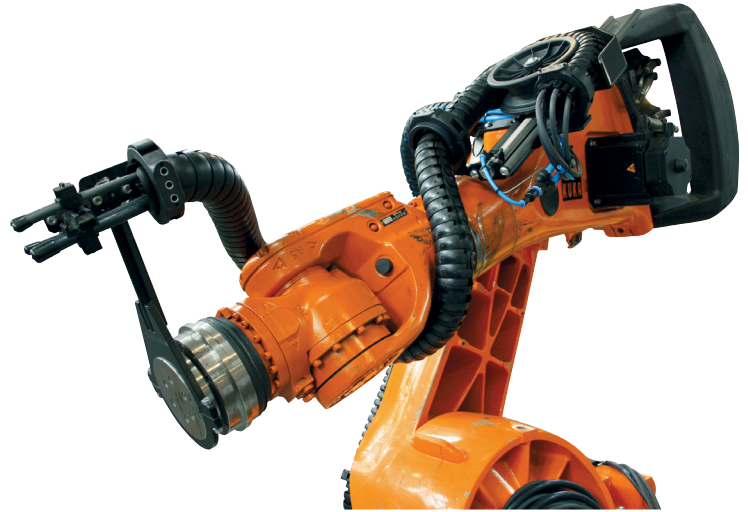


Robotic cable management made easy

Industrial six-axis robots perform intricate, repetitive movements that greatly improve productivity and throughput. The end-of-use tool on these robots require power, data and other media to be supplied through cables that run on the outside of the robot. These cables must bypass each axis of the robot using a secondary cable management system. Here, incredibly complex movement can be achieved, but only if high-performing cables and cable management systems are used.



Cable failure can eliminate productivity achieved through automation, which presents one of the biggest issues with robotic cable management—it is often the last step to be taken in the design process. Six-axis robots have multiple movement profiles and several points that must be considered when routing cables for the end effector. The rotational capabilities of the sixth-axis alone require a cable that can withstand torsional forces. A cable designed especially for robotic movements should be considered in the early stages of development.

The cable carrier used in industrial robots must allow cables to move freely within and remain dynamic while the robot is in motion. There are many traditional cable management systems that bind cables together, which restricts movement and creates points of stress, therefore accelerating cable failure. Poor cable management combined with a cable unsuitable for torsional robotic movements can also cause early cable failure and unwanted downtime.

Modern, flexible cables for torsional motion

In respect to continuous flexing applications, the three types of movement include linear, torsional and multi-axis (free movement). The end-of-use tools on robots require all the same types of electrical requirements as a linear system, but a cable designed for linear movement should never be used for robotic applications. From the outside, a linear and torsional cable look the same. The unseen difference is the construction and special design of the torsional cable. Torsional cables should always be used on robots, as they are able to bend more than 180°, absorb strain and extend the life cycle of the cable.

Torsional cables incorporate a special conductor design that optimizes torsional motion with a certain strand size and pitch length. Insulated conductors should be twisted in a way that allows for torsion, while keeping all internal cable components functional. To achieve this, special buffering tapes and strength members can keep parts moving flexibly in the cable. Special shield designs are required to prolong the mechanical life of the material, whether it be a braided or special spiral shield. Jacket materials that have been proven to resist abrasion and be bendable enough for twisting are also needed. These features are included in the **chainflex® CF-ROBOT** line of cables, specifically engineered for robotic applications.



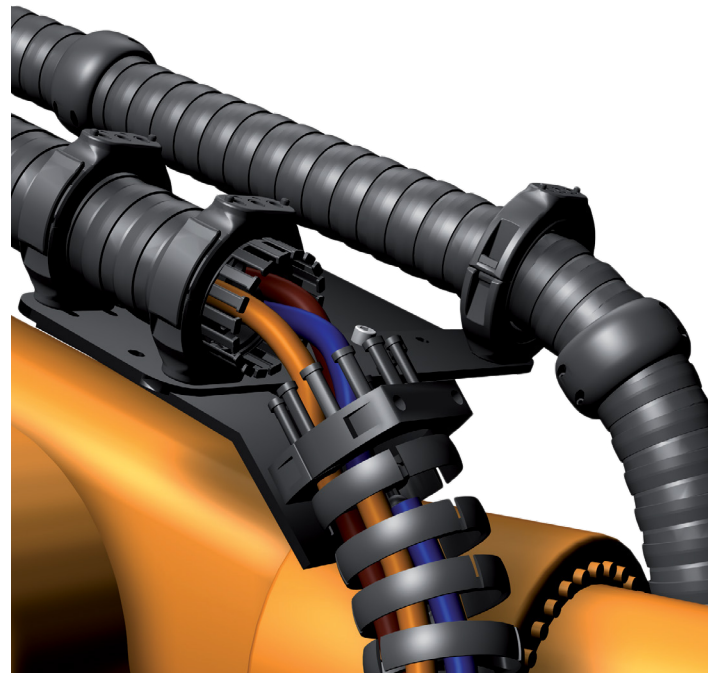
Proper robotic cable management

Though torsional robotic cables have been designed to withstand the strains of six-axis motion, a cable management system should be used to ensure longest possible service life. If improperly housed, cables will wear prematurely or fall into the working area and become tangled. Corrugated tubing is often used for management, but it has limited torsion resistance. Enclosed dress packs can be made with corrugated tubing housed in reinforced plastic for added strength, but the non-modular design makes cable maintenance difficult and requires replacement of the whole system if only one component breaks.



Customizable robotic cable carrier systems that mount directly on the robot are the most ideal cable management system for six-axis robots. These systems can be used on a variety of applications due to their increased range of motion. Similar to an enclosed dress pack, the spring loaded design is equipped with strain relief that allows for easy removable or replacement of cables (without dismantling the entire system). The **triflex® R** cable management system from igus® is a recommended modular, multi-axis system designed to guide and protect cables and hoses. The system is made up of one-piece links that require no additional components, such as spring mechanisms for support. Individual links can be replaced as needed, which reduces costs and downtime. The ball-and-socket design enables movements of all axes and the small bending radius makes it ideal for saving space. An integrated fiber rod also returns cables to a home position after a cycle is complete.

While many alternative systems utilize a more restrictive cable package that runs cables from the robot case to the end effector, igus® engineers treat the six-axis robots in three separate segments: the sixth to third axis, the third to second axis, and the second to first axis. By segmenting the dress pack into three shorter sections, the carrier will not wrap, catch or snag on machines. Maximum cable control is achieved, and stress on cables and hoses is minimized. Service life is also significantly increased. The design of triflex® twists the whole cable bundle when the sixth axis rotates, allowing the cables to be twisted without kinking. Other solutions, such as tube-style solutions, are not capable of that type of motion. Integrating a flexible management system like triflex® is what most affects the success of the cabling.



Tested for seamless integration



Tested together in the 29,600 sq. ft. igus® test lab—the largest in the industry—chainflex® CF-ROBOT cables and triflex® R cable carriers have been proven to work reliably in six-axis robots. A preliminary test is conducted with a fixed point of 3.2 ft. and torsion of $\pm 180^\circ$ for a minimum of three million cycles. This is followed up with a second test cycle at a 8.2 ft. point and a $\pm 270^\circ$ torsion field. These test results have validated that all CF-ROBOT cables carry the chainflex® guarantee for performance up to 10 million torsion cycles or 36 months. Together, the CF-ROBOT flexible cables and triflex® cable carriers create a robotic cable management system that is easy to install and drastically improves performance.

To learn more, explore the range of [chainflex® cables](#), [triflex® R systems](#) or [directly contact an expert](#).