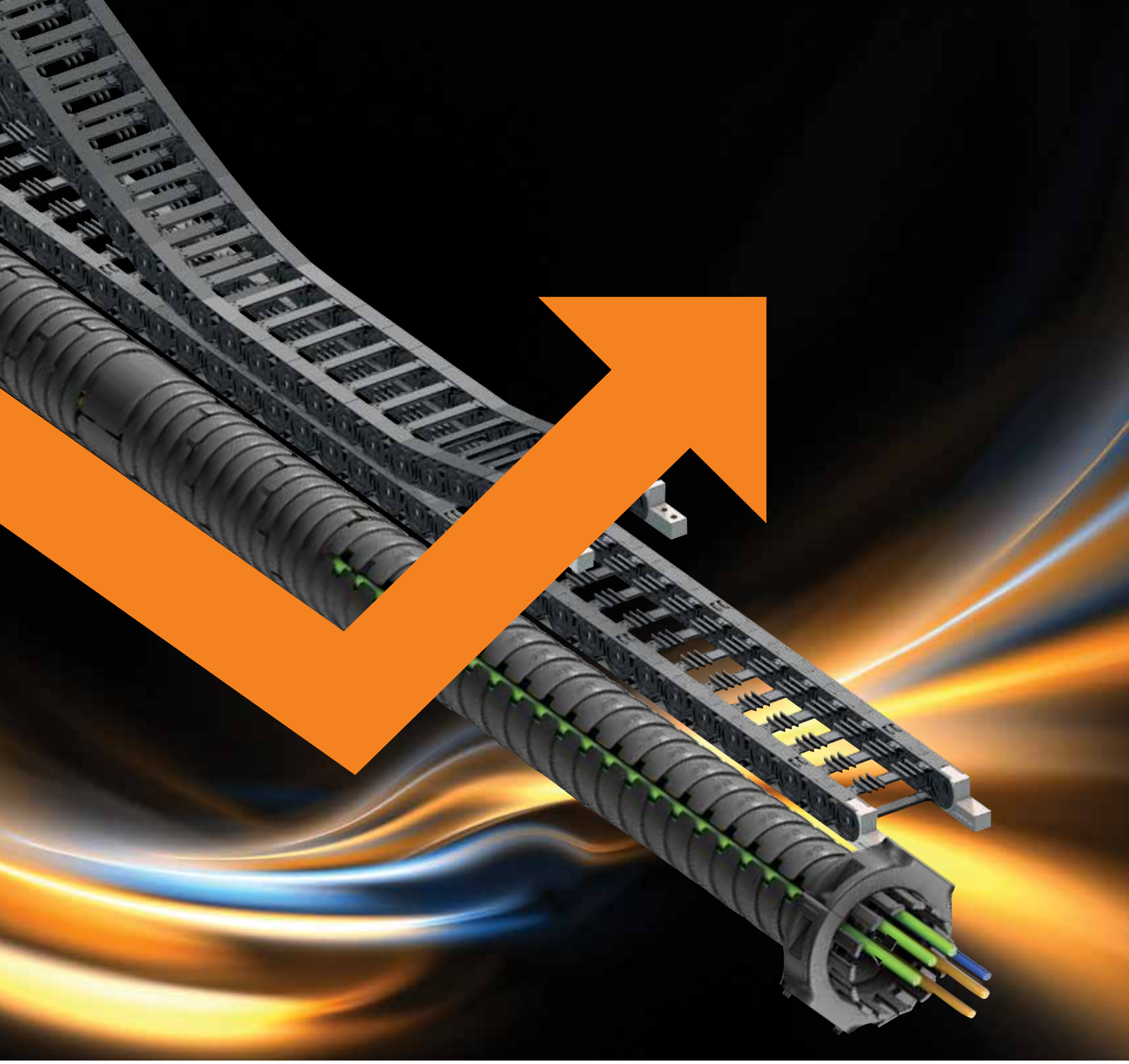


WHITE PAPER:

From the robot dress pack revolution to abrasion-free cleanroom chains to heavy-duty chains with extended service life

Faster, more durable, more modification optiions ... e-chain system® trends

igus®

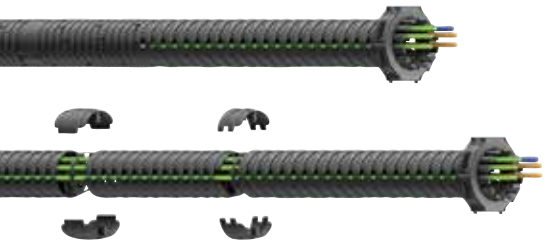
Today, e-chain® cable carriers are a standard machine part throughout automation technology. Their application spectrum is similarly broad–from semiconductor manufacture in cleanrooms to container cranes. As varied as chains are, there are technology trends and customer preferences that remain the same across industries.

Industry standard

If a machine moves–think robot arms, linear systems, linear robot axes, or crane bridges–it uses e-chain cable carriers. Today, this is the proven state of the art, and design engineers are generally familiar with their use. From the point of view of igus® as a global leader in energy supply system manufacture, this means that there is less and less market potential in established areas of application–that is, less and less replacement of other systems with e-chain cable carriers. The advantages of guiding cables in chains are simply obvious and have been well-known for a long time.

The trends

The reason why there is a suitable system for almost any application is that the market is large. The foundation is therefore laid, but now is the time to refine and expand in different directions. For example, e-chain cable carriers offer new degrees of freedom. Their use is becoming simpler. Travel speed and service life is increasing in heavy-duty applications. There are new solutions for challenging areas of application such as the semiconductor industry, and customized energy supply systems are being developed for niche applications such as oil extraction and shore power supply. These trends are illustrated here briefly with current examples of igus trade show innovations.



Revolution in robot energy supply: igus® telescopic triflex TRX
Source: igus® GmbH

New degrees of freedom: 3D chain with integrated retraction system

Until now, a separate retraction system was needed for the 3D energy supply on the robot arm, which creates a length compensation in the movement. This was because the length of the energy supply has, until now, been fixed. Now the triflex® TRX provides a chain that can move in three dimensions and adapt its length to the robot arm reach. The chain element design and integrated retraction band allow the chain to extend automatically by up to 40% and retract again, without a space-intensive, expensive retraction system on the robot. It also ensures high tensile strength (up to 1,000N), easy filling from the exterior, and position stability for the cables in the chain.

e-loop as an alternative to the service loop
Source: igus® GmbH

For the niche: heavy-duty guides for heavy cables

On drilling equipment for oil and gas exploration, for example, heavy hose and cable packages must be guided from the equipment to the moving unit with the drill pipe. Service loops, such as the igus® e-loop, are designed for this. The hydraulic lines and electrical cables are guided in a chain that is very largely closed with circular cross sections and three or four chambers. Another central chamber holds a cable that can absorb forces of up to 90t. The loop's outer skin has bumpers made of foam material. They protect chains and cables from impact due to strong winds.

In response to the request of a customer who manufactures drill ships, igus has now developed a larger-dimension version of this design: the e-loop 430 with an outer diameter of a whopping 430mm. This innovation shows that igus is focused on more than just offshore and onshore drilling rigs. Another attractive market for this heavy-duty cable guide is environmentally friendly shore power supply for maritime vessels. And, as is typical for igus solutions, the user has the option of receiving their e-loop harnessed, rolled up and ready to install as a readychain® (or, in this case, a "readyloop"). This ready-to-install receipt of harnessed chain systems is another trend for e-chain® cable carriers.

Maximum service life for the latest generation of cranes: igus heavy-duty rol e-chain cable carrier
Source: igus® GmbH

Faster, further and more durable

The container cranes of the latest power class are even faster and larger to be able to keep up with the size of the ships. The rol e-chain cable carriers on crane bridges move at up to 984 ft/min (300m/min) on travels of up to 750 meters, constantly accelerating and braking as they do so. Under these conditions, the chain is to achieve a service life of 15 years, or 375,000 kilometers of running performance. That is what the crane manufacturers and operators want. And that is what igus has delivered with its new rol e-chain P4HD.

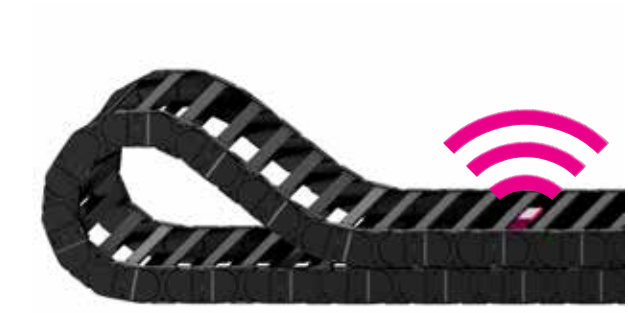
It features a 50% service life improvement over its predecessor series, the P4.1. This increase is achieved by a number of design

Easy handling - E4Q e-chain can be opened and closed completely without tools

Source: igus® GmbH

Supplying energy without measurable abrasion: igus e-chain C6

Source: igus® GmbH



An example of smart plastics condition monitoring is an EC.W separator that measures the abrasion condition of the igus E4 e-chain cable carrier and transmits it.

Source: igus® GmbH

detail improvements and the use of new, highly abrasion-resistant motion plastics, and it has been confirmed in endurance tests in the igus® laboratory. All components–rollers, bearing bolts, crossbars, etc.–can be replaced without disassembling the entire chain. If necessary, the P4HD can also be used to retrofit existing ship-to-shore cranes with a long-lasting e-chain® cable carrier.

Development goal achieved - handling simplified

Introduced in 2020, the E4Q series quickly became a "classic" in the igus e-chain cable carrier product range. One reason for this is that its assembly is fast and simple because it doesn't require tools. Now the chain is available with a new interior separation that can be adapted without tools in a very short time. In practice, this means that it takes around 40% less time than the E4.1–a great advantage for mechanical engineering applications. This is where the E4Q comes in, especially for long travels.

Clean, cleaner, C6

It looks like a normal e-chain cable carrier, but it was developed specifically for use in cleanrooms. This environment demands that any abrasion must be minimized. The principle has proven useful, and now the C6 series (C stands for "clean") is being improved again–this time with a new design and the use of a new tribo-optimized, abrasion-optimized high-performance polymer. The result is less abrasion, enhanced torsional strength, and quieter, lower-vibration operation. This e-chain cable carrier is designed for cleanrooms of the highest class (Class 1).

Summary: product range differentiation

This (by no means exhaustive) overview shows that the market is becoming differentiated. There are suitable e-chain cable carriers for every special application, from cleanrooms to drilling platforms. And another megatrend is right around the corner. In the future, energy supply systems will become smart, as integrated sensors will continuously detect the operating condition in the interest of predictive maintenance, and make precise predictions about the remaining service life.

Additional links/literature:

- White paper: triple E-class container ships and the requirements of energy supplies for STS cranes
- Brochure: smart plastics/predictive maintenance
- www.igus.com/info/news-2021-overview

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