

## MASTERFLEX® PUMP TUBING FORMULATION DESCRIPTIONS

### SILICONE TUBING

While our silicone tubing formulations share many characteristics, there are some basic differences.

### PLATINUM-CURED SILICONE TUBING

- ▶ Slightly greater clarity
- ▶ Smooth surface; lower protein binding levels
- ▶ Fewer potential leachables
- ▶ Ideal for pharmaceutical and biotechnology use

### PEROXIDE-CURED SILICONE TUBING

- ▶ Greater physical compression capability
- ▶ Economical, longer tubing life
- ▶ Potential outgassing of peroxide products

### BIOPHARM SILICONE TUBING (PLATINUM-CURED)

- ▶ Ultra-smooth inner surface minimizes particle entrapment
- ▶ Very low extractables, with documented biocompatibility for sensitive applications
- ▶ Ideal for lab, biotech, and pharmaceutical applications

### BIOPHARM PLUS SILICONE TUBING (PLATINUM-CURED)

- ▶ All of the benefits of BioPharm silicone tubing (at left), plus:
- ▶ Longest tubing life of any silicone pump tubing
- ▶ Lower spallation than regular silicone
- ▶ Enhanced pressure capability
- ▶ Exceptional flow stability and dispense accuracy

### TO STERILIZE ALL SILICONE TUBING:

**High-speed instrument (flash) autoclave:** Place tubing on nonlinting cloth or sterilizing paper in a clean, open tray for 10 minutes at 132°C (270°F) at 2 kg/cm<sup>2</sup> (30 psi).

**Standard gravity autoclave:** Wrap tubing in nonlinting cloth or sterilizing paper and place in a clean, open tray for 30 minutes at 121°C (250°F) at 1 kg/cm<sup>2</sup> (15 psi).

**Prevacuum high-temperature autoclave:** Wrap tubing in nonlinting cloth or sterilizing paper and place in a clean, open tray for normal cycle of 30 to 35 minutes at 121°C (250°F).

**Gamma radiation:** 5.0 Mrad.

Pump tubing formulation		Silicone (platinum-cured)	Silicone (peroxide-cured)	MASTERFLEX® Exclusive BioPharm Silicone (platinum-cured)	MASTERFLEX® Exclusive BioPharm Plus Silicone (platinum-cured)
Series number		96410 and 96510	96400 and 96406	96420 and 96421	96440 and 96441
Advantages		Excellent biocompatibility. No leachable additives, DOP, or plasticizers; phthalate and latex-free; odorless and nontoxic, fungus-resistant. No taste imparted to transported fluids. Extremely good over a wide temperature range. Weather, ozone, corona, and radiation resistant. Minimal tendency to take a set.	Excellent biocompatibility. No additives, plasticizers or DOP; odorless and nontoxic, fungus-resistant. No taste imparted to transported fluids. Extremely good at low temperatures. Weather, ozone, corona, and radiation resistant. Minimal tendency to take a set.	Ultra-smooth inner surface minimizes particle entrapment. Lower absorption; excellent biocompatibility; no leachable additive, DOP, or plasticizers. Very low extractables. Odorless and nontoxic, fungus-resistant. No taste imparted to transported fluids. Weather, ozone, corona, and radiation resistant.	Similar to BioPharm Silicone, plus: Longest life of any silicone pump tubing. Lower spallation than regular silicone. Enhanced pressure capability. Fungus-resistant. Nontoxic, no leachable plasticizers. Lower gas permeability than other silicones. Use with many acids and alkalis.
Limitations		Do not use with concentrated acids and bases, organic solvents, or oils. Relatively high gas permeability.	Do not use with concentrated solvents, oils, acids. Relatively high gas permeability.	Do not use with concentrated solvents, oils, or acids. Relatively high gas permeability.	Do not use with concentrated solvents, oils, or acids. Relatively high gas permeability.
Application suitability:					
Acids		Not recommended	Not recommended	Not recommended	Not recommended
Alkalies		Not recommended	Not recommended	Not recommended	Not recommended
Organic solvents		Not recommended	Not recommended	Not recommended	Not recommended
Pressure		Fair	Fair	Fair	Fair
Vacuum		Good	Good	Good	Good
Viscous fluids		Fair	Fair	Fair	Fair
Sterile fluids		Excellent	Excellent	Excellent	Excellent
Physical characteristics and composition		Thermal set rubber. Siloxane polymers and amorphous silica. Excellent compression strength. Soft material; flexible. Translucent, clear to light amber.	Thermal set rubber. Siloxane polymers and amorphous silica. Excellent compression strength. Soft material. Translucent, clear to light amber.	Thermal set rubber. Siloxane polymers and amorphous silica. Excellent compression strength. Soft material. Translucent, clear to light amber.	Thermal set rubber. Siloxane polymers and amorphous silica. Excellent compression strength. Soft material. Translucent, clear to light amber.
Temperature range					
Static		-50 to 230°C (-58 to 446°F)	-50 to 230°C (-58 to 446°F)	-60 to 232°C (-75 to 450°F)	-60 to 232°C (-75 to 450°F)
Dynamic (pumping)		-40 to 100°C (-40 to 212°F)	-40 to 100°C (-40 to 212°F)	-40 to 100°C (-40 to 212°F)	-40 to 100°C (-40 to 212°F)
Meets classifications		USP Class V Extractables Exceeds Class VI Implant European Pharmacopoeia (EP 3.2.9) FDA 21 CFR 177.2600; FDA 21 CFR 210 and 211; Exceeds 3A Sanitary cGMPs ; Reach Compliant, RoHS Compliant, ADCF Compliant	USP Class VI European Pharmacopoeia (EP 3.2.9) FDA 21 CFR 177.2600 Exceeds 3A sanitary standards Reach Compliant, RoHS Compliant, ADCF Compliant	USP Class VI European Pharmacopoeia (EP 3.2.9) FDA 21 CFR 177.2600 Exceeds 3A sanitary standards Reach Compliant, RoHS Compliant	USP Class VI European Pharmacopoeia (EP 3.2.9) FDA 21 CFR 177.2600 Exceeds 3A sanitary standards Reach Compliant, RoHS Compliant
Gas permeability cc x mm (cm <sup>2</sup> x sec x cm Hg) x 10 <sup>-10</sup>		CO <sub>2</sub> : 20,132 H <sub>2</sub> : 6579 O <sub>2</sub> : 7961 N <sub>2</sub> : 2763	CO <sub>2</sub> : 20,132 H <sub>2</sub> : 6579 O <sub>2</sub> : 7961 N <sub>2</sub> : 2763	CO <sub>2</sub> : 25,147 H <sub>2</sub> : — O <sub>2</sub> : 4715 N <sub>2</sub> : 2284	CO <sub>2</sub> : 25,147 H <sub>2</sub> : — O <sub>2</sub> : 4715 N <sub>2</sub> : 2284
Cleaning/sterilization		Clean with hot water/soap solution; use a non-oily soap such as Ivory®, not synthetic detergent or oil-based soap as they may be absorbed by the tubing and into the fluid. Rinse well with distilled water. Ethylene oxide (EtO) sterilization is not recommended—sufficient data is not available about complete outgassing of residual EtO and other EtO products.	Clean with isopropyl alcohol or hot water/soap solution; use a non-oily soap such as Ivory®, not synthetic detergent or oil-based soap as they may be absorbed by the tubing and into the fluid. Rinse thoroughly with distilled water. May use EtO. Autoclavable.	Sterilize by EtO, autoclave, or gamma radiation up to 5.0 Mrad. To autoclave: coil loosely in nonlinting cloth or paper; autoclave at 121°C (250°F), 1 bar (15 psi) for 30 minutes.	Sterilize by EtO, autoclave, or gamma radiation up to 5.0 Mrad. To autoclave: coil loosely in nonlinting cloth or paper; autoclave at 121°C (250°F), 1 bar (15 psi) for 30 minutes.



## OTHER BIOPHARMACEUTICAL TUBING

In addition to silicone, we also carry other pump tubing formulations that are biocompatible and well-suited to biotech and pharmaceutical laboratory or production applications.

### PURI-FLEX™ TUBING

- ▶ Heat sealable and weldable
- ▶ Long pump life when compared to silicone or many other TPE tubings
- ▶ Low spallation when compared to silicone or many other TPE tubings

### C-FLEX® TUBING

- ▶ Combines biocompatibility of silicone with chemical resistance similar to Tygon®
- ▶ Heat sealable, weldable, economical





### C-FLEX® ULTRA TUBING

- ▶ Combines biocompatibility of silicone with chemical resistance similar to Tygon®
- ▶ Heat sealable, weldable, economical
- ▶ Longest pump life of any C-FLEX formulation
- ▶ Low spallation and reduced residue
- ▶ Engineered specifically for peristaltic pumps

### PHARMED® BPT TUBING

- ▶ Up to 10,000 hours of tubing life
- ▶ Resists ozone and UV radiation
- ▶ Noncytotoxic and nonhemolytic
- ▶ Ideal for tissue and cell culture work
- ▶ Heat sealable and bondable

### MASTERFLEX® Exclusive

Pump tubing formulation	Puri-Flex™	C-Flex®	C-Flex® ULTRA	PharMed® BPT
Series number	96419	06424	06434	06508
				
Advantages	Biocompatible. Heat sealable and weldable. Long pump life when compared to silicone or other TPE tubings. Low spallation when compared to silicone or some other TPE tubings. Very low protein binding. Cost effective. No halogens or phthalates.	Physical properties similar to silicone with chemical compatibility of Tygon®. Inexpensive. Biocompatible. Heat sealable and weldable.	Physical properties similar to silicone with chemical compatibility of Tygon®. Biocompatible. Heat sealable and weldable. Longer pump life and lower spallation than C-FLEX (06424).	Great for tissue and cell work—nontoxic and nonhemolytic. Long service life minimizes risk of fluid exposure; reduces tubing costs and pump downtime. Opaque to UV and visible light to protect light-sensitive fluids. Low gas permeability. High-pressure 10.3 bar (150 psi) version available.
Limitations	Do not use with concentrated solvents, oils, or acids. Moderate temperature range.	Not recommended for use with hydrocarbons. Moderate pumping life.	Not recommended for use with hydrocarbons.	Potential leaching of USP mineral oil or blend material.
Application suitability:				
Acids	Good	Good	Good	Good
Alkalies	Good	Good	Good	Good
Organic solvents	Not recommended	Not recommended	Not recommended	Not recommended
Pressure	Good	Fair	Fair	Good
Vacuum	Good	Good	Good	Good
Viscous fluids	Excellent	Fair	Fair	Excellent
Sterile fluids	Excellent	Excellent	Excellent	Excellent
Physical characteristics and composition	Thermoplastic elastomers. Excellent tensile and tear strength. Translucent, clear to light white.	Thermoplastic elastomer. Styrene-ethylene-butylene modified block copolymer with silicone oil. Excellent tensile and tear strength Soft material. Opaque, white.	Thermoplastic elastomer. Styrene-ethylene-butylene modified block copolymer with silicone oil. Excellent tensile and tear strength Translucent.	Thermoplastic elastomer. Polypropylene-based material with USP mineral oil. Excellent tensile strength. Firm (stiff) material. Opaque, beige.
Temperature range				
Static	-50 to 135°C (-58 to 275°F)	-60 to 121°C (-76 to 249°F)	-60 to 121°C (-76.6 to 250°F)	-51 to 132°C (-60 to 270°F)
Dynamic (pumping)	-30 to 80°C (-22 to 176°F)	-40 to 60°C (-40 to 140°F)	-40 to 80°C (-40 to 176°F)	-20 to 80°C (-4 to 176°F)
Meets classifications	USP Class VI FDA 21 CFR 177.2600 and 177.1810 Reach Compliant RoHS Compliant ADCF Compliant	USP Class VI European Pharmacopoeia (EP 3.2.9) FDA 21 CFR 177.2600 Reach Compliant, RoHS Compliant, ADCF Compliant	USP Class VI European Pharmacopoeia (EP 3.2.9) Reach Compliant, RoHS Compliant, ADCF Compliant	USP Class VI European Pharmacopoeia (EP 3.2.9) FDA 21 CFR 177.2600 NSF-51 Reach Compliant, RoHS Compliant
Gas permeability cc x mm (cm <sup>2</sup> x sec x cm Hg) x 10 <sup>-10</sup>	CO <sub>2</sub> : 1200 H <sub>2</sub> : — O <sub>2</sub> : 200 N <sub>2</sub> : 80	CO <sub>2</sub> : — H <sub>2</sub> : — O <sub>2</sub> : 150 N <sub>2</sub> : —	CO <sub>2</sub> : 2.1 H <sub>2</sub> : — O <sub>2</sub> : 1.1 N <sub>2</sub> : 3.4	CO <sub>2</sub> : 1200 H <sub>2</sub> : — O <sub>2</sub> : 200 N <sub>2</sub> : 80
Cleaning/sterilization	Sterilize by EtO, autoclave up to 135°C (275°F), gamma radiation up to 4.5 Mrad. To autoclave: coil loosely in nonlinting cloth or paper; autoclave from 121°C (250°F) to 135°C (275°F).	Sterilize by EtO, autoclave, or gamma radiation. To autoclave: do not clamp; autoclave up to maximum steam temperature of 132°C (290°F) for up to 10 minutes. Flush autoclaving at 135°C (275°F) is not recommended.	Sterilize by gamma radiation or one cycle of autoclave at 121°C (250°F), 1 bar (15 psi) for 30 minutes.	Sterilize by EtO, autoclave, or gamma radiation up to 2.5 Mrad. Repeated autoclaving will not affect overall life.

## MASTERFLEX® PUMP TUBING FORMULATIONS DESCRIPTIONS

### PHARMAPURE® TUBING

- ▶ Biocompatibility similar to PharMed® BPT
- ▶ Long life under continuous pressure up to 2.7 bar (40 psi)
- ▶ Very low spallation and low extractables

### CHEM-DURANCE® BIO TUBING

- ▶ Excellent chemical resistance
- ▶ Excellent pumping life
- ▶ Low spallation
- ▶ USP Class VI specifications
- ▶ Masterflex exclusive

### PTFE TUBING

- ▶ Chemically inert; best chemical resistance of any pump tubing
- ▶ Sold in molded pump tubing elements
- ▶ Use with PTFE tubing pump head

### TYGON® E-LFL TUBING

- ▶ Longest tubing life of all Tygon tubing formulations
- ▶ Broad chemical compatibility
- ▶ Low gas permeability

### TYGON® E-FOOD TUBING

- ▶ Meets various food and sanitary regulations
- ▶ Unaffected by common commercial sanitizers
- ▶ Nonwetting properties allow flush-cleaning and complete drainage
- ▶ Smooth inner surface






### STERILIZATION

**Ethylene oxide (ETO):** Coil tubing loosely in nonlinting cloth or sterilization paper. Follow the sterilization equipment manufacturer's directions as to gas type, concentration, times, and temperatures; maintain humidity within the prescribed limits, generally between 30 to 65%.

**Standard gravity autoclave:** Coil tubing loosely in nonlinting cloth or sterilizing paper, and place in a clean, open tray for 30 minutes at 121°C (250°F) at 1 kg/cm<sup>2</sup> (15 psi); air dry at max 66°C (150°F) for 2 to 2½ hours until clear.

**Gamma radiation:** Cap ends of tubing if required. Radiation should be product specific and according to GMP guidelines.

### MASTERFLEX® Exclusive

Pump tubing formulation	PharmaPure®	Chem-Durance® Bio	PTFE	Tygon® E-LFL	Tygon® E-Food (B-44-4X)	
Series number	06435	06442	77390	06440	06418	
						
Advantages	Nontoxic and nonhemolytic (similar to PharMed® BPT); biocompatible. Long life even under pressure; up to 1000 hours at 2.7 bar (40 psi). Very low spallation—protects fluid purity. Low extractables. Low gas permeability.	Excellent chemical resistance. Excellent life and durability under pressure. Low spallation. Plasticizer-free inner liner. High dielectric constant. Excellent biocompatibility.	Chemically inert. Excellent chemical resistance. Will not leach into or absorb out of fluid being pumped. Extremely low gas permeability. Nontoxic. Virtually nonporous. Low coefficient of friction.	Longest life of all Tygon® peristaltic tubing (up to 1000 hrs). Clear for easy flow monitoring. Broad chemical resistance. Nonaging, nonoxidizing. Low gas permeability. Smooth bore. Good for viscous fluids. High dielectric constant.	Designed especially for handling food products. Bore is extremely smooth (better than most stainless steels) Nontoxic, will not affect taste or odor, and clear for CIP and flow verification. Excellent nonwetting properties permit flush cleaning and complete drainage. High dielectric constant.	
Limitations	Potential leaching of USP mineral oil or blend material.	Requires high starting torque.	Limited pumping life. Sold as tube elements only; no continuous lengths available.	Do not use with strong acids and alkalis.	Limited pumping life.	
Application suitability:						
Acids	Good	Excellent	Excellent	Good	Good	
Alkalies	Good	Excellent	Excellent	Good	Good	
Organic solvents	Not recommended	Good	Excellent	Not recommended	Not recommended	
Pressure	Good	Excellent	Good	Good	Good	
Vacuum	Good	Excellent	Good	Good	Good	
Viscous fluids	Excellent	Excellent	Excellent	Excellent	Excellent	
Sterile fluids	Excellent	Excellent	Good	Good	Fair	
Physical characteristics and composition	Thermoplastic elastomer. Polypropylene-based material with USP mineral oil. Excellent tensile strength. Firm (stiff) material. Opaque, off-white.	Thermoplastic elastomer (for outer jacket). Plasticizer-free inner liner. Firm (stiff) material. Opaque, beige.	Polytetrafluoroethylene. Rigid material. Translucent, white.	Thermoplastic. PVC-based material with plasticizer. Firm (stiff) material. Transparent, clear.	Thermoplastic. PVC-based material with plasticizer. Firm (stiff) material. Transparent, clear.	
Temperature range	Static	-51 to 132°C (-60 to 270°F)	-60 to 74°C (-71 to 165°F)	-240 to 260°C (-400 to 500°F)	-46 to 74°C (-51 to 165°F)	-36 to 74°C (-32 to 165°F)
	Dynamic (pumping)	-20 to 80°C (-4 to 176°F)	0 to 40°C (32 to 104°F)	-40 to 150°C (-40 to 302°F)	0 to 40°C (32 to 104°F)	0 to 40°C (32 to 104°F)
Meets classifications	USP Class VI FDA 21 CFR 177.2600 European Pharmacopoeia (EP 3.2.9) Reach Compliant RoHS Compliant	USP Class VI FDA 21 CFR 177.2600 Reach Compliant RoHS Compliant	USP Class VI Reach (non-DEHP) ADCF RoHS	USP Class VI European Pharmacopoeia 3.2.9 FDA 21 CFR 175.300 EU Food Reach (non-DEHP) RoHS, ADCF	FDA 21 CFR 175.300 EU Food NSF-51 Reach (non-DEHP) RoHS ADCF 3A	
Gas permeability cc x mm (cm <sup>2</sup> x sec x cm Hg) x 10 <sup>-10</sup>	CO <sub>2</sub> : 1200 H <sub>2</sub> : — O <sub>2</sub> : 200 N <sub>2</sub> : 80	CO <sub>2</sub> : 745 H <sub>2</sub> : — O <sub>2</sub> : 200 N <sub>2</sub> : 80	CO <sub>2</sub> : 6.8 H <sub>2</sub> : — O <sub>2</sub> : — N <sub>2</sub> : 1.0	CO <sub>2</sub> : 563 H <sub>2</sub> : — O <sub>2</sub> : 124 N <sub>2</sub> : 67	CO <sub>2</sub> : 270 H <sub>2</sub> : 97 O <sub>2</sub> : 60 N <sub>2</sub> : 30	
Cleaning/sterilization	Sterilize by EtO, autoclave or gamma radiation up to 2.5 Mrad. Repeated autoclaving will not affect overall life.	Sterilize with ethylene oxide (EtO) radiation or autoclave. To autoclave: Coil loosely in nonlinting cloth or paper, autoclave at 121°C (250°F) 1 kg/cm <sup>2</sup> (15 psi) for 30 minutes; air dry at 66°C (150°F) for 2 to 2½ hours. Radiation: 2.5 Mrads.	Sterilize by EtO, autoclave or dry heat.	Sterilize with EtO or autoclave. To autoclave: Coil tubing loosely in nonlinting cloth or paper, autoclave at 121°C (250°F), 1 kg/cm <sup>2</sup> (15 psi) for 30 minutes (tubing will appear milky); air dry at max 66°C (150°F) for 2 to 2½ hours until clear.	Unaffected by commercial sanitizers (with recommended procedures). Sterilize by EtO or autoclave. To autoclave: Coil tubing loosely in nonlinting cloth or paper; autoclave at 121°C (250°F), 1 kg/cm <sup>2</sup> (15 psi) for 30 minutes (tubing will appear milky); air dry at max 66°C (150°F) for 2 to 2½ hours until clear.	



## OTHER INDUSTRIAL AND FOOD-GRADE TUBING

### TYGON® E-LAB TUBING

- ▶ Ideal for general transfer applications
- ▶ Economical
- ▶ Nontoxic, nonaging, and nonoxidizing

### TYGON® FUEL & LUBRICANT TUBING

- ▶ Ideal for transferring hydrocarbons, gasoline, kerosene, heating oils, cutting compounds, and glycol-based coolants
- ▶ Not for use with concentrated strong acids or alkalies

### TYGON® CHEMICAL TUBING

- ▶ Best chemical resistance of Tygon formulations
- ▶ Compatible with some organics
- ▶ Plasticizer-free

### NORPRENE® TUBING






- ▶ Up to 10,000 hours of tubing life
- ▶ Best choice for pressure/vacuum applications
- ▶ Resists heat, ozone, acids, and alkalies
- ▶ Heat sealable and bondable
- ▶ Nonaging, nonoxidizing

### NORPRENE® FOOD TUBING

- ▶ Ideal for high-temperature food and beverage applications
- ▶ Similar characteristics as Norprene® tubing
- ▶ Meets FDA and NSF standards

### WHERE TO ORDER TUBING

C/L® TUBING .....	33
L/S® TUBING .....	68-73
I/P® TUBING .....	126-130
B/T® TUBING .....	153

Pump tubing formulation	Tygon® E-Lab (E-3603)	Tygon® Fuel & Lubricant (F-4040-A)	Tygon® Chemical (2001)	Norprene® (A 60 G)	Norprene® Food (A 60 F)
Series number	06509	06401	06475	06404	06402
					
<b>Advantages</b>	Inexpensive tubing for general laboratory applications. Clear for easy flow monitoring. Handles virtually all inorganic chemicals. Nonaging, nonoxidizing. Low gas permeability. Good for viscous fluids. High dielectric constant.	Specially formulated to transport hydrocarbons, petroleum products, and distillates. Suitable for gasoline, kerosene, heating oils, cutting fluids, and glycol-based coolants. Minimum extractability. Low gas permeability. High dielectric constant.	Best chemical resistance of any Tygon® formulation. Compatible with many polar solvents. Plasticizer-free. Clear for easy flow monitoring. Low extractability. Low gas permeability. High dielectric constant.	Best choice for vacuum/pressure applications. Offers longest pump tubing life. Heat, ambient ozone resistant. Good resistance to acids/alkalies. Black color hides dirt and dust. Heat sealable, nonaging, and nonoxidizing. High dielectric constant. High-pressure version available.	Similar to Norprene® (06404) but with FDA approval. Excellent for food/dairy applications. Longest life, good flow consistency. Heat and ozone resistant. Good resistance to acids/alkalies. Heat sealable, nonaging, and nonoxidizing. High dielectric constant.
<b>Limitations</b>	Limited pumping life.	Don't use with strong acids and alkalies.	Limited pumping life. Some external spallation during use (does not affect tubing ID). Recommended for use with Easy-Load®, Easy-Load® II, and Easy-Load® 3 pump heads only.	Potential leaching of USP mineral oil or blend material.	Potential leaching of USP mineral oil or blend material.
<b>Application suitability:</b>					
Acids	Good	Good	Excellent	Good	Good
Alkalies	Good	Good	Excellent	Good	Good
Organic solvents	Not recommended	Not recommended	Good	Not recommended	Not recommended
Pressure	Good	Good	Good	Excellent	Excellent
Vacuum	Good	Good	Good	Excellent	Excellent
Viscous fluids	Excellent	Excellent	Excellent	Excellent	Excellent
Sterile fluids	Poor	Poor	Good	Not recommended	Good
<b>Physical characteristics and composition</b>	Thermoplastic. PVC-based material with plasticizer. Firm (stiff) material. Transparent, clear.	Thermoplastic. PVC-based material with plasticizer. Firm (stiff) material. Transparent, yellow.	Thermoplastic elastomer. PVC- and plasticizer-free material. Firm (stiff) material. Transparent, clear.	Thermoplastic elastomer. Polypropylene-based material with USP mineral oil. Excellent tensile strength. Firm (stiff) material. Opaque, black.	Thermoplastic elastomer. Polypropylene-based material with USP mineral oil. Excellent tensile strength. Firm (stiff) material. Opaque, beige.
<b>Temperature range</b>	-46 to 74°C (-51 to 165°F) 0 to 40°C (32 to 104°F)	-37 to 74°C (-35 to 165°F) 0 to 40°C (32 to 104°F)	-77 to 57°C (-108 to 135°F) 0 to 40°C (32 to 104°F)	-59 to 132°C (-60 to 270°F) -20 to 80°C (-4 to 176°F)	-59 to 132°C (-60 to 270°F) -20 to 80°C (-4 to 176°F)
<b>Meets classifications</b>	USP Class VI FDA 21 CFR 175.300 EU Food NSF-51 Reach (non-DEHP) RoHS ADCF	None Reach Compliant RoHS Compliant ADCF Compliant	FDA 21 CFR 175.300 Reach Compliant RoHS Compliant ADCF Compliant	NSF-51 Reach Compliant RoHS Compliant =	FDA 21 CFR 177.2600 NSF-51 Reach Compliant RoHS Compliant
<b>Gas permeability</b> cc x mm (cm <sup>2</sup> x sec x cm Hg) x 10 <sup>-10</sup>	CO <sub>2</sub> : 360 H <sub>2</sub> : 97 O <sub>2</sub> : 80 N <sub>2</sub> : 40	CO <sub>2</sub> : 100 H <sub>2</sub> : 97 O <sub>2</sub> : 22 N <sub>2</sub> : 12	CO <sub>2</sub> : 114 H <sub>2</sub> : — O <sub>2</sub> : 19 N <sub>2</sub> : 9	CO <sub>2</sub> : 1200 H <sub>2</sub> : — O <sub>2</sub> : 200 N <sub>2</sub> : 80	CO <sub>2</sub> : 1200 H <sub>2</sub> : — O <sub>2</sub> : 200 N <sub>2</sub> : 80
<b>Cleaning/sterilization</b>	Sterilize with EtO or autoclave. To autoclave: Coil tubing loosely in nonlinting cloth or paper; autoclave at 121°C (250°F), 1 kg/cm <sup>2</sup> (15 psi) for 30 minutes (tubing will appear milky); air dry at max 66°C (150°F) for 2 to 2½ hours until clear.	Sterilization is not recommended.	Sterilize by EtO, autoclave, or gamma radiation. To autoclave: Coil tubing loosely in nonlinting cloth or paper; autoclave at 121°C (250°F), 1 kg/cm <sup>2</sup> (15 psi) for 30 minutes (tubing will appear milky); air dry at max 66°C (150°F) for 2 to 2½ hours until clear.	Sterilize by autoclave, EtO, and gamma. Repeated sterilization will not affect overall life.	Sterilize by autoclave, EtO, and gamma. Repeated autoclaving will not affect overall life.



## OTHER INDUSTRIAL AND FOOD-GRADE TUBING

### GORE® HIGH-RESILIENCE TUBING, STYLE 100SC

- ▶ Long life at continuous pressure up to 4 bar (60 psi)
- ▶ Excellent flow stability
- ▶ Spallation-free
- ▶ Low gas permeability

### GORE® HIGH-RESILIENCE TUBING, STYLE 500

- ▶ Very similar to Style 100SC, plus:
- ▶ Excellent chemical resistance
- ▶ Compatible with many inorganic and organic chemicals

### GORE® HIGH-RESILIENCE TUBING, STYLE 400

- ▶ Long life under pressure
- ▶ Minimal break-in period
- ▶ Excellent chemical compatibility
- ▶ Ideal for industrial applications

### VITON® TUBING

- ▶ Excellent chemical resistance
- ▶ Resists corrosives, solvents, and oils at elevated temperatures

### WHERE TO ORDER TUBING

C/L® TUBING .....	33
L/S® TUBING .....	68–73
I/P® TUBING .....	126–130
B/T® TUBING .....	153

Pump tubing formulation	GORE® Style 100SC	GORE® Style 500	GORE® Style 400	Viton®
Series number	96190	96191	06439	96412
Advantages	Long life, even under pressures up to 4 bar (60 psi). Excellent flow stability; <1% change in flow rate as tubing wears. No break-in period required. Spallation-free. Excellent biocompatibility. Low extractables.	Similar to STA-PURE® PCS tubing but with enhanced chemical resistance. Resistant to many organic and inorganic fluids. Long life at pressure up to 60 psi (4 bar). Spallation-free. Excellent biocompatibility. Low gas permeability.	Long life under pressure. Excellent tubing life. Minimal break-in period. Spallation-free. Excellent chemical compatibility. Ideal for industrial applications.	Perfect for food and lab applications where FDA compliance is required. Excellent chemical resistance. Resistant to corrosives, solvents, and oils at elevated temperatures. Low gas permeability.
Limitations	Sold as tube elements only; no continuous lengths available.	Sold as tube elements only; no continuous lengths available.	Does not meet either USP or FDA classifications. Limited temperature range. Sold as tube elements only. No continuous lengths available.	Limited pumping life.
Application suitability:				
Acids	Not recommended	Excellent	Excellent	Excellent
Alkalies	Not recommended	Good	Excellent	Excellent
Organic solvents	Not recommended	Excellent	Variable—test before using	Variable—test before using
Pressure	Excellent	Excellent	Excellent	Good
Vacuum	Good	Good	Good	Good
Viscous fluids	Good	Good	Good	Good
Sterile fluids	Excellent	Excellent	Not recommended	Fair
Physical characteristics and composition	ePTFE (expanded PTFE) and platinum-cured silicone. Excellent tensile strength. Firm (stiff) material. Opaque, white.	ePTFE (expanded PTFE) and fluoroelastomer. Excellent tensile strength. Firm (stiff) material. Opaque, white.	ePTFE and Viton® type F fluoroelastomer (FKM). Excellent tensile and tear strength. Opaque, beige.	Thermal set rubber. Viton B (67% fluorine). Firm (stiff) material. Opaque, black.
Temperature range	Static	–40 to 150°C (–40 to 302°F)	–80 to 200°C (–112 to 392°F)	0 to 200°C (52 to 390°F)
	Dynamic (pumping)	–40 to 150°C (–40 to 302°F)	–40 to 150°C (–40 to 302°F)	0 to 150°C (32 to 302°F)
Meets classifications	RoHS Compliant REACH Compliant	RoHS Compliant REACH Compliant	RoHS Compliant	FDA 21 CFR 177.2600 ADCF Compliant
Gas permeability cc x mm (cm <sup>2</sup> x sec x cm Hg) x 10 <sup>-10</sup>	CO <sub>2</sub> : 20,132 H <sub>2</sub> : 6579 O <sub>2</sub> : 7961 N <sub>2</sub> : 2763	CO <sub>2</sub> : 76 to 79 H <sub>2</sub> : — O <sub>2</sub> : — N <sub>2</sub> : 4.3	CO <sub>2</sub> : 77 H <sub>2</sub> : — O <sub>2</sub> : 14 N <sub>2</sub> : 4.3	CO <sub>2</sub> : 76 to 79 H <sub>2</sub> : — O <sub>2</sub> : 13 to 15 N <sub>2</sub> : 4.3
Cleaning/sterilization	N/A: For industrial use only	N/A: For industrial use only	N/A: For industrial use only.	—