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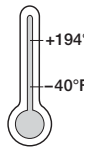
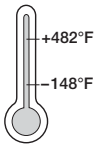
QuickSpec: www.igus.com/qs/DryLin.asp

DryLin® R Linear Plain Bearing

DryLin® R linear plain bearings, made from solid polymers, are dimensionally equivalent to standard ball bearings. They are made entirely of wear resistant iglide® materials and offer technical advantages as well as a clear price advantage.



iglide® J
iglide® J200



iglide® T500

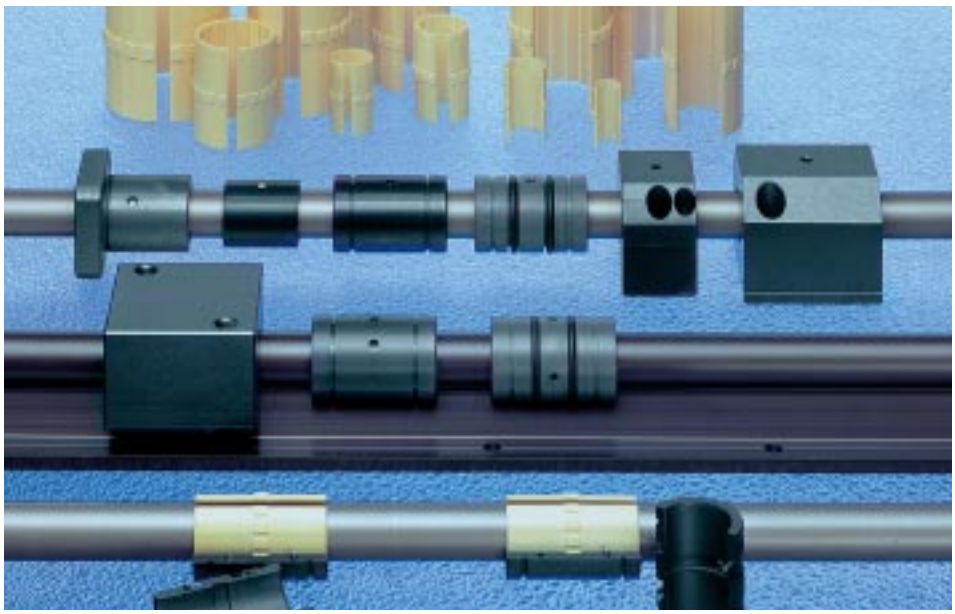
Technical Data

Liners:	Maintenance-free
Materials:	
●	iglide® J
●	iglide® J200
●	iglide® T500
Max. speed:	up to 15 ft/s
Shaft materials:	
●	Anodized aluminum
●	Case-hardened steel
●	Stainless steel
●	Cold-rolled steel
●	Hard chrome-plated
●	carbon fibre

DryLin® R can be used in extreme dirt conditions

DryLin® R can be used in high temperature environments

DryLin® R can be used for applications with aggressive chemicals



DryLin® R: Linear Plain Bearings

DryLin® R is dimensionally interchangeable with linear ball bearings, but offers cleaner, more cost-effective results even in harsh environments. The standard RJUI/RJUM bearing consists of an iglide® J liner slip-fit into an aluminum housing. The unique grooved design of the J liner minimizes clearance, is suitable for use in extremely wet and dirty environments, and is easily replaceable. Dimensionally interchangeable all-polymer parts RJI/RJM are also available for cost-savings, weight reduction, and other technical advantages. Both parts are secured with retaining clips, as are ball bearings. DryLin R guides may also be used with the high temperature, chemically resistant TUI/TUM liners for extreme applications.

Advantages of DryLin® R

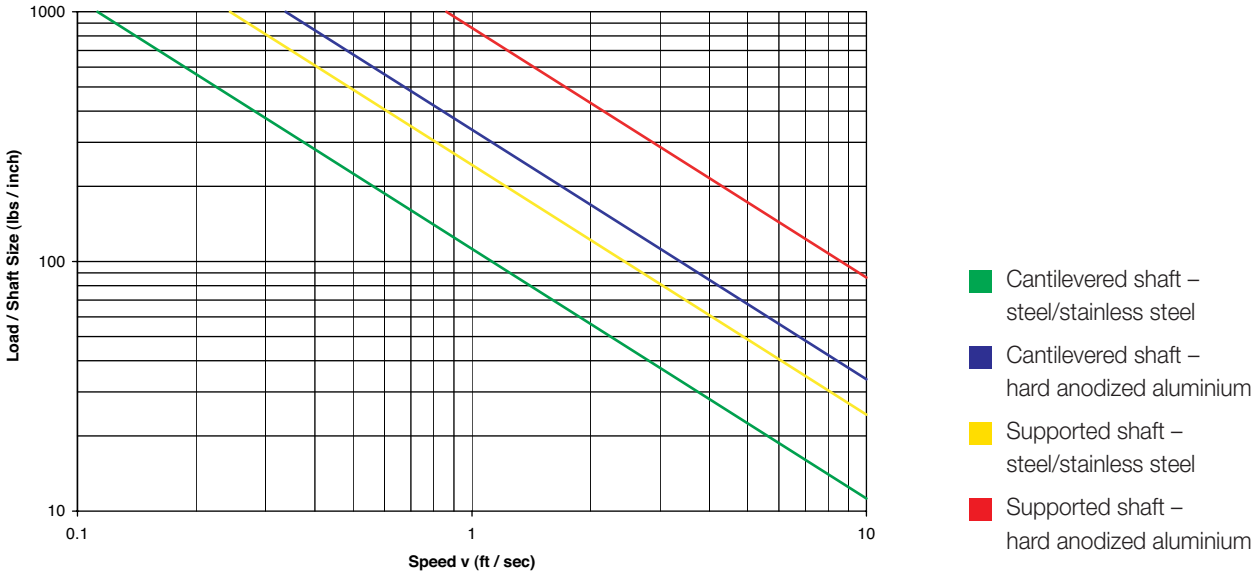
- Self-lubricating
- Maintenance-free
- Can be used in extreme dirt conditions
- Can be used underwater or in washdown conditions
- Replaceable liner
- Dimensionally interchangeable with standard recirculating ball bearings
- Vibration dampening
- No seals or wipers needed
- Compensation for shaft misalignment (03 series)

1. Self aligning adapter aluminum anodized
2. Stainless steel adapter (optional)
3. Standard flanged housing anodized aluminum
4. Standard iglide® J liner
5. High temperature iglide® T500 liner
6. Pillow blocks - dimensionally interchangeable with ball bearings

DryLin® R Linear Plain Bearing Material Table

General Properties	Unit	iglide® J	iglide® T500	iglide® J200 (Available in some sizes)	Testing Method
Density	g/cm³	1.49	1.44	1.72	
Color		Yellow	Black	Dark grey	
Max. moisture absorption at 23 °C/50% r. F.	% weight	0.3	0.1	0.2	DIN 53495
Max. moisture absorption at 73°F	% weight	1.3	0.5	0.7	
Coefficient of sliding friction. dynamic against steel	µ	0.06 - 0.18	0.09 - 0.27	0.11- 0.17	
P x V value. max. (dry)	psi x fpm	9,700	37,700	8,600	
Mechanical Properties					
Modulus of elasticity	PSI	398,090	1,174,806	406,105	DIN 53457
Tensile strength at 68°F	PSI	10587	24656	8412	DIN 53452
Compressive strength	PSI	8702	14504	n.d.	
Permissible static surface pressure (68°F)	PSI	5076	21755	3335	
Shore D hardness		74	85	70	DIN 53505
Physical and Thermal Properties					
Max. long term application temperature	°F	194	482	194	
Max. short term application temperature	°F	248	599	248	
Min. application temperature	°F	-58	-148	-58	
Thermal conductivity	W/m x K	0.25	0.6	0.24	ASTM C 177
Coefficient of thermal expansion (at 68°C)	$K^{-1} \times 10^{-5}$	10	5	8	DIN 53752
Electrical Properties					
Specific volume resistance	Ωcm	> 10^{13}	< 10^{5}	> 10^{8}	DIN IEC 93
Surface resistance	Ω	> 10^{12}	< 10^{3}	> 10^{8}	DIN 53482

Table 24.1: Material Data



Graph 24.1: DryLin® R – Comparison of the permissible dynamic loads at equivalent diameters

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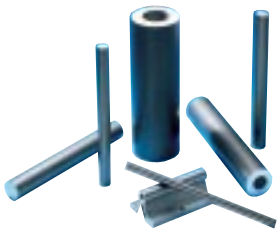
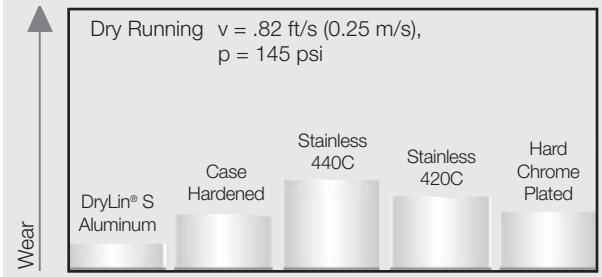
Shaft Materials and DryLin® R Linear Plain Bearings



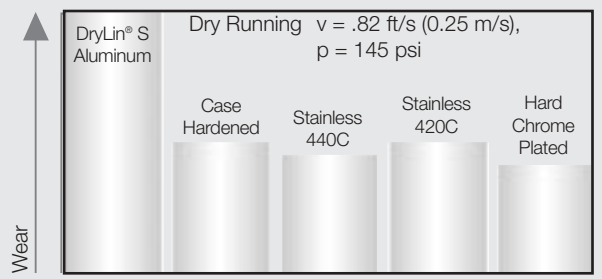
DryLin® S: Hard-Anodized Shafting

Although DryLin® R works well with various steel shafts, DryLin® S hard-anodized aluminum shafting was specifically developed as the optimal sliding surface for DryLin® R when using our standard iglide® J/J200 liner material. This combination achieves the lowest frictional properties, and reduces wear by up to 50% versus steel shafting — not to mention being very lightweight and extremely cost-effective.

iglide® J – various shaft materials



iglide® T500 – various shaft materials



The iglide® J material

iglide® J material gliding on different surface materials achieved the best results in our tests. Comprehensive laboratory tests showed that iglide® J is by far the most suitable polymer material for linear motion applications. Special Characteristics of iglide® J:

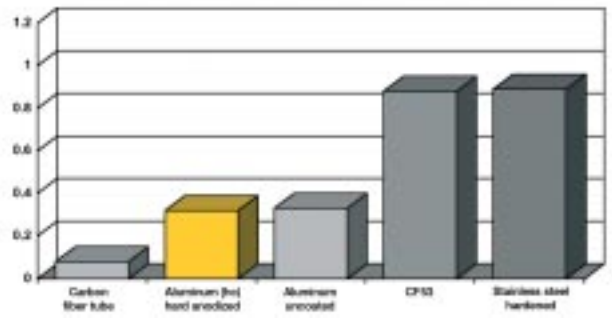
- Lowest coefficient of friction on all materials
- Very low abrasion values during dry operation
- Excellent wear resistance
- Maintenance free dry operation
- Vibration dampening
- Very low moisture absorption
- Recommended for all shaft materials

The iglide® T500 material

iglide® T500 is defined by its combination of high temperature resistance with compressive strength, along with high resistance to chemicals. iglide® T500 achieves the best wear results with stainless steel and chrome plated steel shafts. Special characteristics:

- Temperature resistant from -148°F to +482°F in continuous operation
- Universal resistance to chemicals
- High compressive strength
- Very low moisture absorption
- Great wear resistance through the entire temperature range

Shaft Material	Suitability
Hardened, ground steel shafts	+ + + +
Hardened, ground stainless steel shafts	+ + +
Hard-anodized or anodized aluminum shafts	+ + + + +
Free-cutting steel	+ +
Ceramic	+ + +
GFK and CFK Shafts	+
HR Carbon steel K	+
303 Stainless steel/304 stainless steel	+ +



Recommended Shafting for DryLin® R

Size in inches	Class "L" Tolerance	Size in mm	h9
1/4"	.2495"/.2490"	6	6.000/5.988
3/8"	.3745"/.3740"	8	8.000/7.988
1/2"	.4995"/.4990"	10	10.000/9.988
5/8"	.6245"/.6240"	12	12.000/11.988
3/4"	.7495"/.7490"	16	16.000/15.988
1"	.9995"/.9990"	20	20.000/19.988
1 1/4"	1.2495"/1.2490"	25	25.000/24.988
1 1/2"	1.4994"/1.4989"	30	30.000/29.987
2"	1.9994"/1.9987"	40	40.000/39.987
		50	50.000/49.984

DryLin® high-temperature bearings made of iglide® T500 are used to support the sealing bar in this packaging machine. The TUM liners run without lubrication at temperatures of around 266°F, allowing a class leading output of 90 cycles/min.

Chemical Resistance

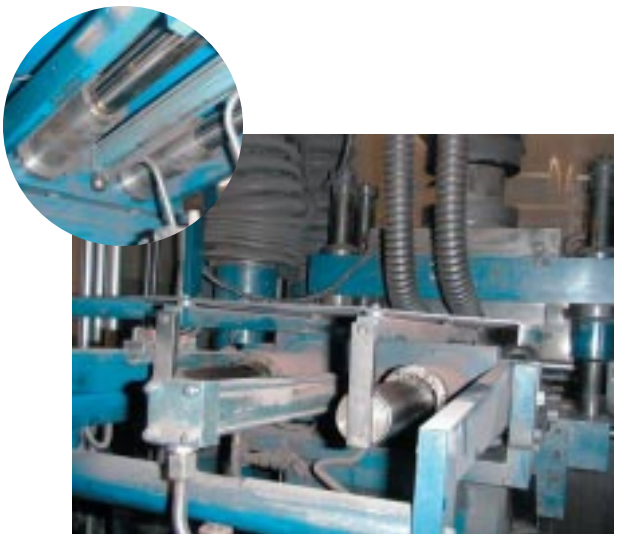
iglide® J is resistant to weak acids, diluted lyes and to fuels and all types of lubricants. Even the frequent chemical washdowns of machines in the food industry are not a problem for DryLin® linear plain bearings.
T500 liners were developed specifically for chemical resistance and high temperature applications. T500 liners run particularly well when combined with stainless steel shafts, which are also recommended for chemical resistance.

Medium	iglide® J Resistance	iglide® T500
Alcohol	Resistant	Resistant
Chlorinated hydrocarbons	Resistant	Resistant
Ester	Not Resistant	Resistant
Greases, oils	Resistant	Resistant
Ketones	Conditionally Resistant	Resistant
Fuels	Resistant	Resistant
Weak acids	Conditionally Resistant	Resistant
Strong acids	Not Resistant	Conditionally Resistant
Weak lyes	Resistant	Resistant
Strong lyes	Resistant	Resistant
Sea water	Resistant	Resistant

Table 17.3: Chemical resistance of iglide® J and iglide® T500

Corrosion Behavior

The low moisture absorption of iglide® J and T500 allows design in underwater areas. With the use of stainless steel shafts or anodized aluminum, a corrosion resistant guide results. Anodized aluminum is resistant to chemically neutral materials in the PH range 5 to 8. For special applications it is recommended to test coated aluminum sample parts to examine results prior to their use.



Stick-Slip Behavior

Stick-slip occurs when there is intermittent movement between two sliding partners. The stop and go movement is caused by frequent changes from static to dynamic friction.
The coefficients of static and sliding friction are close enough to each other for iglide® J that the danger of stick-slip behavior is very low.

	Coefficient of Static Friction	Coefficient of Dynamic Friction
J/Cold Rolled Steel	0.16	0.13

Coefficients of friction

Structure of the DryLin® R Part Numbers

The part numbers of the DryLin® R Linear bearings are designated according to the following system

R J U I - 3 1 - 16 - TW

Housing
R = closed
O = open
T = split
F = flange

Bearing Material
J = iglide® J Liner (standard)
T = iglide® T500 liner for high temperatures

Design Plain Bearing
U = standard Liner
Z = pressfit sleeve bearing (any iglide® material)

Measuring System
M = metric
I = Inches

Assembly Type
0 = standard liner in aluminum adapter
1 = standard liner in aluminum adpater in pillow block
2 = low clearance liner in aluminum adapter
3 = low clearance liner in aluminum adapterin pillow block

Bearing Type
0 = standard fixed bearing
1 = thin walled, short bearing
2 = self-aligning

Inner diameter, nominal

For Twin Length (leave blank for standard)

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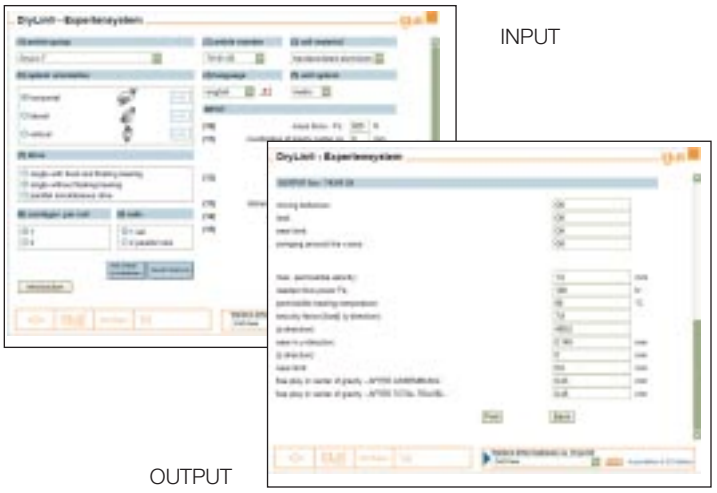
DryLin® R Linear Plain Bearing

The Expert System

The Online Expert System (www.igus.com) enables the user to quickly and confidently determine the suitability of one or all DryLin systems in a particular application, and is able to calculate the following:

- Bearing lifetime in miles or kilometers
- The necessary drive force
- The maximum permissible continuous speed
- Bearing wear and the theoretical clearance

The system is able to determine proper functionality, and provides warning signals in order for the user to optimize the design. Information with regards to drive force, center-of-gravity, and required lifetime are also given.



Dirt, Dust, Fibers

An important distinction among all the linear plain bearings is their compatibility with dirt. For most systems, the use of wiper or seals is recommended to prevent dirt accumulation. No other system has the design benefits for use in dust, lint, and coarse dirt as DryLin®

The patented design of the bearing surface using individual slide pads connected by thin film sections, provides performance benefits for dirty environments.

Dirt, even if it becomes wet on the shaft, is wiped away by the individual glide pads and is moved into the contact-free areas. The glide sections of the DryLin® bearings then slide on the shaft that has been cleared of all contaminants.

DryLin® R provides reliability in applications also under the action of dust and coarse dirt

DryLin® R linear bearings in a safety door

DryLin® R bearings in a retrieval robot with speeds up to 1574 fpm

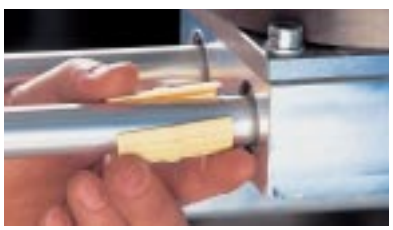
Split Linear Bearings

Applications that operate on the edge of technical feasibility or in extremely harsh environments are characterized by the frequent replacement of the linear bearings. In many cases, service life can be multiplied many times by DryLin®. However, extreme applications, replacement of the bearings can be necessary even with DryLin®.

DryLin® linear bearings can contribute to considerable cost reductions in such cases, as only the bearings liner made of plastics has to be replaced. This often means a reduction of more than 90% in replacement part costs. The iglide® J liner can be replaced, while a ball-bearing cage cannot.

The new range of split adapters offers even greater cost savings. Shafts need no longer be removed from the housing. The two shells of the adapter can be opened very easily. The high-performance plastic bearing inside is split and can easily be pulled off the shaft. Clip a new bearing over the shaft, put the two adapter halves together, install - done!

With this product line of split DryLin® bearings, installation times can be reduced to a minimum.

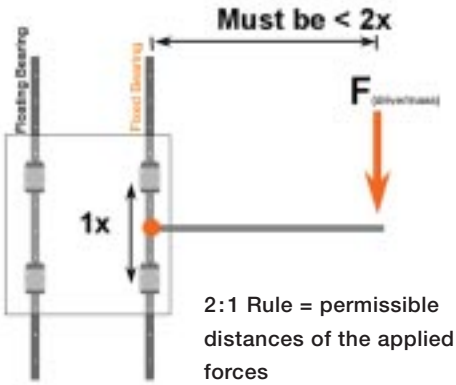


The DryLin® liner can be pushed easily onto the shaft

Then the adapter is fitted over the liner

Installation is simple and reduces downtime and maintenance costs

Eccentric Forces



2:1 Rule = permissible distances of the applied forces

The 2:1 Rule

When using linear plain bearings it is important to ensure that the acting forces follow the 2:1 Rule (see drawing). If either the load or the drive force (F) is greater than twice the bearing length (1X), then a binding or interrupted motion may occur.

If the location of the drive force or load cannot be changed, simply increase the distance between the bearings, or create a counterbalance to move the center-of-gravity back within the 2 to 1 ratio.

Online Lifetime Calculation www.igus.com

Fixed and Floating Bearing Mounting Instructions

When using systems with 2 parallel rails, one side must be designated as the “fixed” rail, and the opposite side as the “floating” rail.

Why use floating bearings?

- Promotes smooth gliding performance and maximizes bearing life
- Prevents binding caused by parallelism and angle errors
- Decreases necessary drive force and wear by minimizing friction-forces
- Enhances the precision of the system over the bearings’ lifetime.
- Reduce assembly time and cost

Fixed Bearings

The “fixed” bearing rail should be positioned closest to the drive force. This rail will determine the precision of the system; no system should contain more than two “fixed” bearings.

Floating/Self-Aligning Bearings

The “floating” rail should be the rail located furthest from the drive force. It is to act only as a guide, and will compensate for any misalignments or angle errors in the system ensuring proper functionality.

Mounting Surfaces

The mounting surfaces for rails and bearings should have a very flat surface (e.g milled surface) in order to enhance performance. Variations in these surfaces may be compensated for by using floating bearings.

DryLin® R - Mounting Instructions

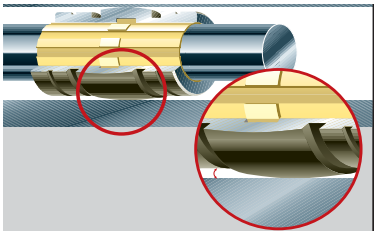
DryLin® R linear plain bearings in the 03 Design Series offer great advantages in applications with parallel shafts. By their geometry, they are able to compensate for alignment and parallelism errors and should be used on the shaft located furthest from the drive mechanism.

The design provides a spherical area on the outer diameter of the aluminum adapter for self-alignment. Reductions in load capacity are prevented, since the shaft always lies on the total projected surface.

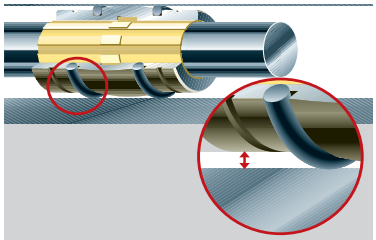
Thanks to the even load distribution over the entire bearing, edge loads are not possible with the self-aligning Drylin® R linear plain bearings. Even in unfavorable conditions, the load is supported by the entire projected surface

In order to compensate for parallelism errors between two shafts, the outer diameter is designed to be smaller than the housing bore diameter by 0.2 - 0.3 mm (depending on the size). With the use of mounted O-rings, these bearings have an elastic bearing seat. The overdimension allows for the maximum compensation of possible shaft misalignment.

The DryLin® R self-aligning bearings are delivered hard-anodized. These surfaces guarantee the highest wear resistance if the aluminum bearing moves in the housing during compensation adjustments.



The spherical DryLin® adapters can compensate for alignment errors. A hard-anodization protects the aluminum adapter from wear.



With built in clearances and the use of O-rings, the self-aligning DryLin® R bearings of the 03 Design Series can compensate for parallelism errors.

The self-aligning DryLin® R bearings of the 06 LL design series can compensate parallelism errors up to ± .12” (3mm).

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DryLin® R Linear Plain Bearing - Applications

This application, a rotary transfer machine, seals champagne bottles with corks, aluminum caps and wire braid. The fact that the DryLin® guide systems are lubricant free is important in the food sector, additional benefits include resistance to chemicals and cleaning.

This application from the food industry transfers breads and pastries from one conveyor to the next. Lubrication is totally prohibited due to food contact. Another reason for using the DryLin® R linear plain bearings is the resistance to corrosive cleaning agents. Additional benefits include the reduced design space required by the iglide® J bearings and the excellent corrosion resistance.