



# e-spool

The next generation of the  
**cable reel**

## WHITE PAPER

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## What is an e-spool?

The igus® e-spool is an alternative to traditional cable reels, which are used to guide cables and hoses in confined spaces. The e-spool system can guide several cables or media lines, including power, control or pneumatics, in one reel. In most cases, the e-spool runs without electrical power, making it very easy to use, but for some unique applications it can also be developed with a motorized drive solution. It is easy to install, flexible, space-saving and extremely reliable.

The system is designed with two different igus® energy supply systems in an innovative way. First, a standard igus® E2/000 e-chain® is guided on a steel spool. An integrated retraction spring within the spool provides retraction force and manages any slack. Additionally, an igus® twisterband connects the rotating spool to the base structure, where the fixed cables enter the system. The twisterband is what makes the e-spool truly unique, as it eliminates an array of complications that typically come with other cable reels—this will be explored in more detail later in the paper. The twisterband can be configured on one or both sides of the spool, depending on the application's requirements. The e-chain® is available for stroke lengths up to 14m (0-4m, 4-7m, 7-14m) with two inner width options (80 and 125 mm), allowing for modularity in the type and quantity of energy sources that are guided. In the starting position of the e-spool, the e-chain® is completely rolled up, which saves space and keeps pathways clear.



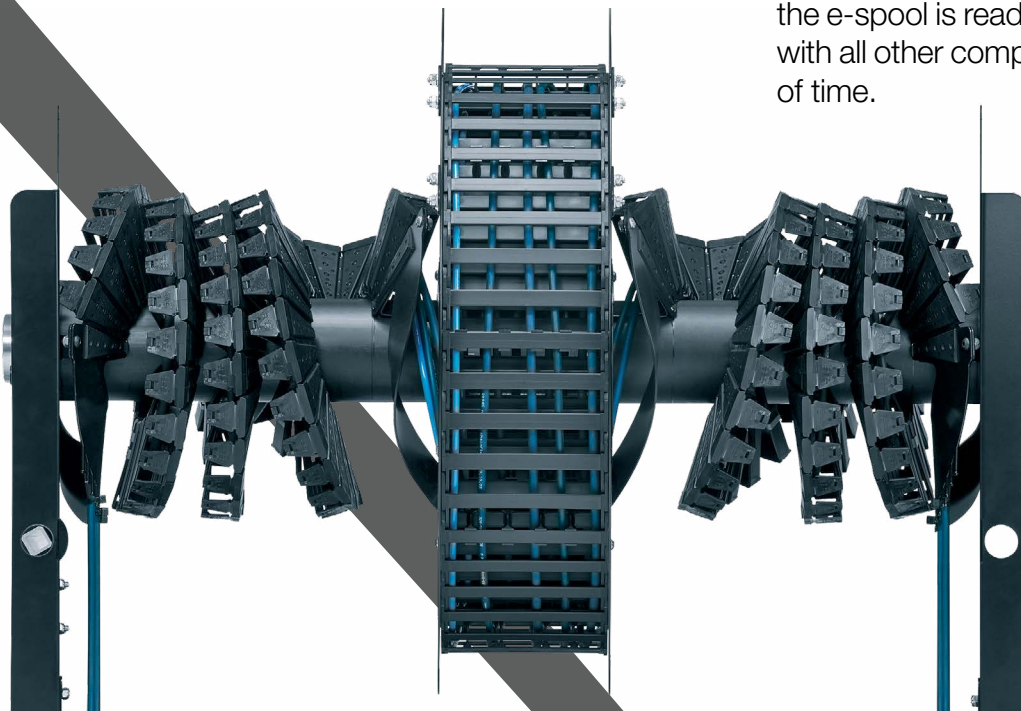
# Why choose e-spool over traditional cable reels?

igus® created the e-spool as a replacement for the traditional cable reels and zigzag systems. The solution was designed so that it would successfully eliminate issues that these other systems often cause.

In traditional cable reels, a cable is run from the source (panel box, PLC, etc) to the fixed point of a slip ring. A second cable is then run from the rotational point of a slip ring to the end effector (lighting truss, assembly tool, etc.). This requires two lengths of cable, with four ends to be terminated. More terminations mean more installation labor and more points of potential failure. In an e-spool, a single continuous cable is run from the source to the end effector without any intermediate terminations, improving the quality of the electrical signal and minimizing the risk of failure. The e-spool is also designed to be much more versatile in what types of energy it can carry. In traditional cable reels, only one cable can be used per reel. Traditional solutions also require different types of reels for different energy sources, which have different form factors and must be purchased from multiple different suppliers. Since the e-spool does not contain a specialized slip ring or rotary feed through, multiple energy supply lines of multiple different types (power, control, data, pneumatic) can be

guided in a single system. The e-spool is also designed to be more modular and adaptable than conventional systems. In conventional systems, a slip ring or rotary feedthrough is an integral part of the cable reel, and is designed to accommodate a specific number of conductors of a specific size. If the customer's electrical requirements change, and additional capacity is required, the entire cable reel must be replaced with one that contains a higher capacity slip ring. With the e-spool, if the electrical requirements change, the cable management system can remain in place and only the cable must be changed. Cables are installed by simply opening the crossbars and laying the cables in to the two cable carriers.

The e-spool's design is also optimized for extended service life. It is expected to achieve between 70,000 and 200,000 strokes, depending on the application, while traditional cable reels often require service at a lesser number of cycles. In the igus® test lab, the e-spool's spring was tested in respect to its service life expectancy and the results were superior. In all tests, the e-spool achieved a minimum service life of at least 70,000 strokes. Once maximum service life is reached, only the spring pack must be exchanged, which is a short 15 minute service effort. Once the spring is replaced, the e-spool is ready to deliver another full service period, with all other components lasting for an extended period of time.





video: e-spool in the igus® test lab

The e-spool offers many advanced design features intended to improve overall ease of use. The retraction spring is fully enclosed in a steel housing, eliminating the risk of injury and keeping consistent tension on the cable carrier. The spring housing is also equipped with a sprocket and can be adjusted with a shaft and screw to increase or decrease spring tension dependent on the application. The sides of the e-spool have handles for safe and easy handling. The bottom plate increases sturdiness and makes transportation simpler. Stop plates are attached to the end of the chain as an additional safety feature, preventing the system from over-rotating. The e-spool is also offered with the e-chain® and spring pack on either the right or left side. This allows for versatility in mounting when space is restricted. Maintaining the e-spool is also easier than maintaining traditional solutions. The spring of the

e-spool is the only component that will ever need to be replaced, however, the design allows for easy and quick 15 minute installation, while other solutions' springs are more difficult and time-consuming to replace.

Along with the technical benefits of e-spool, the cost can also be lower than traditional solutions. Light-duty industrial cable reels can be offered at a very low cost, but they are not rated for automated operation. Medium-duty industrial cable reels rated for automated operation are only slightly less expensive than e-spools. However, since traditional industrial reels can only guide one cable per reel, the costs become much greater when multiple cables are involved. Since the e-spool can handle multiple cables in one reel, overall costs are likely to be lower in these scenarios.



# Driving more success by replacing slip rings with a twisterband



twisterband: replacement for slip rings in the e-spool system

A big difference between the e-spool and other cable reels is that in the design, the e-spool does not contain any slip rings, while other cable reels do. Slip rings are used to transfer data and other electrical signals from a stationary point to a rotating point. They are made up of two main components: a carbon or metal brush and a metal ring. The brush contacts the ring as it spins and electrical current flows through the brush to the ring to create a continuous electrical signal. Though slip rings provide a functional solution to transfer current through a rotational junction, they are sensitive to external and environmental factors such as dust, dirt, moisture or other forms of contamination, and require regular maintenance to remain operational.

There are various problems that can lead to maintenance or complete replacement of slip rings, with the most common issue being wear or threading of brushes. As the brush wears down, it wears fine grooves into the contact ring, while also covering the inside of the slip ring in fine dust from the brush wear. The brushes themselves and their retaining springs must then be replaced, which can be a messy and tedious process that also requires powering down the electrical system to safely work on the internal components. Loss of contact between the brush and the ring is another cause of

failure, which can cause unexpected faults in production machinery or interruption of electrical current in the case of a lighting truss or similar application. Copper or steel slip rings are also inclined to corrode in wet or outdoor environments, especially if they aren't properly sealed, further increasing the risk of failure. In short, slip rings are simply prone to overall wear, therefore increasing the likelihood of ongoing problems and the need for regular maintenance.

The [twisterband](#) is the brainchild of igus® engineers; it is the component in the e-spool that allows the system to function without any slip rings. It is a plastic energy chain that allows rotary movement in a compact space. It provides maintenance-free guidance in confined spaces, and fully secures the media it guides. Rotary motion up to 7,000 degrees horizontally and 3,000 degrees vertically is possible, as well as speeds up to 360 degrees per second. This particularly novel component eliminates an array of possible complications when the e-spool is applied in any given application. Since energy or media can be guided together with continuous end-to-end connection, and the rotary motion required to roll and unroll the e-chain® is done via a twisterband solution, there is no need for slip rings.

# Applications and industries

The most common consumers of the e-spool are those in the theatre/stage construction industry. It is also often integrated into telescopic applications, indoor cranes, control panels and more.

The e-spool is regularly used in the theatre/stage construction industry for raising and lowering lighting, sound and other stage equipment. The industry constantly demands enhanced technology and a high number of cables used, so the e-spool is ideal since it allows multiple cables and media to be enclosed in one e-chain® without limitations on the direction of travel. Traditional theatre cable reels generally only handle one cable type, and multiple reels have to be used for multiple cables. This causes problems for technicians when overhead space above stages is limited or already allocated by other lifting equipment. Additionally, traditional theatre cable reels need slip rings for rotation, making guiding fiber optic or data cables difficult or impossible. Outdated solutions are likely suffer issues with signal quality, complicating high fidelity audio playback or audio recording. The e-spool has been successfully used to eliminate these issues in numerous customer installations.

The e-spool's quiet operation is another reason that it is well-suited for noise sensitive applications such as stage installations. In the igus® test laboratory, which is the largest in the industry, the e-spool was intensely tested for its noise emissions during operation. The e-spool was able to reach noise levels below 46dB (A) in the test—incredibly quiet results.



video: e-spool in the Liverpool Student Union Theater

# e-spool product range

There are many different e-spools available in various sizes and travel lengths. The **standard**, full size e-spool is available in multiple different configurations to suit a wide range of applications. The standard is available with a standard or HD version spring pack, which offers additional retraction force from the spring for applications with heavier fill weights. The **mini e-spool** is a compact version of the e-spool used for smaller applications. It is extremely space saving and has a very lightweight design. Typical applications that are integrated with the mini e-spool are indoor applications that require short linear, rotary or small circular movements. The **e-spool power** is a motor-driven system for long travel lengths up to 115 feet. It has an exceptionally long service life due to the retraction system and motor, and longer travels can be implemented. Theatre and stage applications, indoor cranes, maritime and shipbuilding can all benefit from the e-spool power. A fourth model is the **e-spool manual**, which was specifically designed for applications where only one cable needs to be managed and must be moved about freely, such as a robot pendant or control panel. A ratchet mechanism is integrated in the e-spool manual to lock the spool at extension for use. It can then be released and wound back up for storage once operation is complete. This e-spool is suitable for manual operation, and is often used in cable-connected tools and control consoles. The shore power industry can also benefit from the e-spool. igus® offers a customized **shore-power e-spool** that can be installed in a vessel or terminal to supply power to vessels while berthed. The igus® shore power e-spool is a motorized cable reel for unwinding cables that are suitable for use in medium voltage shore side connections. It does not require a slip ring, provides a continuous run of cable from the shore power outlet to the connector, and resists seawater, extreme temperatures and vibrations.



video: how to install cables into an e-spool

Aside from the standard offerings, igus® develops customized solutions as well. There are standard systems available with special additions, including systems with tubes, RBR chains, and stainless or colored systems. There are also more custom-built options, including e-spools designed for longer travels, systems with a different chain or custom changes to the steel parts to better integrate to a customer's machine. The unique structure of the e-spool can put some mechanical stress on cables, so in order to help relieve these strains, there are a few guidelines that should be followed when filling an e-spool with cables. Shielded cables designed for continuous torsional flexing such as chainflex® CFROBOT cables should be used when the maximum possible service life is desired. Cables should be placed side by side in the linear chain and never stacked on top of each other. Wherever possible, separators should be used to protect cables from becoming crossed or tangled. Cables should also be inserted according to diameter and/or bend radius, with the smallest cables towards the inside of the carrier and the increasingly larger cables towards the outside. Strain relief should be installed at both ends of the cable.

*For more information on e-spool, visit [igus.ca/espool](http://igus.ca/espool) or contact us at +1-800.965.2496/orders@igus.com*