

automotive

igus® energy supply solutions for vehicles



plastics for longer life®... igus®

...onboard...

www.igus.eu/automotive-onboard

Reduce cost ...



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Onboard systems

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

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

igus® is certified according to DIN EN ISO 9001:2008 and TS16949:2009 for all product lines. At the largest laboratory in the industry with more than 1,750 m² floor area, specific requirements can be simulated and the service life predicted accurately. In more than 80 countries, igus® is represented by its subsidiaries or distributors and currently employs almost 2,700 employees (1,700 in Cologne alone).

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

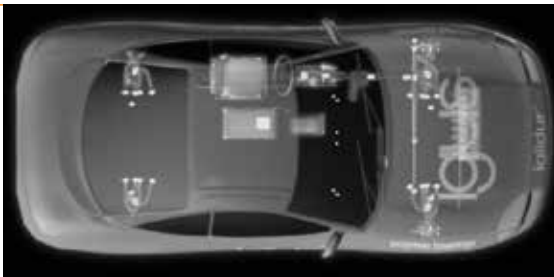
Our online tools also enable you to reduce process costs. igus® delivers from stock in 24-48 hours! And you can visit our industry website for more information

 www.igus.eu/automotive-onboard

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® iglidur® 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 sun roof
- 3 Seat adjustment

- 4 Headlights
- 5 Interior systems
- 6 Wiper systems

- 7 Powered windows

...with motion plastics® from igus®

Tailored solutions ...

Reduce cost ... improve technology ...

The following requirements are met by our standard e-chains® from stock:

- Minimum 200,000 cycles of service life, often exceeding 1 million
- Serial production for 10 years minimum
- Thermal shock resistance -40°C to +80°C
- Smooth running max. 60 dB(A)
- Dirt resistance
- Many types with fire class UL94-V2 or V0
- 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

 www.igus.eu/automotive-onboard



... 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 customised 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 moveable, 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.

 www.igus.eu/automotive-onboard

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



... for your application

... with igus® plastic e-chains®, e. g. in cars



Powered windows



Tailgate



Powered sun roof



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
- High accelerations and forces
- Long service life

... for your installation space ...

Powered sun roof

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
- High accelerations and forces
- 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
- 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

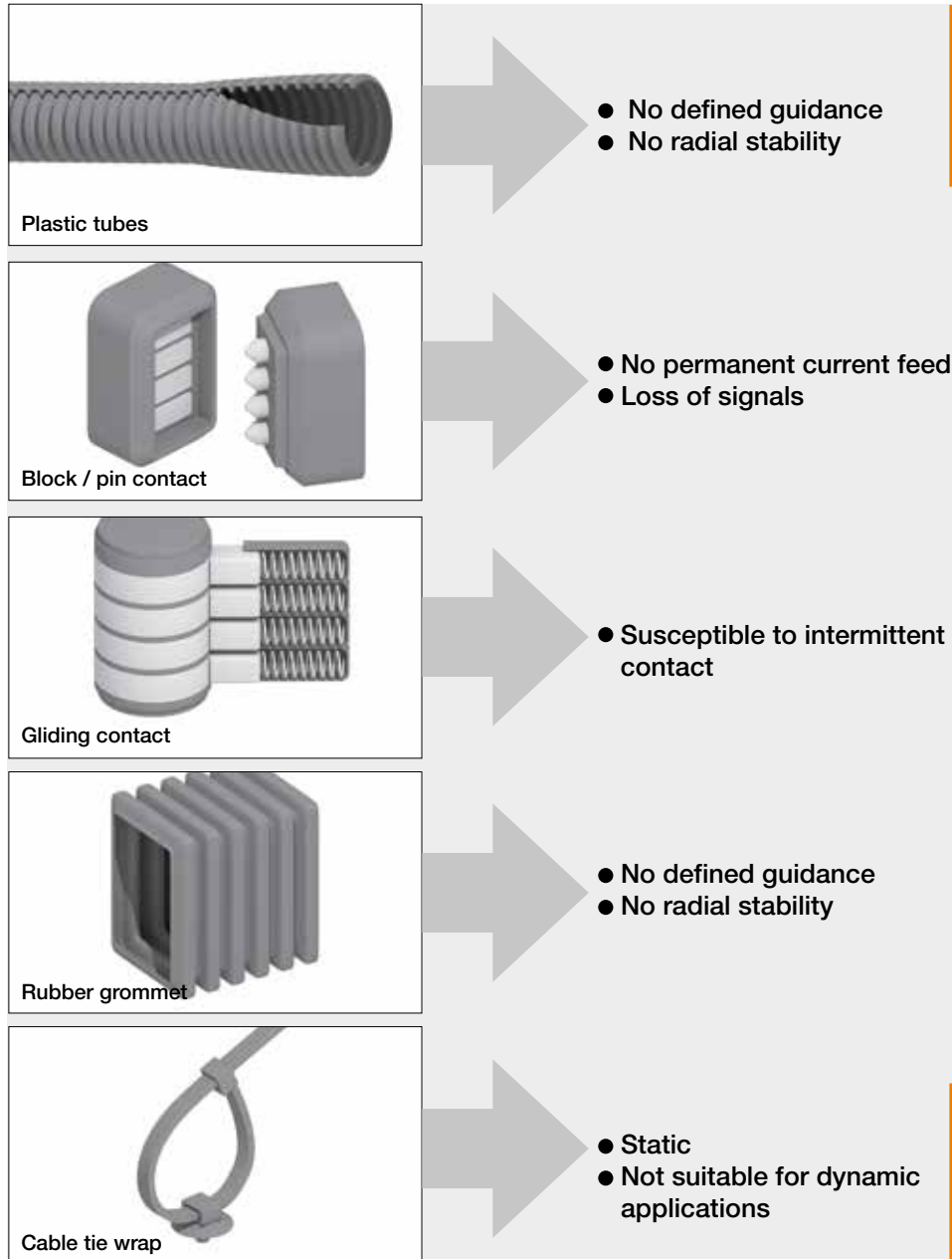
Keyless entry system, ambience, speakers, powered windows, safety systems

- 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



... igus® solutions

e-chains® catalogue parts and special solutions



E2 micro

► Page 16



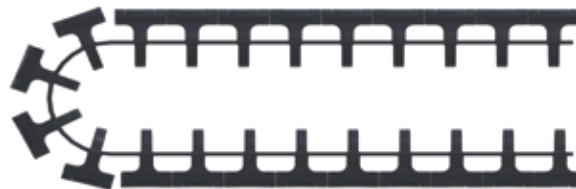
E1

► Page 18



e-rib

► Page 20



Customer-specific solutions

► Page 22

igus®
solution

Tested: service life ...

Some basic parameters of igus® e-chains® "from stock" ...



At least 200,000 cycles service life, often exceeding 1 million



Thermal shock resistance -40°C to +80°C



Serial production for 10 years minimum

... predictable

... tested in the 1,750 m² large igus® lab



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



Dirt resistance



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

Standard products for all ...

e-chainsystem® 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.

 www.igus.eu/E2micro

- One and two-piece e-chains®, from 5 mm inner height and bending radii from 10 mm
- High torsion resistance
- Smallest inner heights and bending radii
- Mounting brackets with optional strain relief
- Small pitch for silent operation
- Cable-friendly interior
- Low weight
- Large pins for a long service life
- Favourable internal/external dimensions ratio
- UL-94-V2 und UL-94-V0 classification for many types

Example:
e-chainsystem® E2.10/E2.15

100% more tensile load than
comparable igus® e-chains®

25% more unsupported
length than comparable
igus® e-chains®

Available in 2 inner heights
(10/15 mm) and many widths/
radii

3 versions:

- Snap open on the outer radius
- Snap open on the inner radius
- Not openable

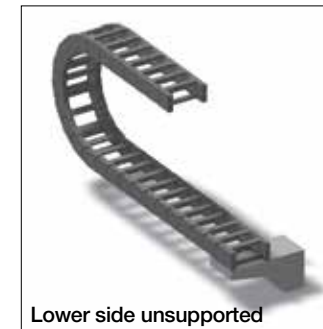
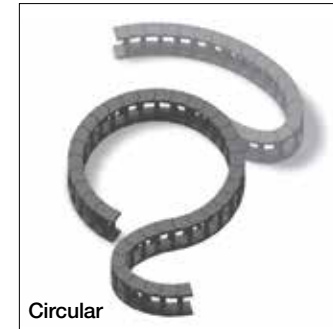
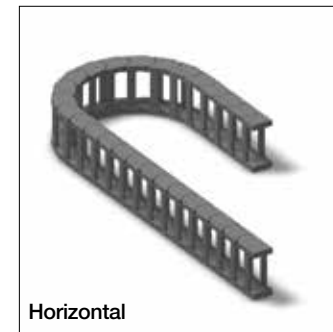
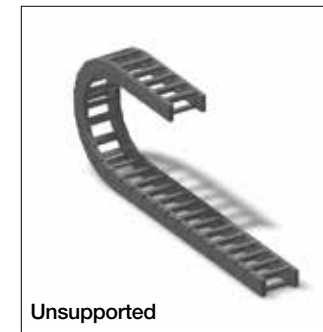
10 %
lighter

Opens 10
times faster*

... requirements and orientations

... available from stock

The task of e-chainsystems® is to reliably supply energy and data to moving consumer equipment. They are suitable for universal applications with different types of motion and travel. They can supply electricity, such as 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® band

e-chainsystem® E1

System E1 – for simple motions

E1 e-chain®: modular, one-piece band for simple applications. The E1 opens up additional application areas where e-chains® 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

 www.igus.eu/E1

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 colours available upon request

Stabilise corrugated hoses

e-chainsystem® e-rib

e-rib – to stabilisation 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 stabilises the corrugated hose so that it can move in only one direction. 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

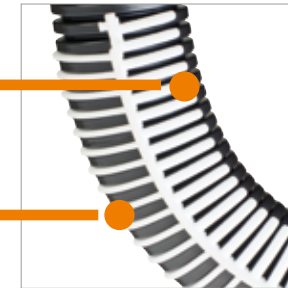
 www.igus.eu/e-rib

Stabilised corrugated hose

Defined movements

Prevents lateral movements

Allows unsupported lengths



Moving energy made easy ...

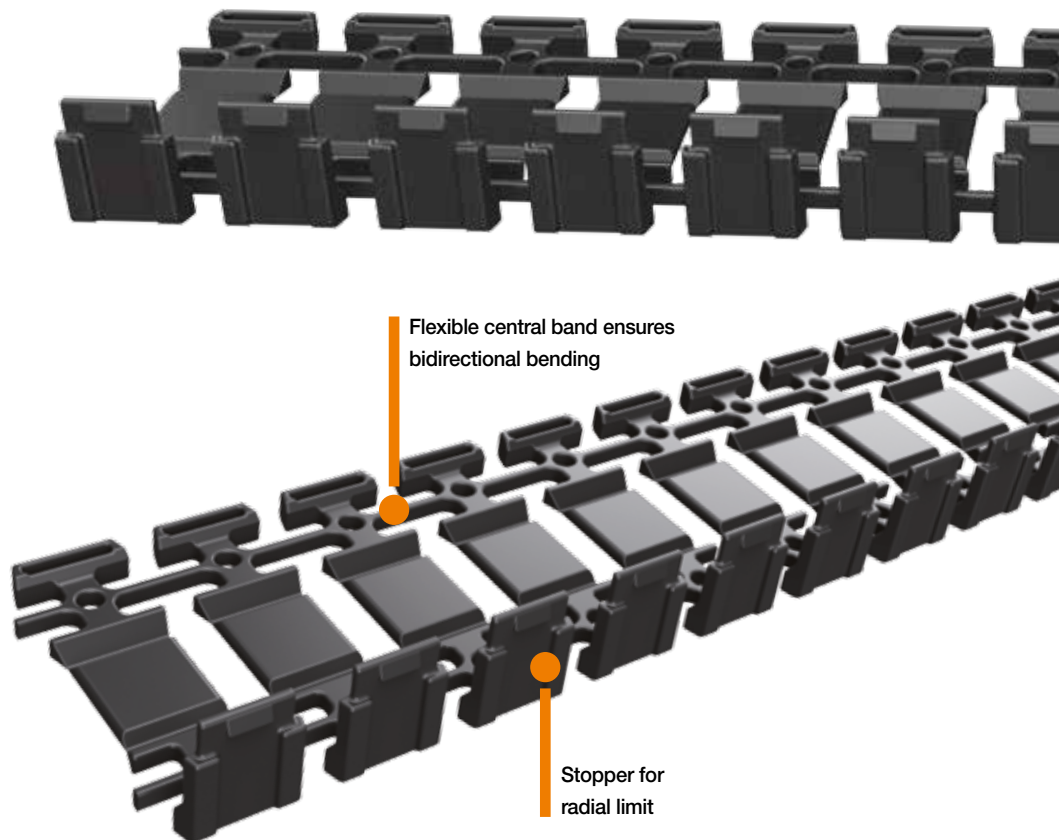
Special custom solutions ...

System E1 module – for simple movements

The E1 system offers the stabilising 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 segment
- Cost-effective: light and low priced

 www.igus.eu/automotive-onboard



... 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)

 www.igus.eu/snapchain



twisterband - Rotary movements in small spaces

- Guide energy, data, fibre optic cables and media together in one system
- Cost effective and low wear
- Up to 7,000° and more 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)

 www.igus.eu/twisterband



e-skin – the corrugated hose that can do more

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

 www.igus.eu/e-skin



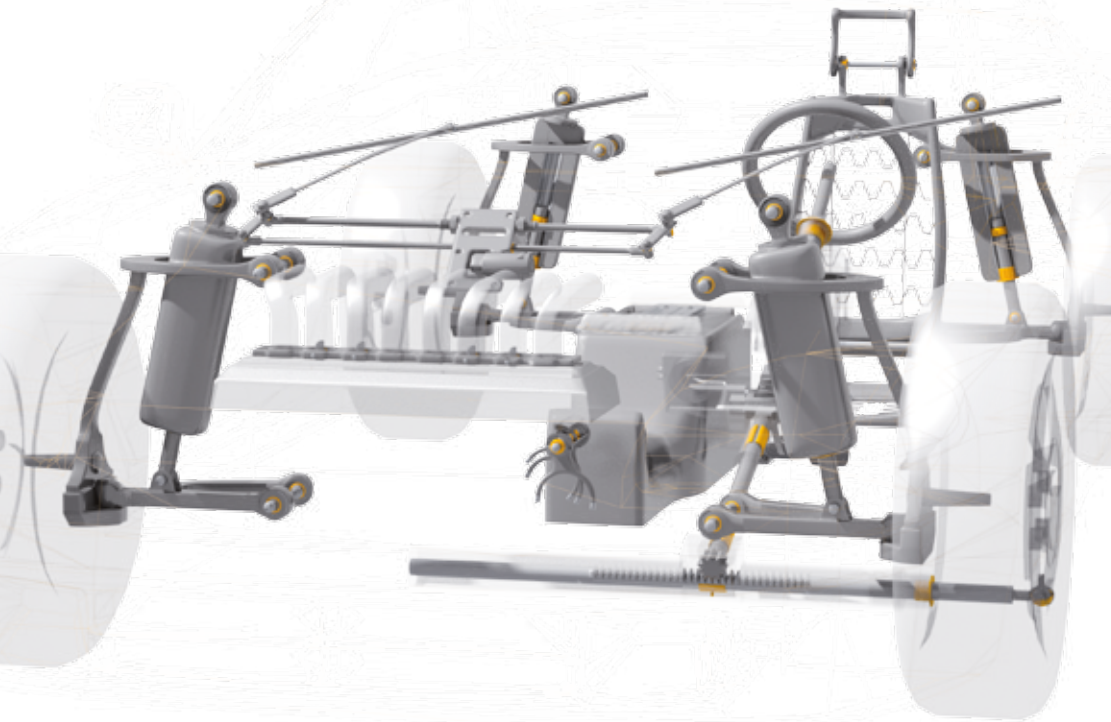
triflex® R - 3D e-chain® for all axes

- Secure energy supply for multi-axis movements
- 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

 www.igus.eu/triflexR


igus® plastic plain bearings ...

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



Maintenance- and lubrication free iglidur® polymer plain bearings used in many areas in the vehicle

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

For interesting applications where iglidur® helps reduce cost and improve technology in the vehicle, see  www.igus-automotive.eu

... in vehicles

... and cost-effective

Economy



igidur® M250

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



The economic solution for large series – iglidur® GLW

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



igidur® RN56

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

Basic



igidur® G – the all-rounder

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



igidur® J

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



igidur® RN89

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

Specialists



igidur® P210

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



igidur® J350

- Temperature-resistant
- Wear-resistant
- Impact resistant



igidur® RN248

- CDP-suitable
- Extremely conductive
- Wear-resistant

Premium



igidur® H4

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



igidur® X – High-temperature material

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

Customised



Customer solutions:

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

 www.igus.eu/igidur



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 onsite support, specialised software and lots test data, we can guarantee a solution that meets your specific needs.

 www.igus.eu/robotics



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



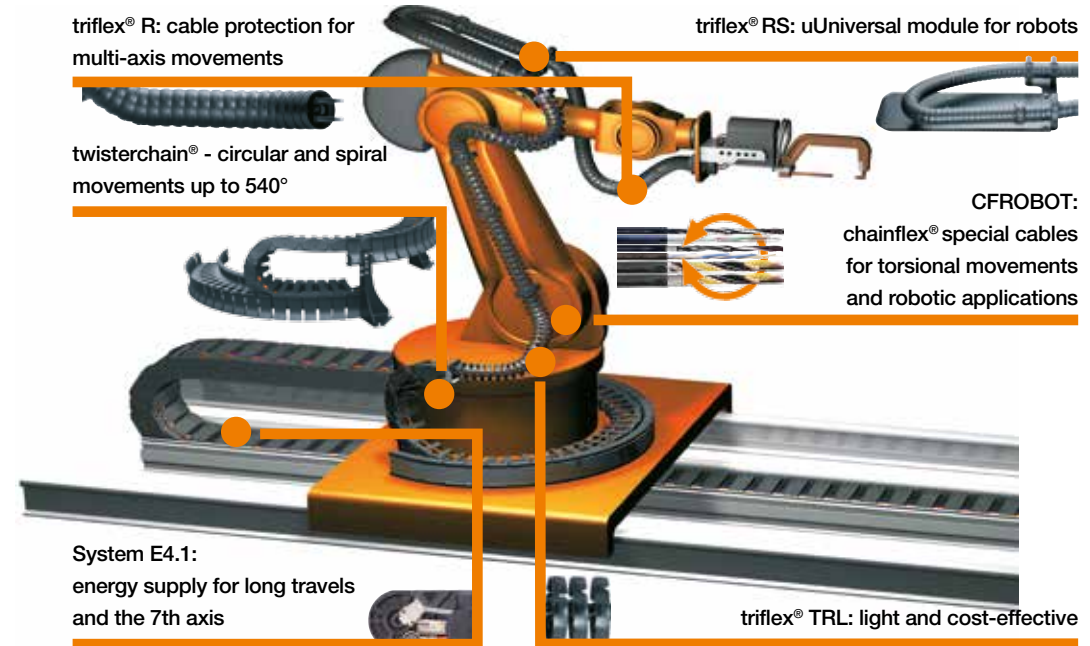
triflex® RS system

- 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

 www.igus.eu/triflexR

 www.igus.eu/TRLF

 www.igus.eu/triflexRS



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 4 m/s



chainflex® torsion cables

- chainflex® robotic cables for torsion applications in energy chains®
- Available as hybrid, control, motor, servo, bus, data or fibre optic cables
- Torsion of $\pm 180^\circ$ per 1 m cable length
- Service life minimum 3 million cycles
- Various approvals
- Flame-retardant, oil resistant, UV resistant



e-chainsystem® 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 2000 mm through extension links
- Snap open along both sides
- Travel distance: Over 200 m

 www.igus.eu/twisterchain

 www.igus.eu/CFROBOT

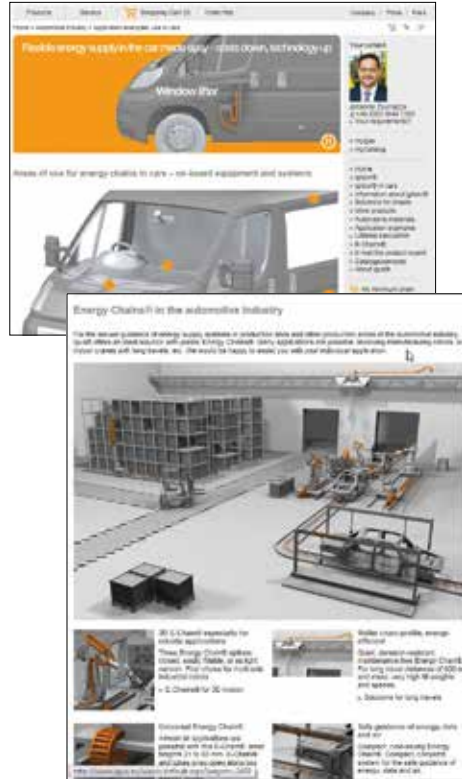
 www.igus.eu/E4.1

igus® services ...



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

www.igus.eu/automotive-onboard



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 a service life prediction.

www.igus.eu/online

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 customised support for specialised applications. igus® already has many years of experience and specialised resources in many industries.

www.igus.eu/industry

... quick and reliable



The igus® delivery service

Over 97% availability of all catalogue parts.

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

www.igus.eu/24



Modern injection moulding technology

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



The igus® lab

The industry's largest test lab (1,750m²) conducts more than two billion test cycles per year on a total of 107 test rigs.

- Extensive test databases
- Customised tests on request

www.igus.eu/test

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 tribo-polymers – high-performance plastics, which we have optimised 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 /16949:2009

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

/newsletter

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

Register here: www.igus.eu/newsletter

/contact

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

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