5. drylin Linear Guide Systems

...Rail-, Miniature-, Profile-Guides...Linear Plain Bearings and Shafts...

...plastics
Application Examples: drylin®

More exciting examples ➤ [www.igus.eu/drylin-applications](http://www.igus.eu/drylin-applications)

GESET ETIKETTIER-SYSTEME GmbH
LABEL FEEDING SYSTEM/PACKAGING TECHNOLOGY
Quick and flexible format adjustment with absolute freedom from lubrication at lower costs – implemented with the drylin® T linear guide system. Further advantage: Guide carriage with manual clamping.

CHAMPAGNE-BOTTLE SEALING MACHINE
Freedom from lubricants and chemical resistance, drylin® guides score highly in facilities in the food sector.
(Sick International Kellereimaschinen GmbH)

ERSASCOPE INSPECTION OPTICS
The vertical positioning of the optics is carried out by the drylin® T linear guide system whose continuously adjustable clearance provides for the required precision and a smooth, vibration-free operation.
(ERSA GmbH)

DOOR ADJUSTMENT
The smooth, low noise operation and the enormous cost advantages are obtained by the use of the drylin® R linear plain bearings on hard-anodised guide shafts to guide the doors of machine tools.
(Alzmetall GmbH + Co. KG)

FORMING, FILLING AND SEALING MACHINE
drylin® high temperature bearings (up to +120 °C) are used in the tool guide system of this forming, filling and sealing machine.
(Unifill SpA, Italy)

SYSTEMS FOR THE PRODUCTION OF ALUMINIUM CARTRIDGES
The absolute freedom from lubricants and the resistance to paint spray led to the application of drylin® R linear plain bearings.
(Mall + Herlan GmbH)

MOBILE AND STATIONARY SAW MILLS
drylin® W modular linear guide system and iglidur® J liner for adjusting the saw blade guide.
(Serra Maschinenbau GmbH)

igus® GmbH Germany | Phone +49 2203 9649-145 Fax -334 | info@igus.de | www.igus.eu
drylin® Linear Guide Systems

**drylin® T**
Rail guide systems
► from page 903

**drylin® N**
Low profile guide systems
► from page 925

**drylin® W**
Modular guide systems
► from page 939

**drylin® R**
Round shaft guide systems
► from page 975
drylin® is a range of maintenance-and lubrication-free linear bearings. This range includes linear modules with leadscrew and belt drives. The main benefits in addition to zero maintenance and lubrication are strength and resistance to external influences such as soiling, moisture, chemicals, heat and impact.

- Maintenance-free
- Wear-resistant
- Insensitive to impacts and vibrations
- Corrosion-resistant
- Resistant to dirt, dust and humidity
- Low coefficients of friction
- Weight reduction

drylin® linear bearings operate on gliding pads unlike the traditional recirculating ball bearing systems. This gives a larger contact surface resulting in lower surface pressure. This leads to advantages which include:

- The use of non-hardened shafts
- The use of non metallic shafts
- Scratching and shaft damage is completely excluded.

Shafts and rail materials
The large surface area of drylin linear plain bearings, when compared to traditional ball bearings, means that under a given load the bearing pressure is greatly reduced. This allows soft shaft materials to be used, including hard anodised aluminium, which in turn gives additional benefits in friction and wear rate values. Also VA stainless steel shafts can be used when chemical resistance is required. Of course, standard linear hardened shafts can also be used with drylin linear bearings.

Dry Run, without Lubrication
drylin® linear bearing systems are designed for running dry. As there is no grease or oil present, the application tends to naturally self clean, any particles are wiped away from the sliding surface by the ribbed design of the drylin polymer bearing. This works well even in coarse dirt or even sand.

Optimum load distribution
Heat conductivity

<table>
<thead>
<tr>
<th>Material</th>
<th>[W / m · K]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminium</td>
<td>235</td>
</tr>
<tr>
<td>Unalloyed steel</td>
<td>48 - 58</td>
</tr>
<tr>
<td>High-alloyed</td>
<td>15</td>
</tr>
</tbody>
</table>

Table 01: Heat conductivity

Average surface speed

\[ \text{Average surface speed} = \frac{\text{Travel distance per cycle [m]}}{\text{total cycle time [sec]}} \]
Corrosion Behavior
The low humidity absorption of iglidur® J, J200 and X permits even underwater applications. The use of stainless steel or anodised aluminium shafts provides a corrosion-resistant guide system. Anodised aluminium is resistant to chemically neutral substances in the range pH 2 to 7. For special applications separate tests are recommended for anodised aluminium sample parts for that specific application, igus can supply, free of charge, small sample lengths for this.

Chemical Resistance
iglidur® J is resistant to weak acids, dilute alkalies as well as to fuels and all kinds of lubricants. The intensive cleaning of machines with standard commercial cleaning agents, even in the food sector, is therefore not a problem for the guides. For applications in environments with aggressive chemicals, the use of the drylin® R bearings equipped with iglidur® X liners is recommended. The resistance of linear bearing systems is equally dependent on the shaft or rail material. As an option most resistant to chemicals, a high-alloyed stainless steel is offered, for instance X105 CrMo 17 (1.4125), or alternatively the use of soft VA steels (e.g. 1.4571).

Application Temperatures
Bearings made of iglidur® J and J200 can be used in the temperature range between −50 and +90 °C. Bearings with higher precision classes can show alternative temperature area. Please follow the indication on the respective product page. In applications with aluminium shafts and/or rails, significantly higher loads and speeds can be achieved due to the excellent heat conductivity. Bearings made of iglidur® X can be used in the range of −100 °C to +250 °C.

Use in Dirt
Applications in coarse dirt and even sand are possible. Particles are repelled from the contact surface by the movement itself.

Hard Anodised Surfaces
Hard anodised surfaces are characterized by good wear properties, high chemical resistance and a high degree of hardness. It is a technical and not a decorative surface. Color alteration and slight cracking may occur, but do not influence the resistance, the corrosion behavior or the bearing properties. Cutting surfaces and machined surfaces are uncoated.

Lifetime calculation, CAD files and much more support | www.drylin.eu

Materials
igus® offers different options for the bearing and shaft/rail materials for drylin® linear systems. Tests conducted over the years have shown that iglidur® J, J200 and X are the ideal materials for most linear applications due to their positive properties in wear and friction.

Ideal Material Combinations
iglidur® J
The iglidur® J material achieved the best results among almost all shaft materials in our tests. Comparative laboratory tests show that iglidur® J is the most low-wear, low-friction polymer for linear applications. Special properties of iglidur® J:
- Maintenance-free, dry-running
- Low coefficients of friction with all materials
- Excellent wear resistance
- Low humidity absorption
► More about iglidur® J from page 109.

iglidur® J200
iglidur® J200 was designed and developed especially for linear applications which use hard-anodised aluminium. This combination achieves by far the best results in our laboratory tests.

Special properties of iglidur® J200:
- Totally maintenance-free
- Extremely high service life on hard-anodised aluminium
- Low coefficients of friction with hard-anodised aluminium
- Excellent wear resistance with anodised aluminium
► More about iglidur® J200 from page 295.

iglidur® X
iglidur® X is characterized by high temperature resistance and compressive strength combined with extreme resistance to chemicals. iglidur® X achieves the best wear resistance on stainless steel and chrome-plated steel shafts.

Special properties of iglidur® X:
- Totally maintenance-free
- Temperature resistance from −100 °C to +250 °C in continuous operation
- Universal resistance to chemicals
- Very low humidity absorption
► More about iglidur® X from page 173.

Other possible materials:
- iglidur® A180, FDA-compliant
- More about iglidur® A180 from page 411.

Drylin® | Glides instead of Rolling!

Extreme application conditions in the offshore industry

Filling machine, Krones AG, Rosenheim

The iglidur® X material in heavy-duty use under high temperatures in foundries

Lubrication-free and insensitive to dirt
**drylin® T**

**Monorail Systems**

- from page 903
- drylin® T monorail guides are made to the classic design. Their dimensions are identical to standard commercial ball guide systems and are used in almost all industries.
  - 100% lubrication-free
  - Adjustable clearance
  - Automatic clearance adjustment
  - High static load capacity
  - Service life up to 50,000 km
  - High insensitivity to dirt

- Max. stat. load capacity: 14,000 N
- Max. application temperature: –40 °C to +90 °C
- Corrosion resistance: ●●●
- Chemical resistance: ●●
- Insensitivity to dirt: ●●●●

**drylin® N**

**Low Profile Guide Systems**

- from page 925
- drylin® N flat guides have an extremely low profile, run lubrication free and are very light. If extreme precision is not required, they are an interesting alternative to miniature ball guide systems and custom solutions.
  - Design height: 6–12 mm
  - Many carriage options – also with pretension
  - Rails in silver or black anodised

- Max. stat. load capacity: 1,000 N
- Max. application temperature: –40 °C to +90 °C
- Corrosion resistance: ●●
- Chemical resistance: ●
- Insensitivity to dirt: ●●

**drylin® W**

**Modular Guide Systems**

- from page 939
- drylin® W profile guides offer a large and varied modular system with 20 different profiles and more than 50 carriage options. The system offers versatile use and is an alternative to all common guide systems.
  - Easy installation
  - Angular rail with floating bearing function enables a diagonal assembly
  - Space saving and compact
  - VA stainless steel version also available

- Max. stat. load capacity: 12,800 N
- Max. application temperature: –100 °C to +250 °C
- Corrosion resistance: ●●●●
- Chemical resistance: ●●●
- Insensitivity to dirt: ●●●●

**drylin® R**

**Round Shaft Guide Systems**

- from page 975
- drylin® R shaft guides as an alternative to ball bushings. Polymer plain bearings can now work lubrication-free on all available shaft materials, and not only on hardened steel shafts.
  - Same dimensions as standard ball bearings
  - Shafts, Pillow Blocks and Accessories available from stock
  - 8 different shaft materials
  - Interchangeable liners
  - Low weight
  - More than 50% cost saving
  - Also supported shafts
  - Individually machined
  - Available from stock
  - Diameters 6–50 mm
  - Fixed and moving shaft supports
  - Shaft end supports with different designs

- Max. stat. load capacity: 40,000 N
- Max. application temperature: –40 °C to +250 °C
- Corrosion resistance: ●●●●
- Chemical resistance: ●●●
- Insensitivity to dirt: ●●●●

---

For more information, visit [www.drylin.eu](http://www.drylin.eu).
Insensitivity to Dust and Dirt

drylin® linear bearings offer the ultimate dirt and dust resistance. As external lubrication is eliminated, dirt particles cannot get stuck in oil or grease residues. If they are on the guideway, they are removed from the track by the plastic gliding element that acts like a wiper. The lack of seals enables the gliding elements to guide the dirt through the bearing via channels and thus minimize pressure build-up in front of the bearing. If the liners get worn out due to extremely dirty conditions, these can be easily replaced in all systems.

Typical sectors of industry and application areas
- Agricultural economy
- Plant design
- Printing industry
- Glass industry
- Heavy Duty
- Woodworking
- Textile technology
- Packaging

Parting unit with talcum powder
Mobile saw mills
Welding head
Concrete cutting machine
Filling-shoe mechanism in a compaction unit
Stop dog system of a sliding table panel saw

drylin® linear slide systems
Lifetime calculation, CAD files and much more support ► www.drylin.eu
Clean and hygienic

drylin® linear guides work with plastic sliding bearings instead of balls. These plastics are iglidur® high-performance polymers which integrate dry lubricants within the material. Compared to roller guides this enables a lubrication-free operation and gives guarantee to the user that machine parts or products to be packaged will not be contaminated by oil.

Typical sectors of industry and application areas
- Automation
- Automotive
- Electronics industry
- Film and TV
- Food industry
- Medical
- Furniture/industrial design
- Test engineering and quality assurance
- Cleanroom
- Sports and leisure
- Packaging

Vacuum pressure casting machine with drylin® W feeder
Corrosion and Chemical Resistance

Some parts of the drylin® linear bearing range can be manufactured in pure stainless steel. Here the materials 1.4301, 1.4305, 1.4408 and 1.4571 are often used – generally described as VA. These soft stainless steels are chemically resistant materials and can be used as linear guides without problems along with iglidur® J and/or iglidur® X bearings.

Typical sectors of industry and application areas
- Disposal engineering
- Fluid technology
- Beverage technology
- Food industry
- Offshore
- Marine engineering

Blister machine/Packaging technology

Forming, filling and sealing machine

Plant for the manufacture of die-casting molds

Offshore-Drilling-Riser

Leather splitting machine

Bag forming, filling and sealing machine

Blister machine/Packaging technology
All drylin® guide systems are clearly qualified for clean room applications. The differentiation between the various clean room classes is only dependent on load and speed of the application. The combination of iglidur® J and hard anodised aluminium is classified as level 1 in the ESD compatibility according to SEMI E78-0998 (Highest rank).

The following drylin® guide systems by igus® GmbH were examined: N40, W10, T25 and T30. See below for detailed results.

Linear guide system drylin® TK-10-30-01:
“For the linear guide system drylin® TK-10-30-01 by igus® GmbH, it is possible, on the calculations of the likelihood of violation of threshold values of the detection sizes 0.2 µm, 0.3 µm, 0.5 µm, and 5 µm with motion speed of \( v = 0.1 \) m/s, to clearly derive suitability for clean rooms classified as ISO Class 3 according to DIN EN ISO 14644-1.”

Linear guide system drylin® NK-02-40-02:
“For the linear guide system drylin® NK-02-40-02 by igus® GmbH, it is possible, on the calculations of the likelihood of violation of threshold values of the detection sizes 0.2 µm, 0.3 µm, 0.5 µm, and 5 µm with motion speed of \( v = 1 \) m/s, to clearly derive suitability for clean rooms classified as ISO Class 6 according to DIN EN ISO 14644-1.”

The measurement results of the ESD compatibility according to SEMI E78-0998 show that the linear guide system drylin® NK-02-40-02 can be classified as “level 1” (Highest rank). See Fraunhofer IPA Report No.: IG 0308-295 73.

The measurement results of the ESD compatibility according to SEMI E78-0998 show that the linear guide system drylin® TK-01-25-02 can be classified as “level 1” (Highest rank).

Linear guide system drylin® WK-10-40-15-01:
“For the linear guide system drylin® WK-10-40-15-01 by igus® GmbH, it is possible, on the calculations of the likelihood of violation of threshold values of the detection sizes 0.2 µm, 0.3 µm, 0.5 µm, and 5 µm with motion speed of \( v = 1 \) m/s, to clearly derive suitability for clean rooms classified as ISO Class 6 according to DIN EN ISO 14644-1.”

The measurement results of the ESD compatibility according to SEMI E78-0998 show that the linear guide system drylin® WK-10-40-15-01 can be classified as “level 1” (Highest rank). See Fraunhofer IPA Report No.: IG 0308-295 74.