



For fast cleaning, igus has developed a linear guide with a lubrication-free, FDA-compliant linear carriage.

# Clean, safe, lubrication-free

## igus drive components get things moving in food production

There is no industrial production without movement, including food production, which involves additional requirements, most of them related to hygiene – which means daily washing with steam and pressure. Grease-free components that can be cleaned quickly and thus shorten downtimes are in demand. There are several good reasons why igus drive components have proven themselves under these special conditions and been used in a wide variety of applications for many years.

**A**s a specialist in motion plastics, igus uses high-performance plastics developed in-house. In addition to a long service life even under severe (and greatly varying) stresses, these materials feature incorporated lubricant. This means that no separate lubricant is needed – a huge bonus if not an absolute requirement in food production, processing, and packaging. In linear technology applications, these plastics are often paired with hard-anodised aluminium or "soft" stainless steel as a mating surface if corrosion resistance and FDA conformity are to be part of the specification profile.

### Long service life in highly automated production lines

Regardless of hygienic design, there are other food production and packaging requirements that have to do with the large quantities and the correspondingly high productivity, among other things. The systems often work 24/7 (possibly with interruptions for frequent thorough cleaning) with very short cycle times. Under these circumstances, users and operators demand maximum service life from every moving (and therefore never completely wear-free) component and minimum risk of premature failure. This is necessary because the machines are often linked together to form production lines, so failure of just one machine drive element can stop the entire production or packaging line. These are typical conditions under which igus plain bearings hold up throughout automation technology – with strong representation in the food and beverage industry. The reason is that the rotary iglidur bearing bushes and drylin linear systems can be cleaned with the same processes that are common there (washdown, CIP, high-pressure or superheated steam cleaning, strong cleaning media).



**Lubrication-free and hygienic: the PRT slewing ring bearing can remain installed in an application with food contact during cleaning.**

**2. Seite:**



**GEA uses xiros F180 plastic ball bearings in the film guide rollers of its thermoforming packaging systems. The maintenance-free automatic web edge control with drylin trapezoidal lead screw nut and drylin R liners creates the conditions for processing various film qualities.**

**Bearings from the modular system in thermoforming systems:**

An example from the packaging sector: GEA, a leading manufacturer of thermoforming systems for packaging fresh food, uses the igus modular construction system and lubricant-free linear bearings, rotary bearings, and drives. It uses these bearings for innovative designs of its own, such as a compact tensioning system that always keeps the film tension within acceptable parameters. A drylin trapezoidal lead screw with a nut made of iglidur tribo-plastic is used in the longitudinal direction during web edge control. It shifts the film roll in the axial direction. Rotary bearings are realised with xiros-series polymer deep groove ball bearings. Combining polymer housing and stainless-steel balls ensures lubrication-free, maintenance-free operation, and FDA approval documents its suitability for food packaging. In the thermoforming and sealing station lifting stations, igus plain bearings perform heavy work, moving the tools vertically.

**Ready-to-install function modules for labelling systems:**

Another example comes from filling and labelling technology: A world market leader's systems typically label 60,000 bottles per hour. That's 1,000 per minute, or just under 17 per second, and in just over two shifts (16.66 hours), the system can label a million bottles. This places high demands on all moving components, and especially on their precision and wear resistance. They also need to be lubrication-free to avoid contamination, especially since bottles are often open when they are labelled. The plant manufacturer benefits not only from the special specifications of igus bearing technology, but also from ready-to-install functional igus components, such as clamps, measuring scales, fastening elements, deflection rollers, and adjustment elements for sensors with linear adjustment options. This reduces system assembly time and ensures the required precision. It is typical for igus to work with users to develop products to meet very specific requirements, especially regarding hygiene. Here, too, is an example from filling technology: the design engineers at KHS in Bad Kreuznach wanted plain bearing bushes that could be fully flushed. Classic iglidur bearings with a smooth surface do not entirely meet this requirement. So KHS chose a liner with longitudinal crossbars that can be easily flushed while still installed. But one small thing remained that could be improved: after flushing, tracks were visible

on the shafts. igus and KHS found a solution to this problem as well: on the sliding surface on the bearing interior, the groove is now helical (spiral). This ensures complete coverage during movement and prevents smearing. On the outside, the liner has nubs to maintain a specific distance from the bearing housing. Now that side can be flushed as well. The result is a fully flushable, streak-free plain bearing bushing. This detailed solution represents a design principle that igus often uses in food machinery construction: Moving components do not have to be encapsulated to meet very high hygiene requirements. If residue-free flushing is guaranteed, an open design even has advantages over encapsulation because the user can check bearing cleanliness at any time.

### Flushability is an alternative to encapsulation

Based on this principle, igus has now developed a hygienic-design linear guide system, the drylin W, that is ready for mass production. The main challenge was how to create a gap-free design. The focus was on designing a completely washable carriage and rail that would allow liquids to drain freely without collecting water. "This is a brand-new product for the linear technology market. So far, most hygienic design solutions have been based on a completely enclosed unit," says Stefan Niermann, Head of Business Unit Linear Technology (find out more in the interview below). This new carriage is made entirely of FDA- and EU10/2011-compliant high-performance polymer. The lubrication-free material with its low coefficients of friction has already proved itself as a plain bearing material in numerous applications in the food industry. Hygienic screws and extra-large flushing grooves are also used. Bevelled edges allow cleaning agents to run off quickly. The bottom seal protects the space under the rail from dirt accumulation and prevents food and chemical residue deposits from forming. For the same reason, shafts are sealed to protect gaps from residue. Corrosion-free, high-alloy 316 stainless steel is used for the linear rail to avoid microscopic surface structures and prevent dirt from adhering.

3.Seite:



The KHS Innoket Neo module for bottling plants applies labels to up to 60,000 bottles per hour – in a compact space and with high precision. Right: The guide roller axes are supported with xiros polymer ball bearings.

### Conversation with Lars Braun and Stefan Niermann on the subject of hygienic design

## "We find the arguments for open systems convincing"

Lars Braun, igus Packing Industry Manager, and Stefan Niermann, Head of Business Unit Linear Technology, present the latest hygienic-design motion plastics innovations and explain why igus recently became a member of the EHEDG consortium.

**LT: Mr Niermann, the igus range of hygienic bearing technology for the food and packaging industry is growing. What are the latest new products?**

**Stefan Niermann:**

There are several new products, one of which is especially important to us. We have developed a drylin linear guide especially for the food industry – with an optimised hygienic design that meets EU standards and follows EHEDG guidelines.

**What are its main features? Niermann:** We used a standard drylin W linear guide as the basis. It has the same connection dimensions as a conventional ball guide. But the carriage is made entirely of plastic, and the design is open and free of dead space. The system can be completely flushed, including with CIP processes, making it hygienic.

**What do users say about their initial experiences? Lars Braun:** We have had feedback from the very beginning. We started with several ideas and product studies that we presented to some pilot customers. On this basis, we then jointly developed the concept that is now ready for mass production and already being used by a manufacturer of multiple-head scales.



**Stefan Niermann, Leiter des Geschäftsbereichs Lineartechnik bei igus: „Der Schlitten unserer neuen drylin-Linearführung im Hygienic Design besteht komplett aus Kunststoff, das Design ist offen und tottraumfrei gestaltet. Das System ist vollständig spülbar und somit hygienegerecht, auch mit CIP-Verfahren.“**

**Stefan Niermann, Head of Business Unit Linear Technology at igus: "The carriage of our new hygienic-design drylin linear guide is made entirely of plastic, and the design is open and free of dead space. The system can be completely flushed – including with CIP processes – and is therefore hygienic."**

**Why is this a concept and not a product or series?**

**Niermann:** We are deliberately taking a different approach here and adapting this concept specifically to the application. For example, the flushing channels have to be arranged differently according to installation position. We are so flexible in terms of production technology that we can design and manufacture an optimal, hygienic linear guide for any customer. Our material is also flexible. In addition to FDA-approved iglidur A160, A181, and A350, there are alternative high-performance polymers with good sliding properties – always blue, of course.

**4.Seite:**

**What about other hygienic-design principles, such as rounded edges or smooth surfaces? Did you consider them as well?**

**Niermann:** Of course. The entire design is coordinated so that no pockets of dirt can accumulate. We have extensive experience here. Surface quality, sealing materials, flushing holes, bevelled edges, rounded shapes, no parts that can get lost: we meet all relevant hygienic-design requirements.

**You mentioned the EHEDG guidelines. They now require that moving components either have a gap-free design or be encapsulated. Your linear guide does neither. Why is that?**

**Niermann:** It is true that, as of today, we would not receive EHEDG certification for this linear guide because it is not encapsulated. But our extensive experience with hygiene-sensitive applications shows us the clear advantages of an open design over an

encapsulated one. You can clean in place and ensure that all dirt residue is removed. No one knows what contamination encapsulation hides. And an open component is always more compact and easier to service. These advantages can be realised only if you work without lubricants, as we do. **Braun:** We have the "open or closed" discussion with many customers, and we find the arguments for open systems convincing. We hope to initiate this discussion in committees such as the EHEDG to encourage certification for open moving parts. That is an important reason why we recently joined the EHEDG.

**In addition to this linear guide, you have introduced another new, hygienic bearing element. Braun:** Yes, based on a design study from last year, we developed a PRT slewing ring bearing with an encapsulated design made of stainless steel with an FDA-compliant iglidur polymer as the sliding partner.

#### **Where do you see applications for this bearing in food production?**

**Braun:** A typical application is driverless transport systems or mobile robots that work in hygiene-sensitive areas. The PRT bearings are lightweight and compact, and as long as no extreme rotary movement is needed, it has many applications – now in the food industry, too.

#### **So far, we have talked about only one of your two business areas – bearing technology. What about energy chains? Do your colleagues there also have a hygienic-design series in their product range?**

**Braun:** They do, and it's also very up-to-date. The TH3 series is our first energy chain developed from the ground up for hygienic areas. Here, too, we use the open concept with flushing holes for perfect cleanability. And we provide the food industry with an innovation in the form of a mature, high-performance series product. This is worth mentioning because many manufacturers have used more or less convincing do-it-yourself solutions to guide cables and hoses under hygienic conditions. Now they can use a catalogue product developed specifically for this sensitive application.

#### **igus company profile**

Improve what moves – in a CO<sub>2</sub>-neutral manner and without plastic waste. With this goal in mind, igus GmbH develops and produces lubrication-free high-performance plastics that are tribologically optimised (that is, optimised for friction and wear). The motion plastics, as they are called, include energy chains, cables, plain bearings, linear and drive technology, 3D printing, low-cost robotics, and intelligent sensors that help customers improve their technology and reduce costs. At igus, it all started in a garage. Margret and Günter Blase founded igus in 1964. The couple won over their first customer issuing this challenge: "Give me your most difficult injection-moulded part, and I'll find a solution." This laid the foundation for the company's success. Today igus serves around 188,000 customers from over 50 industries worldwide. Around 4,600 employees at 31 locations come up with new ideas daily, make high-quality products, ensure streamlined processes and delivery times and, above all, stay close to the customer. Research in the industry's largest test laboratory constantly yields innovations. All igus products are put through their paces in an area of 3,800 square metres – including an outdoor test site, cleanroom laboratory, and cold chamber. Ten billion cycles are run every year on energy chains and cables alone. The test results from the laboratory are incorporated into a database that enables users to calculate the igus product service life very easily with an online tool. igus is also pursuing the goal of promoting the circular economy for plastics. After all, there are often still no options for sustainable reuse of plastics. igus hopes to end this linear economy with its Change program. Since 2019, customers have been able to send their worn-out energy chains, regardless of the manufacturer, to igus and have them recycled to create new products. To further advance the regenerative plastics industry, igus added its own online platform the recycling offer in October 2022. Users can transfer not only energy chains, but also other components made of other technical plastics, to the circular economy. The platform also offers a digital marketplace that allows access to selected recyclates for purchase. And igus invests in other companies' forward-looking sustainability projects. One of these is the British recycling pioneer Mura Technology, which uses a new type of chemical recycling called Hydrothermal Plastic Recycling Solution (HydroPRS) to turn plastics back into crude oil – using just water, heat, and pressure.