



Solutions for Medical Devices

Market Brochure | Zeus Inc.



zeusinc.com

Medical Market Focus

Working with OEMs, medical device manufacturers, suppliers, and distributors, Zeus develops precision polymer products for both vascular and non-vascular applications. These tight tolerance extrusions enable innovative device designs, helping create products that are thinner, stronger, and safer.

Solutions include catheter components, implantable products, microporous materials, monofilaments, multi-lumens, and membranes. Our engineers can work with you to develop custom polymer solutions that extend the frontiers of medical science and significantly improve patient care.

NEUROVASCULAR

- PTFE Glass-Filled Monofilament
- PTFE Liners
- Polyimide Family Liners
- Tie Layer
- Jacketing (Peba, Nylon, TPU)
- FluoroPEELZ™ Peelable Heat Shrink

CARDIOVASCULAR

- PTFE Monofilament & Glass-Filled Monofilament
- PTFE Liners
- Polyimide Family Liners
- Tie Layer
- Jacketing (Peba, Nylon, TPU)
- Aeos™ ePTFE (Tubing, Membrane)
- Absorv™ Bioabsorbable Extrusions
- Bioweb™ PTFE/PU Composite Membranes
- FluoroPEELZ™ Peelable Heat Shrink
- PTFE/FEP Flared Tubes

ENDOSCOPY

- PTFE Liners
- Polyimide Family Liners
- Tie Layer
- Aeos™ ePTFE (Tubing)
- PTFE Spiral Stripe Heat Shrink

CRM / EP

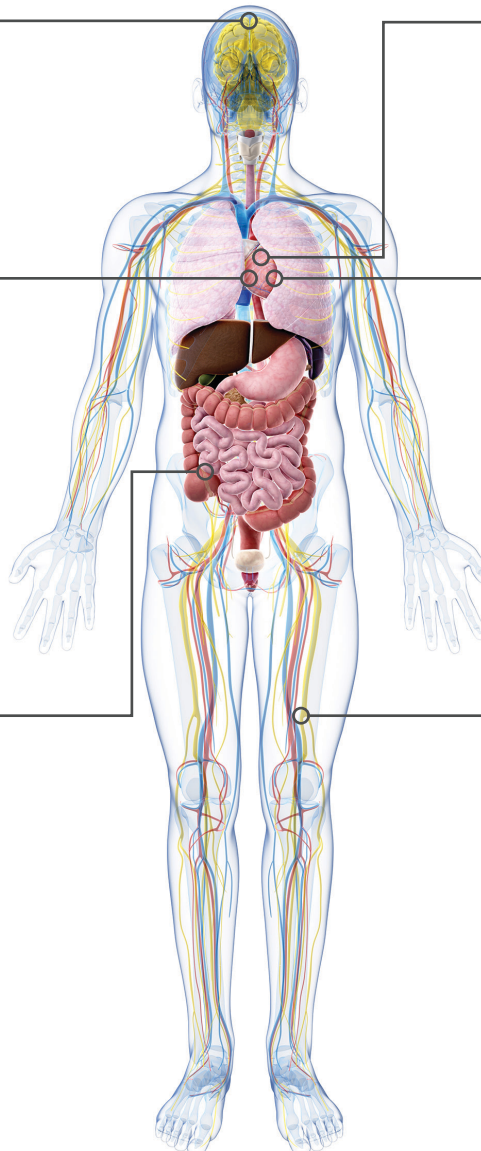
- PTFE Liners
- Polyimide Family Liners
- Tie Layer
- FluoroPEELZ™ Peelable Heat Shrink
- LCP monofilament

STRUCTURAL HEART

- PTFE Liners
- Tie Layer
- Aeos™ (Suture Monofilament & Membrane)
- Jacketing (Peba, Nylon, TPU)
- Absorv™ Bioabsorbable Extrusions
- Bioweb™ PTFE/PU Composite Membranes
- FluoroPEELZ™ Peelable Heat Shrink

PERIPHERAL

- PTFE Monofilament
- PTFE Liners
- Tie Layer
- Jacketing (Peba, Nylon, TPU)
- Aeos™ ePTFE (Tubing & Membrane)
- Bioweb™ PTFE/PU Composite Membranes
- Absorv™ Bioabsorbable Extrusions
- FluoroPEELZ™ Peelable Heat Shrink
- PEBX Glide™
- PEEK Glide™
- PTFE/FEP Flared Tubes



Catheter Components

Mandrels -

PTFE Monofilament & Glass-Filled Monofilament

Extruded PTFE monofilament is a primary foundational component used for mandrels in catheter construction. PTFE's naturally smooth non-stick surface helps facilitate mandrel removal after construction of the finished catheter. For designs requiring a high PIC count, glass particles can be compounded with PTFE resin prior to extrusion to enhance mechanical properties of the extruded monofilament.

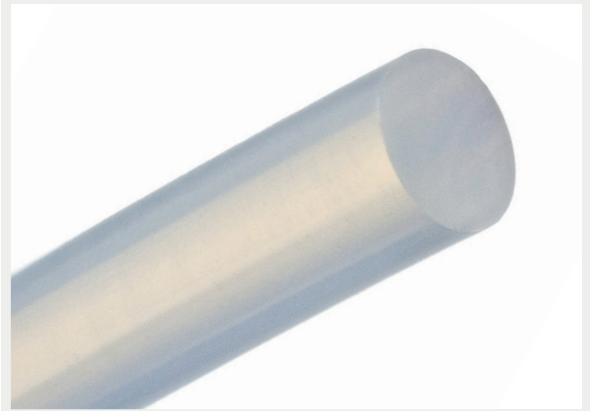
Catheter Liners -

PTFE Sub-Lite-Wall™ Liners

Zeus Sub-Lite-Wall™ is our family of super-thin-walled extrusions with wall thicknesses from 0.005" (0.127 mm) and below. With industry-leading sizing, tight tolerances, and high performance properties, Zeus PTFE Sub-Lite-Wall™ Liners are an ideal choice for a wide variety of advanced vascular catheter designs.

PTFE Sub-Lite-Wall™ StreamLiner™

StreamLiner™ VT and XT represent our thinnest and most flexible free-extruded PTFE liners. Pairing max wall thicknesses of 0.001" / 0.0254 mm (VT) and 0.00075" / 0.01905 mm (XT) with best-in-class tensile strength, free-extruded StreamLiner™ VT and XT catheter liners enable advanced catheter designs with smaller profiles or larger working channels.



PTFE Monofilament

- High Lubricity for Easy Removal
- High Operating Temperature (500 °F / 260 °C)
- OD Tolerances as Low as 0.0005" (0.0127 mm)



PTFE Sub-Lite-Wall™ Liners

- Thin and Flexible
- Largest Range of ID and Wall Size in the Industry
- Ability to Customize Performance



PTFE Sub-Lite-Wall™ StreamLiner™

- Thinner and More Flexible than Sub-Lite-Wall™
- Access to Smaller, More Complex Vasculature
- Maximize Working Channel or Minimize Profile

Catheter Components cont.

Catheter Liners -

PTFE Sub-Lite-Wall™ StreamLiner™ Over-The-Wire

StreamLiner™ Over-The-Wire (OTW) is the latest addition to the StreamLiner™ family and helps bridge the gap between film cast and free-extruded liner technology. StreamLiner™ OTW liners provide the same thin walls and tight tolerances as free-extruded StreamLiner™, but with softer, more flexible mechanical performance enabling next-gen catheter designs to navigate the most tortuous vasculatures.

PTFE Sub-Lite-Wall™ Multi-Lumens

Engineering steerable and deflectable catheters can be challenging. As a single, process-ready extrusion, PTFE Sub-Lite-Wall™ multi-lumen tubing helps simplify steerable catheter construction, reduce manufacturing steps, and improve yields.

Polyimide and PI Glide™ Tubing

Polyimide (PI) tubing can be produced in a range of ID sizes with thin walls and extremely tight tolerances while still retaining its strength and pushability, enabling it to reach the smallest vasculatures. When enhanced lubricity is needed, PI Glide™, a PI/PTFE composite, provides up to 25% lower coefficient of friction on the inside diameter, outside diameter, or both.



PTFE Sub-Lite-Wall™ Over-The-Wire

- Thinnest and Most Flexible Extruded Liners
 - Nominal Walls Down to 0.0004" (0.0102 mm)
- Access to the Most Tortuous Vasculature
- Maximize Working Channel or Minimize Profile



PTFE Sub-Lite-Wall™ Multi-Lumens

- High Structural Integrity
- Improved Planarity & Performance
- Extremely Thin Walls



Polyimide and PI Glide™

- High Tensile Strength
- Customizable Mechanical Properties
- REACH and EU MDR ready*

**Our thorough analytical test results indicate that no SVHC/CMR restricted substances are intentionally included in Zeus-supplied polyimide products at levels above the 0.1% threshold outlined by REACH and EU MDR.*

Catheter Components cont.

Reinforced Polyimide Tubing

Braid and coil reinforced polyimide tubing is available for challenging applications that require enhanced torque, flexibility, kink resistance, improved pushability, or increased strength. Reinforced polyimide tubing can be produced in full-load and half-load braid patterns, with various PPI (picks per inch). Reinforced polyimide tubing is also available in coil configurations with various WPI (wraps per inch) to meet your specifications.

Bonding and Adhesion -

Tie Layer

Delamination is a challenging failure mode in catheter construction that can ultimately lead to failures in the field and product recalls. Tie layer helps combat this by creating a melt-bondable surface that improves adhesion. By improving jacket-to-liner bond strength, Tie Layer helps to improve patient safety, enhance catheter performance, and reduce manufacturing costs.

Braiding and Reinforcement -

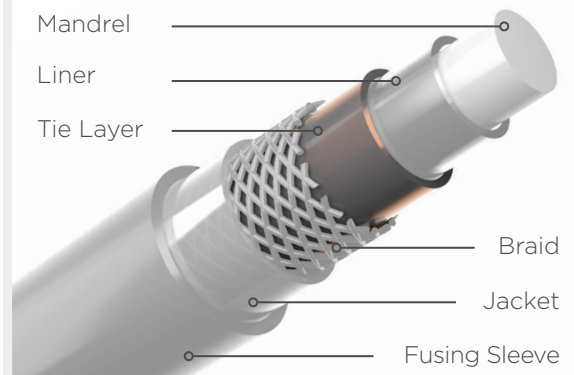
LCP Monofilament

Liquid crystal polymer (LCP) has significant advantages for catheter construction and as a monofilament, out-performs almost all other plastic or polymer braiding media. LCP is strong and rivals even stainless steel in some areas. Because LCP is a non-metal, however, catheters made with LCP braiding are compatible with magnetic resonance imaging (MRI) – a highly preferred trait.



Reinforced Polyimide Tubing

- Enhanced Torque Transmission
- Improved Flexibility and Kink Resistance
- Increased Strength and Pushability
- REACH and EU MDR ready*



Tie Layer

- Pebax® - 35D to 72D durometers
- Vestamid® 75D (Nylons)



LCP Monofilament

- High Strength
- Low Elongation
- Class VI Approved

**Our thorough analytical test results indicate that no SVHC/CMR restricted substances are intentionally included in Zeus-supplied polyimide products at levels above the 0.1% threshold outlined by REACH and EU MDR.*

Catheter Components cont.

Jacketing -

Pebax® and PEBX Glide™

Pebax® is a highly preferred family of materials for catheter jacketing because its polyether-block-amide composition supports easier customization. The customizable nature of the Pebax® family surpasses nearly all other thermoplastic elastomers allowing properties such as hardness, chemical resistance, and even processing to be fine-tuned. When more lubricity is needed, PEBX Glide™, our high lubricity PEBA blend, offers up to a 60 percent decrease in coefficient of friction, resulting in reduced drag and enhanced performance.

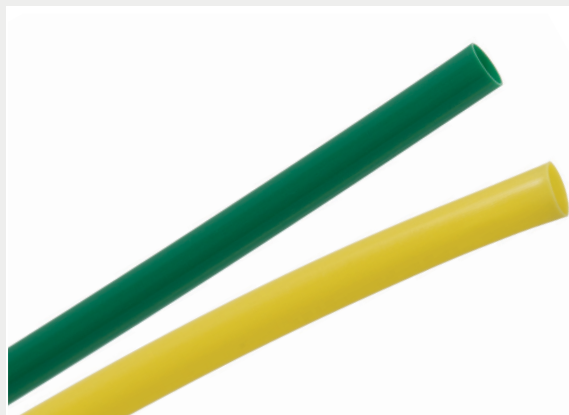
Nylon and Nylon Glide™

As a pioneer in the extrusion of precision-engineered polymers, we recognize the unique performance attributes of Nylon 6/6, 11, and 12 for catheter applications. Nylon Glide™, our high lubricity Nylon blend, retains many of the same mechanical properties that make Nylon 6/6, 11, and 12 attractive for catheter jacketing, but with the added benefit of reduced drag.

Reflow and Assembly Aids -

FluoroPEELZ™

Catheter construction is a delicate and laborious process that leaves no room for error, especially in the final step of removing the recovered heat shrink from over the outer catheter shaft. Zeus FluoroPEELZ™ brings simplicity to this critical step. With a simple linear tear, FluoroPEELZ™ peelable heat shrink helps increase yields, improve safety, and simplify catheter construction. FluoroPEELZ™ can be ordered pre-slit to increase throughput.



Pebax® and PEBX Glide™

- Variable Durometers (Shore D Hardness 35 to 72)
- Available in Multiple Colors
- Customizable



Nylon and Nylon Glide™

- Multiple Grades (Nylon 6/6, Nylon 11, Nylon 12)
- Available in Multiple Colors
- Customizable



FluoroPEELZ™

- Shrink Ratios up to 2:1
- Accelerated Production
- Enhanced Yields

Catheter Components cont.

FEP Heat Shrink

For other recovery options, FEP heat shrink may be your preferred method. Just like FluoroPEELZ®, FEP heat shrink offers exceptional chemical resistance and is Class VI approved. FEP heat shrink can be provided with temperature profiles as low as 455 °F (235 °C) for sensitive applications.

Additional Medical Components

Balloon/Stent Protectors -

PTFE and FEP Flared Tubing

Balloon protectors manufactured from PTFE and FEP help to ensure balloons are not exposed to abrasion or rubbing during shipping and handling. While typically flared on both ends to make placing the protector over the balloon or stent even easier, we also offer other additional customizations such as flanging, bell-shaped ends, double-flaring, and more.

Guidewire Encapsulation -

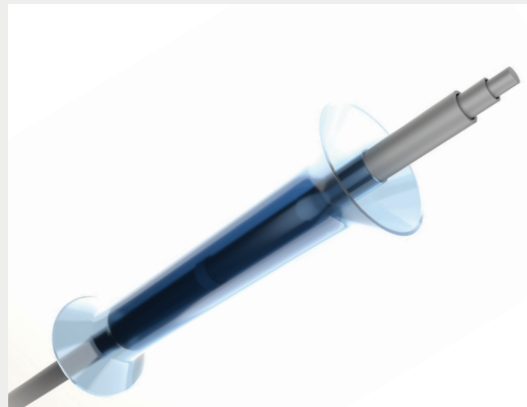
PTFE Spiral-Stripe Heat Shrink

PTFE spiral stripe heat shrink gives physicians the visibility they need to perform a variety of endoscopic procedures from colonoscopy to bronchoscopy to ERCP. Spiral striped heat shrink over the guidewire allows surgeons to not only be sure of guidewire location but also track its rotation within the body.



FEP Heat Shrink

- Shrink Ratios up to 2:1
- Chemical Resistance
- Optical Clarity



PTFE and FEP Flared Tubing

- Customizable
- Low Surface Friction
- Improved Device Protection



PTFE Spiral-Stripe Heat Shrink

- Increased Lubricity
- Enhanced Visual Feedback
- Customizable

Additional Medical Components cont.

Electrical Insulation -

TPU Multi-Lumen Tubing

For devices that require multiple electrical leads, or wires, to pass through a single tube, Zeus' TPU multi-lumen extrusions are an ideal choice. These multi-lumen extrusions feature excellent dielectric properties and flexibility, and can be tailored to meet the specific requirements of your design.

PEEKshrink™

PEEKshrink™'s excellent dielectric properties, ability to withstand autoclave temperatures, and its resistance to abrasion and wear make it a preferred polymer for protecting, isolating, and insulating probes, meters, or other electrical components used in medical or clinical laboratory settings.

Introducers & Dilators -

PTFE, FEP, Pebax®, PEBX Glide™, HDPE Tubing

Zeus tubing for dilators and introducers is available in multiple resins to better tailor the material for the application. These extrusions are highly amenable to end modifications such as tapering, flaring, and tipping for smooth dilator-to-sheath transition and lower insertion force.



TPU Multi-Lumen Tubing

- Customizable Up to 13 Lumens
- Shore A Durometers Available
- Consistent Spacing Between Lumens



PEEKshrink™

- High Continuous Service Temperature (500 °F / 260 °C)
- Shrink Ratios Up to 1.4:1
- Available in Colors



PTFE, FEP, Pebax®, PEBX Glide™, HDPE Tubing

- Lubricious
- Smooth Dilator-to-Sheath Transition
- Radio-opaque (RO) Fillers Available

Additional Medical Components cont.

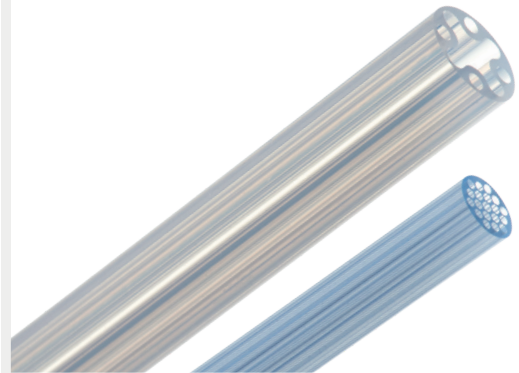
Other Device Components -

Multi-Lumen Tubing & Custom Profiles

Multi-lumen tubing is often used in demanding applications such as minimally invasive surgery where the ultra-fine lumens allow multiple functions or instruments to be placed within a limited space. Multi-lumens are available in multiple materials including PTFE, ePTFE, FEP, PFA, PEEK, TPU and more.

PEEK and PEEK Glide™ Tubing

PEEK's high strength-to-weight ratio lends itself to being ideal replacement for stainless steel and other metals in a variety of medical devices. With PEEK Glide™, engineers have a unique solution when looking for reduced drag, with up to a 17 percent decrease in coefficient of friction as compared to standard PEEK.



Multi-Lumen Tubing & Custom Profiles

- Highly Customizable
- Extensive Range of Sizes
- Etching Available



PEEK and PEEK Glide™ Tubing

- Lightweight
- Biocompatible
- Lubricious

Value-Add Services -

Improve Manufacturing Efficiency

Zeus offers many Value-Add Services to refine your product to your specific application. These services are typically additional manufacturing steps on tubing which we can provide for you to better optimize your finished product. Our ability to perform these operations in-house allows you to work with one well established vendor while eliminating processing steps that save you time and money.



Includes:

- Skiving
- Pad Printing
 - Flanging
- Overmolding
- Drilling/Punching
 - Flaring
 - Scoring
 - Slitting
- Draw Down
- Heat Sealing

Biomaterials

Absorv™ Bioabsorbable Extrusions

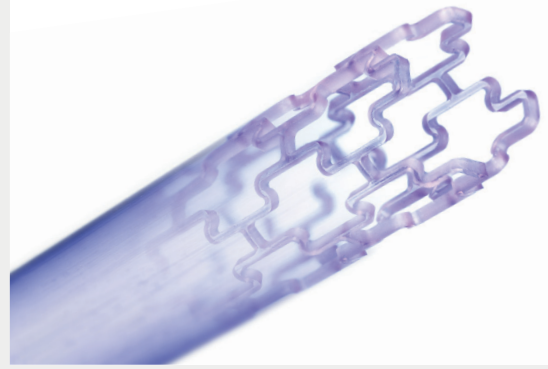
Absorv™ is our family of bioabsorbable extrusions consisting of tubing, XSE oriented tubing, monofilament, drawn fiber, and ribbon. Absorv™ products are made from absorbable synthetic polyester polymers including poly-L-lactic acid (PLLA), poly(lactic-co-glycolic acid; PLGA), poly-ε-caprolactone (PCL), and others. Various material combinations of these bioabsorbable polymers can be utilized to achieve tailored performance characteristics and absorption rates (typically ranging from 1-36 months) for use in a variety of implantable applications.

Aeos™ ePTFE Products

Made by expanding PTFE under controlled conditions, Zeus Aeos™ ePTFE products feature a unique structure of solid nodes interconnected by a matrix of fibrils. These customizable products excel in applications that demand ultra-thin membranes, porosity, flexibility, and strength. Product forms include monofilament, suture monofilament, tubing, Sub-Lite-Wall® tubing, ribbon, profiles, multi-lumens, and membranes.

Bioweb™ PTFE/PU Composite Membranes

Bioweb™ PTFE/PU composite membranes provide an efficient adhesion platform for stents and scaffolds, enabling low-profile encapsulation over nitinol frames without sutures at a much lower temperature (266 °F / 130 °C) than traditional ePTFE coverings (572 °F / 300 °C). In addition to lower temperature bonding than ePTFE, Bioweb™'s PU layer combined with the PTFE layer provides isotropic mechanical properties, allowing Bioweb™ to encapsulate a wider variety of frames and unique geometries.



ABSORV™

- 100 µm Wall Thicknesses Available
- Controlled Rates of Degradation
- Varying Strengths and Stiffness



AEOS™ ePTFE

- Microporous
- Hydrophobic
- Low Coefficient of Friction



Bioweb™

- Low-Temperature Encapsulation
- Implantable
- Isotropic Mechanical Properties

ACCELERATE YOUR PROTOTYPING

with **FREE SAMPLES** of our polymer tubing.



FAST

EASY

FREE

WHY IT'S FAST AND EASY:



NO PURCHASE ORDERS
OR PAYMENT REQUIRED



CHOOSE THE
SAMPLES YOU WANT



SAMPLES SHIP WITHIN
48 HOURS

GET SAMPLES NOW AT
[ZEUSINC.COM/VSL](https://zeusinc.com/vsl)

*For standard delivery please allow 3-5 days for domestic shipments and 6-10 days for international shipments once order has shipped. If expedited delivery is selected a local Zeus customer representative will be contacting you for your freight carrier information.

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Get to know Zeus.



2,400+
TEAM MEMBERS



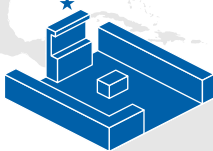
ZOS
OPERATIONAL
EXCELLENCE



100+
COUNTRIES
SERVED



160+
SCIENTISTS, ENGINEERS,
AND R&D PERSONNEL



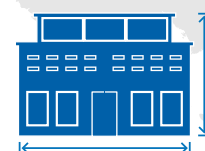
35+
DEVOTED
CLEAN ROOMS



CERTIFIED
ISO 9001 | AS 9100
ISO 13485



100+
CLASS VI APPROVED
RESINS & PIGMENTS



13
WORLD-CLASS
FACILITIES

— OUR MISSION —

PROVIDE SOLUTIONS · ENABLE INNOVATION · ENHANCE LIVES

Zeus, headquartered in Orangeburg, South Carolina, is the world's leading polymer extrusion and catheter design manufacturer. With over 55 years of experience in medical, aerospace, energy, automotive, fiber optics, and other leading industries, Zeus's mission is to provide solutions, enable innovation, and enhance lives. The company employs over 2,400 people worldwide with facilities in Aiken, Columbia, Gaston, Orangeburg, and St. Matthews, South Carolina; Branchburg, New Jersey; Chattanooga, Tennessee; San Jose, California; Arden Hills, Minnesota; Guangzhou, China; and Letterkenny, Ireland. For more information, visit www.zeusinc.com.



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