

# Glass-Sealed Connectors Help Increase the Longevity and Reliability of Medical Devices

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Contributed Article

## Medical devices benefit from the dependability and resiliency provided by glass-sealed connectors as protection against autoclaving conditions.

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by *Jochen Herzberg, SCHOTT Electronic Packaging*

In today's era of rapid technological advancement, medical devices have become more complex and capable than ever thanks to the integration of advanced electronic components. Steam sterilization in the autoclave is a staple of the medical industry. This crucially important process pits devices against temperatures of 273°F and two bars of pressure to ensure devices are sterile and safe to use before each procedure. The electronics inside modern medical appliances need protection from the intense conditions in the autoclave. One of the most important components in this process is the connector, which makes electrical and data connections between device sections.

Implementation of high-quality connectors using the right materials is crucial. Inferior components can weaken the protection of the device's electronics. Glass-to-metal sealing technology, already used in other harsh-environment applications, such as aviation, aerospace, and automotive safety, has emerged as an ideal solution in the development and manufacture of medical connectors. Glass-to-metal sealed connectors offer a resilient and dependable option that remains reliably gas-tight for over 3,500 autoclaving cycles, subsequently helping extend the lifespan of medical devices.

### Potential Difficulties With Polymer-Sealed Connectors

Many medical connectors are sealed with polymers or epoxy resins, which are not capable of maintaining a dependable seal over a long period. During the autoclaving process, and especially after repeated cycles, polymer-based connectors will allow for a certain permeability of moisture. This can cause damage to electronic components. The binders and chemicals that make up polymer seals deteriorate over time, leaving a brittle shield incapable of providing truly reliable protection from autoclaving conditions.

The aging process and breakdown of these organic materials can happen quickly, sometimes after as few as 100 autoclaving cycles. The potential inability of polymer seals to stand up to the fundamentally important autoclaving process can lead to a plethora of

problems: shortened device lifespan, failure during a procedure, and increased total cost of ownership from compromised seal integrity.

### **Connectors Are Strengthened by the Integrity of Glass**

A common argument against glass as a material is the idea that it is easily broken. Glass-to-metal sealing technology challenges this concept. Using advanced manufacturing processes, the glass preform and metal pieces are heated to a temperature that makes the glass molten, fusing the glass and metal together to create a gas-tight and pressure-proof seal.

Glass seals maintain integrity because glass is inorganic, non-aging, non-porous, and resistant to drastic environmental changes. This makes it a choice material to use in the manufacture of medical connectors because it has a proven ability to withstand the autoclaving process over 3,500 times. The strong seal effectively prevents the ingress of moisture and other outside contaminants, safeguarding electronics from damaging humidity and particulates.

### **Peace of Mind for Medical Professionals**

Medicine is a profession in which confidence is of utmost importance on a universal scale. A doctor's confidence in his abilities, decisions, colleagues, and treatment all come together in the effort to create a successful patient outcome. The same need for confidence applies to medical devices. Medical professionals must be able to trust their equipment. The use of devices with glass-to-metal sealed connectors goes a long way to help establish this on many fronts.

Cross-contamination incidents are one of the most substantial threats to patient safety and professional integrity in the medical industry. Mitigating the risk of such incidents is the reason why the autoclaving process is extremely important in medical environments. Traditionally, steam sterilization presents a major strain on devices because it can accelerate wear on components. With protection for electronics from glass-to-metal connectors, devices can undergo a complete and intensive autoclaving cycle over 3,500



Autoclavable glass-sealed connector from SCHOTT.



Autoclavable connectors enable superior reliability and performance in operating room devices

times without risk of accelerated damage or wear on the electronics.

Increased reliability aided by the use of glass-to-metal connectors eases worry in both operating rooms and finance offices. Glass-to-metal connectors can help extend device service life, reduce maintenance costs, and lessen the chance of warranty claims and physician frustrations. Surgeons and patients can experience the safety benefit of a decreased chance of device failure, while hospital budgets can experience a reduced burden thanks to a less-frequent device replacement schedule.

### **Design Possibilities Enabled by Customizable Glass-to-Metal Technology**

Versatility is another key benefit that sets glass-to-metal sealed connectors apart in a constantly developing medical landscape. Integration possibilities for medical applications include surgical tools, endoscopes, and instruments for spectrometry and pulse oximetry. Customization possibilities can be met for individual and exact application needs, enabling design flexibility for medical device engineers. This creates the opportunity to conceptualize distinct ideas while still meeting strict regulatory requirements for medical devices.

Glass-to-metal sealed medical connectors can be custom-designed in a number of ways, including varying shapes, sizes, and pin configurations to match requirements for integration in medical devices that require power and data supply and must be repeatedly autoclaved.

Devices and techniques will change, but the rigid standards for autoclaving requirements for hygienic operating rooms will remain a constant. As medical instruments and technologies grow more sophisticated and complex, it is increasingly important to guard sensitive components from the autoclaving process while supporting their longevity. Glass, in its distinct role as an inorganic and reliable sealing material, offers a way.

### **About the Author**

Jochen Herzberg is an innovation leader at SCHOTT Electronic Packaging in Landshut, Germany. He oversees the global pipeline of new business projects with a special focus on medical applications. Jochen works in cooperation with SCHOTT's R&D engineers as well as directly with customers to formulate customized connector solutions based on individual application needs. His career at SCHOTT began 10 years ago as a development engineer, working at facilities in both Mainz, Germany and Tokyo, Japan. He can be reached at [Jochen.Herzberg@schott.com](mailto:Jochen.Herzberg@schott.com).

