

# automotive

igus® energy supply solutions for vehicles



Plastics for longer life®...igus

# ...onboard

[www.igus.com/automotive](http://www.igus.com/automotive)

ECS-B20

# Reduce cost ...



## Energy supply made easy ... specifically customized for your space, weight and load limits.

Our plastic products are used in the automotive industry, especially in **onboard systems** such as sliding doors, seating systems and other mobile applications in cars, utility and special vehicles. The requirements of energy supply solutions in vehicles are becoming ever more complex. The vast number of movable, electrically controlled functions in cars, including the seats, speakers, powered windows, security and locking systems, etc., require reliable, long-lasting, and lightweight solutions for the reliable supply of energy and signals.

### Kenneth Block

Automotive Product Manager-

Tel.: 269.372.7370

Cell: 269.207.9511

Email: [kblock@igus.com](mailto:kblock@igus.com)

igus® is certified according to DIN EN, ISO 9001:2008, and TS16949:2009 for all product lines. Specific product requirements can be simulated and service life can be accurately predicted at the igus® laboratory. igus® is represented in more than 80 countries by subsidiaries and distributors, which employ nearly 2,700 people.

If you have any questions about our products, or need samples for initial function tests, please contact me anytime.

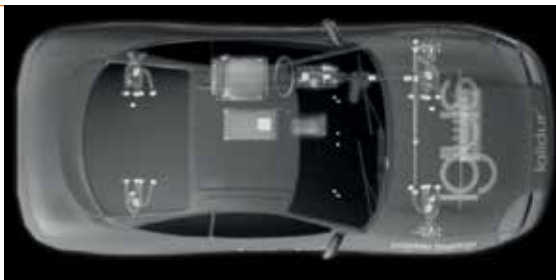
Our online tools also enable you to reduce process costs. igus® delivers from stock in 24-48 hours! Please visit our industry website for more information

 [www.igus.com/automotive](http://www.igus.com/automotive)

I look forward to speaking with you.

### More than 50 years of igus® plastics expertise

Maintenance-free plastic products are used in vehicles and in automotive production. Over 200 million igus® iglide® plastic plain bearings are already installed in cars worldwide.



# improve technology ...

igus® energy supply systems in ...



1 Tailgates

2 Sliding doors

3 Seat adjustment

4 Window systems

5 Interior systems

6 Wiper systems



1 Tailgates

2 Powered sunroof

3 Seat adjustment

4 Headlights

5 Interior systems

6 Wiper systems

7 Powered windows

with motion plastics from igus® <sub>3</sub>

# Tailored solutions ...

## Reduce cost ... improve technology ...

The following requirements are met by our standard E-Chains®, available from stock:

- Minimum 200,000 cycles of service life, often exceeding 1 million
- Serial production for 10 years minimum
- Thermal shock resistance -40°F to +176°F
- Smooth running max. 60 dB(A)
- Dirt resistance
- Many types with fire class UL94-V2 or V0 certification
- Chemical resistance to lubricating oil, engine oil transmission oil, hydraulic oil, fuel, coolants, saline solutions, battery acids, etc.
- 100,000 solutions from stock in many lengths, widths, radii and other options



# for your application

... with igus® plastic E-Chains®, e.g. in delivery van



Powered windows



Tailgates



Seat adjustment



Wiper systems



Sliding doors



Hinged doors

# Tailored solutions ...

## Reduce cost ... improve technology ...

Specifically customized for your space, weight and load limits. Whether in cars, commercial or special vehicles – the requirements for power supply solutions are becoming increasingly complex. The vast number of movable, electrically controlled functions and settings in door systems, seat systems, speakers, powered windows, security systems, locking systems, etc., require durable and lightweight solutions for the reliable supply of energy and signals.

- Low weight
- Low wear and low maintenance
- Very flexible
- Defined movements
- For all installation types
- Corrosion resistant
- Low priced and available from stock
- Special designs delivered quickly





# for your application

... with igus® plastic E-Chains®, e.g. in cars



Powered windows



Tailgates



Powered sunroof



Lights



Interior systems



Wiper systems

# Moving energy made easy ...

## igus® plastic E-Chains® in onboard systems



### Powered windows

Electric auto tinting glass,  
heated windows

- Protection against transverse forces
- Innovative products that can be assembled quickly
- Cost reduction through less installation time
- Guides sensitive high-voltage cables
- Noise dampening



### Tailgate

Heated rear window, sensor  
technology, lamps

- Space-saving installation
- Cost reduction through less installation time
- Handles high forces and accelerations
- Long service life



# for your installation space ...

## Powered sunroof

### Electric auto tinting glass, heated windows

- Insensitive to dirt
- Guides and protects in confined spaces
- Long service life
- Special solutions to customer requirements



## Light

### Cornering light

- Space-saving installation
- Cost reduction through less installation time
- Highly dynamic applications
- Long service life



# ... to your weight and ...

## igus® plastic E-Chains® in onboard systems



### Wiper systems

#### Wiper arm mounting, kinematics, heated wipers

- High fatigue strength
- Insensitive to dirt
- Long service life
- Handles high forces and accelerations
- Dimensionally stable in different environmental conditions



### Interior systems

#### Central arm consoles, displays, TV and hi-fi systems, loading aids, rear seat system with controls, steering wheel adjustment, pedals

- Quick fitting of cables
- For confined spaces
- Guide sensitive bus, data, high-voltage and media cables
- For most types of motion
- Guides and protects in confined spaces

# load limits

## Seat adjustment

**Sensor technology e.g. PODS, security and comfort systems**

- Insensitive to dirt
- Guide sensitive bus, data, high-voltage and media cables in confined spaces
- Long service life
- Special solutions on customer request
- Guides sensitive bus, data, high-voltage and media cables
- Quick fitting of cables



## Hinged doors

**Keyless entry system, lighting, speakers, powered windows, safety systems**

- Noise dampening
- Insensitive to dirt
- Most types of motion
- Guide sensitive bus, data, high-voltage and media cables
- High dynamic demands
- Long service life
- Dimensionally stable in different environmental conditions
- High accelerations and forces
- Large product selection
- Special solutions on customer request
- Retraction systems



# Conventional solutions ...

## Conventional solutions, compared to igus® solutions



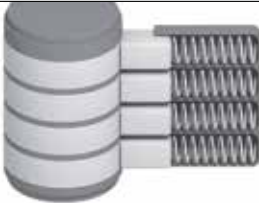
Plastic corrugated tubes

- No defined guidance
- No radial stability



Block / pin contact

- No permanent current feed
- Loss of signals



Gliding contact

- Susceptible to intermittent contact



Rubber grommet

- No defined guidance
- No radial stability



Cable tiewrap

- Static
- Not suitable for dynamic applications

## E-Chains<sup>®</sup> catalog parts and special solutions

igus<sup>®</sup>  
solution



**E2 micro**

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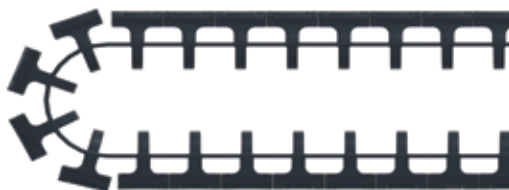
**E1**

► Page 18



**E-Rib**

► Page 19



**Customer-specific solutions**

► Page 20

# Tested: service life ...

Some basic parameters of igus® E-Chains® available from stock ...



Service life of at least 200,000 cycles; often exceeding 1 million cycles



Thermal shock resistance -40°F to +176°F

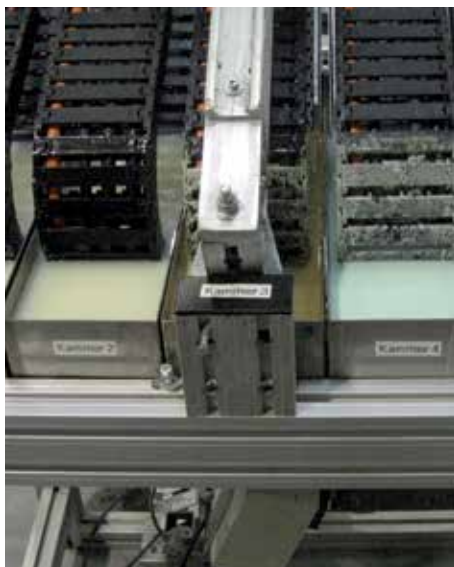


Serial production for minimum 10 years



# predictable

... tested in the 18,840 sq. ft. igus® lab



Chemical resistance to lubricating oil, motor oil, transmission oil, hydraulic oil, fuel, coolants, saline solutions, battery acids, etc.



Resistant to dirt and debris



Test for torsion with E-Chains® and Chainflex® cables



100,000 solutions from stock in numerous lengths, widths, radii and options



Many types with fire class UL94-V2 or V0 certification

# Standard products for all ...

## E-Chain Systems® for all installation orientations ...

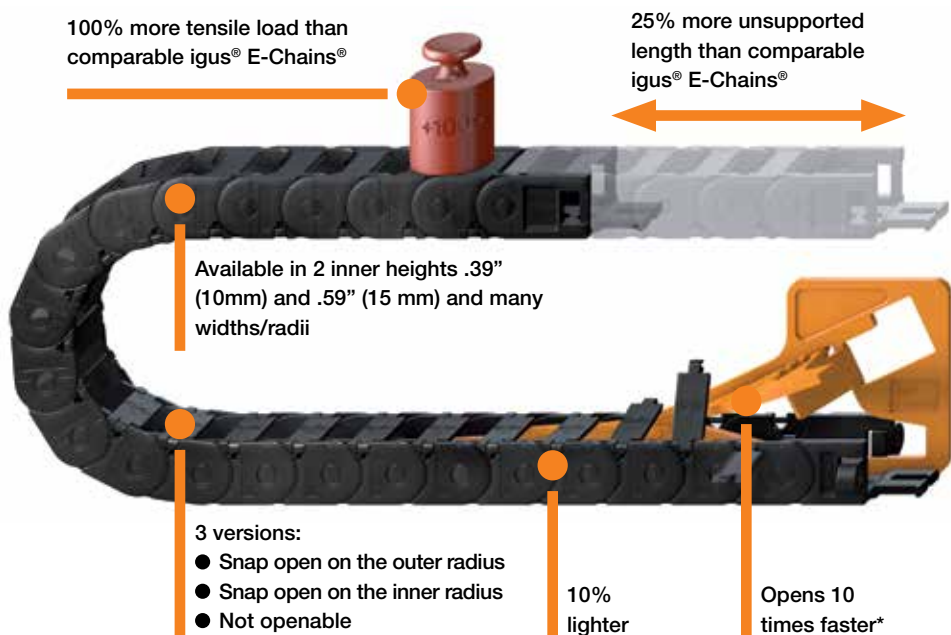
### E2 micro: for small installation spaces

With our standard E2 micro products a variety of applications are already operating in vehicle equipment. In addition, we can develop individual solutions and special concepts for our customers to guide electrical and media (even pneumatic) cables in the best way possible.

- One and two-piece E-Chains®, from .20" (5 mm) inner height and bending radii from .39" (10 mm)
- High torsion resistance
- Smallest inner heights and bending radii of all igus® E-Chains®
- Mounting brackets with optional strain relief
- Small pitch for silent operation
- Cable-friendly interior
- Low weight
- Large pins for a long service life
- Favorable internal/external dimensions ratio
- UL-94-V2 and UL-94-V0 classification for many types

### Example:

#### E-Chain System® E2-10/E2-15



# requirements and orientations

## ... available from stock

The task of E-Chain Systems® is to reliably supply energy and data to moving equipment. They are suitable for universal applications with different types of motion and travel. They can supply electricity, sensitive bus and data cables, FOC, gas, air and liquids. For very high dynamic loads and long service life in the most varied environments.



# Low priced E-Chain<sup>®</sup> band

## E-Chain System<sup>®</sup> E1

### System E1 – for simple motions

E1 E-Chain<sup>®</sup>: modular, one-piece band for simple applications. The E1 opens up additional application areas where E-Chains<sup>®</sup> were previously over-specified. E1 is cost-effective for large units volumes, quick to assemble and provides a reliable system for occasionally moving cables.

- Cost-effective solution for large volumes
- Length of each chain band: 255 mm
- Can be shortened or lengthened as required
- Easy to snap-open
- Mounting link for connection of several chain bands
- Easy to fix using the countersunk hole on the chain band
- Several potential materials
- UL-94-V2 classification

**Save time:**  
very easy to fill  
using of snap-  
open lids

**Easy to shorten:**  
just cut the segment

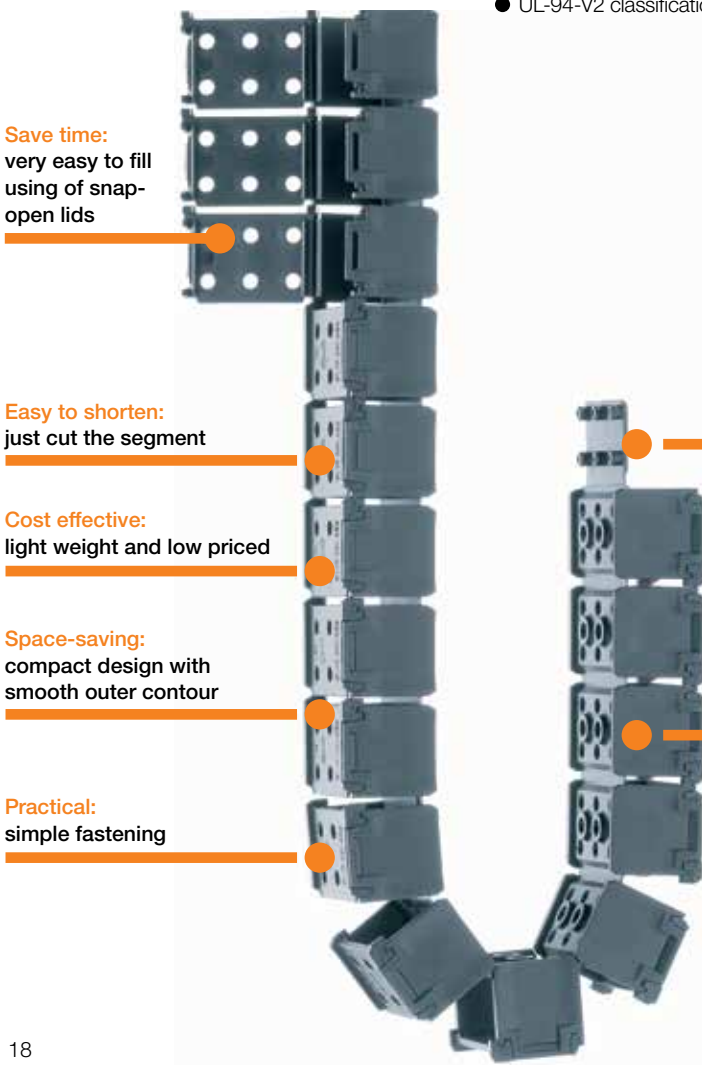
**Cost effective:**  
light weight and low priced

**Space-saving:**  
compact design with  
smooth outer contour

**Practical:**  
simple fastening

**Easy to extend:**  
strips can be snapped  
together

**Several options:**  
different materials  
and colors available  
upon request



# Stabilize corrugated hoses

## E-Chain System® E-Rib

### E-Rib – provides stabilization of existing corrugated tube systems

The E-Rib is clipped onto the corrugated hose, so that the "valleys" in the corrugated hose are filled at the top. The e-rib stabilizes the corrugated hose to limit the bending radius. The E-Rib elements on the sides allow the corrugated hose to have an unsupported length.

- Less installation space required despite added unsupported length function
- Cable-friendly with defined minimum bend radius
- Can be easily retrofitted
- Several corrugated hoses can be guided next to each other
- Stability preventing unintentional sideways movements
- No change in the interior of the corrugated hose

Stabilized corrugated hose

Defined movements

Prevents lateral movements

Allows unsupported lengths



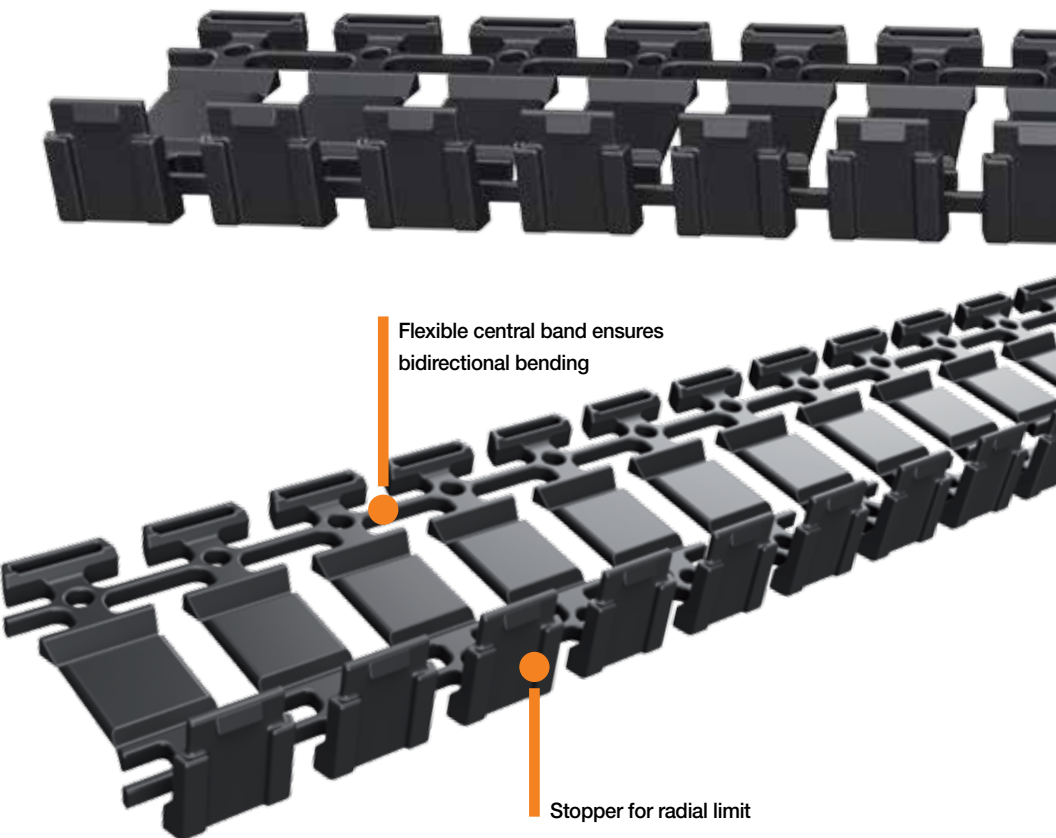
# Moving energy made easy ...

## Special custom solutions ...

### System E1 module – for simple movements

The E1 system offers the stabilizing function of a chain, while reducing the weight and price. Due to its one-piece modular design, it can be easily lengthened and shortened, and can be used when solutions to save time and cost are required. Due to the elastic properties, the E1 module can be bent in a sideways direction without losing its minimum radius.

- Save time: Very easy to fill because of snap-open lids
- Easy to extend: Strips can simply be snapped together
- Easy to shorten: just cut the segments
- Cost-effective: light and low priced





# with igus® E-Chains®

## ... and more E-Chain® solutions



### SnapChain – the cable tie that can do more

- Quickly assemble cable packets in bundles
- Loops can be adjusted and modified anytime
- Suitable for short lengths, ideally 5 - 10 links
- Low-priced alternative to custom cable arms
- Snap-open along the inner or outer radius
- iF design award winner
- Flexible in 1 or 2 directions (RBR)



### E-Skin – the corrugated hose that can do more

- Defined direction of motion
- Self-supporting allowing short unsupported lengths
- Oval design allows for more interior space than round corrugated hoses
- Easy filling due to snap open mechanism
- Interior separation modules for organizing different cables
- Dust and water proof
- Suitable for cleanrooms according to IPA class 1
- Prevents unwanted lateral movements



### TwisterBand - Rotary movements in small spaces

- Guide energy, data, fiber optic cables and media together in one system
- Cost effective and low wear
- Up to 7,000° and more of possible rotation horizontally, and up to 3,000° vertically
- Rotary speeds up to 180°/s
- Bands can be lengthened and shortened as required
- Small installation space, fits very closely around the rotary axis
- Can be used in various installation positions (horizontal, vertical, overhead)

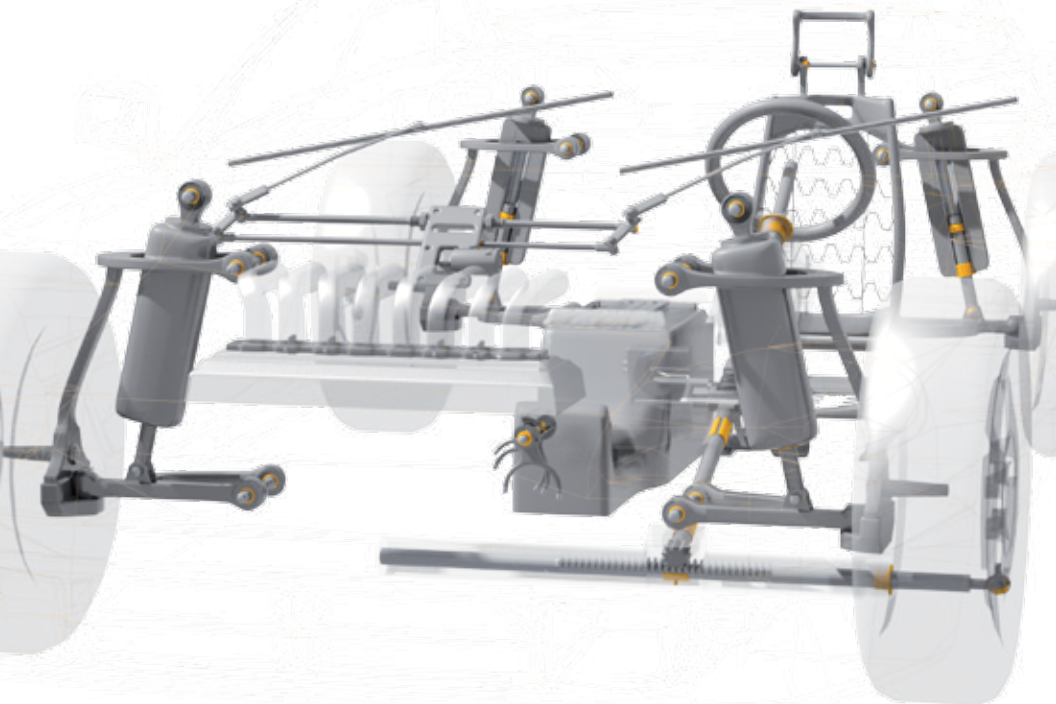


### Triflex® R - 3D E-Chain® for all axes

- Secure energy supply for multi-axis movement
- High torsional stability
- Can be lengthened and shortened as required
- Large filling space
- Smooth outer contours
- Small bend radius
- Connection through ball and socket system to absorb high tensile forces
- One-piece link, so extremely light in weight

# igus® plastic plain bearings ...

Light, wear-resistant, smooth running, corrosion-resistant



## Maintenance and self-lubricating iglide® plastic plain bearings used in many areas of the vehicle

There is ever more pressure on automotive manufacturers to save as much weight as possible on every component. iglide® plastic bearings reduce the weight in each bearing position by a factor of 7 when compared to metal solutions. iglide® plain bearings are already used in millions of cars each year. In addition to low weight, the benefits include wear resistance, low noise, corrosion resistance and cost.

For interesting applications where iglide® helps reduce cost and improve technology in the vehicle, visit [www.igus.com/automotive](http://www.igus.com/automotive) for more information.

# in vehicles

... and cost-effective

## Economy



### iglide® M250

- Excellent vibration dampening
- Resistant to edge loads
- Low-cost



### The economic solution for large series – iglide® GLW

- Small gliding paths, high static loads
- CDP-suitable
- Applications: seating systems



### iglide® RN56

- CDP-suitable
- Insensitive to dirt
- Low-cost

## Basic



### iglide® G300 – the all-rounder

- Significantly higher wear resistance than iglide® GLW
- CDP-suitable
- Applications: convertible roof systems, fittings



### iglide® J

- Low coefficients of friction in dry operation
- Good gliding partner even for "soft" materials
- Applications: seat adjustment and mirror drive



### iglide® RN89

- Conductive material for all applications with CDP coating
- Applications: Seating and convertible roof systems

## Specialists



### iglide® P210

- Also suitable for soft shafts
- Low wear
- Low friction



### iglide® J350

- Temperature-resistant
- Wear-resistant
- Impact resistant



### iglide® RN248

- CDP-suitable
- Extremely conductive
- Wear-resistant

## Premium



### iglide® H4

- Resistant against fuels, transmission oils, etc.
- Minimum moisture absorption
- Applications: Throttle valves, suction tubes



### iglide® T500 – High-temperature material

- High compressive strength
- High chemical resistance
- +250 °C continuous working temperature

## Customized



### Customer solutions:

Individually adapted materials with special properties: We develop the plastic that's needed for your application and find the ideal solution.

# igus® solutions for ...



## Robotic applications pose an extreme challenge for energy supply systems

Energy supplies for robots should be tough, reliable and easy to operate. With the igus® Triflex® R construction kit you have a product range that combines these features. When combined with our on-site support, specialized software and extensive test data, we can guarantee a solution that meets your specific needs.



### Triflex® TRC Robot E-Chain®

- Enclosed design, also protects against dust and dirt
- High tensile force absorption due to the ball and socket joint
- Torsion stop dog on each chain-link
- $\pm 10^\circ$  rotation per chain link
- Modular system for easy lengthening and shortening



### Triflex® TRL(F) Robot E-Chain®

- Lightweight construction – installation-friendly, modular, cost-efficient and long-lasting
- Lightning-fast filling of cables and hoses due to the "easy" mechanism
- High tensile force absorption due to ball and socket joint
- Modular system for easy lengthening and shortening



### Triflex® RS system

- Prevent loop formation on the robot head
- Single module, space-saving and quickly mounted on the industrial robot
- Stop dog for a defined range of motion
- Many versions available, e.g. with adjustable, variable retraction force by means of a pressure control valve

# manufacturing and automation

**Triflex® R:** cable protection for multi-axis movements

**Triflex® RS:** universal module for robots

**TwisterChain®** - circular and spiral movements up to 540°

**CFROBOT:**

**Chainflex®** special cables for torsional movements and robotic applications

**System E4-1:** energy supply for long travels and the 7th axis

**Triflex® TRL:** light and cost-effective



## TwisterChain®

- Circular, spiral movements up to 540°
- Easy cable replacement
- Modular, rugged design, variable widths
- Cable-friendly interior
- Can be used in rotational speeds up to 13 ft/s (4 m/s)



## Chainflex® torsion cables

- Chainflex® robotic cables for torsion applications in E-Chains®
- Available as hybrid, control, motor, servo, bus, data or fiber optic cables
- Torsion of  $\pm 180^\circ$  per 3.28 ft. (1 m) cable length
- Service life minimum 3 million cycles
- Various approvals
- Flame-retardant, oil resistant, UV resistant



## E-Chain System® E4-1

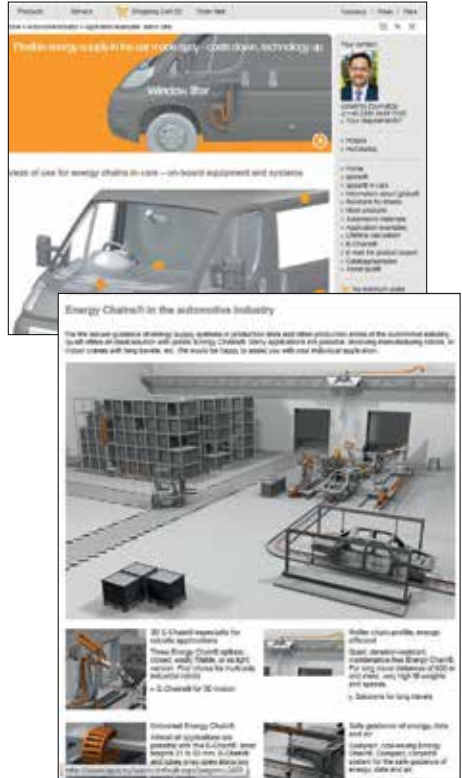
- Smooth, cable friendly interior surfaces
- Low-noise operation due to integrated brake on the radius stop dogs
- Sound dampers as an additional noise-reducing option
- Numerous interior separation options
- Large accessory kits
- Widths up to 78.7" (2000 mm) through extension links
- Snap open along both sides
- Travel distance: Over 656 ft. (200 m)

# igus® services ...



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

[www.igus.com/automotive](http://www.igus.com/automotive)



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

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

## For any task – in any batch size

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



# quick and reliable



## The igus® delivery service

Over 97% of all catalog parts available from stock.

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



## Modern injection molding 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 (18,840 ft<sup>2</sup>) conducts more than two billion test cycles per year on a total of 107 test rigs.

- Extensive test databases
- Customized tests on request

## igus® motion plastics®

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



# 9001:2008

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.



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