



WHITE PAPER

Key Technology Trends Driving the Medical
Connector Market

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DEVICE MANUFACTURERS AND CONNECTOR MANUFACTURERS PARTNER FOR INNOVATION

The quality and reliability of electronic equipment is vital for every industry, but it is especially critical in the medical industry where human life and safety depend on equipment operating as intended. This formidable responsibility not only impacts the device manufacturer, but the suppliers of every enabling component.

Current medical market trends driving collaboration between medical device and connector manufacturers include increased demand for safety and regulatory compliance, lower-cost disposable solutions, higher-resolution imaging capabilities, and enhanced durability.

IMPROVED SAFETY AND REGULATORY COMPLIANCE

The integration of additional features and functional capabilities means these devices are more susceptible to effects of electrostatic discharge (ESD). Although static shocks are a widespread phenomenon, they can be hazardous in medical environments — causing software to freeze, reboot, or malfunction, damaging delicate circuitry, or even shocking patients and operators. As a result, the International Electrotechnical Commission (IEC) nearly doubled its ESD performance requirements in the fourth edition of the IEC 60601-1-2:2014 standard, which was published in 2014 and required global device compliance by December 31, 2018. The minimum voltage that a panel-mounted receptacle must withstand is now 15kV, measured from the receptacle housing to the internal electrical contacts, which represents a dramatic increase from the 8kV minimum mandated by the previous edition of the standard.

To address new project developments with challenging connectivity demands, we suggest plastic REDEL SP Series connectors, which offer advanced features including eight additional high-density electrical contacts in the same small form factor and a tested ESD resistance of 25kV, which not only meets the new IEC standard but provides medical device designers plenty of room for future-proofing designs. For current applications that require backward compatibility, our popular REDEL 1P Series plastic achieved an ESD rating of 13kV which is well over the incumbent standard, but still slightly short of the new one. Our engineering team quickly identified an elegant solution - by simply adding a thicker dress nut to our connectors customers can meet the demands of the new standard without a costly redesign.



[LEMO REDEL SP Connectors](#) plastic, self-latching push-pull with an ergonomic grip, color-coding and keying options, high contact density, and an IP50 seal. They also exhibit high resistance to chemicals, shock, and sterilization processes.

LOWER-COST DISPOSABLE SOLUTIONS

Coupled with the longstanding desire for lower-cost medical solutions is an increasing trend toward disposable devices. Medical manufacturers are constantly imbuing their products with new and better capabilities to keep pace with market demands and remain competitive in a densely populated marketplace, so the significant cost constraints levied against disposable components present a real engineering challenge, especially since these devices still require advanced performance capabilities despite the fact that will only be used for one procedure and then thrown away. For example, the demand for higher-resolution imaging and mapping capabilities requires higher-density electrical contacts, but imaging equipment is one of the many medical device segments increasingly employing disposable devices. So, connector manufacturers must come up with creative solutions for minimizing cost while simultaneously enhancing capabilities.

Minimizing cost is an even greater concern in disposable medical applications than in reusable devices that can be readily sterilized many times. From the connector manufacturers' point of view, the properties that can't be compromised — like operating performance and reliability — must remain unchanged, while all those that can — like longevity — must be analyzed for potential cost-saving opportunities.

Strategies include using high-quality but lower-cost materials that might be less mechanically or chemically robust than those employed in connectors designed to withstand thousands of steam cycles and mitigating the use of high-cost materials such as reducing gold-plating thickness.



[LEMO REDEL Disposable Connectors](#) for disposable electrosurgical devices.

HIGHER-RESOLUTION IMAGING CAPABILITIES

In addition to driving a portion of the demand for disposable devices, the widespread demand for higher-resolution medical imaging capabilities is leading many medical device manufacturers to incorporate fiber optic connectivity technologies. Connector manufacturers with demonstrated expertise in developing advanced fiber optic contacts for use in telecommunications and industrial applications, can apply their knowledge to medical industry innovations. Fiber optic technology is readily available and proven both safe and effective for transmitting high-speed, high-bandwidth data, like high-frequency imaging signals, but the challenge lies in training end-users to clean the fibers regularly and properly to ensure optimal performance.



ENHANCED DURABILITY

The trend toward more sophisticated electronics often leads to higher costs, so manufacturers are continually looking for better ways to protect the integrity of higher-end devices against the potential hazards including multiple autoclave sterilization cycles. One of the most effective approaches is to enhance the durability of the device and its enabling components. Connector manufacturers can utilize welded glass-to-metal or ceramic-to-metal hermetic vacuum seals, which have long been used in other industries with a high cost of failure and are proven to provide a superior degree of sealing integrity. The glass used in these applications is processed and fused at high temperatures around the metal, which effectively makes it break-resistant and prevents the leakage or ingress of liquid or gas of any kind. Hermetic seals are tested based on how many helium atoms can pass through at a certain leakage rate and are thus vastly superior to O-ring, epoxy, and other traditional sealing technologies. They can also be accomplished using a broad range of different glass, metal, and/or ceramic materials to achieve an array of different combinations with various mechanical and insulating properties and costs.

Banner Ad URL: <https://www.lemo.com/en/application/medical-connector>

LEMO is the acknowledged leader in the design and manufacture of precision custom connection and cable solutions. LEMO's high quality Push-Pull connectors are found in a variety of challenging application environments including medical, industrial control, test and measurement, audio-video and telecommunications.

LEMO has been designing precision connectors for seven decades. Offering more than 75,000 combinations of product that continue to grow through custom specific designs, LEMO and its affiliated sister companies REDEL, NORTHWIRE and COELVER currently serve more than 100,000 customers in over 80 countries around the world.

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