

aircraft..

igus® solutions for the aviation industry

plastics for longer life®... igus

...interior

... www.igus.eu/aircraft ...

Reduce cost ...



Nils Schumacher

Head of International Sales for drylin® Linear Technology
Phone: +49 2203 9649 691
Email: nschumacher@igus.de



Alexander Mühlens

Product Manager for drylin® Drive Technology
Phone: +49 2203 9649 7742
E-mail: amuehlens@igus.de

Lightweight, quiet, failsafe and as small as possible. igus® products fulfil these requirements for aircraft interior with the added benefit of being lubrication- and maintenance-free.

The development of components for aircraft interiors focuses on specific criteria. igus® offers the optimum solution for virtually any moving application in the interior.

- **Lubrication-free** – entirely clean operation and 100% maintenance-free thanks to igus® high-performance polymers (UL94 & V0 certification on request)
- **Lightweight** – thanks to the use of lightweight components such as plastic, aluminium or carbon
- **Quiet** – igus® bearings, linear guides and energy chains® slide smoothly and virtually silently since they are designed without balls
- **Small** – igus® products adapt to any installation space ... while remaining fully functional

For these reasons, igus® products are ideally suited for a variety of applications in the aircraft interior, including seating kinematics, in headrests that can be height-adjusted in fixed steps, in table extensions, footrest adjustments, mobile cabin partitions or for the adjustment, function and maintenance of entertainment systems.

Customised special parts as well as mechanically produced prototypes are always possible.

Advantages of igus® products at a glance:

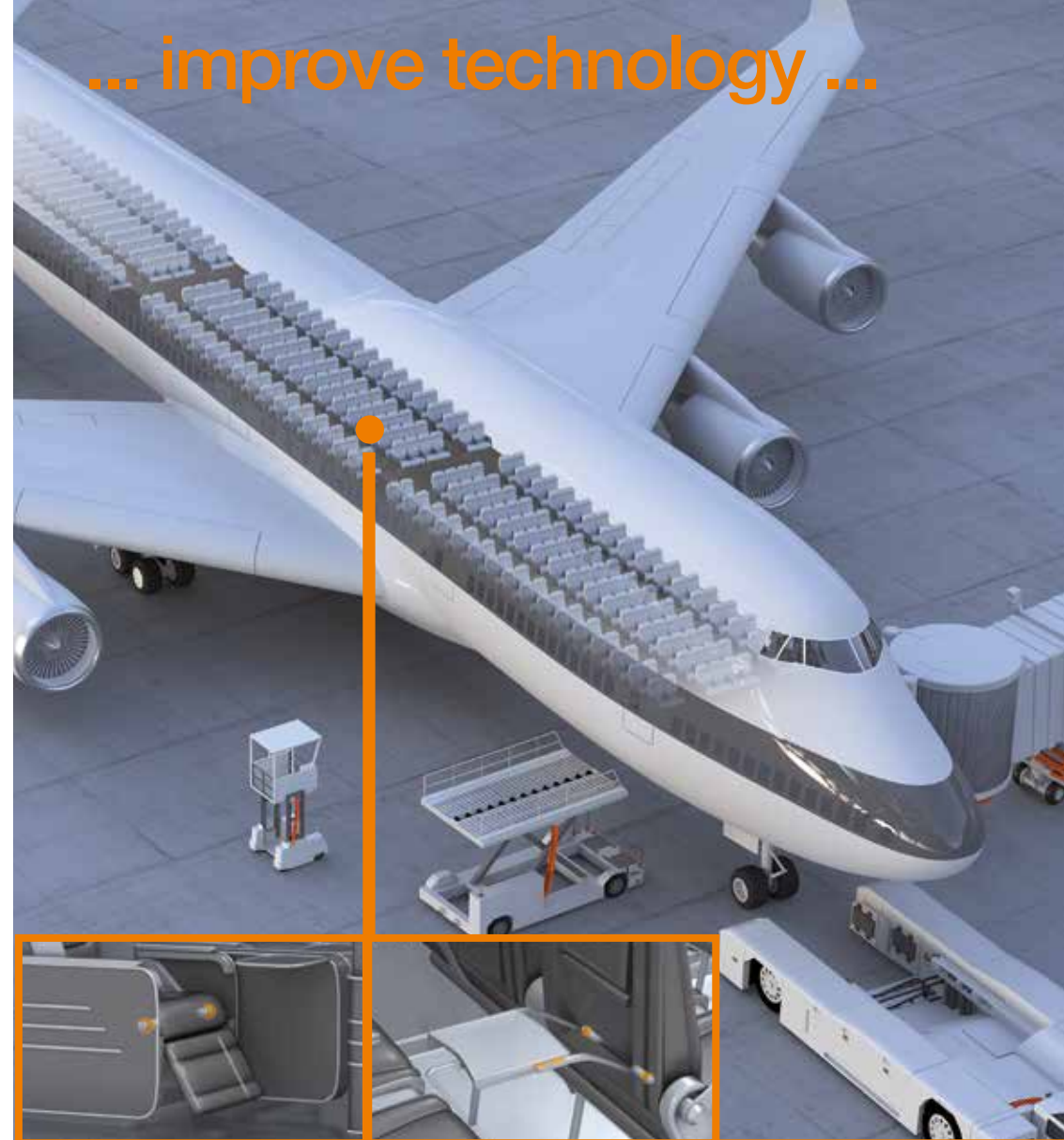
- **Lubrication- and maintenance-free**
- **Weight savings**
- **Quiet operation**
- **Vibration dampening**
- **Available from stock**

30 online tools also enable you to reduce process costs. Function and service life can be calculated and our product finder quickly guides you to the igus® product you need. Also visit our industry website!

 www.igus.eu/aircraft

We hope you enjoy reading this edition and collating ideas.

... improve technology ...



... with motion plastics® from igus®

Save weight ...

with motion plastics® from igus® ...



Adjustable armrests



igidur® G bearings

- Wear-resistant
- Many standard dimensions; also available in accordance with UL94 V0

www.igus.eu/g



drylin® N flat guide

- Lightweight
- Installation height between 6 and 12 mm
- Various carriage options

www.igus.eu/drylinN



Adjustable leg- and footrests



igidur® clip bearings

- Easy assembly
- Captive with double flange
- Abrasion-resistant

www.igus.eu/MCM



drylin® T rail guide

- Corrosion resistant
- Low weight
- Compact design
- Light and quiet

www.igus.eu/drylinT



Height-adjustable headrests



drylin® NT telescopic guide

- Adjustable
- Optional adjustments in fixed steps
- Extremely quiet

www.igus.eu/NT



drylin® W profile guide

- Extensive linear construction kit
- Single or double rails
- Linear bearings and complete carriages

www.igus.eu/drylinW

... dispense with lubrication ...

... in aircraft cabins

Table adjustment (economy class)



igidur® J plain bearings

- Vibration dampening
- Extremely low coefficient of friction
- For rotary, pivoting and linear movements

www.igus.eu/J



drylin® R shaft guides

- Same dimensions as ball bearings
- Durable due to hard anodised aluminium shafts

www.igus.eu/drylinR



Table extension (business class)



igidur® JVSM plain bearings

- Preloaded in a clearance-free manner
- Rattle-free
- Maintenance-free

www.igus.eu/JVSM



drylin® T low profile linear guide system

- Compact design
- Same dimensions as recirculating ball bearings
- Carriages with V0 certification optional

www.igus.eu/drylinT



Cabin doors ...



igidur® J350 bearings

- Temperatures up to 180° C
- Classification in acc. with UL94 "Safety Tests for Flammability", V0 rating
- Wear resistant



SFRJ350 bar stock

- Bar stocks up to Ø 100 mm
- For prototypes and small batch series
- Media-resistant

www.igus.eu/barstock



... Reduce noise level ...

with motion plastics® from igus® ...



Adjustments of tablets, pads, smartphones



igubal® EGLM spherical bearings

- Angle-compensation
- Very low weight
- Shock resistant

www.igus.eu/igubal



drylin® W curved guide

- Customised radii
- Best possible field of view
- Lubrication-free adjustment

www.igus.eu/drylinW



Luggage compartment flap



igidur® M250 bearings

- Excellent level of vibration dampening
- Durable against edge loads
- Thick-walled, DIN 1850

www.igus.eu/M250



drylin® W profile guide

- Precise guidance
- Curved; can be delivered with customised radii
- Hybrid bearings with integrated roller for easy movement

www.igus.eu/drylinW



Horizontal seat adjustment



e-chain® micro

- For the smallest installation spaces and radii
- UL94-V2 (optional V0)
- Gentle on the cables

www.igus.eu/E2micro



e-chain® easychain®

- Easy to fill even when installed
- Flexible highly dynamic and quiet

www.igus.eu/easychain

... dampen vibrations ...

... in aircraft cabins

TV monitor



igubal® KSTM + ESTM pillow block bearings

- Lightweight
- Compensation for misalignments
- For all shaft materials
- Lubrication-free
- High fatigue strength
- Compensation for edge loads

www.igus.eu/igubal



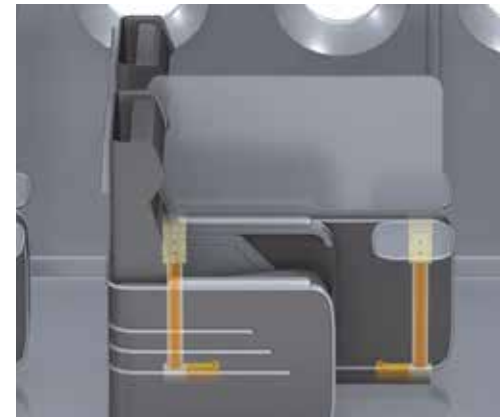
Partitions



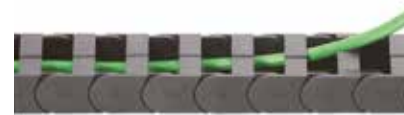
drylin® ZLW toothed belt axis

- Ready-to-install linear axes
- Lead screw or toothed belt drive
- Customised stroke lengths
- Can be configured with NEMA stepper motors or DC motors
- Lightweight and low noise
- Can also be delivered with a carbon linear guide (100% metal-free)

www.igus.eu/drylinZLW



Seat adjustment



e-chains® ZF for rotary applications

- Lightweight, low noise and abrasion-resistant
- Reliable cable guidance
- V0 and V2 fire classes possible
- Easy to fill and assemble
- Can be delivered fabricated with chainflex® cables

www.igus.eu/ZF



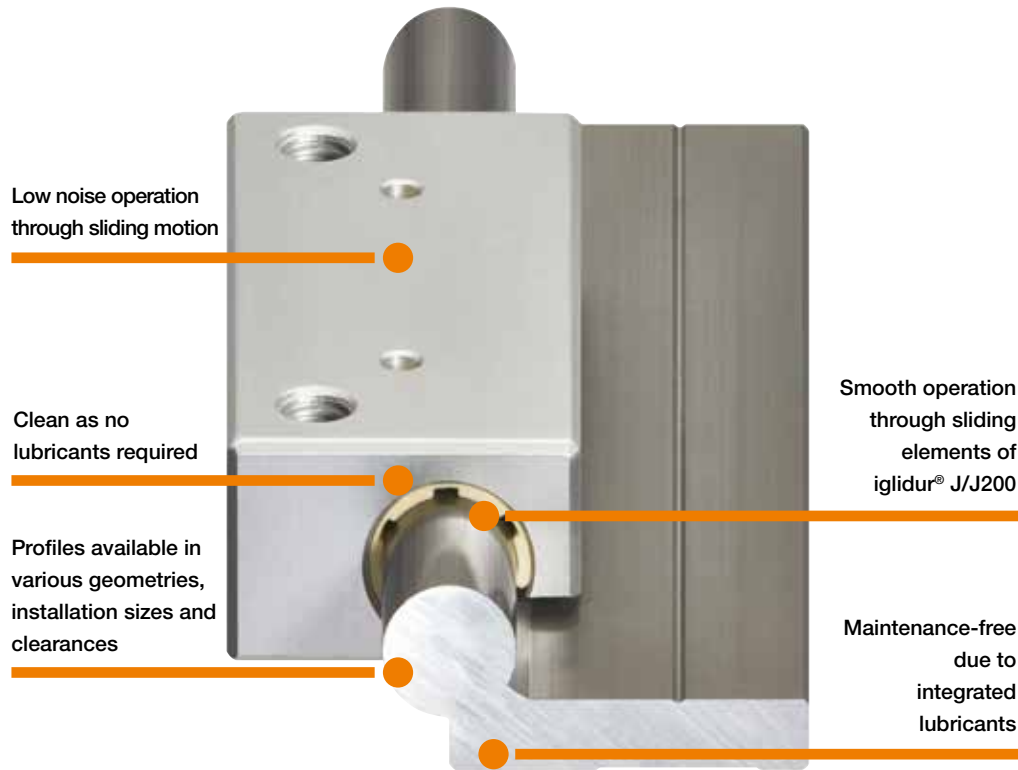
drylin® linear technology ...

Lubrication- and maintenance-free linear guides – drylin®

drylin® is a product range of lubrication-free linear plain bearings based on the principle of sliding instead of rolling. Tribologically optimised iglidur® high performance polymers are used as sliding surfaces. drylin® linear systems travel in dry operation and are maintenance-free. Linear guides on rails or round shafts are available. The drylin® drive technology can supply ready-to-connect systems with lead screw drives or toothed belt drives, with or without motor. The focus is on, besides the freedom from maintenance and lubrication, the ruggedness and insensitivity to influences such as dirt, water, chemicals, heat or impact.

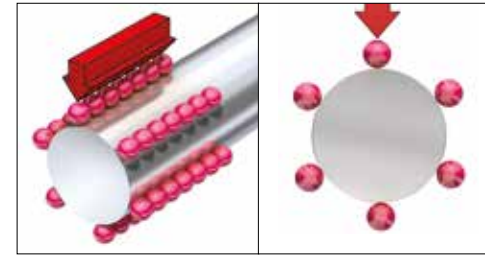
- Resistant to dirt due to dry operation
- Resistant to impacts and vibrations
- High static load capacity
- Suited for short-stroke applications
- Low weight
- Vibration dampening
- Quiet operation
- Metric and imperial dimensions
- Special designs according to customer needs
- Available from stock

 www.igus.eu/drylin



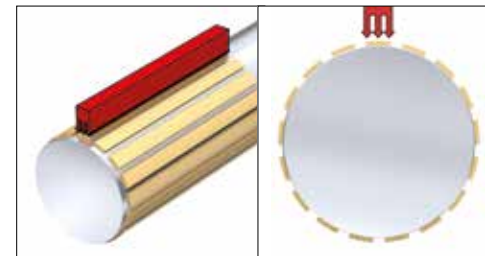
... sliding instead of rolling

The principle of igus® linear technology



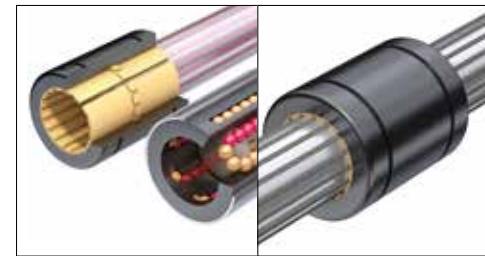
"Conventional" rolling bearings – point contact

Force is transmitted via balls at certain points. The system requires lubrication to ensure proper functionality.



drylin® plain bearings – surface contact

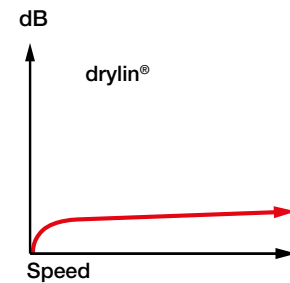
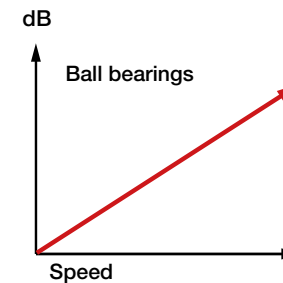
The force is transmitted two-dimensionally over liners or sliding elements. The system is lubrication- and maintenance-free over the entire service life.



Resistant to dirt, dust and moisture through lubrication-free use and dirt channels.

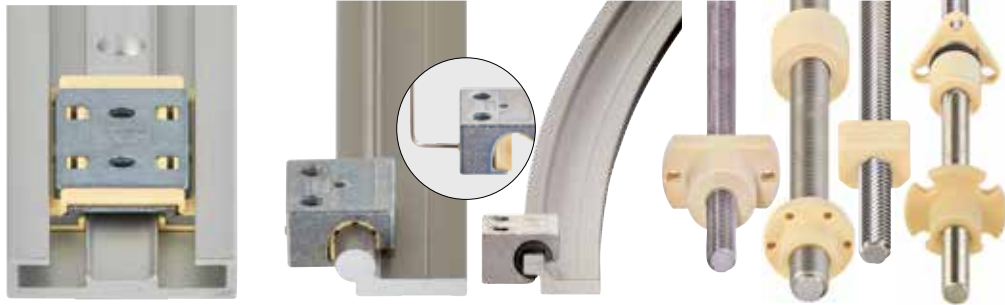
Quiet operation

The quiet operation is also a benefit of sliding rather than rolling. Operation is much quieter compared to re-circulating ball systems. The sliding motion is extremely quiet and only a light friction noise is audible.



Low noise, lubrication-free ...

igus® solutions for cabin fittings, such as:



drylin® N low profile guide systems

- 100% lubrication-free
- Low installation height between 6 and 12 mm
- Light weight
- Numerous carriage options – also with pretension

www.igus.eu/drylinN

drylin® W linear linear system

- Easy installation, maintenance-free
- Resistant to dirt due to dry operation
- Low weight and quiet operation
- Angular rail with floating bearing function for corner installations

www.igus.eu/drylinW

drylin® lead screw technology

- Efficient and durable dryspin® technology
- Self-locking trapezoidal and metric threads
- Lead screw nuts made from 5 iglidur® materials

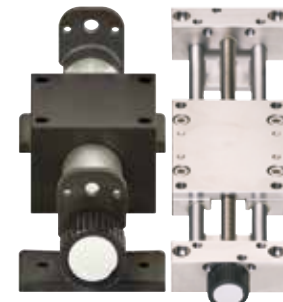
www.igus.eu/drylinSD



drylin® T/R rails and shaft guides

- Interchangeable with ball bearings / recirculating ball bearings
- Adjustable linear carriages
- Replaceable liners
- 100% lubrication-free

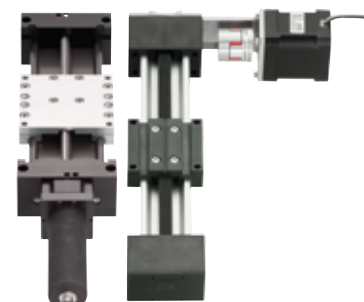
www.igus.eu/drylinR



drylin® drive technology

- Linear modules with lead screw drive or toothed belt
- For manual or electrical adjustments
- Configuration with customised stroke lengths

www.igus.eu/drylin-drive



drylin® E drive technology

- Linear axes with stepper motors/ DC motors
- Failsafe thanks to the use of encoders and initiators
- Can be combined for gantry configurations

www.igus.eu/drylinE

... lightweight ... drylin® carbon

25% lighter than aluminium – 75% lighter than steel

Extremely lightweight and yet extremely strong – our new, tribologically optimised drylin® linear systems made from plastic and carbon combine these two specifications

www.igus.eu/drylin-carbon

- Extremely light
- Robust und reliable
- 100% lubrication-free
- Metal-free, non-magnetic
- X-ray transparent

drylin® WSPC linear guide

The combination of the WSPC-06-30 double shaft profile, made from high-strength and durable carbon, and a linear carriage made from lubrication-free dry-tech® material make this innovative system extremely lightweight and robust, while maintaining all the tried-and-tested specifications of a drylin® W linear guide.

www.igus.eu/drylinWSPC



- Extremely light
- Lubrication- and maintenance-free
- Metal-free, non-magnetic
- Tribologically optimised

drylin® SAW linear module

The structure of the drylin® linear module SAW is based on the lubrication-free drylin® W linear guide with a carbon rail profile and a dry-tech® linear carriage. The lead screw drive can be configured with steel/stainless steel or hard anodised aluminium. The innovative use of carbon reduces the rail weight by approximately 25% compared to aluminium.

www.igus.eu/drylinSAW



- Customised stroke lengths
- Trapezoidal or high helix thread drives
- For manual adjustments
- Up to a length of 300 mm

drylin® ZLW toothed belt axis

The combination of tribologically optimised drylin® W linear guide made from carbon with dry-tech® polymers in the carriage and end blocks make the ZLW-0630-P toothed belt axis the first completely metal-free toothed belt axis. The system is extremely lightweight and completely maintenance-free thanks to the uniform solid plastic construction within the end blocks. This is achieved, for example, by the use of xiros® ball bearings (with plastic or glass balls) which allow all bearings to operate dry and without the need for lubrication.

www.igus.eu/drylinW



- Lightweight
- Metal-free design, non-magnetic
- Neoprene toothed belt drive with glass fibre reinforcement
- Up to a length of 1,000 mm

iglidur® plastic plain bearings ...

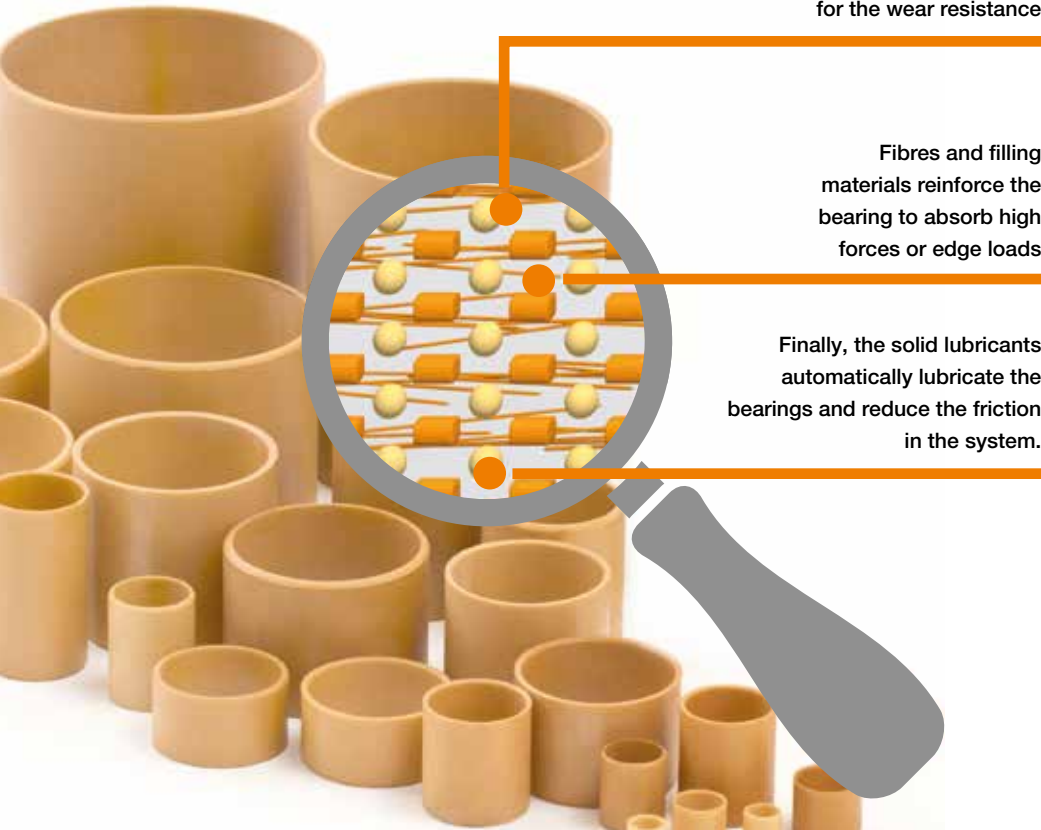
Lubrication- and maintenance-free plain bearings made from high-performance plastics – iglidur®.

No lubrication or maintenance required, while cutting costs and increasing service life, everything from stock and delivered promptly – that is the central idea of all igus® products. iglidur® plastics have been extensively tested with respect to wear and friction coefficients including other relevant material properties. iglidur® polymer plain bearings from igus® signifies the step from the plastic bushing to the tested and therefore predictable machine element.

- Lubrication-free
- Lightweight
- Maintenance-free
- High static loads
- Corrosion free
- Vibration dampening
- Metric and imperial dimensions
- Special dimension and designs

 www.igus.eu/iglidur

Structure of iglidur® plastic plain bearings:



The base polymers are crucial for the wear resistance

Fibres and filling materials reinforce the bearing to absorb high forces or edge loads

Finally, the solid lubricants automatically lubricate the bearings and reduce the friction in the system.

... also according to UL94 V0

iglidur® plain bearings



iglidur® polymer plain bearing with V0 classification according to UL94

The material achieves the UL94 V0 rating and is therefore ideally suited for applications with stringent fire protection regulations (vehicle and aircraft interiors, building interior systems, etc.). Other properties are similar to the general purpose iglidur® G material.

- Lubrication- and maintenance-free
- UL94 V0 rating
- High abrasion resistance
- Universal application
- Vertical burn test; CS-25.853 APP F Part 1a 1(ii) (12 seconds) is available for a selection of iglidur® materials

 www.igus.eu/GV0

Self-aligning ... igubal® spherical bearings



Dirt resistant igubal® spherical bearings

igubal® pillow block bearings are self-aligning bearing elements completely made of plastics. The split and self-aligning pillow block bearings are easy to assemble, adjust to all angular variances, and in many cases were already able to replace special housings.

- Different types of designs, e.g. spherical, double, joint, flanged and pillow block bearings
- Different spherical ball materials
- Extremely cost-effective
- Service life can be calculated online

 www.igus.eu/igubal

igus® special parts

Customised special parts from quantities as low as 1 ...



Special parts made from tribo-plastics according to customer requirement

speedimold is primarily simple! Constructive special solutions just as you need it, virtually everything is possible. iglidur® offers you self lubricating and maintenance-free solutions, all according to your wishes, "off the shelf" or "custom made", especially for your applications: Choose from 8 iglidur® tribo-plastic materials iglidur® G, iglidur® J, iglidur® W300, iglidur® X, iglidur® M250, iglidur® P, iglidur®

A180, iglidur® H2 and igumid G. You will get, depending on the complexity of parts, injection moulded parts in 1 to 10 days with no minimum order value.

www.igus.eu/speedimold



Special parts made from iglidur® materials

speedicut uses the entire range of iglidur® bar stock materials and produces parts according to customer requirements very quickly. Like the proven speedigus® rapid tooling system, speedicut easily and quickly creates a cost estimate based on a 3D model. The parts are then delivered within a few days.

www.igus.eu/speedicut



Additional customised components available, such as machined drylin® W rails.

Just ask and together we will develop the "one" component that is optimally suited for your application.

www.igus.eu/drylin

Filaments and liners

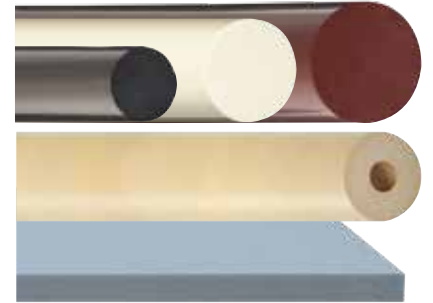
... from the dry-tech® bearing technology



Simply cut and stick Tribo-Tape

- For lining tribologically stressed surfaces and shapes in a variety of ways
- Easy to cut and stick
- Less space required
- self-adhesive back

www.igus.eu/tribotape



For free design – iglidur® bar stock

- iglidur® materials as round bars, tubes and plates
- Currently 20 iglidur® materials to choose from
- Cut to required size without paying for offcuts
- Mechanical processing from quantities as low as 1
- Maintenance-free and predictable

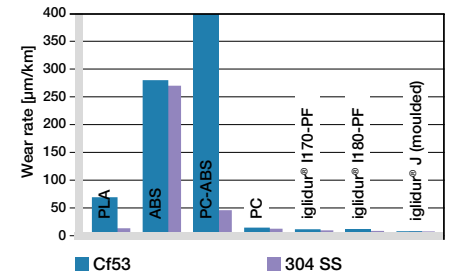
www.igus.eu/barstock

igidur® Tribo-Filament for 3D printers

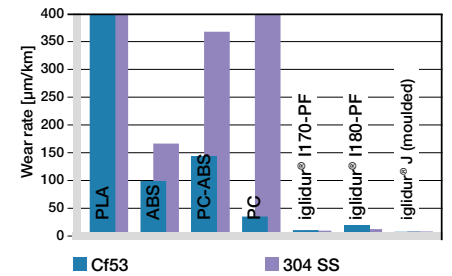
The new material is up to 50 times more abrasion-resistant than conventional 3D print materials

- Design custom parts or manufacture prototypes while also relying on the tested service life of igus® materials
- Select from three highly wear-resistant igus® materials: iglidur® I170-PF, iglidur® I180-PF and iglidur® J260-PF
- Give it a try with our starter kits with 25 g each of iglidur® I170 (in 1.75 mm), iglidur® I180 and iglidur® J260 (in 1.75 mm / 3 mm)

www.igus.eu/tribo-printing



Wear, pivoting: $v = 0.01$ m/s; $p = 1$ MPa; $\beta = 60^\circ$



Wear, linear: $v = 0.1$ m/s; $p = 1$ MPa; $l = 5$ mm

e-chains® and chainflex® cables

A choice from 100,000 components in the e-chain® module kit ...

e-chainsystems® are the "umbilical cord" of modern machines. They reduce downtime and increase the service lives of cables and hoses. Plastic energy chains® have been developed, produced and tested by igus® since 1971. e-chainsystems® carry sensitive bus, data and fibre optic cables, as well as energy forms such as electricity, gas, air and hydraulics.

- Carry sensitive bus, data and fibre optic cables, as well as other energy forms such as electricity, gas, air and liquids in one system
- For extremely high dynamic loads and high demands for the service life

- For all environments and climates (from -40 °C to +120 °C)
- Many types of orientation and application
- Easy to clean
- Space-saving installation
- Also available made from detectable material or as ESD/ATEX version
- Enclosed or open construction types
- Easy assembly of the modular system on site, as well as quick retrofitting of cables

www.igus.eu/e-chains



Lightweight, flexible, easy to fill – easychain®

- Easy to fill
- UL94-V2 (optional V0)
- Flexible dynamic and quiet
- Lightweight and cost-effective

www.igus.eu/easychain



The system for all installation situations – the allrounder E4.1 system

- Strong, snap open e-chain® for large unsupported lengths
- Can also be delivered as an enclosed tube
- Inner heights up to 162 mm

www.igus.eu/E4-1

chainflex® cables for highly flexible movements ...



PVC control cables CF130.UL & CF140.UL

- For medium load requirements
- PVC outer jacket (CF140 shielded)
- Flame retardant

www.igus.eu/CF130



TPE control cables CF98 & CF99

- For extremely high load requirements
- Particularly small radii
- TPE outer jacket (CF99 shielded)

www.igus.eu/CF98



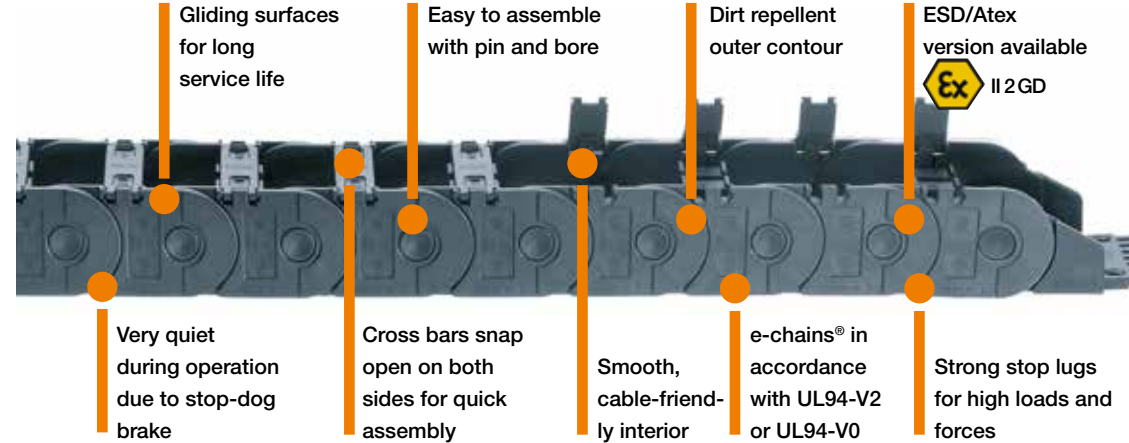
PVC Ethernet cable CAT5/GigE CFBUS.PVC

- For medium load requirements
- PVC outer jacket
- Shielded
- Oil-resistant and flame-retardant

www.igus.eu/CFBUS

... for all movement types

...for tiny installation spaces, extreme loads



Small, strong, flexible – E2 micro

- For the smallest installation spaces
- UL94-V2 (V0 optional)
- Strong, light and quiet
- For all installation orientations

www.igus.eu/E2micro



Excellent stability/size ratio – E2 mini

- Good size/strength ratio
- Quiet operation
- UL94-V2
- Snap open, easy to fill

www.igus.eu/E2mini

... and long service life



PVC motor cables CF885/CF886

igus® chainflex® M cable product range – costs up to 57% less than comparable chainflex® types.

www.igus.eu/chainflexM



PVC motor cables CF31

- For high load requirements
- PVC outer jacket
- Shielded
- Oil-resistant and flame-retardant

www.igus.eu/CF31



PVC hybrid servo cables CF220UL.H

For unsupported applications and medium duty for different drive manufacturers.

www.igus.eu/CF220UL.H

igus® solutions for the ...

Not only in and on the aircraft ...

Failsafe energy chain systems® and maintenance-free linear guides

... improve technology and reduce costs of the vehicles on the runway.

Weather-resistant igus® plastic solutions

... help you to reduce logistics and assembly times as well as throughput times and virtually eliminate the need for maintenance.

Our energy supply solutions

... for failsafe guidance of cables as well as hydraulic and pneumatic hoses in almost all vehicles.

Eliminating the need for lubrication

... makes our plastic plain bearings and linear bearings maintenance-free and ideally suited for outdoor use.



Learn more at:

www.igus.eu/aircraft

... ground handling at the airport

... but also on the runway: igus® has the necessary experience



Boarding bridges: Heavy loads and guiding many cables in a failsafe manner



Ambulifts: Stability and reliability during strong vibrations



Aircraft tractors: High resistance against dirt and other environmental conditions



De-icing vehicles: Failsafe operation at temperatures between -40 °C and +120 °C



Container stackers: e-chain® E4.1 – can be opened from both sides



Boarding bridges: For any movement and environment – e-chains® and chainflex® cables

igus® services ...



Visit our industry web pages for more information, products, application examples and useful online-tools.

www.igus.eu/aircraft



Quickly find and configure products and calculate service life - all online.

Using our online product finders you can find the right igus® product and get a service life prediction.

www.igus.eu/online

i For any task - in any quantity

Different industries need different solutions. Whether in mechanical engineering, automotive manufacturing or in the robot industry – igus® offers customised support for specialised applications. igus® already has many years of experience and specialised resources for many industries

www.igus.eu/industry

... fast and reliable.



The igus® delivery service

Over 97% availability of all catalogue parts – no need for you to hold stock

- Over 100,000 products from stock
- No minimum order value
- No surcharges for small quantities
- No costs for cutting cables
- No packaging costs

www.igus.eu/24



Modern injection moulding technology

The igus® GmbH quality policy is based on the objective of identifying and meeting customer needs, and of always being a professional partner and reliable supplier. igus® has always been committed to producing products of the best possible quality and consistently developing innovative solutions.



The igus® lab

The industry's largest test lab (2,750m²) conducts more than two billion test cycles per year on a total of 107 test rigs.

- Extensive test databases
- Customised tests on request

www.igus.eu/test

i igus® motion plastics®

One vision has been driving us for 50 years – motion plastics®: moving parts made from plastic that cost less and last longer. Our core technology consists of tribo-polymers – high-performance plastics, which we have optimised for friction and wear. This technology has made us into a worldwide leader for developing and manufacturing energy supply systems and plain bearings.



/9001:2008 /16949:2009

igus® is certified in accordance with ISO 9001:2008 and ISO/TS 16949:2009 in the field of energy supply systems, cables and harnessing, as well as plastic bearings.

/newsletter

Free of charge! Discover more about the latest trends and innovations from the world of igus® motion plastics®. Many exciting applications and videos for your industry.

Register here: www.igus.eu/newsletter

/contact

Your contact person for your industry and your country: www.igus.eu/contact

igus®

igus® GmbH
Spicher Str. 1a
51147 Cologne
Tel. +49 2203 9649-145
Fax +49 2203 9649-334
info@igus.de
www.igus.eu

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