# Linear Bearings

Linear bearing products are offered in greater diversity than rotary bearings intimidating many people who might otherwise use these products to improve their machine designs. The choices can be broken into sets rather than one broad array by identifying basic machine functions and features that are required.

One choice is whether the stroke (i.e. length of travel) is shorter than the limits of the bearing system or whether a recirculating product is needed for what may be considered an unlimited stroke. The former product would be something such as flat cage and roller assemblies or die set bearings. Unlimited stroke bearings require rolling elements that recirculate such as those used with shaft assemblies or monorail systems.

Simplicity of design and assembly desired can help us choose. Shaft and bushing systems require lots of parts and labor and simple design errors can easily be made. Carriage and monorail systems need merely be aligned and attached to the structure but cost more per part.

Another important choice is between conformity and rigidity. For example, the use of a roller monorail system with preload can provide the most rigid recirculating system while requiring the most exacting standards of manufacturing and assembly for the mating components. Ball monorail systems would be more forgiving to errors of manufacturing or expanded tolerances while sacrificing rigidity and load capacity. Products and solutions are widely different depending on the answer to those basic questions.

Regardless of your needs, the following charts can help you make sense of the many different linear systems available. You can make your system successful with these selection criteria.

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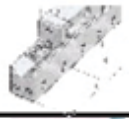
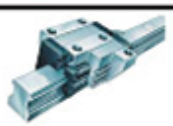
| LINEAR GUIDANCE SYSTEMS REFERENCE CHART | |
|---|---|
| **LINEAR GUIDANCE SYSTEM TYPE** | |
| Flat Cage Assemblies |  |
| Recirculating Roller Bearings |  |
| Recirculating Roller Systems |  |
| Recirculating Linear Ball Systems - 6 Row |  |
| Recirculating Linear Ball Systems - 4 Row |  |
| Recirculating Ball Unit |  |
| Recirculating Linear Ball Systems - 2 Row |  |
| Track Roller System |  |
| Round Shaft System |  |

*BSA wishes to especially thank David Zoesch, INA USA Corporation, for his help in preparing this ESC Report.*

| Linear Guidance Systems | Load Capacity | Rigidity | Accuracy | Friction | Speed |
|---|---|---|---|---|---|
| Round Shaft System - Ball Bearing |  |  |  |  |  |
| Round Shaft System - Plain Bearing |  |  |  |  |  |
| Track Roller System |  |  |  |  |  |
| Recirculating Ball System - Two Row |  |  |  |  |  |
| Recirculating Ball Unit |  |  |  |  |  |
| Recirculating Ball System - Four Row |  |  |  |  |  |
| Recirculating Ball System - Six Row |  |  |  |  |  |
| Recirculating Roller System |  |  |  |  |  |
| Recirculating Roller Bearing |  |  |  |  |  |
| Flat Cage System |  |  |  |  |  |

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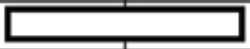
| Linear Systems | Segment 1 | Segment 2 | Segment 3 |
|---|---|---|---|
| Flat Cage Assemblies |  | | |
| Recirculating Roller Bearing |  | | |
| Recirculating Roller Systems |  | | |
| Recirculating Ball - 6 row |  | | |
| Recirculating Ball - 4 row |  | | |
| Recirculating Ball Unit |  | | |
| Recirculating Ball - 2 row |  | | |
| Track Roller System |  | | |
| Round Shaft System |  | | |
| | | | |

| Characteristics | Segment 1 | Segment 2 | Segment 3 |
|---|---|---|---|
| Load carrying capacity | High | Moderate | Low |
| Rigidity | Very high | Moderate | Low |
| Accuracy | Very high | Moderate | Low |
| Speed | Low | High | Moderate |
| Friction | Moderate | Low | Moderate |
| Total travel | Low | High | High / Moderate |
| Areas of application (example) | • Measuring machines<br>• Precision machine tools<br>• Precision designs in general machine construction | • Machine tools<br>• Woodworking machines<br>• Sheet metal processing<br>• Medical technology<br>• Handling equipment<br>• General machine constr. | • Feed systems<br>• Transport systems<br>• Handling systems<br>• General machine construction |

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