Writing a connector prescription

The medical market is changing rapidly and suppliers will have to meet demands for smaller, fast and cheaper connectors. By **Neil Tyler**

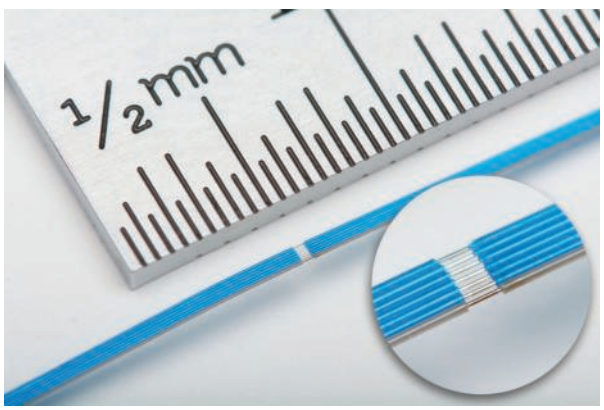
Medical device technology is one of the most vibrant markets for connectors. Commonly separated into three primary segments – imaging and diagnostic equipment, therapeutic equipment and other medical equipment – the medical electronics market is having to address rising health care costs, as well as dramatic advances in medical technology.

"The market is adapting to unprecedented external market forces and on a global scale," comments Anthony Kalaijakis, strategic industry marketing manager with Molex. "For instance, the healthcare reforms we are seeing across more developed regions have changed the socio-political environment surrounding healthcare, not only in high GDP consumption countries – primarily seeking greater efficiency – but also in those developing countries seeking access to technology."

Roberta Rebora, vp of marketing and communications at Smiths Connectors, agrees. "Medical device components are evolving at a lightning-fast pace and this has given rise to demands and requirements from what is, essentially, a brand new breed of customer. Across the board initiatives aimed at minimising health costs have, in fact, created a demand for medical electronic equipment that can work with total reliability in medical facilities and in the steadily growing portable home healthcare sector."

What that means for companies operating in this market is that greater value is being placed on innovation, breakthroughs in technology and manufacturing efficiency.

"We are faced with a call to action," says Kalaijakis. "To make things smaller, faster and cheaper, and to have the ability to communicate wirelessly."



Crucially, designing connectors for the medical market requires that engineers focus on eliminating the potential for failure or a loss of functionality: vital when medical connectors will be exposed to damage due to a combination of environmental factors and/or through poor usage.

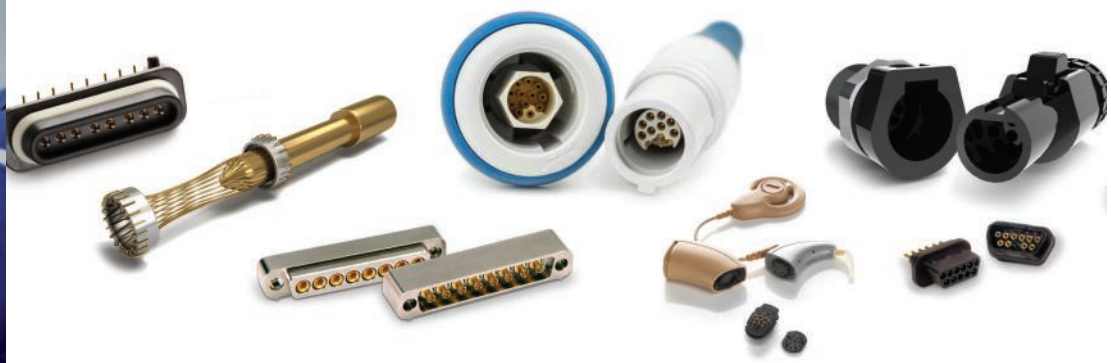
"We are having to develop and bring to market leading edge medical connectors designed for high reliability. At the same time, the connectors need to be cost effective, ergonomic and able to tolerate various sterilisation and cleaning protocols," Rebora explains. "Since they are used by doctors, they must also be easy to manipulate wearing surgical gloves."

In order to prevent mismatching, for example, Smiths' connectors and cables are colour coded, so they are always placed correctly.

Rebora continues: "In many cases, the connector on the patient is connected to a probe or similar device and intended for one time use only. Others, however, will need to be robust enough to withstand up to more than 20,000 cycles."

Because many physiological signals are small – a typical electrocardiogram (ECG) signal has a peak amplitude of about 1mV – the connector's electrical properties must also be able to remain constant across its lifetime.

As a result of these low signal levels, engineers may be required to ensure the connector has EMC



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protection, such as shielding.

As the medical market becomes more technology based, electrical connectors are playing a greater role in supporting and improving the capabilities of medical devices across multiple application disciplines.

"For the most part, they will have to withstand exposure to various chemicals, offer EMI/RFI protection and be immune to shock and vibration," suggests Rebora.

These are critical factors and can make choosing the right connector a complex issue – and design engineers need to be aware of them.

"We are also using new materials, such as plastics and metals, which are suitable for medical applications. They have enabled innovative new designs and have given a second life to existing technology," says Kalaijakis.

"A few examples of 'repurposing' technology include Molex' MediSpec Medical Plastic Circular connector system, which employs a modified version of the LFH contact system to meet the technology, performance and value expectations associated with the medical industry.

"Another technology that we have adapted from the commercial side is 3D moulded circuits from our antenna business unit for use in class II and III designs."

Smiths Connectors has a track record of repurposing technologies and has incorporated best in class spring probe technology into a range of medical connectors.

"We can deliver a high level of reliability, coupled with higher density, at the cost levels being demanded by the medical industry," Rebora explains. "For example, the latest addition to the HyperGrip family, the HG 69way connector, is based on spring probe technology and features 69 contacts in the same package size previously used for 19 conventional contacts.

"Spring probe technology delivers a number of benefits besides space saving, such as design flexibility, blind mating, longevity, constant contact resistance, high pointing accuracy, high currents and frequencies."

Another contact technology from Smiths is Eclipta, which deploys a double edge card contact system to provide more reliable connectors for effective and safe disposable medical device applications.

"Although edge card connectors have been used for more than 50 years, it is a design that has not typically been used in disposable medical applications. It therefore represents real progress in bringing to market an innovative technology that assists physicians in critical procedures and which delivers scalability, serviceability and affordability – all of which are required by disposable medical devices," suggests Rebora.

Hybrid connectors are another key trend in the medical market, she notes. "Hybrid connectors combine electrical signals and power, along with fibre optics and fluid interconnects, to address the needs of a broad range of medical applications."

"The breakthroughs at Molex have been influenced by the convergence of Medtech and commercial electronics," explains Kalaijakis. Recent acquisitions have contributed to the company's expansion of its medical business, including Polymicro Technologies, Temp-Flex Specialty Wire and Cable, Affinity Medical Technologies and FCT Electronics. "The multiplier in value does not come from the individual assets acquired, but rather from the synergy created toward a total solution," Kalaijakis adds.

Rebora and Kalaijakis say medical standards are having an impact on the development of new products and that connectors must be able to address the specific requirements associated with various medical applications – from MRI, which requires non magnetic materials, to disposable devices, which must work reliably for a limited time, and connectors which must resist liquid ingress, while being easy to clean and sterilise.

With the rise of portable medical devices and home devices, size and weight of the equipment – and the connector – have become more important. Miniature connectors are required, but that makes managing factors such as clearance and creepage distances for signals with a higher voltage even more important.

In the next five years, technologies from other industries – such as robotics, 3D optical scanning and high speed signal and data processing – will contribute to the development of new connector solutions.