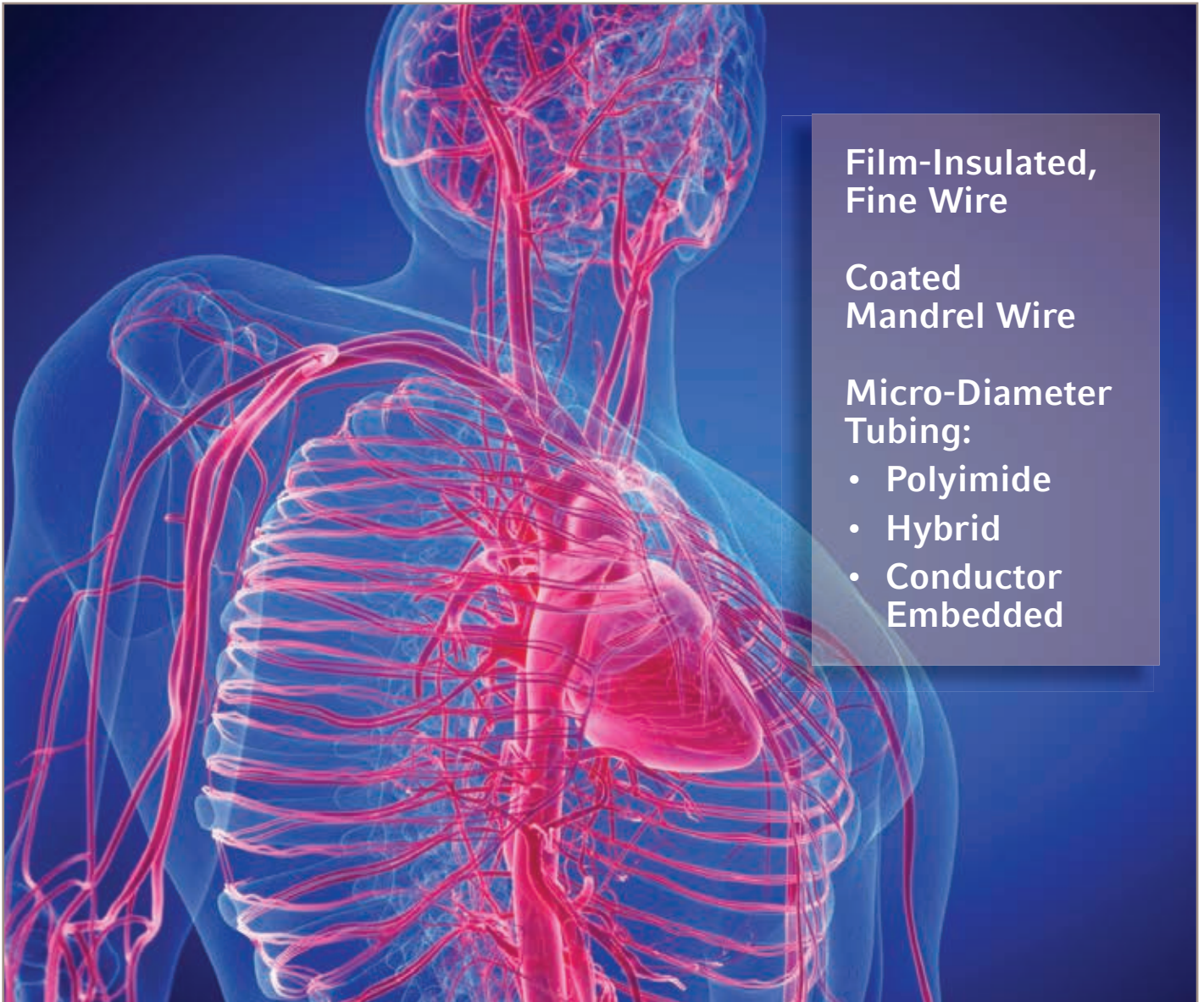


# Insulated Medical Wire and Micro-Diameter Tubing

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Film-Insulated,  
Fine Wire

Coated  
Mandrel Wire

Micro-Diameter  
Tubing:

- Polyimide
- Hybrid
- Conductor  
Embedded

# Your Great Ideas + Our Comprehensive Capabilities = Innovative Solutions

## Film-Insulated, Fine Wire

Teleflex Medical OEM manufactures a full line of insulated and uninsulated wire products. Customer uses include:

- Electrophysiology
- Peripheral vascular
- Pain management
- Urology
- Cardiology
- Neurology
- Endoscopy
- Laparoscopy

### METAL TYPES AND CONSTRUCTIONS

- Copper/copper alloys, stainless steel, nickel/copper Alloy 400, copper clad steel, copper clad stainless steel, titanium, nitinol, silver, constantan, CS95, DFT®, and nickel/nickel alloys
- Environmentally friendly copper alloys: HPC-35EF® and HPC-80EF®
- Plating on metals include silver, and nickel
- Single end, stranded, bunched, bobbins, or flat

### FILM INSULATED

- Unique polymer coating process over most wire materials
- Coatings include: polyimide, polyester, nylon, polyurethane, formvar, butvar, Pebax®, and epoxy
- Single end (round), multi-filar (twisted or parallel)
- 30 to 46 AWG with single, heavy, triple, quad coatings, and thermocouple types T, J, K, and E
- Natural or colored polymers available

### SPECIALIZED WIRE CAPABILITIES

- Laser-stripped, film-insulated wire
- Cut to length and straightened wire
- Thermocouple welding

### COATED MANDREL WIRE

- Forms high-precision tubing ID's
- Low friction polymer coated over most base metals
- PD-Slick™ material (a combination of polyimide and PTFE) is used as a top layer over polyimide or PTFE to improve bondability and flexibility

## Micro-Diameter Tubing

Teleflex Medical OEM has decades-long experience in the precision extrusion of PTFE, FEP, and other high-performance fluoropolymers and thermoplastics.

Recognizing the surging demand for tubing with extremely small dimensions for wall thickness and inside diameter, we expand our capabilities to include micro-diameter polyimide and polymer tubing components that are used for many customer applications, including cardiovascular, neurovascular, endoscopy and laparoscopy.

### POLYIMIDE

- Standard material for high strength products
- Excellent radiation, solvent, and cryogenic resistance

### THERMOPLASTICS

- Materials include: Pebax®, nylon and Vestamid®
- Used as a top layer, over polyimide or PTFE, to improve bondability and flexibility

### HYBRIDS

- Different polymers layered in a single tube construction
- Outstanding combination of strength, flexibility, and bondability

### REINFORCEMENT

- Increased strength, flexibility, torque, burst strength, and kink resistance
- Metal wire or non-metallic (PEEK, polyester) fibers inside the tubing wall
- Round or flat wire that is coiled or braided
- Longitudinal wires may be added for increased axial strength and stiffness

### CONDUCTOR EMBEDDED

- Coiled or braided construction
- Conductor or thermocouple wires inside the tubing wall
- Provides electrical pathways for power or sensors

### LOW FRICTION

- In order to reduce friction, PTFE or PTFE composites are applied on the ID or OD

### SPECIALIZED TUBING CAPABILITIES

- Polyimide tubing, micro-cut lengths
- Flaring, tipping, and forming for polyimide tubes
- Laser machining for polyimide tubes
- Pad printing on tubing products

# Guide to Tubing Materials

Teleflex Medical OEM offers an extensive line of polymer materials for micro-diameter tubing products, including ultra-small, thin-walled catheters. In addition, we have expertise in a full range of Pebax® durometers, nylon, and Vestamid®. Are you looking for a customized solution? You can count on our expert team for unique composites and tubing constructs.

## Characteristics of Selected Tubing Materials\*

	POLYIMIDE	PD-SLICK™ <i>(reduced friction)</i>	PEEK <i>(reference only)</i>
Tensile Break Strength (PSI); (MPa)	44,367; 306	23,082; 160	16,000; 110
Ultimate Elongation (%)	80	65	20
Modulus of Elasticity (KSI); (MPa)	286; 1,970	232; 1,600	500; 3,400
Dielectric Strength (V/MIL, Dry DC)	3,400	3,311	480
Operation Temperature (°C) (MAX)	240	240	249
Moisture Absorption (24 hrs)	0.84 WT%	0.23 WT%	0.1 WT%
Coefficient of Dynamic Friction (Dry)	0.27	0.13	0.38
Scrape Resistance (Cycles to Failure)	8	5	N/A

	PTFE	PEBAX® 63D	NYLON 12
Tensile Break Strength (PSI); (MPa)	4,000;28	3,509; 24	6,530; 45
Ultimate Elongation (%)	250	28	5
Modulus of Elasticity (KSI); (MPa)	59; 407	14; 96	203; 1,400
Dielectric Strength (V/MIL, Dry DC)	1,500	2,079	737
Operation Temperature (°C) (MAX)	260	156	100
Moisture Absorption (24 hrs)	0 WT%	1.02 WT%	1.60 WT%
Coefficient of Dynamic Friction (Dry)	0.09	0.22	N/A
Scrape Resistance (Cycles to Failure)	2	0.5	N/A

\*Physical properties are all nominal values and should not be used for specification purposes.



### LET'S GET TO WORK ON YOUR PROJECT

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# Specs: Micro-Diameter Tubing

Teleflex Medical OEM offers some of the tightest tolerance polymer and wire-reinforced polymer tubing constructions in the industry. Our processes allow for the manufacture of small diameters and ultra-thin wall sections.

SIZE	TUBING ID		ID TOLERANCE		WALL THICKNESS		WALL TOLERANCE		BRAID/ COIL WIRE REINFORCEMENT
	INCHES	MM	INCHES	MM	INCHES	MM	INCHES	MM	
44 - 42	0.0020 - 0.0025	0.0508 - 0.0635	± 0.0002	± 0.005	0.0003 - .0005	0.008 - 0.013	± 0.00025	± 0.0064	NO
41 - 40	0.0028 - 0.0031	0.0711 - .0787	± 0.0002	± 0.005	0.0003 - .0005	0.008 - 0.013	± 0.00025	± 0.0064	NO
39 - 36	0.0035 - 0.0050	0.089 - .127	± 0.0002	± 0.005	0.0005 - .001	0.0127 - 0.0254	± 0.00025	± 0.0064	NO
35 - 33	0.0056 - 0.0071	0.142 - .180	± 0.0002	± 0.005	0.0005 - .0015	0.0127 - 0.0381	± 0.00025	± 0.0064	NO
32 - 30	0.0080 - 0.0100	0.203 - .254	± 0.00025	± 0.0064	0.0005 - 0.003	0.0127 - 0.0762	± 0.00025 - ± 0.00030	± 0.0064 - ± 0.0076	YES
29 - 24	0.0113 - 0.0201	0.287 - .511	± 0.0003	± 0.0076	0.0005 - 0.005	0.0127 - 0.127	± 0.00025 - ± 0.0005	± 0.0064 - ± 0.0127	YES
23 - 20	0.0226 - 0.0320	0.574 - .813	± 0.0003	± 0.0076	0.0005 - 0.007	0.0127 - 0.178	± 0.00025 - ± 0.0005	± 0.0064 - ± 0.0127	YES
19 - 15	0.0359 - 0.0571	0.912 - 1.45	± 0.0005	± 0.0127	0.0010 - 0.007	0.0254 - 0.178	± 0.00025 - ± 0.0005	± 0.0064 - ± 0.0127	YES
14-13	0.0641 - 0.0720	1.63 - 1.83	± 0.0007	± 0.0178	0.0015 - 0.007	0.0381 - 0.178	± 0.0003 - ± 0.0005	± 0.0076 - ± 0.0127	YES
12-11	0.0808 - 0.0910	2.05 - 2.31	± 0.0007	± 0.0178	0.002 - 0.007	0.0508 - 0.178	± 0.0003 - ± 0.0005	± 0.0076 - ± 0.0127	YES

# Specs: Micro-Diameter, Film-Insulated, Fine Wire

This table defines the dimensions of standard, polyimide film insulation thickness builds over copper wire.\*  
 Teleflex Medical OEM builds custom, film-insulated fine wire products out of nearly any metal polymer combination.

AWG SIZE	BARE WIRE DIA. (IN) NOMINAL	BARE WIRE DIA. (MM) NOMINAL	DC RESISTANCE (OHMS / MFT @ 20 °C)		DC RESISTANCE (OHMS / Km @ 20 °C)		SINGLE BUILD				HEAVY BUILD				TRIPLE BUILD				QUAD BUILD			
			MIN	MAX	MIN	MAX	MINIMUM INCREASE DIAMETER (IN)	MAXIMUM OVERALL DIAMETER (IN)	MINIMUM INCREASE DIAMETER (mm)	MAXIMUM OVERALL DIAMETER (mm)	MINIMUM INCREASE DIAMETER (IN)	MAXIMUM OVERALL DIAMETER (IN)	MINIMUM INCREASE DIAMETER (mm)	MAXIMUM OVERALL DIAMETER (mm)	MINIMUM INCREASE DIAMETER (IN)	MAXIMUM OVERALL DIAMETER (IN)	MINIMUM INCREASE DIAMETER (mm)	MAXIMUM OVERALL DIAMETER (mm)	MINIMUM INCREASE DIAMETER (IN)	MAXIMUM OVERALL DIAMETER (IN)	MINIMUM INCREASE DIAMETER (mm)	MAXIMUM OVERALL DIAMETER (mm)
30	0.0100	0.254	101.7	105.8	333.7	347.1	0.0007	0.0112	0.018	0.284	0.0013	0.0121	0.033	0.307	0.0020	0.0126	0.051	0.320	0.0026	0.0138	0.066	0.351
31	0.0089	0.226	128	133.9	419.9	439.3	0.0006	0.0100	0.015	0.254	0.0012	0.0108	0.030	0.274	0.0018	0.0114	0.046	0.290	0.0024	0.0125	0.061	0.318
32	0.0080	0.203	158.1	166.2	518.7	545.3	0.0006	0.0090	0.015	0.229	0.0011	0.0097	0.028	0.246	0.0017	0.0102	0.043	0.259	0.0022	0.0112	0.056	0.284
33	0.0071	0.180	200.1	211.7	656.5	694.6	0.0005	0.0081	0.013	0.206	0.0010	0.0087	0.025	0.221	0.0015	0.0092	0.038	0.234	0.0020	0.0101	0.051	0.257
34	0.0063	0.160	253.2	269.8	830.7	885.2	0.0005	0.0072	0.013	0.183	0.0009	0.0078	0.023	0.198	0.0014	0.0083	0.036	0.211	0.0019	0.0091	0.048	0.231
35	0.0056	0.142	319.2	342.8	1047.2	1124.7	0.0004	0.0065	0.010	0.165	0.0009	0.0070	0.023	0.178	0.0013	0.0075	0.033	0.191	0.0017	0.0082	0.043	0.208
36	0.0050	0.127	398.7	431.9	1308.1	1417.0	0.0004	0.0058	0.010	0.147	0.0008	0.0063	0.020	0.160	0.0012	0.0067	0.030	0.170	0.0016	0.0074	0.041	0.188
37	0.0045	0.114	490.1	535.7	1607.9	1757.5	0.0004	0.0052	0.010	0.132	0.0007	0.0057	0.018	0.145	0.0011	0.0061	0.028	0.155	0.0014	0.0067	0.036	0.170
38	0.0040	0.102	617	681.9	2024.3	2237.2	0.0003	0.0047	0.008	0.119	0.0007	0.0051	0.018	0.130	0.0010	0.0055	0.025	0.140	0.0013	0.0060	0.033	0.152
39	0.0035	0.089	800.2	897.1	2625.3	2943.2	0.0003	0.0042	0.008	0.107	0.0006	0.0045	0.015	0.114	0.0009	0.0049	0.023	0.124	0.0012	0.0054	0.030	0.137
40	0.0031	0.079	1013	1152	3323.5	3779.5	0.0003	0.0037	0.008	0.094	0.0005	0.0040	0.013	0.102	0.0008	0.0044	0.020	0.112	0.0011	0.0049	0.028	0.124
41	0.0028	0.071	1233	1423	4045.3	4668.6	0.0003	0.0033	0.008	0.084	0.0005	0.0037	0.013	0.094	0.0008	0.0040	0.020	0.102	0.0010	0.0044	0.025	0.112
42	0.0025	0.064	1534	1801	5032.8	5908.8	0.0002	0.0030	0.005	0.076	0.0005	0.0033	0.013	0.084	0.0007	0.0036	0.018	0.091	0.0009	0.0039	0.023	0.099
43	0.0022	0.056	1960	2352	6430.4	7716.5	0.0002	0.0027	0.005	0.069	0.0004	0.0029	0.010	0.074	0.0006	0.0032	0.015	0.081	0.0008	0.0036	0.020	0.091
44	0.0020	0.051	2352	2873	7716.5	9425.9	0.0002	0.0024	0.005	0.061	0.0004	0.0026	0.010	0.066	0.0006	0.0029	0.015	0.074	0.0008	0.0032	0.020	0.081
45	0.00176	0.045	3080	3616	10105.0	11863.5	0.0002	0.0022	0.005	0.056	0.0004	0.0024	0.010	0.061	0.0006	0.0029	0.015	0.074	0.0008	0.0032	0.020	0.081
46	0.00157	0.040	3870	4544	12696.9	14908.1	0.0002	0.0020	0.005	0.051	0.0003	0.0021	0.008	0.053	0.0006	0.0029	0.015	0.074	0.0008	0.0032	0.020	0.081

\*Ultrafine constructions may be available upon request

# This is Innovation. This is Precision. This is Teleflex Medical OEM.

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## WORK WITH THE EXPERTS™

Teleflex Medical OEM is here to help you succeed. We are a leading provider of development and manufacturing services to medical device manufacturers across the world. We set ourselves apart with:

- Extensive, vertically-integrated capabilities
- Decades of experience
- Deep, across application expertise
- State-of-the-industry facilities

You can count on Teleflex Medical OEM to deliver innovative solutions for custom-engineered:

- Extrusion\micro-diameter tubing
- Diagnostic and interventional catheters
- Balloons and balloon catheters
- Film-insulated, fine wire
- Coated mandrel wire
- Conductors
- Sheath/dilator sets
- Sutures and performance fibers
- Bioresorbable sutures, yarns, and resins

## WE'RE READY TO PARTNER WITH YOU

At Teleflex Medical OEM, we've built a dedicated team of engineers, material and polymer experts, and skilled technicians to provide you with an industry-leading expertise in the development and manufacture of advanced tubing and medical wires.

Driven by your needs, our approach is collaborative and dynamic from concept to execution. Sit down with us. Discuss ideas and concepts. Provide feedback on prototypes. Our team will seem like a natural extension of your own R&D department and operations staff.

## OUR ADVANTAGE:

### VERTICALLY INTEGRATED CAPABILITIES

Teleflex Medical OEM is a true single source solution. We have virtually everything necessary for your project's success.

- Product concept development
- Engineering
- Design for manufacturability
- Regulatory services
- Material selection and formulation
- Prototyping
- Testing and validation
- Production process development
- Custom tooling
- Manufacturing, both small and large volumes
- Assembly
- Packaging
- Sterilization\*

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