

Cranes

Moving energy supply solutions for port equipment



• Tech up, cost down. It's our job.

igus[®].eu ■■■

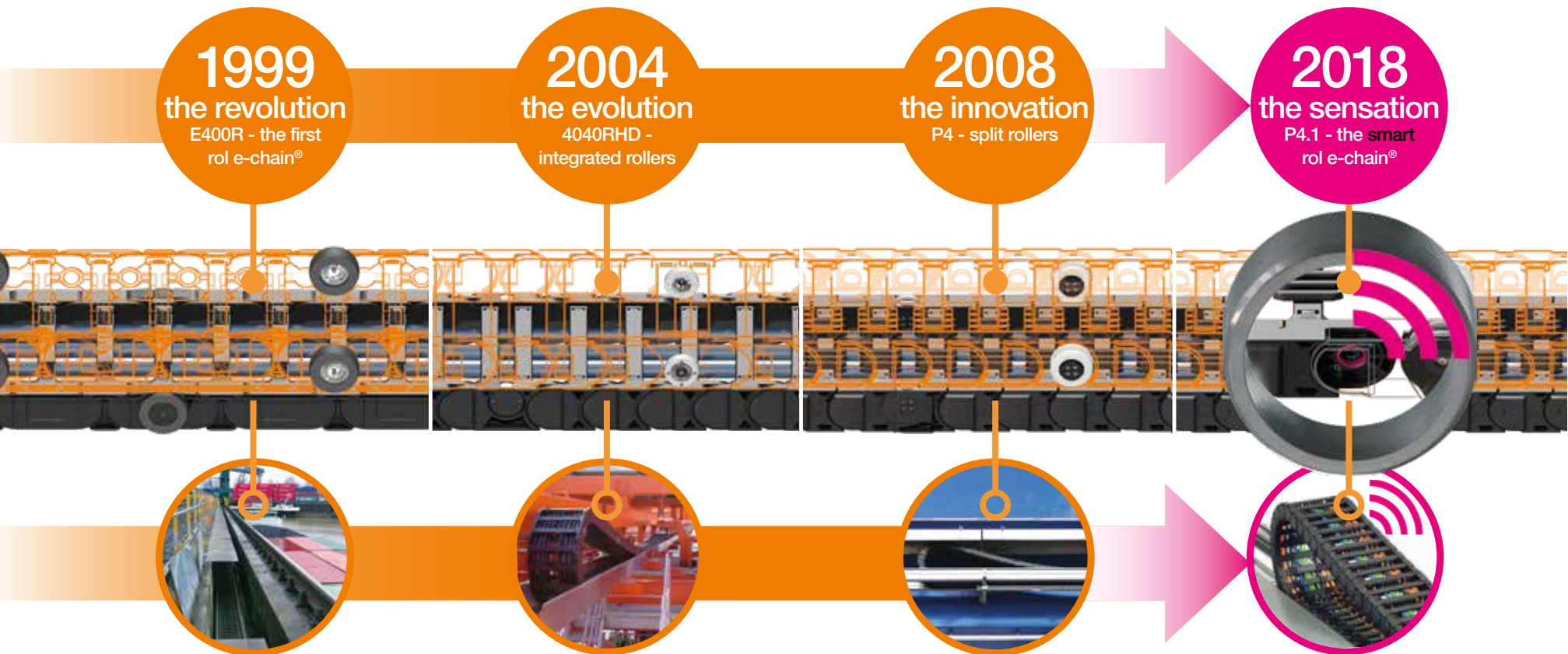
www.igus.eu/cranes

motion plastics® - moving energy supply systems for port equipment

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

The port - a tough environment with high equipment duty cycles and no tolerance for unexpected equipment downtime. igus® energy chain systems and chainflex® cables have proven their durability under these conditions as a cable management system for trolley travel on over 1,280 Ship-to-Shore cranes and close to 7,200 RTG, (A)RMG and ASC cranes world wide. In 1999 a milestone was set for igus® with the installation of the first igus® rol e-chain® for a 130m crane travel at a river port in Germany. The integration of rollers into the side part of the

chain link helped to significantly reduce the coefficient of friction and therefore the energy needed to move the chain system. The rol e-chain® opened the doors to travels beyond 100m and became the standard for crane applications. Today, the igus® energy chain ensures safe and secure cable guidance on various reach stacker models, spreaders, bulkhandling and shipyard cranes. Also long travel lengths, such as the quayside travel of Ship-to-Shore cranes or high speed ASC stacking travels can be realised.



www.igus.eu/cranes



Straddle Carrier
Spreader travel



Rubber Tyre Gantry (RTG)
Trolley Travel



Rail Mounted Gantry (RMG)
Crane Travel



Goliath Crane
Top and bottom trolley travel



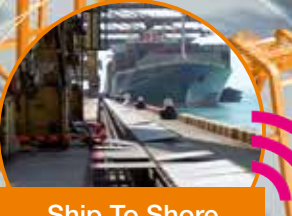
Spreader



Ship To Shore Cranes (STS)
Trolley Travel



Automated Stacking Cranes (ASC)
Trolley Travel
Crane Travel



Ship To Shore Cranes (STS)
Crane Travel

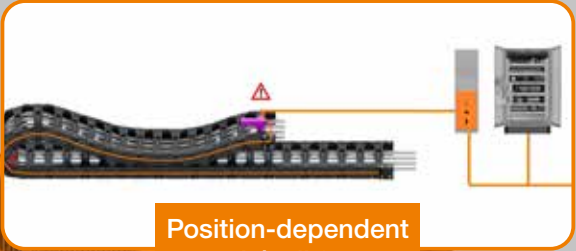
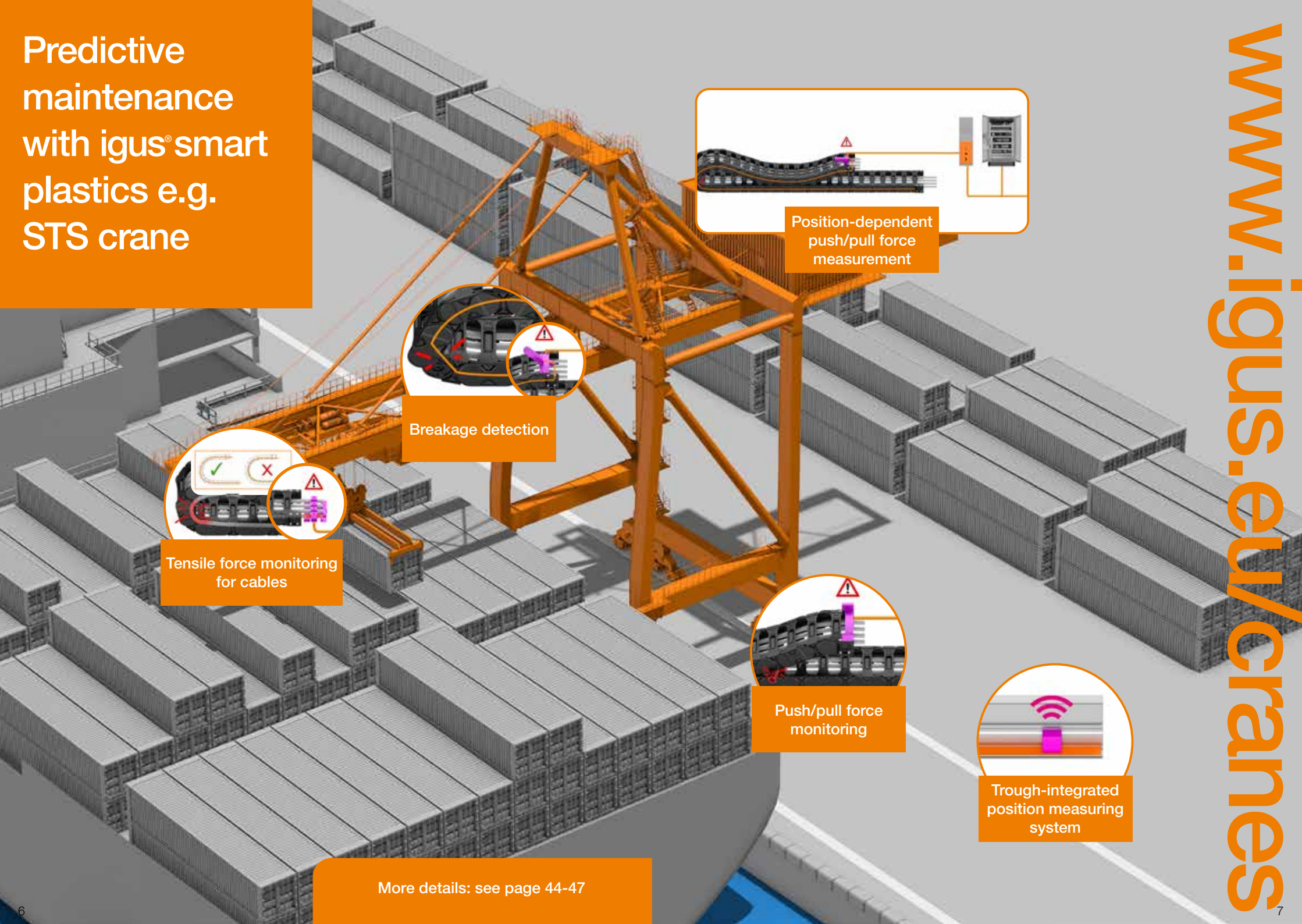


Reach Stacker
Boom & cabin movement

Maintenance-free
and
weather-resistant
- motion plastics®
for port equipment

www.igus.eu/cranes

Predictive maintenance with igus® smart plastics e.g. STS crane



Position-dependent push/pull force measurement



Breakage detection



Tensile force monitoring for cables



Push/pull force monitoring



Trough-integrated position measuring system

More details: see page 44-47

Always the right solution for the port industry

Container cranes are increasing in size and trolley speed to accommodate ever growing ship sizes and faster turnaround times, setting new requirements for the trolley cable guidance system. With innovations, such as the roller integrated into the chain link, and the latest monitoring and remote energy chain diagnostic tools, igus® energy chain systems are well designed for longer and higher speed trolley travels. The chain system offers a safe and reliable cable guidance solution, with technical and economical benefits to the end user.

The main advantages of an igus® energy chain system for crane builders and operators are:

- igus® smart plastics® - enabling precise maintenance planning
- Low maintenance requirement - less equipment downtime
- Designed for high traveling speeds - no additional drives or control systems required
- Space-saving design - lower installation height & no cable loop station

For further information and application examples of crane applications and port equipment, go to our website:

www.igus.eu/cranes



www.igus.eu/cranes

Ship-To-Shore trolley travel



Energy chains with integrated rollers reduce the friction needed to move the chain and reduce the wear over the lifetime of the chain. igus® has over 20 years experience in the design and operation of rol e-chains®. The first rol e-chain® on a Ship-to-Shore crane was installed in 1999 in the Netherlands.

www.igus.eu/cranes

Ship-To-Shore trolley travel



igus® energy chain systems can be installed on all types of Ship-to-Shore cranes, whether it is a double trolley, shuttle boom or gooseneck design. Depending on the type of crane, the chain system can be positioned either on top, on the side or below the crane girder.



www.igus.eu/cranes

Ship-To-Shore quayside travel



With travel lengths of more than 900m, igus® energy chain systems, in combination with igus® chainflex® medium-voltage cables, are a suitable alternative to classic cable reeling or bus bar systems for the quayside or container stacking travel.



www.igus.eu/cranes

RTG trolley travel



For over 20 years igus has been driving the change of the cable guidance system on RTGs. Today the energy chain system is a well established cable guidance system for trolley travel, in use on numerous RTGs around the world. The heavy-duty series 4040(R)HD chain, as a gliding or roller chain version, is the preferred choice. Also the igus® chainflex® cables, with TPE outer jackets, have proved to be long lasting in this demanding environment.



www.igus.eu/cranes

(A)RMG trolley travel



With longer travel lengths and a bigger cable package, the (A)RMG mostly requires an opposing energy chain system to safely guide all cables in a compact installation space. The chain system can either be installed on top or on the side of the crane girder.



ASC trolley travel

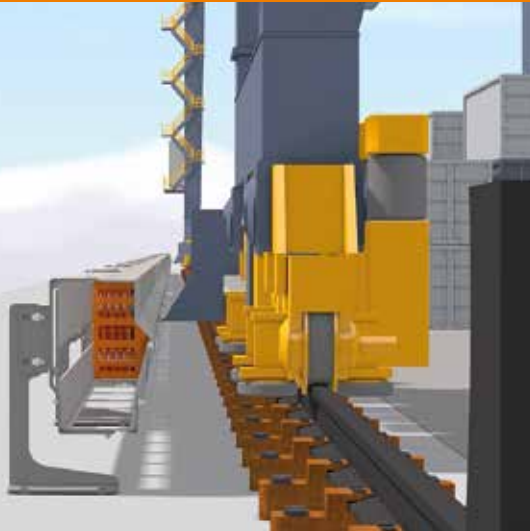


With the removal of the driver from the equipment, automatic stacking cranes require a safe and reliable cable guidance system. igus® heavy-duty roller chain systems, in combination with igus® chainflex® cables, provide a safe and dependable solution, with very little maintenance required.



www.igus.eu/cranes

ASC/(A)RMG crane travel



The igus® energy chain system is a suitable alternative to the classic cable reeling system for ASC stacking travels. It offers secure cable guidance for standard igus® chainflex® cables, without adding any additional weight to the crane. Less maintenance is required when compared with a cable reeling system, as no additional power and control systems are required and no slip rings or rotary units are used.



Goliath Crane trolley travels



The first energy chain system installed on a Goliath crane was for a US shipyard in 1997. Since then, igus® has equipped over 100 Goliath cranes (new builds and retrofits) around the world with a chain system for the upper and lower trolley. With travel lengths of up to 165m, the igus® heavy-duty roller chain® series 4040RHD and 5050RHD are the first choice to carry the high cable loads.

Goliath Crane trolley travels



A guided standing energy chain has proven to be a superior alternative to traditional pantograph solutions for the safe cable and hose guidance for the spreader movement on Straddle Carriers. Installed along the side of the leg, below the driver cabin, the system allows an unobstructed view of the spreader. The chain system also positively influences the driving behaviour of the machine, especially during cornering.



www.igus.eu/cranes

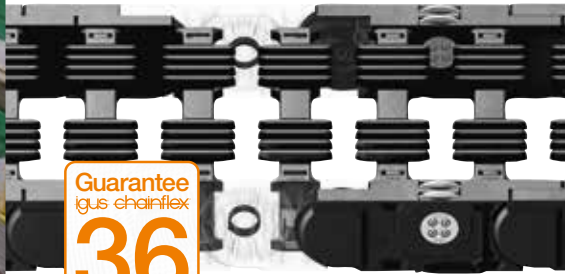
Reach stacker boom & cabin travel



To safely guide the cables and hoses for the boom and cabin travel on Reach Stackers, igus® polymer chains offer a lightweight, corrosion and lubrication-free solution.



www.igus.eu/cranes



Guarantee
igus chainflex
36
month guarantee

Profile rol e-chain®: for very high fill weights and speeds

- Very low noise and vibration
- Abrasion-resistant energy supply system on long travels up to 800m or more
- Increase efficiency and reduce energy consumption

 www.igus.eu/P4



Guarantee
igus chainflex
36
month guarantee



rol e-chain® for STS application: rolling instead of gliding

- Long travels of more than 800m are possible
- For extreme travel speeds of up to 10m/s with cable loads of up to 50kg/m
- Resistant to weather effects

 www.igus.eu/role



Guarantee
igus chainflex
36
month guarantee

For almost any application: E4.1 system in a reach stacker

- The best e-chain® in the product range
- Stronger whilst having the same or even smaller dimensions than previous versions
- Almost all accessories and mounting dimensions are identical.

 www.igus.eu/E4-1

Heavy duty: e-chains® for the highest loads

- High loads up to 100kg/m or more
- Extremely torsion-resistant and wear-resistant thanks to large gliding surfaces
- Extremely high tensile strength for long travels

 www.igus.eu/E4HD



The standard: modular aluminium guide-trough construction kit

- Heavy duty version of the construction kit system
- Very simple, modular assembly
- Corrosion-resistant, seawater-resistant aluminium profile (acc. to EN 6060)

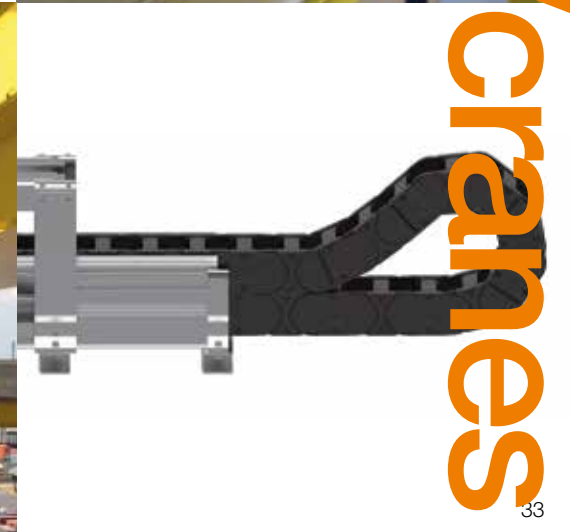
 www.igus.eu/s-alu



Aluminium trough with anti-rise guard: for more safety

- Anti-rise guard for use in very long travels now available from stock
- Seawater and corrosion-resistant
- Enhanced reliability where high forces and long distances are involved

 www.igus.eu/s-alu

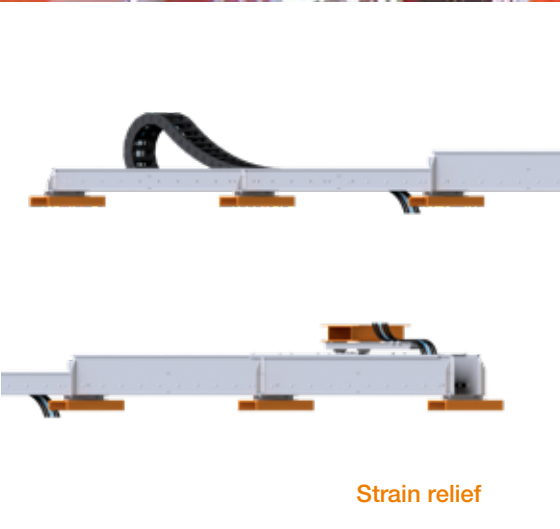


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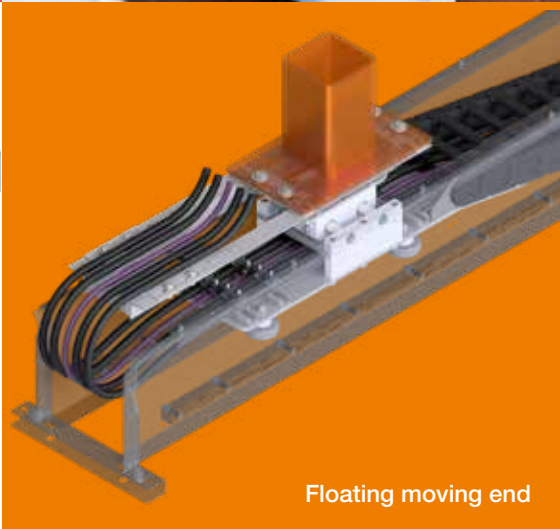


Engineered for cranes

- Fast engineering: project planning, drawing, quotation, delivery, documentation – individual
- Standardised – configured – cost-effective
- All components tested - with igus® guarantee
- All components have been specially developed for the requirements on cranes – with over 20 years of experience
- The right energy supply solution for any application –
- Travel lengths of 1,000m and more are possible
- High-speed applications, rotating energy supply systems ...



Strain relief



Floating moving end

Guide trough

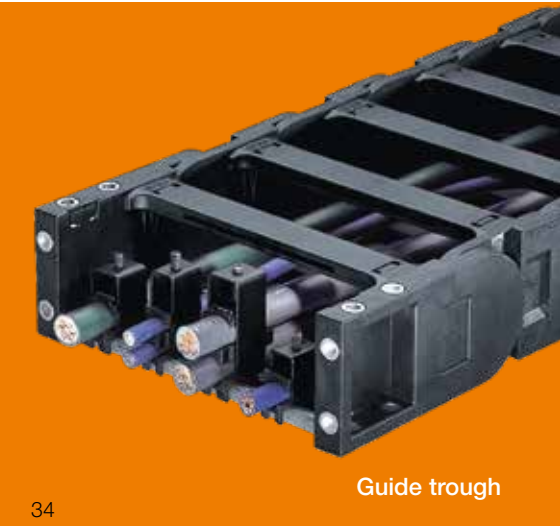
- Excellent stability for resistance to lateral wind loads
- HD installation set/stop nuts – safety during operation
- Climb guard - protecting the e-chain®
- Available in aluminium, galvanised steel and stainless steel

Floating moving end

- Lateral compensation - low wear
- Increase the expected service life
- FTA1000, FTA3250, FTA-HD versions

Accessories

- Housing/covers to protect against weather
- Special strain relief for cable protection
- Rotating energy supply solutions without sliding contacts



Guide trough



Rotating energy supply system

 www.igus.eu/engineering

Customised & retrofit

- Data registration and engineering service
- Modernisation of your energy supply equipment
- Pre-assembled e-chain systems - readychains®
- Minimal downtime of your crane
- igus® installation and supervisor service
- Inspection/maintenance service/ guarantee extension
- Competence directly from the manufacturer

 www.igus.eu/assemblyservice

Your service options – You have the choice

Short reaction times



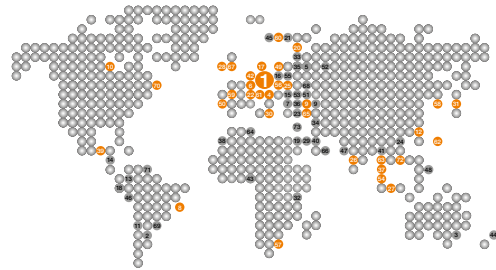
On-site measurement



Project planning



... harnessing



Worldwide igus® service.



igus® installation and supervision service



Inspection and maintenance

Test laboratory - Outdoor test facility



Automated high-speed testing facility

In the outdoor area in Cologne, plastic energy chains and cables with a travel speed of up to 8m/s and a fill weight of up to 50kg/m are tested over a travel of 400 metres.

With additional units, travels up to 1000 metres can be simulated in the future. In addition to the mechanical loads caused by the movement of the transfer vehicle, environmental influences act on the energy chains and cables being tested.





Tested ...



- Long service life in dirty environments and in sunlight
- Tested for more than 76 million strokes in e-chains®
- With a bend radius factor of 9.4xd



Extensive Test database

www.igus.eu/cranes

Tested ...



- Cable test in the climate chamber
- Tested in moving energy chains down to -40°C
- More than 250 tests conducted in parallel in 58 test facilities



Tested ...



- No wear under tough conditions
- Insensitive to saltwater, no corrosion



Tested ...



- Service life test whilst subjected to severe vibration, e.g. installed upright as in a rock drill



From more than 15,000 tests performed per year, we have created what is probably the world's largest test database. This database gives us the ability to always select the right product for your specific application. Individual tests for your industry are also possible.

 www.igus.eu/test

cranes

chainflex® for the crane industry

More than 1,354 chainflex® cables for use in e-chain systems®

- Wear-resistant TPE, PUR and oil-resistant PVC outer jacket
- Halogen-free and/or flame-retardant materials
- Smallest bend radii down to 4xd
- 36-month guarantee for chainflex® cables
- Various approvals and standards: UL, CSA, CE, DESINA, CEI ...

 www.igus.eu/chainflex



More than 1,354 chainflex® cable types from stock

Single core CF330.D and CF340

The halogen-free TPE individual cables for the high levels of mechanical stress on cranes and during installation.

- UV-resistant outer jacket
- Oil-resistant, bio-oil resistant
- Flexible at low temperatures
- PVC and halogen free
- Nominal voltage: 0.6/1kV
- Bend radius of the e-chain®: 7.5xd

Halogen-free motor cables CF37.D and CF38

The halogen-free TPE power cable for the high levels of mechanical stress on cranes and during installation.

- UV-resistant outer jacket, gusset-filled extruded
- Oil resistant, bio-oil resistant
- Flexible at low temperatures
- PVC and halogen-free
- Nominal voltage: 0.6/1kV
- Bend radius of the e-chain®: 7.5xd

Four-core motor cable CF30, CF31m CF34.UL.D and CF35.UL

Shielded motor cable for inverter function up to 600/1000V and up to 70mm²

Single core motor cable CF300.UL.D and CF310.UL

Shielded and unshielded single core motor cables for demanding applications, up to 185mm²

Fibre Optic Cables

Fibre optic cable (62.5/125 or 50/125), 2, 6 or 12 cores – all fibre optic cables are tested for several million reverse bends

Single-core motor cable

Shielded, highly flexible single cores for medium voltages of up to 6/10kV for the highest requirements in crane construction, heavy engineering, etc.: 1 x 25/16 to 1 x 95/16 cross section

Data cables, e.g. CF211, CF240, CF11

Available for all continuous data systems in e-chains® applications. Even for large cross-sections, e.g. at 3x2x2.5mm², or with voltage carrying connecting cores inside a cable.

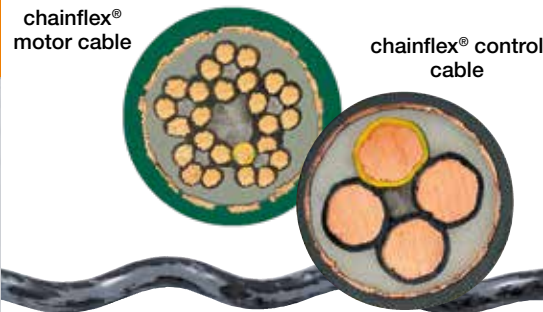
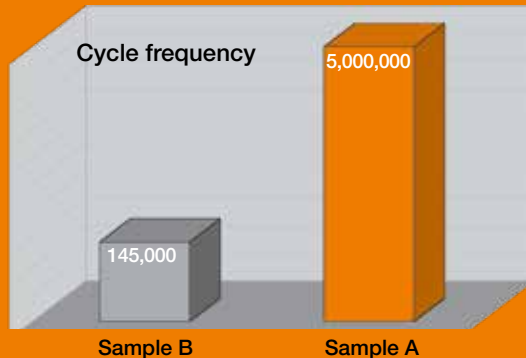
Control cables, e.g. CF5/CF6, CF9/CF10

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

36-month guarantee for all cables* ...



Tested! Tested!



Corkscrew after 145,000 double strokes (Sample B)

igus® CF27: no wear, even after 5 million double strokes (Sample A)

Solutions for status monitoring and predictive maintenance

smart plastics® allow quick, efficient action

A digitalisation strategy that begins by connecting and networking individual assemblies and components is faster and costs much less. Plant operators can directly profit from the connectivity of smart components: status monitoring in real time and without the use of personnel or predictive maintenance.

The term "smart plastics®" is used to refer to components such as e-chain systems® and chainflex® cables for dynamic applications, that,

when equipped with connectivity and sensors, make complex automation solutions Industry 4.0 compatible. Another advantage is that smart plastics® can work classically (offline), but always have the option of use in networked online processes.



icom modules for predictive maintenance



icom.plus

The module displays the initial calculated time of fault-free operation on the equipment monitor.

- Module for the isense offline system
- Display by means of the equipment monitor
- Alarm function in the event of problems
- Indication in good time that maintenance is necessary

The module for the sensors EC.W, EC.I, EC.PP

icom.online

Due to digital networking, the module shows the length of time of fault-free operation in real time.

- Continuous overview of the service life in real time, in all parts of the production plant thanks to "machine learning"
- Module for the isense online system
- Comparison with igus® cloud via IoT
- Indication of information through web dashboard or customer display
- Definition of limits and alarm if limits are exceeded
- Alarm output on dashboard and also by e-mail and SMS

The IoT module for the sensors: EC.M, EC.W, EC.I, EC.PP

Sensors for smart energy chains

Sensors for smart cables

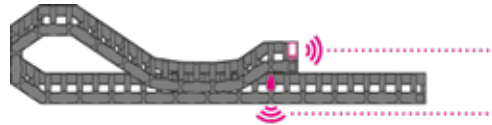


Predictive maintenance

EC.M

Sensor for movement on e-chains®

- Detects values such as acceleration, speed, temperature and cycles
- Supplies data for calculation of the minimum fault-free operating time

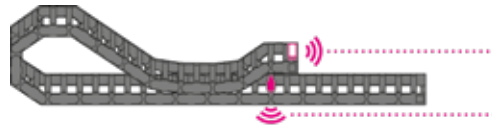


- Can be connected to icom/icom.plus
- Predictive maintenance

EC.W

Sensor for abrasion on e-chains®

- Measures wear at crossbar, pin/bore connection or liner, depending on the type of sensor
- Compares specified algorithms with real use data



- Can be connected to icom/icom.plus
- Predictive maintenance

EC.I

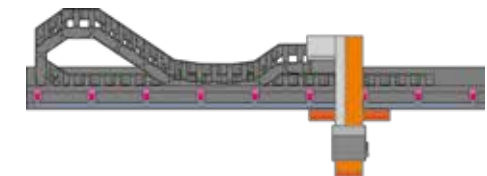
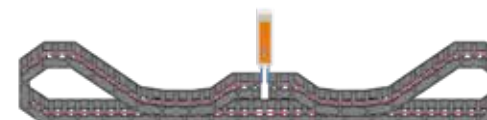
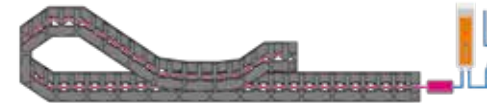
Non-contact wear measurement of e-chains®

- Integrated in the chain link, the component subjected to the greatest mechanical stress
- Measures the wear of the pin/bore connection in % without contact occurring
- Sends a signal if the specified limit is reached



- Can be connected to icom/icom.plus
- Predictive maintenance

Condition Monitoring



- Can be connected to icom/icom.plus
- Predictive maintenance

EC.P: Push/pull force monitoring

- Measures the push/pull forces acting on the e-chain®
- Recommends shutdown of the equipment if a force limit is exceeded

EC.B: Sensor for breakage detection in e-chains®

- Detects chain breakage in the early stages
- Prevents overloading and subsequent system failures

EC.B/EC.B2: Two sensors and one module for the detection of e-chain® breakage

- For long travels and opposing e-chains®
- Detects chain breakage in the early stages
- Two sensors send signals to a DIN rail module

CF.P: Sensor for measuring tensile forces on cables

- Measures the forces directly at the strain relief element
- Triggers a shutdown by means of the NC contact if forces are excessive

EC.PP

Sensor for position-sensitive push/pull force measurement

- Integrates a positioning system into the e-chain®
- Supplies information on position-dependent push/pull forces
- Position information from the application can be used for other purposes

More than 650
ports worldwide
operate with igus®
motion plastics®



www.igus.eu/cranes

/9001:2015 /16949:2016

igus® is certified in accordance with ISO 9001:2015 and ISO/TS 16949:2016 in the field of energy supply systems, cables and harnessing, as well as polymer bearings.

/14001:2015

igus® is certified according to ISO 14001:2015. This accepted basis for environmental management systems supports us on our way to a CO₂-neutral factory.

/newsletter

Get more information about motion plastics® innovations and trends: exciting applications, videos, test results, online seminars and much more. Compact and free of charge. Register here:

www.igus.eu/newsletter

/online

You can find out more about crane technology here: www.igus.eu/cranes



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* The chainflex® guarantee assumes the operating conditions are valid for the respective cable family. These consist of parameters such as temperature, movement type, torsion, media influence and bend radius. The guarantee begins on the day of delivery and continues for 36 months or 10 million double strokes (for cables of the chainflex 800 family up to 5 million double strokes, for cables of the high-end types up to 40 million double strokes); whichever comes first. The number of double strokes depends on the type of installation and the cable quality. This is described in the current catalogue, in the data sheets and in the service life calculator (<https://www.igus.eu/ChainflexTools/ServiceLifeCalculator>).