

Tri-layer Extrusions

For Coronary & Neurovascular Catheters



Tri-layer extruded polymer tubes combine a lubricious inner surface with a bondable outer surface ideal for inner member shaft components used in coronary, neurovascular and other catheter applications. The low friction interior surface enhances movement of guide wires or other devices within the shaft, while the exterior allows for bonding of distal tips, balloon, or proximal connectors. A middle layer bonds the two distinctly different polymers used for the inner and outer layers.

Tri-layer extruded tubes are used in catheter systems that navigate deep into the vascular system by following a preplaced guide wire. Tri-layer extrusions are also used as working channels within a catheter assembly to allow for insertion of a tool or implant through the lumen to the therapeutic site.

Common Sizes – Tri-layer extrusions are most commonly produced with inside diameters of 0.016” to 0.017” to accommodate 0.014” coronary guide wires. Tri-layer extrusions are also available in sizes to accommodate a range of unique guide wires diameters, including 0.018”, 0.025”, 0.035” and 0.038”. Wall thicknesses are typically between 0.002” and 0.003”. Putnam Plastics is capable of producing tri-layer extrusions in diameters of over 0.250”.

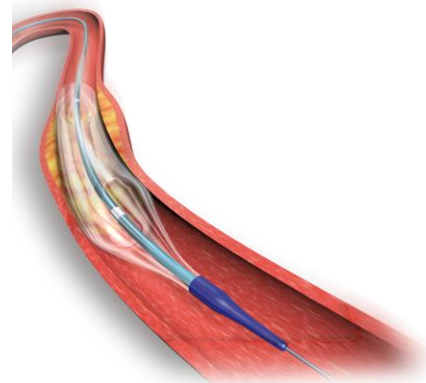
Tolerances – For tri-layer extrusions with diameters of 0.016 to 0.017”, tolerances of +/- 0.0005” are available. For large diameter tri-layers, tolerances of +/- 0.002” can be achieved.

Layer Thickness – Wall ratios between inner and outer layers are commonly in ratios of 25%:75% or 20%:80%. The middle layer is typically 0.0002” thick to provide an uninterrupted layer throughout the extrusion.

Inner Layer Material - The inner layer need only be thick enough to provide an uninterrupted lubricious surface. High Density Polyethylene (HDPE) is commonly used for the inner layer.

Outer Layer Material - The outer layer is made as thick as possible for mechanical strength of the shaft, while providing enough inner layer wall thickness to ensure manufacturability. The polymers used for the bondable outer layer include polyether block amides (Pebax®) or polyamides (nylons 11 and 12).

Color – Tri-layer extrusions may be colored for aesthetic or size coding purposes. While a range of colors are available, surface requirements of the inner and outer members limit some pigment types and loadings.



Surface – A smooth glossy surface free of bumps is important on the inner surface to ensure ease of guide wire movement. A smooth outer surface reduces stress concentrations in the thin wall which compromise tensile and elongation properties. Gels inherent in polymers, are a common source of bumps in thin wall extrusions. Throughout the manufacturing process, from material selection through compounding and extrusion, gels are minimized or removed wherever possible.

About Putnam

For over two decades, Putnam Plastics has provided comprehensive extrusion technologies for medical catheters and minimally invasive devices. Technologies include thermoplastic and fluoropolymers extrusions, polyimide tubing, printing, and tipping and machining tubes. Putnam offers development through validated manufacturing services.



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