Dual Vee™ Single Edge Slide System

Overview

Load/Life Relationship

Several factors influence the service life of a Dual Vee™ linear system.
Through research and development a simple method has been devised to estimate the load/life relationship for a specific Dual Vee™ guide mechanism under defined loading conditions.
The methodology accounts for the size of the Dual Vee™ bearing elements, relative spacing, and the orientation, location and magnitude of the load.
The curve is based upon clean, well lubricated track conditions, so for applications where lubrication is prohibited, a derating factor must be applied.
It is important to note that considerations such as maximum velocity, acceleration rates, duty cycle, stroke length, environmental conditions, the presence of shock, vibration and extreme temperature ranges can all impact service life to varying degrees.
As such, the sizing method outlined below should be used conservatively, and considered only as a guideline for the sizing of Dual Vee™ components and assemblies.
When time and budget permits, the prototyping of a Dual Vee™ arrangement is recommended to confirm service life expectations.

The Load/Life Equation – Sizing and Selection

The life of a Dual Vee™ guide will be limited to the life of the most heavily loaded bearing in the design.

Step 1: Calculate the resultant radial and axial loads reflected to each bearing element in the linear guide design.
If assistance is required in resolving specific loads into the resultant reaction forces at the guide wheel interface, contact Technical.
It is recommended that the Application Data Sheet be submitted beforehand (ask sales for details), with as much application information detailed as possible.

Step 2: Calculate the load factor for the most heavily loaded bearing.
LF = LA / Lamax + LR / LR max
Where;

LF	= Load factor
LA	= Resultant axial load on the guide wheel
LAmax	= The maximum axial working load capacity of the guide wheel
LR	= Resultant radial load on the guide wheel
LRmax	= The maximum radial working load capacity of the guide wheel

- Bearings should be sized such that LF≤1
- The most heavily loaded bearing will have the highest load factor

Due to varying application load and speed parameters and environmental conditions, the appropriate adjustment factor must be applied to the maximum axial and radial working load capacities (LAmax and Lrmax) as follows:

Adjustment Factor	Application Conditions
1.0-0.7	Clean, low speed, low shock, low duty
0.7-0.4	Moderate contaminants, medium duty, low to medium vibration, moderate speed
0.4-0.1	Heavy contamination, high acceleration, high speed, medium to high shock, high vibration, high duty cycle, dry running.

Oscillating motion resulting in less than one full revolution of the wheel under load can cause accelerated wear on the internal bearing elements.
Testing of such systems is recommended to verify compatibility of the design with load/life requirements.
In lightly loaded applications bearing preload can be higher than the working load.
A figure equivalent to 3% of the radial working load capacity should therefore be included in the LR figure when calculating life.

Lubrication

Lubrication is the key to maximising the life of a Dual Vee™ linear guide. Internally, Dual Vee™ guide wheels are lubricated for life with an extreme pressure, corrosion resistant grease. However, lubrication of the wheel/track interface is the responsibility of the user. A light machine oil or an extreme pressure grease will serve well in minimising wear, stick slip, and corrosion on the guide ways in a Dual Vee™ based design. Lubrication will maximise the load capacity of an individual bearing element. As such, for any specific application loading condition, the presence of lubrication on the guide ways will significantly increase the service life over a non-lubricated configuration under the same loads. Lubrication will also increase the maximum linear velocity that a Dual Vee™ bearing arrangement can endure. In applications where high speed or high acceleration rates are present, lubrication of the wheel/track interface is highly recommended. Lastly, lubrication will reduce the overall coefficient of friction of the guide, which, depending on the level of preload, can fall anywhere from 0.008 to 0.015. The availability of lubricators and wheel covers gives design engineers an opportunity to design lubrication right into the Dual Vee™ mechanism with little effort (ask sales for details).