Helix Linear Technologies is the most high-tech lead screw manufacturing facility in the world. With the release of our new precision lead screws, Helix produces the broadest product line of any lead screw manufacturer globally. We offer precision rolled, milled, or ground screws in diameters from 1/8” to 6”, or 2mm to 150mm, and leads from 0.012” to 3”, or .3mm to 75mm. Helix offers a complete line of nuts in standard and anti-backlash designs with centralizing threads to match our precision lead screws. Our lead screw assemblies have the lowest backlash on the market.

With the release of new product lines, Helix has even more economical options in the 1/8” to 1” diameter range. We have also developed additional custom anti-backlash nut designs, which are available upon request.

Helix services the expanding and evolving customer-driven market for precision linear motion products. When you need Acme, Trapezoidal, or high-helix lead screws with a precision, low backlash nut, or a state-of-the-art anti-backlash design, we deliver the highest quality and exceptional value to our customers.

CULTURE
Our culture is based on a team of smart, happy and competitive professionals focused on manufacturing innovative products centered on delivering precise electromechanical linear motion solutions. We are in the people business, as well as the product business. People make and sell our products and a team of smart, happy and competitive people make a company healthy.

OPERATIONS
Our company is built to deliver high-quality products and engineering support to solve the most demanding linear motion applications in any industry. We deliver components and subsystem solutions to high volume OEMs and custom machine builders to help secure their success.

COMPANY
Helix is a global supplier to the Medical Device, Life Science, Security, Semiconductor, Aerospace, Electromechanical and Defense industries. Helix leads the linear motion industry by manufacturing the highest quality linear actuation solutions in the world. We focus entirely on manufacturing electromechanical actuation systems that help our customer be more productive and profitable. Our execution of innovative product designs solves real problems for our customers and builds a foundation for long term success.

HISTORY
Helix was founded in 2011 to manufacture high-quality lead screws for the growing electromechanical actuation industry. Helix’s rapid growth has included the addition of linear actuator solutions to deliver integrated and turnkey solutions.
## INDEX

- Oval Track System .......................................................... 2-3
- Straight and Ring Rail....................................................... 4
- Rollers/Floating Bearings............................................... 5
- Cap Seal/Lubricate Wiper .............................................. 6
- Lubricate......................................................................... 7
- Oval Rail ......................................................................... 8-9
- Ring Rail ......................................................................... 10-11
- Straight Rail .................................................................... 12-13
- Rollers ............................................................................. 14-15
- Linear Guide ..................................................................... 16-17
- Assembly Instructions ..................................................... 18
- Load/Life Calculation ...................................................... 19
- Load Capacities ............................................................... 20-23
OVAL TRACK SYSTEM

Helix provides a wide choice of sizes and options to build linear, curve motion system. All of components including linear guides, ring guides, bearings and lubricate parts are designed standard and modularized. Customer can select and build motion system easy and quickly.

Rail Profiles are produced in German.
Design and produce according to DIN standard.
Ring rail radius are standard, Straight rail length is optional.
Additional locating device realize carriages precision location.
The connections between belt and carriages are flexible and torque protected.
Raydent (corrosion protection) is optional for rail.

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**OVAL TRACK SYSTEM**

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- Design and produce according to DIN standard.
- Ring rail radius are standard, Straight rail length is optional.
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- The connections between belt and carriages are flexible and torque protected.
- Raydent (corrosion protection) is optional for rail.

1-855-435-4958
**Straight Rail**

- Made of Germany high quality bearing steel
- Deep hardened in working surfaces for high wear resistance
- Ground Double 70° V working edges together to ensure parallelism
- Soft rail body for customization machining process
- Provide 3 standard sizes for customer’s selection
- Two precision rails G1 and G3 is optional, ground and un-ground
- Precision G3 rail length could be up to 5.5 meters without connection
- Longer length (Unlimited) can be achieved by connection

**Ring Rail**

- Made of high quality bearing steel
- Deep hardened in working surfaces for high wear resistance
- Ground Double 70° V working edge ensure parallelism
- All surfaces are ground for precision
- Provide wide range of standard sizes
- Customized assembly holes are available

**Precision**

Helix provides two precision grades, G1 ground and G3 unground. Here we must emphasize that G3 grade’s motion is also very smooth and stable. It is fit for smooth running without very high precision and low cost request. But when linear rail connect ring rail, it must be G1 grade.
Rollers

- Made of high quality bearing steel
- Whole body hardened for high wear resistance
- Supply Twin and Double row bearings (See below figure)
- Concentric / Eccentric bolt supplied

![Twin bearing](image1)
![Double row bearing](image2)

Floating Bearing

- Outer ring could float in axial direction to compensate installation parallelism
- Made of high quality bearing steel
- Whole body hardened for high wear resistance
- Concentric / Eccentric bolt supplied

Roller Type Selection

<table>
<thead>
<tr>
<th>SS</th>
<th>SVR</th>
<th>25</th>
<th>RS</th>
<th>DR</th>
<th>C</th>
</tr>
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<tr>
<td>Bolt Type, C: concentric, E: Eccentric, DE: Double Eccentric for Curve Rail</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Roller Internal Structure (DR: Double Balls Roller, F: Floating Roller, Vacant is Twin Bearing)</td>
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<td></td>
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<tr>
<td>Seal Type (RS: Rubber seals, ZZ: Steel Shields)</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Roller Size</td>
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<tr>
<td>Roller Type</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Roller Material (SS: Stainless Steel, Vacant is Bearing Steel)</td>
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<td></td>
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</table>

Roller Type Selection - Please refer to pages 14-15.
Cap Seal

- Protect bearing against dust
- Protect operator for safety
- Lubricated felt wiper contact rail’s working surface to increase load capacity and life
- Standard and interchangeable

Lubricate Wiper

- Lubricated felt wiper contact rail’s working surface to increase load capacity and life
- Lubricated felt wiper is pushed lightly by a small spring to ensure low friction with the rail’s working surface
- Easy to fill lubricate oil from its fill hole
- Standard and interchangeable
**Lubricate**

- Lubricated felt wiper contact rail’s working surface to increase load capacity and life
- Lubricated felt wiper is pushed lightly by a small spring to ensure low friction with the rail’s working surface
- Oil charging holes supplied for the Track Motion System
- Automatic lubricate bleed could connect to the rail’s oil charging holes very easily.
- Standard and interchangeable
Oval Rail

<table>
<thead>
<tr>
<th>Assembly Code</th>
<th>Components</th>
<th>Carriage</th>
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<th>B</th>
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<td>Ring Rail: HCR44 468 R180</td>
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<td>Ring Rail: HCR44 612 R180</td>
<td>HSRC44 612</td>
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<td>Ring Rail: HCR76 799 R180</td>
<td>HSRC76 799</td>
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<tr>
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<td>Ring Rail: HCR76 1033 R180</td>
<td>HSRC76 1033</td>
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</tbody>
</table>
### Type Code

**SB- LGV 25 X 2000 -CR25 159 R180**

- **Segment angular**: 180°
- **Ring railway diameter**
- **Ring railway size**
- **Railway length**
- **Railway size**
- **Linear railway**
- **Helix motion symbol**

### Dimension

<table>
<thead>
<tr>
<th>C</th>
<th>C1</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>H</th>
<th>H1</th>
<th>M</th>
<th>S°</th>
<th>T°</th>
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<td>11.25</td>
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<td>160</td>
<td>100</td>
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<td>2x10</td>
<td>58.5</td>
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<td>799</td>
<td>22.5</td>
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<td>2x10</td>
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<tr>
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<td>205</td>
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<td>225</td>
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<td>1501</td>
<td>18</td>
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1-855-435-4958
Ring Rail

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### Type Code

**HCR25 351 R180 (N)**

<table>
<thead>
<tr>
<th>Type Code</th>
<th>Screw holes option</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Segement angular 90°, 180°, full360° Ring</td>
</tr>
</tbody>
</table>

#### Ring rail size

- I: 10
- H: 4.2
- J: 10x6
- L (Ø<depth): 6
- Ø M: 8
- Hole Number: 45
- Hole Position ± 0.2: 22.5
- Weight (kg): 0.77

#### Hole Number

- I: 10
- H: 4.2
- J: 10x6
- L (Ø<depth): 6
- Ø M: 8
- Hole Number: 45
- Hole Position ± 0.2: 22.5
- Weight (kg): 1.2

#### Hole Number

- I: 10
- H: 4.2
- J: 10x6
- L (Ø<depth): 6
- Ø M: 12
- Hole Number: 30
- Hole Position ± 0.2: 15
- Weight (kg): 1.65

#### Hole Number

- I: 12.5
- H: 6
- J: 11x7
- L (Ø<depth): 7
- Ø M: 12
- Hole Number: 30
- Hole Position ± 0.2: 15
- Weight (kg): 5.1

#### Hole Number

- I: 12.5
- H: 6
- J: 11x7
- L (Ø<depth): 7
- Ø M: 16
- Hole Number: 22.5
- Hole Position ± 0.2: 11.25
- Weight (kg): 6.7

#### Hole Number

- I: 19.5
- H: 9
- J: 20x13
- L (Ø<depth): 11
- Ø M: 16
- Hole Number: 22.5
- Hole Position ± 0.2: 11.25
- Weight (kg): 25

#### Hole Number

- I: 19.5
- H: 9
- J: 20x13
- L (Ø<depth): 11
- Ø M: 20
- Hole Number: 18
- Hole Position ± 0.2: 9
- Weight (kg): 32

#### Hole Number

- I: 19.5
- H: 9
- J: 20x13
- L (Ø<depth): 11
- Ø M: 20
- Hole Number: 18
- Hole Position ± 0.2: 9
- Weight (kg): 41

#### Hole Number

- I: 19.5
- H: 9
- J: 20x13
- L (Ø<depth): 11
- Ø M: 20
- Hole Number: 18
- Hole Position ± 0.2: 9
- Weight (kg): 48.7

---

1-855-435-4958
### Straight Rail

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<table>
<thead>
<tr>
<th>Type</th>
<th>A</th>
<th>B</th>
<th>C</th>
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<tbody>
<tr>
<td></td>
<td>G1</td>
<td>G3</td>
<td>G1</td>
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<tr>
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<tr>
<td>HSB-LGV76XL</td>
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<td>76.2</td>
<td>24</td>
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</tbody>
</table>

The table above provides the specifications for different types of Straight Rails. The columns represent various dimensions and specifications as follows:

- **Type**: The type of Straight Rail.
- **A**: A dimension specification.
- **B**: B dimension specification.
- **C**: C dimension specification.

The table includes three grades: G1 and G3, with G1 typically being the standard grade and G3 indicating a higher precision grade.
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## Rollers

![Roller Diagram]

### Table: Bearing Load Capacities (N)

<table>
<thead>
<tr>
<th>Type</th>
<th>Roller Category</th>
<th>Outer Diameter A</th>
<th>Eccentrical Distance J</th>
<th>Bearing Load Capacities (N)</th>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Radial</td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td>Co</td>
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<tr>
<td>HSVR-25C</td>
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<tr>
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<tr>
<td>HSRD-25C</td>
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<tr>
<td>HSRF-25C</td>
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<tr>
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**Dimension**

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<th>G</th>
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Linear Guide

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</table>
The specifications and data in this publication are believed to be accurate and reliable. However, it is the responsibility of the user to validate the correctness of these specifications and data to suit their needs. If the equipment proves to be defective, defective products will be replaced without charge if promptly returned. No liability is assumed beyond such replacement.
**Assembly manual**

1. Match rollers to carriage plate

Please mount the concentric bearing to one side of carriage plate, and eccentric bearing to the other side following the direction of railway. In case of circle motion carriage, the concentric bearing should be mounted to the side where mounting-hole distance is shorter. Please refer to below picture.

![Diagram of Concentric and Eccentric Bearings](image)

2. Mounting to railway

Carriage assembly should be mounted from the end of railway. Please do not put any overstress when mounting.

3. Adjust the clearance between bearing and railway

- Tighten concentric bearings first.
- Then rotate eccentric bearing via rotate hexagonal key at the end of stud to adjust the clearance between railway and bearing.
- Adjust the clearance to zero.
- Slide the carriage by hand and adjust to the extent where there causes a slight slipping resistance.

Correct condition is where moving power becomes the recommended value as below table by putting load by push-pull gauge to the running direction of carriage.

**Recommended pre-load by push-pull gauge**

<table>
<thead>
<tr>
<th>V track bearing size</th>
<th>Pre-load (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>4</td>
</tr>
<tr>
<td>44</td>
<td>8</td>
</tr>
<tr>
<td>76</td>
<td>12</td>
</tr>
</tbody>
</table>

- Keep eccentric bearing's position and tighten the nut.

**Important note**

Appropriate pre-load provide the system rigidity. However, over preload will decrease system's life rapidly. Please be careful.
Load / Life calculation

Due to the hardness of the railway and fatigue analysis of railway and roller, the railway's life does not determine the system life. It is determined by roller's life. Load capacity of the motion guide system varies mainly by the size of bearing and railway, lubricated or not, and the load magnitude and direction. Other factors include speed and acceleration and environment etc. To calculate system life, loading factor LF should be calculated firstly. Here we provide two methods to calculate the loading factor.

Standard 4 bearings carriage calculation

If the system use Helix standard 4 bearings carriage, then calculation can use below formula.

\[
LF = \frac{F_y}{F_{ymax}} + \frac{F_z}{F_{zmax}} + \frac{M_x}{M_{xmax}} + \frac{M_y}{M_{ymax}} + \frac{M_z}{M_{zmax}}
\]

- \(F_y\) - Actual load in Y direction. (N)
- \(F_z\) - Actual load in Z direction. (N)
- \(M_x\) - Actual moment in X direction. (N·m)
- \(M_y\) - Actual moment in Y direction. (N·m)
- \(M_z\) - Actual moment in Z direction. (N·m)

Below parameters can be taken from the table of Load capacity.

- \(F_{ymax}\) - Max load capacity in Y direction. (N)
- \(F_{zmax}\) - Max load capacity in Z direction. (N)
- \(M_{xmax}\) - Max moment capacity in X direction. (N·m)
- \(M_{ymax}\) - Max moment capacity in Y direction. (N·m)
- \(M_{zmax}\) - Max moment capacity in Z direction. (N·m)
Straight rail carriage’s load capacity

<table>
<thead>
<tr>
<th>Carriage Type</th>
<th>Dry system</th>
<th>Lubricated system</th>
<th>Lubricated system/Double Row Bearings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fy</td>
<td>Fz</td>
<td>Mx</td>
</tr>
<tr>
<td>HSLC25</td>
<td>410</td>
<td>410</td>
<td>4.6</td>
</tr>
<tr>
<td>HSLC44</td>
<td>790</td>
<td>790</td>
<td>16</td>
</tr>
<tr>
<td>HSLC76</td>
<td>1850</td>
<td>1850</td>
<td>65</td>
</tr>
</tbody>
</table>

Roller load factor

If the system does not use Helix standard 4 roller carriage, it is necessary to calculate each roller's loading factor. Biggest loaded roller’s load determines the system's life.

<table>
<thead>
<tr>
<th>Carriage Type</th>
<th>Dry system</th>
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<tbody>
<tr>
<td></td>
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<td>HSLC25</td>
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</tr>
<tr>
<td>HSLC76</td>
<td>1850</td>
<td>1850</td>
<td>65</td>
</tr>
</tbody>
</table>

If the system does not use Helix standard 4 roller carriage, it is necessary to calculate each roller’s loading factor. Biggest loaded roller’s load determines the system’s life.
LF - Loading factor

\[ LF = \frac{F_y}{F_{y,max}} + \frac{F_z}{F_{z,max}} \]

*LF should be less than 1.0 for any combination of load*

Fy - Actual axial capacity. (N)
Fz - Actual radial capacity. (N)

Below parameters can be taken from below table.

Fy max - Max axial load. (N)
Fz max - Max radial load. (N)

**Roller’s load capacity**

*Roller Type Selection - Please refer to pages 14-15.*

**Life calculation**

After getting Loading Factor LF, the life in km can be calculated by selecting one of below two formulas. The basic life can be taken from table below.

**Dry system**

\[ \text{Life(km)} = \frac{\text{Basic}_\text{life}}{(0.03 + 0.97LF^2f)^2} \]

**Lubricated system**

\[ \text{Life(km)} = \frac{\text{Basic}_\text{life}}{(0.03 + 0.97LF^2f)^2} \]

**Basic life**

<table>
<thead>
<tr>
<th>Bearing type</th>
<th>Dry system</th>
<th>Lubricated system</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSVR-25</td>
<td>100</td>
<td>150</td>
</tr>
<tr>
<td>HSVR-34</td>
<td>100</td>
<td>150</td>
</tr>
<tr>
<td>HSVR-54</td>
<td>150</td>
<td>250</td>
</tr>
</tbody>
</table>
Calculation example

A machine uses SB-LGV25 spacer railway and standard carriage. The carriage and work-piece total weight is 8 kg. When the carriage is moving, there is an external load of 50 N exerted as shown in the drawing. The working environment is clean. There is no vibration or shock.

The load factor LF is calculated using the formula:

\[ LF = \frac{F_y}{F_{ymax}} + \frac{F_z}{F_{zmax}} + \frac{M_x}{M_{xmax}} + \frac{M_y}{M_{ymax}} + \frac{M_z}{M_{zmax}} \]

- \( F_y = 8 \text{ kg} \times 9.8 \text{ (gravity)} = 78.40 \text{ N} \)
- \( F_z = 50 \text{ N} \)
- \( M_x = 50 \times 0.05 = 2.5 \text{ N} \cdot \text{m} \)
- \( M_y = 0 \)
- \( M_z = 0 \)

\( LF = \frac{78.40}{1280} + \frac{50}{1200} + \frac{2.5}{14} + 0 + 0 = 0.2816 \)

The load factor LF is used to calculate the life of the system.

For a dry system with basic life of 100 km and reduction coefficient \( f = 1.3 \):

\[ \text{Life (km)} = \frac{100}{(0.03 + 0.97 \times 0.2816 \times 1.3)} = 674 \text{ km} \]

For a lubricated system with basic life of 150 km and reduction coefficient \( f = 1.1 \):

\[ \text{Life (km)} = \frac{150}{(0.03 + 0.97 \times 0.2816 \times 1.1)} = 4155 \text{ km} \]

The calculation example demonstrates the importance of lubrication for the life of the system. Please pay attention to install the lubrication system for your system.

---

**f - Reduction coefficient of the application and environment.**

| None vibration or shock, Low speed (≤1 m/s), Low frequency shift direction, clean environment. | 1-1.5 |
| Light vibration or shock, medium speed (1-2.5 m/s) Medium frequency shift direction, some dirtiness | 1.5-2 |
| Heavy vibration or shock, high speed (>2.5 m/s) High frequency shift direction, heavy dirty | 2-3.5 |
Calculation example

A machine uses SB-LGV25 spacer railway and standard carriage. The carriage and work-piece total weight 8 kg. When the carriage moving, there is an external load of 50 N exerted as below drawing. Working environment is clean. There is none vibration or shock.

\[ LF = \frac{F_y}{F_{ymax}} + \frac{F_z}{F_{zmax}} + \frac{M_x}{M_{xmax}} + \frac{M_y}{M_{ymax}} + \frac{M_z}{M_{zmax}} \]

\( F_y = 8 \text{kg} \times 9.8 \text{(gravity)} = 78.40 \text{N} \)
\( F_z = 50 \text{N} \)
\( M_x = 50 \times 0.05 = 2.5 \text{N m} \)
\( M_y = 0 \)
\( M_z = 0 \)

The load factor LF is calculated using the above formula.

Then life (km) calculation can use formula as below:

**Dry system**

\[ \text{Life(km)} = \frac{\text{Basic\_life}}{(0.03 + 0.97LF \times f)^2} \]

Basic life is 100 km.

According to the description of working condition, take \( f = 1.3 \).

\[ \text{Life(km)} = \frac{100}{(0.03 + 0.97 \times 0.2816 \times 1.3)^2} = 674 \text{km} \]

**Lubricated system**

Basic life is 150 km, take \( f = 1.1 \)

\[ \text{Life(km)} = \frac{\text{Basic\_life}}{(0.03 + 0.97LF \times f)^2} \]

\[ \text{Life(km)} = \frac{150}{(0.03 + 0.97 \times 0.2816 \times 1.1)^2} = 4155 \text{km} \]

From this example, it shows clearly that lubrication is so important for the life. Please pay attention to install the lubrication system for your system.