot \left( \frac{F}{2} \cdot \frac{a}{d} \right) \]
\[ P_2 = \frac{F}{4} \cdot \left( \frac{F}{2} \cdot \frac{b}{c} \right) + \left( \frac{F}{2} \cdot \frac{a}{d} \right) \]
\[ P_3 = \frac{F}{4} + \left( \frac{F}{2} \cdot \frac{b}{c} \right) \cdot \left( \frac{F}{2} \cdot \frac{a}{d} \right) \]
\[ P_4 = \frac{F}{4} + \left( \frac{F}{2} \cdot \frac{b}{c} \right) + \left( \frac{F}{2} \cdot \frac{a}{d} \right) \]

Note: Slider #4 (P4) should always be nearest to the point of the load

Horizontal Motion – Parallel Rails / 2 Sliders

Load on the sliders:
\[ P_{1a} = P_{2a} = \frac{F}{2} \]
\[ P_{2b} = P_{1b} = F \cdot \frac{a}{b} \]
Use the values from the static load maximums given in the charts beginning on page 6 in the calculations below to verify acceptable loading conditions.

**Calculation Factors:**
- Fza and Fya are the radial and axial results of external forces in newtons (N)
- Mxa, Mya, and Mza are the external moments being applied in newton-meters (N-m)
- Fy, Fz, Mx, My, and Mz are the load ratings for various directions and moments
- s.f. is the relative safety factor as applied from the table below

**Single Load Force Calculations**

\[
\frac{Fza}{Fz} < 1 \text{ s.f.}
\]

**Multiple Load Force Calculation**

\[
\frac{Fza}{Fz} + \frac{Fya}{Fy} + \frac{Mxa}{Mx} + \frac{Mya}{My} + \frac{Mza}{Mz} < 1 \text{ s.f.}
\]

**Calculation Factors**

Use the following variables with the equations below to calculate the approximate travel life of Redi-Rail® sliders under various loading conditions.
- L = Estimated travel life in meters (m)
- Fza and Fya are the axial and radial results of applied external forces in newtons (N)
- Mxa, Mya, and Mza are the external moments being applied in newton-meters (N-m)
- Fd is the dynamic slider capacity constant from the charts beginning on page 6
- Fy, Fz, Mx, My, and Mz are the load ratings for various directions and moments as found beginning on page 6
- s.f. is the relative safety factor from the table below

**Safety Factor**

Use the “s.f.” to adjust for dynamic forces and conditions particular to the application

**Application Condition** | **S.F.**
---|---
Consistently smooth motion with low frequency of travel reversal, slow speed (<30% MAX), no shock load or vibration, no elastic yield or deformation, clean environment | 1 – 1.5
Normal assembly or shop floor conditions, moderate speed (30% MAX to 75% MAX), normal shock or vibration conditions | 1.5 – 2
Frequent reversal of travel, high speeds (>75% MAX), shock loads and/or vibration present, high elastic yield or deformation, heavy dirt and dust in environment | 2 – 3.5
Technical • Static Loading Calculations

Load Calculations
L = applied load / number of wheel pairs
LR = wheel radial load
LO = wheel load from moment
A = load offset dimension

Horizontal Motion – Center Loaded
Lo1 = L • (B - A) • FA
Lo2 = (L • FA) - Lo1

Horizontal Motion – Overhung Load
Lo1 = L • A • FA
Lo2 = (L • FA) + Lo1

Vertical Motion
Lo1 = L • A • FA
LR = (L • FA) + Lo1

Wheel/Bushing Assembly
Use SAE series N flat washers and lock washers to secure the wheel bushing assemblies

<table>
<thead>
<tr>
<th>Bushings</th>
<th>Inch</th>
<th>Metric</th>
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</thead>
<tbody>
<tr>
<td>VB1</td>
<td>#6</td>
<td>MVB1 M4</td>
</tr>
<tr>
<td>VB2</td>
<td>1/4</td>
<td>MVB2 M6</td>
</tr>
<tr>
<td>VB3</td>
<td>5/16</td>
<td>MVB3 M8</td>
</tr>
<tr>
<td>VB4</td>
<td>3/8</td>
<td>MVB4 M10</td>
</tr>
<tr>
<td>VR1</td>
<td>#6, M3</td>
<td>VR3 1/4”, M6</td>
</tr>
<tr>
<td>VR2</td>
<td>#10, M6</td>
<td>VR4 5/16”, M8</td>
</tr>
</tbody>
</table>
Technical Specifications

Linear Bearing for Axial & Radial Loads
Prior to welding, disassemble bearing components. To avoid cracks in welded joints, please use welding electrodes and core weld for unalloyed steel.

Outer ring – Case-hardened steel En 31 - SAE 52100 hardened at 60-2 HRC.
Inner ring – Hardened steel En 31 - SAE 52100 hardened at 62-2 HRC.

Cylindrical rollers – Flat ground heads are hardened steel, En 31 - SAE 52100, hardened at 59-64 HRC.

Bolt tolerance – 0.05 mm:

Profile rails – High quality 18MnNb6 steel at standard lengths of 6 m (19.7 ft). Yield point of 430 N/mm², tensile strength of 550-770 N/mm². Rails are not hardened but have a Brinell hardness of 160-210. The guide ways in the rails should be lightly greased and not painted.

Clamp flange – Low carbon steel, adjustable clamp.

Flange plate – Low carbon steel. Special designs available, contact manufacturer.

Seals – Bearings with fixed axial bearing (HVB-053 to HVB-063) – radial bearing has steel labyrinth and side guide roller with rubber seals. Bearings with eccentric adjustable axial bearing (HVBEA-454 to HVBEA-463) – Both radial and axial bearings utilize rubber seals (RS type).

Lubrication – Bearings are supplied lubricated with grease grade 3. Bearings from HVB-055 to HVB-063 can be re-lubricated with grease zerk. Adjustable bearings are not available with zerk.

Bearing coefficient of frictions – .010 static, .005 dynamic.

Temperature – Resistant from -30°C to 120°C (-22°F to 248°F).

Bearing Life Calculations:

\[ L_{10} = \left(16667 \right) \cdot \left( \frac{C}{P} \right)^{10/3} \cdot \left( \text{Hours} \right) \]

\[ C = \text{Dynamic load rating (kN)} \]

\[ P = \text{Automatic dynamic load (kN)} \]

\[ n = \text{Revolutions per minute (rpm)} \]

Note: Above calculation formula is for predicting life expectancy with 90% reliability level. Customers shall use their discretion to determine the reduction factor based on the actual operation needs and conditions such as reliability level, load, speed, impact, and environments.

Adjusting Axial Bearings
1. Remove front screws
2. Rotate axial bearing shaft (see diagram below)
3. Check dimension A (repeat step 2, if needed)
4. Re-install front screws
5. Recommend use of a breakable Loctite®

Calculation of \( f_{\text{max}} \) for cantilevered loads

\[ Q = \text{Load capacity (N)} \]

\[ L = \text{Load distance to suspension point (mm)} \]

\[ P = \text{Suspension point} \]

\[ A = \text{Bearing distance (mm)} \]

Recommended 500 mm to 1000 mm

Formula: 

\[ F_{\text{MAX stat radial}} = \frac{Q \cdot L}{2 \cdot A} \]

MAX Hertzian = 850 N/mm² for all profile rails

Indicated here are \( F_{\text{MAX stat radial}} + \text{axial} \) for each bearing
Mounting Instructions

1. The overall system clearance should be 1.524 mm to 3.048 mm Inner Rail Distance = Saddle Width + (1.524 mm to 3.048 mm)

2. Verify that the axial bearing is aligned parallel to the rail; especially in vertical operations
Important Notice about Lifetime Calculations

There is no known formula for accurately and reliably calculating the actual lifetime of a linear or rotary bearing system.

The formulas within this section are solely based upon the statistical probability of success. It is important to recognize and distinguish between formulas of absolute certainty and probability.

Even though these formulas are not absolutely certain, they have been generally accepted as the best available method for determining bearing lifetime by the International Organization for Standardization (ISO), as well as its membership bodies; including, but not limited to: American National Standards Institute (ANSI), Deutsches Institut für Normung (DIN) & Japanese Industrial Standards Committee (JISC).

Static & Dynamic Load Ratings

PBC Linear uses the two internationally accepted methods for calculating the Rated Lifetime, Static, and Dynamic Capacities. Per the international standard, all lifetimes are calculated to an L10 life of 100 km (105 meters or ≈3.94 million inches). The two standards used are:

- ISO76  Rolling Bearings – Static Load Ratings
- ISO281  Rolling Bearings – Dynamic Load Ratings & Rating Life

Note: Some suppliers may choose to rate their bearings based upon a useful life of less than 100 km or a probability of success less than 90%. This causes their bearings to falsely appear to have a higher static and dynamic load capacity. If a catalog does not specifically note L10 = 100 km, caution should be used when comparing load capacity or life values between suppliers. The most commonly used values are L10 = 50 km and L25 = 50 km. For comparison, at L10 = 100 km, an example bearing has a maximum static load of 1000 N. That exact same bearing as an L10 = 50 km maximum static load of ≈2300 N and an L25 = 50 km maximum static load of ≈4600 N!

In summary, the static load ratings are defined as the maximum applied load (or moment) which will result in the permanent deformation which does not exceed 1/10,000 of the diameter of the rolling element (ball or rod) within the bearing. The basic dynamic load rating, C, is the load of a constant magnitude and direction, which a sufficiently large number of apparently identical bearings can endure for a basic rating life of one million revolutions. It’s important to note that both the static and dynamic values are determined though ISO-Approved formulas. These formulas take into account several factors, including the design, internal geometry, material type, material quality, and lubrication type.

Note: Additional factors are provided so that the estimated lifetime (default = 100 km) and/or the probability of success (default = 90%) can be changed from their default value to any desired value.

Operating Lifetime

The Operating Life (or Operating Lifetime) is the actual life achieved by a rolling bearing. The actual lifetime typically varies from the calculated lifetime, sometimes significantly. It is not possible to accurately and reliably determine the actual Operating Life through calculations due to the large variety of operating and installation conditions. The most reliable method to achieve an approximation is by comparing the current application to similar applications. Primary factors which can negatively affect the life and are generally not included in calculations are:

- Contamination within the application
- Inadequate or improper lubrication
- Operational conditions different from calculated values, including unexpected forces and moments
- Insufficient and/or excessive operating clearance between the roller and guideway
- Excessive interference between roller and guideway (typically due to misalignment or excessive preload)
- Temperature out of range
- High shock loads (exceeding static load capacity)
- Vibration (which causes false brinelling resulting from fretting)
- Short stroke reciprocating motion (also causes False Brinelling)
- Damage caused during installation or from improper handling
- Improper mating surface hardness (when not used with a PBC Linear rail)
Technical • Life Calculation

Terms, Definitions & Symbols

The following variables are used within the equations listed on the following pages:

- **Fy_app** = Force applied in the Y direction (radial force), N
- **Fz_app** = Force applied in the Z direction (axial force), N
- **Mx_app** = Moment applied about the X axis, N
- **My_app** = Moment applied about the Y axis, N
- **Mz_app** = Moment applied about the Z axis, N
- **Fy_MAX** = Maximum allowable force in the Y direction (radial force), N
- **Fz_MAX** = Maximum allowable force in the Z direction (axial force), N
- **Mx_MAX** = Maximum allowable moment about the X axis, N • m
- **My_MAX** = Maximum allowable moment about the Y axis, N • m
- **Mz_MAX** = Maximum allowable moment about the Z axis, N • m
- **Da** = Rolling contact diameter, from product tables, mm
- **fh** = Shaft (rail) hardness reduction factor
- **fl** = Required Lifetime (km) reduction factor
- **fr** = Reliability reduction factor
- **fss** = Short stroke reduction factor
- **L10** = Basic rating life, km (10^3 m)
- **Pr** = Equivalent radial (Fy) load, N
- **s.f** = safety factor

Note: PBC Linear has chosen to depart from the nomenclature standards used by ISO. Instead, PBC Linear uses a convention that is more in line with other PBC Linear products. This ensures that all PBC Linear products use the same naming conventions, making it easier to compare multiple products from different product families. The Y direction (radial force) and Z direction (axial force) are dependant upon the orientation of the wheel bearing.

Conversions

- newton (N) x 0.2248 = lb.
- (lbf) meter x 0.0397 = inch
- newton - meter (N-m) x 8.851 = in.-lb.

Derivation

The lifetime formula within ISO 281 gives the life in millions of revolutions. The conversion from rotary life to linear life is done using the conversion factors listed in the following three equations. This derivation applies to both individual rollers and carriages. Lrev and Ldistance represent the lifetime of the bearing in revolutions and linear distance, respectively.

Note: Attention must be paid to units of measure, especially when considering products from different manufacturers. All of the lifetime formulas within this section yield results in kilometers; however, not all companies follow the same standard. Some companies may express life in meters or 100’s of kilometers.

\[
L_{Distance} = [1 \cdot 10^5 \text{m}] = L_{rev} [1,000,000 \text{ rev}] \cdot \left(3.14 \ D_a \left[\frac{\text{mm}}{\text{rev}}\right] \cdot \frac{1 \cdot 10^5 \text{m}}{1,000,000,000 \text{ mm}}\right)
\]

Eq. 1

\[
L_{Distance} = [1 \cdot 10^5 \text{m}] = L_{rev} \cdot (0.0314 \ D_a)
\]

Eq. 2

\[
L_{Distance} = [\text{km}] = 100 \cdot L_{rev} \cdot (0.0314 \ D_a) = 3.14 \cdot D_a \cdot L_{rev}
\]

Eq. 3

Link to whitepaper "The Facts About Roller Bearing Life Calculations"
**Technical • Life Calculation**

**Individual Rollers – All products except Hevi-Rail Rollers**

Most of the individual rollers within this catalog are Radial Ball Bearings. The following formulas should be used for all individual bearings except Hevi-Rail bearings (which are roller bearings). This formula calculates the basic rating life (L10 life), which does not take into account any reduction factors based upon the application.

\[
L_{10} [km] = 3.14 \cdot D_a \cdot \left( f_L \cdot f_H \cdot f_{SS} \cdot \frac{F_{y_{max}}}{P_r} \right)^3 \cdot (f_R)
\]

Eq. 4

\[
P_r = X \cdot F_{y_{app}} + Y \cdot F_{y_{app}}
\]

Eq. 5

The values for X & Y can be found using the table listed below.

**Individual Rollers – Hevi-Rail Rollers**

Hevi-Rail bearings are roller bearings, as opposed to radial ball bearings. The formulas are very similar to the formulas shown above, with only some minor changes.

Note: Hevi-Rail rollers are combined bearings. Essentially two bearings combined into one. Life calculations should be performed for both the radial and the axial bearing.

\[
L_{a, 10} [km] = 3.14 \cdot D_a \cdot \left( f_L \cdot f_H \cdot f_{SS} \cdot \frac{F_{y_{max}}}{P_z} \right)^{\frac{10}{3}} \cdot (f_R)
\]

Eq. 6

\[
L_{a, 10} [km] = 3.14 \cdot D_a \cdot \left( f_L \cdot f_H \cdot f_{SS} \cdot \frac{F_{y_{max}}}{P_z} \right)^{\frac{10}{3}} \cdot (f_R)
\]

Eq. 7

**Values of X & Y for Radial Ball Bearing Life Formula**

<table>
<thead>
<tr>
<th>Product</th>
<th>( \frac{F_{z_{app}}}{F_{y_{app}}} \leq \epsilon )</th>
<th>( \frac{F_{z_{app}}}{F_{y_{app}}} &gt; \epsilon )</th>
<th>( \leq \epsilon )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>Y</td>
<td>X</td>
</tr>
<tr>
<td>Commercial Rail (all sizes)</td>
<td>1</td>
<td>0</td>
<td>0.41</td>
</tr>
<tr>
<td>Hardened Crown Rollers</td>
<td>1</td>
<td>0</td>
<td>0.41</td>
</tr>
<tr>
<td>Integral-V (IVT) (Compact Linear Guides)</td>
<td>1</td>
<td>0.78</td>
<td>0.63</td>
</tr>
<tr>
<td>Integral-V (IVT) (all other sizes &amp; types)</td>
<td>1</td>
<td>0.78</td>
<td>0.63</td>
</tr>
<tr>
<td>Redi-Rail (all sizes &amp; types)</td>
<td>1</td>
<td>0.78</td>
<td>0.63</td>
</tr>
<tr>
<td>Steel-Rail (all sizes &amp; types)</td>
<td>1</td>
<td>0.78</td>
<td>0.63</td>
</tr>
<tr>
<td>V-Rail (all sizes)</td>
<td>1</td>
<td>0.78</td>
<td>0.63</td>
</tr>
</tbody>
</table>
Carriage (Slider) Assemblies

Formulas for calculating the estimated lifetime for carriage assemblies are fundamentally similar to the calculations for the individual rollers. The most accurate method for determining the life of a carriage (slider) assembly is to create a free body diagram for the carriage and determine the axial, radial, and moment load applied to each individual roller. This method is cumbersome and is usually only required in the most severe of circumstances. In most cases, the carriage (slider) assembly can be treated as a rigid body and calculations can be completed based upon the load ratings for the entire carriage (slider):

\[
L_{10} [\text{km}] = 100 \cdot \left( \frac{1}{f_L \cdot f_H \cdot f_{SS}} \cdot \left( \frac{F_{y_{app}}}{F_{y_{max}}} + \frac{F_{z_{app}}}{F_{z_{max}}} + \frac{M_{x_{app}}}{M_{x_{max}}} + \frac{M_{y_{app}}}{M_{y_{max}}} + \frac{M_{z_{app}}}{M_{z_{max}}} \right) \right)^3 \cdot (f_R) \quad \text{Eq. 8}
\]

Safety Factor

All individual rollers and carriages are subject to use a balancing formula, which ensures an adequate product life. The following formulas should be used for all CRT Products:

\[
\text{Carriages} \quad \frac{1}{\text{s.f.}} \geq \frac{F_{y_{app}}}{F_{y_{max}}} + \frac{F_{z_{app}}}{F_{z_{max}}} + \frac{M_{x_{app}}}{M_{x_{max}}} + \frac{M_{y_{app}}}{M_{y_{max}}} + \frac{M_{z_{app}}}{M_{z_{max}}} \quad \text{Eq. 9}
\]

\[
\text{Individual Bearings} \quad \frac{1}{\text{s.f.}} \geq \frac{F_{y_{app}}}{F_{y_{max}}} + \frac{F_{z_{app}}}{F_{z_{max}}} \quad \text{Eq. 10}
\]

Where the safety factor value can be determined using the following table.

**Recommended Safety Factor (s.f.)**

<table>
<thead>
<tr>
<th>Duty</th>
<th>Shock/Vibration</th>
<th>Reverse Frequency</th>
<th>Contamination</th>
<th>S.F.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Light</td>
<td>None</td>
<td>Smooth &amp; Low</td>
<td>None</td>
<td>1.0 – 1.2</td>
</tr>
<tr>
<td>Light</td>
<td>Light</td>
<td>Light</td>
<td>Light</td>
<td>1.2 – 1.5</td>
</tr>
<tr>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>1.5 – 2.0</td>
</tr>
<tr>
<td>Heavy</td>
<td>Heavy</td>
<td>High &amp; Fast</td>
<td>Heavy</td>
<td>2.0 – 3.5</td>
</tr>
</tbody>
</table>

Note: The table above contains suggested safety factors based upon the most commonly encountered adjustment criteria. Additional criteria may require raising the safety factor.

**Minimum Load Notice**

It is possible to apply too small of a load to a bearing / carriage. In this case, there is a possibility of the outer ring slipping or the roller lifting off the track. This can cause unexpected vibration or skidding, which reduces the life of the bearing. Therefore, the following condition should be met under dynamic load conditions:

\[
\text{Minimum Dynamic Load} \rightarrow \frac{F_{y_{app}}}{F_{y_{max}}} \leq 50 \quad \text{Eq. 11}
\]

Minimum Load Notice

It is possible to apply too small of a load to a bearing / carriage. In this case, there is a possibility of the outer ring slipping or the roller lifting off the track. This can cause unexpected vibration or skidding, which reduces the life of the bearing. Therefore, the following condition should be met under dynamic load conditions:

\[
\text{Minimum Dynamic Load} \rightarrow \frac{F_{y_{app}}}{F_{y_{max}}} \leq 50
\]

Eq. 11
Heavy Load Notice

It is also possible to over load the bearings. Extra-heavy loads can cause unexpected stress concentrations in the bearing or railway, which reduce the actual lifetime below the minimally acceptable level. These stress concentrations typically come from unexpected vibrations within the application or unexpectedly high preload forces caused by misalignment, damage, or thermal expansion. In these cases, a larger safety factor should be used.

\[ \text{Use Caution} \rightarrow P_{re} > 0.5 \cdot C_r \quad \text{Eq. 12} \]

Note: Although typically applying to linear motion rolling bearings, ISO 14728-1 states that the above equation should be followed. It should be treated as a rule as opposed to a guideline.

If the product under consideration is a carriage (slider) assembly and \( P_r > 0.5 \cdot C_r \), then it is recommended to consider the axial, radial and moment load applied to each individual roller to ensure each roller still has an adequate safety factor.

Shaft/Rail Hardness Factor, \( f_H \)

It is possible to use a softer rail material in combination with PBC Linear’s CRT products; however, it is necessary to reduce the static and dynamic load capacities of each product. The reduced load capacity is known as the “Effective Load Capacity”, which can be calculated using the formula below. The reduction factor, \( f_H \), can be determined using the table below.

For easy reference, some of the most common materials have been plotted on the on the table below:

\[
\begin{align*}
\text{Dynamic} & \rightarrow F_{Y_{Eff}} = F_Y \cdot f_H \quad \text{Eq. 13} \\
\text{Static} & \rightarrow F_{OY_{Eff}} = F_{OY} \cdot f_H \quad \text{Eq. 14}
\end{align*}
\]

Approximate Comparison of Common International Materials

For easy reference, some of the most common materials have been plotted on the table below:

<table>
<thead>
<tr>
<th>#</th>
<th>TYPE</th>
<th>EN NAME</th>
<th>EN #</th>
<th>ASTM/AISI</th>
<th>TYPICAL HARDNESS</th>
<th>( f_H )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Steel</td>
<td>C60</td>
<td>1.0601</td>
<td>1060</td>
<td>60-62</td>
<td>1.0</td>
</tr>
<tr>
<td>2</td>
<td>Steel</td>
<td>52.3</td>
<td>1.0570</td>
<td>1024</td>
<td>19-22</td>
<td>0.1</td>
</tr>
<tr>
<td>3</td>
<td>Stainless Steel</td>
<td>X46 Cr13</td>
<td>1.4034</td>
<td>420</td>
<td>51-53</td>
<td>0.7</td>
</tr>
<tr>
<td>4</td>
<td>Stainless Steel</td>
<td>X90 CrMoV18</td>
<td>1.4112</td>
<td>440B</td>
<td>53-55</td>
<td>0.8</td>
</tr>
<tr>
<td>5</td>
<td>Stainless Steel</td>
<td>X105 CrMo17</td>
<td>1.4125</td>
<td>440C</td>
<td>59-61</td>
<td>0.95-1.0</td>
</tr>
</tbody>
</table>

Note: The values listed in the above table should be considered for reference only. It is critical that individual suppliers are contacted to ensure an accurate hardness rating. Depending upon the supplier, “hardness” can actually be the minimum, maximum, or average value. The wrong interpretation can have unexpected consequences for the application. When given the choice, PBC Linear recommends using the “minimum hardness” when determining the reduction factor as this is the most conservative method.

1. Material Types may not be an exact match. PBC Linear has carefully reviewed the material standards and has determined that if there is not an exact match, the listed materials are the closest approximation. A material specialist should be consulted before translating one material type to another.

2. Different suppliers may have alternate ranges for material hardness, depending upon their heat treating process. Consult manufacturer’s specifications for a more exact number / range.
The standard lifetime formulas listed within this catalog describe an L10 life based upon 100 km, in accordance to the applicable ISO standards. Sometimes 100 km is either excessive or shy of the target life of a machine and the required lifetime needs to be adjusted. An appropriate adjustment factor can be found using the chart.

The L10 Life Formulas are a statistical probability formula with a success rate of 90%. Sometimes an L10 life (90% success) is just not good enough and the formulas need to be modified in order to have a higher probability of success. In this case, choose the desired reliability rate and insert the fR value into the life equation.
Short Stroke Factor, \( f_{ss} \)

In the case that the travel distance is low, a short stroke reduction factor must be included. In general, this factor only applies when the stroke is less than 2\( \times \) the carriage length. In the case of individual bearings, use two full revolutions of the bearing.

\[
\text{Stroke ratio, carriage (slider)} = \frac{\text{stroke [mm]}}{\text{carriage length [mm]}} \quad \text{Eq. 15}
\]

\[
\text{Stroke ratio, individual bearing} = \frac{\text{stroke [mm]}}{\pi D_p [\text{mm}]} \quad \text{Eq. 15}
\]
### General Installation

As a general rule, all of the products within the catalog have a higher radial (Fy) than axial (Fz) load capacity. Whenever possible, designers should attempt to orient the bearings so the primary applied load is in the radial direction.

### Commercial Rail

Commercial Rail is typically used in applications which require low to moderate accuracy. It is generally not necessary to use any advanced manufacturing or assembly techniques to secure this rail system into place.

**Note:** If an assembly plan requires Commercial Rail to be installed with dial indicators, calipers, or other sensitive measuring equipment, then likely this product has probably been over-specified for an application. Consider using a more accurate product for these applications, such as the V-Guide System, Redi-Rail, Integral-V (IVT), or Steel Rail.

### Hardened Crown Roller Rail

**Note:** If an assembly plan requires Hardened Crown Roller rails to be installed with dial indicators, calipers, or other sensitive measuring equipment, then it is likely this product has probably been over-specified for an application. Consider using a more accurate product in these applications, such as the V-Guide System, Integral-V (IVT), Redi-Rail, or Flexible Steel Rail.

### Redi-Rail

The Redi-Rail product is very versatile and can be used in applications that require low accuracy or moderate-high accuracy. In applications that require low accuracy, no special installation, and alignment procedures are needed. In applications that require moderate to high accuracy, use advanced assembly techniques similar to those used for installing profile rail guideways.

**Note:** Refer to the PRT (Profile Rail Technology) catalog for more detailed information related to advanced assembly techniques.

### Hevi-Rail

Hevi-Rail is typically used in applications that require moderate accuracy. There are two common methods for installing Hevi-Rail: Welding & Clamp Flanges.

#### Welding

The preferred method of welding Hevi-Rail, Flange Plates, and Hevi-Rail Clamp Flanges is MIG Welding. Please follow the guidelines listed below when MIG welding Hevi-Rail, Flange Plates and Hevi-Rail Clamp Flanges.

1. Use a metal brush or grinder to remove rust or paint from surface to be welded.
2. Bevel joint edges on metals thicker than 3/8" to ensure the weld fully penetrates to the base of the metal. (HVR-2, HVR-3, HVR-4, HVR-5 HVR-6, HVRI-08, HVRI-09, HVRI-10, and HVRI-11).
3. Ensure that grounding clamp is engaged in clean metal.
4. When welding HVR-S, HVR-0, HVR-1, and HVRI-07 sections of Hevi-Rail it is recommended to use .03" diameter wire. A preferable grade wire for mild steel is ER70S-3.
5. When welding thick sections of Hevi-Rail, it is recommended to use .035"-.045" ER70S-3 wire. Weld at a higher heat level to obtain a deep penetration. This is recommended for HVR-2, HVR-3, HVR-4, HVR-5 HVR-6, HVRI-08, HVRI-09, HVRI-10, and HVRI-11.
6. A 75% Argon / 25% Carbon Dioxide mix is a preferable general purpose shielding gas when welding mild steels like Hevi-Rail.
7. Know your load calculations, when in doubt meet with your structural or mechanical engineer.
8. Destructive testing facilities are recommended for testing weld strength. Periodic destructive testing ensures that the welding equipment and welding practices are yielding safe and strong welds.
9. Never weld a mild steel Hevi-Rail product to a dissimilar metal such as cast iron or stainless steel.

#### Clamp Flanges

When using bolts to hold a Clamp Flange to Hevi-Rail HVR1, HVR-2, HVR-3, HVR-4, HVR-5, or HVR-6, it is recommend to drill a detent in the top of the rail where the screw seats. Many customers use a drill point smaller than the minor diameter of the tap diameter to put a point in the rail. This is preferred in systems that have vibrations and harmonics in its environment. Some customers use bolts to align and assemble the system, then weld the clamp to the rail.
Securing Fasteners

PBC Linear makes no specific recommendation as to whether or not thread-locking fluid (i.e. Loctite®), lock nuts, lock washers, etc., should be used within a given application. Sound engineering fundamentals and company policies should dictate the use of anti-vibration components and technology. Some common reference materials include, but are not limited to:

- Your company’s policies and/or engineering specifications
- Marks’s Standard Handbook for Mechanical Engineers, published by McGraw-Hill (English)
- Machinery’s Handbook, published by Industrial Press (English)
- Roloff/Matek Maschinenelemente, published by Vieweg (German)

Fastener Quantity

It may not be necessary to use a fastener within every supplied fixing hole. This is especially true for applications carrying a light load (high factor of safety). Engineering statics equations can be used to determine the amount of deflection within a rail if not all fixing holes are used. Modern tools, such as FEA, can also be used to speed up this process.

Welding

The recommendations and guidelines listed herein are recommendations only. Always follow your specific company’s policies, welding equipment manufacturer’s instructions, guidelines established by national standards agencies (i.e. ANSI/DIN) and city/state/federal laws or civil guidelines related to proper welding practices. Improper application or installation of PBC Linear products can result in property damage, death, or serious bodily injury.

Note: Improper installation of carriages with spring-loaded lubricators can permanently damage the lubricator material. Damage caused by improper installation is not covered by PBC Linear’s warranty.

Initial Lubrication

After installation, follow the initial lubrication instructions located within this catalog or at www.pbclinear.com. All products are shipped with a preservative material, which should not be considered a true performance lubricant. Lubricant should be added before initial use.

Painting/Powder Coating

Most PBC Linear products can be painted or powder coated after installation to match the aesthetic appearance of the parent structure. It is highly recommended that the bearing’s raceway be masked during this process. These coatings will typically not withstand the pressure of a typical operation and will flake off. These flakes will act as bumps causing the rollers to experience unplanned vibration. This can cause an unexpected shortening of the life of the rollers/carriage.
Roller Lubrication
All smaller rollers (in the Redi-Rail, IVT, V-Guide, Commercial Rail, Hardened Crown Roller families, and smaller diameter Hevi-Rail bearings) are lubricated internally for long life. No additional lubrication is necessary. The rollers are sealed (or shielded) against the operating environment to prevent egress of lubricant, and prevent ingress of contaminants. Some larger rollers (in the Hevi-Rail family) are supplied with a grease access point and can be re-lubricated using a zerk fitting.

Raceway/Guideway Lubrication
To ensure long life, it is necessary to have a thin film of lubrication on the Raceway / Railway at all times. When properly applied, lubrication:
- Reduces wear
- Reduces stress on the contact surfaces
- Reduces friction (and therefore heat buildup)
- Allows for operation at specifications in this catalog (de-rating is required for un-lubricated applications)
- Helps protect the metal surfaces against corrosion (rust and fretting corrosion)

Lubrication Type
Technical, environmental, ecological, and economic factors will determine whether oil or grease should be used in an application. One of the most significant factors in the lubrication selected is the environmental conditions. If extreme conditions are expected, it is highly recommended that a representative from a lubrication company is consulted. This includes heavy contamination when the expected particle size is smaller than 0.1 mm (0.005 in.) as small particles can more easily bypass seals and wipers.

CAUTION! The compatibility of lubricants must always be checked! This check should be done under both static and dynamic conditions and within the operating environment. Some lubricants may have unexpected, negative reactions with the plastics, elastomers or non-ferrous metals within the products. It is possible to draw upon previous and practical experience or guidelines from the lubricant manufacturer. When in doubt, consult the lubricant manufacturer.

Initial Lubrication (during installation)
PBC Linear Guides and Raceways are shipped with a preservative lubrication applied to the raceway. During installation, it is necessary to apply additional lubrication. Provided there are no application conflicts, PBC Linear recommends high quality lithium soap grease as the initial lubricant. This grease should be applied to the entire raceway, not just the portion used during normal operation. Oil or grease may be used for re-lubrication.

Note: Coated / Plated rails, Commercial Rail, Hardened Crown Roller, and Hevi-Rail rails are typically shipped without any preservative lubrication. See the Hevi-Rail section for more details: sandblast and lightly oiled option is available for Hevi-Rail.

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

While the actual lubrication intervals are application specific and determined only through testing, the following guidelines can typically be used as a starting reference point under normal conditions:
- Re-lubrication every 1000 km; 50000 cycles or six months (whichever occurs first).
Oil Filled Polymer Lubricator

Some PBC Linear products offer a high quality polymer lubricator. PBC Linear uses an advanced, oil filled porous polymer, which has been tested to show better performance and longer life than similar wiper / lubricators made of oil or grease filled felt. In some applications, this special lubricator will last the life of the application without additional re-lubrication.

This lubricant within the polymer is NSF Registered for both H1 & H2 applications (Direct and Indirect contact with food). It can also be used for wash down and industrial applications. The lubrication within the polymer contains corrosion inhibitors, anti-oxidants, and extreme pressure (E.P) additives. The table below shows some specific properties for the lubricant.

<table>
<thead>
<tr>
<th>Product Lubricated</th>
<th>Un-Lubricated</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Load kg</td>
<td>100</td>
<td>25</td>
</tr>
<tr>
<td>Max Speed m/s</td>
<td>2</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Properties for Lubrication in Advanced Oil-Filled Plastic Properties for Lubrication in Advanced Oil-Filled Plastic

| Upper Temp Limit | 99° (210°F) | Lower Temp Limit | -40° (-40°F) | Specific Gravity | 0.86 | Viscosity at 40°C cSt | 150 | Viscosity at 100°C CST | 16.5 |

Used Lubricants

Used lubricants should be disposed of using environmentally-friendly methods. Most lubricant manufacturers have guidelines regarding their allowable storage, use, and disposal. In addition, some countries have regulations regarding storage, use, and disposal of lubricants for occupational safety and/or environmental protection. Furthermore, some companies may have adopted internationally accepted quality and standards policies (i.e. ISO14001), which will further regulate the use of lubricants within an application.

These guidelines and regulations must be followed. Care should be exercised as to not specify a lubricant which is forbidden.

Lubrication Failure

Contamination and lack of lubrication are the two primary causes of (ball based) linear guide failures. Lack of lubrication will cause fretting corrosion, which can cause permanent system damage and eventually lead to system failure. As it applies to this product, fretting corrosion is a form of damage caused as a combination of corrosion and abrasive wear. Fretting corrosion can typically be seen as a reddish discoloration on either mating raceway (track or roller). Fretting corrosion can sometimes be confused with rust. Both are signs that additional lubrication is necessary and the re-lubrication period must be decreased.

Operation in an Un-Lubricated State

While not recommended, it is possible to run most systems without lubrication; however, there will be significant reductions to maximum load, maximum speed, and expected life. The table below shows that a typical un-lubricated system will have a significantly reduced maximum load and a reduced maximum speed when compared to a properly lubricated system.

Typical Reductions for Max Load & Speed for Un-Lubricated Systems

<table>
<thead>
<tr>
<th>Product</th>
<th>Lubricated</th>
<th>Un-Lubricated</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Max Load</td>
<td>100</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Max Speed</td>
<td>2</td>
<td>1.5</td>
</tr>
</tbody>
</table>

In addition to significant reductions in maximum load and speed, un-lubricated system will also experience an extreme reduction in expected life. The table below shows the expected life for both a lubricated and un-lubricated system for two different products with two different applied loads. The approximate reduction in lifetime has also been calculated.

Typical Life Reductions for Un-Lubricated Systems

<table>
<thead>
<tr>
<th>Product</th>
<th>Lubricated</th>
<th>Un-Lubricated</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Life 1</td>
<td>5,410,200</td>
<td>88,900</td>
</tr>
<tr>
<td></td>
<td>Life 2</td>
<td>22,860,000</td>
<td>533,400</td>
</tr>
<tr>
<td>C</td>
<td>Life 3</td>
<td>50,800,000</td>
<td>863,600</td>
</tr>
<tr>
<td></td>
<td>Life 4</td>
<td>8,382,000</td>
<td>152,400</td>
</tr>
</tbody>
</table>

Note: Actual performance will vary depending upon specific application conditions. PBC Linear has removed the actual product name from the examples listed above as the results may not be repeatable, depending upon specific application conditions. While these values are typical, specific reductions should be determined by tests conducted under actual application conditions.
Operating Temperature
The Cam Roller products shown in the catalog have a wide operating temperature limit. All of the products within this catalog can be used within the following range: -20°C to +80°C (-4°F to 176°F). For applications outside of this range, first refer to the specifications for individual products. If a wider range is still needed, please contact our applications engineering group using the contact information below.

The temperature range for these products is limited by the lubricant, engineered polymer wipers, and composite cover materials. In most cases, changing the lubricant or the engineered polymer will extend the operating temperature limit for the product.

Velocity & Acceleration
For maximum velocities, check the product specifications. The maximum velocities will range from 0.76 m/s up to 12 m/s. Higher speeds may be possible, but may not be sustainable. Please contact our applications engineering group for sustained speeds above 12 m/s (33 ft/s).

Unless otherwise noted, the maximum possible acceleration of all CRT products is approximately 5 G's (50 m/s², 160 ft/s²). Higher accelerations are possible, but may not be sustainable. Please contact our applications engineering group for sustained accelerations above 5 G's.

Contact Information
If you need to contact our applications engineering group, please use one of the following methods:
Phone: 1.800.962.8979 (inside USA)
Phone: +1.815.389.5600 (outside USA)
Email: application.engineering@pbclinear.com

Safety guidelines

Product Safety
PBC Linear’s products are designed and manufactured to the most current level of technology and research. If the bearing (or linear guide) arrangement is designed, handled, installed, and maintained correctly, then they do not give rise to any known or direct hazards. Misapplication, improper handling, improper installation, or improper maintenance may lead to premature product failure, which may have unintended consequences.

Read & Follow Instructions
This publication describes standard products. Since these are used in numerous applications, PBC Linear cannot make a judgment as to whether any malfunctions will cause harm to persons or property. It is always, and fundamentally, the responsibility of the designer and user to ensure that all specifications are observed, and that all necessary safety information is communicated to the end user. This applies in particular to applications in which product failure and/or malfunction may constitute a hazard to human beings.

Symbols
This publication uses several hazard, warning and notification symbols which are defined in accordance to ANSI Z535.6-2006.

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