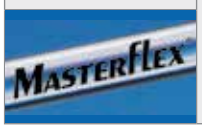
Masterflex® Tubing Formulations

Pump tubing formulation	Advantages	Application suitability†							Meets classifications	Gas permeability	Sterilization
		Acids	Alkalies	Organic solvents	Pressure	Vacuum	Viscous fluids	Sterile fluids			
Silicone (platinum-cured)	Excellent biocompatibility. No leachable additives, DOP, or plasticizers; phthalate and latex-free; odorless and nontoxic, fungus-resistant. No taste imparted to transported fluids. Weather, ozone, corona, and radiation resistant. Minimal tendency to take a set. Translucent, clear to light amber.	N/R	N/R	N/R	F	G	F	E	USP Class V Extractables Exceeds Class VI Implant European Pharmacopoeia (EP 3.1.9) FDA 21 CFR 177.2600; FDA 21 CFR 210 and 211; Exceeds 3A sanitary cGMPs; REACH (non-DEHP) compliant RoHS compliant ADCF compliant	CO_2: 20,132 H_2: 6579 O_2: 7961 N_2: 2763	Sterilize by EtO, autoclave, or gamma radiation.
		Temperature range: Static: –50 to 230°C (–58 to 446°F) Dynamic (pumping): –40 to 100°C (–40 to 212°F)									
Silicone (peroxide-cured)	Excellent biocompatibility. No additives, plasticizers or DOP; odorless and nontoxic, fungus-resistant. No taste imparted to transported fluids. Weather, ozone, corona, and radiation resistant. Minimal tendency to take a set. Translucent, clear to light amber.	N/R	N/R	N/R	F	G	F	E	USP Class VI European Pharmacopoeia (EP 3.1.9) FDA 21 CFR 177.2600 Exceeds 3A sanitary standards REACH (non-DEHP) compliant RoHS compliant ADCF compliant	CO_2: 20,132 H_2: 6579 O_2: 7961 N_2: 2763	Sterilize by EtO or autoclave.
		Temperature range: Static: –50 to 230°C (–58 to 446°F) Dynamic (pumping): –40 to 100°C (–40 to 212°F)									
BioPharm Silicone (platinum-cured)	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. Translucent, clear to light amber.	N/R	N/R	N/R	F	G	F	E	USP Class VI European Pharmacopoeia (EP 3.1.9) FDA 21 CFR 177.2600 Exceeds 3A sanitary standards REACH (non-DEHP) compliant RoHS compliant	CO_2: 25,147 H_2: — O_2: 4715 N_2: 2284	Sterilize by EtO, autoclave, or gamma radiation.
		Temperature range: Static: –60 to 232°C (–75 to 450°F) Dynamic (pumping): –40 to 100°C (–40 to 212°F)									
BioPharm Plus Silicone (platinum-cured)	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. Translucent, clear to light amber.	N/R	N/R	N/R	F	G	F	E	USP Class VI European Pharmacopoeia (EP 3.1.9) FDA 21 CFR 177.2600 Exceeds 3A sanitary standards REACH (non-DEHP) compliant RoHS compliant	CO_2: 25,147 H_2: — O_2: 4715 N_2: 2284	Sterilize by EtO, autoclave, or gamma radiation.
		Temperature range: Static: –60 to 232°C (–75 to 450°F) Dynamic (pumping): –40 to 100°C (–40 to 212°F)									
Puri-Flex™	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. Translucent, clear to light white.	G	G	N/R	G	G	E	E	USP Class VI FDA 21 CFR 177.2600 and 177.1810 REACH (non-DEHP) compliant RoHS compliant ADCF compliant	CO_2: 1200 H_2: — O_2: 200 N_2: 80	Sterilize by EtO, autoclave up to 135°C (275°F), gamma radiation up to 4.5 Mrad.
		Temperature range: Static: –50 to 135°C (–58 to 275°F) Dynamic (pumping): –30 to 100°C (–22 to 212°F)									
C-Flex®	Physical properties similar to silicone with chemical compatibility of Tygon®. Inexpensive. Biocompatible. Heat sealable and weldable. Opaque, white.	G	G	N/R	F	G	F	E	USP Class VI European Pharmacopoeia (EP 3.2.9) REACH (non-DEHP) compliant RoHS compliant ADCF compliant	CO_2: — H_2: — O_2: 150 N_2: —	Sterilize by EtO, autoclave, or gamma radiation.
		Temperature range: Static: –45 to 121°C (–50 to 250°F) Dynamic (pumping): –40 to 100°C (–40 to 212°F)									
C-Flex® ULTRA	Physical properties similar to silicone with chemical compatibility of Tygon®. Biocompatible. Heat sealable and weldable. Longer pump life and lower spallation than C-Flex. Translucent.	G	G	N/R	F	G	F	E	USP Class VI European Pharmacopoeia (EP 3.2.9) REACH (non-DEHP) compliant RoHS compliant ADCF compliant	CO_2: 2.1 H_2: — O_2: 1.1 N_2: 3.4	Sterilize by gamma radiation or one cycle of autoclave at 121°C (250°F), 1 bar (15 psi) for 30 minutes.
		Temperature range: Static: –45 to 121°C (–50 to 250°F) Dynamic (pumping): –40 to 100°C (–40 to 212°F)									

†E = Excellent, G = Good, F = Fair, P = Poor, N/R = not recommended

Masterflex® Tubing Formulations (continued)

Pump tubing formulation	Advantages	Application suitability†							Meets classifications	Gas permeability	Sterilization
		Acids	Alkalies	Organic solvents	Pressure	Vacuum	Viscous fluids	Sterile fluids			
PharMed® BPT 	Great for tissue and cell work—nontoxic and nonhemolytic. Long service life (up to 10,000 hrs); 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. Opaque, beige	G	G	N/R	G	G	E	E	USP Class VI European Pharmacopoeia (EP 3.2.9) FDA 21 CFR 177.2600 NSF-51 REACH (non-DEHP) compliant RoHS compliant	CO_2: 1200 H_2: — O_2: 200 N_2: 80	Sterilize by EtO, autoclave, or gamma radiation up to 2.5 Mrad.
		Temperature range: Static: –51 to 132°C (–60 to 270°F) Dynamic (pumping): –20 to 100°C (–4 to 212°F)									
Solve-Flex® 	Excellent chemical resistance, especially with solvents. Chemically inert. Low spallation. Nontoxic. Low coefficient of friction. Fluoropolymer-lined tubing. Opaque, white.	E	E	E	F	G	E	E	USP Class VI	—	Sterilize by EtO.
		Temperature range: Static: –51 to 132°C (–60 to 270°F) Dynamic (pumping): –20 to 100°C (–4 to 212°F)									
PharmaPure® 	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. Opaque, off-white.	G	G	N/R	G	G	E	E	USP Class VI FDA 21 CFR 177.2600 European Pharmacopoeia (EP 3.2.9) REACH (non-DEHP) compliant RoHS Compliant	CO_2: 1200 H_2: — O_2: 200 N_2: 80	Sterilize by EtO, autoclave or gamma radiation up to 2.5 Mrad.
		Temperature range: Static: –51 to 132°C (–60 to 270°F) Dynamic (pumping): –20 to 100°C (–4 to 212°F)									
Chem-Durance® Bio 	Excellent chemical resistance. Excellent life and durability under pressure. Low spallation. Plasticizer-free inner liner. High dielectric constant. Excellent biocompatibility. Opaque, beige.	E	E	G	E	E	E	E	USP Class VI FDA 21 CFR 177.2600 REACH (non-DEHP) compliant RoHS Compliant	CO_2: 745 H_2: — O_2: 200 N_2: 80	Sterilize with ethylene oxide (EtO) radiation or autoclave.
		Temperature range: Static: –60 to 74°C (–71 to 165°F) Dynamic (pumping): 0 to 40°C (32 to 104°F)									
PTFE 	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. Translucent, white.	E	E	E	G	G	E	G	USP Class VI REACH (non-DEHP) compliant RoHS compliant ADCF compliant	CO_2: 6.8 H_2: — O_2: — N_2: 1.0	Sterilize by EtO, autoclave, or gamma irradiation.
		Temperature range: Static: –240 to 260°C (–400 to 500°F) Dynamic (pumping): –40 to 150°C (–40 to 302°F)									
Tygon® E-LFL 	Longest life of all Tygon® peristaltic tubing. Clear for easy flow monitoring. Broad chemical resistance. Nonaging, nonoxidizing. Low gas permeability. Smooth bore. Good for viscous fluids. High dielectric constant. Transparent, clear.	G	G	N/R	G	G	E	G	USP Class VI European Pharmacopia (EP 3.2.9) FDA 21 CFR 175.300 EU Food REACH (non-DEHP) compliant RoHS compliant ADCF compliant	CO_2: 563 H_2: — O_2: 124 N_2: 67	Sterilize by EtO or autoclave.
		Temperature range: Static: –46 to 74°C (–51 to 165°F) Dynamic (pumping): 0 to 40°C (32 to 104°F)									
Tygon® E-Food (B-44-4X) 	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. Transparent, clear.	G	G	N/R	G	G	E	F	FDA 21 CFR 175.300 EU Food NSF-51 REACH (non-DEHP) compliant RoHS compliant ADCF compliant Meets 3A sanitary standards	CO_2: 270 H_2: 97 O_2: 60 N_2: 30	Sterilize by EtO or autoclave.
		Temperature range: Static: –36 to 74°C (–32 to 165°F) Dynamic (pumping): 0 to 40°C (32 to 104°F)									

†E = Excellent, G = Good, F = Fair, P = Poor, N/R = not recommended

Choosing the Right MASTERFLEX® Tubing

Pump tubing formulation	Advantages	Application suitability†							Meets classifications	Gas permeability	Sterilization
		Acids	Alkalies	Organic solvents	Pressure	Vacuum	Viscous fluids	Sterile fluids			
Tygon® E-Lab (E-3603)	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. Transparent, clear.	G	G	N/R	G	G	E	P	USP Class VI FDA 21 CFR 175.300 EU Food NSF-51 REACH (non-DEHP) compliant RoHS compliant ADCF compliant	CO_2: 360 H_2: 97 O_2: 80 N_2: 40	Sterilize by EtO or autoclave.
		Temperature range: Static: –46 to 74°C (–51 to 165°F) Dynamic (pumping): 0 to 40°C (32 to 104°F)									
Tygon® Chemical (2001)	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. Transparent, clear.	E	E	G	G	G	E	G	FDA 21 CFR 175.300 REACH (non-DEHP) compliant RoHS compliant ADCF compliant	CO_2: 114 H_2: — O_2: 19 N_2: 9	Sterilize by EtO, autoclave, or gamma radiation.
		Temperature range: Static: –77 to 57°C (–108 to 135°F) Dynamic (pumping): 0 to 40°C (32 to 104°F)									
Tygon® Fuel & Lubricant (F-4040-A)	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. Transparent, yellow.	G	G	N/R	G	G	E	P	REACH (non-DEHP) compliant RoHS compliant ADCF compliant	CO_2: 100 H_2: 97 O_2: 22 N_2: 12	Sterilization is not recommended.
		Temperature range: Static: –37 to 74°C (–35 to 165°F) Dynamic (pumping): 0 to 40°C (32 to 104°F)									
Norprene® (A 60 G)	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. Opaque, black.	G	G	N/R	E	E	E	N/R	NSF-51 REACH (non-DEHP) compliant RoHS compliant	CO_2: 1200 H_2: — O_2: 200 N_2: 80	Sterilize by EtO, autoclave, or gamma irradiation.
		Temperature range: Static: –59 to 132°C (–60 to 270°F) Dynamic (pumping): –20 to 100°C (–4 to 212°F)									
Norprene® Food (A 60 F)	Similar to Norprene® 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. Opaque, beige.	G	G	N/R	E	E	E	G	FDA 21 CFR 177.2600 NSF-51 REACH (non-DEHP) compliant RoHS compliant	CO_2: 1200 H_2: — O_2: 200 N_2: 80	Sterilize by EtO, autoclave, or gamma irradiation.
		Temperature range: Static: –59 to 132°C (–60 to 270°F) Dynamic (pumping): –20 to 100°C (–4 to 212°F)									
Viton®	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. Opaque, black.	E	E	Variable—test before using	G	G	G	F	FDA 21 CFR 177.2600 ADCF compliant	CO_2: 76 to 79 H_2: — O_2: 13 to 15 N_2: 4.3	Sterilization is not recommended.
		Temperature range: Static: –32 to 205°C (–25 to 400°F) Dynamic (pumping): 0 to 150°C (32 to 302°F)									

†E = Excellent, G = Good, F = Fair, P = Poor, N/R = not recommended

Masterflex® Tubing Test Kit

Our FREE Tubing Test Kit is a simple way to test your chemicals against different tubing formulations. Kit contains samples of 19 different pump tubing formulations, formulation descriptions, a selection guide, instructions on how to test your tubing, and complete ordering information. Call today! Request item 00101-10.

Request your FREE test kit today!