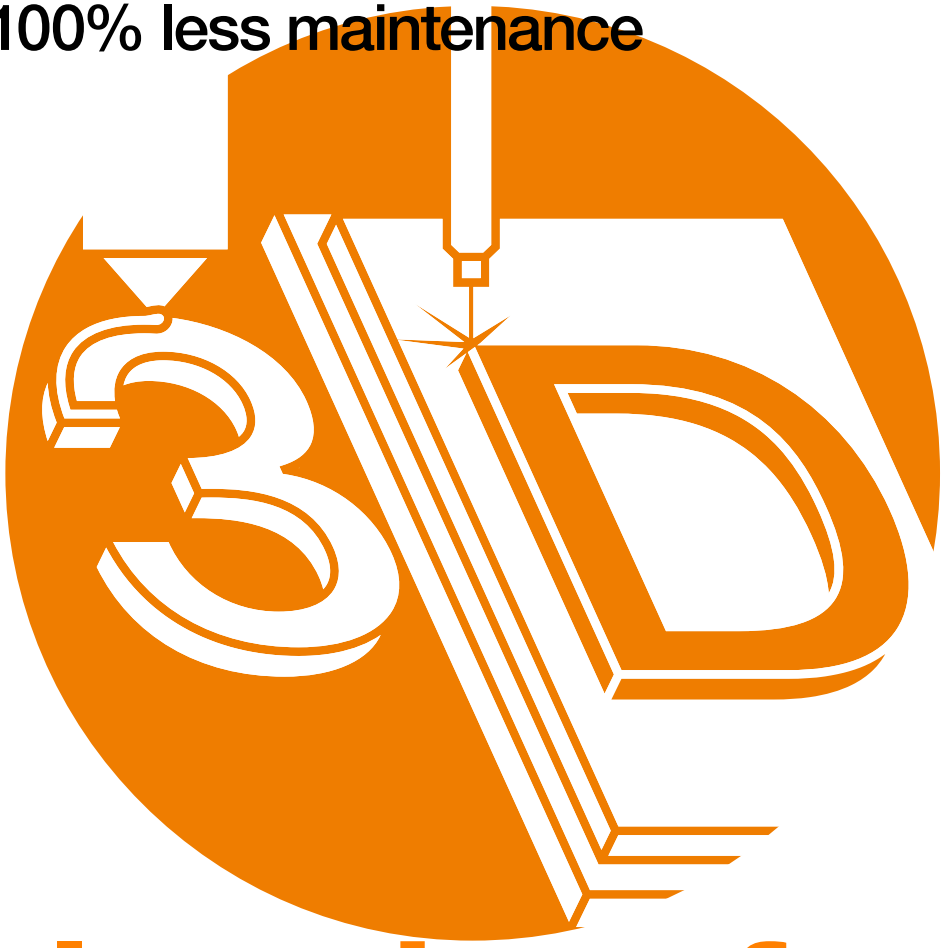
3D printing

Solutions for 3D printing
40% less costs, 80% less weight,
100% less maintenance



plastics for

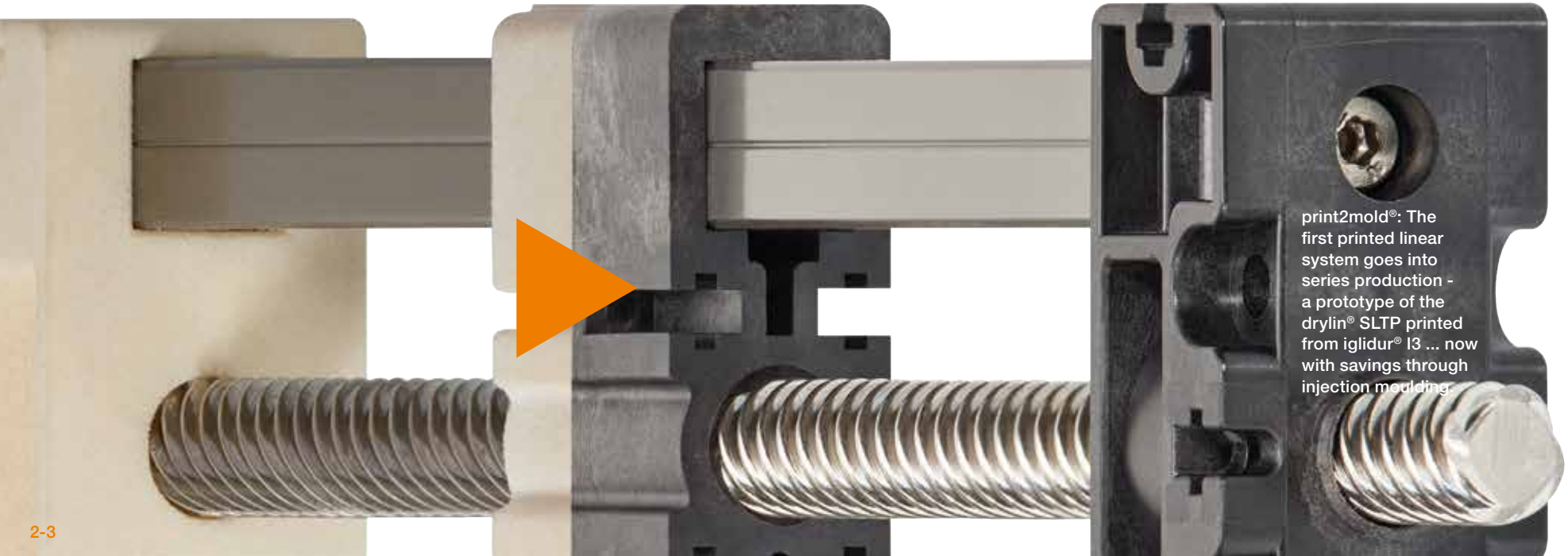
Longer life

100% lubrication-free bearings.

Lubrication-free printing and lubrication-free bearings. Maximum freedom in 3D printing due to the large igus® motion plastics® modular system. Lubrication-free printing.

Highly abrasion and wear-resistant tribo-plastics for additive manufacturing by laser sintering (SLS) or with the aid of filament (FDM/FFF), enable the printed bearing to be used directly. The function of the printed bearing can be tested reliably from prototype and small quantities to volume production.

Lubrication-free bearing arrangement. The use of igus® high-performance plastics enable 3D printers and scanners to operate without lubrication and maintenance. The drylin® linear plain bearings are quiet and smooth, as metallic balls are not required. The dryspin® lead screw nuts adjust the print bed efficiently and precisely, and the igus® energy chains prevent cable failures, extending machine operating times. With our online tools, you also save process costs.



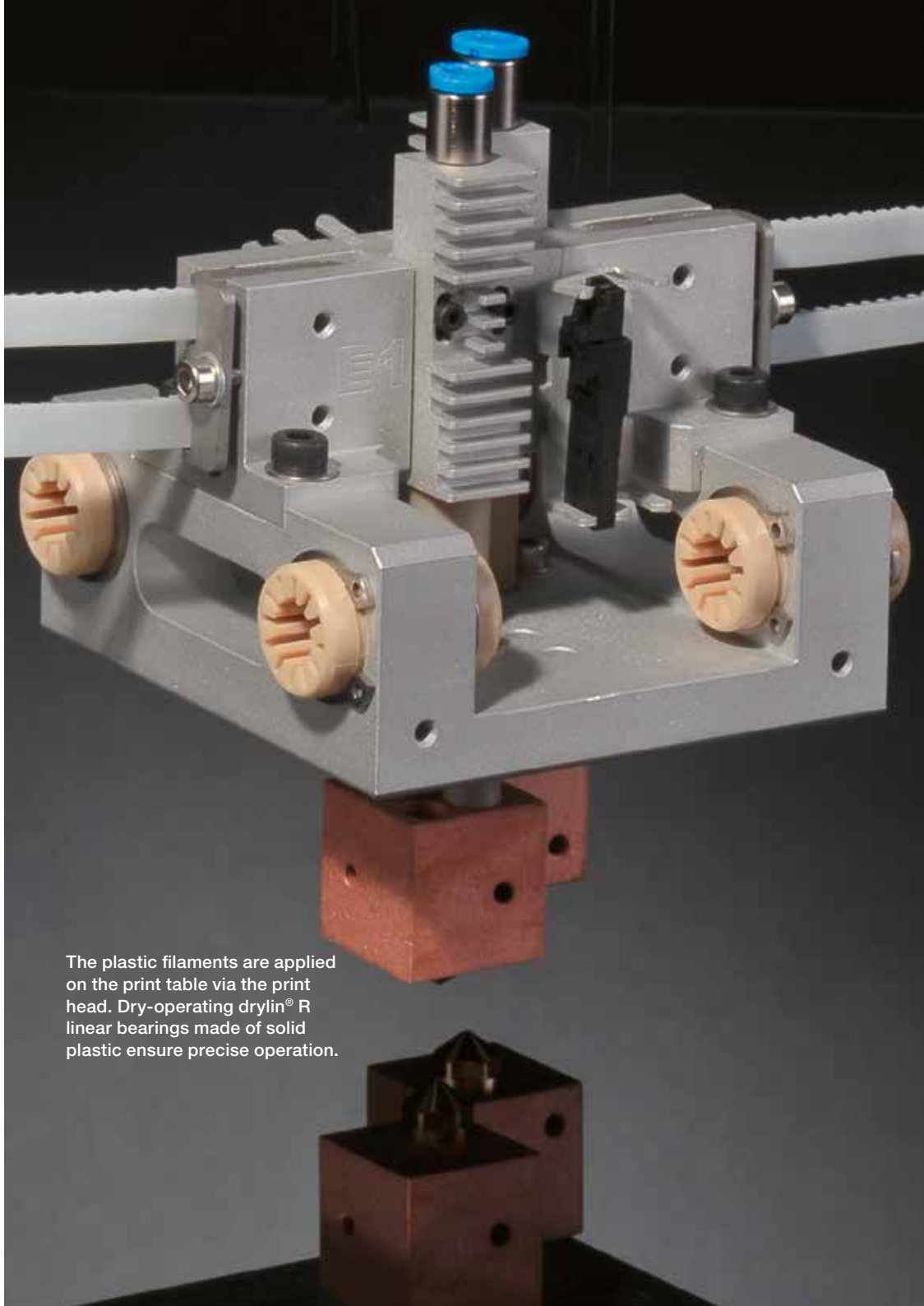
print2mold®: The first printed linear system goes into series production - a prototype of the drylin® SLTP printed from iglidur® I3 ... now with savings through injection moulding.

Printed, injection-moulded, machined - with the same tribological specifications

Tribo-parts required? It is all a question of quantity. With around 100 different materials for the most diverse environments, igus® offers the largest selection of tribo-optimised plastics. This large selection allows the most common methods of processing tribo-plastics such as 3D printing, extrusion or injection moulding at igus®. In this way, the designer always has the appropriate part in the right quantity at every stage of the project development.

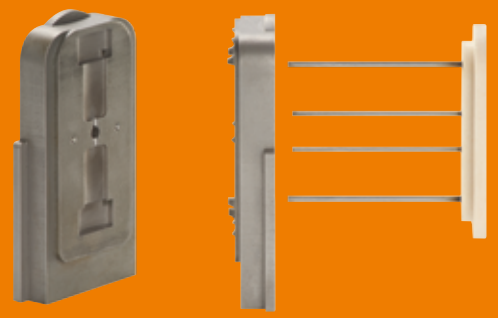
Advantages of igus® products in 3D printing:

- Lubrication-free, due to integrated solid lubricants
- Quiet operation and smooth sliding
- Resistance to dirt
- Long service life
- Corrosion-resistant
- Large range of materials and models
- Delivery from stock, from 1 piece despatched within 24hrs



The plastic filaments are applied on the print table via the print head. Dry-operating drylin® R linear bearings made of solid plastic ensure precise operation.

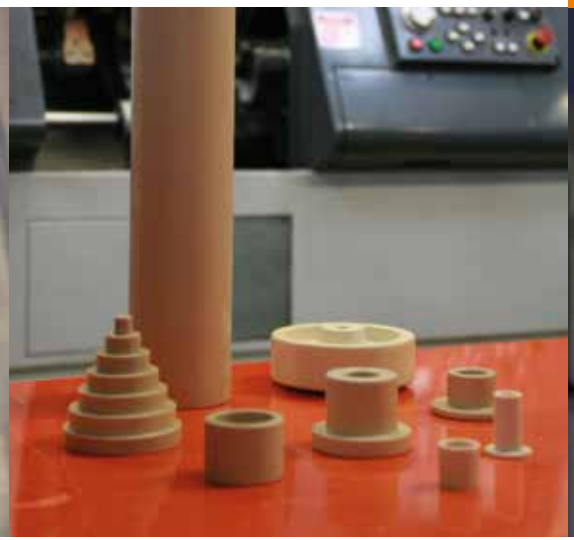
From prototypes and small quantities up to high-volume production



Printed metal tools

Higher quantities with metallic 3D printing tools. Get special wear-resistant parts quickly from any iglidur® material

- Individual wear-resistant part made with the injection-moulding method in 1 to 2 weeks
- Up to 40% lower tool costs
- Cost-efficient and delivered quickly
- Efficient, no minimum order quantity
- Large quantities and reusable



3D printing/Laser sintering

For prototypes and small quantities made from tribofilaments® or laser sintering. Wear-resistant materials for 3D printing and the laser sintering process - print them yourself or have them printed at igus®.

- Up to 50 times more abrasion-resistant than conventional 3D print materials
- Various iglidur® materials available for FDM/FFF (filament) and SLS (powder)
- No tool costs, cost-effective, no minimum order quantity
- More than 500,000 abrasion-resistant laser sintering components already in use

Milled / Turned

For small volumes made of iglidur® bar stock. Complete design freedom: Either as semi-finished stock material to produce your own parts or supplied machine-finished.

- As a round bar in Ø10-100mm
- Lengths 100-1,000mm
- As plate material in 2-40mm thicknesses

Printed tools

For small volumes made from iglidur® granules. 3D-printed injection moulds. Wear-resistant parts with simple geometry can be manufactured from most iglidur® materials.

- Get custom products in 5 days
- Up to 80% more cost-effective than conventional injection mould tools
- For prototypes and small volumes

Injection moulding

For volume production made from iglidur® granules. Modern injection moulding systems enable the cost-effective production of standard and special parts.

- Online orders and calculations
- 100,000 products from stock

Tribo plastics for laser sintering - designing in 3D with iglidur® I3

Tested! The material iglidur® I3, which was specially developed for laser sintering, showed an abrasion resistance up to 20 times better than conventional materials. This further increases the degrees of freedom in the design of sliding components prone to wear.

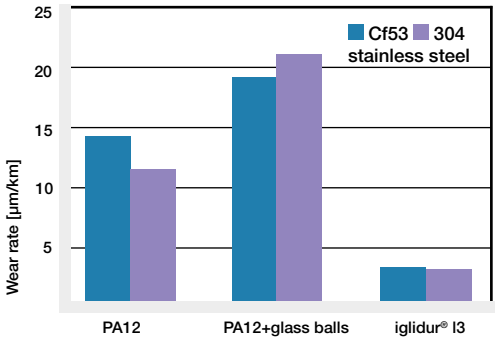
- Wear-resistant
- Good mechanical properties
- Accurate surface details
- Can be processed using the standard parameter set
- Refresh rate: 75%
- High abrasion resistance, suitable for all kinds of wear-resistant parts, spur gears and bevel gears.

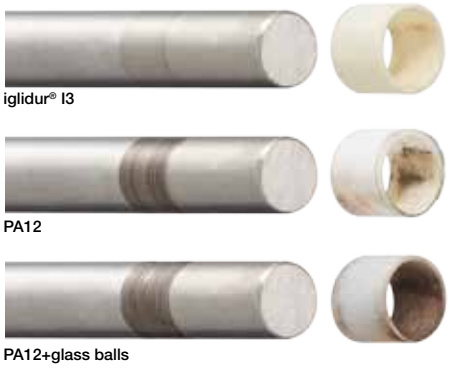
FMV SS 302

Compliant according to FMV SS 302

Wear, rotating

v = 0.3m/s p = 1MPa





Material: iglidur® I6 specifically developed for worm gear applications

- Food compatible according to FDA and EU10/2011
- Excellent abrasion resistance
- Extremely long operating times
- For all types of wear-resistant parts and worm gears

Material: iglidur® I8-ESD components with ESD specifications

- Electrostatically dissipative (ESD) and black
- Excellent service life – for example, a pivoting abrasion resistance factor of 2 compared to PA 12, can be calculated online
- Can be processed on regular and low-cost laser sintering systems
- Excellent wear rates in underwater applications

Material: iglidur® I10 chemical-resistant and foodstuff-compliant

- High chemical resistance
- Food compatible according to FDA and EU10/2011
- Tough
- Applicable in the electroplating industry

The correct iglidur® filament for your application

Recommended iglidur® tribofilament® according to application temperature and printers

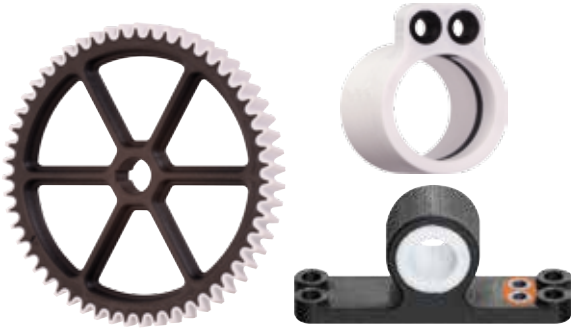
Ambient temperature in the application	All printers (also open installation space)	Closed installation space	Heatable installation space approx. +100°C	Heatable installation space approx. +160°C
-30 to +65°C	iglidur® I150 iglidur® I151 igumid P150**	iglidur® I150* iglidur® I151* igumid P150*/**		
-40 to +80°C	iglidur® I190*	iglidur® I190*		
-30 to +100°C		iglidur® I180 iglidur® I180-BL	iglidur® I180* iglidur® I180-BL*	
-100 to +120°C			iglidur® J260	
-50 to +170°C				iglidur® RW370
from -100°C up to +180°C				iglidur® A350

*This 3D printer is only needed for larger parts (> 100mm), the previous printer is suitable for smaller parts.
**The material is abrasive, therefore a wear-resistant nozzle and drive wheel is required.

igus® multi-material printing

Different specifications combined - multi-material printing at igus®

If you want to combine the different advantages of our filaments, multi-material printing is ideal. With the 4K printer, tribofilaments® can be connected with up to 3 other filaments. In this way, multifunctional special parts are produced quickly and economically in one step. Many different nozzles can be attached to the print head of the 3D printer, each of which processes one filament. Since the 3D printer switches between materials in each layer in this process, there is no restriction from a geometric point of view on how the "phases" can be combined. Due to the different textures of the filaments it was possible to print a lever made of two components. One material has high rigidity which allows high loads. At the same time, however, the bearing points remain very smooth-running, durable and wear-resistant. A combination of a carbon fibre-reinforced filament such as igumid P150 and a tribologically optimised material, such as one of the iglidur® tribofilaments® from igus®, is suitable here. Components with smart functions are recommended as a further application for multi-material printing. An integrated sensor layer can warn of overload and wear limit when it is reached, thus enabling predictive maintenance.

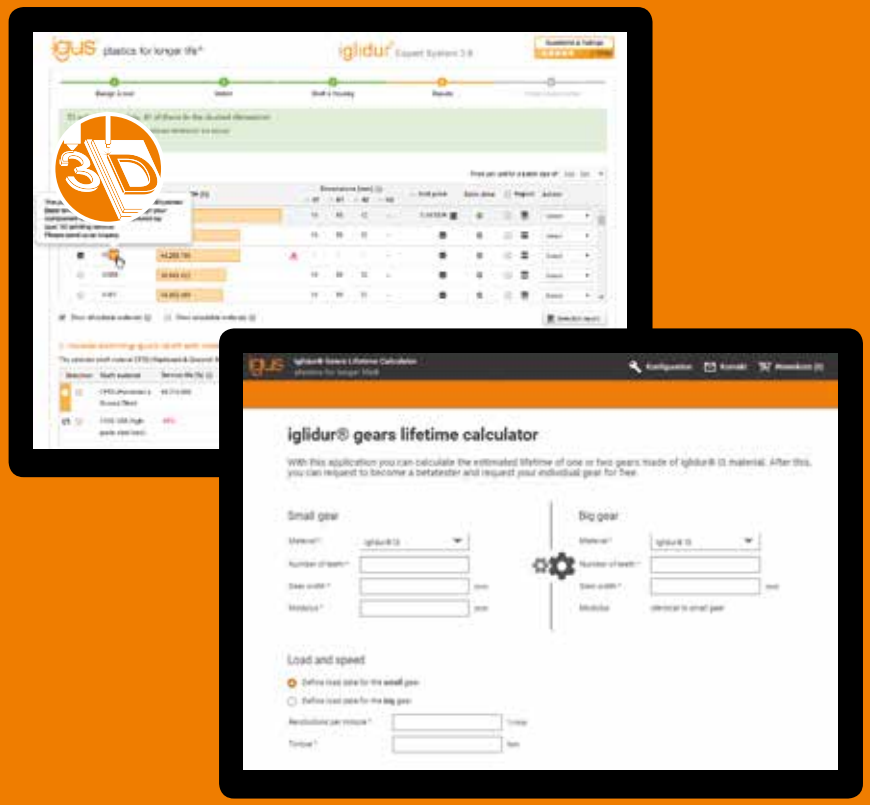


New all-rounder tribofilament® iglidur® I190: abrasion-resistant components with high strength

Stable and abrasion-resistant.

- Bending strength 80MPa, the best iglidur® tribofilament® for regular 3D printers
- Easy processing on standard 3D printers
- Excellent service life - abrasion resistance 50 times better than conventional 3D printing materials
- Lubrication-free and maintenance-free
- Application temperature: 90°C
- Nozzle temperature: 270 - 280°C
- Print bed temperature: 70 - 90°C

Calculate the service life of 3D printing materials online



Calculate the service life of 3D printed plain bearings and gears online order directly

- Calculation of the expected service life for 3D printing and laser sintering
- Plain bearing service life calculation with iglidur® J260, iglidur® I180, iglidur® I150, iglidur® I6, iglidur® I3 and more
- 3D model is created automatically (without flange)
- Price is directly determined in the service life calculator
- Clearance after press-fit: 0.03-0.23mm
- Gear service life calculator with iglidur® I3 and iglidur® I8-ESD - No login necessary

3D printing with tribofilaments®: 50 times more abrasion-resistant

Wear-resistant parts made of igus® tribofilaments® are up to 50 times more wear-resistant than standard materials for 3D printing and therefore achieve a long service life.
Due to their tribological properties, they are ideal for 3D printing spare parts and wear-resistant parts for e.g. plain bearings, drive nuts, gears and other wear-resistant parts. The igus® tribofilaments® can be processed on 3D printers based on the melt strand deposition process (FDM/FFF) where the nozzle temperature is adjustable.

Material: iglidur® J260-PF
Extremely long service life and excellent coefficient of friction
- Outstanding abrasion resistance of tribofilaments®
- Application temperature from -100°C to +120°C
- High-quality processing
- Nozzle temperature: from +260°C to +280°C

Material: iglidur® I150-PF wear-resistant parts printed the easy way
- High abrasion resistance at low speeds
- Good mechanical properties
- Easiest to process tribofilament® (also without heated print bed)
- Nozzle temperature: +240–250°C
- New: iglidur® I151 with FDA and EU10/2011 conformity and blue in colour

Material: iglidur® A350 for food technology
- Food compatible according to FDA and EU10/2011
- Application temperature from -100°C to +180°C
- High temperature printer necessary
- Nozzle temperature: +360°C to +370°C

Material: iglidur® I180-PF / I180-PF-BL
Best combination of machinability and service life
- Excellent abrasion resistance
- Good mechanical properties
- Nozzle temperature: 250°C to 260°C
- Also in black and blue (iglidur® I180-PF-BL)
- Application temperature: -40°C to 100°C

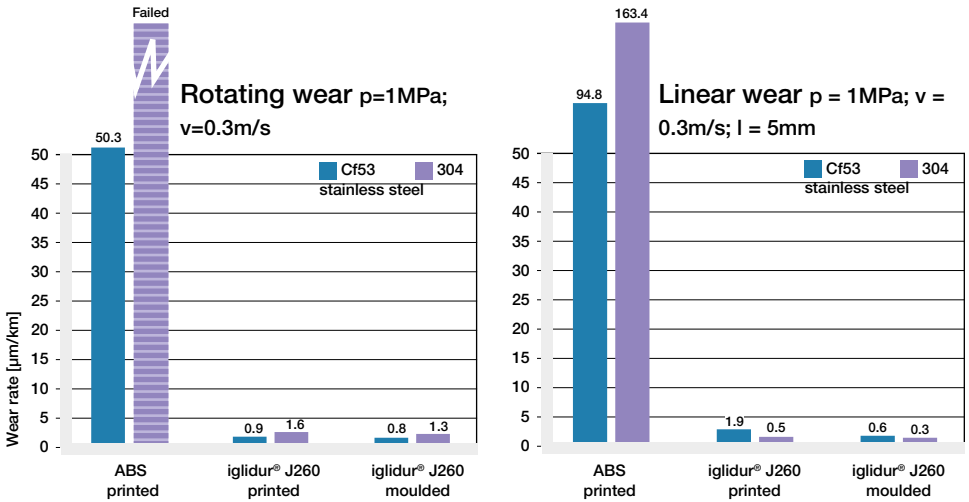
Material: iglidur® RW370 ideal for railway technology
- High strength
- Flame-retardant, according to UL94-V0 and DIN EN 45545
- Application temperature from –50°C to +170°C
- High temperature printer necessary
- Nozzle temperature: +350°C to +360°C

tribofilament® iglidur® J260: Printed as well as injection-moulded

3D printing filament impresses in testing with injection-moulded quality tribofilament.® iglidur® J260 is more wear-resistant than standard printing material.

Our test series prove that printed plain bearings made of our iglidur® J260 filament are as wear-resistant as our injection-moulded parts made of the same material. In addition, the tests have proved that iglidur® 3D printing filaments have significantly lower coefficients of friction and up to 50 times higher abrasion resistance than conventional 3D printing materials. iglidur® tribofilaments® are the only 3D printing materials that are well suited to moving applications. This means that printed parts such as plain bearings, drive nuts or worm gears can be installed directly and used as wear-resistant parts - from the prototype phase to volume production.

- Outstanding abrasion resistance of tribofilaments®
- Application temperature from -100°C to +120°C
- High-quality processing
- Available as filament, bar stock and injection moulded part - from prototype up to volume production



Tribo sensation:
iglidur® J260-PF filament

More cost-effective prducts - a crucial component: the largest test laboratory in the industry. 3,800 m² laboratory, over 15,000 tests and two billion test strokes a year.

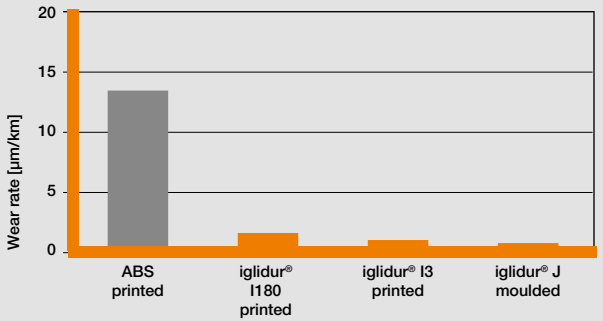
tribofilaments® - Material specifications and tests

Density	g/cm³	1.30	1.21	1.37	1.35	1.42	1.34
Colour		white	white	yellow	yellow	blue	beige
Max. moisture absorption at +23°C and 50% r.h.	% weight	0.3	0.3	1.4	0.2	0.6	0.25
Max. moisture absorption	% weight	0.7	0.9	6	0.4	1.9	1.2
Mechanical properties							
Flexural modulus	MPa	1,700	1,000	2,400	1,000	1,250/1,390[1)]	2,100
Flexural strength at +20°C	MPa	54/37[1)]	46/33[1)]	55/75[1)]	41/13[1)]	50/46[1)]	91/30[1)]
Shore D hardness		62	66	71	66	76	80
Physical and thermal properties							
Maximum long-term application temperature	°C	+65	+80	+90	+120	+180	+170
Maximum short-term application temperature	°C	+75	+90	+110	+140	+210	+190
Min. application temperature	°C	–30	–40	–40	–100	–100	-50
Electrical properties							
Specific transitional resistance	Ωcm	> 10^{13}	> 10^{12}	> 10^{12}	> 10^{12}	> 10^{11}	> 10^{12}
Surface resistance	Ω	> 10^{12}	> 10^{11}	> 10^{11}	> 10^{10}	> 10^{11}	> 10^{12}

[1)] Printed flat/upright

Wear, linear

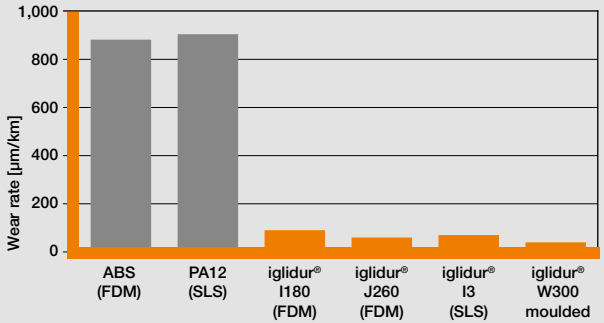
p = 0.11MPa, v = 0.34m/s, l = 370mm



ABS printed

iglidur® I180 printed

Wear, rotating p =20MPa; v = 0.01m/s, 304 stainless steel



ABS

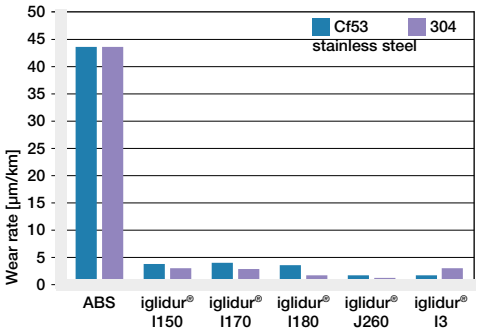
PA12

iglidur® I3

iglidur® I180

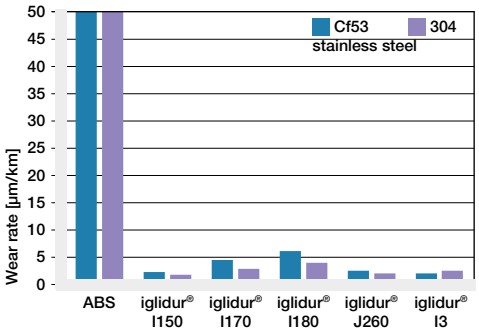
Wear, pivoting

p = 1MPa, v = 0.01m/s

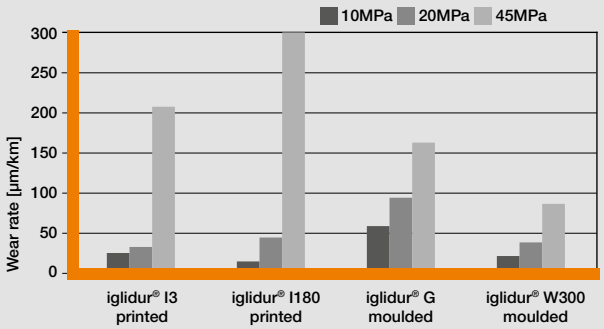


Wear, short stroke

p = 1MPa, v = 0.1m/s



Wear, pivoting shaft: 304 stainless steel, v = 0.01m/s; ß = 60°



iglidur® I3

iglidur® I180

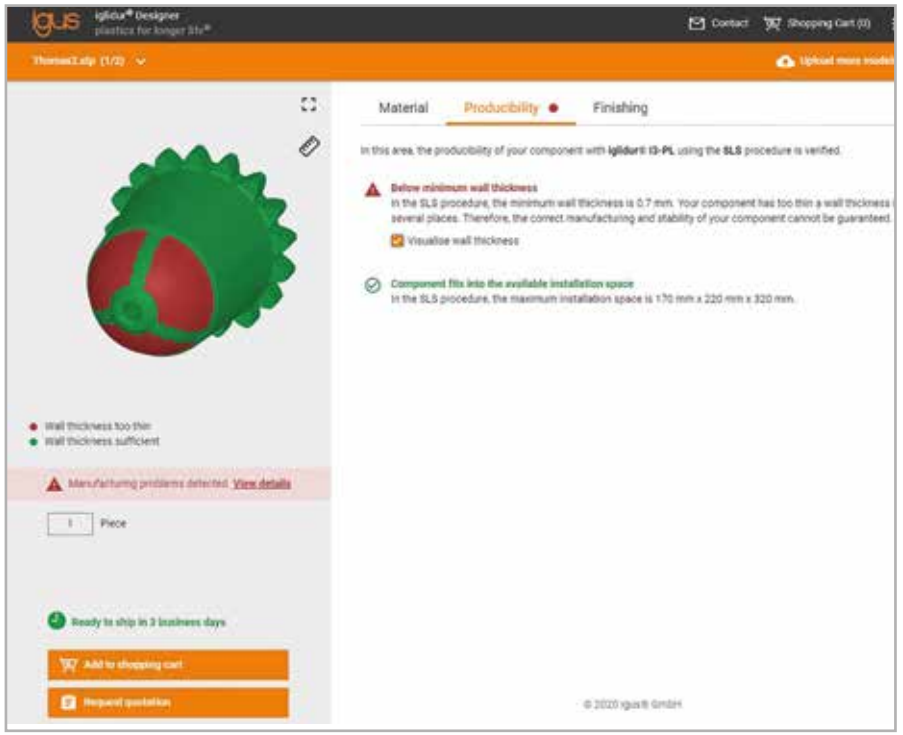
iglidur® G

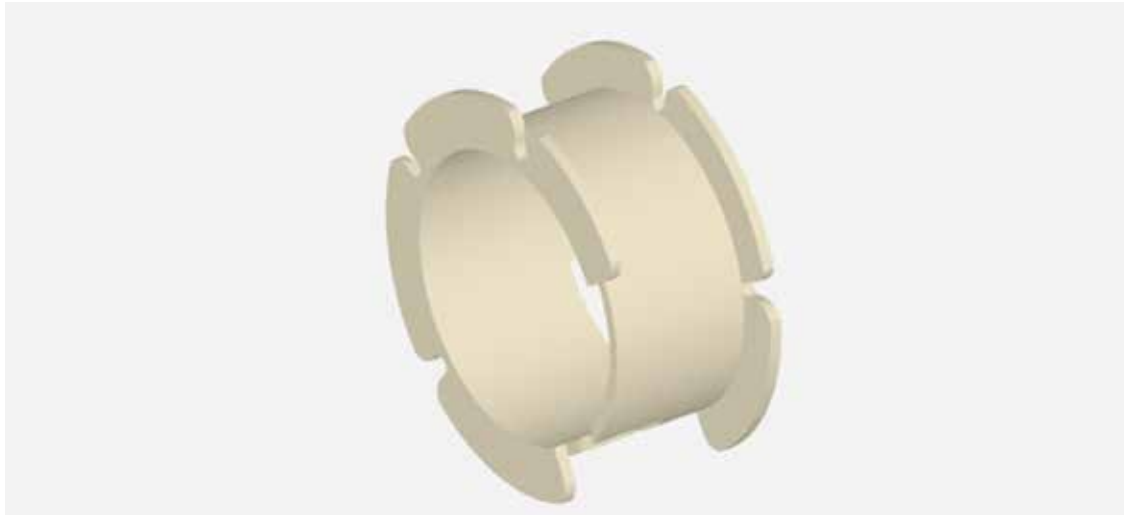
iglidur® W300

3D printing service - for customised parts made from high-performance plastics

In two simple steps a 3D printed component - with instant price

We print your individual component from lubrication-free and abrasion-resistant iglidur® high-performance plastics. Upload your drawing in STEP or STL format, check the 360 degree view and select a special filament. We deliver your part - depending on the complexity - after 24 hours. **Extremely strong when tested against machined and injection-moulded parts.** 3D printing materials from igus® are made of iglidur® high-performance plastics, which are ideally suitable for moving applications. They guarantee a long service life as well as high abrasion resistance of individual wear-resistant parts.



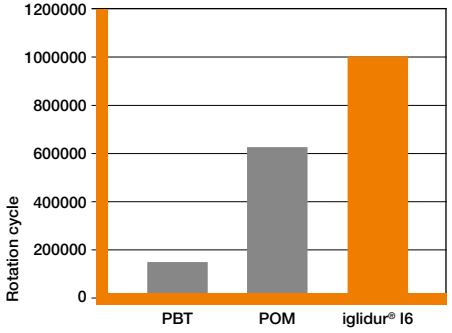


Get to your individual component in 3 steps with the igus® configurators

Gear, belt pulley or plain bearing - with the 3D print CAD configurators from igus® you can configure your individual component online, free of charge and order it directly at the igus® web shop.

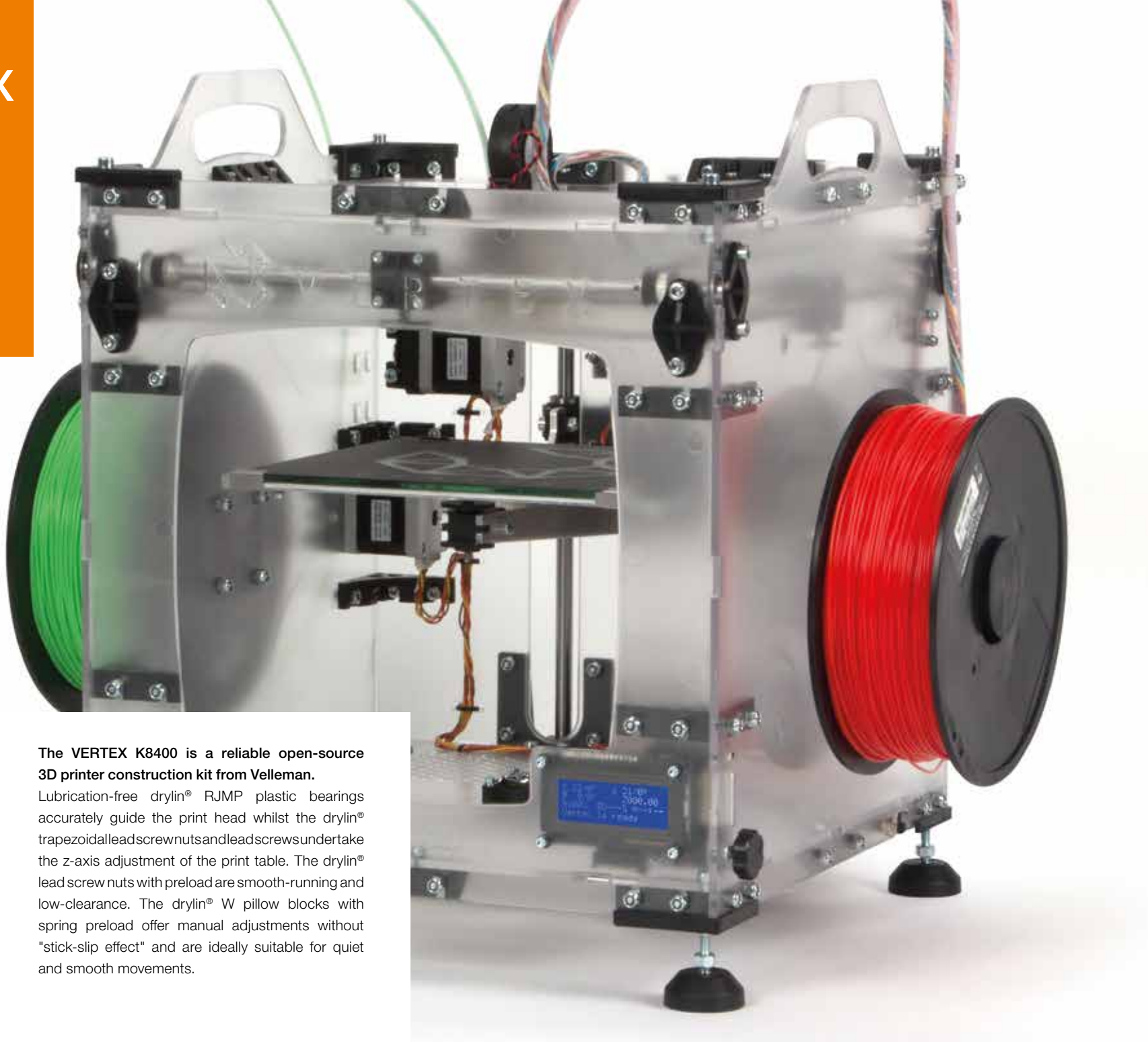
The configurators reduce repetitive design work and save time and money. The online configurators allow you to create a component in just 3 steps and help you to configure a dataset suitable for 3D printing. Gears, for example, are very difficult to design without tools because they have a complex intricate shape. With the gear configurator, a simple and practical tool has been developed and a gear can be configured even with special dimensions. The configurator only requires data such as tooth module, number of teeth, width and inner diameter. The 3D model is displayed in real time according to specifications and can then be exported as a STEP file. By uploading the file in the igus® 3D printing service, the configured gear made of the durable laser sintering material iglidur® I3 or iglidur® I6 can be ordered directly from igus®. In addition to the configurators for gears, belt pulleys and plain bearings, configurators for lead screw nuts, sliding elements, rollers and racks are also available.

Service life of worm gear in test 12rpm; 4.9Nm



Service life doubled in tests, iglidur® I6 clearly held its own against milled gears. Gears made of POM showed total wear after 621,000 cycles, milled gears made of PBT broke after 155,000 cycles, while gears made of iglidur® I6 were still functional after more than 1 million cycles.

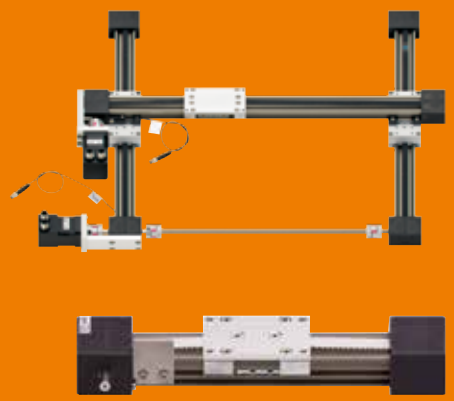
drylin® in VERTEX 3D printer - Lightweight, quiet and lubrication-free



The VERTEX K8400 is a reliable open-source 3D printer construction kit from Velleman.
Lubrication-free drylin® RJMP plastic bearings accurately guide the print head whilst the drylin® trapezoidal lead screw nuts and lead screws undertake the z-axis adjustment of the print table. The drylin® lead screw nuts with preload are smooth-running and low-clearance. The drylin® W pillow blocks with spring preload offer manual adjustments without "stick-slip effect" and are ideally suitable for quiet and smooth movements.

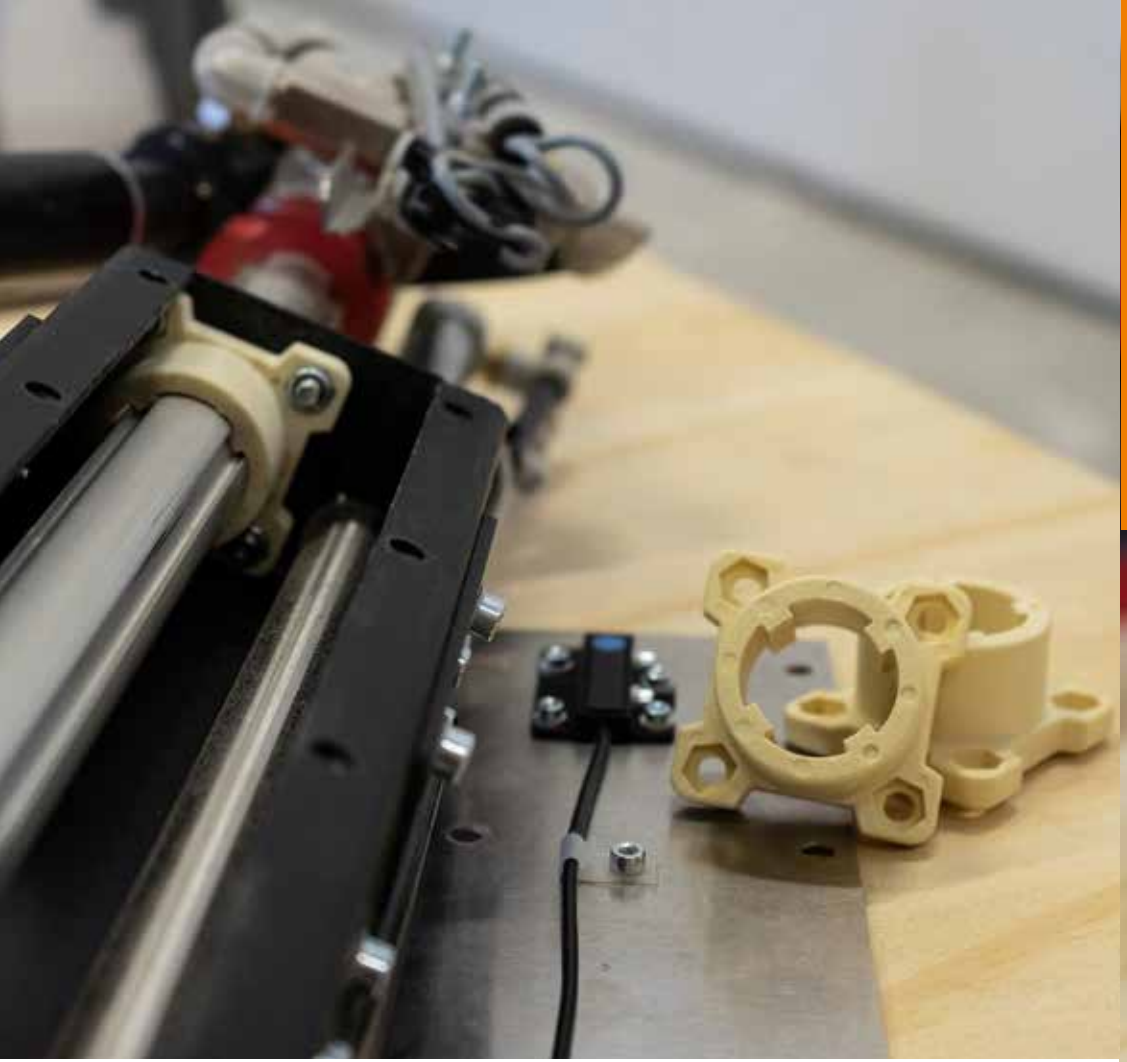
The house from the XXL 3D printer

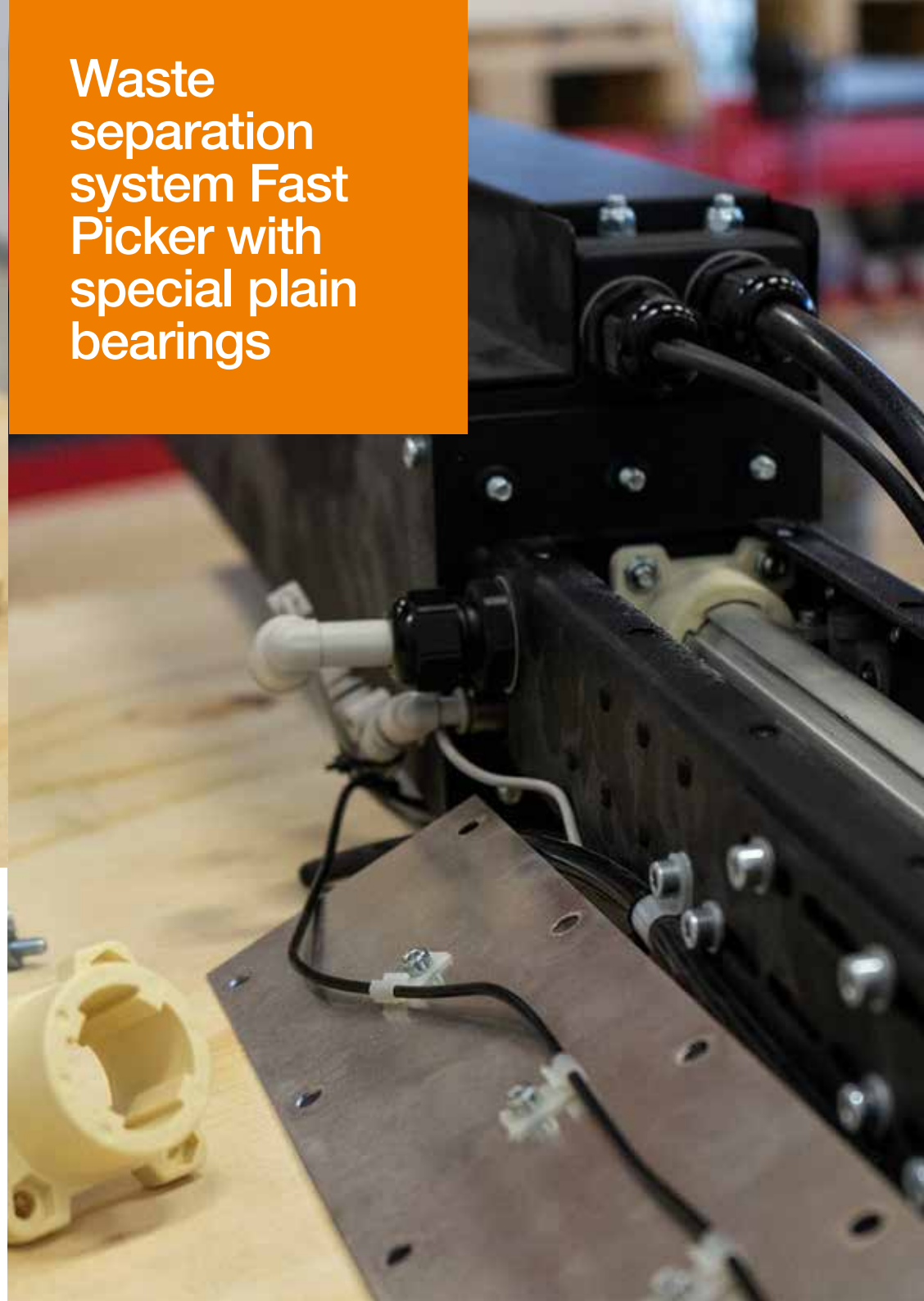
Simply huge: The mobile XXL 3D printer from the inside.



With the second generation of the "Kamermaker 2.0", larger elements can be printed with high precision and greater speed. A customer from the Netherlands builds entire buildings this way with its mobile 3D printer in XXL format. This is not only environmentally friendly, varied and practical, but also simplifies the logistics considerably: the elements are printed on site, put in place and filled with concrete. The print head of the 3D printer moves with a room linear robot from igus®. The drylin® toothed belt units, lead screws/lead screw nut systems, igubal® pillow block bearings and igus® energy chains are all used here.

Waste separation system Fast Picker with special plain bearings





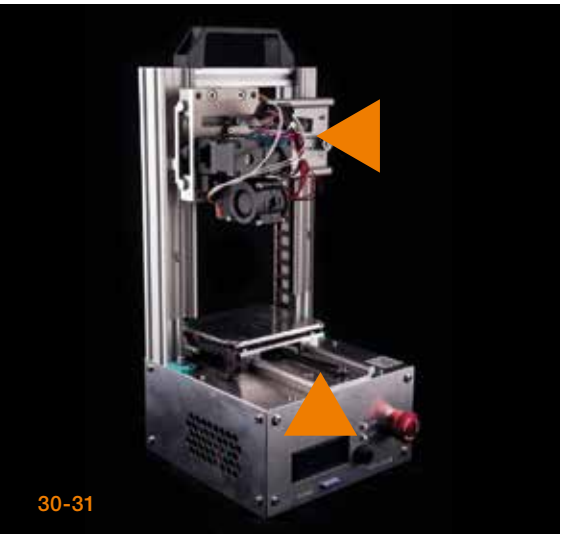
For an AI-controlled waste separation system, the company ZenRobotics from Finland needed complex-shaped plain bearings that enable speeds of up to 3m/s on an aluminium axis. A prototype made of iglidur® I3 proved that the complexity of the component could be achieved with 3D printing. The company then chose the print2mold® process, in which the injection mould is produced in the 3D printer and can therefore be manufactured cost-effectively and within 24 hours. The final bearings were made of iglidur® J2. The print2mold® component was a fraction of the cost of the laser sintering component (approx. €49/piece) at approx. €5/piece, and from 100 pieces the cost of the tool was covered.

Lubrication-free, precise and light - igus® in 3D printers

A whole construction kit for new ideas. igus® offers you lubrication and maintenance-free components with ready-to-install system solutions - suitable for any installation space. **Plain bearings, linear guides, energy chains** and matching **cables** in varying sizes and materials facilitate the creativity of designers. Energy chains assembled with cables and connectors as well as ready-to-install linear axes with motors, simplify assembly and reduce the risk of failure. With a robust design, lightweight components, ensuring a quiet operation and insensitivity to dirt, igus® offers a wide range of solutions.

Advantages of igus® products in 3D printers:

- Lubrication-free
- Quiet operation and smooth sliding
- Resistance to dirt
- Long service life
- Corrosion-resistant
- Great variety of materials
- Delivery from stock from 24hrs, no minimum order quantity,



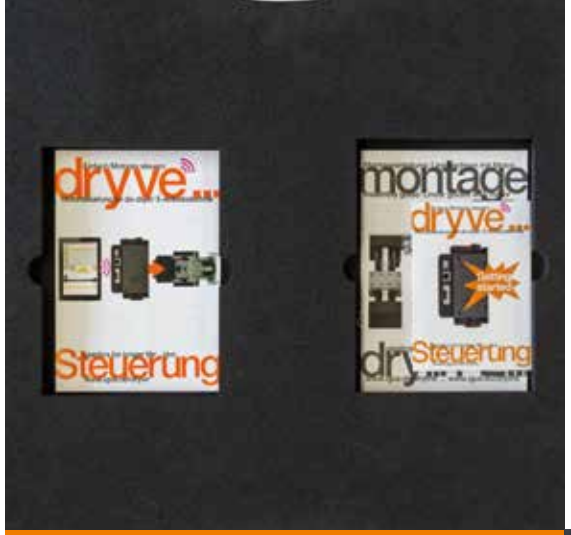
drylin® W profile guides represent a cost-effective pre-assembled system. The design allows maximum flexibility in construction and easy assembly through the use of single or double rails.

Extremely flexible and cable-friendly design: the 3D e-chain® triflex® R

Ready-to-install Pick & Place delta robots

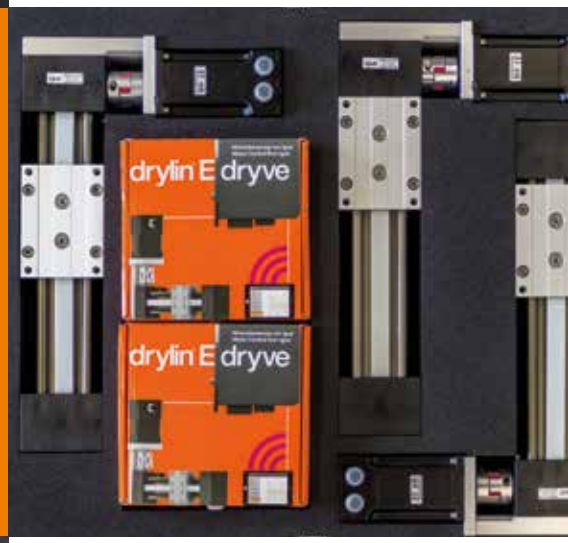
Cost-effective and lightweight modular system for delta robots

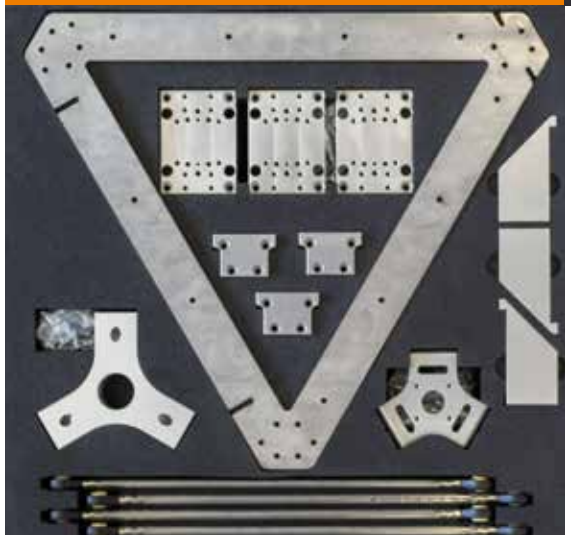
- For simple and automated assembly tasks
- Lubrication-free and maintenance-free drylin® ZLW toothed belt axis
- Pick rate of 60/min due to low-weight components made of plastic and aluminium
- Workspace up to ø 380mm
- If required, pre-assembled, incl. transport frame or installation kit
- Precise positioning due to motors with encoders
- Adapter plate for connection to T-slot profiles
- Optional: safe cable guidance for multi-dimensional movements with e-chain® triflex® R series
- TRC.30/TRE.30. Possibility of adaptation

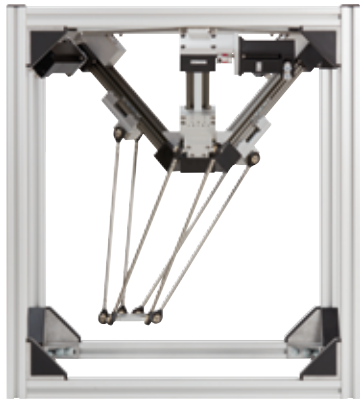


Delta robot consisting of:

- 3 drylin® toothed belt axes with NEMA23 XL
- Encoder stepper motors
- Lightweight igubal® delta kinematics
- Mounting brackets for installation in a frame
- Possibilities of adaptation for grippers/motors
- dryve D1 stepper motor control systems as option
- As a construction kit or completely pre-assembled in a transport frame.
- Accessories: Initiator kits
- TRC.30/TRE.30. Possibility of adaptation



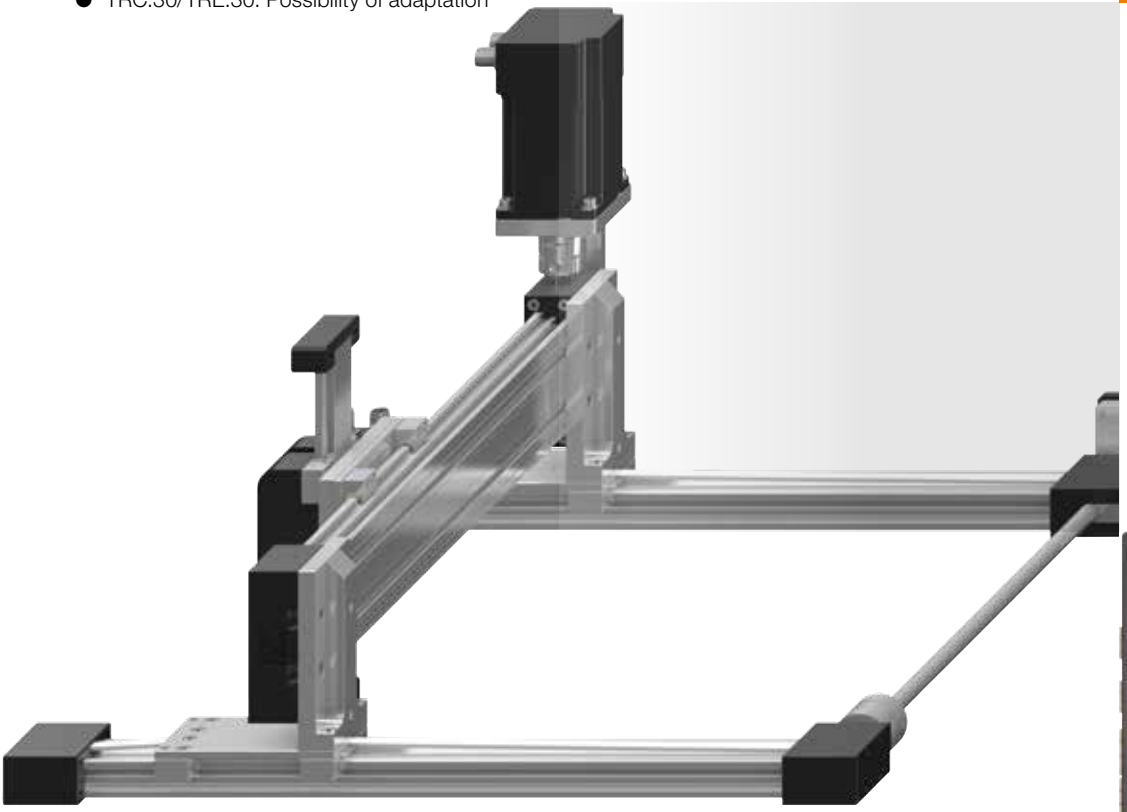




Compact linear robot with 3 axes, available in 24 hours

Kit consisting of drylin® ZLW-0630 toothed belt axis (x axis), the new ZLW-06-60 (y axis) and the GRW-0630 cantilever axis (z axis)

- Working area: 400mm x 400mm x 100mm
- Lubrication-free drylin® W profile guide system
- Ready to connect, with NEMA17/23 stepper motors with encoder
- Suitable mounting brackets for system profiles available as options
- Available in 24 hours
- Movements with e-chain® triflex® R-Series
- TRC.30/TRE.30. Possibility of adaptation



When should I choose the igus® room linear robot:

- For loads up to 2.5kg
- For precision requirements up to approx. 0.8mm
- Speeds up to a max. 0,5 m/s

Easy-to-operate dryve D1 motor control system for DC-EC and stepper motors

Select, click, control ... Travels, positions, speeds, running times - defined with the web-based control for drylin® E linear systems from igus®. Quick commissioning without software or app installation. A simple and intuitive user interface enables settings via smart phone, tablet or laptop in a few minutes. Standardised communication protocols such as CANopen or Modbus TCP make it very easy to connect to industrial control systems such as Siemens S7 or Beckhoff.

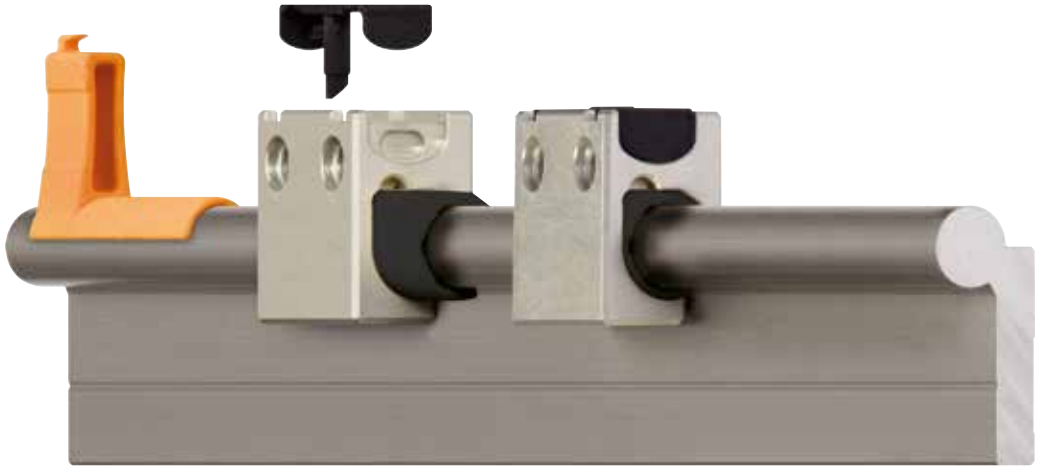
dryve D3 DC motor control system

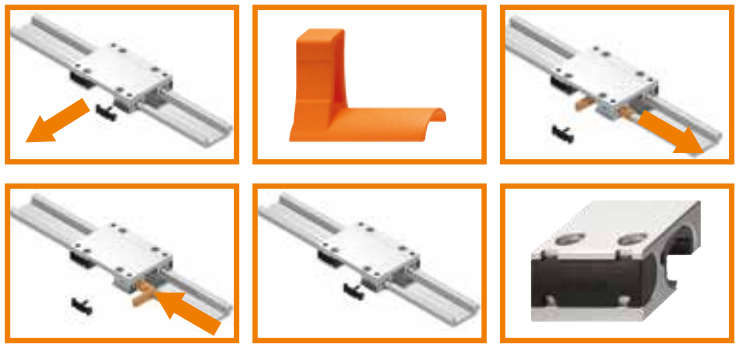
Easy control of linear systems. The dryve D3 is a cost-effective control unit for direct-current motors and is ready to use immediately. It can be connected quickly and is very easy to use – without any additional connection work. Buttons and rotary controls on the housing make it possible to control linear carriages without a PC, laptop or tablet. Different speeds as well as starting modes can be set.

drylin® W housing bearings – change the bearing directly on the rail

Efficient drylin® W housing bearing for longer and more reliable operating times

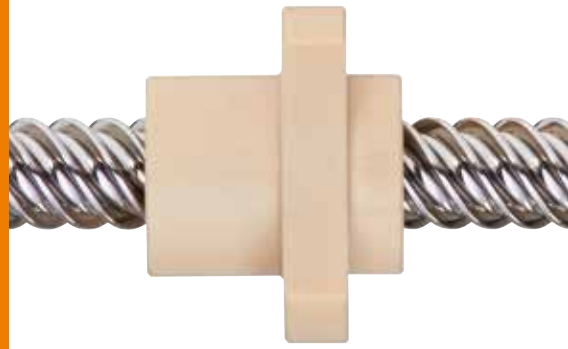
- Fast bearing replacement without disassembly
- Longer operating times and shorter downtimes
- High performance due to iglidur® J200 for 24/7 operation
- Silent due to sliding on lubrication-free high-performance polymers
- Suitable for all round drylin® W profile rails (single and double shafts, high profiles)
- All existing drylin® W systems of size 10 with a round shaft can be retrofitted with the new type of bearing (incl. guides, linear axes, gantry robots)
- Even faster bearing replacement with practical mounting tool





Even faster bearing replacement with practical mounting tool

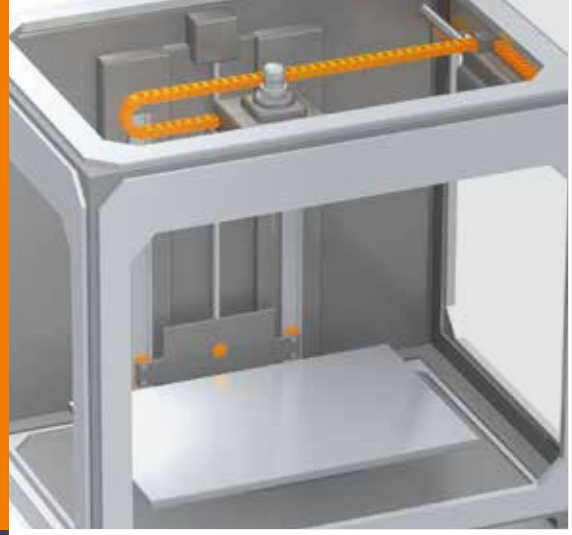
igus® extends world's largest lead screw shop with new nut material



Lubrication-free lead screw nuts made of iglidur® J200 offers up to three times the service life

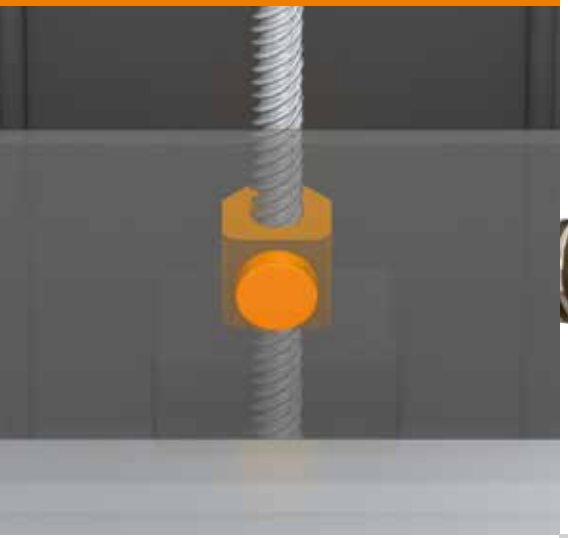
The durable material iglidur® J200, igus® expands its largest range of lead screw systems in the catalogue and online. The advantage of the online shop: high helix, trapezoidal and metric threads can be easily configured individually online with the lead screw configurator and the service life can be calculated. In addition to three lead screw materials, the customer can choose from nine lubrication-free and maintenance-free nut materials for different requirements. Also included: the highly wear-resistant iglidur® J200 material with high efficiency.

At the igus® online lead screw shop, engineers can select from over 5,000 lead screw drive combinations.



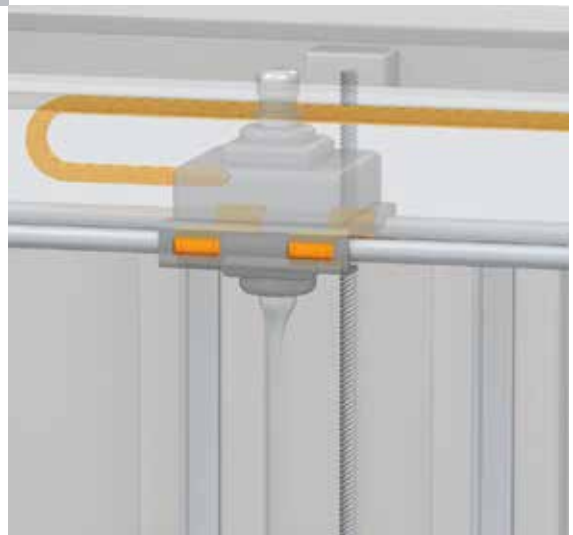
e-chain® E2.1 micro: Cable guide for print head

- For small bend radii
- Lightweight
- Quiet operation



drylin® lead screw technology: Lowering of the printing table

- Smooth running and low clearance
- Constant radial preload
- Lead screw nuts made of iglidur® E7 - quiet and durable

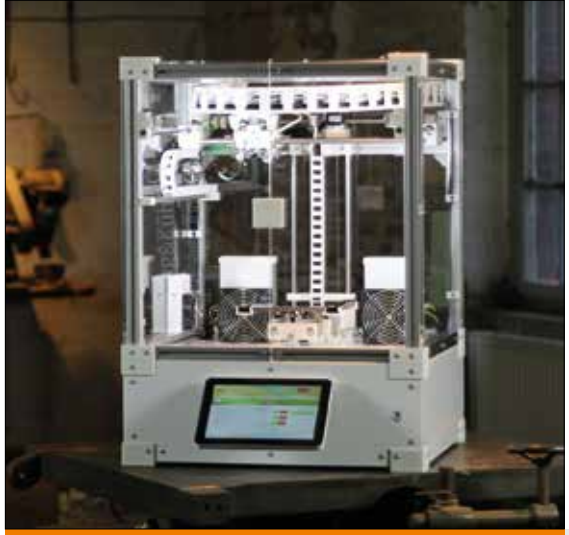


drylin® R in shaft guide: linear movement of the XY axis

- Very low friction values in dry operation
- Corrosion-free
- Dimensions identical to recirculating ball bearings

drylin® E7 in shaft guide: high acceleration rates and temperatures up to +80°C

- Up to 8x longer service life on steel and stainless steel shafts
- Precise
- For drylin® linear bearing and housing in ø 10-60mm

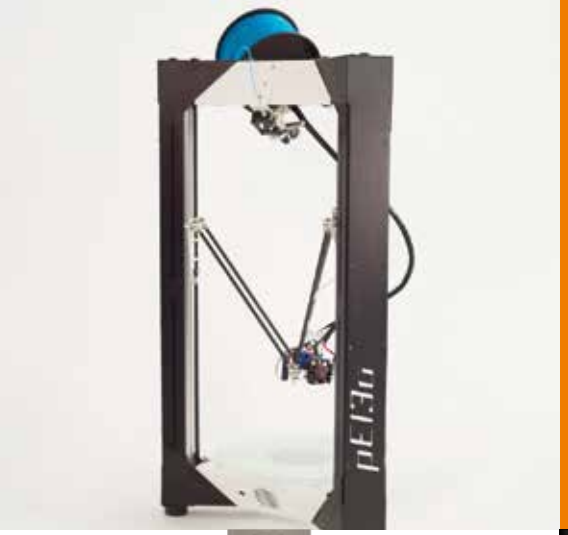


drylin® W in laser sintering printer for best printing properties

- Robust and dirt-resistant linear guide
- Lubrication and maintenance-free
- Linear housing with spring preload

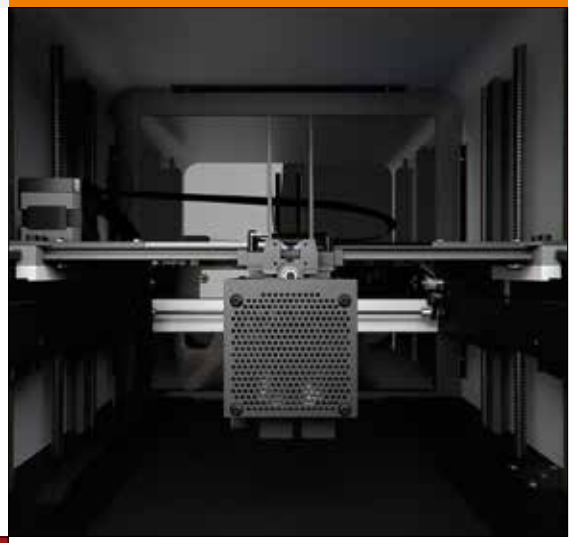
drylin® RJ4JP open-source printer: quiet and precise

- For manual adjustments without "stick-slip effect"
- Quiet and smooth movements
- Low weight and easy assembly



drylin® N in print head: Precise and consistent movement

- Compact linear guide in four installation sizes
- For every installation space
- Pre-load prism slide with constant spring preload



drylin® T in hobby printers: Compact and cost-effective

- Classic miniature guide in four sizes (7-15mm)
- Compact design, robust carriages
- With clearance setting upon request

igubal® in delta printer: Light, flexible and robust

- Angle compensation
- Precise guidance of the print head
- Available with inner and outer thread in many sizes

Tested ...

- Test: Wear rate pivoting
- Load per bearing point between 25N and 300N
- Surface speed: 0.01m/s

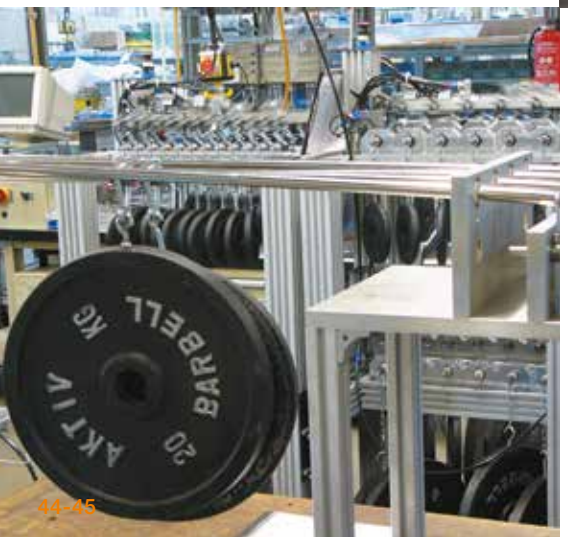
Extensive test database

Tested ...

- igus® extends the xiros® test stand in the industry's largest test laboratory for plastics in motion

Tested ...

- Test: Service life of lead screw nuts
- Load: 25N to 50N
- Speed: up to 1m/s



Tested ...

- Test: Wear rate linear
- Load per bearing point: 10N to 200N
- Surface speed: 0.1m/s up to 0.3m/s

Possibly the world's largest test database has been created from over 15,000 tests per year. It enables us to always select the right product for your specific application. Individual tests can also be performed for your industry.

From a garage in Cologne to the world market with igus tribopolymers. What began in 1964 with a single injection moulding machine and confidence in the potential of polymer materials in a backyard has developed over the years into a global company. Today, the 4,200 employees ensure new ideas, high-quality products, lean processes, short delivery times reach customers every day. igus® accomplishes around 7,000 deliveries every day. To ensure fast service and individual consultation, 14 warehouses and assembly centres are available to customers worldwide.

Lots of room for innovation - the flexible igus® factory

Over 4,200 employees in 31 branches worldwide