CASE STUDY

High Flex Wearable Cable Assemblies

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□ Winchester's engineers identified several challenges to be addressed – flexibility, biocompatibility, strength, & waterproofing. Solving these key hurdles would mean success in the field and better patient quality of life.

A cable's ability to achieve a high flexibility count (> 10M cycles) is determined by the construction of the cable. The IEC 60228 standard presented by the customer could not yield breakage greater than 10%. By strategically laying the individual conductors during the extrusion process, a cable flexibility dramatically increases. Equally important is the individual raw components selected. A solid center conductor is not suitable for high flex application, therefore, using alternate conductors will dramatically improve a cable life over flexure. Typical pure copper center conductors can be replaced with alloys such as copper, aluminum, or copper clad steel.

In selecting the raw components, special care had to be taken to ensure all material that could come in contact with patients were biocompatible as defined by ISO 10993. The device would need to withstand harsh chemicals as it would be subjected to multiple cleanings throughout the lifecycle. Along with biocompatibility and a rigorous cleaning process, the cable could not become "tacky" in order to prevent catching of skin or clothing.

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The strength of the cable was also an important consideration. Again, construction and raw material selection are the main deciding factors on the strength and performance of the cable. The natural movement of patients caused unexpected strain at all termination points. Winchester engineers recommended a strain relief be incorporated into the cable as well as a custom overmold at the termination points. By doing so, this would transfer the energy of these unexpected strains from the termination points to the connector shell, board, and cable.
The current design of this class II device required patients to remove the device while bathing. Due to the critical nature of the application and Winchester's engineering history, it was determined that an IP67 rating for the termination points and connectors would be required. Increasing the rating to IP67 required a redesigned connector and specific construction of the strain relief at the cable-connector transition. Working to the IP67 rating would allow patients to wear the device in a bath or shower and reduce the chance of a patient emergency due to the removal of the device.

Winchester Solution

Winchester's engineers designed a custom multiconductor bulk cable using a stranded alloy with a specialized lay to maximize flexibility and minimize size that was "non-tacky" and biocompatible. To satisfy IP67 requirements, a custom overmold for all termination points was designed that would also double as a strain relief. For additional strength, a kevlar strand was included in the cable at the extrusion process. With the overmold and kevlar strand combined, the cable assembly was able to withstand the strains and harsh cleanings throughout the device's lifecycle as defined by the customer.

Customer Improvement

The resulting design, high-flex multiconductor cable assembly, was approved by the customer and orders placed. By Winchester's engineers working closely with the customer, Winchester was able to fully understand the issues and provide a turnkey tested cable assembly that includes termination of the bulk cable to the customer's PCB's with an overmold. The new design provided a more reliable product that exceeded the customer's flexibility, environmental, and strength requirements. Patients would now be able to wear the device at all times including while bathing.

Contact our Winchester Interconnect Experts for your custom solution!

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