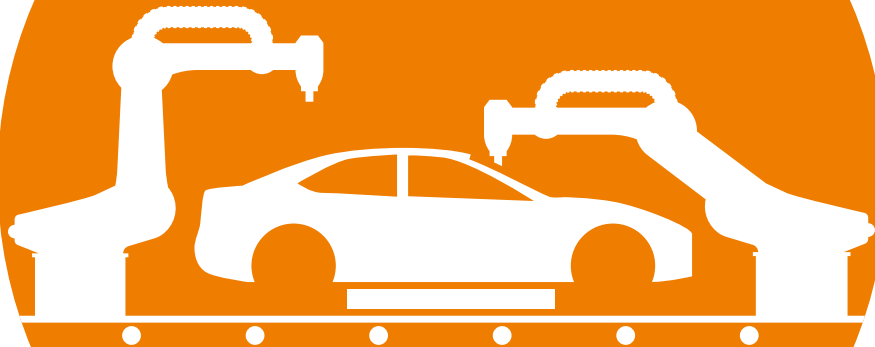


# Automotive production

Industry solutions and products



Tech up, Cost down. It's our job.

**igus<sup>®</sup>.eu**

[www.igus.eu/automotive-production](http://www.igus.eu/automotive-production)

# Less maintenance time and cost in automotive production

In automotive production, the factory never stops. Robots for assembly and welding work are in continuous use, as are all the components that supply them with energy and data. This is exactly what motion plastics® where developed for: continuous moving operation.

triflex® R energy supply systems protect and guide cables that must perform complex, torsional movements on robots and other rotating machines. For the best service life, the energy supply systems should be used with our chainflex® cables, for which we offer a guarantee of up to 36 months\*. And if you want to understand the condition of your energy supply, you can use our smart plastics sensors. Whether a new project or a retrofit, our universal modular kit solutions can be tailored to any automotive production application.

I would be happy to answer any questions you may have about igus® solutions for automotive production.



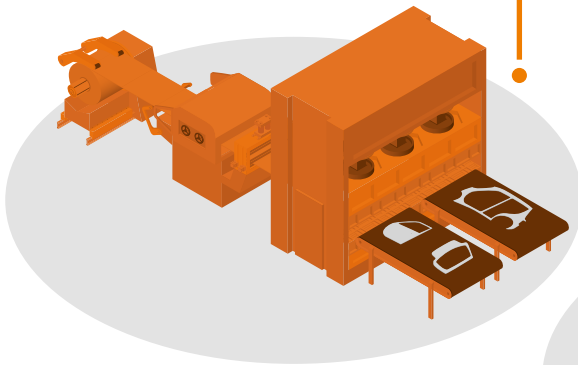
**Andreas Dengler**

Automotive Production Industry Manager

Phone +49 (0)22 03 96 49 77 34

adengler@igus.net

Pressing plant



Car body construction

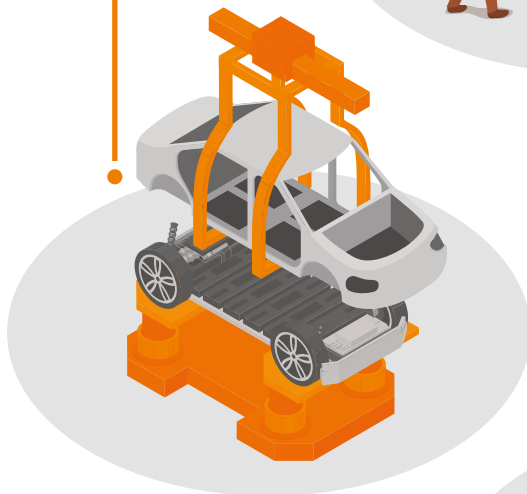


Tech up, Cost down.  
It's our job.

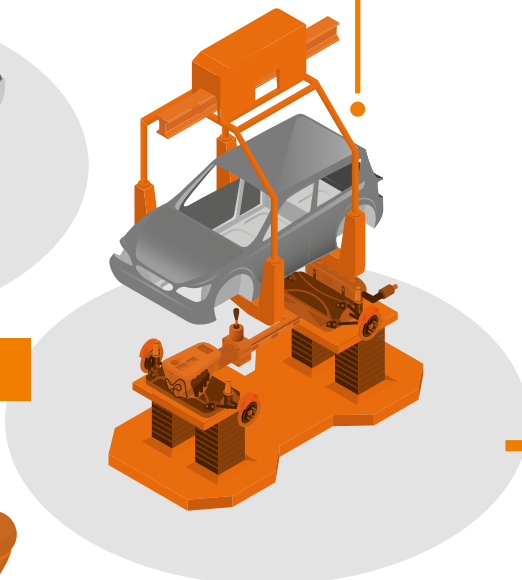
Final assembly



E-powertrain



ICE Powertrain



Painting



[www.igus.eu/automotive-production](http://www.igus.eu/automotive-production)

# Pressing plant



Large cycle numbers at high speeds and accelerations, large forces, an oily environment: these are just some of the factors that components in the pressing plant must be able to withstand. At the same time, they must meet stringent requirements, since the pressing process must not have downtime, but also be smooth, efficient, and as fast as possible. igus® components are designed for just such requirements – they are at their best during challenging movements.





[www.igus.eu/automotive-production](http://www.igus.eu/automotive-production)

# Products for automotive production Pressing plant

## e-chainsystem® E6

The E6 series offers many advantages in addition to a long service life. It offers extremely quiet, low-vibration operation by minimising the polygon effect, which occurs when the energy supply rolls.

- Extremely quiet operation – 46 dB(A) depending on speed
- Openable along the inner and outer radius
- Available as a fully enclosed tube
- Very strong in unsupported applications
- For high speeds and accelerations
- Modular design, can be lengthened or shortened as required
- Minimal vibration
- High stability and tensile strength
- Various inner separation elements available
- KMA mounting brackets can be supplied with integrated strain relief



[www.igus.eu/e6](http://www.igus.eu/e6)



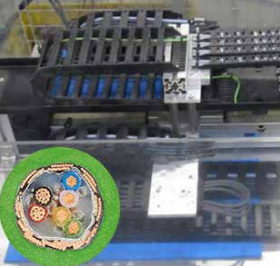


## chainflex® servo cable CF27.D with shielded pair

It is important to consider cable screening when selecting cables for motors with frequency converters. These high frequency-controlled drives, or variable frequency drives (VFDs), can have issues with electro-magnetic interference, but cables used in motors with frequency converters often only have elementary EMC protection.

Extensive igus® tests led to the development of a new shielding design for control pairs. Its high coverage and special design gives it very high levels of EMC protection.

- For extremely heavy-duty applications
- Bend radius down to 7.5xd
- Special pair shielding for 30% faster harnessing
- PUR outer jacket
- Oil-resistant and coolant-resistant
- PVC-free
- Free from halogen and silicone
- Flame-retardant
- Overall shield
- Notch-resistant
- Strip cables 50% faster with CFRIP® tear strips



## chainflex® CF113.D measuring system cable

chainflex® cables have been developed specifically for movement and are tested in more than 800 simultaneous tests in our in-house test laboratory – the CF113.D, for instance, has successfully completed 32 million strokes.

- For extremely heavy-duty applications
- Bend radius up to 7.5xd
- PUR outer jacket
- Oil-resistant and coolant-resistant
- Free from halogen and silicone
- Flame-retardant
- Overall shield
- Notch-resistant
- PVC-free
- Strip cables 50% faster with CFRIP® tear strips

 [www.igus.eu/product/1120](http://www.igus.eu/product/1120)



CF113.D

 [www.igus.eu/product/1086](http://www.igus.eu/product/1086)

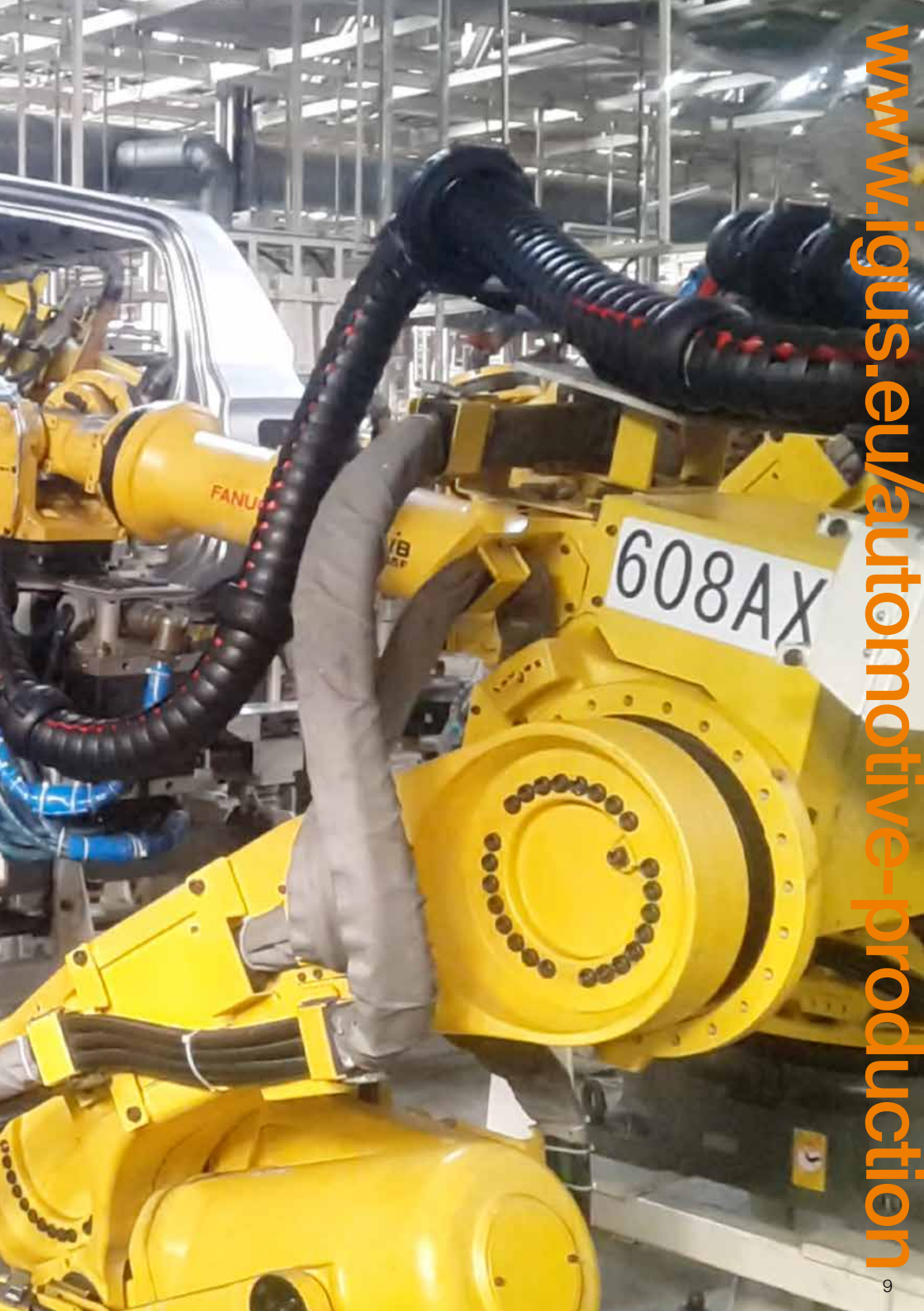


# Car body construction



The process flows in car body construction are continuous and interdependent. If a machine part stops, the entire production line stops. To protect electrical and pneumatic supplies for robots from sparks and debris under complex torsional movements, igus® has developed the triflex® energy chain. It has no problem with multi-axis movement and is easy to install, maintain and adjust.





[www.igus.eu/automotive-production](http://www.igus.eu/automotive-production)

# Products for automotive production car body construction



## igus® robotics

Harnessed dress packs and cables for robots. The packages consist of a triflex® R e-chain®, filled completely with chainflex® cables and hoses for the supply of energy, data and media. Users have the option of having the cables harnessed with connectors in accordance with 24 manufacturer standards. The dress packs allow a quick replacement of the energy supply.



## readycable® completely harnessed cables

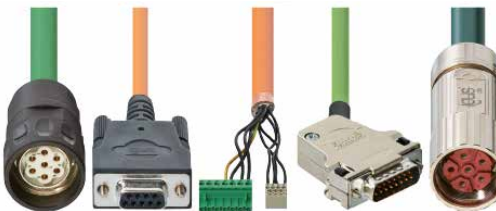
Seven cable qualities and a service life that can be calculated online

We offer around 4,600 harnessed motor, servo, signal and encoder cables that meet 24 manufacturer standards such as SEW and Siemens, which makes us the world leader in harnessed cables for use in energy chains.

With seven different cable qualities, the range always offers the most cost-effective drive cable that is guaranteed to work. Thanks to the online service life calculator for ready-to-connect cables, the expected service life for the chosen application can be calculated quickly. igus® is also the only manufacturer to guarantee cables for up to 36 months or 10 million strokes.



[www.igus.eu/readycable](http://www.igus.eu/readycable)





## triflex® RSE – Retraction system for welding, riveting and screwing robots

As automated production technology becomes more varied, the demands on the energy management systems are increasing. More and more often, not only electrical and pneumatic supplies must be routed on production robots, but also feed hoses for bolts, rivets and screws. Since they cannot cope with small bend radii, the new triflex® RSE relies on a very simple linear retraction system without deflection or sag.

## triflex® R – multi-axis e-chains® for robot applications

The triflex® R energy chain has been specifically developed for demanding multi-axis robots. Its high flexibility and tensile force absorption allow a rotation of about  $\pm 10^\circ$  per chain link around the longitudinal axis. Unlike a corrugated hose, triflex® R offers a defined bend radius, which greatly increases the service life of guided cables and hoses. Easy to lengthen and shorten.

- Cost-effective and “easy” design: simply press cables in. **triflex® TRL**
- Very easy to fill, high torsion resistance. **triflex® TRE**
- Closed design offers maximum swarf protection. **triflex® TRC**  
TRCF version can also be opened and closed



The purpose of the triflex® RSE retraction system is to hold the e-chain® as closely as possible to the robot arm so that it does not impede or block the robot's movements. The system is especially lightweight and cost-effective.

- Available for triflex® sizes 40-125
- Shorter cable lengths, as there is no deflection
- Cost-effective
- Space-saving design
- Fewer deflection points, higher process reliability, including for laser cables and fluid hoses



[www.igus.eu/RSE](http://www.igus.eu/RSE)



[www.igus.eu/triflexr](http://www.igus.eu/triflexr)

# Painting



The paint shop is a sensitive environment. No foreign bodies may contaminate the paint, and explosion protection must also be maintained. The paints that are processed play a role here, but properly designed tools and machines can have a preventive effect. That is why, in addition to energy chains made of especially abrasion-resistant material, we also offer several models made of conductive ESD material.





[www.igus.eu/automotive-production](http://www.igus.eu/automotive-production)

# Products for automotive production Painting

## ESD energy chains

Energy chains made of conductive ESD material are used to avoid static charge build-up in manufacturing processes for electronic components or assemblies.

Working with the PTB (Physikalisch-Technische-Bundesanstalt) in Braunschweig, Germany, we took measurements of the electrical surface leakage resistance for e-chains® with the igumid GC special material back in 1992 and supplemented them with additional certifications in 1998 and 1999 according to DIN 53482 and the Federation of Trade Associations ZH1/200 guidelines for static electricity.

- ESD material tested for over 10 million cycles for the toughest requirements
- Openable e-chains® with mounting brackets and interior separation in ESD design, available from stock
- Standardised product – igumid ESD
- Proven over years of use in explosion-proof areas
- Short delivery times: 24 hrs



[www.igumid.eu/esd](http://www.igumid.eu/esd)





## Cables with TPE jacket material

A cable's outer jacket protects it against such items as mechanical load, temperature and chemical substances. TPE-U materials are used primarily in flexible cables, since the material performs very well under mechanical loads and is resistant to external influences such as chemicals and extreme temperatures.

### chainflex® CF9 control cable, for example

- For extremely heavy-duty applications
- TPE outer jacket
- Coolant-resistant and low-temperature-flexible
- Resistant to hydrolysis and microbes
- Free of halogen, silicon and PVC
- UV-resistant
- Strip cables 50% faster with CFRIP® tear strips



[www.igus.eu/product/1013](http://www.igus.eu/product/1013)

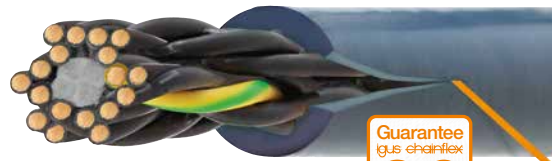
## E6.1 e-chain system®

The E6.1 system is often the first choice when e-chains® for cleanrooms, high dynamics or low noise levels are required. The easy accessibility and the high strength mean the E6.1 family are perfect for demanding tasks.

- Option without camber (NC) simply by turning the inner link
- Extremely quiet due to small pitch and “brake” in the stop-dog system (E61.29.070.055.0 at 1m/s = 32dB(A) according to igus® Internal Test 4479)
- Extremely low vibration
- Low-abrasion principle (no pin/bore connection)
- Smooth operation because there is virtually no polygon effect
- Smooth interior design for a long lifetime for cables and hoses
- E61.29 series: crossbars openable from both sides can be removed along the inner or outer radius
- About 30% lighter than the E6 system
- E61.29 series: crossbars openable from both sides can be removed along the inner or outer radius



[www.igus.eu/E6-1](http://www.igus.eu/E6-1)



# Powertrain



The powertrain production line has high machine precision and reliability requirements. The various stations, some of which have long routes, form a complex system with high dynamics, and any damage to a machine or component affects the entire production line. Production without disruption or maintenance downtime is vital.







[www.igus.eu/automotive-production](http://www.igus.eu/automotive-production)

# Products for automotive production Powertrain

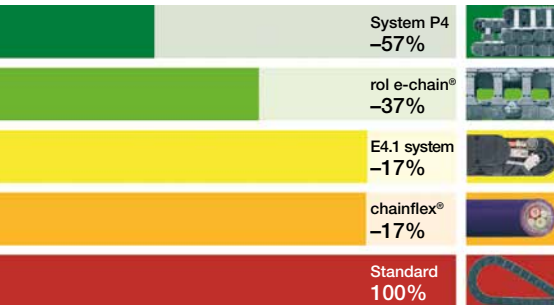


## e-chain® series P4: reduce drive force by up to 57%

The P4 system helps to lower energy consumption dramatically because, when combined with chainflex® cables, it reduces the drive forces required to move the system by as much as 57%. This is possible because the P4 e-chain® does not glide but instead rolls when moving.

- Identical pitch of the e-chain® link with or without roller
- Very quiet operation, since the upper run rollers travel through the lower run rollers (not on top of each other, as was the case for the rol e-chains used previously)
- Captive roller integrated into the side link
- Long distances (up to 800m), high fill weights (up to 30kg/m)
- For high travel speeds (up to 10m/s)
- Modular P4 kit with interior separations for the E4 system

 [www.igus.eu/P4](http://www.igus.eu/P4)



Guarantee  
igus echainflex  
**36**  
up to 36 months guarantee



### Prevent downtime in the engine plant

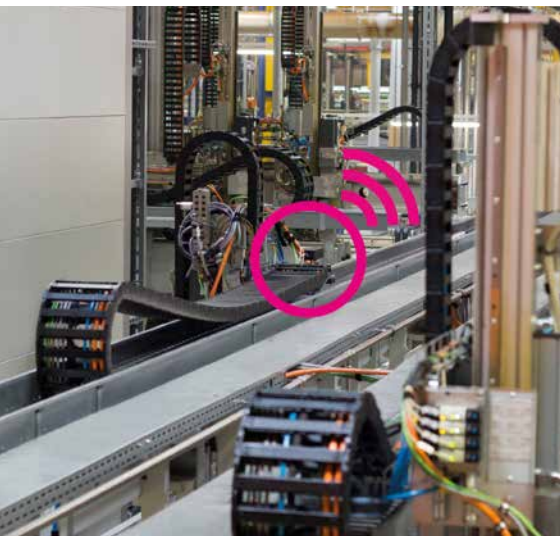
On average, an engine comes off the assembly line every 14 seconds - in peak periods, more than 6,000 engines are produced every working day. This output can only be achieved using a high degree of automation with reliable components. Companies therefore rely on smart plastics in order to avoid unforeseen failures and plant shutdowns.

With the help of a sensor unit and a polymer wire inside the energy chain, the isense EC.B module monitors the chain's condition. In the event of a chain breakage, the machine is stopped automatically to prevent subsequent damage.

isense EC.W modules have also been fitted. A sensor built into the crossbar signals advanced wear of the chain. Measuring wear data allows the chain's remaining service life to be predicted.



[www.igus.eu/smartplastics](http://www.igus.eu/smartplastics)



### P4.1 rol e-chain®

The P4.1 rol e-chain® series makes it possible to increase system safety and reliability. There is a pivot-point in every chain link connection. This point has now been re-equipped with maintenance-free high-performance polymer plain bearings, which more than double the service life.

- Longer service life (375,000km running performance) due to maintenance-free tribo-polymer plain bearings in chain link connections
- Long travels of more than 1,000m
- Speeds of more than 5m/s
- Low vibration and noise thanks to the split profile roller
- Integrated predictive maintenance sensors
- Energy chains and cables guaranteed for up to 36 months or the number of double strokes determined by the service life calculator



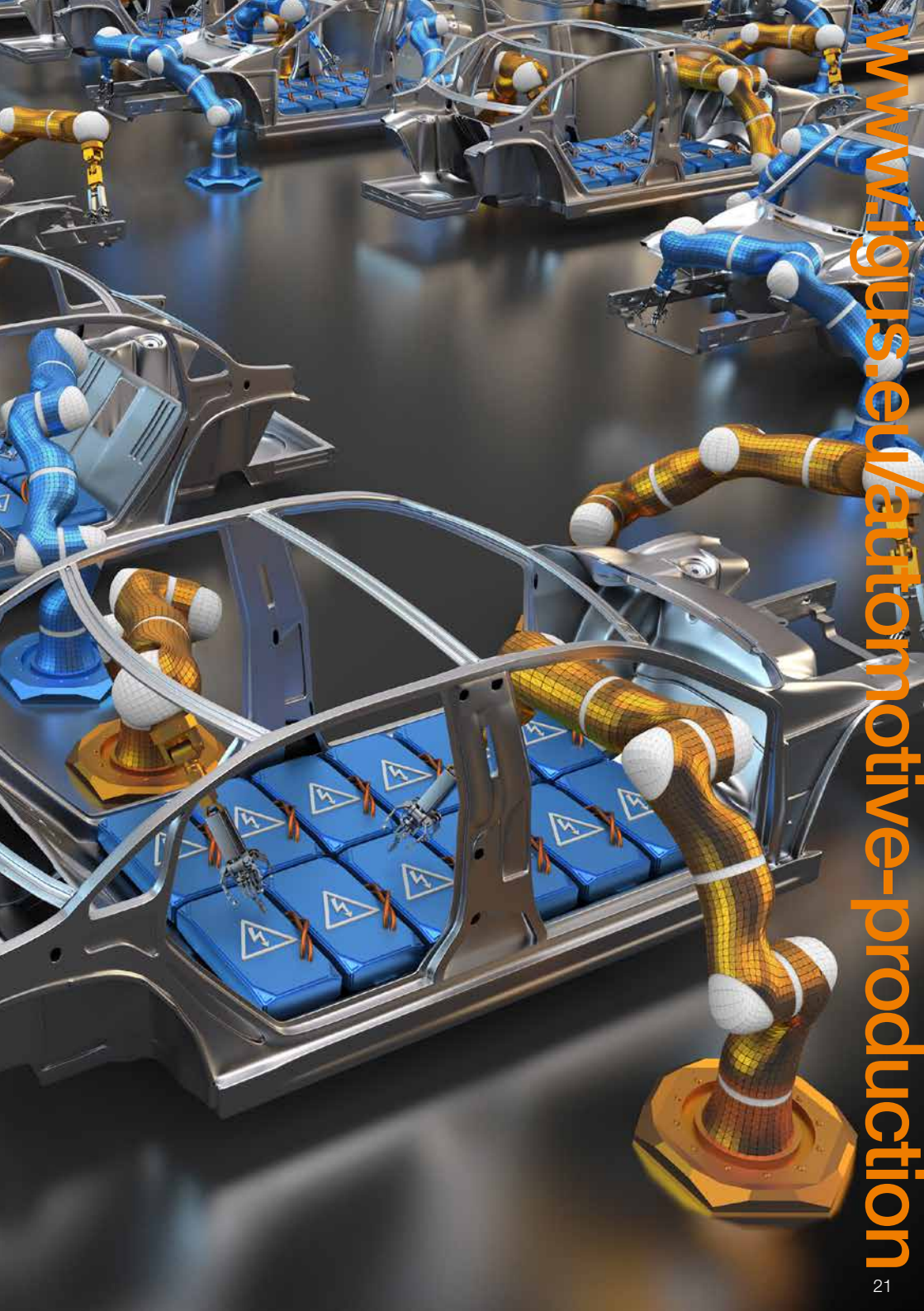
[www.igus.eu/P4-1](http://www.igus.eu/P4-1)

# E-powertrain/ hydrogen



Welding and bonding robots are a primary part of automated electrical and hydrogen drive manufacture. These precise machines are remarkable for their agility and speed. To keep up, each sub-component must fulfil certain requirements. Energy chains mounted on the robot's exterior should be flexible while protecting cables and material hoses reliably even when their bend radii are small. The energy chains should also be easy to open so that cables and media hoses can be replaced quickly.





[www.igus.eu/automotive-production](http://www.igus.eu/automotive-production)

# Products for automotive production E-powertrain/ hydrogen



## ... in use

This laser welding robot works very fast. It requires a fail-safe and flexible energy supply. The problem is that due to their different bend radii, optical cables for camera monitoring and control and power cables cannot be guided together. The solution is to guide the optical cables with the igus® FlexBar spring module, and the other cables with triflex® R e-chains®.

## Series E4.1 – chain, open-able from both sides with crossbars every link

- 1 Attachment from any side: with KMA mounting brackets
- 2 Cost-effective: optimised internal space
- 3 Easy filling: inner cross section completely accessible
- 4 Precise separation: notch crossbar with visual scale
- 5 Short assembly time: openable from both sides along the inner or outer radius
- 6 No preload: rotating the outer link results in an NC version
- 7 Chip protection: very tightly sealed lids
- 8 High strength: great forces thanks to undercut design
- 9 Straight run: due to inner/outer link principle



### When is the E4.38L used:

- If a light, cost-effective e-chain® with 38mm of inner height and high dynamics is required
- Lower weight possible with higher dynamics
- Inner width of up to 150mm
- For unsupported lengths up to 2.75m and fill weights up to 13kg/m
- If a ratio of inner to outer dimensions optimised with thinner outer links and an optimised opening crossbar geometry is required
- If very tightly fitting lids and bases that leave almost no gaps or openings are required
- Also suitable for side-mounted, standing and hanging applications
- When short installation times are required



[www.igus.eu/E4.1L](http://www.igus.eu/E4.1L)



## System triflex® R TRCF.85 series

- 1 TRCF – enclosed design with snap-lock mechanism
- 2 High tensile strength thanks to special ball and socket design
- 3 Multi-dimensional mobility: twist up to about  $\pm 10^\circ$  per link along the longitudinal axis
- 4 Easy to open for large, rigid hoses and/or many cables
- 5 Easy assembly and disassembly – injection-moulded component
- 6 Abrasion-resistant and dirt-repellent
- 7 Three-chamber system for interior separation
- 8 Small bend radii and short pitch
- 9 Extremely easy attachment to the machine/robot

### The TRCF.85 series is used when:

- A secure energy supply is required for multi-axis movements
- High torsion resistance is required
- The system needs to be easy to lengthen and shorten
- A small bend radius is desired
- High tensile strength is important
- A smooth, robust outer contour is required to avoid snagging

### Systems for other requirements

#### twisterchain®

- For circular movements with high fill weights

#### triflex® R TRE

- If an easy-to-fill variant is required

#### triflex® R TRL

- When a less expensive, less sophisticated 3D solution is desired



[www.igus.eu/web/TRCF85](http://www.igus.eu/web/TRCF85)

# Final assembly, filling equipment, material handling



The final assembly line provides the finishing touches in the production chain. However, the necessity of smooth processes is no less here than at the beginning of production. Manipulators, which often assist people in manufacturing during this step, should be easy to move. Here, lightweight but tough energy chains made of plastic are just right. Supporting rollers allow even long distances to be covered easily and reliably in these applications.







[www.igus.eu/automotive-production](http://www.igus.eu/automotive-production)

# Products for automotive production Final assembly

## rol e-chain® system – rolling instead of gliding

Conventionally designed e-chains® are used in gliding applications for long travels. The rol-e chain® was developed to expand the technical limits of this method of operation.

### Seven uses for the rol e-chain®

- Large reduction in drive power to below 25% for moving the e-chain®
- Travels of up to 800m
- speeds up to 6m/s
- Various roller types for optimum application adaptation
- Uniform roller resistance in dirty environments
- Available as a ready-to-install, harnessed system
- System guarantee for harnessed systems (depending on the application)



[www.igus.eu/E44RHD](http://www.igus.eu/E44RHD)

## igus® e-chain system® with E4/4RHD rollers – for harsh environ- ments

Great strength, low wear, and a maintenance-free roller system for reducing push/pull forces, are all reasons why the heavy-duty series igus® rol e-chain® is especially well-suited to harsh environments.

- 1 Large pin/bore connection
- 2 Low forces
- 3 Heavy duty
- 4 Strong rectangular stop-dog
- 5 Low wear
- 6 Fast
- 7 Cable-friendly interior separation
- 8 Modular
- 9 All-in-one system
- 10 Reinforced side sections
- 11 Openable from both sides
- 12 Maintenance-free
- 13 Long travels
- 14 Torsional stability thanks to undercut design
- 15 Conductive



## Difficult tasks made easy

Most of the customer-specific handling systems designed by HUSCH Handhabungstechnik GmbH, based in Höhenkirchen, Germany, are used in industries such as automotive, food and glass. igus® products and services help the company produce durable, high-quality equipment.

From the very beginning, igus® products such as energy chains for linear travels and three-dimensional triflex® R energy supplies have been used in manipulators. So have a variety of parts from the plain bearings area (iglidur® G, Z, PRT and drylin® Q) – and there are good reasons for that: long service life, toughness and freedom from maintenance. “There are even more reasons too. igus® is always moving forward, and even ten years ago, when we founded our company, it impressed us with its functionality and outstanding CAD integration”, says CEO Lorenz Humpel. “We use the CAD models provided to us, or we use the online configurator.”

Special challenges in the projects, such as wheel installation or tasks in harsh foundry environments, often include tight installation spaces or rotation around several axes. igus® products always ensure quiet operation and ease of movement. This is where the quality, durability, and toughness of motion plastics® pays off.



# Innovations for automotive production



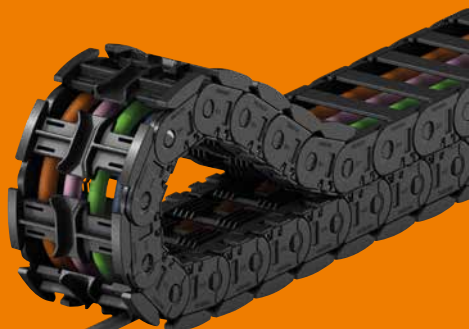
Fibre-rod system for UR10 + UR10e  
[www.igus.eu/ur10](http://www.igus.eu/ur10)



CRM – compact rotary module  
[www.igus.eu/info/rotary-module](http://www.igus.eu/info/rotary-module)



igubal® JEM-SP  
[www.igus.eu/jem-sp](http://www.igus.eu/jem-sp)



autoglide 5  
[www.igus.eu/autoglide5](http://www.igus.eu/autoglide5)



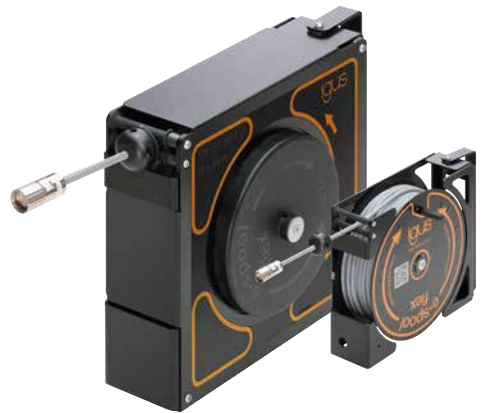
chainflex® CASE  
[www.igus.eu/cfcase](http://www.igus.eu/cfcase)





drylin® ZLW seventh axis

[www.igus.eu/info/n20-zlw-7th-axis](http://www.igus.eu/info/n20-zlw-7th-axis)



e-spool® flex 2.0

[www.igus.eu/e-spool-flex](http://www.igus.eu/e-spool-flex)

### autoglide 5 – the alternative to the busbar

- Energy, data, air and liquids in ONE system
- Often saves two or more other systems needed for transmitting data
- 4m/s speed
- 80m travel
- Quiet operation: 63db(A) at 2m/s
- 50% of the hall floor remains free, no guide trough needed

### chainflex® CASE – ship'n store for shipping and storing goods on reels

- Simple storage directly at the place of use and unreeling right from the box
- The QR code label link to the product page makes reordering 60% faster

### CRM – compact rotary module – the rotary module from the e-spool® flex series

- No slip ring
- Can be equipped with any kind of line (electricity, data, air or fluids)
- Can also be equipped with corrugated tubes
- Small installation space, very low profile
- Rotation angle up to 6,480° (depending on system)

### drylin® ZLW 7th axis – more flexibility for universal robots

- Matching adapter kits for robolink® DP and UR with UR Cap Integration
- Up to four times more workspace for robots
- Ready-to-install linear 7th axis in robotics
- Flexible stroke length of up to 3,000mm; longer stroke lengths available upon request

### e-spool® flex 2.0 – retractable supply of energy, data, air and liquids, without slip ring

- Without interruption (no slip ring)
- Space-saving, can be mounted anywhere
- Constant tensile load on the cable
- Locking mechanism for the cable

### Fibre-rod system for UR10 + UR10e for optimal cable guidance

- Elongated holes allow infinite fibre-rod module adjustment
- Directed preload
- Easy to retrofit
- Low wear if the e-chain® is kept above axes 4-6

### igubal® JEM-SP – solid steel housing with maintenance-free iglidur® J polymer spherical ball

- Service life in dirty environment up by a factor of 8 higher than with ball bearings
- Support greater static loads

# chainflex® cables for automotive production

## PROFINET cables: the leading cable for any movement application

The igus® chainflex® cable range includes a variety of PROFINET cables: it has a total of nine different cable types, all specifically developed for constant movement in the energy chain.



[www.igus.eu/info/unharnessed-cables-profinet](http://www.igus.eu/info/unharnessed-cables-profinet)

## Guarantee of up to 36 months for all cables ...

We issue a guarantee of up to 36 months for our cables, because we are able to make reliable predictions about their service life thanks to more than 30 years of experience in our 3,800m<sup>2</sup> test laboratory and 700 concurrent experiments.

igus® has now become the first German company to have this promise validated for its chainflex® cables. In a painstaking certification process “Underwriters Laboratories” confirmed its accuracy.

**igus 36-month  
chainflex cable  
guarantee and  
service life  
calculator based  
on 2 billion test  
cycles per year**



You can find all the information about the chainflex® test laboratory here:



[www.igus.eu/info/unharnessed-cables-tests-overview](http://www.igus.eu/info/unharnessed-cables-tests-overview)



## chainflex® CFROBOT – Robot cables for 3D movements with large torsional components

The increasingly complex movements in industrial applications demand twistable and/or three-dimensionally moving cables with a long service life such as classic chainflex® cables. A movable robot arm, for example, generates high bending, centrifugal and torsion forces in a robot cable. All of our chainflex® robot cables have been specifically designed and tested for this special requirement.



[www.igus.eu/CFROBOT](http://www.igus.eu/CFROBOT)

# IO-Link cable for torsional and e-chain® use

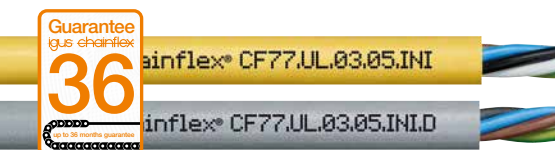
## Tech up

- Optimised for twisted ( $\pm 180^\circ/\text{m}$ ) use in robots
- For small installation spaces (up to 6.8xd) with a service life that can be calculated online

## Cost down

- Costs 32% less than currently available solutions,

such as CF77.UL, CF77.UL.D



 [www.igus.eu/new-chainflex-io-link](http://www.igus.eu/new-chainflex-io-link)

# Robot motor cable for rotation angles of $180^\circ/\text{m}$ in twistable applications

Targeted expansion of the chainflex® product portfolio, adding cables with PUR outer jackets

## Tech up

- Optimised for twisted ( $\pm 180^\circ/\text{m}$ ) use on robots
- Product range addition for small installation spaces

## Cost down

- Use in small installation spaces

CFROBOT 7, for example



 [www.igus.eu/info/n20-cfrobot7](http://www.igus.eu/info/n20-cfrobot7)

# More than 1,354 chainflex® cable types from stock

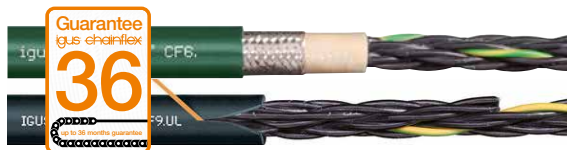
## Flexible control cable

Depending on the type, chainflex® control cables can be torsion-resistant, suitable for especially narrow radii or very low temperatures, UV-resistant, flame-retardant and halogen-free. Tested in the igus® laboratory with millions of cycles in e-chains®, they provide guaranteed reliability.

PVC, PUR and TPE provide a large product range for any application area, shielded and unshielded cables, and a large number of cross-sections and core types.

- No. 1 in terms of choice, testing and guarantee
- Can be calculated and configured

Control cables, e.g. CF5/CF6, CF9/CF10



 [www.igus.eu/info/unharnessed-cables-control-cables-chainflex](http://www.igus.eu/info/unharnessed-cables-control-cables-chainflex)

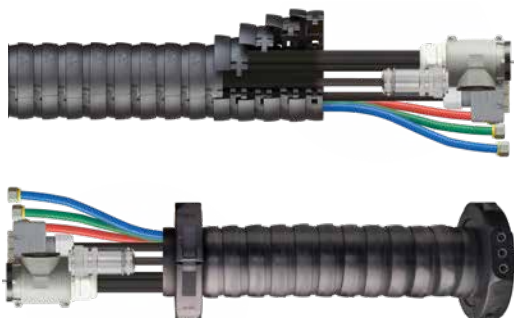
# Harnessed for you

## Harnessed hoses and cables for robots

The packages consist of a triflex® R e-chain®, filled completely with chainflex® cables and hoses for supplying energy, data and media. Users have the option of having the cables harnessed with connectors in accordance with 24 manufacturer standards. The dress packs allow a quick replacement of the energy supply.



[www.igus.eu/info/energy-chains-hose-packages](http://www.igus.eu/info/energy-chains-hose-packages)



## Module Connect – an energy supply with just ONE connector

One housing and more than 100 freely combinable industrial plug inserts for electric cables, fibre optic cables and pneumatics, provide countless combinations for your tailored interface from a modular kit.

- **Flexible thanks to mounting brackets** for wall or floor mounting and joint connection
- Various **sealing elements** adapt individually to different cable diameters: **three or four cable outlets**
- Strong and easy to handle thanks to the one-piece, screw-on **clamping jaw**
- Fibre-reinforced high-performance polymer **takes less space and weighs less** than conventional rectangular connectors
- **connected in seconds**
- Up to four HARTING Han Modular inserts per housing (pneumatics, power, bus and signal, for example): **more than 100 plug inserts to choose from**



[www.igus.eu/moduleconnect](http://www.igus.eu/moduleconnect)







## Ready-to-connect AIDA cable packages for automation

The German Automobile Manufacturers Automation Initiative (AIDA) has established guidelines for the wiring that connects the switch cabinet, the robot base and the moving robotic axes.

igus® readycable® follows this standard for robot cabling in automotive production and now offers ready-to-connect chainflex® cables for safe and reliable use from the catalogue or according to individual specifications.

You can request more information at:

 [www.igus.eu/aida](http://www.igus.eu/aida)



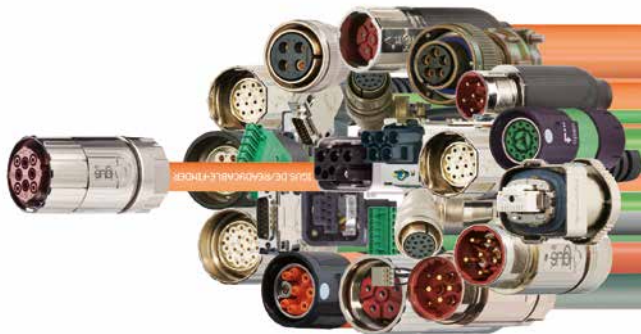
## Harnessed cables: readycable®

readycable® harnessed cables are ready-to-connect cables for use in energy chains. As a manufacturer and harnesser, igus® offers everything from a single source, reducing throughput times and the number of suppliers. The portfolio includes an extensive range of catalogue products, including cables harnessed according to manufacturers' standards and various industrial standards as well as customised components produced singly or in volume. Numerous cable types and qualities, with different approvals and certifications of conformity, to choose from. All components are subjected to extensive quality checks and function tests.

 [www.igus.eu/readycable/robot-cable](http://www.igus.eu/readycable/robot-cable)

### Request a customised cable

Is your drive manufacturer not listed in our catalogue range of products? Can't find the cable you want? No problem: custom harnessing is part of our daily business!



# readychain® – e-chain system® delivered pre-assembled and ready to install



## readychain® saves 3-8 hours of assembly time

In 12 readychain® factories around the world, 1,600 systems are produced each week – assembly time-optimised to increase your cash flow. The largest factory for harnessed readychain® systems (4,700m<sup>2</sup>) with 160 employees in Cologne.

- Eliminate storage costs for cables, e-chains® and connectors
- Cut throughput times in half
- Flexibility when orders vary
- Reduce the number of suppliers and orders by 75%
- Minimise your machine downtime
- System guarantee – depending on the application



[www.igus.eu/readychain](http://www.igus.eu/readychain)



## The largest test laboratory in the industry – Experience, test data, tools





## The igus® laboratory and field experience

Cutting costs while guaranteeing maximum process reliability – this gap can be bridged only with intensive research and testing. The industry's largest test lab conducts more than two billion test cycles per year on a total of 107 test rigs. Our mechanical engineering components work reliably in real-world manufacturing because they have already passed the test before they ever leave the igus® warehouse.

- 3,800m<sup>2</sup> chain and cable laboratory in Cologne
- More than 15,000 tests, around 4,000 for e-chains® and chainflex® and around 11,000 for dry-tech® (rotating, pivoting, linear, tumbling, heated, underwater, and so on.)
- 450 test rigs for bearings
- 10 billion e-chain® cycles
- 3,500 tested cables
- 400 customer-specific examinations

 [www.igus.eu/test](http://www.igus.eu/test)

## Test data and tools

We don't stop using the data obtained by various testing methods from our test laboratory when we finish with development. Our customers enjoy the advantage of being able to access our experience, the test results, and the materials technology that has grown out of them – in a processed form: online, we offer numerous tools free of charge to help you choose and buy the right products:

- Service life calculator
- Configurators for product comparison
- Product finder
- Product configurators
- CAD configurators

 [www.igus.eu/online](http://www.igus.eu/online)

## One of more than 50 online tools

### Robot equipment configurator

Find the right energy supply for 400 types of robot online. Use the new igus® robot equipment configurator to get customised, reliable energy supply for industrial robots in just a few clicks.

 [www.igus.eu/quickrobot](http://www.igus.eu/quickrobot)



# e-chains® for automotive production



## e-chain® E2.1 series

The E2.1 series e-chains® adapt to the requirements of the machine, not the other way round: you can choose the best energy chain or energy tube for safe and reliable cable guidance from over 850 different variants – including as a system consisting of chain, cables and connectors.

More filling space, easy filling and assembly, as well as long service life are just some of the benefits of the E2.1 series. This new generation of two-piece energy chains was developed as part of continuous improvement of the preceding series (E2/000), which has proved its worth for over 15 years. The E2.1 series offers extremely fast filling from the side or from the top – either in the inner or outer radius, using a chain opener or screwdriver.

### Tech up

- 20% to 30% larger gliding surfaces for longer service life in gliding operation than the previous series (E2/000)
- 7dB(A) quieter due to an integrated brake starting at size E2.26
- Also available as a fully enclosed version, a standard solution for hydraulic hoses
- 10% more strength than the previous series (E2/000)
- Good accessibility: crossbars can be opened from both sides, from above and from the side on the inner or outer radius

### Cost down

- The new closed E2C.21 design costs around 30% less than the previous series (E2/000)
- Longer service life thanks to gliding surfaces for gliding applications
- Simplified interior separation system installation thanks to an integrated grid
- Cable-friendly due to smooth interior
- Extremely small bend radii (from 28mm) so that less installation space is needed
- Guaranteed for up to 36 months\*\*
- Predictive maintenance – optionally with the additional **i.Sense** module



[www.igus.eu/E2-1](http://www.igus.eu/E2-1)



1 Optional noise dampening – 17dB(A) less noise <sup>2</sup>

2 20% greater strength <sup>1</sup>

3 Crossbars (e-chain®)/lid (e-tube) – 40% faster filling <sup>1</sup>

4 10% less weight <sup>1</sup>

## e-chain® E4Q series

E4Q series energy chains were developed to offer the best possible solution for unsupported and long travels. Based on the robust E4.1 energy chain standard, proven over the course of 12 years, the new series brings a long service life and a high degree of modularity.

### Tech up

- Tool-free opening and closing
- Reduced projection into the interior for easier filling with the open e-chain® <sup>1</sup>
- 15% greater crossbar pull-out strength <sup>1</sup>
- 10% less weight thanks to material removal <sup>1</sup>
- Optional: 17dB(A) quieter thanks to noise-dampening parts made of noise-reducing material <sup>2</sup>

### Cost down

- Up to 40% less installation time than for the E4.1 system
- Up to 35% saving possible in borderline applications <sup>3</sup>
- Guaranteed for up to 36 months\*\*
- Predictive maintenance – optionally with the additional **i.Sense** module

<sup>3</sup> Higher fill weight allows more cost-effective, smaller series to be used if necessary

<sup>1</sup> Compared to the E4.1 system

<sup>2</sup> Compared to the 4040C series

# Condition monitoring: i.Sense

If smart plastics are used for condition monitoring, they immediately report any unexpected operating state, switch off the system or sound an alarm. Industrial manufacturers use this function to minimise system failures and downtime.

- Records machine status regularly or constantly
- Avoids crashes with fast switch-off
- data recording modules

 [www.igus.eu/info/condition-monitoring](http://www.igus.eu/info/condition-monitoring)

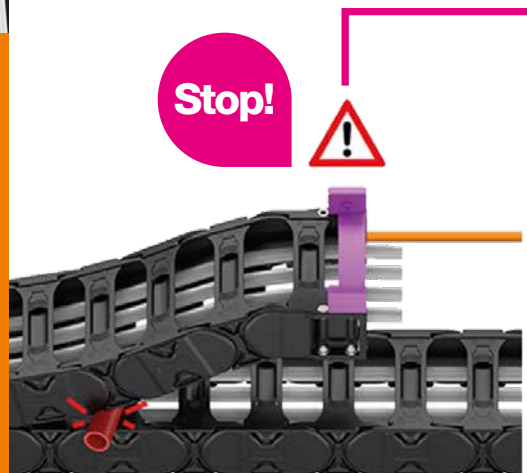


## Module

- Evaluate all sensor data based on igus® algorithms
- Inform the system controls in real time of any mechanical faults that occur

## Condition monitoring

Condition monitoring means regular or continuous detection of the machine's condition (in areas such as wear). This is done in pursuit of two goals: reliability and machine efficiency.



IS.EC.P



## Control cabinet

- simple module installation on top-hat (DIN) rail
- Integration into the existing plant control system via NC contacts
- 24V DC voltage supply



IS.EC.P



IS.EC.B



IS.CF.P

## Sensor units

- IS.EC.P  
push/pull force detection for energy chains
- IS.EC.B  
energy chain breakage detection
- IS.CF.P  
tensile force monitoring for cables



IS.EC.B



IS.CF.P

# Predictive maintenance: i.Cee

The central element of the predictive maintenance system is the i.Cee software. Working with sensors on the energy chain, the plain bearing bush or a linear carriage, it transforms products deliverable from stock into smart products. This upgrade creates the capability of determining your igus® product's maximum service life and the perfect servicing time. The software we provide and a few sensors transform standard products available from stock into a smart energy supply system or smart bearing technology in no time.

- Avoid expensive production stoppages
- Precise prediction of maintenance
- Maximise the service life of the igus® components you are using
- Another quick, simple step for integrating your system(s) into networked Industry 4.0 concepts



[www.igus.eu/predictive-maintenance](http://www.igus.eu/predictive-maintenance)

## i.Cee Hardware

### i.Cee:box

- Installation on or in the control cabinet for wireless communication with the sensor modules via LoRa technology
- Central unit for communication with LoRa sensors
- Supply of several assets possible
- Power supply via Ethernet cable
- i.Sense modules can also be connected via USB

### i.Cee:plus

- Installation on top-hat (DIN) rail in control cabinet
- Sensor data storage and processing
- Continuous product service life calculation
- Upgrade to Cloud possible

### i.Cee:custom

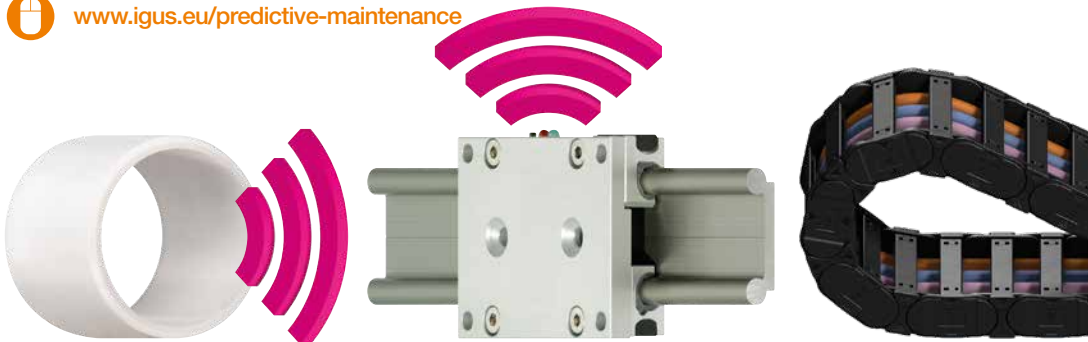
- igus® supplies the i.Cee software and uses the customer hardware
- Individual solution development with the customer

### i.Cee:net

- Can be connected to the igus® cloud (optional)

## Sensors

provide abrasion and movement data

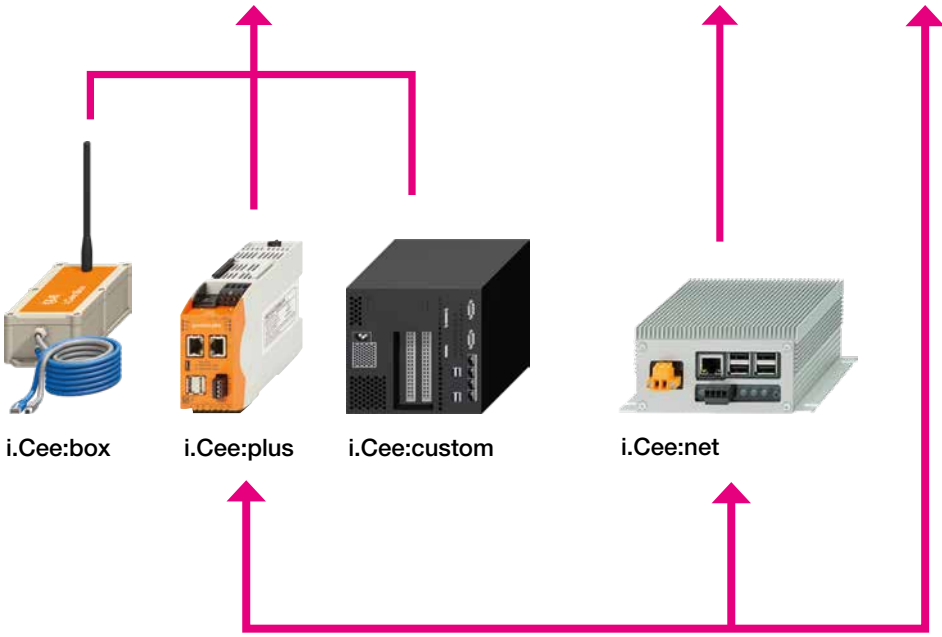
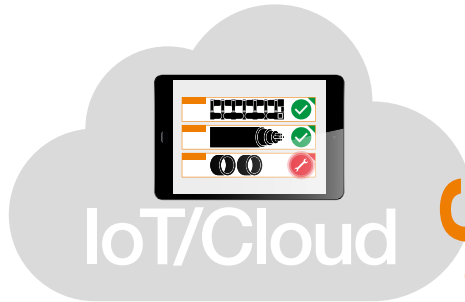
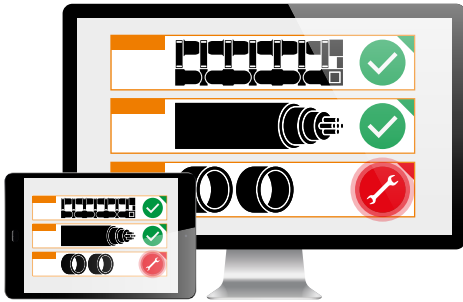




Two options for data transmission

Offline: i.Cee:software  
i.Cee:local

Online:  
i.Cee:cloud



[www.igus.eu/smartplastios](http://www.igus.eu/smartplastios)

# igus® service

- Data collection and engineering service
- Modernisation of your energy supply equipment
- Pre-assembled readychain® systems
- Minimal downtime
- Installation and supervisor service
- Inspection/maintenance service and guarantee extension

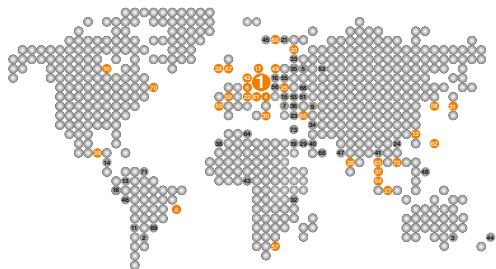


[www.igus.eu/assembly-service](http://www.igus.eu/assembly-service)

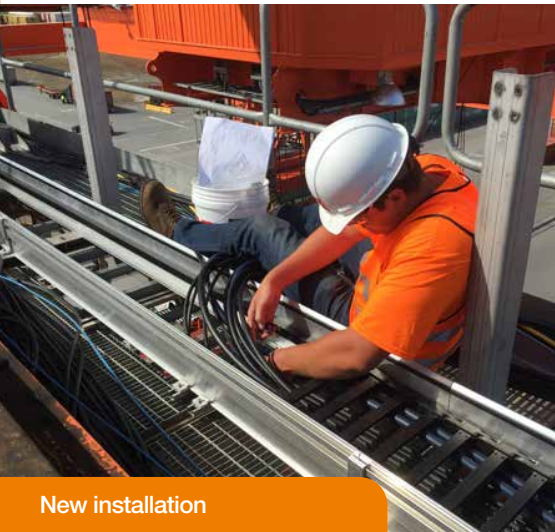
## Short reaction times



Project planning

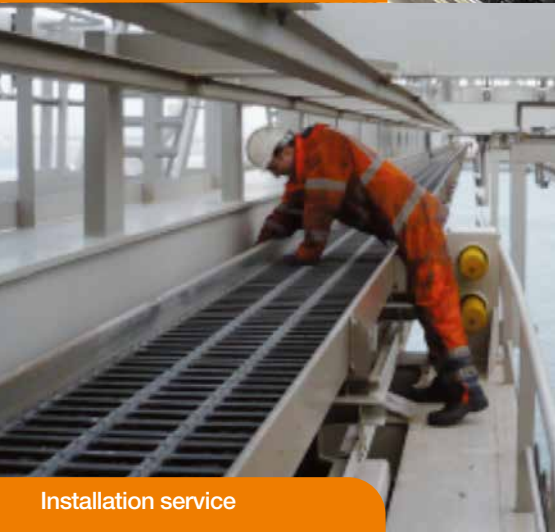


Harnessing

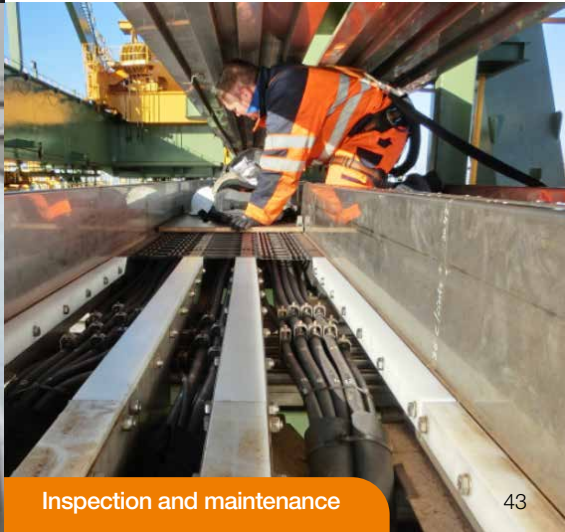


New installation

## Modernisation, conversion, retrofitting



Installation service



Inspection and maintenance

# Sustainability at igus®

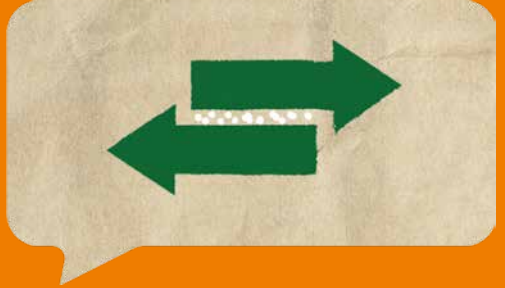
Since 1964, we have been developing high-performance polymers for movement that advance our clients' manufacturing efforts. We want them to improve technology and reduce costs.

From the very beginning, recycling was an important issue, and now we reuse 99% of our plastic waste from production by processing it to make granulate material, which we feed back into the production process.

Products that last longer and require no lubrication contribute to preserving our environment. No lubricants means less pollution. Less abrasion means less pollution with microplastics. Less weight means less energy required for movement.



Rarely replace ...  
Durable material



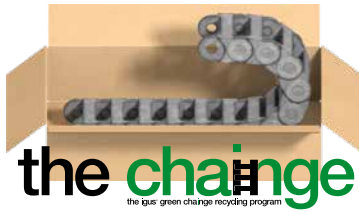
Extremely low friction, saving energy ...  
Optimised tribology



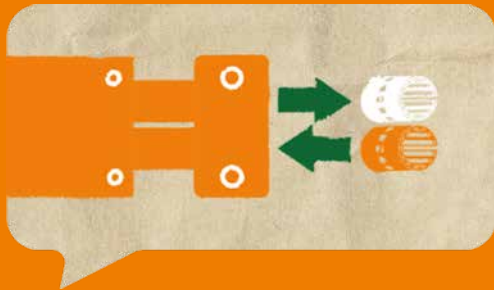
No lubricating oil pollution ...  
Lubrication-free and clean bearing technology



Lightweight, saving energy ...  
Lightweight polymer material



**New life for old chains ...**  
Recycling of old energy chains



**Save resources and cost ...**  
Exchange bearings for drylin® linear guides



**Replace only damaged parts ...**  
Predictive maintenance with smart plastics



**99% of the waste can be reused ...**  
Internal recycling since the company's founding

## change Recycling Programme for energy chains

You can send us your old energy chains instead of simply disposing of them with the rest of your industrial waste.

The key is that we accept all energy chains, even those from other manufacturers. We separate the material and shred it on site. We turn the granulate material from competitors' chains over to circular economy exchanges. We use the recycled material from igus® e-chains® for the injection moulding of new products. We reward your commitment with an igus® voucher based on the weight of the chains you send us.

It's simple:

 [www.igus.eu/change](http://www.igus.eu/change)

## Other projects

**Plastic2oil:** in order to support the plastics circular economy, igus® has now invested EUR 4.7 million in a company that plans to start up the first commercial Cat-HTR™ plant. Catalytic hydrothermal reactor technology can be used to convert plastic waste to mineral oil in just 20 minutes.

The “**clean igus®**” programme: plastics in production do not end up as waste, but are collected and recycled.

**Local reforestation projects** with our subsidiaries worldwide

**Our environmental management is certified according to ISO 14001.**

An internal project group continuously introduces sustainable everyday improvements.

 [www.igus.eu/sustainability](http://www.igus.eu/sustainability)

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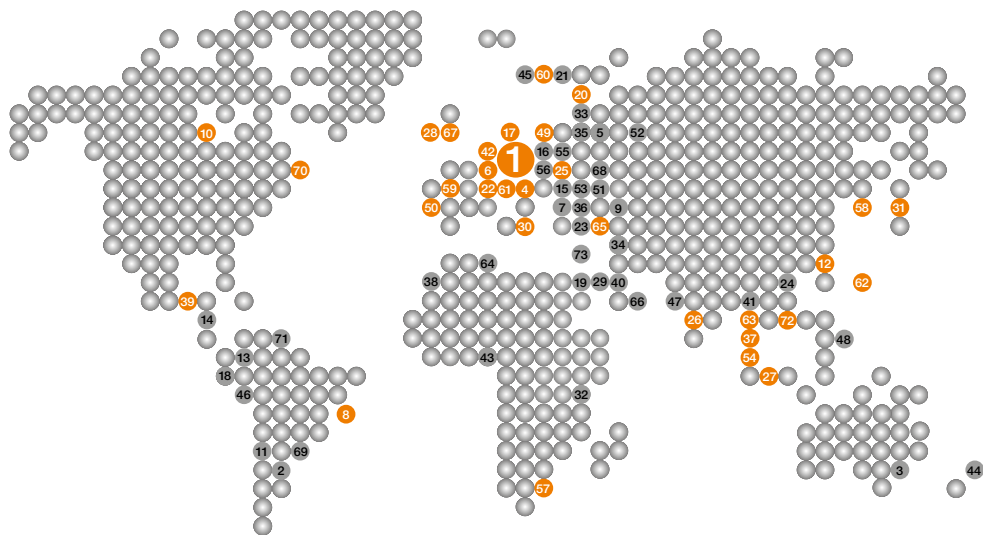
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