**Introductions**

DryLin® T slide guide rails were developed for applications in the automation and handling industries. Rather than extreme precision the development objective was a robust linear guide system for reliable use in the widest range of different environments. DryLin® T guide rails are shock resistant and have an extremely low weight design. DryLin® T slide guide rails are exceptionally quiet in operation because there are no moving parts or metallic rollers.

**Special Characteristics**
- No lubrication necessary
- Adjustable clearance
- Replaceable sliding inserts
- Quiet operation
- Resistant to dust, dirt and moisture
- Corrosion resistant
- High static load rating in all directions
- Low weight
- Shock and vibration resistant
- Excellent wear resistance

**Design**

DryLin® T slide guide rails consist of carriages mounted on the rail.

1. The rail, together with the basic body of the wagon, is made of aluminium Al Mg Si 0.5. The rail is hard anodised and the aluminium body of the slide is clear anodised.
2. The guide bearing consists of six opposing pairs of slide inserts made of Igusur J.
3. One side of each of the three guide bearings can be infinitely adjusted in height.
4. All steel parts are galvanised.
5. The end covers are made of plastic.

**Dimensions**

The mounting directions of the DryLin® T slide guide rails are interchangeable with the usual recirculating ball guides. The DryLin® T slide rail guides offer further advantages compared to other linear guides:

- Very high accelerations possible
- Extreme speeds can be attained quickly
- Minimum effort for assembly
- Replaceable slide inserts
- Maintenance free
- Corrosion resistant

**Static Load-Bearing Capacity**

<table>
<thead>
<tr>
<th>Type</th>
<th>C oy (N)</th>
<th>C oy (N)</th>
<th>C oz (N)</th>
<th>M ox (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>4000</td>
<td>4000</td>
<td>2000</td>
<td>32</td>
</tr>
<tr>
<td>20</td>
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<td>30</td>
<td>14000</td>
<td>14000</td>
<td>7000</td>
<td>200</td>
</tr>
</tbody>
</table>
Calculation

For the exact calculation of the DryLin® T linear guide system it is essential to find out whether the position of the forces is within the allowed limits and if the sliding element where the highest forces occur is not overloaded. The calculation of the possible driving force and the maximum speed allowed is important. The position of the guiding system leads to different formulas for calculation. Factors concerning shocks and acceleration forces are not included in the calculation, therefore the distance between maximum load and allowable load has to be observed.

This analysis cannot provide information regarding the wear or lifetime of the system.

Procedure

Preparation
Step 1: change the position of the system.
Step 2: control of the distances between the forces and comparison with the maximum distances allowed.

Calculation
Step 3: calculation of the necessary driving force.
Step 4: calculation of the maximum load on the bearings in y- and z- direction.

Result
Step 5: control of the maximum load on the bearings, the sliding element where the biggest load occurs (step 4).
Step 6: Establishing the maximum speed allowed for the calculated loads of step 4.

Evaluation

![Graph showing relationship between Centrifugal Bearing Load (N) and Permissible Mean Speed (m/s) for different models TW01-15, TW01-20, TW01-25, and TW01-30.](image-url)
**One Rail and One Carriage**

**Step 2:** maximum allowable distances between the acting forces

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Sx (mm)</th>
<th>Sy, ay (mm)</th>
<th>Sz, az (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TW01-15</td>
<td>14</td>
<td>44</td>
<td>55</td>
</tr>
<tr>
<td>TW01-20</td>
<td>17</td>
<td>52</td>
<td>67</td>
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<tr>
<td>TW01-25</td>
<td>20</td>
<td>59</td>
<td>78</td>
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<tr>
<td>TW01-30</td>
<td>24</td>
<td>72</td>
<td>93</td>
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</table>

**Horizontal Mounting**

**Step 3:** calculate required driving force

\[
F_a = \frac{F_s \mu L_x (Z_M+2S_z)}{Z_M (L_x-2a_z \mu)}
\]

**Step 4:** maximum bearing load in y direction

\[
F_{y, \text{max}} = F_s \left[ \frac{S_x}{L_m} + \frac{S_z}{Z_m} + 0.5 + \frac{\mu (a_y+Y_0) (Z_M+2S_z)}{Z_M (L_x-2a_z \mu)} \right]
\]

maximum bearing load in z direction

\[
F_{z, \text{max}} = \frac{2F_s \mu a_z (Z_M+2S_z)}{Z_M (L_x-2a_z \mu)}
\]

**Vertical Mounting**

**Step 3:** calculate required driving force

\[
F_a = \frac{F_s \mu L_x (Z_M+2S_y)}{Z_M [L_x-2\mu (a_y+Y_0)]}
\]

**Step 4:** maximum bearing load in y direction

\[
F_{y, \text{max}} = \left[ \frac{F_s}{S_y+Y_0} + \frac{\mu (a_y+Y_0) (Z_M+2S_y)}{Z_M [L_x-2\mu (a_y+Y_0)]} \right]
\]

maximum bearing load in z direction

\[
F_{z, \text{max}} = F_s \left[ \frac{2S_x}{L_x} + \frac{\mu (a_y+Y_0) (Z_M+2S_y)}{Z_M [L_x-2\mu (a_y+Y_0)]} \right]
\]
**Linear Motion**

**DryLin® T Linear Bearings**
With High Performance Polymers

**One Rail and Two Carriages**

**Step 2:** maximum allowable distances between the acting forces

**Horizontal Mounting**

**Step 3:** calculate required driving force

\[ F_a = \frac{F_s \mu W_x (Z_M + 2S_z)}{Z_M (W_x - 2a \mu)} \]

**Step 4:** maximum bearing load in \( y \) direction

\[ F_y \max = \frac{F_s}{2} \left[ \frac{S_x}{W_x} + \frac{S_z}{Z_M} + \frac{2\mu (a_y + Y_0) (Z_M + 2S_z)}{Z_M (W_x - 2a \mu)} \right] \]

- \( S_x = W_x - S_x \) (if \( S_x < 0.5W_x \))
- \( S_x = 5S_x \) (if \( W_x > S_x > 0.5W_x \))

maximum bearing load in \( z \) direction

\[ F_z \max = \frac{F_s \mu a_z (Z_M + 2S_z)}{Z_M (W_x - 2a \mu)} \]

**Vertical Mounting**

**Step 3:** calculate required driving force

\[ F_a = \frac{F_s \mu W_x [Z_M + 2(S_y + Y_0)]}{Z_M [W_x - 2\mu (a_y + Y_0)]} \]

**Step 4:** maximum bearing load in \( y \) direction

\[ F_y \max = F_s \left[ \frac{S_x}{W_x} + \frac{S_y + Y_0}{2Z_M} + \frac{\mu a_z [Z_M + 2(S_y + Y_0)]}{Z_M [W_x - 2\mu (a_y + Y_0)]} \right] \]

- \( S_x = W_x - S_x \) (if \( S_x < 0.5W_x \))
- \( S_x = 5S_x \) (if \( W_x > S_x > 0.5W_x \))

maximum bearing load in \( z \) direction

\[ F_z \max = \frac{F_s}{2} \left[ \frac{S_y}{Z_M} + \frac{\mu (a_y + Y_0) [Z_M + 2(S_y + Y_0)]}{Z_M [W_x - 2\mu (a_y + Y_0)]} \right] \]
**Two Rails and Two Carriages**

**Step 2:** maximum allowable distances between the acting forces

**Horizontal Mounting**

**Step 3:** calculate required driving force

\[
F_a = \frac{F_s \mu W_x}{Z_m (W_x - 2a_2 \mu)}
\]

**Step 4:** maximum bearing load in y direction

\[
F_y \text{ max} = \frac{F_s}{2} \left[ \frac{S_x k}{W_x} + \frac{S_z k}{b} + \frac{\mu (a_y + Y_0)}{2 (W_x - 2a_2 \mu)} \right]
\]

- \(S_x k = W_x - S_x \) (if \( S_x < 0.5W_x \))
- \(S_x k = 5x \) (if \( W_x > S_x > 0.5W_x \))
- \(S_z k = b - S_z \) (if \( S_z < 0.5b \))
- \(S_z k = S_z \) (if \( b > S_z > 0.5b \))

maximum bearing load in z direction

\[
F_z \text{ max} = \frac{F_s \mu a_z}{W_x - 2a_2 \mu}
\]

**Vertical Mounting**

**Step 3:** calculate required driving force

\[
F_a = \frac{F_s \mu W_x [b + 2(S_y + Y_0)]}{b [W_x - 2\mu (a_y + Y_0)]}
\]

**Step 4:** maximum bearing load in y direction

\[
F_y \text{ max} = \frac{F_s}{4} \left[ \frac{(S_y + Y_0)}{b} + \frac{\mu (a_y + Y_0) [b + 2(S_y + Y_0)]}{b [W_x - 2\mu (a_y + Y_0)]} \right]
\]

maximum bearing load in z direction

\[
F_z \text{ max} = \frac{F_s}{W_x} \left[ \frac{S_x k \mu a_z [b + 2(S_y + Y_0)]}{b [W_x - 2\mu (a_y + Y_0)]} \right]
\]

- \(S_x k = W_x - S_x \) (if \( S_x < 0.5W_x \))
- \(S_x k = 5x \) (if \( W_x > S_x > 0.5W_x \))
## Step 5: maximum permissible load

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Fy max, Fz max (N)</th>
<th>Lx (mm)</th>
<th>Zm (mm)</th>
<th>Yo (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TW01-15</td>
<td>2000</td>
<td>29</td>
<td>16</td>
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<td>15.0</td>
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<td>TW01-25</td>
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<tr>
<td>TW01-30</td>
<td>7000</td>
<td>49</td>
<td>29</td>
<td>21.5</td>
</tr>
</tbody>
</table>

μ = 0.2 dynamic application  μ = 0 static application

- Fa : driving force
- Fs : applied mass force
- Fy, Fz : bearing load in y or z direction
- Sx, Sy, Sz : distance of mass force in xy or z direction
- ay, az : distance of driving force in xy or z direction
- Wx : distance of carriages on a rail
- Lx : constant from table
- Zm : constant from table
- Yo : constant from table
- b : distance of guide rails
- μ : coefficient of friction
Setting the Clearance

DryLin® T are delivered ready for mounting. The setting of the bearing clearance is carried out at the factory.

The pre-adjustment is carried out on the basis of the displacement force per slide.

If you have special requirements please indicate in your order whether particularly limited or extended bearing play is to be preset.

If required the bearing play of the DryLin® T slides can be readjusted. This should always take place without any additional load:

1. First loosen the lock nuts.

2. The guide play for the 3 bearing points can then be readjusted with an Allen key. In doing so please check the effectiveness via the sliding forces.

3. After you have adjusted all 3 bearing levels the play on the guide inserts should be checked once again.

4. There is a danger that the excessive reduction of the clearance seizes the slide elements and that the play cannot be re-set simply by loosening the Allen screws. The sliding elements are then loosened again by pressing the reset button on the opposite side. Please use a 3mm pin for models 25 and 30 and a 2.5mm pin for the models 15 and 20 to press strongly against the readjusting spring. You must already have loosened the respective hexagon socket screws.
**The Sliding Inserts**
The Iglidur J material with hard anodised aluminium achieved the best results by far in our tests.

Comprehensive investigations showed that for the relevant loads of linear guides the slide bearings made of Iglidur J are the most suitable.

They offer the greatest wear resistance and at the same time guarantee very favourable abrasion values.

Compared to slide partners made of hardened steel it even proved possible to further improve the abrasion resistance by a factor of 3 using gliding partners made of hard anodised aluminium.

**Special Characteristics of Iglidur J**
- very low abrasion values during dry operation
- excellent wear resistance
- maintenance-free operation
- vibration damping
- very low moisture absorption

**Operating Temperatures**
Iglidur J slide bearings can be used under temperatures of -40°C to a maximum of +90°C. The excellent heat conduction of the aluminium rail means that it is only necessary to take note of the generated friction heat during very high speeds for prolonged periods of time.

**Chemical Resistance**
Iglidur J is resistant to weak acids, diluted alkalis, as well as fuels and all types of lubricants.

The very low moisture absorption allows them to be used in wet or moist environments.

The resistance to alkalis allows them to be used in applications in which plants or parts of them have to be frequently cleaned.
Fitting Instructions

The DryLin® T slide guide rail always requires a small clearance between the slide and rail.

The connecting surface which is screwed to the slide must be very flat, otherwise there is a danger that the slide will be subjected to tension.

When two parallel rails are used one slide must be fitted as a fixed bearing and one slide must be fitted as a floating bearing. When you order we will therefore ask you to describe the fitting situation, preferably on the special order form.

DryLin® T slide rail guides are supplied in assembled and pre-set conditions.

If necessary the slides can be removed for better mounting of the rails.

Please note that the side with endcover which has the part number on the bottom right-hand edge must be first pushed onto the rail.

The setting of the bearing clearance is also to adjust the slide exactly to match the slide rail. Both the rails and the plastic cover of the slide are marked to avoid accidentally turning the slide around when mounting.

TECHNICAL DATA

<table>
<thead>
<tr>
<th>Slide Rail</th>
<th>Material</th>
<th>Aluminium, extruded</th>
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</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Al Mg Si 0.5</td>
<td></td>
</tr>
<tr>
<td>Coating</td>
<td>Hard anodised, 50μm</td>
<td></td>
</tr>
<tr>
<td>Hardness</td>
<td>500 HV</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Slide Wagon</th>
<th>Basic body</th>
<th>Aluminium, extruded profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Al Mg Si 0.5</td>
<td>Anodised, E6/EV1</td>
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<tr>
<td>Coating</td>
<td></td>
<td>Maintenance-free sliding bearing</td>
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<tr>
<td>Slide inserts</td>
<td></td>
<td>material Igldur J</td>
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<tr>
<td>Screws</td>
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<td>Galvanised steel</td>
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<tr>
<td>Springs</td>
<td></td>
<td>Galvanised steel</td>
</tr>
<tr>
<td>Cover</td>
<td></td>
<td>Plastic</td>
</tr>
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</table>

Maximum Sliding Speed 10 m/s
Temperature Range -40°C to +90°C