

# How to Spec Custom Cables for Medical Devices



Figure 1. Smaller cables are being sought after as medical devices become smaller and more portable

As the advancement of medical technology continues, it is important to note that progress could not have been made without advancements in signaling and control and power system interconnect components: including wires and cables. Historically, such components were often overlooked until late in the design process causing undesired results, delay in launch or a redesign of device systems. However, companies with robust product development processes include interconnect considerations early in their product development.

Creating a custom cable allows the designer to have control over conductor counts, AWG sizes, color codes, tolerances, insulation and jacket materials, shielding and print legends. Custom designs also allow control of overall diameters so that the cable will fit in existing ancillary components like grips, connectors, grommets, and strain reliefs. Moreover, custom cables make it easier to ensure that inferior cables are not substituted.

One of the emerging trends in medical device technology is the miniaturization of the products. As an example, MRI machines which once required multiple rooms to house the magnet, power supply and controls, now commonly fit into a single room. Ultrasound machines have gone portable and fit on mobile carts while consumer medical devices fit in the palm of the hand. This size reduction is often called miniaturization and is a trend which is picking up steam in medical applications.

Miniaturization allows for reduced space requirements in installation, transport and storage. Going smaller typically allows for improved diagnostic capabilities and sensitivity since power requirements and distance to the subject are reduced. Smaller medical devices can be less susceptible to noise from outside sources – such as building wiring or other nearby devices.

Similar to medical devices, miniaturization has benefits to wire and cable. Cable with a smaller cross-section can be more flexible. Also, a cable with smaller diameter can be bent more tightly while still maintaining the specified minimum bend radius. Smaller cable means lighter cable which can aid the ease of deployment as well as just seem less cumbersome when

laid on a patient. Custom cables play a big role in miniaturization as gauge sizes may decrease while conductor counts increase, shielding options with supreme EMI protection, and jacket and insulation materials will need to be flexible and meet specified requirements.

Unlike traditional wires and cables, those used in medical devices must be flexible and able to withstand repeated flexing. They are also regulated under strict guidelines due to safety requirements and, depending on device type, the potential for patient contact of varying type and duration. Such wires and cables need to function flawlessly after repeated sterilization processes including autoclave, gamma, and ethylene oxide, as well as regular exposure to disinfectant wipes, liquids and aerosols. Jacket materials that can withstand sterilization and meet biocompatibility requirements include silicone, thermoplastic elastomers, and medical grade thermoplastic polyurethanes.

Selection of the cable jacket, sometimes referred to as the outer sheath, is based on the requirements of the application. For example, EKG leads will have a jacket, insulation, or tape-shield laminate that differs from those used in endoscopes or laparoscopes. While some connections may require increased flexibility, others may require a specialized material that can resist the corrosive nature of sterilization. Further consideration are based on the method(s) of sterilization the cable will undergo and the expected number of sterilization cycles during the intended life of the cable.

Realizing a medical device and bringing the device to market is a complex and sometimes difficult project. Regardless if you are a well-honed medical device manufacturer with a robust design process and quality systems or a small start-up navigating the waters for the first time, unanticipated setbacks, delays and cost overruns can occur. Choosing the best vendors as partners may help to mitigate these setbacks and bring a project back to fruition more quickly.

Whether you're looking for inside the box or outside of the box components, knowing the cable requirements is a must in the medical device industry. Need small or large cable, specialty conductors and insulation, lumens, special shielding, biocompatibility requirements or part with sterilization compatibility? Try designing custom cables to satisfy your medical interconnect needs.