LOROM

Choosing The Right Medical Cable Jacket

Technical Whitepaper

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Complete Manufacturing

Let LOROM assist you selecting the right jacket for your medical application

The appearance and cosmetic effect is important for your products in terms of customer appeal and suitable industrial design.

More than purely ergonomics should be considered when selecting a material. Like every manufactured product, first impressions of quality is taken from how it feels and looks for the doctor, dentist, surgeon, or nurse, medical cables are no exception.

Although the internal construction of a cable is vital to its overall performance, regardless of it being a coaxial cable or twisted pair construction contained within the outer jacket of the cable, it is the exterior of the cable that is the most observable indication of the quality of the product.

Ergonomic and tactile feel of a cable and is how it is perceived by the user is largely influenced by the jacket material and the resulting overall flexibility of the cable.

Cable appearance

Appearance of the cable jacket will in almost all cases have no impact on mechanical or electrical performance of a cable assembly.

But should be taking into consideration in early design stages of your medical device or equipment for several reasons:

- Specific cable color required matching device color scheme
- Cable color could differentiate a specific function from others
- The right color will reduce visible dirt or debris
- White is often considered the color of choice for medical equipment and devices, however white cable jacket will show marks or dirt, which may detract from the "clinical look" of the cable assembly.
- Other than white, neutral colors are most commonly used and include light grey, darker greys and black. But, in addition to neutral colors, cable jacket can be extruded in almost any custom color.

LOROM has the color matching equipment and compound facility to provide your medical cable any color of choice.

Standard colors available by Pantone number or RAL numbers.

If your equipment or device has a specific color that needs to matches is highly recommended to match the resin color to a sample rather than depend upon either a Pantone or RAL number.

The Feel of the Jacket and Cable Flexibility

In addition to the appearance of the cable jacket, the feel to the user often implies a great deal about the quality of the cable assembly. Different materials offer a different tactile feel and more significantly softer grades of even the same material feel different.

Silicone is the softest and most flexible material used for medical cable jackets. In addition to being soft and flexible, silicone withstand a high number of sterilization cycles by autoclave.

As uncoated silicone cables are "tacky" and easily accumulate dirt, LOROM has a developed coating technology addressing this issue.

The LOROM dispersion/coating technology gives the cable jacket a silky texture enabling easy to cleaning.
As alternatives to Silicone LOROM offers rubberized polyvinylchloride as a soft material. Available in medical grades meeting FDA and ISO biocompatibility requirements as well as being RoHS compliant.

Our specialized rubberized PVC jackets will be more durable than one made of silicone for the same wall thickness, can be very flexible and is a lower cost material.

In house compounded LOROM Thermoplastic elastomers, such as TPE, R and U's are more durable than silicone and PVC
We offer soft grades that are similar in flexibility and shore hardness as SILICONE.

TPE cable jackets typically have a smooth feel convey the feeling of high quality.

Thermoplastic polyurethane (TPU) is the most durable of materials commonly used to jacket medical cable. It has excellent abrasion resistance; tensile strength and excellent crush resistance.

And, while it is available in softer grades, it is typically not as flexible as the three previously listed materials.

Cable jackets are intended as primary function is to insulate various components within the cable as protection from damage during use, cleaning and sterilization.

We recommend Polyurethane jackets and over mold for maximum abuse protection. Examples of applications are cables used by first responders or for used outside of a clinical setting.

For cables that will be subject to a high number of sterilization cycles, a silicone jacket offers the maximum protection.

Balance between durability and flexibility of Cable Jackets

The durability of a cable jacket is a function of the type of material, as described previously, but also of the hardness of

the material and wall thickness of the jacket. Increasing the wall thickness of the cable jacket increases the durability, but conversely reduces the flexibility of the cable, irrespective of the material.

Provides Additional Strength

Additional strength and protection of cable terminations can be achieved by employing a robust cable jacket that is mechanically clamped to the internal components. If this method is used, the stronger and thicker the cable jacket, the greater the protection of terminations is.

Polyurethane is the most durable material commonly used for medical cable jackets and can add significant strength to the cable assembly. Silicone, while having other advantageous properties, offers the least amount of added strength or protection. A thermoplastic elastomer, TPE-R is stronger than silicone and typically more flexible than polyurethane.

Skin Contact and Material Selection

LOROM materials used in medical devices are compliant to ISO 10993 and FDA regulations for biocompatibility.

The nature of the application, most patient cables come in contact with the body and therefore should employ medical-grade, biocompatible materials.

LOROM Materials used for medical cable jackets are medical grades, meeting biocompatibility requirements.

Cleaning and Disinfection

Before selecting a material it should be determined what methods can be used to clean and disinfect a cable.

Standardization ANSI/AAMI EC53 describes minimum for cleaning and disinfection of ECG Cables and Lead wires.

Section 4.3.1 of the standard details cleaning and disinfection requirements with the following solutions:

- Green soap or alcohol-free hand soap
- 2% glutaraldehyde solution
- Sodium hypochlorite (bleach) solution 10% in water
- Alcohol based solutions are often used in clinical settings,.

The following table offers guidance in the selection of both cable jacket and over mold resins based on how the cable assembly will be cleaned or disinfected:

Material	Sodiun hypochlorite bleech	Isopropyl Alcohol	Glutaral-dehyde
PVC	Good	Good	Fair
TPE-R	Excellent	Excellent	Excellent
TPU	Poor	Poor	Good
Silicone	Good	Excellent	Good

Sterilization

Elimination of all microorganisms by sterilization, the selection of a suitable cable jacket material becomes even more significant. Of the three most common methods: steam autoclave, low-temperature hydrogen peroxide or peracetic acid steam autoclave is the most challenging for many materials used for cable jackets and over molding.

Of the materials commonly used for medical cable jackets, only silicone can withstand hundreds of autoclave cycles.
The following table may assist in the selection of both cable jacket and over mold material based on which common sterilization method will be employed:

Material	Autoclave	Gamma	Ethylene oxide	Low temp hydrogen peroxide	Paracetic Acid
PVC	Poor	Excellent	Excellent	Good	Good
TPE-R	Fair	Excellent	Excellent	Good	Good/Excellent
TPU	Poor	Excellent	Excellent	Good	Good
Silicone	Excellent	Excellent	Good	Excellent	Good/Excellent

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