



igus® motion plastic solutions for ...
automotive

plastics for longer life® ... igus
technology
www.igus.com/automotive

Automotive...

It could not be easier!



The public debate on the greenhouse effect and the resulting emission limits have put pressure on car manufacturers to save as much weight as possible in each component.

Every gram counts. iglide®

plastic bearings can reduce the weight of every bearing point by a factor of seven when compared to metal solutions.

Millions of iglide® plain bearings are already used in automobile manufacturing each year. On the following pages, find a wide variety of applications with some extreme requirements, and how our high-performance plastics stand up to the challenging demands of not only weight constraints but also:

- wear resistance
- low vibration and noise
- corrosion resistance
- cost

In your search for information, check out our variety of free online tools at www.igus-automotive.com, or contact us directly for personal support in your selection for the best bearing solution.

Enjoy reading and getting ideas.

Yours

Kenneth Block

Automotive Product Manager



igus® catalogs

Excerpt of catalog on next pages, order igus® catalogs online www.igus.com/catalog.



Ordering times

Monday to Friday 7:00 am - 8:00 pm



Contact

Phone 800.521.2747
Fax 401.438.7270



Online

Visit www.igus-automotive.com for more information.



Questions?

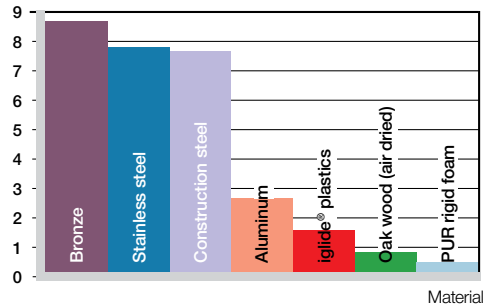
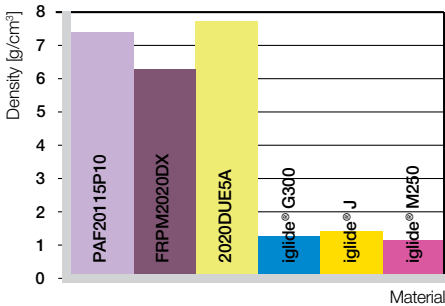
For answers, feel free to call us, or try our free online tools at: www.igus.com.

Light...

Lightweight construction with iglide®

Besides the advantages of dynamic driving, strict environmental and emissions standards compel car manufacturers to keep the weight of every component to the minimum. By replacing metallic plain bearings with iglide® plain bearings, enormous weight advantages can be immediately achieved. Every gram counts. Major weight reductions can be achieved by replacing metal bearings with iglide® bearings.

Metallic rolled DU bearings compared to iglide®



The weight of a single DU bearing is equal to that of seven iglide® bearings

Where is igus in the car?

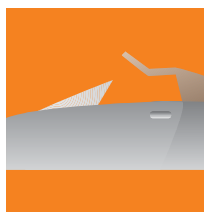
Self-lubricating and maintenance-free iglide® plastic bearings



WINDSHIELD WIPER:

Arm and blade, kinematics

- Corrosion resistant
- Highly flexible, yet strong
- Resistant against dirt
- Economically priced



CONVERTIBLE TOP:

linkages, kinematics, locks

- Self-lubricating
- Quiet operation
- Can be used with standard bar shock shafting
- Suitable for E-coating
- No special requirement for rivet/shaft



HINGES:

Door hinges, Multi-articulation hinges

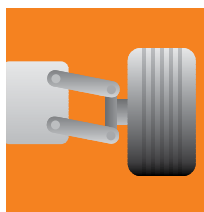
- High compressive strength
- High wear resistance
- Suitable for E-coating
- Corrosion resistant
- Economically priced



SEATS:

Seat height adjustments, crash active headrests

- Quiet operation
- High static load
- Can be used with bar shock shafting
- Suitable for E-coating
- Low precision shafting possible



CHASSIS:

Shock absorber, brakes, control arms

- High compressive strength
- Damping
- Resistant to dirt
- Economically priced



are used in a variety of automobile applications



STEERING SYSTEM:

Column adjustment, steering shaft

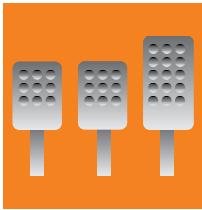
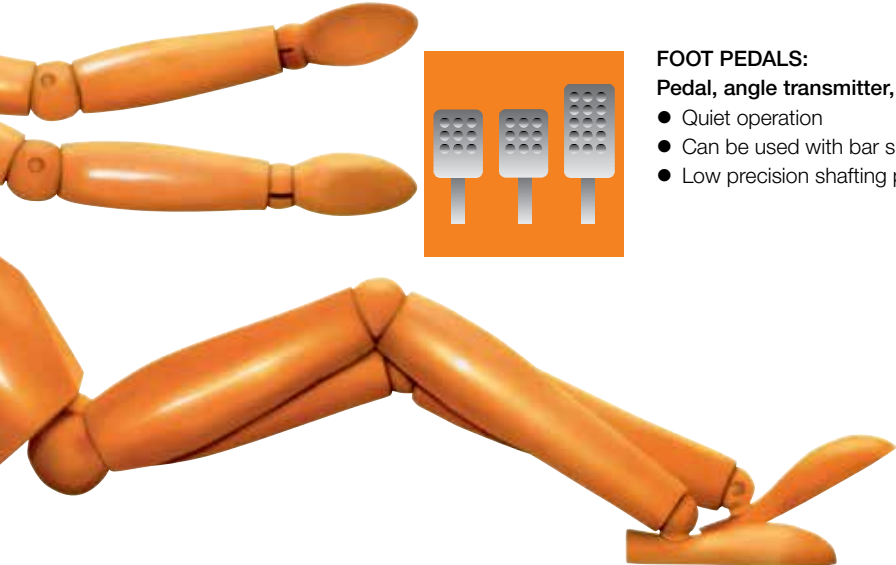
- Low coefficient of friction
- Can be used with bar shock shafting
- High rigidity
- No need for polished shafting



ENGINE COMPARTMENT:

Variable air intake, EGR (exhaust gas re-circulation), belt tensioner, throttle valve

- Long term operating temperature up to 482°F (250°C)
- Resistant to fuel, gear oils, brake fluids, etc.
- Over molding with plastic possible
- Good vibration damping characteristics



FOOT PEDALS:

Pedal, angle transmitter, sensors

- Quiet operation
- Can be used with bar shock shafting
- Low precision shafting possible



GEAR BOX:

Actuator and fork

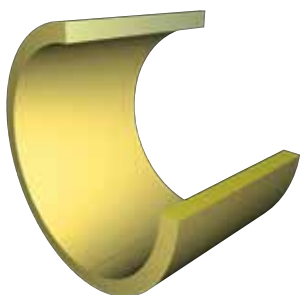
- Vibration damping
- Resistant to gear oils
- Long term operating temperature up to 392°F (200°C)
- Economically priced

100% self-lubricating ...

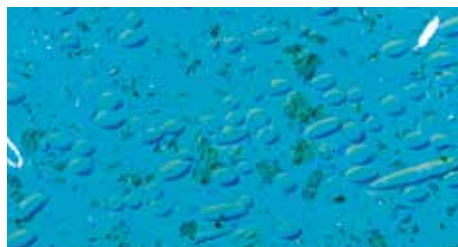
What is iglide® and what can it do?

What is iglide®?

iglide® plastic materials are tribologically optimized with solid lubricants and reinforced by specialized fibers. All iglide materials are tested thousands of times, and proven over millions of cycles. Homogenous blending means that unlike components that are lined or coated, there is no anti-friction film that can be forced apart under pressure.



iglide® plain bearings composed of a homogenous blend of a base polymer, composite fibers, and solid lubricants.



iglide® compounds: Basic polymers with fibers and solid lubricants, magnified 200 times, dyed.



What can iglide® achieve in automotive applications?

- Low weight
- Great performance ratio
- Tailor-made materials and solutions
- Low clearance bearings, exactly designed for your housing bore and shaft tolerance
- Re-calibrated bearings for equalizing tolerances on punched bores
- Preloaded bearings for equalizing tube tolerances for pedal systems
- Bearings with special damping action for bearing assemblies for control forks in transmissions
- Self-lubricating bearings insensitive to dirt in the suspension system
- One-stop shopping: research and development, application assistance, production, installation and world-wide logistics

iglide® materials for automotive

The most important materials for automotive applications are listed below. We have subdivided the materials into "groups" so as to make your choice easier. Over 7,000 standard sizes from Ø (2 mm to 150 mm) are available from stock, in over 30 materials. Inch sizes are also available from stock. Short delivery times for special sizes.

Economy



iglide® M250

- Excellent vibration dampening
- Resistant to edge loading
- Cost-effective



iglide® GLW

- Short gliding travels, high static loads
- Suitable for E-coating
- Applications: e.g. seats



iglide® RN56

- Suitable for E-coating
- Resistant to dirt
- Cost-effective

Spezialisten



iglide® P210

- Even for soft shafts
- Low wear
- Low friction



iglide® J350

- Temperature resistant
- Wear resistant
- Impact resistant



iglide® RN248

- Suitable for E-coating
- Extremely conductive
- Wear resistant

Basic



iglide® G – general purpose

- Higher wear-resistance than iglide® GLW
- Suitable for E-coating
- Applications: convertible tops, fittings



iglide® J

- Best friction values for dry running
- Good glide surface also for all "soft" materials
- Applications: with quick rotation; seat adjustment and mirror actuators



iglide® RN89

- Conductive material for all applications with E-coating
- Applications: Seat and convertible top systems



iglide® H2:

- For high temperatures
- High chemical-resistance
- Cost-effective

Premium



iglide® H4

- Resistant to all fuels, gear oils and brake fluid
- Minimum moisture absorption
- Applications: throttle valves, intake manifolds



iglide® T500 - material for high temperatures

- High compressive strength
- High chemical resistance
- Long term application temperature: 482°F (+250°C)

Customized



Customized:

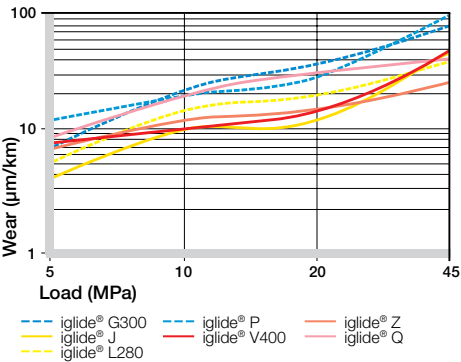
Individually matched materials with special properties: we develop the plastic which your application needs. We find the optimum solution together with you.

Predictable ...

Precisely calculate material properties

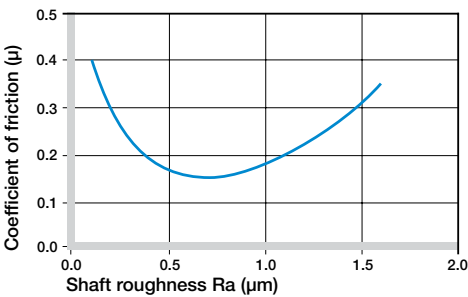
iglide® plain bearings mean a step up from the plastic bearing to a tested and calculable machine element. Our extensive database for plastic bearings can help you to select the optimum material for your application.

The igus® wear-resistant material



Wear of iglide® bearings at medium and high loads.

Works with rougher shafts

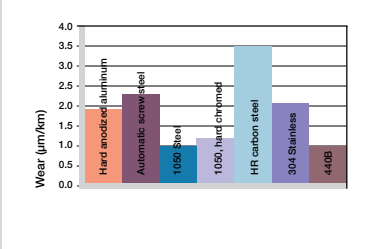
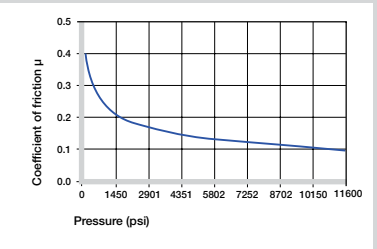
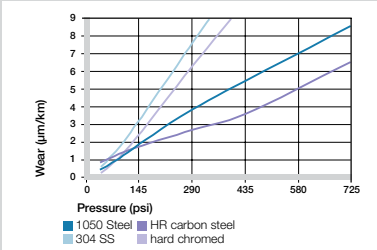
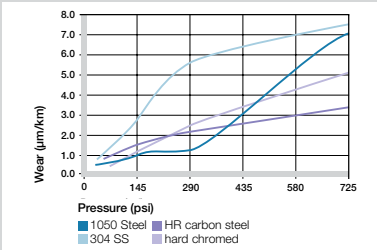


Coefficient of friction of iglide® G300 depending on the shaft surface (shaft Case hardened steel)

Shafts which are too smooth are often unfavorable and may lead to stick-slip phenomena and noise.

Reliable database: Thousands of test results

Results of over 15,000 tests per year are incorporated in the iglide® database.



Tested ...



igus® test laboratory

Applications with high cycle rates, speeds and accelerations in demanding environmental conditions require tested and reliable plastic bearings and linear systems. igus® constantly conducts tests in its in-house laboratory under real-world conditions. Every year over 5,000 tests are carried out on plain bearings.




Pivot wear test rig for testing the pivoting wear rate for medium loads



Measuring the inner diameter of a press-fitted bearing

Material data ...

		General properties						Mechanical properties				
Material		Density (g/cm ³)	Max. moisture absorption at +73°F / 50 % r. h. (% weight)	Max. moisture absorption (% weight)	Coefficient of sliding friction. Dynamic against steel (μ)	PV value. max. (dry) (psi · m/s)	Fire classification	Modulus of elasticity (psi)	Tensile strength at +68°F (psi)	Compressive strength (axial) (psi)	max. permissible static surface pressure (+68°F) (psi)	Shore-D hardness
iglide® M250		1.14	1.4	7.6	0.18-0.40	3,400	V-2	391,600	16,240	7,542	2,901	79
iglide® GLW		1.36	1.3	5.5	0.1-0.24	8,600	HB	1,117,000	34,080	10,730	11,600	78
iglide® RN56		1.47	0.7	4.0				1,088,000	29,010		11,600	80
iglide® G300		1.46	0.7	4.0	0.08-0.15	12,000	HB	1,131,000	30,460	11,310	11,600	81
iglide® J		1.49	0.3	1.3	0.06-0.18	9,700	HB	348,100	10,590	8,702	5,076	74
iglide® RN89		1.44	0.9	3.9				855,700	21,760		6,527	79
iglide® H2		1.72	0.1	0.2	0.07-0.30	16,500	V-0	1,494,000	30,460	15,810	15,950	88
iglide® P210		1.40	0.3	0.5			HB	319,100	9,427		7,252	75
iglide® J350		1.44	0.3	1.6	0.08-0.2	13,000	V-0	291,100	7,977	8,702	8,702	80
iglide® RN248		1.25	1.4	7.6				391,600	14,360		7,252	-
iglide® H4		1.79	0.1	0.2	0.08-0.25	9,400	V-0	1,088,000	17,400	7,252	9,427	80
iglide® T500		1.44	0.1	0.5	0.09-0.27	37,700	V-0	1,175,000	24,660	14,500	21,760	85
PA 6		1.14	2.8	8.5			V-2	464,100				
PBT		1.30	0.3	0.5			HB	1,450,000	12,330			
POM		1.41	0.2	0.8			HB	275,600	14,070	3,336	3,336	78
PTFE		2.18	0.1	0.1			V-0		2,031			51
PEEK		1.31	0.20	0.45			V-0	-	20,310			

Physical and thermal properties			Electrical properties		Wear. different shaft materials. oscillating. p=145 psi. v=0.03 ft/s						Wear. different shaft materials. rotating p=145 psi. v=0.98 ft/s					
Max. long term application temperature [°F]	Max. short term application temperature [°F]	Min. application temperature [°F]	Specific volume resistance [Ωcm]	Surface resistance [Ω]	H. a. aluminum	Automatic screw steel	Cf53	HR carbon steel	304 SS	High grade steel	H. a. aluminum	Automatic screw steel	Cf53	HR carbon steel	304 SS	High grade steel
+176	+338	-40	> 10 ¹³	> 10 ¹¹	12.9	9.5	10.9	12.9	11.2	11.2	2.5	3.0	5.82	2.26	2.7	5.2
+212	+320	-40	> 10 ¹¹	> 10 ¹¹	4.5	17.1	5.0	22.0	18.5	1.5	11.7	98.1	9.3	28.5	14.2	16.5
+266	+428	-40	> 10 ¹³	> 10 ¹¹	5.3		3.7	13.7	14.9	15.4						
+266	+428	-40	> 10 ¹³	> 10 ¹¹	1.9	12.0	2.7	19.0	2.5	1.9	1.0	4.3	2.7	1.88	11.9	7.6
+194	+248	-58	> 10 ¹³	> 10 ¹²	0.6	4.7	1.1	1.3	1.0	1.9	0.3	1.2	0.4	0.57	0.5	0.6
+194	+338	-40	> 10 ⁴	> 10 ⁴	3.4	4.0	1.5	1.4	0.7	0.5	0.2	0.9	1.5	0.7	2.7	1.7
+392	+464	-40	> 10 ¹⁵	> 10 ¹⁴	4.5	18.7	14.6	32.3	6.4	8.5	14.6	4.8	18.76	11.9	18.3	3.8
+212	+320	-40	-	> 10 ¹¹	1.9	1.86	0.9	1.9	1.0	1.9	0.6	0.7	0.4	4.3	1.0	0.4
+356	+428	-148	> 10 ¹³	> 10 ¹⁰	0.3	5.36	0.9	2.58	0.6	0.9	2.67	2.4	1.34	1.34	1.72	1.14
+194	+338	-40	< 10 ⁹	< 10 ⁹	1.0		4.0	6.0	2.0	4.0						
+392	+464	-40	> 10 ¹³	> 10 ¹²	2.6	7.7	2.1	4.3	1.7	2.2	6.3	3.2	2.2	2.1	9.6	5.9
+482	+599	-148	< 10 ⁶	< 10 ³	12.6	6.3	5.3	9.9	8.0	9.0	20.5	1.9	8.1	5.1	5.9	12.2
+185	+320	-40	10 ¹⁵	10 ¹³	39.3		19.9		34.9							
+230	+392		10 ¹³	10 ¹⁵	9.9		50.6		36.7							
+194	+248	-58	> 10 ¹²	> 10 ¹²	3.7		1.7		1.7							
+500	+572	-328	10 ¹⁶	10 ¹⁶												
+482	+590				5.2		7.7		3.7							

Vehicle interior...



Seating

Rattle-free mounting of seating systems with iglide® plain bearings, e.g. inner-/tilt- and seat height adjustment.

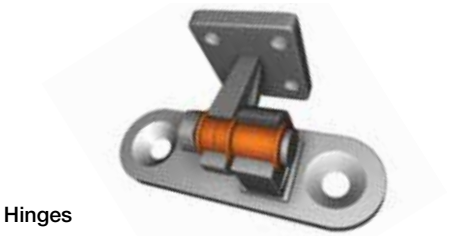
- Tolerance compensation possible
- Suitable for E-coating
- High static loads of up to 17,400 psi
- Quiet operation



Convertible systems | multi-joint hinges

All articulation points are furnished with iglide® bearings.

- Self-lubricating, maintenance-free
- Corrosion-free
- Quiet operation
- Suitable for E-coating



Hinges

iglide® is used in door and multi-joint hinges, such as in the trunk, hood, pedestrian protection, etc.

- Corrosion-free
- Tolerance compensation possible
- Suitable for E-coating
- Quiet operation



Pedal

Axial and radial pre-stressed iglide® plain bearings avoid vibrations and noises.

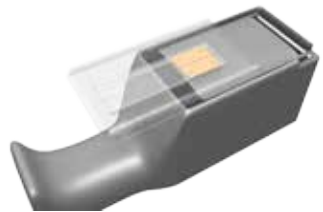
- Tolerance compensation possible
- Resistant to edge load
- High static loads



Steering system

Various bearing points in steering columns and shafts can be equipped with iglide® plain bearings.

- Noise dampening
- High resistance to shock loads
- Wear-resistant
- Cost-effective



Armrests

drylin® linear guides replace telescopic guides.

- High rigidity
- Easy assembly
- Self-lubricating

Engine compartment



Shift forks

In gear links and shift forks, iglide® plain bearings replace metal bearings and roller bearings.

- Noise dampening
- Resistant to transmission oil
- Corrosion-resistant



Belt tensioner

iglide® plain bearings run with an assembly lubrication provided under extreme operating conditions.

- High-frequency oscillating motion
- Heavy dirt accumulation
- Running temperature from:
-40°F up to 248°F (-40°C up to +120°C)



Throttle bodies

iglide® plain bearings replace needle bearings.

- Cost-effective
- Capable of overmolding with plastics



Valve (FGR and Turbo-loader)

iglide® plain bearings run in short-stroke linear motion with extreme soot pollution from exhaust fumes and high temperatures.

- Low friction
- Wear resistance
- High temperature resistance



Active intake manifolds

Flap mounting of variable intake manifolds with iglide® plain bearings.

- Economic product design, i.e. pillow blocks
- Tolerance compensation by means of an o-ring



ABS pump

Guide troughs made of iglide® materials are used in high frequency short stroke movements up to 50Hz.

- Wear-resistant
- Fulfills cleanliness requirements
- Fulfills high accuracy requirements

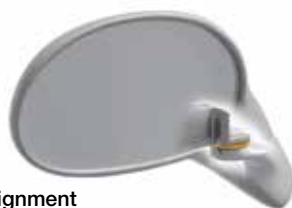
Exterior ... Utility vehicles



Chassis

iglide® slide bearings replace roller bearings and POM ball sockets in heavily stressed axle journals.

- High absorption
- Low sticking friction
- High compression strength
- Lightweight



Mirror alignment

iglide® thrust washers replace metallic bearings and simple plastics.

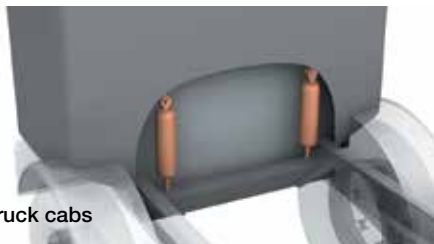
- Low sticking friction
- Quiet operation
- Special design possible



Brake calipers

iglide® plain bearings replace metallic bearings for use under extreme conditions – no knocking under extreme vibrations.

- High media resistance
- Lightweight
- Cost-effective



Truck cabs

iglide® plain bearings often replace metallic bearings in the hinge eyes of hydraulic dampers.

- Low sticking friction
- Good vibration dampening
- Resistant to dirt
- Corrosion-free



Windshield wipers

iglide® plain bearings replace metallic bearings on wiper blades and arms.

- High alternate bending strength
- Corrosion-free
- High compressive strength
- Media resistance



Lift gates

iglide® plain bearings replace metallic bearings and other systems with central lubrication.

- Withstand extremely high edge loads
- Self-lubricating
- Resistant to dirt
- High wear-resistance

Solutions for punched steel

iglide® easyclip



- Easy axial push-in
- Axial safety through the 2nd flange
- Simple installation by wrapping
- One-side thrust surface

iglide® double flange bushing



- Compress and slide in
- Loss-proof pre-assembly
- "Right" axial thrust surfaces on both sides
- Flanging not required

iglide® flange bushing



- "Right" axial thrust surfaces on both sides
- Simple, automated flanging
- Tolerance compensation through axial pre-tension

iglide® SnapOn



- Washer is pre-assembled on bushing with undercut
- Axial compensation of tolerance
- Loss-proof pre-assembly

Customized ...

Solutions for individual requirements

Everything is possible – iglide® specials and solutions

Special design solutions such as non-clatter and low-play bearings, axial tolerance compensation, anti-rotation, knurled surfaces, lubrication pockets – virtually anything is possible.



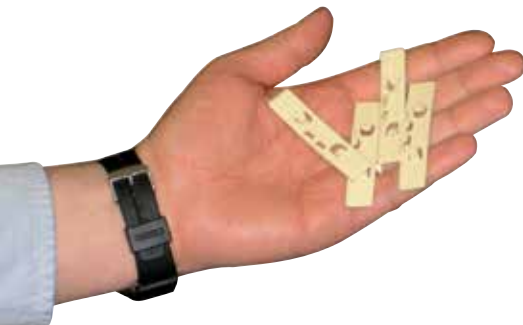
What is speedigus?

Simple; choose any iglide® material, get molded parts in 1 to 10 days, depending on complexity of the part. Full technical component information given with every quotation, including lead time options. Absolute maximum delivery is 15 days.



QuickSpecial
Customized bearing parts

► www.igus.com/speedigus



Backlash ...

Solutions for E-coating processes

Low clearance iglide® bearing by recalibration during E-coating process

Seating, convertible systems and articulating joints often use simple punched housings or drawn sheet metal. Nevertheless, there should be a low clearance bearing to obtain quiet operation.

Our solution is:

iglide® bearings use the high temperatures of the E-coating process to calibrate the bearing.



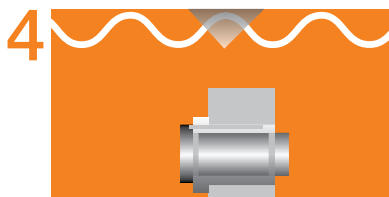
Poor tolerance of punched housing or drawn sheet metal



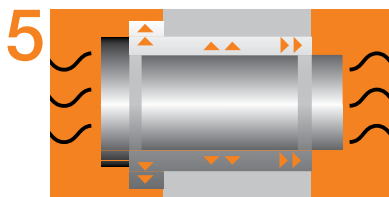
Assembly of iglide® bearing with transition fit



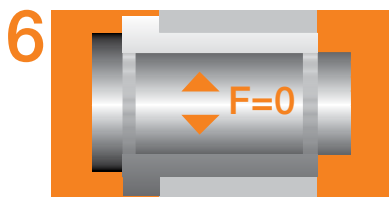
Assembly of shaft/rievt with overlap fit



e-coating process



Recalibration during drying process
(max. 60 minutes at max. 220 °C)



Result: Low clearance bearing in spite of poorly tolerated housing bore/shaft

Spherical bearings ...

Self-lubricating and maintenance-free

- Maintenance-free igubal® spherical bearings diameters from (2 to 50 mm)
- Resistant to chemicals and corrosion
- Very good vibration dampening properties
- High frequencies and speeds possible
- Predictable lifetime

igubal® is a system of self-aligning bearing elements completely made of plastic.

With the igubal® series, a complete system of self-aligning bearing elements are available for the design engineer: Rod end bearings, clevis joints, flange bearings, spherical bearings and pillow block bearings.

Self-aligning bearings are easy to mount, suit all angular variations, and in many cases have already been able to replace special housings.

The igubal® user utilizes all advantages of the employed high performance plastics. They have excellent vibration dampening properties, and are technically applicable in dry operation. They are insensitive to dirt, can operate in liquids and even in chemicals and are completely resistant to corrosion.



Rod end bearings with male/female thread; right/left, also as HT version for up to +392°F.



Angle and axial joints, fitting screws.



Clevis joints and spring loaded pins, individual or combined (also with rod end bearings).

Available from stock ...



Various types of pillow block bearings, with shared housing and/or spherical ball (optional).



Flange bearing with 2 or 4 bore holes, also as an HT version for up to 392°F.



Spherical bearings and self-aligning clip bearings.



Spherical balls made from iglide® materials.



Double spherical bearings and coupling bars.

Easy removal ...

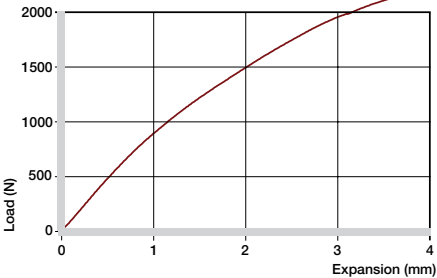
igubal® double joint bars

igubal® plastic double joint bars as mechanical connecting element between 2 components.

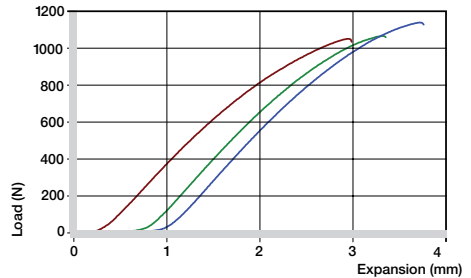
- Up to +250°C operating temperature
- Lightweight
- Self-lubricating
- Corrosion-resistant
- Customized design
- Rapid prototypes available in 5 days



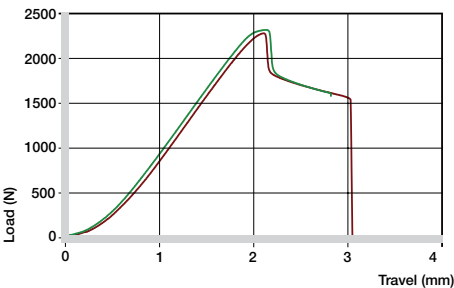
Tensile stresses at ambient temperature



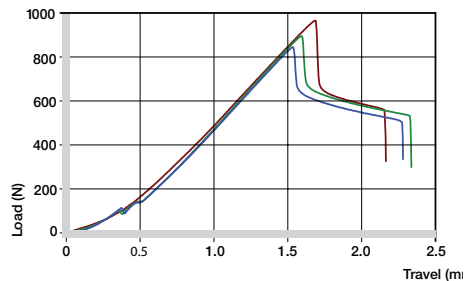
Tensile stresses at 248°F (120°C)



Compressive loads at ambient temperature



Compressive loads at 248°F (120°C)



Self-lubricating and maintenance-free



Turbo charger

igubal® double joint bars made of high-temperature material replace metallic coupling bars for applications of up to 392°F (200°C).

- Good vibration damping characteristics
- High long term application temperature
- High wear resistance



Gear box

igubal® double joint bars replace metallic connections.

- Noise reduction
- Vibration damping
- High rigidity
- Cost-effective



Active intake manifolds

Plastic double joint bars replace mechanical joint bars.

- Weight reductions of up to 90%
- Low wear rates

100% self-lubricating ...

drylin® linear and drive technology

drylin® is a range of maintenance-free and self-lubricating linear bearings in four different type series. Besides the freedom from maintenance and external lubricants, the main features include ruggedness and the insensitivity to dirt, water, chemicals, heat or impacts.

Additionally, the range is complemented by complete linear units with spindle drive or toothed belt, leadscrews nuts and threads, and new: drive technology - complete systems with linear axis and motor.

- Same mounting dimensions as linear ball guides
- Resistant to chemicals, corrosion and dirt
- Low weight permits high frequencies and maximum accelerations
- Impact and vibration resistant, quiet operation
- Predictable lifetime

Rail guide systems



drylin® T are the classical linear guides.

- 100% self-lubricating
- Dimensions are identical to standard commercial ball guide systems
- Automatic clearance adjustment
- High static load capacity

Low-profile guide systems



drylin® N flat guides have an extremely low built.

- 100% self-lubricating
- Lightweight and small construction height: 6-12 mm
- Numerous carriage options – also with preload
- Interesting alternative to miniature ball guide systems

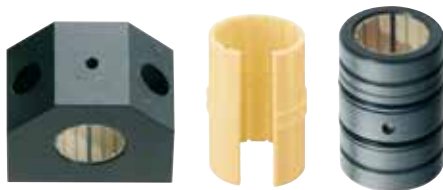
Modular guide systems



drylin® W guide systems offer a large and complex modular system.

- 14 different profiles and more than 50 carriage options
- Easy installation
- Versatile use, space saving and compact

Round shaft guide systems



drylin® R as an alternative to ball linings.

- 100% self-lubricating
- Same dimensions as standard ball bearings
- Shafts, supports and accessories available from stock
- Replaceable liners

Sliding instead of rolling

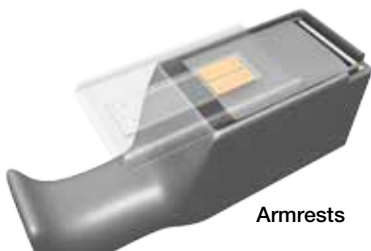
drylin® linear and drive technology

Lead screw drives



Convert a rotary motion into a linear motion.

- 100% self-lubricating
- Trapezoidal or high helix thread
- Optionally clearance-free through anti-backlash feature

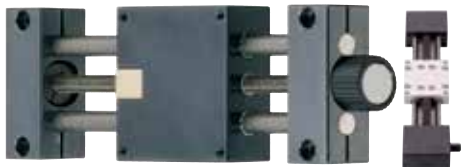


Armrests

drylin® linear guides replace telescopic guides.

- High stiffness
- Easy assembly
- Self-lubricating

Linear slide tables



Linear slide modules drives with trapezoidal thread, high helix thread or gear belts.

- 100% self-lubricating
- For size adjustments as far as fast small-part-handling
- Numerous accessories available



Sliding roof

Self-lubricating iglide® plain bearings fitted in drylin® linear guides replace lubricated plastics.

- Low sticking friction
- Resistance to dirt
- Low moisture absorption

Drive technology



drylin® E – “E” as in electric

- Complete systems: Linear axis plus motor, ready to fit
- Self-lubricating, lightweight and silent
- Configuration online possible
- Available in 3-4 days



plastics for longer life®...

drylin® linear and drive technology



The igus® quality assurance

The quality policy of igus® is to identify and meet customer needs, and to always be a competent and reliable supplier. igus® has always been committed to producing products at the best available quality level, and to consistently develop innovative solutions.



Better for the environment

Because iglide® is free of external lubricants, no contaminants are discharged into the environment. Additionally, the low weight of iglide® plastic plain bearings reduce power requirements, making them better for the environment.



Motion plastics

For 50 years, we have been driven by a single vision – motion plastics: innovations from plastics that move machinery.

Triboplastics are our core technology – high-performance plastics, which we optimize from both a friction and a wear perspective. This technology has made us a global leader for developing and manufacturing energy supply systems and plain bearings.



Extensive test database

What is probably the world's largest database, was created from the results of more than 15,000 tests. This database gives us the ability to select the right product for your specific application.



Tribology testing in the plain bearing lab, igus® Cologne, Germany

Energy supply from stock

e-chain systems® for modern machinery



Designed to guide and protect

e-chains® and e-chain systems® are the lifeline of modern machines. They reduce downtimes and increase the service lives of cables and hoses.

Plastic e-chains® have been developed, produced and tested by igus® since 1971. The igus® product range includes over 80,000 innovative products from stock and from "batch size one". From the smallest Micro Flizz® chain to the world's biggest polymer e-chain®.

For the safe supply of energy in production lines and other areas of the automotive industry, igus® offers an ideal solution with plastic energy supply chains. Whether in manufacturing robots or indoor cranes with long travels, many applications are possible.



Robots, 3D and circular movements



triflex®, triflex® R, E-Z triflex®, twisterchain®, TwisterBand

- Closed design
- Easy to equip
- For 2 or 3 axes
- Modular design

Easy to fill



E-Z Chain and Zipper e-chains®

- One-piece e-chains®
- Quick to fill from inside or outside
- Extremely fast opening and closing
- Small and medium-sized e-chains® and E-tubes

All around, small and medium sizes



System E2 mini, E2 micro and E2/000

- Standard e-chains®, small and medium sizes
- Inner heights: .20" to 1.77" (5 to 45 mm)
- Small divisions, smooth operation
- Versatile, modular interior separation, cable-friendly

Also e-chains® can be directly used in the vehicle, e.g. in permanently powered sliding doors, seat adjusters, as conduits on the rear spoiler or in telescopic struts. If you need a cable guide or a kink protection – just ask us.

Robotics, hose packages ...

e-chain systems® for modern machines

triflex® R: Cable protection for 3D and torsional movements

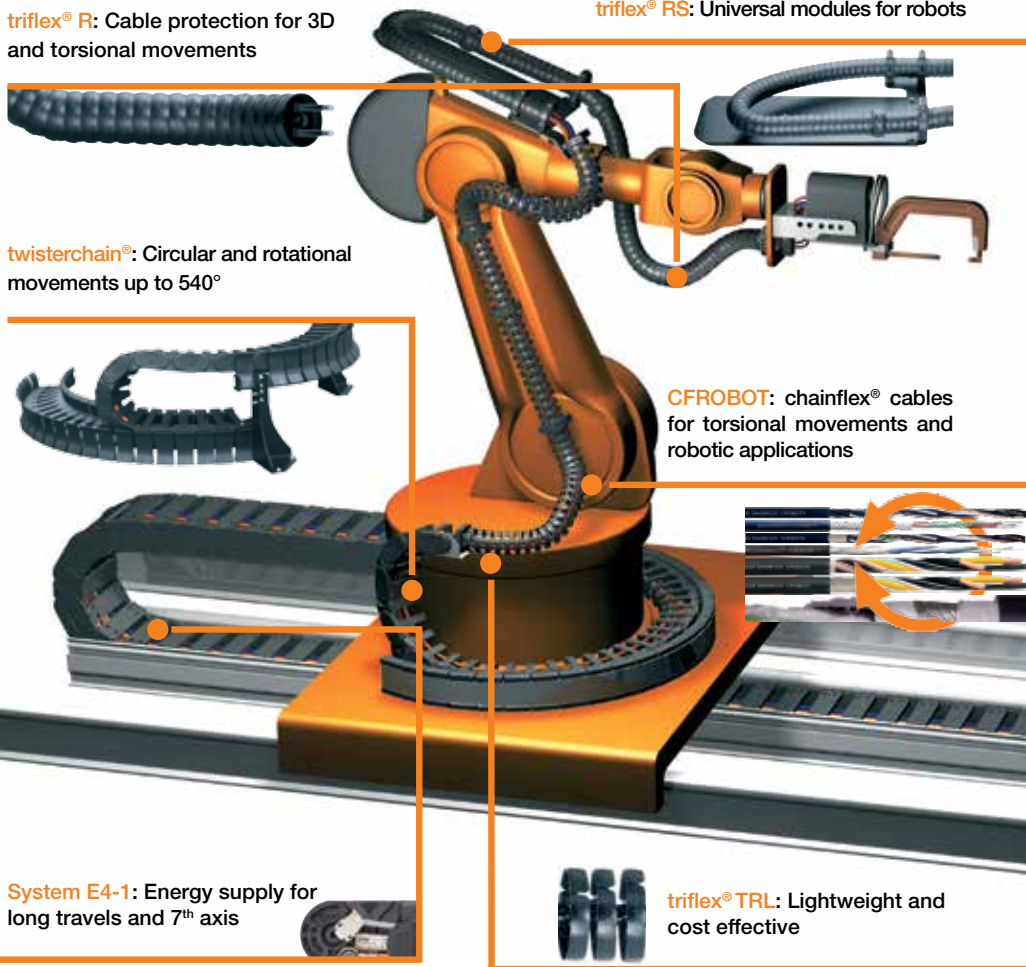
triflex® RS: Universal modules for robots

twisterchain®: Circular and rotational movements up to 540°

CFROBOT: chainflex® cables for torsional movements and robotic applications

System E4-1: Energy supply for long travels and 7th axis

triflex® TRL: Lightweight and cost effective



from stock ...

triflex® R options and variety of components



TRE – quick insertion of cables

- Simple filling with cables and hoses
- Especially for assembled cables
- TRC and TRE links can be combined
- Available in 7 sizes from 30 to 125 mm
- B and C version specifically for more complex applications



Type: standard mounting bracket

- Quick and simple mounting with snap-on connection
- Extremely short downtimes for replacement of a filled triflex® R
- With or without tiewrap plates, or as intermediate connections



triflex® R Quick exchange kit

- Changed in seconds without tools
- One time only alignment
- Perfect for triflex® R readychain®
- Suits all additional axles: Ø 30 mm, Ø 32 mm, Ø 34 mm

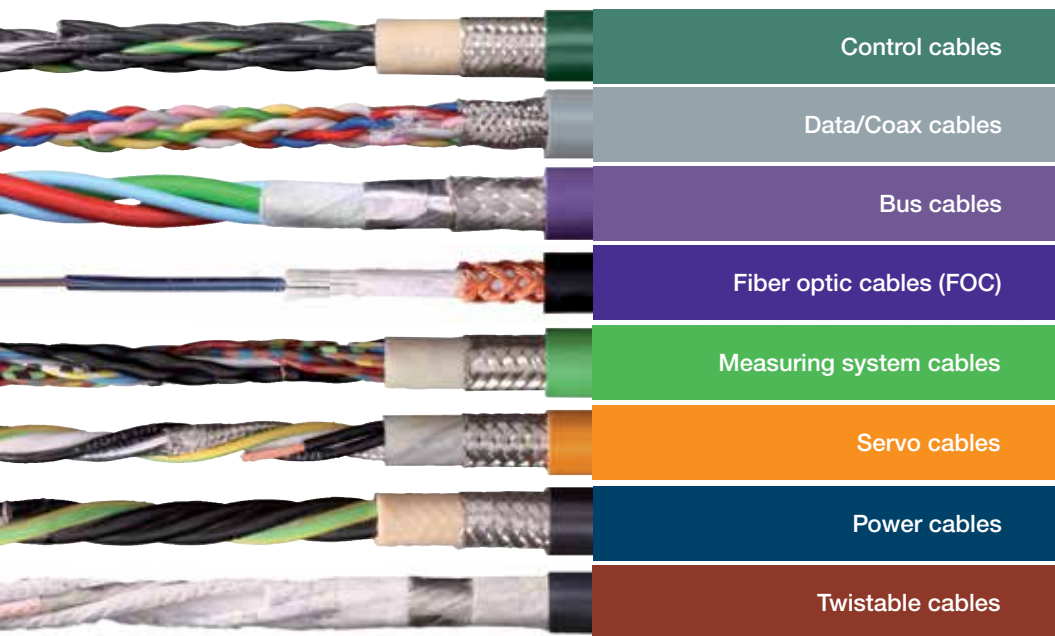


triflex® RS system

- Integrated recuperating spring prevents loop formations and give a directed pretension to the triflex® R
- Toolless mounting brackets for safe fastening
- Single module, space-saving and quickly mounted on common robots; from stock

Cables from stock ...

More than 1,000 types of cables available from stock



More than 1,000 chainflex® cables developed especially for the use in e-chain systems®

- Wear resistant TPE, PUR, and oil-resistant PVC outer jackets
- Halogen-free and/or flame-retardant materials
- Certifications including: UL, CSA, CE, DESINA, CEI
- Smallest radii up to $4 \times d$

Certifications and approvals for chainflex® cables

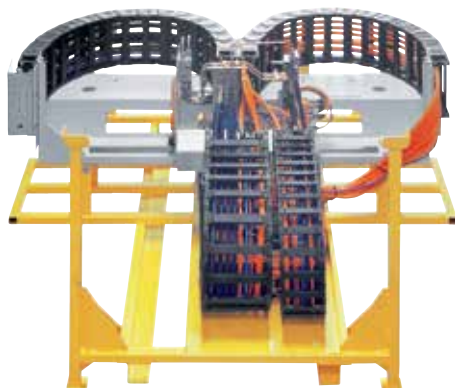


Pre-harnessed systems ...

Harnessed cables in shipped from stock in 24 hours and readychain systems® in 3-10 days

700 systems per week in 11 readychain® factories worldwide - reduce assembly time and optimize cashflow

- Reduce storage costs for cables, chains and connectors to zero
- Reduce throughput times by half
- Get flexibility in production demand fluctuations
- Reduce number of suppliers and purchase orders by 75%
- Minimize machine downtime for your customers
- Receive a system warranty based on a free design review



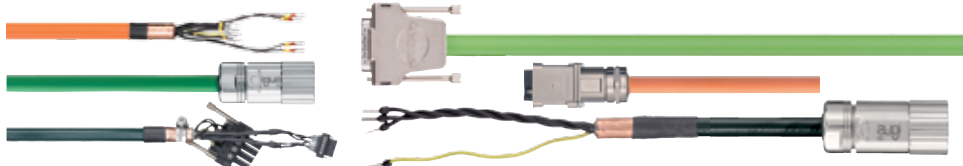
readycable - Allen Bradley, Siemens and Fanuc available from stock

igus® offers over 2,800 cables pre-harnessed to 20 different manufacturers standards*.

Professionally manufactured, 100% tested.

- Servo, motor and signal / encoder cables
- No cutting costs, no minimum charge for small quantities and packaging
- Cable length according to your needs
- Smallest bending radii from $7.5 \times d$
- Reduce storage costs and increase cash flow

*For manufacturers standards other than Allen Bradley, Siemens and Fanuc, please consult igus® for lead time.





46. Poland

igus® Sp. z o.o.
Dokładowa 12/1C Street
02-234 Warsaw
Phone +48 22 8636770
Fax +48 22 8636169
info@igus.pl

47. Portugal

igus® Lda.
R. Eng. Ezequiel Campos,
239
4100-231 Porto
Phone +351 22 6109000
Fax +351 22 8326321
info@igus.pt

48. Romania

TechCon Industry SRL
Calea Grangatei nr. 60
060345 Bucuresti
Phone +40 21 2219-640
Fax +40 21 2219-766
automatizari@meleco.ro

48. Romania

Hennlich SRL
Str. Paruta, Nr.17
310106 Arad
Phone +40 257 211119
Fax +40 257 211021
igus@hennlich.ro

49. Russia

OOO igus®
40/22, Nikolayevskaya st.,
bldg. 4, office 500-510
Moscow, 109004
info@igus.ru

49. Russia

OOO Hennlich
Ozernaja 16
building 1, office 4
170026 Tyer
Phone +7 4822 787 180
Fax +7 4822 630 180
hennlich@hennlich.ru

50. Saudi Arabia

AFI
Khalaf Bin Hesham Street
Box 0908
31423 Dammam
Phone +966 38740033
Fax +966 38740077
marketing@afi.com.sa

51. Serbia + Montenegro

Hennlich d.o.o. Beograd
Radomira Markovica 1/3
11222 Beograd / Srbija
Phone +381 11 63 098 17
Fax +381 11 63 098 20
office@hennlich.rs

52. Singapore-ASEAN HQ

igus® Singapore Pte Ltd
15 Shaw Road, #03-02
Singapore 367363
Phone +65 6487-1411
Fax +65 6487-1511
info@igus.com.sg

53. Slovakia

igus® Slovakia s.r.o.
Fadranská 3
049 01 Nitra
Slovakia
Mob. +421 949 459 409
info@igus.sk

53. Slovakia

Hennlich s.r.o.
Račianska 188
SK-831 53 Bratislava
Phone +421 2 50202504
+421 2 50202505
Fax +421 2 50202520
info@hennlich.sk

54. Slovenia

igus® d.o.o.
Tržaška c. 134
1000 Ljubljana
Slovenia
Mob. +386 (0)30 601 610
info@igus.si

54. Slovenia

Hennlich, d.o.o.
Industrijska tehnika
Podpart 33
SI-4244 Podpart
Phone +386 4 53206-10
Fax +386 4 53206-20
info@hennlich.si

55. South Africa

igus® Pty. Ltd.
Unit 29
Midline Business Park
Cnr Le Roux & Richards Drive
Midrand 1682
Phone +27 11312-1843
Fax +27 11312-1594
sales.za@igus.de

56. South Korea

igus® Korea Co. Ltd.
613-14 Namchondong,
Namdonggu
Incheon City, 405-846
Phone +82 32 82129-11
Fax +82 32 82129-13
info@igus.kr

57. Spain

igus® S.L.
C/ Libertad, 6
Polígono Nido de Sueño
08840 Viladecans - BCN
Phone +34 936 473950
Fax +34 936 473951
igus.es@igus.es

58. Sweden

igus® ab
Knut Falst väg 6
256 69 Helsingborg
Phone +46 42 323270
Fax +46 42 211555
info@igus.se

58. Sweden - e-chains®

OEM Automatic AB
Box 1011 Dalsgatan 4
573 28 Tranås
Phone +46 75 2424100
Fax +46 75 2424159
info@aut.oem.se

58. Sweden - plain bearings

Colly Components AB
P.O. Box 76
164 94 Kista
Phone +46 8 7030100
Fax +46 8 7030841
info@time.colly.se

59. Switzerland

igus® Schweiz GmbH
Winkstr. 5
4622 Egerkingen
Phone +41 62 3889707
Fax +41 62 3889799
info@igus.ch

60. Syria

ETTA Systems
Al-Hanna St. Shalan Building
12850 Damascus
Phone +96 311 332 5519
Fax +96 311 334 2699
info@ettasystems.com

61. Taiwan

igus® Taiwan Company Ltd.
5F, No. 35, 24th Road
Taichung Industrial Park
Taichung 40650
Phone +886 4 2358-1000
Fax +886 4 2358-1100
info@igus.com.tw

62. Thailand

igus® Thailand Co., Ltd
10 Floor, Unit C1
Thangpoom Tower
1550 New Petchaburi Road
Mekasorn Rothwail
Bangkok 10400 Thailand
Ph. Fax +66 632 652 7325
info@igus.co.th

62. Thailand

Autoflexible Advanced Engineering Co., Ltd.
117 Sol. Sukhumvit,
62/1 Sukhumvit Rd.
Bangkok, Phrakong,
Bangkok 10260
Phone +66 2 3112111
Fax +66 2 3327900
info@igus.th

63. Tunisia

BOUDRANT
1000 Tunis - Tunisia
Phone +216 71340244
Fax +216 71348910
info@boudrant.com.tn

64. Turkey

HIDREL Hidrolik Elemanlar
Sanayi ve Ticaret A.Ş.
Percemli Sk. No. 7
Tunel Mevki
34420 Kağıthane / Istanbul
Phone +90 212 2404931
Fax +90 212 2920850
info@hidrel.com.tr

65. United Arab Emirates

Unigrup (FZE)
1st floor Rasana
Building M602
Sharjah Intern. Airport Freezone
P.O. Box 120500
Sharjah - UAE
Phone +971 6 5578385
Fax +971 6 5578387
automation@unigrup.ae

65. United Arab Emirates

Power & Technology Trading Co. LLC
P.O. Box 33372 SHJ
Sharjah - UAE
Phone +971 6 5421300
Fax +971 6 5422730
sales@powertech.ae

66. United Kingdom

igus®
Creswell Rd.
Northampton NN4 7PW
Phone +44 1604 677240
Fax +44 1604 677242
sales@igus.co.uk

67. Ukraine

Cominpro Ltd.
Homena Rotunda 12,
Office 220
61058 Kharkov
Phone +38 0577174914
Fax +38 0577174914
cominpro@gmail.com

67. Ukraine

Hennlich Ukraine LLC (HQ)
Kramatorska Street 15
84100 Sloviansk City,
Donetsky Region
Phone +38 06262 33540
hennlich@hennlich.com.ua

68. Uruguay

Larrique Rulemanes SA
Galicia 1204
Montevideo-Uruguay
Phone +598 29021773
Fax +598 29084824
larrique@larrique.com.uy

69. USA

igus® inc.
P.O. Box 14349
East Providence
RI 02914
Phone +1 401 4382200
Fax +1 401 4382720
webmaster@igus.com

70. Venezuela

Neumatica Rotonda C.A.
Prof. Ay. Michelena
C.O. Altas Locales B-10 y
B-11
Valencia, Edo. Carabobo
Phone +58 241 832.64.64
+58 241 832.32.50
+58 241 838.98.19
Fax +58 241 832.62.83
ventas@neumaticar.com

71. Vietnam

igus® Singapore Pte Ltd
The Representative Office in HCMC
Center Tower
Unit 028, 4th Floor
72-74 Nguyen Thi Minh Khai
Street, District 3,
Ho Chi Minh City, Vietnam
Phone +84 8 6299 9197
Fax +84 8 6299 9195
info@igus.com

igus® worldwide

igus® offices

igus® distributors

1 Germany

igus® GmbH
Spicher Str. 1a
51147 Köln
P.O. Box 90 61 23
51127 Köln
Phone +49 2203 9648-0
Fax +49 2203 9648-222
info@igus.de, www.igus.de

2 Argentina

Borintech SRL
Av. Elcano 4971
C1427CH Buenos Aires
Phone +54 11 4556 1000
Fax +54 11 4556 1000
igus@borintech.com

3 Australia

Treotham Automation Pty. Ltd.
14 Sydneyham Road
Brookvale NSW 2100
Phone +61 2 9907-1788
Fax +61 2 9907-1778
info@treotham.com.au

4 Austria

igus® polymer Innovation GmbH
Ort 55
4843 Ampfing
Phone +43 7675 4005-0
Fax +43 7675 3203
igus-austria@igus.at

5 Belarus

SODO Hennich
Kharkovskaya Str. 90-8
Minsk, 220015
Phone +375 17 207-1828
Fax +375 17 207-3971
info@hennich.by

6 Belgium/Luxembourg

igus® B.V.B.A.
Kolonel Begaultlaan 75
3012 Willebe
Phone +32 16 314431
Fax +32 16 314439
info@igus.be

7 Bosnia & Herzegovina

Hennich d.o.o.
Dormala Bječica 185
Avaz Business Center
71000 Sarajevo
Phone +387 33 45 14 39
Fax +387 33 45 14 39
info@hennich.ba

8 Brazil

igus® do Brasil Ltda.
Avenida Marginal Norte da
via Anhanguera 53.780
Vila Rami - Jundiaí
CEP 13206-245 - SP
Phone +55 11 5531-4487
Fax +55 11 5531-4488
vendas@igus.com.br

9 Bulgaria

igus® EOOD
2, Lul Aysir str., fl.4, of. 4
1404 Sofia, Bulgaria
Phone +359 2 850 8409
Fax +359 2 850 8409
info@igus.bg

9 Bulgaria

Hennich OOD, BG
4003 Plovdiv, Bulgaria
147A, Brezovsko shose Str.,
Rota center, fl. 3
Phone +359 32 621 326
Fax +359 32 621 929
office@hennich.bg

10 Canada

igus® Office Canada
201 Millway Ave.
Unit 25
Concord
Ontario L4K 5K8
Phone +1 905 768-6448
Fax +1 905 768-6658
webmaster@igus.com

11 Chile

Vendortec
San Martin # 2097
Maipo - Santiago
Phone +56 2 7106825
ventas@vendortec.cl

12 China

igus® Shanghai Co., Ltd.
No.48 Warehouse,
11 Debaio Road, WGO FTZ,
Shanghai 200131,
P.R.China
Shanghai 200131, P.R.C.
Phone +86 21 51303100
Fax +86 21 51303200
master@igus.com.cn

13 Colombia

Colsein Ltda
Parque Industrial Gran
Sabana
Edificio / Building 32
Tocancipá, CUN 251017
Phone +57 1-519-0967
iriano@colsein.com.co

14 Costa Rica

Enesa Equipos
Neumáticos S.A.
Del Colegio Marista
100 este, 200 sur, 25 este
Urbanización Chirales
Alajuela, Costa Rica
Phone +506 2440-2393
Fax +506 2440-2393
equiposneumaticos@enesa.net

15 Croatia

igus® d.o.o.
Ventilatorska 9
10250 Lucko Zagreb
Croatia
info@igus.hr

15 Croatia

Hennich, Industrijska d.o.o.
Slupnickobreljka 17
Slupnicki Obraz
10255 Gorji Slupnik
Phone +385 1 3874334
Fax +385 1 3874336
hennich@hennich.hr

16 Czech Republic

HENNICH s.r.o.
Geskopkova 9
412 01 Lomnice
Phone +420 416 7113-39
Fax +420 416 7113-39
info@hennich.cz

17 Denmark

igus® ApS
Postboks 243
6800 Viborg
Phone +45 86 603373
Fax +45 86 603273
info@igus.dk

17 Denmark - e-chains®

Solar A/S
Industrivej Vest 43
6800 Vejen
Phone +45 76 961200
Fax +45 75 36 4759
solar@solar.dk

18 Ecuador

Ecuainetec
El Zumbado ES-32 y el Vanguard
Quito
Phone +593 2 2253757
Fax +593 2 2461833
info@ecuainetec.com.ec

19 Egypt

Fedcom Trading
Mohamed Fayed Sami & Co.
12, El Mahad El Swiseri St.,
Flat 10 - 2nd Floor-Zamalek
Cairo - A.R. of Egypt
Phone +202 27362537
Fax +202 27363196
mohamed.fayed@fedcom.com

19 Egypt

IEE International Company
for Electrical Engineering
2nd floor, 25 Orabi St
Down Town, Cairo
Phone +202 25767370
Fax +202 25767375
kamel@iee-egypt.com

20 Estonia

igus® OÜ
Lõtsa 44
Tallinn 11415
Phone +372 667 5600
Fax +372 667 5601
info@igus.ee

21 Finland

SKS Mekanikka Oy
Marinkyläntie 50
01720 Vantaa
Phone +358 20 7646522
Fax +358 20 7646824
mekan@skv.fi

21 Finland - chainflex®

SKS Automaatio Oy
Marinkyläntie 50
01720 Vantaa
Phone +358 20 7646748
Fax +358 20 7646820
automaatio@skv.fi

22 France

igus® SARL
49, avenue des Pipinières
Parc Médicus
94260 Fresnes
Phone +33 1 49840404
Fax +33 1 49840394
info@igus.fr

23 Greece - e-chains®

Chrimotor s.a.
71, Sp. Patsi str.
118 55 Athens
Phone +30 210 34 26574
Fax +30 210 3425595
info@chrimotor.gr

23 Greece - Plain bearings

J. & E. Papadopoulos S.A.
2 Polidelfous str.
Piraeus, 185 40
Phone +30 210 4113133
Fax +30 210 4116781
sales@papadopoulos-sa.com

24 Hong Kong

Sky Top Enterprises Ltd.
Room 1707, Block C, Wah Tai
Ind Centre, Wah Sing Street
Kwai Chung, Hong Kong
Phone +852 22434278
Fax +852 22434279
skytop@ctmail.com

25 Hungary

igus® Hungaria Kft.
Ipari Park u.10,
1044 Budapest
Phone +36 1 3065486
Fax +36 1 4310374
info@igus.hu

26 Hungary

Tech-Con Kft.
Vésd utca 9-11
1133 Budapest
Phone +36 1 4124161
Fax +36 1 4124171
tech-con@tech-con.hu

26 India

igus® (India) Pvt. Ltd.
30/1, Sky No. 17/3
Euro School Road,
Dadha Nekund Industrial
Area, - 2nd Stage
Mahadevapura Post
Bangalore 560048
Phone +91 80 45127800
Fax +91 80 45127802
info@igus.in

27 Indonesia

PT Igu® Indonesia
Garma Centre Suite 6040-6050
Jalan Kapten Subjianto Dj.
BSD City
Tangerang 15321
Phone +62 21 537 61 83 / 84
info@igus.co.id

28 Iran

Tameen Ehtiajat Fani
Tehran (TAF CO.)
62, Jafarshahr Ave., Unit 5
15816 Tehran, Iran
Phone +98 21-8831 78 512
Fax +98 21-8882 02 68
info@tcf-co.com

29 Ireland

igus® Ireland
Caswell Rd
Northampton NN4 7PW
Phone +44 1604 677240
Fax +44 1604 677242
sales@igus.ie

30 Israel

Conlog LTD
P.O. Box 3285
17 Hamelassim Str.
Industrial Zone Kiyat Arie
Petach-Tikva 49130
Phone +972 3 9260956
Fax +972 3 9263967
conlog@conlog.co.il

31 Italy

igus® S.r.l.
Via della Rovedina, 4
23890 Robbiate (LC)
Phone +39 039 5906.1
Fax +39 039 5906.222
igustalia@igus.it

32 Japan

igus® k.k.
Arcacenter 15F, 1-2-1 Kishi,
Sumida-ku Tokyo JAPAN
Zip 130-0013
Phone +81 358 192030
Fax +81 358 192055
info@igus.co.jp

33 Jordan

Al Hazam Adtech
Abu Alarda Street, Building No. 1
Amman
Phone +962 64 170100
Fax +962 64 169993
info.jod@adtech-trading.com

34 Latvia

igus® OÜ
Lõtsa 44
Tallinn 11415
Phone +372 667 5600
Fax +372 667 5601
info@igus.ee

35 Lebanon

Mecanix Shops
Gebran Sali
Charles Helou Avenue
Beirut
Phone +961 1 486701
Fax +961 1 490929
mecanix@dm.net.lb

36 Lithuania

Hitech UAB
Terminalo g. 3
54469 Brulskiu k. (Kauno LEZ)
Kauno raj.
Phone +370 37 323271
Fax +370 37 323273
info@hitech.lt

37 Macedonia, Albania, Kosovo

Hennich DOOEL
Boris Kidric 88
zip: 1200, Tetovo MK
Phone +389 44614411
Mob. +389 76 200 770
drian.gsm@hennich.mk

38 Malaysia

igus® Malaysia Sdn Bhd
No. 19-1, Jalan PUJ 1/3F
Surway Mas Commercial
Centre
47301 Petaling Jaya
Selangor D.E.
Phone +603 78805475
Fax +603 78805479
info@igus.my

39 Morocco

AFIT
6, Rue Amir Abdelkader
20300 Casablanca
Phone +212 522 633759
Fax +212 522 618351
soutis.vu@premium.net.ma

40 Mexico

igus® México S. de RL de CV.
Boulevard Aeropuerto Miguel
Álem 160 Int. 135
Col. Conador Industrial Toluca Lerma
Lerma, Estado de Mexico C.P. 5004
Phone +52 728294 3185
Fax +52 728284 3187
fmarquez@igus.com

41 Netherlands

igus® B.V.
Starmengweg 9
3769 ES Soestenberg
Phone +31 346 353932
Fax +31 346 353849
igus.nl@igus.de

41 Netherlands - Plain bearings

Eloce Holland BV
Kamerlingh Onnesweg 28
NL-3316 GL Dordrecht
Phone +31 78 6544777
Fax +31 78 6544733
info@eloce.nl

42 New Zealand

Automation Equipment Ltd.
26 Tawn Place
PO Box 5656
Hamilton
Phone +64 7 8490281
Fax +64 7 8490242
sales@autoeqg.co.nz

43 Norway

ASI Automatik AS
Ingv. Ludvigssensgate 23
3007 Drammen
Phone +47 9008 1100
info@asiflex.no

44 Peru

Profaco S.A.C.
Calle Bolívar 388/of. 203
Miraflores
Lima 18 - Perú
Phone +51 1 2414370
Fax +51 1 2428008
ventas@profaco.com

45 Philippines

Silicon Exports Corp.
Suite 6A, 8414 Dr. A, Santos
Ave., Sucat, 1700 Pateraque
City
Rizal/Manila
Phone +63 2 8250126
Fax +63 2 8250141
info.philippines@igus.com.sg

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igus® Inc.
PO Box 14349
East Providence, RI 02914
Tel: 800-521-2747
Fax: 401-438-7270
E-mail: sales@igus.com
www.igus.com

