TUBING

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TUBING	PEEK-LINED STAINLESS STEEL (PLS)	STAINLESS STEEL	PEEK	CAPILLARY PEEK	FUSED SILICA	PEEKsil™	SPIRAL-LINK™	RADEL®
Page	63	64	66	67	67	68	69	69
Description	Biocompatible, chemically inert to most commonly-used solvents, PLS tubing offers a PEEK inner layer which serves as the fluid pathway, jacketed by stainless steel. • Ideal for bio-inert UHPLC applications • Can be bent into various shapes without affecting performance	Seamless, pre-cut 316 stainless steel tubing meets the exacting requirements of today's analyses. Thorough preparation guarantees that the tubing is truly ready-to-use, with flat-burr-free ends and a clean finish. • Wide selection of outside and inside diameters and lengths • Pre-cut to ensure burr-free, flat connections • Many sizes feature a color-coded band for easy ID identification	Biocompatible, chemically inert to most commonly used solvents, PEEK tubing is flexible, offers a very smooth internal surface, and can be easily cut to desired lengths. • Great alternative for stainless steel tubing in high pressure applications • Many sizes available in color scheme to help identify ID	All the benefits of larger sized PEEK tubing, while serving as an excellent alternative to more traditional fused silica and stainless steel capillary tubing. Capillary PEEK tubing is available in a wide range of micro and nano-scale inner diameters. • Available in common capillary tubing sizes with tight tolerances on OD and ID • Tubing sleeves available for capillary tubing connections	Because of the tight tolerances of fused silica's inner diameters, this tubing is used for micro-scale analyses such as micro and nano-HPLC and capillary electrophoresis. • Most commonly used OD and ID sizes available • High quality, polyimide-clad fused silica • Offered in convenient, two meter lengths	PEEKsil is mechanically strong and has ideal characteristics for sealing with metal or polymer fittings. • Comprised of high quality fused silica sheathed by PEEK tubing • Excellent chemical compatibility • Very tight manufacturing tolerances • Good replacement for stainless steel, PEEK, or standard fused silica	The PEEK Spiral Link coils expand and contract, allowing you to easily move your system components or even make equipment repairs whenever needed, without the hassle of breaking connections. • Available in several specific volumes • Includes two SealTight™ fittings	A mechanically strong and chemically resistant material, much like PEEK polymer, Radel is frequently used in medical applications where repeated autoclave sterilization is performed (tests show product stability after 1,000 cycles). Radel tubing is also transparent, allowing technicians to visually monitor flow through their instrument. Readily wetted surfaces help keep air bubbles from accumulating on inner surfaces as well. • Withstands up to 12,500 psi (862 bar) • Transparent and autoclavable
Specifications								
OD (outside diameter)	1/16" (1.6 mm)	0.020" (510 µm), 1/32" (785 µm), 1/16" (1.55 mm), 1/8" (3.2 mm)	1/16" (1.55 mm), 0.071" (1.8 mm), 0.079" (2.0 mm), 1/8" (3.2 mm)	0.0145" (360 µm), 1/32" (785 µm), 0.020" (0.5 mm)	0.0145" (360 µm)	0.0145" (360 µm), 1/32" (785 µm), 1/16" (1.55 mm)	1/16" (1.55 mm)	1/16" (1.55 mm), 1/8" (3.2 mm)
ID (inside diameter)	0.001" (25 µm)–0.010" (254 µm)	0.004" (100 µm)–0.080" (2.0 mm)	0.001" (25 µm)–0.080" (2.0 mm)	0.001" (25 µm)–0.020" (0.50 mm)	0.0008" (20 µm)–0.006" (150 µm)	0.001" (25 µm)–0.012" (300 µm)	0.005" (125 µm)–0.030" (0.75 mm)	0.010" (0.25 mm)–0.062" (1.55 mm)
Operating Temp	-51 to 100 °C	-51 to 289 °C	-51 to 100 °C	-51 to 100 °C	-51 to 100 °C	-51 to 100 °C	-51 to 100 °C	-51 to 100 °C
Pressure Rating	17,400 psi (1,200 bar)	N/A*	500–10,000 psi (34–690 bar)	2,000–5,000 psi (138–345 bar)	N/A*	10,000 psi (690 bar)	7,000 psi (484 bar)	5,500–12,500 psi (379–862 bar)
Typical Tolerances	±5 to 15 µm	±0.001" (25 µm) for 1/16" OD tubing, ±0.003" (75 µm) for 1/8" OD tubing	±0.001" (25 µm) for 1/16" OD tubing, ±0.003" (75 µm) for 1/8" OD tubing	±0.0005" (12.5 µm)	±0.0004" (10 µm)	±0.0004" (10 µm)	±0.001" (25 µm) for 1/16" OD tubing	±0.001" (25 µm) for 1/16" OD tubing, ±0.003" (75 µm) for 1/8" OD tubing
Refractive Index (Clarity)	Opaque	Opaque	Opaque	Opaque	1.78	Opaque	Opaque	1.672
pH Range	0–14	1–14	0–14	0–14	0–10	0–10	0–14	1–14
Sterilization Techniques	Gamma irradiation; ethylene oxide; thermal	Gamma irradiation; ethylene oxide; thermal	Gamma irradiation; ethylene oxide; thermal	Gamma irradiation; ethylene oxide; thermal	Ethylene oxide; thermal	Ethylene oxide; thermal	Gamma irradiation; ethylene oxide; thermal	Thermal, gamma irradiation
Autoclavable?	Y	Y	Y	Y	Y	Y	Y	Y

**The manufacturer of this tubing or material does not publish this specification.*

Upchurch Scientific® Tubing OD Sizes

Please use this table as a reference tool to help quickly locate within this chapter the appropriate OD size tubing for your application.

Size	Tubing OD	Page(s)
.	360 µm	67, 68, 72
.	510 µm	65, 67
•	1/32"	65, 67, 68, 71
●	1/16"	63, 65, 66, 68, 69, 71, 72, 73, 77
●	1/8"	65, 66, 69, 71, 72, 73
●	3/16"	71, 72
●	1/4"	71, 72, 73

Size	Tubing OD	Page(s)
●	5/16"	71
•	1 mm	71
●	1.8 mm	66
●	2 mm	66, 71
●	3 mm	71
●	4 mm	71

Biocompatible UHPLC Tubing

- PEEK-Lined Stainless Steel (PLS)
- Pressures to 17,400 psi (1,200 bar)
- Bends with no loss of performance
- 6 different inner diameters in 4 pre-cut lengths available
- Pre-assembled with VHP-325 fittings

IDEX Health & Science introduces NEW PEEK-Lined Stainless Steel (PLS) Tubing for biocompatible UHPLC applications. The tubing combines the strength of industry-standard 316 Stainless Steel with the chemical inertness of PEEK polymer to enable more efficient bio-separations at pressures up to 17,400 psi (1,200 bar).

The unique design features of PLS Tubing allow it to be bent into shapes that may be required by the system equipment — including angled bends and even sample loops for the injection valve — all with no loss of performance. Even in a bent shape, the PEEK lining maintains its integrity along the entire length.

PLS Tubing achieves its maximum performance of 17,400 psi (1,200 bar) when used with Upchurch Scientific® VHP Fittings. The standard configuration of this tubing automatically pairs a length of tubing with two VHP-325 fittings, which allow repeat connections at UHPLC pressures.

PLS Tubing

Part No.	ID	Length	Includes
PEEK-LINED STAINLESS STEEL (PLS) TUBING, 1/16" OD			
UP-6025100	25 µm (0.001")	100 mm (4")	(2) VHP-325
UP-6025200	25 µm (0.001")	200 mm (8")	(2) VHP-325
UP-6025300	25 µm (0.001")	300 mm (12")	(2) VHP-325
UP-6025500	25 µm (0.001")	500 mm (1.6')	(2) VHP-325
UP-6050100	50 µm (0.002")	100 mm (4")	(2) VHP-325
UP-6050200	50 µm (0.002")	200 mm (8")	(2) VHP-325
UP-6050300	50 µm (0.002")	300 mm (12")	(2) VHP-325
UP-6050500	50 µm (0.002")	500 mm (1.6')	(2) VHP-325
UP-6075100	75 µm (0.003")	100 mm (4")	(2) VHP-325
UP-6075200	75 µm (0.003")	200 mm (8")	(2) VHP-325
UP-6075300	75 µm (0.003")	300 mm (12")	(2) VHP-325
UP-6075500	75 µm (0.003")	500 mm (1.6')	(2) VHP-325
UP-6100100	100 µm (0.004")	100 mm (4")	(2) VHP-325
UP-6100200	100 µm (0.004")	200 mm (8")	(2) VHP-325
UP-6100300	100 µm (0.004")	300 mm (12")	(2) VHP-325
UP-6100500	100 µm (0.004")	500 mm (1.6')	(2) VHP-325
UP-6125100	125 µm (0.005")	100 mm (4")	(2) VHP-325
UP-6125200	125 µm (0.005")	200 mm (8")	(2) VHP-325
UP-6125300	125 µm (0.005")	300 mm (12")	(2) VHP-325
UP-6125500	125 µm (0.005")	500 mm (1.6')	(2) VHP-325
UP-6175100	175 µm (0.007")	100 mm (4")	(2) VHP-325
UP-6175200	175 µm (0.007")	200 mm (8")	(2) VHP-325
UP-6175300	175 µm (0.007")	300 mm (12")	(2) VHP-325
UP-6175500	175 µm (0.007")	500 mm (1.6')	(2) VHP-325
UP-6254100	254 µm (0.010")	100 mm (4")	(2) VHP-325
UP-6254200	254 µm (0.010")	200 mm (8")	(2) VHP-325
UP-6254300	254 µm (0.010")	300 mm (12")	(2) VHP-325
UP-6254500	254 µm (0.010")	500 mm (1.6')	(2) VHP-325

Custom lengths of tubing are available. Contact us for more information.

SPECIFICATIONS & DETAILS

PEEK-lined Stainless Steel (PLS) tubing carries a maximum pressure rating of 17,400 psi (1,200 bar). Additionally, inner diameter tolerances range from ±5–15 µm, depending upon the nominal inner diameter of the tubing.

Peek-lined Stainless Steel (PLS) Tubing "Smart" Numbering System

UP-{OD}{ID}{Length}

{OD}	{ID}	{Length}
6 (for 1/16")	025 (for 25 µm)	050 (for 50 mm)
	050 (for 50 µm)	100 (for 100 mm)
	075 (for 75 µm)	200 (for 200 mm)
	100 (for 100 µm)	300 (for 300 mm)
	125 (for 125 µm)	
	175 (for 175 µm)	
	254 (for 254 µm)	

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Stainless Steel Tubing

- Precut 316 stainless steel*
- Available ODs include 0.020", 1/32", 1/16", and 1/8"
- Color-coded banding for easy identification of the inner diameter

IDEX Health & Science seamless, precut stainless steel tubing is designed to meet the exacting requirements of today's analyses. We machine cut and polish each end, deburr the inside and outside edges, and passivate the tubing (please see the passivation information on this page). Finally, we flush reagent-grade isopropanol through each piece.

Our thorough preparation and cleaning procedure guarantees tubing that is truly ready-to-use, with flat, burr-free ends and a clean finish. This care is important in achieving zero-dead-volume connections and good chromatographic results.

We offer a variety of precut lengths as well as longer lengths (5' and 25') of some sizes. Cutting the tubing disturbs and roughens the tubing's end surface, so we recommend using our precut tubing whenever possible. If you need to cut tubing to custom lengths, we suggest you then passivate the tubing. For a description of a cold passivation process, please contact IDEX Health & Science or visit our website at www.idex-hs.com and search for "stainless steel tubing."

** Except our 0.020" OD Stainless Steel Tubing, which is manufactured from 304 series stainless steel.*

APPLICATION NOTE

- Our 1/32" OD tubing is designed for enhanced flexibility in high pressure applications.
- Standard 1/16" and 1/8" OD stainless steel tubing is suited for most analytical applications.

SPECIFICATIONS & DETAILS

- Maximum Recommended Operating Temperature: 750 °F (399 °C).
- Rockwell Hardness (B): Maximum of 95.
- Meets ASTM A269 and A213.

Tubing OD	OD Tolerance	Tubing ID	ID Tolerance
0.020"	±0.0005" (12.5 µm)	All	±0.0005" (12.5 µm)
1/32"	+0.002"/-0.000" (+50 µm/-0 µm)	All, except 0.004" (0.10 mm)	+0.000"/-0.002" (+0 µm/-50 µm)
1/32"	+0.002"/-0.000" (+50 µm/-0 µm)	0.004" (0.10 mm)	+0.002"/-0.000" (+50 µm/-0 µm)
1/16"	+0.002"/-0.000" (+50 µm/-0 µm)	All	±0.001" (25 µm)
1/8"	±0.003" (75 µm)	All	±0.003" (75 µm)

RELATED PRODUCTS

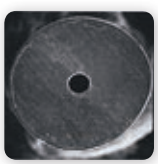
- Our 0.020" OD tubing is the size of choice for the Rheodyne® Model 8125 Micro-Scale Injector Valve (page 132).
- PEEK polymer tubing is available in all of these sizes, listed on pages 66–67.

NOTE

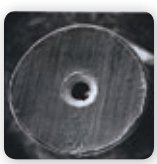
PEEK polymer tubing can be used to replace stainless steel tubing in most liquid analytical systems. Unlike stainless steel tubing, PEEK tubing is biocompatible, flexible, and can easily be cut to desired lengths. See pages 66–68.

All Stainless Steel tubing longer than 1 m is coiled.

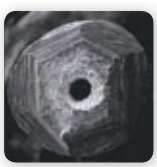
The Beauty of Precut Tubing



Precut tubing



Tubing cut by a commercially available tubing cutter



File cut tubing

Stainless Steel Tubing Passivation

Stainless steel is naturally self-passivating, forming an oxidized layer on newly created surfaces. IDEX Health & Science takes extra steps to ensure the chemical resistance of our stainless steel tubing by manually passivating before and after the tubing is cut into specified lengths (except in a few cases where size is prohibitive). In the precut stage, the internal wall is acid passivated and flushed. After the tubing is cut, deburred and polished, it is completely submerged in an acid passivation bath and again flushed clean. The table below summarizes the manual passivation steps performed for each size of our stainless steel tubing:

Tubing OD	Precut Passivation	Postcut Passivation
0.020"	All	All
1/32"	All	All
1/16"	All	All, ex. 25' lengths
1/8"	None	All, ex. 3 & 5 m lengths

NOTE

Understanding the Maximum Pressure Value of Stainless Steel Tubing

Stainless steel is unique as a material. The Maximum Pressure value listed for each part number is the safe, continuous working pressure limit that IDEX Health & Science has assigned for the tubing. It reflects a safety margin before the tubing begins to "yield" — which is well below the tubing's "burst" pressure. For more information, contact IDEX Health & Science or your authorized Distributor.

Part No.	ID	Length	Color	Maximum Pressure
STAINLESS STEEL, 0.020" OD				
U-119	0.005" (0.125 mm)	5 cm (2")	N/A	17,200 psi (1,186 bar)
U-120	0.005" (0.125 mm)	10 cm (4")	N/A	17,200 psi (1,186 bar)
U-121	0.005" (0.125 mm)	20 cm (8")	N/A	17,200 psi (1,186 bar)
U-122	0.005" (0.125 mm)	30 cm (12")	N/A	17,200 psi (1,186 bar)
U-123	0.005" (0.125 mm)	50 cm (1.6')	N/A	17,200 psi (1,186 bar)
U-124	0.005" (0.125 mm)	1 m (3.2')	N/A	17,200 psi (1,186 bar)
U-125	0.005" (0.125 mm)	1.5 m (5')	N/A	17,200 psi (1,186 bar)
STAINLESS STEEL, 1/32" OD				
U-1114	0.004" (0.10 mm)	5 cm (2")	Red	19,300 psi (1,331 bar)
U-1115	0.004" (0.10 mm)	10 cm (4")	Red	19,300 psi (1,331 bar)
U-1116	0.004" (0.10 mm)	20 cm (8")	Red	19,300 psi (1,331 bar)
U-1117	0.004" (0.10 mm)	30 cm (12")	Red	19,300 psi (1,331 bar)
U-1120	0.006" (0.15 mm)	5 cm (2")	Yellow	19,300 psi (1,331 bar)
U-1121	0.006" (0.15 mm)	10 cm (4")	Yellow	19,300 psi (1,331 bar)
U-1122	0.006" (0.15 mm)	20 cm (8")	Yellow	19,300 psi (1,331 bar)
U-1123	0.006" (0.15 mm)	30 cm (12")	Yellow	19,300 psi (1,331 bar)
U-1125	0.008" (0.20 mm)	5 cm (2")	Clear	17,800 psi (1,227 bar)
U-1126	0.008" (0.20 mm)	10 cm (4")	Clear	17,800 psi (1,227 bar)
U-1127	0.008" (0.20 mm)	20 cm (8")	Clear	17,800 psi (1,227 bar)
★ **U-1128**	0.008" (0.20 mm)	30 cm (12")	Clear	17,800 psi (1,227 bar)
U-1130	0.010" (0.25 mm)	5 cm (2")	Blue	16,200 psi (1,117 bar)
U-1131	0.010" (0.25 mm)	10 cm (4")	Blue	16,200 psi (1,117 bar)
U-1132	0.010" (0.25 mm)	20 cm (8")	Blue	16,200 psi (1,117 bar)
U-1133	0.010" (0.25 mm)	30 cm (12")	Blue	16,200 psi (1,117 bar)
U-1140	0.015" (0.40 mm)	5 cm (2")	Green	12,300 psi (848 bar)
U-1141	0.015" (0.40 mm)	10 cm (4")	Green	12,300 psi (848 bar)
U-1142	0.015" (0.40 mm)	20 cm (8")	Green	12,300 psi (848 bar)
U-1143	0.015" (0.40 mm)	30 cm (12")	Green	12,300 psi (848 bar)
U-1145	0.018" (0.45 mm)	5 cm (2")	Black	10,000 psi (689 bar)
U-1146	0.018" (0.45 mm)	10 cm (4")	Black	10,000 psi (689 bar)
U-1147	0.018" (0.45 mm)	20 cm (8")	Black	10,000 psi (689 bar)
U-1148	0.018" (0.45 mm)	30 cm (12")	Black	10,000 psi (689 bar)

Part No.	ID	Length	Color	Maximum Pressure
STAINLESS STEEL, 1/16" OD				
U-220	0.004" (0.100 mm)	5 cm (2")	N/A	22,100 psi (1,523 bar)
U-221	0.004" (0.100 mm)	10 cm (4")	N/A	22,100 psi (1,523 bar)
U-222	0.004" (0.100 mm)	20 cm (8")	N/A	22,100 psi (1,523 bar)
U-223	0.004" (0.100 mm)	30 cm (12")	N/A	22,100 psi (1,523 bar)
U-224	0.004" (0.100 mm)	0.5 m (1.6')	N/A	22,100 psi (1,523 bar)
U-225	0.004" (0.100 mm)	1 m (3.2')	N/A	22,100 psi (1,523 bar)
U-152	0.005" (0.125 mm)	5 cm (2")	Red	21,600 psi (1,489 bar)
U-153	0.005" (0.125 mm)	10 cm (4")	Red	21,600 psi (1,489 bar)
U-154	0.005" (0.125 mm)	20 cm (8")	Red	21,600 psi (1,489 bar)
U-155	0.005" (0.125 mm)	30 cm (12")	Red	21,600 psi (1,489 bar)
U-156	0.005" (0.125 mm)	0.5 m (1.6')	Red	21,600 psi (1,489 bar)
U-157	0.005" (0.125 mm)	1 m (3.2')	Red	21,600 psi (1,489 bar)
U-158	0.005" (0.125 mm)	1.5 m (5')	Red	21,600 psi (1,489 bar)
U-160	0.005" (0.125 mm)	7.6 m (25')	Red	21,600 psi (1,489 bar)
U-126	0.007" (0.175 mm)	5 cm (2")	Black	20,900 psi (1,441 bar)
U-127	0.007" (0.175 mm)	10 cm (4")	Black	20,900 psi (1,441 bar)
U-128	0.007" (0.175 mm)	20 cm (8")	Black	20,900 psi (1,441 bar)
U-129	0.007" (0.175 mm)	30 cm (12")	Black	20,900 psi (1,441 bar)
U-130	0.007" (0.175 mm)	0.5 m (1.6')	Black	20,900 psi (1,441 bar)
U-131	0.007" (0.175 mm)	1 m (3.2')	Black	20,900 psi (1,441 bar)
U-108	0.007" (0.175 mm)	1.5 m (5')	Black	20,900 psi (1,441 bar)
U-161	0.007" (0.175 mm)	7.6 m (25')	Black	20,900 psi (1,441 bar)
★ **U-111**	0.010" (0.25 mm)	5 cm (2")	Blue	19,700 psi (1,358 bar)
★ **U-112**	0.010" (0.25 mm)	10 cm (4")	Blue	19,700 psi (1,358 bar)
U-113	0.010" (0.25 mm)	20 cm (8")	Blue	19,700 psi (1,358 bar)
★ **U-114**	0.010" (0.25 mm)	30 cm (12")	Blue	19,700 psi (1,358 bar)
U-132	0.010" (0.25 mm)	0.5 m (1.6')	Blue	19,700 psi (1,358 bar)
U-133	0.010" (0.25 mm)	1 m (3.2')	Blue	19,700 psi (1,358 bar)
U-106	0.010" (0.25 mm)	1.5 m (5')	Blue	19,700 psi (1,358 bar)
U-162	0.010" (0.25 mm)	7.6 m (25')	Blue	19,700 psi (1,358 bar)
U-101	0.020" (0.5 mm)	5 cm (2")	Yellow	15,800 psi (1,089 bar)
U-102	0.020" (0.5 mm)	10 cm (4")	Yellow	15,800 psi (1,089 bar)
U-103	0.020" (0.5 mm)	20 cm (8")	Yellow	15,800 psi (1,089 bar)
U-104	0.020" (0.5 mm)	30 cm (12")	Yellow	15,800 psi (1,089 bar)
U-134	0.020" (0.5 mm)	0.5 m (1.6')	Yellow	15,800 psi (1,089 bar)
U-135	0.020" (0.5 mm)	1 m (3.2')	Yellow	15,800 psi (1,089 bar)
★ **U-105**	0.020" (0.5 mm)	1.5 m (5')	Yellow	15,800 psi (1,089 bar)
U-163	0.020" (0.5 mm)	7.6 m (25')	Yellow	15,800 psi (1,089 bar)
U-115	0.030" (0.75 mm)	5 cm (2")	White	12,000 psi (827 bar)
U-116	0.030" (0.75 mm)	10 cm (4")	White	12,000 psi (827 bar)
U-117	0.030" (0.75 mm)	20 cm (8")	White	12,000 psi (827 bar)
U-118	0.030" (0.75 mm)	30 cm (12")	White	12,000 psi (827 bar)
U-136	0.030" (0.75 mm)	0.5 m (1.6')	White	12,000 psi (827 bar)
U-137	0.030" (0.75 mm)	1 m (3.2')	White	12,000 psi (827 bar)
★ **U-107**	0.030" (0.75 mm)	1.5 m (5')	White	12,000 psi (827 bar)
★ **U-164**	0.030" (0.75 mm)	7.6 m (25')	White	12,000 psi (827 bar)
U-138	0.040" (1.0 mm)	5 cm (2")	N/A	8,100 psi (558 bar)
U-139	0.040" (1.0 mm)	10 cm (4")	N/A	8,100 psi (558 bar)
U-140	0.040" (1.0 mm)	20 cm (8")	N/A	8,100 psi (558 bar)
U-141	0.040" (1.0 mm)	30 cm (12")	N/A	8,100 psi (558 bar)
U-142	0.040" (1.0 mm)	0.5 m (1.6')	N/A	8,100 psi (558 bar)
U-143	0.040" (1.0 mm)	1 m (3.2')	N/A	8,100 psi (558 bar)
U-144	0.040" (1.0 mm)	1.5 m (5')	N/A	8,100 psi (558 bar)
★ **U-165**	0.040" (1.0 mm)	7.6 m (25')	N/A	8,100 psi (558 bar)
U-145	0.046" (1.15 mm)	5 cm (2")	N/A	5,800 psi (400 bar)
U-146	0.046" (1.15 mm)	10 cm (4")	N/A	5,800 psi (400 bar)
U-147	0.046" (1.15 mm)	20 cm (8")	N/A	5,800 psi (400 bar)
U-148	0.046" (1.15 mm)	30 cm (12")	N/A	5,800 psi (400 bar)
U-149	0.046" (1.15 mm)	0.5 m (1.6')	N/A	5,800 psi (400 bar)
U-150	0.046" (1.15 mm)	1 m (3.2')	N/A	5,800 psi (400 bar)
U-151	0.046" (1.15 mm)	1.5 m (5')	N/A	5,800 psi (400 bar)
STAINLESS STEEL, 1/8" OD				
U-815	0.080" (2.0 mm)	15 cm (6")	N/A	7,600 psi (524 bar)
U-825	0.080" (2.0 mm)	25 cm (10")	N/A	7,600 psi (524 bar)
U-800	0.080" (2.0 mm)	1 m (3.2')	N/A	7,600 psi (524 bar)
U-803	0.080" (2.0 mm)	3 m (9.8')	N/A	7,600 psi (524 bar)
U-805	0.080" (2.0 mm)	5 m (16')	N/A	7,600 psi (524 bar)

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PEEK Tubing

- 1/16", 1/8", 1.8 mm, or 2.0 mm outside diameter available
- Biocompatible, inert, and easily cut
- Great for high pressure applications
- Maximum continuous use temperature: 100 °C

Upchurch Scientific® PEEK (polyetheretherketone) polymer tubing is biocompatible, chemically inert to most solvents, and can be used to replace stainless steel tubing in most liquid analytical systems. Unlike stainless steel tubing, PEEK tubing is flexible and can be easily cut to desired lengths.

PEEK tubing has a very smooth internal surface, which causes less turbulence than similarly sized metal tubing, contributing to improved resolution of sample bands. Of all our polymer tubing materials, PEEK is the least permeable to gas (see material properties on our website: www.idex-hs.com).

In addition, much of our 1/16" OD tubing is color-coded so different IDs are easily identified. Our proprietary extrusion process ensures color permanence in our tubing.

Our 5' length tubing is rough cut to approximately 5'1". A trim cut should be made before use, especially for smaller ID tubing. PEEK tubing can be cut easily with a razor blade. However for an improved cut, try our Tubing Cutters on page 74.

	Part No.	ID	Color	Max. Pressure
	PEEK TUBING, 1/16" OD X 5' (1.5 M)			
	1559	0.001" (25 µm) ID	Natural	10,000 psi (690 bar)
	1560	0.0025" (65 µm) ID	Natural	7,000 psi (483 bar)
★	**1561**	0.004" (0.10 mm) ID	Black	7,000 psi (483 bar)
★	**1535**	0.005" (0.125 mm) ID	Red	7,000 psi (483 bar)
★	**1562**	0.006" (0.15 mm) ID	Purple	7,000 psi (483 bar)
	1536	0.007" (0.175 mm) ID	Yellow	7,000 psi (483 bar)
★	**1531**	0.010" (0.25 mm) ID	Natural	7,000 psi (483 bar)
★	**1531B**	0.010" (0.25 mm) ID	Blue	7,000 psi (483 bar)
★	**1565**	0.015" (0.40 mm) ID	Gray	7,000 psi (483 bar)
	1532	0.020" (0.50 mm) ID	Orange	7,000 psi (483 bar)
★	**1533**	0.030" (0.75 mm) ID	Green	7,000 psi (483 bar)
★	**1538**	0.040" (1.00 mm) ID	Natural	5,000 psi (345 bar)
★	**1537**	0.055" (1.40 mm) ID	Natural	500 psi (34 bar)
	PEEK TUBING, 1/8" OD X 5' (1.5 M)			
	1534	0.062" (1.55 mm) ID	Natural	4,000 psi (276 bar)
★	**1544**	0.080" (2.00 mm) ID	Natural	3,000 psi (207 bar)
	PEEK TUBING, 1.8 MM OD X 5' (1.5 M)			
	1539	0.055" (1.40 mm) ID	Natural	500 psi (34 bar)
	PEEK TUBING, 2.0 MM OD X 5' (1.5 M)			
	1590	0.042" (1.05 mm) ID	Natural	5,000 psi (345 bar)

APPLICATION NOTE

What Size PEEK Tubing Should I Use?

- It is usually safe to use 1/16" OD x 0.010" ID tubing throughout an analytical HPLC system. With a 0.010" ID, the pressure drop across most tubing lengths is negligible, and the ID is small enough to minimize band broadening.
- High pressure semi-prep LC systems will most likely use 1/8" OD tubing.
- Use 1.8 mm OD tubing to replace fluoropolymer tubing used in some Pharmacia®/GE Healthcare systems.
- Use our 1/32" OD tubing for the high pressure flow path of some microbore HPLC systems.
- Choose 360 µm OD tubing for most capillary systems.
- PEEK tubing is available in additional sizes and in 50' and 100' lengths. Contact your local Distributor or IDEX Health & Science directly for pricing information.

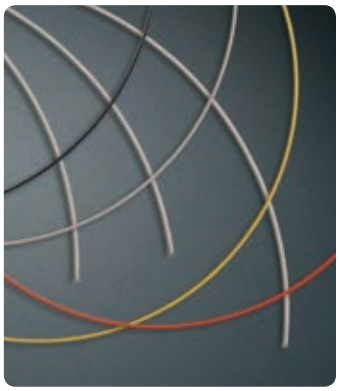
SPECIFICATIONS & DETAILS

Tubing OD	OD Tolerance
1/16"	±0.001" (25 µm)
1.8 mm	±0.002" (50 µm)
2.0 mm	±0.002" (50 µm)
1/8"	±0.003" (75 µm)

Tubing ID	ID Tolerance
25 µm	±0.0005" (12.5 µm)
All	±0.001" (25 µm)
All	±0.001" (25 µm)
All	±0.003" (75 µm)

Capillary PEEK Tubing

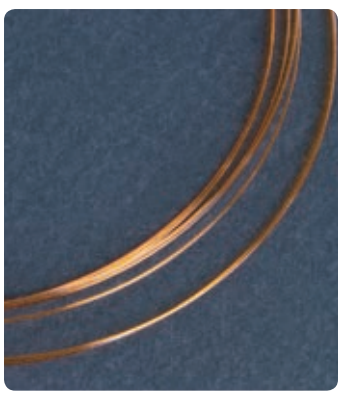
- 360 µm, 510 µm, or 1/32" outside diameter available
- IDs as small as 25 µm (0.001")



Capillary PEEK tubing offers all the benefits of larger sized PEEK tubing, while serving as an excellent alternative to more traditional fused silica and stainless steel capillary tubing (see Application Note, right). The capillary tubing can be coupled to many of the products in the Connectors chapter (starting on page 34) and to some of the valves in the Valves chapter (starting on page 124).

Fused Silica Tubing

- Five inner diameters with most common capillary outside diameter, 360 µm
- Cut in convenient lengths, up to 2 m



These products are manufactured from synthetic fused silica with a polyimide coating.

	Part No.	ID	Color	Max. Pressure	Qty.
	CAPILLARY PEEK TUBING, 360 µm OD				
	1574	25 µm (0.001") ID x 5' (1.5 m)	Natural	5,000 psi (345 bar)	ea.
	1570	50 µm (0.002") ID x 5' (1.5 m)	Natural	2,000 psi (138 bar)	ea.
	1573	75 µm (0.003") ID x 5' (1.5 m)	Black	2,000 psi (138 bar)	ea.
	1571	100 µm (0.004") ID x 5' (1.5 m)	Red	2,000 psi (138 bar)	ea.
	1572	150 µm (0.006") ID x 5' (1.5 m)	Yellow	2,000 psi (138 bar)	ea.
	CAPILLARY PEEK TUBING, 510 µm (0.020") OD				
	1543	0.0025" (65 µm) ID x 5' (1.5 m)	Natural	2,000 psi (138 bar)	ea.
★	**1541**	0.005" (0.125 mm) ID x 5' (1.5 m)	Natural	2,000 psi (138 bar)	ea.
	1542	0.010" (0.254 mm) ID x 5' (1.5 m)	Natural	2,000 psi (138 bar)	ea.
	CAPILLARY PEEK TUBING, 1/32" OD				
	1567	0.001" (25 µm) ID x 5' (1.5 m)	Natural	5,000 psi (345 bar)	ea.
	1579	0.0025" (65 µm) ID x 5' (1.5 m)	Natural	5,000 psi (345 bar)	ea.
	1578	0.0035" (90 µm) ID x 5' (1.5 m)	Black	5,000 psi (345 bar)	ea.
	1576	0.005" (0.125 mm) ID x 5' (1.5 m)	Red	5,000 psi (345 bar)	ea.
	1577	0.007" (0.175 mm) ID x 5' (1.5 m)	Yellow	5,000 psi (345 bar)	ea.
	1575	0.008" (0.20 mm) ID x 5' (1.5 m)	Natural	5,000 psi (345 bar)	ea.
	1580	0.009" (0.23 mm) ID x 5' (1.5 m)	Gray	5,000 psi (345 bar)	ea.
	1581	0.010" (0.25 mm) ID x 5' (1.5 m)	Blue	5,000 psi (345 bar)	ea.
	1568	0.015" (0.40 mm) ID x 5' (1.5 m)	Natural	5,000 psi (345 bar)	ea.
★	**1569**	0.020" (0.50 mm) ID x 5' (1.5 m)	Orange	3,000 psi (207 bar)	ea.
	787-KIT	1/32" OD x 12" Kit Kit contains (1) 10-pack of each 1/32" OD x 12" size listed above.			Kit
	FUSED SILICA TUBING, 360 µm OD				
★	**FS-120**	20 µm (0.0008") ID x 2 m (6.4')	Natural	10,000 psi (690 bar)	ea.
★	**FS-150**	50 µm (0.002") ID x 2 m (6.4')	Natural	10,000 psi (690 bar)	ea.
	FS-175	75 µm (0.003") ID x 2 m (6.4')	Natural	10,000 psi (690 bar)	ea.
	FS-110	100 µm (0.004") ID x 2 m (6.4')	Natural	10,000 psi (690 bar)	ea.
	FS-115	150 µm (0.006") ID x 2 m (6.4')	Natural	10,000 psi (690 bar)	ea.

APPLICATION NOTE

- An independent study conducted by a major pharmaceutical company indicated LC-MS chromatographic performance could be improved in some cases by switching the post-column transfer line from fused silica to PEEK polymer tubing. The switch dramatically reduced peak tailing and eliminated the degradation of peak symmetry as injection volume was reduced. For more information, please contact us or order the "Improved LC-MS Results Study" from the "Request Literature" section of our website at www.idex-hs.com.
- To straighten PEEK polymer tubing, first choose a piece of stainless steel tubing with an inner diameter slightly larger than the OD of your tubing and with an appropriate length for the PEEK tubing you wish to straighten. For instance, for 1/16" OD PEEK tubing with a length of 10", choose our U-825 tubing (stainless steel, 1/8" OD x 0.080" ID x 25 cm long, page 64). Slip your PEEK tubing into the stainless steel tubing. Place this "sleeved" tubing into an oven and bake at 425 °F (218 °C) for 30 minutes or 350 °F (177 °C) for 60 minutes. Allow the sleeved tubing to return to room temperature naturally (i.e., do not quench it with water). Once cooled, remove the PEEK tubing from the stainless steel sleeve and inspect it for straightness. If needed, repeat the process until the desired straightness is achieved.

NOTE

Because the thru-hole of our 25 µm ID PEEK tubing is very small, it is possible for some fittings to cause the ID to become occluded. Please use caution, especially with wrench-tightened fittings. For more information, please contact IDEX Health & Science or your local Distributor directly.

SPECIFICATIONS & DETAILS

Capillary PEEK Tubing Specifications

Tubing OD	Tubing ID	OD/ID Tolerances
360 µm	All	±0.0005" (12.5 µm)
510 µm	All	±0.001" (25 µm)
1/32"	All	±0.0005" (12.5 µm)

Fused Silica Tubing Specifications

Tubing OD	Tubing ID	OD Tolerance	ID Tolerance
360 µm	20 µm (0.0008")	±0.0004" (10 µm)	±0.00008" (2 µm)
360 µm	50 µm (0.002") and 75 µm (0.003")	±0.0004" (10 µm)	±0.00012" (3 µm)
360 µm	100 µm (0.004") and 150 µm (0.006")	±0.0004" (10 µm)	±0.00016" (4 µm)

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PEEKsil™ Tubing

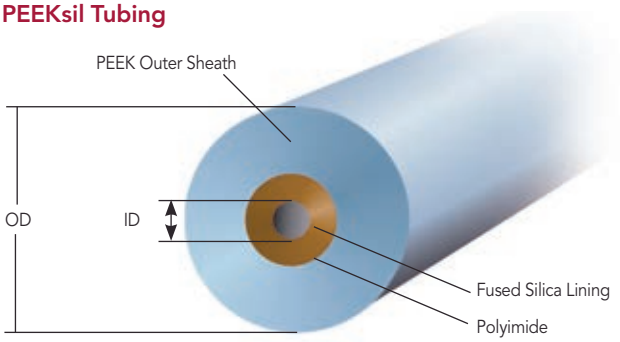
- PEEK covered fused silica
- 360 µm, 1/32", and 1/16" outside diameters with a wide variety of inside diameters
- Precut to numerous standard lengths

PEEKsil's sheathing is mechanically strong and has ideal characteristics for sealing with many styles of fittings. The fused silica core provides a consistent and rigid fluid pathway with very tight tolerances and industry-accepted chemical properties. Together, this makes PEEKsil tubing ideal for numerous applications. In fact, PEEKsil can be used as a direct replacement for conventional stainless steel or PEEK tubing in many analytical systems.

Like traditional fused silica tubing, PEEKsil has excellent chemical compatibility and extremely low adsorption characteristics, especially when compared with stainless steel.

Please Note: ***Do not cut this tubing.*** *It should be used at its precut lengths because of permanent damage caused by conventional cutters.*

PEEKsil Tubing



SPECIFICATIONS & DETAILS

Tubing OD	OD Tolerance	Tubing ID	ID Tolerance
360 µm	±0.0004" (10 µm)	25 µm	±0.00004" (1 µm)
1/32"	±0.0008" (20 µm)	50–100 µm	±0.00012" (3 µm)
1/16"	±0.0012" (30 µm)	0.15–0.30 mm	±0.0002" (5 µm)

Part No.	ID	Length	Color	Qty.
PEEKSIL TUBING, 360 µm OD				
360255	25 µm (0.001")	5 cm (2")	Orange	2-pk
3602510	25 µm (0.001")	10 cm (4")	Orange	2-pk
3602515	25 µm (0.001")	15 cm (6")	Orange	2-pk
3602525	25 µm (0.001")	25 cm (10")	Orange	2-pk
3602550	25 µm (0.001")	50 cm (1.6')	Orange	2-pk
360505	50 µm (0.002")	5 cm (2")	Natural	2-pk
3605010	50 µm (0.002")	10 cm (4")	Natural	2-pk
3605015	50 µm (0.002")	15 cm (6")	Natural	2-pk
3605025	50 µm (0.002")	25 cm (10")	Natural	2-pk
3605050	50 µm (0.002")	50 cm (1.6')	Natural	2-pk
PEEKSIL TUBING, 1/32" OD				
3255	25 µm (0.001")	5 cm (2")	Orange	2-pk
32510	25 µm (0.001")	10 cm (4")	Orange	2-pk
32515	25 µm (0.001")	15 cm (6")	Orange	2-pk
32520	25 µm (0.001")	20 cm (8")	Orange	2-pk
32550	25 µm (0.001")	50 cm (1.6')	Orange	2-pk
3505	50 µm (0.002")	5 cm (2")	Natural	2-pk
35010	50 µm (0.002")	10 cm (4")	Natural	2-pk
35015	50 µm (0.002")	15 cm (6")	Natural	2-pk
35020	50 µm (0.002")	20 cm (8")	Natural	2-pk

SPECIFICATIONS & DETAILS

Because PEEKsil tubing has fused silica tubing at its core, the pressure rating for this tubing is determined by the inner diameter of the tubing. The following chart highlights the Maximum Pressure values for this tubing, as determined by SGE International Pty., Ltd., the manufacturer of this tubing:

Tubing ID	Maximum Pressure	Tubing ID	Maximum Pressure
25 µm	25,000 psi (1,723 bar)	150–175 µm	8,500 psi (586 bar)
50 µm	20,000 psi (1,379 bar)	200–300 µm	6,000 psi (414 bar)
75–100 µm	15,000 psi (1,034 bar)		

The pressure ratings provided are indicative of the performance capabilities of the tubing. The actual pressure limits achievable will depend upon the fittings used, the quality of the receiving port, and other factors. Contact IDEX Health & Science or your authorized Distributor for more information.

Part No.	ID	Length	Color	Qty.
PEEKSIL TUBING, 1/32" OD				
★ **35050**	50 µm (0.002")	50 cm (1.6')	Natural	2-pk
3755	75 µm (0.003")	5 cm (2")	Black	2-pk
37510	75 µm (0.003")	10 cm (4")	Black	2-pk
37515	75 µm (0.003")	15 cm (6")	Black	2-pk
37520	75 µm (0.003")	20 cm (8")	Black	2-pk
37550	75 µm (0.003")	50 cm (1.6')	Black	2-pk
31005	100 µm (0.004")	5 cm (2")	Red	2-pk
310010	100 µm (0.004")	10 cm (4")	Red	2-pk
310015	100 µm (0.004")	15 cm (6")	Red	2-pk
310020	100 µm (0.004")	20 cm (8")	Red	2-pk
310050	100 µm (0.004")	50 cm (1.6')	Red	2-pk
31505	150 µm (0.006")	5 cm (2")	Purple	2-pk
315010	150 µm (0.006")	10 cm (4")	Purple	2-pk
315015	150 µm (0.006")	15 cm (6")	Purple	2-pk
315020	150 µm (0.006")	20 cm (8")	Purple	2-pk
★ **315050**	150 µm (0.006")	50 cm (1.6')	Purple	2-pk
PEEKSIL TUBING, 1/16" OD				
6255	25 µm (0.001")	5 cm (2")	Orange	5-pk
62510	25 µm (0.001")	10 cm (4")	Orange	5-pk
62515	25 µm (0.001")	15 cm (6")	Orange	5-pk
62520	25 µm (0.001")	20 cm (8")	Orange	5-pk
62550	25 µm (0.001")	50 cm (1.6')	Orange	2-pk
6505	50 µm (0.002")	5 cm (2")	Natural	5-pk
65010	50 µm (0.002")	10 cm (4")	Natural	5-pk
65015	50 µm (0.002")	15 cm (6")	Natural	5-pk
★ **65020**	50 µm (0.002")	20 cm (8")	Natural	5-pk
65050	50 µm (0.002")	50 cm (1.6')	Natural	2-pk
6755	75 µm (0.003")	5 cm (2")	Black	5-pk
67510	75 µm (0.003")	10 cm (4")	Black	5-pk
67515	75 µm (0.003")	15 cm (6")	Black	5-pk
67520	75 µm (0.003")	20 cm (8")	Black	5-pk
67550	75 µm (0.003")	50 cm (1.6')	Black	2-pk
61005	100 µm (0.004")	5 cm (2")	Red	5-pk
610010	100 µm (0.004")	10 cm (4")	Red	5-pk
610015	100 µm (0.004")	15 cm (6")	Red	5-pk
610020	100 µm (0.004")	20 cm (8")	Red	5-pk
610050	100 µm (0.004")	50 cm (1.6')	Red	2-pk
61505	150 µm (0.006")	5 cm (2")	Purple	5-pk
615010	150 µm (0.006")	10 cm (4")	Purple	5-pk
615015	150 µm (0.006")	15 cm (6")	Purple	5-pk
615020	150 µm (0.006")	20 cm (8")	Purple	5-pk
615050	150 µm (0.006")	50 cm (1.6')	Purple	2-pk
61755	175 µm (0.007")	5 cm (2")	Yellow	5-pk
617510	175 µm (0.007")	10 cm (4")	Yellow	5-pk
617515	175 µm (0.007")	15 cm (6")	Yellow	5-pk
617520	175 µm (0.007")	20 cm (8")	Yellow	5-pk
617550	175 µm (0.007")	50 cm (1.6')	Yellow	2-pk
62005	200 µm (0.008")	5 cm (2")	Blue	5-pk
620010	200 µm (0.008")	10 cm (4")	Blue	5-pk
620015	200 µm (0.008")	15 cm (6")	Blue	5-pk
620020	200 µm (0.008")	20 cm (8")	Blue	5-pk
620050	200 µm (0.008")	50 cm (1.6')	Blue	2-pk
63005	300 µm (0.012")	5 cm (2")	Gray	5-pk
630010	300 µm (0.012")	10 cm (4")	Gray	5-pk
630015	300 µm (0.012")	15 cm (6")	Gray	5-pk
630020	300 µm (0.012")	20 cm (8")	Gray	5-pk
630050	300 µm (0.012")	50 cm (1.6')	Gray	2-pk

Spiral-Link™ Tubing

- Preformed PEEK tubing into a convenient spiral for a sample loop or to facilitate tubing movement
- Many volumes available

The coils of our 1/16" OD Spiral-Link tubing expand and contract, allowing you to more easily move your system components or even make equipment repairs whenever needed, without the hassle of breaking connections.

Upchurch Scientific® Spiral-Link tubing is made of PEEK polymer, a biocompatible, chemically inert material. Spiral-Links come in six different lengths. Our proprietary extrusion process ensures color permanence.

Each Spiral-Link ships with two F-287 SealTight™ Fittings.

NOTE

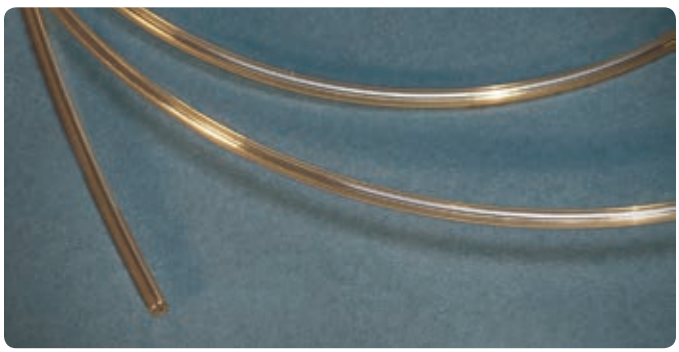
In addition to 0.010" ID shown in the price block below, Spiral-Link tubing is also available with the following IDs: 0.005" (125 µm), 0.020" (0.50 mm), and 0.030" (0.75 mm), all with 1/16" OD. Please contact us or an IDEX Health & Science Distributor for more information, or find these products at www.idex-hs.com.

Radel® Tubing

- Withstands up to 12,500 psi (862 bar)
- Transparent and autoclavable
- 1/16" and 1/8" outside diameters available
- Maximum continuous use temperature: 100 °C

Radel (polyphenylsulfone) is a mechanically strong and chemically resistant material, much like PEEK. Radel is frequently used in medical applications where repeated autoclave sterilization is performed (tests show product stability even after 1,000 cycles). Radel tubing is also transparent, allowing technicians to visually monitor flow through their instrument. Readily wetted surfaces help keep air bubbles from accumulating on inner surfaces.

Please visit our website, www.idex-hs.com, for more information regarding chemical compatibility of Radel.



SPECIFICATIONS & DETAILS

Tubing OD	OD Tolerance
1/16"	±0.001" (25 µm)
1/8"	±0.003" (75 µm)

Tubing ID	ID Tolerance
All	±0.001" (25 µm)
All	±0.003" (75 µm)

Part No.	ID	Length (Prior to Coiling)		Max coil span	Volume
SPIRAL LINK TUBING, 1/16" OD					
17202	0.25 mm (0.010")	20 cm (8")		1.3 cm (0.5")	10 µL
17204	0.25 mm (0.010")	40 cm (15.75")		6.1 cm (2.4")	20 µL
17205	0.25 mm (0.010")	50 cm (19.69")		7.6 cm (3.0")	25 µL
17210	0.25 mm (0.010")	100 cm (39.37")		17.8 cm (7.0")	51 µL
17220	0.25 mm (0.010")	200 cm (78.74")		33 cm (13.0")	101 µL
RADEL TUBING, 1/16" OD					
Part No.	**ID**	**Length**	**Color**	**Max Pressure**	**Volume**
1210	0.25 mm (0.010")	1.5 m (5')	Natural	12,500 psi (862 bar)	N/A
1210L	0.25 mm (0.010")	15 m (50')	Natural	12,500 psi (862 bar)	N/A
1210XL	0.25 mm (0.010")	30 m (100')	Natural	12,500 psi (862 bar)	N/A
1220	0.50 mm (0.020")	1.5 m (5')	Natural	7,500 psi (518 bar)	N/A
1220L	0.50 mm (0.020")	15 m (50')	Natural	7,500 psi (518 bar)	N/A
1220XL	0.50 mm (0.020")	30 m (100')	Natural	7,500 psi (518 bar)	N/A
1230	0.75 mm (0.030")	1.5 m (5')	Natural	5,500 psi (379 bar)	N/A
1230L	0.75 mm (0.030")	15 m (50')	Natural	5,500 psi (379 bar)	N/A
1230XL	0.75 mm (0.030")	30 m (100')	Natural	5,500 psi (379 bar)	N/A
RADEL TUBING, 1/8" OD					
1235	1.55 mm (0.062")	1.5 m (5')	Natural	4,500 psi (310 bar)	N/A
1235L	1.55 mm (0.062")	15 m (50')	Natural	4,500 psi (310 bar)	N/A
★ **1235XL**	1.55 mm (0.062")	30 m (100')	Natural	4,500 psi (310 bar)	N/A

RELATED PRODUCTS

- Some customers report using longer lengths of polymer tubing to add a little back pressure to their system. A more precise way to achieve this objective is to use one of our Back Pressure Regulators, found on page 152.

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TUBING	DuPont® FEP	DuPont PFA	DuPont HIGH PURITY PFA	360 µm DuPont HIGH PURITY PFA	ETFE
Page	**71**	**72**	**72**	**72**	**73**
Description	FEP tubing is a great alternative to traditional PTFE tubing, desirable for use because it is chemically inert to most solvents, easy to cut, and translucent for easy monitoring of solutions passing through. • Great for general, low pressure applications • Many sizes available in multiple colors for easy identification • Tight manufacturing tolerances to ensure product consistency	Offers excellent chemical compatibility, plus due to its inner surface smoothness, PFA tubing tends to be more translucent than PTFE tubing. • Offers higher purity and enhanced translucence when compared with other fluoropolymer tubes • Great for more critical, low pressure applications	This polymer tubing is manufactured from a premium grade of PFA — one of the most contaminant-free polymers on the market. • Offers chemical stability, mechanical strength, and purity for applications such as medical, diagnostic, pharmaceutical, biotechnology, and semiconductor • Excellent replacement for PTFE where gas permeability and surface texture are issues • Clarity of tubing makes PFA an excellent choice for monitoring fluid movement	This tubing offers excellent chemical compatibility, transparency, very low contaminant levels and is available in the most commonly-used outside diameter for capillary tubing applications. • Replacement for capillary tubing in low pressure applications where excellent chemical compatibility is required • Tubing sleeves available for capillary tubing connections	ETFE is chemically inert and more suitable for higher pressure applications (when using aqueous mobile phases) than PTFE, FEP, and PFA. Additionally, because ETFE is more rigid than PTFE, FEP, and PFA, this tubing better resists inner diameter collapse. • Excellent solvent resistance • More durable and less gas permeable than PTFE, FEP, and PFA • Operating temperatures up to 80 °C
Specifications					
OD (outside diameter)	1/32" (785 µm), 0.040" (1.0 mm), 1/16" (1.55 mm), 0.080" (2.0 mm), 0.118"(3.0 mm), 1/8" (3.2 mm), 0.157"(4.0 mm), 3/16" (4.8 mm), 1/4" (6.35 mm), 5/16" (7.94 mm)	1/16" (1.55 mm), 1/8" (3.2 mm)	1/16" (1.55 mm), 1/8" (3.2 mm), 3/16" (4.8 mm), 1/4" (6.35 mm)	0.0145" (360 µm)	1/16" (1.6 mm), 1/8" (3.2 mm), 1/4" (6.35 mm)
ID (inside diameter)	0.003" (0.075 mm) – 0.250" (6.35 mm)	0.020" (0.50 mm)– 0.062" (1.55 mm)	0.020" (0.50 mm)– 0.188" (4.80 mm)	0.002" (50 µm)– 0.006" (150 µm)	0.010" (0.25 mm)– 0.188" (4.80 mm)
Operating Temp	-51 to 50 °C	-51 to 80 °C	-51 to 80 °C	-51 to 80 °C	-51 to 80 °C
Pressure Rating	2,500–4,000 psi (172 - 276 bar)	500–2,000 psi (34–138 bar)	250–2,000 psi (17–138 bar)	1,750–3,500 psi (121–241 bar)	250–4,000 psi (17–276 bar)
Typical Tolerances	±0.001" (25 µm) for 1/16" OD tubing, ±0.003" (75 µm) for 1/8" OD tubing	±0.001" (25 µm) for 1/16" OD tubing, ±0.003" (75 µm) for 1/8" OD tubing	±0.001" (25 µm) for 1/16" OD tubing	±0.0005" (12.5 µm)	±0.001" (25 µm) for 1/16" OD tubing, ±0.003" (75 µm) for 1/8" OD tubing
Refractive Index (Clarity)	1.338	1.34	1.34	1.34	1.4
pH Range	0–14	0–14	0–14	0–14	0–14
Sterilization Techniques	Ethylene oxide; thermal	Ethylene oxide; thermal	Gamma irradiation; ethylene oxide; thermal	Gamma irradiation; ethylene oxide; thermal	Ethylene oxide
Autoclavable?	Y	Y	Y	Y	Y

Upchurch Scientific® Tubing OD Sizes

Please use this table as a reference tool to help quickly locate within this chapter the appropriate OD size tubing for your application.

Size	Tubing OD	Page(s)
.	360 µm	67, 68, 72
.	510 µm	65, 67
•	1/32"	65, 67, 68, 71
●	1/16"	63, 65, 66, 68, 69, 71, 72, 73, 77
●	1/8"	65, 66, 69, 71, 72, 73
●	3/16"	71, 72
●	1/4"	71, 72, 73

Size	Tubing OD	Page(s)
●	5/16"	71
•	1 mm	71
●	1.8 mm	66
●	2 mm	66, 71
●	3 mm	71
●	4 mm	71

DuPont® FEP Fluoropolymer Tubing

- Great for moderate-to-low pressure applications
- 1/32", 1/16", 1/8", 3/16", 1/4", or 5/16" outside diameter available
- 1 mm, 2 mm, 3 mm, or 4 mm outside diameter available
- Maximum continuous use temperature: 50 °C

With virtually identical chemical resistance to PFA at a lower price, FEP tubing is great for general, low pressure applications. Compared to PTFE, FEP (fluorinated ethylene propylene) tubing is held to tighter tolerances and has lower gas permeability (see material properties on our website: www.idex-hs.com).

Much of our FEP Tubing — even the color-tinted options — is translucent, making it possible to watch fluid flow. Using different colored tubing can help identify transfer lines in multisolvent systems. Color coding also allows easy identification of the tubing thru-hole size. Black FEP tubing is available for light-sensitive applications (such as enzymatic and chemi-luminescent reactions) and entering/exiting flow cells.

SPECIFICATIONS & DETAILS

Tubing Size	OD Tolerances	ID Tolerances
1/32" OD	±0.0005" (12.5 µm)	±0.0005" (12.5 µm)
1/16" OD	±0.001" (25 µm)	±0.001" (25 µm)
1/8" OD	±0.003" (75 µm)	±0.003" (75 µm)
3/16" OD	±0.004" (0.10 mm)	±0.004" (0.10 mm)
5/16" OD	±0.004" (0.10 mm)	±0.004" (0.10 mm)
1 mm OD	±0.001" (25 µm)	±0.001" (25 µm)
2 mm OD	±0.003" (75 µm)	±0.003" (75 µm)
3 mm OD	±0.003" (75 µm)	±0.003" (75 µm)
4 mm OD	±0.004" (0.10 mm)	±0.004" (0.10 mm)

Part No.	ID	Length	Color	Max. Pressure
FEP TUBING, 1/32" OD				
1683	0.003" (75 µm)	5' (1.5 m)	Natural	4,000 psi (276 bar)
1684	0.004" (0.10 mm)	5' (1.5 m)	Black	3,000 psi (207 bar)
1685	0.005" (0.125 mm)	5' (1.5 m)	Red	3,000 psi (207 bar)
1686	0.006" (0.15 mm)	5' (1.5 m)	Violet	3,000 psi (207 bar)
1687	0.007" (0.175 mm)	5' (1.5 m)	Yellow	3,000 psi (207 bar)
1688	0.008" (0.20 mm)	5' (1.5 m)	Natural	2,500 psi (172 bar)
1689	0.009" (0.23 mm)	5' (1.5 m)	Blue	2,500 psi (172 bar)
1692	0.016" (0.405 mm)	5' (1.5 m)	Natural	1,500 psi (104 bar)
FEP TUBING, 1/16" OD				
1474	0.004" (0.10 mm)	10' (3 m)	Black	4,000 psi (276 bar)
1475	0.005" (0.125 mm)	10' (3 m)	Red	4,000 psi (276 bar)
1476	0.006" (0.150 mm)	10' (3 m)	Violet	4,00t0 psi (276 bar)
1477	0.007" (0.175 mm)	10' (3 m)	Yellow	4,000 psi (276 bar)
1478	0.008" (0.20 mm)	10' (3 m)	Natural	4,000 psi (276 bar)
1479	0.009" (0.23 mm)	10' (3 m)	Blue	4,000 psi (276 bar)
1526	0.010" (0.25 mm)	10' (3 m)	Natural	3,000 psi (207 bar)
1526B	0.010" (0.25 mm)	10' (3 m)	Blue	3,000 psi (207 bar)
1527	0.010" (0.25 mm)	20' (6 m)	Natural	3,000 psi (207 bar)
1527B	0.010" (0.25 mm)	20' (6 m)	Blue	3,000 psi (207 bar)
1518	0.020" (0.50 mm)	10' (3 m)	Black	2,000 psi (138 bar)
1549	0.020" (0.50 mm)	10' (3 m)	Natural	2,000 psi (138 bar)
1549OR	0.020" (0.50 mm)	10' (3 m)	Orange	2,000 psi (138 bar)
1519	0.020" (0.50 mm)	20' (6 m)	Black	2,000 psi (138 bar)
★ **1548**	0.020" (0.50 mm)	20' (6 m)	Natural	2,000 psi (138 bar)
1548OR	0.020" (0.50 mm)	20' (6 m)	Orange	2,000 psi (138 bar)
1522	0.030" (0.75 mm)	10' (3 m)	Natural	1,000 psi (69 bar)
1522G	0.030" (0.75 mm)	10' (3 m)	Green	1,000 psi (69 bar)
★ **1520**	0.030" (0.75 mm)	20' (6 m)	Natural	1,000 psi (69 bar)
1520G	0.030" (0.75 mm)	20' (6 m)	Green	1,000 psi (69 bar)

Part No.	ID	Length	Color	Max. Pressure
FEP TUBING, 1/8" OD				
★ **1521**	0.062" (1.55 mm)	20' (6 m)	Natural	500 psi (34 bar)
1521BL	0.062" (1.55 mm)	50' (15 m)	Blue	500 psi (34 bar)
1521GL	0.062" (1.55 mm)	50' (15 m)	Green	500 psi (34 bar)
1521ORL	0.062" (1.55 mm)	50' (15 m)	Orange	500 psi (34 bar)
1521RL	0.062" (1.55 mm)	50' (15 m)	Red	500 psi (34 bar)
1521YL	0.062" (1.55 mm)	50' (15 m)	Yellow	500 psi (34 bar)
1523	0.062" (1.55 mm)	10' (3 m)	Natural	500 psi (34 bar)
FEP TUBING, 3/16" OD				
1524	0.125" (3.20 mm)	20' (6 m)	Natural	500 psi (34 bar)
1524L	0.125" (3.20 mm)	50' (15 m)	Natural	500 psi (34 bar)
★ **1524XL**	0.125" (3.20 mm)	100' (30 m)	Natural	500 psi (34 bar)
1525	0.125" (3.20 mm)	10' (3 m)	Natural	500 psi (34 bar)
FEP TUBING, 1/4" OD				
1651	0.156" (4.0 mm)	10' (3 m)	Natural	250 psi (17 bar)
1651L	0.156" (4.0 mm)	50' (15 m)	Natural	250 psi (17 bar)
1651XL	0.156" (4.0 mm)	100' (30 m)	Natural	250 psi (17 bar)
1650	0.188" (4.80 mm)	10' (3 m)	Natural	250 psi (17 bar)
1650L	0.188" (4.80 mm)	50' (15 m)	Natural	250 psi (17 bar)
1650XL	0.188" (4.80 mm)	100' (30 m)	Natural	250 psi (17 bar)
FEP TUBING, 5/16" OD				
1652	0.250" (6.35 mm)	10' (3 m)	Natural	250 psi (17 bar)
1652L	0.250" (6.35 mm)	50' (15 m)	Natural	250 psi (17 bar)
1652XL	0.250" (6.35 mm)	100' (30 m)	Natural	250 psi (17 bar)
FEP TUBING, 1.0 mm OD				
1671	0.020" (0.50 mm)	10' (3 m)	Natural	500 psi (34 bar)
1671L	0.020" (0.50 mm)	50' (15 m)	Natural	500 psi (34 bar)
1671XL	0.020" (0.50 mm)	100' (30 m)	Natural	500 psi (34 bar)
FEP TUBING, 2.0 mm OD				
1673	0.040" (1.0 mm)	10' (3 m)	Natural	500 psi (34 bar)
1673L	0.040" (1.0 mm)	50' (15 m)	Natural	500 psi (34 bar)
1673XL	0.040" (1.0 mm)	100' (30 m)	Natural	500 psi (34 bar)
FEP TUBING, 3.0 mm OD				
1675	0.040" (1.0 mm)	10' (3 m)	Natural	500 psi (34 bar)
1675L	0.040" (1.0 mm)	50' (15 m)	Natural	500 psi (34 bar)
1675XL	0.040" (1.0 mm)	100' (30 m)	Natural	500 psi (34 bar)
1677	0.080" (2.0 mm)	10' (3 m)	Natural	500 psi (34 bar)
1677L	0.080" (2.0 mm)	50' (15 m)	Natural	500 psi (34 bar)
1677XL	0.080" (2.0 mm)	100' (30 m)	Natural	500 psi (34 bar)
FEP TUBING, 4.0 mm OD				
1679	0.120" (3.0 mm)	10' (3 m)	Natural	500 psi (34 bar)
1679L	0.120" (3.0 mm)	50' (15 m)	Natural	500 psi (34 bar)
1679XL	0.120" (3.0 mm)	100' (30 m)	Natural	500 psi (34 bar)

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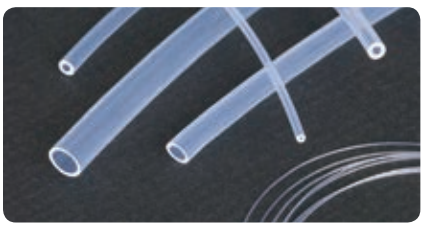
DuPont® PFA Tubing

- 1/16" and 1/8" ODs available
- Excellent solvent resistance and low gas permeability

PFA (perfluoroalkoxyalkane) tubing offers excellent solvent resistance (virtually identical to FEP and PTFE) while adding several advantages. These include smoother surface texture, higher continuous service temperature and superior polymer purity. The recommended maximum operating temperature for our PFA tubing is 80 °C.



DuPont High Purity PFA Tubing

- 360 µm, 1/16", 1/8", 3/16", and 1/4" outside diameters available
- PFA HP and PFA HP Plus Grades available
- Virtually contaminant free

PFA High Purity (HP) tubing offers all of the benefits of standard PFA tubing, with the additional benefit of being manufactured from a premium grade of PFA that is one of the most contaminant-free polymers available. In PFA HP, we offer tubing with the following outer diameters: 1/16", 1/8", 3/16", and 1/4".

PFA High Purity (HP) Plus tubing carries all of the benefits of PFA HP tubing, with the additional benefits of increased ability to withstand repeated flexing; improved resistance to stress cracking when exposed to aggressive fluorosurfactants; and smoother, clearer walls. In PFA HP Plus, we offer tubing with the following outer diameters: 360 µm, 1/16", and 1/8".

(Please Note: Due to the physical nature of the 360 µm OD tubing, we recommend using our A-350 Polymer Tubing Cutter from page 74 when cutting this tubing to length. Additionally, extra care should be taken to ensure fittings are not overtightened and to ensure the tubing is not stretched once secured in place, to ensure the dimensional stability of the tubing.)

SPECIFICATIONS & DETAILS

PFA Tubing Specifications

Tubing OD	OD Tolerances	Tubing ID	ID Tolerance
1/16"	±0.001" (25 µm)	All	±0.001" (25 µm)
1/8"	±0.003" (75 µm)	All	±0.003" (75 µm)

High Purity PFA Tubing Specifications

Tubing OD	OD Tolerances	Tubing ID	ID Tolerance
1/16"	±0.001" (25 µm)	All	±0.001" (25 µm)
1/8"	±0.003" (75 µm)	All	±0.003" (75 µm)
3/16"	±0.003" (75 µm)	All	±0.003" (75 µm)
1/4"	±0.004" (100 µm)	All	±0.004" (100 µm)

360 µm OD PFA HP Tubing Specifications

Tubing OD	OD Tolerance	Tubing ID	ID Tolerance
360 µm	±0.0005" (12.5 µm)	All	±0.0005" (12.5 µm)

Part No.	ID	Length	Color	Max. Pressure
PFA TUBING, 1/16" OD				
1500	0.020" (0.50 mm)	5' (1.5 m)	Natural	2,000 psi (138 bar)
1511	0.020" (0.50 mm)	10' (3 m)	Natural	2,000 psi (138 bar)
1512	0.020" (0.50 mm)	20' (6 m)	Natural	2,000 psi (138 bar)
1512L	0.020" (0.50 mm)	50' (15 m)	Natural	2,000 psi (138 bar)
1502	0.030" (0.75 mm)	5' (1.5 m)	Natural	1,000 psi (69 bar)
1513	0.030" (0.75 mm)	10' (3 m)	Natural	1,000 psi (69 bar)
1514	0.030" (0.75 mm)	20' (6 m)	Natural	1,000 psi (69 bar)
★ **1514L**	0.030" (0.75 mm)	50' (15 m)	Natural	1,000 psi (69 bar)
1503	0.040" (1.0 mm)	5' (1.5 m)	Natural	500 psi (34 bar)
1504	0.040" (1.0 mm)	10' (3 m)	Natural	500 psi (34 bar)
1507	0.040" (1.0 mm)	20' (6 m)	Natural	500 psi (34 bar)
1507L	0.040" (1.0 mm)	50' (15 m)	Natural	500 psi (34 bar)
PFA TUBING, 1/8" OD				
1508	0.062" (1.55 mm)	10' (3 m)	Natural	500 psi (34 bar)
★ **1509**	0.062" (1.55 mm)	20' (6 m)	Natural	500 psi (34 bar)
1509L	0.062" (1.55 mm)	50' (15 m)	Natural	500 psi (34 bar)
PFA TUBING, 1/4" OD				
1649	0.156" (4.0 mm)	10' (3 m)	Natural	250 psi (17 bar)
1649L	0.156" (4.0 mm)	50' (15 m)	Natural	250 psi (17 bar)
1649XL	0.156" (4.0 mm)	100' (30 m)	Natural	250 psi (17 bar)
PFA HP TUBING, 1/16" OD				
1620	0.020" (0.50 mm)	5' (1.5 m)	Natural	2,000 psi (138 bar)
1621	0.020" (0.50 mm)	10' (3 m)	Natural	2,000 psi (138 bar)
1622	0.020" (0.50 mm)	20' (6 m)	Natural	2,000 psi (138 bar)
1622L	0.020" (0.50 mm)	50' (15 m)	Natural	2,000 psi (138 bar)
1630	0.030" (0.75 mm)	5' (1.5 m)	Natural	1,000 psi (69 bar)
1631	0.030" (0.75 mm)	10' (3 m)	Natural	1,000 psi (69 bar)
1632	0.030" (0.75 mm)	20' (6 m)	Natural	1,000 psi (69 bar)
1632L	0.030" (0.75 mm)	50' (15 m)	Natural	1,000 psi (69 bar)
PFA HP TUBING, 1/8" OD				
1640	0.062" (1.55 mm)	10' (3 m)	Natural	500 psi (34 bar)
1641	0.062" (1.55 mm)	20' (6 m)	Natural	500 psi (34 bar)
★ **1641L**	0.062" (1.55 mm)	50' (15 m)	Natural	500 psi (34 bar)
PFA HP TUBING, 3/16" OD				
1642	0.125" (3.20 mm)	10' (3 m)	Natural	250 psi (17 bar)
1642L	0.125" (3.20 mm)	50' (15 m)	Natural	250 psi (17 bar)
1642XL	0.125" (3.20 mm)	100' (30 m)	Natural	250 psi (17 bar)
PFA HP TUBING, 1/4" OD				
1645	0.188" (4.80 mm)	10' (3 m)	Natural	250 psi (17 bar)
1645L	0.188" (4.80 mm)	50' (15 m)	Natural	250 psi (17 bar)
1645XL	0.188" (4.80 mm)	100' (30 m)	Natural	250 psi (17 bar)
PFA HP PLUS TUBING, 1/16" OD				
1900	0.010" (0.25 mm)	5' (1.5 m)	Natural	3,000 psi (207 bar)
1901	0.010" (0.25 mm)	10' (3 m)	Natural	3,000 psi (207 bar)
1902	0.010" (0.25 mm)	20' (6 m)	Natural	3,000 psi (207 bar)
1902L	0.010" (0.25 mm)	50' (15 m)	Natural	3,000 psi (207 bar)
1905	0.020" (0.50 mm)	5' (1.5 m)	Natural	2,000 psi (138 bar)
1906	0.020" (0.50 mm)	10' (3 m)	Natural	2,000 psi (138 bar)
1907	0.020" (0.50 mm)	20' (6 m)	Natural	2,000 psi (138 bar)
1907L	0.020" (0.50 mm)	50' (15 m)	Natural	2,000 psi (138 bar)
1910	0.030" (0.75 mm)	5' (1.5 m)	Natural	1,000 psi (69 bar)
1911	0.030" (0.75 mm)	10' (3 m)	Natural	1,000 psi (69 bar)
1912	0.030" (0.75 mm)	20' (6 m)	Natural	1,000 psi (69 bar)
1912L	0.030" (0.75 mm)	50' (15 m)	Natural	1,000 psi (69 bar)
PFA HP PLUS TUBING, 1/8" OD				
1920	0.062" (1.55 mm)	10' (3 m)	Natural	500 psi (34 bar)
1921	0.062" (1.55 mm)	20' (6 m)	Natural	500 psi (34 bar)
1921L	0.062" (1.55 mm)	50' (15 m)	Natural	500 psi (34 bar)
PFA HP PLUS TUBING, 360 µm OD				
1930	50 µm (0.002")	5' (1.5 m)	Natural	3,500 psi (241 bar)
1931	75 µm (0.003")	5' (1.5 m)	Natural	3,000 psi (207 bar)
1932	100 µm (0.004")	5' (1.5 m)	Natural	2,500 psi (172 bar)
1933	150 µm (0.006")	5' (1.5 m)	Natural	1,750 psi (121 bar)

ETFE Tubing

- Excellent chemical resistance
- Holds pressure up to 4,000 psi (276 bar)
- 1/16", 1/8", or 1/4" outside diameter available
- Maximum continuous operating temperature: 80 °C

Upchurch Scientific® ETFE (ethylene-tetrafluoroethylene) tubing is an excellent fluoropolymer product that offers several benefits over tubing manufactured from PTFE, FEP, or PFA. These benefits include enhanced pressure holding capabilities, increased mechanical stability and lower gas permeability.

Other tubing materials and dimensions may be available. Please contact IDEX Health & Science or your local representative directly.

APPLICATION NOTE

ETFE tubing is an ideal choice for the fluid pathway between the vacuum degasser and the system's pump. Its low gas permeability will help ensure the mobile phase solvents do not regas while in transit.

SPECIFICATIONS & DETAILS

ETFE Tubing Specifications

Tubing OD	Tubing ID	OD/ID Tolerances
1/16" OD	0.010" (0.25 mm), 0.020" (0.50 mm), 0.030" (0.75 mm)	±0.001" (25 µm)
1/16" OD	0.040" (1.0 mm)	±0.002" (50 µm)
1/8" OD	All	±0.003" (75 µm)
1/4" OD	All	±0.004" (100 µm)

	Part No.	ID	Length	Color	Max. Pressure
	ETFE TUBING, 1/16" OD				
	1529	0.010" (0.25 mm)	5' (1.5 m)	Natural	4,000 psi (276 bar)
	1529L	0.010" (0.25 mm)	50' (15 m)	Natural	4,000 psi (276 bar)
	1529XL	0.010" (0.25 mm)	100' (30 m)	Natural	4,000 psi (276 bar)
	1516	0.020" (0.50 mm)	5' (1.5 m)	Natural	3,000 psi (207 bar)
	1516L	0.020" (0.50 mm)	50' (15 m)	Natural	3,000 psi (207 bar)
★	**1516XL**	0.020" (0.50 mm)	100' (30 m)	Natural	3,000 psi (207 bar)
	1528	0.030" (0.75 mm)	5' (1.5 m)	Natural	2,000 psi (138 bar)
	1528L	0.030" (0.75 mm)	50' (15 m)	Natural	2,000 psi (138 bar)
★	**1528XL**	0.030" (0.75 mm)	100' (30 m)	Natural	2,000 psi (138 bar)
	1517	0.040" (1.00 mm)	5' (1.5 m)	Natural	500 psi (34 bar)
	1517L	0.040" (1.00 mm)	50' (15 m)	Natural	500 psi (34 bar)
	1517XL	0.040" (1.00 mm)	100' (30 m)	Natural	500 psi (34 bar)
	ETFE TUBING, 1/8" OD				
	1515	0.062" (1.55 mm)	5' (1.5 m)	Black	1,000 psi (69 bar)
	1515L	0.062" (1.55 mm)	50' (15 m)	Black	1,000 psi (69 bar)
	1515XL	0.062" (1.55 mm)	100' (30 m)	Black	1,000 psi (69 bar)
★	**1530**	0.062" (1.55 mm)	5' (1.5 m)	Natural	1,000 psi (69 bar)
	1530L	0.062" (1.55 mm)	50' (15 m)	Natural	1,000 psi (69 bar)
★	**1530XL**	0.062" (1.55 mm)	100' (30 m)	Natural	1,000 psi (69 bar)
	1648	0.093" (2.40 mm)	5' (1.5 m)	Natural	500 psi (34 bar)
	1648L	0.093" (2.40 mm)	50' (15 m)	Natural	500 psi (34 bar)
★	**1648XL**	0.093" (2.40 mm)	100' (30 m)	Natural	500 psi (34 bar)
	ETFE TUBING, 1/4" OD				
	1647	0.188" (4.80 mm)	5' (1.5 m)	Natural	250 psi (17 bar)
	1647L	0.188" (4.80 mm)	50' (15 m)	Natural	250 psi (17 bar)
	1647XL	0.188" (4.80 mm)	100' (30 m)	Natural	250 psi (17 bar)

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Fused Silica Tubing Cutters

We offer a precision cutter for fused silica tubing — SGT's Shortix™ Cutter (FS-315). This cutter ensures clean, trouble-free cutting of fused silica tubing, providing better cuts than any other product on the market. It also includes a built-in magnifying glass to examine the cut tubing ends. Order the FS-315-02 Maintenance Kit, as needed, to replace a worn or damaged cutting wheel.

FS-315
for fused silica tubing

When using traditional fused silica tubing cutters, only a small part of the tubing wall is scratched, then the tubing is snapped or pulled in two, often resulting in a jagged, uneven cut. With a Shortix Cutter, a clean cut is made every time, regardless of skill or experience, as the cut is made by rotating a diamond blade around the entire circumference of the tubing.

Please Note: The FS-315 Fused Silica Tubing Cutters are designed to cut only tubing with ODs of 350 µm–780 µm and IDs of 100 µm–350 µm.

Polymer Tubing Cutters

- For 1/16", 1/8", 3/16", 1/4", and 5/16" OD tubing

A flat, 90˚, burr-free cut is difficult to obtain with most commercial polymer tubing cutters. Upchurch Scientific® has designed several tubing cutters specifically to cut polymer tubing. This line of tubing cutters includes a standard cutter for 1/16" and 1/8" OD tubing (A-327), and another for large bore tubing (A-329). Each has guide holes to ensure precise cutting. These cutters are durable, reliable, and easy to operate. Five replacement blades are included with each tool.

A-329
for 3/16" - 5/16" OD tubing

A-327
for 1/16" and 1/8" OD tubing

NOTE

- The A-350 Capillary Polymer Tubing Cutter can be used to cut tubing OD sizes other than 360 µm, 510 µm, and 1/32". Simply use the proper NanoTight™ Tubing Sleeve found on page 17. Please note, however, that these sleeves are shorter than those listed on this page, and therefore will last through fewer cuts.
- Our tubing cutters are material specific: the A-327, A-329, A-350, and A-370 should only be used to cut polymer tubing, where as the FS-315 should only be used to cut fused silica tubing.

Capillary Polymer Tubing Cutters

The Upchurch Scientific A-350 Cutter is designed to cut capillary-sized polymer tubing. The cutter makes clean, perpendicular cuts without collapsing thin capillary walls. A set of ten tubing sleeves, required for cutting, are included with each cutter, along with five replacement blades. The included tubing sleeves are for cutting 360 µm OD polymer capillary tubing. Alternative sleeves are available for cutting 510 µm and 1/32" OD tubing. All tubing sleeves are 2" long and are made of DuPont® FEP.

Upchurch Scientific introduces a new tubing cutter specifically for cutting 2.0 mm OD polymer tubing. The A-370 tubing cutter is designed to cut in a similar method to the A-350 capillary polymer tubing cutter. The tubing slides through the cutter and the knob is rotated to spin the tubing as the razor blade circumscribes the tubing, providing a very clean, perpendicular cut.

A-350
for capillary polymer tubing

	Part No.	Description	Qty.
	FUSED SILICA TUBING CUTTERS		
	FS-315	Shortix Fused Silica Tubing Cutter	ea.
	CAPILLARY POLYMER TUBING CUTTER		
★	**A-350**	Capillary Polymer Tubing Cutter* for 360 µm–1/32" OD tubing Includes (1) F-262x 10-pack of sleeves and (1) M-438-03 wrench	ea.
	F-262x	Replacement Sleeves for A-350, 0.0155" ID, Green, for cutting 360 µm OD tubing	10-pk
	F-264x	Alternative Sleeves for A-350, 0.021" ID, Natural, for cutting 510 µm OD tubing	10-pk
	F-267Bx	Alternative Sleeves for A-350, 0.033" ID, Blue, for cutting 1/32" OD tubing	10-pk
★	**A-327**	Standard Polymer Tubing Cutter* for 1/16" and 1/8" OD tubing	ea.
	A-329	Large Bore Polymer Tubing Cutter* for 3/16"– 5/16" OD tubing	ea.
	A-328	Replacement Blades for A-350, A-370, A-327 and A-329	5-pk
NEW!	**A-370**	Polymer Tubing Cutter* for 2.0 mm OD tubing	ea.

** Includes (1) A-328 5-pack of replacement blades.*



TUBING	TYGON® LMT-55	TYGON E-LFL	ISMAPRENE (PHARMED®)	TYGON 3350 SI	SILICONE PEROXIDE
Page	78	78	79	79	80
Description	The inexpensive all-round tubing for general laboratory applications. • Transparent • Resistant to almost all inorganic chemicals • Smooth polished inner wall • Low gas permeability • Non-aging and non-oxidizing	The tubing with the longest service-life of any clear Tygon tubing. • Transparent • Broad chemical resistance • Tasteless • Extremely low particulate spallation • Meets USP Class VI and FDA criteria • Non-aging	The ideal tubing for pharmaceutical and medical applications, and for foodstuffs. • Recommended for cell cultures and tissue • Ideal for production filtration, fermentation, and bioreactor process lines • Very long service-life • Non-toxic and non-hemolytic • Impermeable to normal light and UV-radiation • Appropriate for medical products and foodstuffs • Low particulate spallation • Can be autoclaved repeatedly • Withstands repeated CIP and SIP cleaning and sterilization • Meets USP class VI, FDA, and NSF criteria	The platinum-cured silicone tubing with an ultra-smooth inner surface for sanitary transfer of sensitive fluids. • Can be autoclaved with steam • Excellent biological compatibility • Ultra-smooth inner-bore reduces potential for particle entrapment • Lower level of protein binding • Entirely non-toxic, non-hemolytic and non-pyrogenic • Weather, ozone, sunlight, and radiation resistant • Resistant to fungus • Odorless	Silicone tubing blended with organic peroxide for biological applications. • Can be autoclaved with steam • Excellent biological compatibility • Greater physical compression capability • Not prone to mold • Non-toxic • Waterproof and resistant to ozone, radiation, and sunlight • Resistant to fungus • Odorless
Specifications					
OD (outside diameter)	0.16–0.88" (4.0–22.3 mm)	0.19–0.75" (4.8–19.1 mm)	0.16–1.3" (4.0–33.4 mm)	0.16–1.3" (4.0–33.4 mm)	0.16–1.3" (4.0–33.4 mm)
ID (inside diameter)	0.03–0.61" (0.8–15.9 mm)	0.06–0.5" (1.6–12.7 mm)	0.03–1" (0.8–25.4 mm)	0.03–1" (0.8–25.4 mm)	0.03–1" (0.8–25.4 mm)
Operating Temp	-50 to 74 °C	-50 to 74 °C	-60 to 135 °C	-60 to +200 °C	-51 to 238 °C
Certification(s)		FDA 21 CFR 175.300; US Pharmacopoeia Class VI	FDA 21 CFR 177.2600; US Pharmacopoea Class VI, NSF listed (Standard 51)	FDA 21 CFR, 177.2600, Also exceeds 3A sanitary standards; US Pharmacopoea XXIII Cl.VI;	FDA 21 CFR 177.2600; US Pharmacopoea XXIII Cl.VI
Chemical Resistance					
Acids	Good	Fair	Good	Limited	Limited
Alkaline Solutions	Good	Fair	Good	Limited	Good
Solvents	Not Recommended	Not Recommended	Not Recommended	Limited	Not Recommended
Pressure	Fair	Good	Not Recommended	Not Recommended	Not Recommended
Vacuum	Good	Good	Excellent	Good	Good
Viscous Media	Excellent	Excellent	Good	Fair	Fair
Sterile Media	Limited	Limited	Excellent	Excellent	Excellent
Gas Permeability (at 25 °C)*					
CO_2	360	720	1200	25147	25147
H_2	—	—	—	—	—
0_2	80	160	200	4715	4715
N_2	40	80	80	2284	2284

** Permeability Coefficient =* $\frac{\text{Amount of Gas } (cm^3) \times \text{tubing wall thickness } (cm)}{\text{Surface Area of tubing ID } (cm^2) \times \text{time (sec)} \times \text{pressure drop across tubing wall (cm Hg)}} \times 10^{-10}$

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TUBING	TYGON 2001	TYGON MHLL	TYGON HC F-4040-A	NORPRENE® A-60-G	FLURAN® F-5500-A
Page	80	81	81	82	82
Description	The transparent, plasticizer-free tubing with superior pump-life. Especially designed for MEK and other aggressive solvents. • Plasticizer and oil-free • Smooth inner-bore • Low sorption maintains fluid and tube integrity • Does not impart anything into the pumping medium • No release of hazardous materials when properly incinerated	Chemically resistant to Acetone, MEK and other aggressive solvents. Long life tubing. • Plasticizer-free • Smooth inner-bore • Low sorption maintains fluid integrity • Minimal adhesion and diffusion • Suitable for MEK, Acetone and other corrosive solvents • Long life tubing	The special tubing for hydrocarbons, petroleum products and distillates. • Specially formulated to transport hydrocarbons, petroleum products and distillates • Ideal for gasoline, kerosene, heating oils, cutting liquids and coolants based on glycols • Low gas permeability	The high performance tubing for industrial use. • Offers longest service-life with good flow consistency • Good resistance to acids and alkaline chemicals • Superior weathering • Abrasion resistant • Non-aging and non-oxidizing • Outstanding flexural fatigue resistance • Low gas permeability versus rubber tubing • Ozone (300 pphm) and UV light resistant • Ideal for use in vacuum system	The special tubing for concentrated acids and corrosive solvents. • High chemical resistance • Low gas permeability • Wide temperature range
Specifications					
OD (outside diameter)	0.19–0.88" (4.8–22.3 mm)	0.09–0.18" (2.22–4.63 mm)	0.19–0.75" (4.8–19.1 mm)	0.16–0.9" (4.0–22.3 mm)	0.16–0.6" (4.0–15.9 mm)
ID (inside diameter)	0.06–0.61" (1.6–15.9 mm)	0.01–0.1" (0.38–2.79 mm)	0.06–0.5" (1.6–12.7 mm)	0.03–0.6" (0.8–15.9 mm)	0.03–0.4" (0.8–9.5 mm)
Operating Temp	-73 to 57 °C	-70 to 74 °C	-37 to 74 °C	-60 to 135 °C	-32 to 204 °C
Certification(s)	FDA 21 CFR 177.2600; FDA Approved for contact with foods	FDA 21 CFR 177.2600; US Pharmacopoea Class VI	None	None	GMP
Chemical Resistance					
Acids	Excellent	Excellent	Limited	Excellent	Excellent
Alkaline Solutions	Excellent	Excellent	Not Recommended	Excellent	Excellent
Solvents	Good	Excellent	Not Recommended	Not Recommended	Limited
Pressure	Good	Not Recommended	Good	Not Recommended	Not Recommended
Vacuum	Good	Good	Good	Good	Good
Viscous Media	Excellent	Good	Excellent	Excellent	Good
Sterile Media	Good	Good	Limited	Not Recommended	Fair
Permeability (at 25 °C)					
CO_2	1140	3800	100	1200	38
H_2	—	—	—	—	—
0_2	76	800	22	200	14
N_2	190	320	12	80	5

Peristaltic Pumps & Tubing

The pumps presented on pages 92–108 require peristaltic tubing to operate. Flow rate of a given fluid through a peristaltic tubing pump depends on two variables:

1. The speed of the pump, measured in revolutions per minute (rpm)
2. The volume held with the internal diameter (ID) of the selected tubing

Variable Speed Pump Flow Rates

For a variable speed pump, such as the products on pages 92, 93, and 95–104, the flow rate of a channel can be changed by varying the pump rpm, or by using tubing with different IDs, or a combination of both.

Ordering your Pump & Tubing

Follow these steps to complete your Ismatec® peristaltic tubing pump order:

1. Select the pump for your application from pages 92–104, determined by the requirements of your fluid delivery task(s):
    a. Level of accuracy
    b. Fluid streams (# of channels)
    c. Flow rate range(s)
    d. Need for constant flow, discrete dispensing, or both
    e. Need for variable speed
    f. Need for automation/programmability
2. Note whether the selected pump requires 2-stop, 3-stop, or standard tubing.
3. Review the tubing properties tables on pages 62, 70, 75, and 76 and select the tubing material best suited for your application.
4. Review the page that contains information and options for the tubing material you have selected.
5. Identify the correct part number for the tubing you need, based upon two factors: a) if your pump requires tubing with stops or not, and if so how many; and b) the correct inner diameter and wall thickness for the model pump you are using.
6. If required, order extension tubing that corresponds as closely as possible to the tubing material and ID of your 2-stop or 3-stop tubing.

RELATED PRODUCTS

- Connectors and adapters for peristaltic tubing are on pages 58, 59, and 60.

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Tygon® LMT-55 Tubing

- DEHP Free
- The Tygon blend of choice for general laboratory applications

Tygon LMT-55 offers an all-around, inexpensive option for general laboratory applications. Featuring transparent walls and low gas permeability — and with many different sizes from which to choose — this tubing material option is the option of choice for many less-critical applications. To determine the expected flow rates related to the tubing inner diameters, see the technical specifications for your pump model, listed here in this catalog or in your pump's operating manual.

Please Note: The low overall lifetime of this material will require tubing to replaced more frequently. For a longer life version of Tygon LMT-55, consider Tygon S3 E-LFL.

SPECIFICATIONS & DETAILS

Special Properties	The inexpensive all-round tubing for general laboratory applications	
Advantages	• Transparent • Resistant to almost all inorganic chemicals • Tasteless • Smooth polished inner wall	• Low gas permeability • Non-aging and non-oxidizing • High dielectric constant • LMT-55 will outlast R-3603 in most applications by 3 to 1
Limitations	• Potential leaching of plasticizers	• Short service-life
Physical Properties	• Thermoplastic • PVC-based material with phthalate-free plasticizer	• Flexible, firm, transparent
Service Temperature Range	-50 °C to +74 °C (-58 °F to + 165 °F)	
Applications		
Acids	Good	
Alkaline solutions	Good	
Solvents	Not recommended	
Pressure	Fair	
Vacuum	Good	
Viscous media	Excellent	
Sterile media	Limited	
Complies with the Following Standards		
Sterilization	Autoclavable with steam, 30 minutes at 1 bar (15 psi) and 121 °C (250 °F); tubing will appear milky. Gas sterilization with Ethylene oxide. **Not recommended for sterilization with radiation.**	
Permeability		
CO_2	360	
O_2	80	
N_2	40	

$$\frac{\text{Volume of gas [cm3] x wall thickness [mm]}}{\text{Area of tubing ID [cm2] x time [sec] x pressure drop across tubing wall [cm Hg]}} \times 10^{-10}$$

Odor and taste	None	
Toxicity	Non-toxic	
Tubing life	at 0 bar	35 hrs
	at 0.7 bar	30 hrs

Tygon E-LFL Tubing

- DEHP Free
- Longest service life of any clear Tygon tubing material
- Excellent choice where transparency and good chemical resistance is needed

Tygon S3 E-LFL tubing is available in a broad range of sizes for use throughout our pump product line. Its good chemical resistance coupled with its durability makes it an excellent choice in those applications where longer-life tubing is desired (i.e., where tubes are not disposed of frequently).

In many cases, this tubing can withstand system pressures that are in excess of most peristaltic pumps' abilities, providing built-in safety precautions for your system flow path.

Choose tubing without stops for use with most single-channel pumps. *(Note: Ensure the wall thickness of the tubing you have selected matches the requirements for the pump you are using.)* Choose the 2-stop or 3-stop tubing for use with the versions of our pumps that incorporate cassettes into the pumphead design.

SPECIFICATIONS & DETAILS

Special Properties	The tubing with the longest service-life of any clear Tygon tubing	
Advantages	• Transparent • Broad chemical resistance • Tasteless • Extremely low particulate spallation • Meets USP Class VI and FDA criteria • Non-aging	
Limitations	• Potential leaching of plasticizers	
Physical Properties	• Thermoplastic • PVC-based material with phthalate-free plasticizer • Flexible, firm, transparent	
Service Temperature Range	-50 °C to +74 °C (-58 °F to + 165 °F)	
Applications		
Acids	Fair	
Alkaline solutions	Fair	
Solvents	Not recommended	
Pressure	Good	
Vacuum	Good	
Viscous media	Excellent	
Sterile media	Limited	
Complies with the Following Standards	FDA 21 CFR 175.300; US Pharmacopoea Class VI	
Sterilization	Autoclavable with steam, 30 minutes at 1 bar (15 psi) and 121 °C (250 °F); tubing will appear milky. Gas sterilization with Ethylene oxide. **Not recommended for sterilization with radiation.**	
Permeability		
CO_2	720	
O_2	160	
N_2	80	

$$\frac{\text{Volume of gas [cm3] x wall thickness [mm]}}{\text{Area of tubing ID [cm2] x time [sec] x pressure drop across tubing wall [cm Hg]}} \times 10^{-10}$$

Odor and taste	None	
Toxicity	Non-toxic	
Tubing life	at 0 bar	800 hrs
	at 0.7 bar	700 hrs

Ismaprene Tubing (PharMed®)

- Excellent chemical resistance for traditional peristaltic pump tubing
- Offers FDA and USP Class VI certification

PharMed Ismaprene tubing has long been the tubing of choice for many demanding applications where other polymer blends have been unsuitable for use.

With strong chemical resistance, excellent lifetime, and low gas permeability — coupled with industry-standard certifications — PharMed tubing is offered in options for standard pumps as well as for pumps requiring 2-stop and 3-stop tubing. Special versions are available with welded stops for applications where repeated autoclaving must take place.

SPECIFICATIONS & DETAILS

Special Properties	The ideal tubing for pharmaceutical and medical applications, and for foodstuffs	
Advantages	• Recommended for cell cultures and tissue • Ideal for production filtration, fermentation, and bioreactor process lines • Very long service-life • Non-toxic and non-hemolytic • Impermeable to normal light and UV-radiation • Appropriate for medical products and foodstuffs • Low particulate spallation • Can be autoclaved repeatedly • Withstands repeated CIP and SIP cleaning and sterilization • Meets USP Class VI, FDA, and NSF criteria	
Limitations	• Potential leaching of additives (lubricants)	
Physical Properties	• Thermoplastic elastomer based on polypropylene • Firm, opaque, beige color	
Service Temperature Range	-60 °C to +135 °C (-75 °F to +275 °F)	
Applications		
Acids	Good	
Alkaline solutions	Good	
Solvents	Not recommended	
Pressure	Not recommended	
Vacuum	Excellent	
Viscous media	Good	
Sterile media	Excellent	
Complies with the Following Standards	FDA 21 CFR Part 177.2600; US Pharmacopoea Class VI, NSF listed (Standard 51)	
Sterilization	Autoclavable with steam, 30 minutes at 1 bar (15 psi) and 141 °C (250 °F) Gas sterilization with Ethylene oxide. Sterilization with radiation up to 2.5 mrad. **Caution: Use special tubing version (welded stoppers) when autoclaving 2 or 3-stop color-coded tubing.**	
Permeability		
CO_2	1200	Volume of gas [cm3] x wall thickness [mm] / Area of tubing ID [cm2] x time [sec] x pressure drop across tubing wall [cm Hg] **x 10^{-10}**
O_2	200	
N_2	80	
Odor and taste	Low	
Toxicity	Non-toxic and non-hemolytic	
Tubing life at 0 bar	1000+ hrs	
at 0.7 bar	1000 hrs	

Tygon® 3350 SI Tubing

- Platinum-cured silicone tubing
- Features ultra-smooth inner-bore
- Biocompatible for life science applications

Tygon 3350 SI tubing is a special silicone-based tubing that undergoes a special treatment with platinum to ensure a very smooth internal surface. This surface feature helps improve the material's use with biological applications where solid material may be present. Additionally, the material exhibits a low-level of protein-binding as well as being non-toxic, helping to make this material the top choice for many life science applications.

SPECIFICATIONS & DETAILS

Special Properties	The platinum-cured silicone tubing with an ultra-smooth inner surface for sanitary transfer of sensitive fluids	
Advantages	• Steam autoclavability • Excellent biological compatibility • Ultra-smooth inner-bore reduces potential for particle entrapment • Lower level of protein binding • Entirely non-toxic, non-hemolytic, and non-pyrogenic • Weather, ozone, sunlight, and radiation resistant • Resistant to fungus • Odorless	
Limitations	• Not suitable for concentrated solvents, oils, acids, or diluted sodium hydroxide • Relatively high gas permeability	
Physical Properties	• Thermal set rubber • Siloxane polymers and amorphous silica • Soft, translucent, clear to light amber • Excellent compression strength	
Service Temperature Range	-60 °C to +200 °C (-75 °F to +392 °F)	
Applications		
Acids	Limited	
Alkaline solutions	Limited	
Solvents	Limited	
Pressure	Not recommended	
Vacuum	Good	
Viscous media	Fair	
Sterile media	Excellent	
Complies with the Following Standards	US Pharmacopoea XXIII Cl.VI, FDA 21 CFR, Part 177.2600. Also exceeds 3A sanitary standards.	
Sterilization	Autoclavable with steam, 30 minutes at 1 bar (15 psi) and 121 °C (250 °F) Gas sterilization with Ethylene oxide Sterilization with radiation up to 2.5 mrad.	
Permeability		
CO_2	25147	Volume of gas [cm3] x wall thickness [mm] / Area of tubing ID [cm2] x time [sec] x pressure drop across tubing wall [cm Hg] **x 10^{-10}**
O_2	4715	
N_2	2284	
Odor and taste	None	
Toxicity	Non-toxic	
Tubing life at 0 bar	200 hrs	
at 0.7 bar	100 hrs	

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Silicone Peroxide Tubing

- Non-toxic material great for biological applications
- Soft and translucent for applications requiring visual checks

SPECIFICATIONS & DETAILS

Special Properties		Silicone tubing blended with organic peroxide for biological applications
Advantages		• Steam autoclavability • Excellent biological compatibility • Greater physical compression capability • Not prone to mold • Non-toxic • Waterproof and resistant to ozone, radiation, and sunlight • Resistant to fungus • Odorless
Limitations		• Not recommended for concentrated solvents, oils, acids, or diluted sodium hydroxide • Relatively high gas permeability
Physical Properties		• Polydimethylsiloxane with silica filter and silicone oil • Excellent resistance to compression • Soft, translucent, clear to light amber
Service Temperature Range		-51 °C to +238 °C (-60 °F to +460 °F)
Applications		
	Acids	Limited
	Alkaline solutions	Good
	Solvents	Not recommended
	Pressure	Not recommended
	Vacuum	Good
	Viscous media	Fair
	Sterile media	Excellent
Complies with the Following Standards		FDA 21 CFR 177.2600; US Pharmacopoea XXIII Cl.VI
Sterilization		Autoclavable with steam, 30 minutes at 1 bar (15 psi) and 121 °C (250 °C) Radiation: Irradiate at up to 2.5 mrad **Gas: Not recommended to sterilize with ethylene oxide**
Permeability		
	CO_2	25147
	O_2	4715
	N_2	2284

$$\frac{\text{Volume of gas [cm3] x wall thickness [mm]}}{\text{Area of tubing ID [cm2] x time [sec] x pressure drop across tubing wall [cm Hg]}} \times 10^{-10}$$

Odor and taste		—
Toxicity		—
Tubing life	at 0 bar	—
	at 0.7 bar	—

Tygon® 2001 Tubing for Aggressive Media

- High chemical resistance for broad application use
- Options available for single and multi-channel pump systems
- Ultra-pure tubing for peristaltic pumps

Tygon 2001 tubing features all of the benefits of most Tygon blends — including wall transparency and FDA approval. Added to this is strong chemical resistance for many solutions (excluding hydrocarbons), making Tygon 2001 a material of choice for many demanding applications where other blends may not be suitable.

Options are available in both Standard Tubing, up to 0.626" (15.9 mm) and Stopper Tubing up to 0.109" (2.79 mm).

SPECIFICATIONS & DETAILS

Special Properties		The transparent, plasticizer-free tubing with superior pump-life; especially designed for MEK and other aggressive solvents
Advantages		• Plasticizer and oil-free • Smooth inner-bore • Low sorption maintains fluid and tube integrity • Does not impart anything into the pumping medium • No release of hazardous materials when properly incinerated
Limitations		None
Physical Properties		Polyolefin
Service Temperature Range		-73 °C to +57 °C (-100 °F to +135 °F)
Applications		
	Acids	Excellent
	Alkaline solutions	Excellent
	Solvents	Good / Excellent
Complies with the Following Standards		FDA certification for food contact
Sterilization		Autoclavable with steam, 30 minutes at 1 bar (15 psi) and 141 °C (250 °F). Gas sterilization with Ethylene oxide. Sterilization with radiation up to 2.5 mrad.
Permeability		
	CO_2	1140
	O_2	76
	N_2	190

$$\frac{\text{Volume of gas [cm3] x wall thickness [mm]}}{\text{Area of tubing ID [cm2] x time [sec] x pressure drop across tubing wall [cm Hg]}} \times 10^{-10}$$

Odor and taste		No odor or taste
Toxicity		–
Tubing life	at 0 bar	75 hrs
	at 0.7 bar	–

Tygon® MHLL Tubing

- Dual-layered tubing material
- Pairs chemical resistance and long-life

Tygon MHLL is a unique tubing material, comprised of an inner layer of Tygon MH and an outer layer of PharMed®. This combination helps ensure excellent chemical resistance (except for hydrocarbons and strong ketones) as well as long service life. Available as Stopper Tubing for use with MS/CA cassettes.

Additionally, this material offers both FDA approval as well as USP Class VI approval, making it a material of choice for more demanding life-science applications.

SPECIFICATIONS & DETAILS

Special Properties		• The tubing can be used with acetone and MEK • Long life tubing
Advantages		• Plasticizer-free • Smooth inner-bore • Low sorption maintains fluid integrity • Minimal adhesion and diffusion • Suitable for MEK, Acetone and other corrosive solvents • Long life tubing
Limitations		• Cannot be repeatedly sterilized • Only available as stopper tubing
Physical Properties		• Special thermoplastic of high purity • Without additives • Without plasticizer • Environmental-friendly disposal • Flexible, firm, opaque
Service Temperature Range		-70 °C to +74 °C (-94 °F to + 165 °F)
Applications		
Acids		Excellent
Alkaline solutions		Excellent
Solvents		Excellent
Pressure		Not recommended
Vacuum		Good
Viscous media		Good
Sterile media		Good
Complies with the Following Standards		FDA 21 CFR, Part 177.2600; USP Pharmacopoea Class VI FDA certification for food contact
Sterilization		Autoclavable with steam, 30 minutes at 1 bar (15 psi) and 121 °C (250 °F). Gas sterilization with Ethylene oxide. Sterilization with radiation up to 2.5 mrad **Caution: Can not be repeatedly sterilized.**
Permeability		Volume of gas [cm3] x wall thickness [mm] / Area of tubing ID [cm2] x time [sec] x pressure drop across tubing wall [cm Hg] **x 10^{-10}**
	CO_2	—
	O_2	—
	N_2	—
Odor and taste		No odor or taste
Toxicity		—
Tubing life	at 0 bar	800+ hrs
	at 0.7 bar	800+ hrs

Tygon HC F-4040-A Tubing

- Specially formulated for hydrocarbon-based applications
- Features low gas permeability and good pressure resistance

Tygon F-4040-A tubing has been specially-formulated for use in petroleum (and similar) applications where other Tygon blends cannot be used successfully. The material offers some of the lowest gas permeability rates for atmospheric gases of all the Tygon blends, making it ideal for use in those applications where sensitivity to gas permeation is high or where vacuum may be applied.

In addition to being suitable for hydrocarbon-based applications, this material can also be used successfully with low-concentration acidic solutions as well as mineral salt solutions.

Yellow-tinted, the material offers some degree of translucency, however, it is not as transparent as many other Tygon blends.

SPECIFICATIONS & DETAILS

Special Properties		The special tubing for hydrocarbons, petroleum products and distillates
Advantages		• Specially formulated to transport hydrocarbons, petroleum products, and distillates • Ideal for gasoline, kerosene, heating oils, cutting liquids, and coolants based on glycols • High dielectric constant • Low gas permeability
Limitations		• Not recommended for strong acids and alkalies, foodstuffs, beverages, and medicines • Potential leaching of plasticizers
Physical Properties		• Thermoplastic • PVC-based material with plasticizer • Flexible, firm, translucent, yellow
Service Temperature Range		-37 °C to +74 °C (-35 °F to +165 °F)
Applications		
Acids		Limited
Alkaline solutions		Not recommended
Solvents		Not recommended
Pressure		Good
Vacuum		Good
Viscous media		Excellent
Sterile media		Limited
Complies with the Following Standards		None
Sterilization		Not recommended
Permeability		Volume of gas [cm3] x wall thickness [mm] / Area of tubing ID [cm2] x time [sec] x pressure drop across tubing wall [cm Hg] **x 10^{-10}**
CO_2		100
O_2		22
N_2		12
Odor and taste		Must not be used for foodstuffs, beverages, and drugs
Toxicity		Must not be used for foodstuffs, beverages, and drugs
Tubing life	at 0 bar	60 hrs
	at 0.7 bar	60 hrs

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Norprene® A-60-G Tubing

- Long-life tubing with strong chemical resistance
- Excellent option for industrial applications

Norprene tubing is an excellent alternative to traditional rubber tubing in industrial applications where good chemical resistance is paired with a desire for longer service life.

This tubing material offers additional benefits, including low gas permeability and broad temperature range compatibility. Combined, this material's features help make this tubing the tubing of choice in many applications.

SPECIFICATIONS & DETAILS

Special Properties	The high performance tubing for industrial use	
Advantages	• Offers longest service-life with good flow consistency • Good resistance to acids and alkaline chemicals • Superior weathering • Abrasion resistant • Non-aging and non-oxidizing • Outstanding flexural fatigue resistance • Low gas permeability versus rubber tubing • Ozone (300 pphm) and UV light resistant • Ideal for use in vacuum system	
Limitations	• Potential leaching of blend material	
Physical Properties	• Thermoplastic elastomer based on polypropylene • Excellent tensile strength • Firm, opaque, black	
Service Temperature Range	-60 °C to +135 °C (-75 °F to +275 °F)	
Applications		
Acids	Excellent	
Alkaline solutions	Excellent	
Solvents	Not recommended	
Pressure	Not recommended	
Vacuum	Good	
Viscous media	Excellent	
Sterile media	Not recommended	
Complies with the Following Standards	None	
Sterilization	Not recommended	
Permeability	$\frac{\text{Volume of gas [cm3] x wall thickness [mm]}}{\text{Area of tubing ID [cm2] x time [sec] x pressure drop across tubing wall [cm Hg]}}$	**x 10^{-10}**
CO_2	1200	
O_2	200	
N_2	80	
Odor and taste	Must not be used for foodstuffs, beverages and drugs	
Toxicity	Must not be used for foodstuffs, beverages and drugs	
Tubing life at 0 bar	1000+ hrs	
at 0.7 bar	1000 hrs	

Fluran® F-5500-A Tubing

- Specially-formulated elastomer for use with strong acidic and basic solutions
- Very low gas permeability

Fluran tubing has been specially formulated for use in applications where strong acidic solutions or strong basic solutions are being used.

The material's very low gas permeability also makes this the choice material for applications where fluids can be transferred without being contaminated by atmospheric gases. Additionally, the low gas permeability and relative strength of this material make it a material of choice in vacuum based applications.

SPECIFICATIONS & DETAILS

Special Properties	The special tubing for concentrated acids and corrosive solvents	
Advantages	• High chemical resistance • Low gas permeability • Wide temperature range	
Limitations	• Limited service-life	
Physical Properties	• Fluoroelastomer • Firm, opaque, black	
Service Temperature Range	-31 °C to +204 °C (-25 °F to + 400 °F)	
Applications		
Acids	Excellent	
Alkaline solutions	Excellent	
Solvents	Limited	
Pressure	Not recommended	
Vacuum	Good	
Viscous media	Good	
Sterile media	Fair	
Complies with the Following Standards	None	
Sterilization	Not recommended	
Permeability	$\frac{\text{Volume of gas [cm3] x wall thickness [mm]}}{\text{Area of tubing ID [cm2] x time [sec] x pressure drop across tubing wall [cm Hg]}}$	**x 10^{-10}**
CO_2	38	
O_2	14	
N_2	5	
Odor and taste	—	
Toxicity	—	
Tubing life at 0 bar	150	
at 0.7 bar	90	

The next seven pages contain product numbers for ordering Standard, 2-Stop, 3-Stop, and Extension tubing in each material offered.

Extension Tubing

ID (mm)	TYGON® LMT-55	TYGON R3603/ R3607*	ISMAPRENE (PHARMED®)	SILICONE PEROXIDE	TYGON 2001	TYGON HC F-4040-A	FLURAN® F-5500-A
	Part No.	**Part No.**	**Part No.**	**Part No.**	**Part No.**	**Part No.**	**Part No.**
0.13	SC0226T	SC0226*					
0.19	SC0025T	SC0025*					
0.25	SC0026T	SC0026*	SC0337			SC0173	
0.38	SC0027T	SC0027*	SC0338		SC0854	SC0174	
0.44	SC0028T	SC0028*					
0.51	SC0029T	SC0029*	SC0339			SC0175	SC0550
0.57	SC0030T	SC0030*					
0.64	SC0031T	SC0031*	SC0340	SC0448	SC0856	SC0176	SC0551
0.76	SC0032T	SC0032*	SC0341	SC0449		SC0177	SC0552
0.89	SC0033T	SC0033*	SC0342	SC0450		SC0120	SC0553
0.95	SC0034T	SC0034*					
1.02	SC0035T	SC0035*	SC0343	SC0451	SC0858	SC0121	SC0554
1.09	SC0036T	SC0036*					
1.14	SC0037T	SC0037*	SC0344	SC0452		SC0122	SC0555
1.22	SC0038T	SC0038*					
1.30	SC0039T	SC0039*	SC0345	SC0453		SC0123	SC0556
1.42	SC0040T	SC0040*	SC0346	SC0454		SC0124	SC0557
1.52	SC0041T	SC0041*	SC0347	SC0455	SC0860	SC0125	SC0558
1.65	SC0042T	SC0042*	SC0348	SC0456		SC0126	SC0559
1.75	SC0043T	SC0043*					
1.85	SC0044T	SC0044*	SC0349	SC0457		SC0127	SC0560
2.06	SC0045T	SC0045*	SC0350	SC0458	SC0862	SC0128	SC0561
2.29	SC0046T	SC0046*	SC0351	SC0459		SC0129	SC0562
2.54	SC0047T	SC0047*	SC0352	SC0460		SC0130	SC0563
2.79	SC0048T	SC0048*	SC0353	SC0461	SC0864	SC0131	SC0564
3.17	SC0223T	SC0223*					
Roll Length	10 m	10 m	3 m	15 m	10 m	3 m	10 m

** The Tygon R3603/R3607 formulation is being phased out. Substituting Tygon LMT-55 is highly recommended.*

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2-Stop Tubing

ID (mm)	COLOR CODES	TYGON® LMT-55	TYGON R3603/ R3607 *	TYGON E-LFL	ISMAPRENE (PHARMED®)	PHARMED BPT **	TYGON 3350 SI
		Part No.	**Part No.**	**Part No.**	**Part No.**	**Part No.**	**Part No.**
0.13	Orange-black	SC0188T	SC0188*				
0.19	Orange-red	SC0001T	SC0001*				
0.25	Orange-blue	SC0002T	SC0002*		SC0320	SC0740**	
0.27	Orange-blue			SCE0414			
0.38	Orange-green	SC0003T	SC0003*	SCE0415	SC0321		
0.44	Green-yellow	SC0004T	SC0004*				
0.48	Orange-yellow			SCE0416			
0.51	Orange-yellow	SC0005T	SC0005*		SC0322	SC0741**	SC0620
0.57	White-yellow	SC0006T	SC0006*				
0.64	Orange-white	SC0007T	SC0007*	SCE0417	SC0323		SC0621
0.76	Black-black	SC0008T	SC0008*	SCE0418	SC0324		SC0622
0.89	Orange-orange	SC0009T	SC0009*	SCE0419	SC0325	SC0742**	SC0623
0.95	White-black	SC0010T	SC0010*				
1.02	White-white	SC0011T	SC0011*	SCE0420	SC0326	SC0747**	SC0624
1.09	White-red	SC0012T	SC0012*				
1.14	Red-red	SC0013T	SC0013*	SCE0421	SC0327		SC0625
1.22	Red-grey	SC0014T	SC0014*				
1.25	Grey-grey			SCE0422			
1.30	Grey-grey	SC0015T	SC0015*		SC0328	SC0743**	SC0626
1.37	Yellow-yellow			SCE0423			
1.42	Yellow-yellow	SC0016T	SC0016*		SC0329		SC0627
1.52	Yellow-blue	SC0017T	SC0017*	SCE0424	SC0330	SC0744**	SC0628
1.53	Yellow-blue						
1.60	Blue-blue			SCE0425			
1.65	Blue-blue	SC0018T	SC0018*		SC0331		SC0629
1.75	Blue-green	SC0019T	SC0019*				
1.85	Green-green	SC0020T	SC0020*	SCE0426	SC0332		SC0630
2.06	Purple-purple	SC0021T	SC0021*	SCE0427	SC0333	SC0745**	SC0631
2.20	Purple-black			SCE0428			
2.29	Purple-black	SC0022T	SC0022*		SC0334		SC0632
2.54	Purple-orange	SC0023T	SC0023*		SC0335		SC0633
2.62	Purple-orange			SCE0429			
2.79	Purple-white	SC0024T	SC0024*	SCE0430	SC0336	SC0746**	SC0634
3.17	Black-white	SC0222T	SC0222*				
Tube Length		400 mm	400 mm	400 mm	400 mm	400 mm	400 mm
Pack Size		12 pieces	12 pieces	12 pieces	6 pieces	6 pieces	6 pieces

** The Tygon R3603/R3607 formulation is being phased out. Substituting Tygon LMT-55 is highly recommended.*
*** Welded stoppers for use in an autoclave.*





SILICONE PEROXIDE	TYGON® 2001	TYGON MHLL	TYGON HC F-4040-A	FLURAN F-5500-A	COLOR CODES	ID (mm)	
Part No.	**Part No.**	**Part No.**	**Part No.**	**Part No.**			
					Orange-black	0.13	
					Orange-red	0.19	
			SC0156		Orange-blue	0.25	
					Orange-blue	0.27	
	SC0814	SC0716	SC0157		Orange-green	0.38	
					Green-yellow	0.44	
					Orange-yellow	0.48	
			SC0158	SC0132	Orange-yellow	0.51	
					White-yellow	0.57	
SC0092	SC0816		SC0159	SC0133	Orange-white	0.64	
SC0093		SC0717	SC0160	SC0134	Black-black	0.76	
SC0094			SC0161	SC0135	Orange-orange	0.89	
					White-black	0.95	
SC0095	SC0818		SC0162	SC0136	White-white	1.02	
					White-red	1.09	
SC0096		SC0718	SC0163	SC0137	Red-red	1.14	
					Red-grey	1.22	
					Grey-grey	1.25	
SC0097			SC0164	SC0138	Grey-grey	1.30	
					Yellow-yellow	1.37	
SC0098			SC0165	SC0139	Yellow-yellow	1.42	
SC0099	SC0820	SC0719	SC0166	SC0140	Yellow-blue	1.52	
					Yellow-blue	1.53	
					Blue-blue	1.60	
SC0100			SC0167	SC0141	Blue-blue	1.65	
					Blue-green	1.75	
SC0101			SC0168	SC0142	Green-green	1.85	
SC0102	SC0822	SC0720	SC0169	SC0143	Purple-purple	2.06	
					Purple-black	2.20	
SC0103			SC0170	SC0144	Purple-black	2.29	
SC0104			SC0171	SC0145	Purple-orange	2.54	
					Purple-orange	2.62	
SC0105	SC0824	SC0721	SC0172	SC0146	Purple-white	2.79	
					Black-white	3.17	
400 mm	381 mm	381 mm	400 mm	180 mm			**Tube Length**
6 pieces	6 pieces	6 pieces	12 pieces	12 pieces			**Pack Size**

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3-Stop Tubing

ID (mm)	COLOR CODES	TYGON® LMT-55	TYGON R3603/ R3607 *	TYGON E-LFL	ISMAPRENE (PHARMED®)	PHARMED BPT **	TYGON 3350 SI
		Part No.	**Part No.**	**Part No.**	**Part No.**	**Part No.**	**Part No.**
0.13	Orange-black	SC0189T	SC0189*				
0.19	Orange-red	SC0049T	SC0049*				
0.25	Orange-blue	SC0050T	SC0050*		SC0303	SC0730**	
0.27	Orange-blue			SCE0397			
0.38	Orange-green	SC0051T	SC0051*	SCE0398	SC0304		
0.44	Green-yellow	SC0052T	SC0052*				
0.48	Orange-yellow			SCE0399			
0.51	Orange-yellow	SC0053T	SC0053*		SC0305	SC0731**	SC0600
0.57	White-yellow	SC0054T	SC0054*				
0.64	Orange-white	SC0055T	SC0055*	SCE0400	SC0306		SC0601
0.76	Black-black	SC0056T	SC0056*	SCE0401	SC0307		SC0602
0.89	Orange-orange	SC0057T	SC0057*	SCE0402	SC0308	SC0732**	SC0603
0.95	White-black	SC0058T	SC0058*				
1.02	White-white	SC0059T	SC0059*	SCE0403	SC0309	SC0737**	SC0604
1.09	White-red	SC0060T	SC0060*				
1.14	Red-red	SC0061T	SC0061*	SCE0404	SC0310		SC0605
1.22	Red-grey	SC0062T	SC0062*				
1.25	Grey-grey			SCE0405			
1.30	Grey-grey	SC0063T	SC0063*		SC0311	SC0733**	SC0606
1.37	Yellow-yellow			SCE0406			
1.42	Yellow-yellow	SC0064T	SC0064*		SC0312		SC0607
1.52	Yellow-blue	SC0065T	SC0065*	SCE0407	SC0313	SC0734**	SC0608
1.53	Yellow-blue						
1.60	Blue-blue			SCE0408			
1.65	Blue-blue	SC0066T	SC0066*		SC0314		SC0609
1.75	Blue-green	SC0067T	SC0067*				
1.85	Green-green	SC0068T	SC0068*	SCE0409	SC0315		SC0610
2.06	Purple-purple	SC0069T	SC0069*		SC0316	SC0735**	SC0611
2.20	Purple-black			SCE0411			
2.29	Purple-black	SC0070T	SC0070*		SC0317		SC0612
2.54	Purple-orange	SC0071T	SC0071*		SC0318		SC0613
2.62	Purple-orange			SCE0412			
2.79	Purple-white	SC0072T	SC0072*	SCE0413	SC0319	SC0736**	SC0614
3.17	Black-white	SC0224T	SC0224*				
Tube Length		400 mm	400 mm	400 mm	400 mm	400 mm	400 mm
Pack Size		12 pieces	12 pieces	12 pieces	6 pieces	6 pieces	6 pieces

** The Tygon R3603/R3607 formulation is being phased out. Substituting Tygon LMT-55 is highly recommended.*
*** Welded stoppers for use in an autoclave.*
**** These tubes are equipped with only 2 stoppers for use with MS/CA cassettes.*

SILICONE PEROXIDE	TYGON® 2001***	TYGON MHLL***	TYGON HC F-4040-A	FLURAN F-5500-A	COLOR CODES	ID (mm)	
Part No.	**Part No.**	**Part No.**	**Part No.**	**Part No.**			
					Orange-black	0.13	
					Orange-red	0.19	
			SC0286		Orange-blue	0.25	
					Orange-blue	0.27	
	SC0802***	SC0710***	SC0287		Orange-green	0.38	
					Green-yellow	0.44	
					Orange-yellow	0.48	
			SC0288	SC0255	Orange-yellow	0.51	
					White-yellow	0.57	
SC0106	SC0804***		SC0289	SC0256	Orange-white	0.64	
SC0107		SC0711***	SC0290	SC0257	Black-black	0.76	
SC0108			SC0291	SC0258	Orange-orange	0.89	
					White-black	0.95	
SC0109	SC0806***		SC0292	SC0259	White-white	1.02	
					White-red	1.09	
SC0110		SC0712***	SC0293	SC0260	Red-red	1.14	
					Red-grey	1.22	
					Grey-grey	1.25	
SC0111			SC0294	SC0261	Grey-grey	1.30	
					Yellow-yellow	1.37	
SC0112			SC0295	SC0262	Yellow-yellow	1.42	
SC0113	SC0808***	SC0713***	SC0296	SC0263	Yellow-blue	1.52	
					Yellow-blue	1.53	
					Blue-blue	1.60	
SC0114			SC0297	SC0264	Blue-blue	1.65	
					Blue-green	1.75	
SC0115			SC0298	SC0265	Green-green	1.85	
SC0116	SC0810***	SC0714***	SC0299	SC0266	Purple-purple	2.06	
					Purple-black	2.20	
SC0117			SC0300	SC0267	Purple-black	2.29	
SC0118			SC0301	SC0268	Purple-orange	2.54	
					Purple-orange	2.62	
SC0119	SC0812***	SC0715***	SC0302	SC0269	Purple-white	2.79	
					Black-white	3.17	
	300 mm	300 mm	400 mm	400 mm			**Tube Length**
	6 pieces	6 pieces	12 pieces	12 pieces			**Pack Size**

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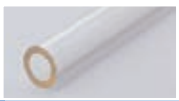
Standard Tubing

ID (mm)	OD (mm)	TYGON® LMT-55	TYGON R3603/ R3607 *	TYGON E-LFL	ISMAPRENE (PHARMED®)	TYGON 3350 SI	SILICONE PEROXIDE
1.6 mm wall thickness (1/16") Standard Tubing		**Part No.**	**Part No.**	**Part No.**	**Part No.**	**Part No.**	**Part No.**
0.8	4.0	SC0355T	MF0001*		MF0009	MF0291	MF0044
1.6	3.2						
1.6	4.8	SC0373T	MF0028*	SCE0389	MF0010	SC0580B	MF0035
2.4	5.6	SC0691T	SC0691*		SC1006	SC0590B	
3.2	6.4	SC0374T	MF0030*	SCE0390	MF0012	SC0581B	MF0037
4.0	7.2	SC0462T	SC0462*				
4.8	8.0	SC0379T	SC0379*	SCE0391	MF0011	SC0582B	MF0045
6.4	9.6	SC0375T	MF0031*	SC0E392	MF0013	SC0584B	MF0046
8.0	11.2	SC0376T	MF0032*	SC0E394	MF0014	SC0587B	MF0047
9.5	12.7	SC0383T	SC0383*			SC0387B	
11.1	14.3	SC0384T	SC0384*			SC0697B	
Roll Length		15 m	15 m	7.5 m	7.5 m	15 m	7.5 m
2.4 mm wall thickness (3/32")							
4.8	9.6	SC0500T	MF0029*		MF0448	SC0583B	MF0288
6.4	11.2	SC0501T	MF0033*			SC0585B	MF0040
8.0	12.8	SC0502T	SC0502*			SC0515B	
9.5	14.3	SC0503T	SC0503*			SC0516B	
11.1	15.9	SC0504T	SC0504*			SC0517B	
12.7	17.5	SC0505T	SC0505*			SC0518B	
15.9	20.7	SC0506T	SC0506*			SC0519B	
Roll Length		15 m	15 m	7.5 m	7.5 m	15 m	7.5 m
3.2 mm wall thickness (1/8")							
4.8	11.2	SC0694T	SC0694*				
6.4	12.8	SC0380T	SC0380*	SCE0393	MF0015	SC0586B	MF0314
8.0	14.4	SC0535T	SC0535*				
9.5	15.9	SC0381T	SC0381*	SCE0395	MF0016	SC0588B	MF0041
11.1	17.5	SC0534T	SC0534*				
12.7	19.1	SC0382T	SC0382*	SCE0396	MF0034	SC0589B	MF0315
15.9	22.3	SC0695T	SC0695*		SC0696	SC0532B	
Roll Length		15 m	15 m	7.5 m	7.5 m	15 m	7.5 m

** The Tygon R3603/R3607 formulation is being phased out. Substituting Tygon LMT-55 is highly recommended.*





TYGON® 2001	TYGON HC F-4040-A	NORPRENE A-60-G	NORPRENE CHEMICAL	VITON®	OD (mm)	ID (mm)
Part No.	**Part No.**	**Part No.**	**Part No.**	**Part No.**	**1.6 mm wall thickness (1/16") Standard Tubing**	
		MF0017		MF0048	4.0	0.8
					3.2	1.6
SC0830	MF0002	SC0357		MF0049	4.8	1.6
					5.6	2.4
SC0831	MF0004	SC0358	SC1022	MF0051	6.4	3.2
					7.2	4.0
SC0832	MF0003	SC0359	SC1023	MF0322	8.0	4.8
SC0833	MF0005	SC0360	SC1024	MF0052	9.6	6.4
SC0834	MF0006	SC0361		MF0053	11.2	8.0
SC0835		SC0385	SC1025		12.7	9.5
		SC0386			14.3	11.1
15 m	15 m	15 m	15 m	7.5 m		**Roll Length**
						2.4 mm wall thickness (3/32")
	MF0476	SC0362		MF0050	9.6	4.8
	MF0007	SC0363		MF0054	11.2	6.4
		SC0511			12.8	8.0
		SC0512			14.3	9.5
					15.9	11.1
					17.5	12.7
					20.7	15.9
	15 m	15 m		7.5 m		**Roll Length**
						3.2 mm wall thickness (1/8")
					11.2	4.8
		SC0364		MF0323	12.8	6.4
					14.4	8.0
	MF0008	SC0365		MF0055	15.9	9.5
					17.5	11.1
SC0845	SC0725	SC0366	SC1026		19.1	12.7
SC0846		SC0698			22.3	15.9
15 m	15 m	15 m	15 m	7.5 m		**Roll Length**