



Industry Case Study

BELDEN
universal

MINIATURE UNIVERSAL JOINT FOR SURGICAL MANIPULATOR

Belden developed a miniature universal joint for a company specializing in surgical instrumentation for a tool used in minimally invasive surgeries.

The manual surgical manipulator system required a joint to transmit power from the handle to the connecting shaft. The system was meant to fill the need between conventional surgical instruments and surgical robotics: while conventional instrumentation does not meet the requirements of advanced endoscopic surgeries, robotic systems are too complex and costly for daily routine use. This manual manipulator represents a new class of surgical devices that provide full freedom and optimal ergonomics during surgeries without the complexity of electromechanical robotic devices. The surgical system has been designed to improve endoscopic suturing and other surgical maneuvers. It can be used for a wide variety of surgical procedures in an array of clinical specialties. The system consists of two hand-guided surgical manipulators. Depending on the surgical task, graspers, scissors, needle holders and other devices can be attached to the tip, with changeovers in seconds. The Belden universal joint transmits power

from the handle to the connecting shaft which serves as a natural extension that emulates the movement of the hand. The universal joint has an outside diameter of 8 mm to accommodate the space limitations of a surgical tool. A deflectable and rotatable tip provides all degrees of handling freedom.

During design development, the customer requested a special hub configuration to ensure secure connection and precise operation. Through innovative manufacturing processes, Belden made modifications to its standard universal joint concept and delivered prototypes for testing. Originally done as two separate pieces, the new product incorporates the universal joint and a component of the internal extension into single piece. Adhering to the sterilization regulations of the medical industry, the universal joint was manufactured in stainless steel.



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