

a comprehensive
guide to Tygon®
tubing formulations

TYGON®

application specific tubing

WHEN THERE'S NO MARGIN FOR ERROR

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TUBING & MARKET OVERVIEW

Tubing Formulations

Product Description

Durometer
Hardness
(Shore A, 15s)

Color

Maximum
Recommended
Operating
Temperature
°F (°C)

Tubing Formulations	Product Description	Durometer Hardness (Shore A, 15s)	Color	Maximum Recommended Operating Temperature °F (°C)
Tygon® Beverage Tubing <i>Formulation B-44-3</i> page 4	Most widely specified clear, flexible tubing	63	Clear	165 (74)
Tygon® Food, Milk and Dairy Tubing <i>Formulation B-44-4X</i> page 4	The preferred clear, flexible tubing for food processing applications	65	Clear	165 (74)
Tygon® Pressure Tubing <i>Formulation B-44-4X I.B.</i> page 5	Most flexible reinforced tubing available	65	Clear (between braid)	165 (74)
Tygon® Silver <i>Antimicrobial Tubing</i> page 5	Antimicrobial tubing that decreases bacterial growth	72	Silver	160 (71)
Norprene® Food Process Tubing <i>Formulation A-60-F</i> page 6	Provides long service life in many hot food/beverage applications	61	Cream	275 (135)
Norprene® Pressure Tubing <i>Formulation A-60-F I.B.</i> page 6	Provides long service life even when exposed to heat, abrasion and pressure	61	Cream	275 (135)
Tygoprene® Pump Tubing <i>Formulation XL-60</i> page 7	Designed specifically for use in peristaltic pumps	60	Translucent	250 (121)
PharMed® BPT Tubing page 7	Long life peristaltic pump/cell culture tubing	64	Cream	275 (135)
Tygon® Laboratory Tubing <i>Formulation R-3603</i> page 8	For consistently reliable analysis in the lab	55	Clear	165 (74)
Tygon® Vacuum Tubing <i>Formulation R-3603</i> page 8	The clear choice for vacuum lines	55	Clear	165 (74)
Tygon® Ultra-Soft Tubing <i>Formulation R-1000</i> page 9	An extremely soft and flexible tubing that offers minimal resistance to compression	40	Clear	125 (52)
Tygon® Long Flex Life Pump Tubing <i>Formulation LFL</i> page 9	For the longest peristaltic pump flex life of any clear, flexible tubing	56	Clear	165 (74)
Versilic® High-Strength Silicone Tubing <i>Formulation SPX-50</i> page 10	Provides long life, strength and durability	50	Translucent	350 (177)
Versilic® High-Strength Silicone Pressure Tubing <i>Formulation SPX-70 I.B.</i> page 10	Provides elevated working pressures in a silicone tubing	71**	Translucent	320 (160)
Tygon® Sanitary Silicone Tubing <i>Formulation 3350</i> page 11	The platinum-cured silicone tubing with the smoothest inner surface for transfer of sensitive fluids	50**	Translucent	400 (204)
Tygon® Sanitary Silicone Pressure Tubing <i>Formulation 3370 I.B.</i> page 11	A platinum-cured silicone tubing that handles up to four times the pressure of Tygon® 3350	70	Translucent (between braid)	320 (160)
Tygon® Medical/Surgical Tubing <i>Formulation S-50-HL</i> page 12	A tubing designed for use in open heart surgery and other medical applications	66	Clear	165 (74)
Tygon® Microbore Tubing <i>Formulation S-54-HL</i> page 12	For precision injection and dispensing	80	Clear	185 (85)
Tygon® High Purity Tubing <i>Formulation 2275</i> page 13	Provides a high level of purity not previously available in a clear, flexible tubing	72	Clear	125 (52)
Tygon® High Purity Pressure Tubing <i>Formulation 2275 I.B.</i> page 13	High purity, low sorption, flexibility and clarity in a single tubing	72	Clear (between braid)	125 (52)
Tygon® Ultra Chemical Resistant Tubing <i>Formulation 2075</i> page 14	Provides the highest degree of chemical resistance in a clear, flexible tubing	72	Clear	125 (52)
Tygon® Plasticizer Free Tubing <i>Formulation 2001</i> page 14	Provides low compression set properties of a thermoset rubber in a clear, flexible tubing	69	Clear	135 (57)
Tygothane® Precision Polyurethane Tubing <i>Formulation C-210-A</i> page 15	For polyurethane applications requiring tight dimensional tolerances	82**	Transparent	200 (93)
Tygothane® Precision Polyurethane Pressure Tubing <i>Formulation C-544-A I.B.</i> page 15	High-performance polyurethane tubing for physically demanding environments	85**	Clear (between braid)	180 (82)
Norprene® Industrial Grade Tubing <i>Formulation A-60-G</i> page 16	Outlasts and outperforms neoprene, EPDM and other specialty rubber tubings	61	Black	275 (135)
Tygon® Fuel and Lubricant Tubing <i>Formulation F-4040-A</i> page 16	Resists embrittlement caused by hydrocarbon-based fluids, remains flexible	57	Translucent Yellow	165 (74)
Tygon® UV Resistant Tubing <i>Formulation R-3400</i> page 17	Stays flexible in ultraviolet environments	64	Black	165 (74)
Fluran® Severe Environment Tubing <i>Formulation F-5500-A</i> page 17	Withstands the harshest of chemicals, even under high temperatures	60**	Black	400 (204)
Tygon® Inert Tubing <i>Formulation SE-200</i> page 18	Complete clarity and high flexibility with the inertness of a fluoropolymer	67***	Clear	170 (77)
Chemfluor® FEP Tubing page 18	For the ultimate in purity, chemical resistance and temperature resistance	55*	Translucent	400 (204)
Chemfluor® PFA Tubing page 18		60*		500 (260)
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Chemical Processing



Environmental



Food and Beverage



Industrial



Laboratory



Medical



Peristaltic Pump



Pharmaceutical/
Biotech



Semiconductor Processing

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The most widely specified clear, flexible tubing, Tygon® Beverage Tubing is frequently chosen for its taste- and odor-free characteristics.



With its smooth, non-porous bore, Tygon® Food, Milk and Dairy Tubing helps ensure a bacteria-free fluid path in a wide variety of food processing applications.

TYGON® BEVERAGE TUBING

FORMULATION B-44-3

- *Taste-free and odor-free*
- *Non-wetting surface permits thorough cleaning and complete drainage*
- *Broad chemical resistance to virtually all non-solvent chemicals*
- *Lightweight and flexible for easy, quick installation*
- *Meets FDA, 3-A and NSF 51 criteria*

Tygon® Beverage Tubing is specially formulated for transferring a wide variety of beverages including soft drinks, fruit juices, flavored teas and bottled water. In virtually all cases, Tygon® Beverage Tubing will not affect the taste or odor of product transferred through it, while its excellent non-wetting properties facilitate complete drainage and permit simple flush-cleaning.

Many of the unique properties inherent to Tygon® Beverage Tubing also apply to a wide variety of complex applications ranging from fine cosmetic production to the dispensing of water-based printing inks found in the publishing industry. The versatility and proven performance of Tygon® Beverage Tubing have made it today's most widely specified clear, flexible plastic tubing.



TYGON® FOOD, MILK AND DAIRY TUBING

FORMULATION B-44-4X

- *Smooth, non-porous bore will not trap particulates or promote bacterial growth*
- *Compatible with foods containing a high oil content*
- *Resistant to harsh alkaline cleaners and sanitizers*
- *Excellent alternative to rigid piping systems*
- *Meets FDA, 3-A and NSF 51 criteria*

Producers of food, milk and dairy products insist upon Tygon® Food, Milk and Dairy Tubing for dependable performance in countless filling, draining, transfer and processing applications. Its smooth, non-porous bore inhibits particle entrapment, promoting a sanitary fluid path by minimizing potential for bacterial growth. It has outstanding resistance to harsh alkaline cleaners and is equally unaffected by commonly used sanitizers.

Non-toxic, taste-free and odor-free, Tygon® Food, Milk and Dairy Tubing meets applicable regulatory standards for contact with food products. Offering complete clarity for positive visual inspection and flow control, it is available in up to a 6" inside diameter, making it a flexible replacement for rigid piping systems.

A special construction of Tygon® Food, Milk and Dairy Tubing also is available for applications involving elevated working pressure.





Reinforced for elevated working pressure, Tygon® Pressure Tubing is the most flexible of the reinforced tubings available today.



Tygon® Silver tubing decreases bacterial growth and provides added value

TYGON® PRESSURE TUBING

FORMULATION B-44-4X I.B.

- *Handles four times the pressure of non-reinforced tubing*
- *Smooth, non-porous bore won't trap particulate matter*
- *Clear wall for visualization of flow*
- *Meets FDA, 3-A and NSF 51 criteria*

Tygon® Pressure Tubing's unique flexibility gets it into service quickly and easily. This means less tubing footage, fittings and labor than required for rigid systems. Reinforced with a tough polyester inner-braid imbedded in the wall, it can handle four times the pressure of non-reinforced tubing. Tygon® Pressure Tubing is compatible with virtually all non-solvent chemicals, meeting the needs of many industries in hundreds of applications where flexibility and higher pressure are required. Its clear wall permits positive flow monitoring and inspection.

The smooth inner bore of Tygon® Pressure Tubing (smoother than virtually all stainless steel) will not trap bacteria-harboring particles, making it ideal for food and beverage use. It is non-toxic, odorless, taste-free and exhibits outstanding resistance to the alkaline cleaners used in this industry.



TYGON® SILVER ANTIMICROBIAL TUBING

New

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- *Plasticizer-free inner bore*
- *Reduces formation of biofilm and mildew*
- *Inhibits growth of microbes*
- *Meets FDA criteria*
- *Meets NSF 51 criteria*

Tygon® Silver Antimicrobial Tubing decreases microbe growth that can lead to foul odors, discoloration and formation of mildew and biofilm on tubing. Microbes can contaminate the material being transferred through tubing as well as degrade the tubing itself. Tygon® Silver Antimicrobial Tubing has been treated on the inner surface to provide protection to the fluids being transferred.

Cleaning procedures, such as washing with detergent and hot water, can kill microbes. This process can be time consuming and costly, and does not provide residual protection against fresh contamination. The additional use of a durable and safe antimicrobial treatment is the best way to provide protection against microbial contamination.

Tygon® Silver Antimicrobial Tubing is FDA registered for food contact and meets NSF 51 criteria.





Formulated for flexural resistance and high temperatures, Norprene® Food Process Tubing does not easily crack or deteriorate, even in physically demanding applications.



Norprene® Pressure Tubing is ideal for clean-in-place and steam-in-place cleaning sterilization systems.

NORPRENE® FOOD PROCESS TUBING

FORMULATION A-60-F

- Temperature resistant from -75°F to 275°F
- Compatible with virtually all common sanitizers and cleaners
- Can be autoclaved repeatedly
- Meets FDA, 3-A and NSF 51 criteria

Formulated to withstand the high temperatures frequently occurring during food and beverage processing, Norprene® Food Process Tubing will outlast and outperform virtually all other food grade tubings. Even following extended exposure to heat and ozone, Norprene® Food Process Tubing will not crack or deteriorate as commonly found when using traditional rubber tubings.

Extremely flexible, Norprene® Food Process Tubing resists kinks and retains its shape while installing quickly and easily. Its excellent flexural fatigue resistance makes it the absolute best choice for use in peristaltic pumps often found in dispensing equipment.

Repeatedly autoclavable, Norprene® Food Process Tubing can be steam cleaned in place, eliminating the need for frequent tubing replacement. When harsh sanitizing solutions are used, it exhibits exceptional chemical resistance and is entirely unaffected by a wide variety of cleaning solutions.

Also available with reinforcement to withstand elevated working pressure.



NORPRENE® PRESSURE TUBING

FORMULATION A-60-F I.B.

- Provides long service life
- Performs well at a range of temperatures
- Ozone and UV light resistant
- Repeatedly autoclavable
- Meets FDA, 3-A and NSF 51 criteria

Ideal for use in clean-in-place and steam-in-place cleaning and sterilization systems, Norprene® Pressure Tubing has excellent alkali resistance and is compatible with numerous oxidizing agents such as hydrogen peroxide, sodium hypochlorite and ozone.

Norprene® Pressure Tubing exhibits excellent resistance to ozone and UV light, with little or no signs of deterioration in laboratory testing to the equivalent of 10 years of outdoor exposure. Norprene® Pressure Tubing provides long service life when exposed to heat, abrasion and pressure. It is temperature resistant up to 275°F and retains flexibility to -75°F.





Tygoprene® XL-60 provides flexibility and long life in peristaltic pump applications



Created with a unique combination of long flex life and biocompatibility, PharMed® BPT Tubing is ideal for life science applications employing peristaltic pumps.

TYGOPRENE® PUMP TUBING

FORMULATION XL-60

- *Long life in peristaltic pumps*
- *Temperature resistant up to 250°F*
- *DEHP-free*
- *FDA approved for food contact*
- *Meets NSF 51 criteria*

Designed specifically for use in peristaltic pump applications, Tygoprene® Pump Tubing maintains a pump life of over 500 hours. With a durometer of Shore A60, it is extremely flexible and exhibits superior flex life. Tygoprene® Pump Tubing can be considered an alternative to silicones and PVC when longer pump life is required.

Tygoprene® Pump Tubing is translucent in color and has excellent chemical resistance to a wide range of fluids, including acids and bases. It remains flexible at -40°F and has a maximum recommended temperature of 250°F. Tygoprene® Pump Tubing has passed the UL 94-HB flammability resistance classification.



PHARMED® BPT TUBING

FOR PERISTALTIC PUMPS AND CELL CULTURE

7

- *Outlasts silicone tubing in peristaltic pumps by up to 30 times*
- *Can be autoclaved repeatedly*
- *Heat weldable for sterile access in closed systems*
- *Documented biocompatibility to the ISO 10993 Standard*
- *Meets USP Class VI, FDA and NSF 51 criteria*

PharMed® BPT Tubing is less permeable to gases and vapors than silicone tubing. It is ideal for cell culture, fermentation, synthesis, separation, purification and process monitoring and control. Independent tests show that PharMed® BPT Tubing is safe for use in sensitive cell culture applications.

PharMed® BPT Tubing has very good general chemical resistance and excellent acid, alkali and oxidation resistance. Opaque to visible and UV light, it helps protect sensitive fluids. Continuous service temperature range is -60°F (-51°C) to 275°F (135°C).





The most consistently reliable tubing for the transfer of liquids and gases. Tygon® Laboratory Tubing handles virtually all inorganic chemicals found in today's laboratories.



Crystal-clear Tygon® Vacuum Tubing outlasts and outperforms traditional rubber tubing in vacuum pump applications.

TYGON® LABORATORY TUBING

FORMULATION R-3603

- Outstanding chemical resistance
- Lot-to-lot consistency for reproducible results
- Increases productivity in peristaltic pumps — outlasts other clear tubing 2 to 1
- Ideal for condensers, incubators, desiccators, gas lines and drain lines
- Meets FDA criteria

Crystal-clear and flexible, Tygon® Laboratory Tubing handles virtually all inorganic chemicals found in the lab. It is non-oxidizing and non-contaminating.

Long-lasting and crack-resistant, Tygon® Laboratory Tubing is less permeable than rubber tubing. The glassy-smooth inner bore helps prevent buildup so that cleaning is facilitated. Coils are marked at 1-foot intervals for easy measuring. Autoclavable. Remains flexible at -45°F (-43°C). Durometer hardness: Shore A, 55.



TYGON® VACUUM TUBING

FORMULATION R-3603

- Holds full vacuum at room temperature
- Will not crack and age like rubber tubing
- Excellent clarity for visual inspection
- Meets FDA criteria

Tygon® Vacuum Tubing has extra-heavy walls that will withstand a full vacuum at room temperature (29.9" [759 mm] of mercury at 73°F [23°C]) and up to (27" [686 mm] of mercury at 140°F [60°C]).

Like standard Tygon® Laboratory Tubing, Tygon® Vacuum Tubing resists most inorganic chemicals and can be used in corrosive atmospheres.

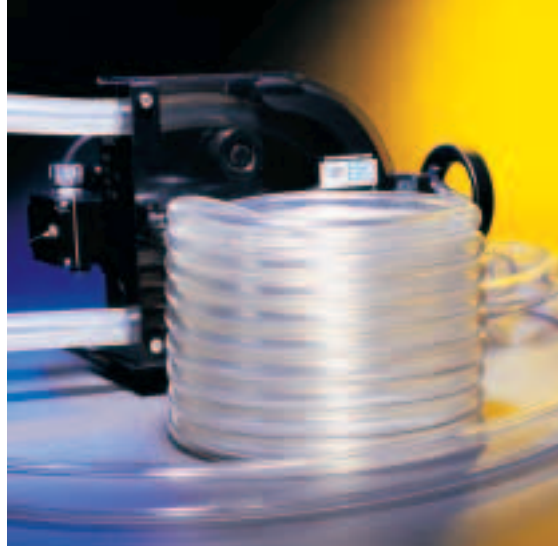
Clarity allows monitoring for possible backups which could result in equipment damage. Tygon® Vacuum Tubing will not swell closed if vacuum pump oil should back up into it.

Low vapor pressure (low outgassing) makes it suitable for vacuum applications down to 3×10^{-2} mm Hg at 165°F (74°C). Ideal for analytical testing of gases or vapors. Well-suited for use in making manometers.





Tygon® Ultra-Soft Tubing provides unmatched flexibility and drapability – characteristics beneficial to numerous laboratory set-ups.



Tygon® Long Flex Life Tubing offers the longest peristaltic pump life of any clear Tygon® tubing formulation.

TYGON® ULTRA-SOFT TUBING

FORMULATION R-1000

- *Ultra-soft and flexible*
- *Performs well at low temperatures (to -100°F)*
- *Excellent for use in low-torque pump applications*
- *Meets FDA and NSF 51 criteria*

Tygon® Ultra-Soft Tubing resists a broad range of aqueous chemicals and provides an excellent alternative to silicone tubing in applications where corrosive chemicals are used. Its minimal resistance to compression permits use in low-torque pump applications, including battery-driven types.

Tygon® Ultra-Soft Tubing stays flexible at temperatures as low as -100°F (-73°C). Its smooth bore facilitates easy cleaning and helps prevent possible buildup. Tygon® Ultra-Soft Tubing is not autoclavable. Durometer hardness: Shore A, 40.



TYGON® LONG FLEX LIFE PUMP TUBING

FORMULATION LFL

- *Longest flex life of any clear Tygon® tubing*
- *Extremely low particulate spallation*
- *Broad chemical resistance*
- *Meets USP Class VI and FDA criteria*

Crystal-clear Tygon® Long Flex Life Pump Tubing is formulated specifically for use in peristaltic pump applications. With its superior flex life characteristics, manufacturing processes can be simplified by reducing production downtime due to pump tubing failure.

The excellent wear properties of Tygon® Long Flex Life Pump Tubing also lead to a reduction of particulate spallation. This feature limits the risk of sensitive-fluid contamination critical to the pharmaceutical, cosmetic, and food and beverage industries.

Non-aging characteristics and broad chemical resistance provide users with versatility in use for a wide variety of applications. Safe and non-toxic Tygon® Long Flex Life Pump Tubing can be produced in up to a 6" inside diameter.





Provides long life, strength and durability in many demanding applications.



A silicone tubing that provides elevated working pressures in a variety of applications.

VERSILIC® HIGH-STRENGTH SILICONE TUBING

FORMULATION SPX-50

- *Ultra-smooth inner bore reduces risk of particle entrapment*
- *Taste and odor free*
- *Withstands temperature extremes from -75°F to 350°F*
- *Meets FDA, 3-A, NSF 51, and USP Class VI criteria*

Peroxide-cured Versilic® High-Strength Silicone Tubing is designed for use in applications where flexibility, resiliency and durability are required. Its smooth inner surface reduces the risk of particulate entrapment and microscopic buildup during fluid transfer. In addition, its high and low working temperatures help the tubing retain its flexibility under extreme conditions.

Because of its consistently reliable performance, Versilic® High-Strength Silicone Tubing is ideal for applications such as food & beverage dispensing & processing, appliance manufacturing, cosmetic production and electronic equipment.

Custom formulations can be designed to provide a combination of features, including ultra-high temperature resistance, electrical conductivity, pigmented colors and long flexural life.



VERSILIC® HIGH-STRENGTH SILICONE PRESSURE TUBING

FORMULATION SPX-70 I.B.

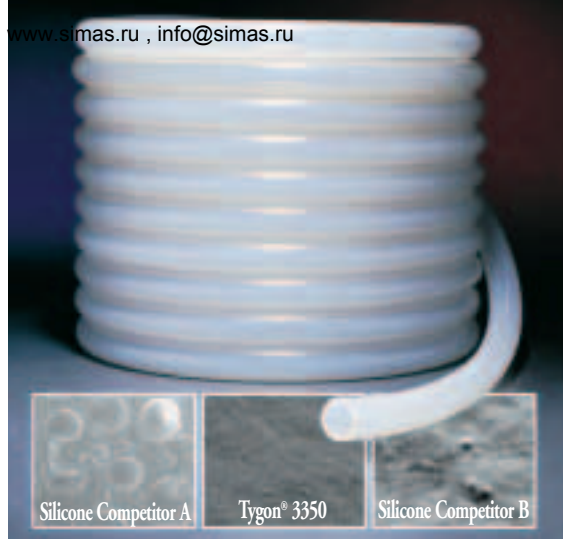
- *Tough braid reinforcement permits use under elevated working pressures*
- *Taste and odor free*
- *Temperature resistant from -112°F to 320°F*
- *Withstands repeated CIP and SIP cleaning and sterilization*
- *Meets FDA, 3-A, NSF 51, and USP Class VI criteria*

Produced from a proprietary combination of silicone elastomers, Versilic® SPX-70 IB Tubing optimizes critical physical properties such as tensile strength, elongation and compression set, resulting in a more physically durable product. Its ultra-smooth inner bore reduces the risk of particle entrapment during fluid transfer.

In addition, Versilic® High-Strength Silicone Pressure Tubing will remain resilient and durable under extreme operating temperatures and repeated cleaning and sterilization.

Versilic® Silicone Tubing complies fully with the requirements of the USP Class VI Criteria and is entirely non-toxic, non-hemolytic and non-pyrogenic.





In a comparison of images of the inner surfaces of Tygon® 3350 silicone tubing and two competitors (captured at 500x magnification with an electron scanning microscope), Tygon® clearly exhibits superior smoothness. As a result, the potential for particle entrapment is greatly reduced.



By combining Tygon® Silicone Pressure Tubing with sanitary fittings, the efficient transfer of high purity fluids is simplified.

TYGON® SANITARY SILICONE TUBING

FORMULATION 3350

- *Ultra-smooth inner bore reduces potential for particle entrapment*
- *Minimal extractables help maintain fluid integrity*
- *Hydrophobic surface improves fluid flow*
- *Documented biocompatibility to the ISO 10993 standard*
- *Meets USP Class VI, FDA, 3-A and NSF 51 criteria*

Designed for high-purity applications, Tygon® Sanitary Silicone Tubing's ultra-smooth inner bore can reduce the risk of particle entrapment and microscopic buildup during sensitive fluid transfer. In-house analysis of the inner surface of Tygon® Sanitary Silicone Tubing compared to other silicone tubing shows that it is up to three times smoother. In addition, this smoother fluid path facilitates complete system cleaning and sterilization.

Using a platinum-curing process, Tygon® Sanitary Silicone Tubing eliminates the concern of extraction often encountered when alternative curing methods are used. It also has been fully characterized using the ISO 10993 standard, reducing user cost and time associated with process validation.

Also available with reinforcement to withstand elevated working pressure.



TYGON® SANITARY SILICONE PRESSURE TUBING

FORMULATION 3370 I.B.

11

- *Consistently smooth inner surface reduces potential for particle entrapment*
- *Withstands repeated CIP and SIP sterilization*
- *Tough braid reinforcement for elevated working pressures*
- *Meets USP Class VI, FDA and NSF 51 criteria*

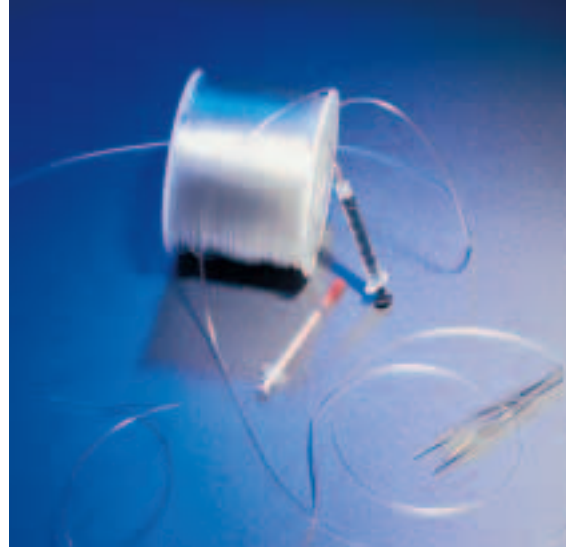
Often specified in high-purity applications, Tygon® Sanitary Silicone Pressure Tubing is produced from a platinum-curing process that helps ensure the highest level of biocompatibility available. The ultra smooth inner surface and the ability to be cleaned and sterilized repeatedly in CIP and SIP systems helps to maintain fluid integrity throughout sensitive fluid transfer or processing. When used in combination with sanitary fittings, complete assemblies can be constructed that provide the sanitary conditions critical to pharmaceutical, biotechnology, cosmetic, food, dairy and beverage applications.

Braid-reinforced for increased pressure resistance, it also provides flexibility, durability, and chemical and temperature resistance to make it the ideal pressure tubing for a wide variety of industries.





Crystal-clear Tygon® Medical/Surgical Tubing provides proven performance in countless medical device applications.



Tygon® Microbore Tubing is designed for precision injection and dispensing in hospital, surgical and laboratory applications.

TYGON® MEDICAL/ SURGICAL TUBING

FORMULATION S-50-HL

- *Ideal for contact with blood*
- *Flexible and resilient with established performance in peristaltic pump applications*
- *Fully characterized to ISO 10993 and FDA guidelines for biocompatibility*
- *Meets USP Class VI criteria*

Originally developed for use in cardiac surgery, Tygon® Medical/Surgical Tubing's consistent quality provides dependable performance in medical device applications. Saint-Gobain Performance Plastics compounds its own materials to specific formulation requirements using select ingredients that have been carefully qualified and specified. To ensure formulation integrity, full characterization of chemical make-up and physical property and biological safety testing are performed. Tygon® Medical/Surgical Tubing has been fully tested for biological safety to the ISO 10993 standard. Durometer hardness: Shore A, 66.

Tygon® Medical/Surgical Tubing can be sterilized by radiation, ethylene oxide, steam or chemical methods.



TYGON® MICROBORE TUBING

FORMULATION S-54-HL

- *Stiff enough for easy handling, soft enough to resist puncturing*
- *Micro-diameter sizes fit needle gauges 30 to 17*
- *Ideal for precision injection and dispensing applications*
- *Meets USP Class VI criteria*

Select Tygon® Microbore Tubing for intravenous and arterial infusion as well as other surgical, hospital and laboratory applications. It is flexible enough to permit use of a single size tubing with several different needle gauges, yet sufficiently rigid to minimize the danger of wall collapse. Tygon® Microbore Tubing is non-toxic, non-pyrogenic and biocompatible. Durometer hardness: Shore A, 83.

Tygon® Microbore Tubing can be sterilized by radiation, ethylene oxide, steam or chemical methods.





With an extremely low sorption rate and no plasticizer to alter fluids, Tygon® High Purity Tubing maintains the integrity of sensitive solutions.



Since Tygon® 2275 I.B. is hydrophobic and resists the sorption of aqueous fluids, it minimizes the risk of fluid alteration in single-use or repeat-use applications.

TYGON® HIGH PURITY TUBING

FORMULATION 2275

- Provides an uncompromising fluid path for sensitive solutions
- Low sorption maintains fluid integrity
- Plasticizer-free — virtually no extractables
- Environmentally friendly — safe to dispose of through incineration
- Documented biocompatibility to the ISO 10993 standard
- Meets USP Class VI, FDA and NSF 51 criteria

Tygon® High Purity Tubing is ideal for handling sensitive fluids such as pharmaceutical or biological solutions. There is virtually no absorption of key fluid constituents into the tubing material or fluid adsorption onto the tubing walls. As a result, fluid alteration and loss is limited. There is no plasticizer to leach into or contaminate the fluid, yet the tubing remains flexible.

Tygon® High Purity Tubing can be sterilized by radiation, ethylene oxide, steam or chemical methods.

Frequently, incineration is used to dispose of contaminated materials. While many tubings release hazardous byproducts when burned, Tygon® High Purity Tubing only releases carbon dioxide and water when properly incinerated, providing safe disposal.

Also available with reinforcement to withstand elevated working pressure.



TYGON® HIGH PURITY PRESSURE TUBING

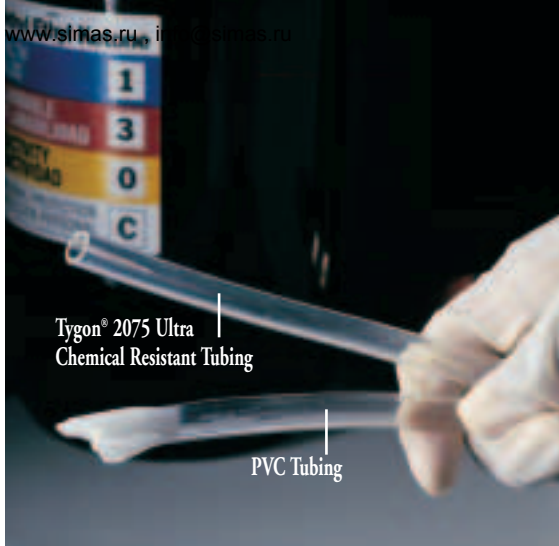
FORMULATION 2275 I.B.

- Low sorption to aqueous fluids
- Plasticizer-free
- Tough braid reinforcement for elevated working pressures
- Meets USP Class VI and FDA criteria

Tygon® 2275 I.B. helps maintain product integrity during fluid transfer in pharmaceutical and biotechnology applications. Loss of fluid through migration into the tubing or adherence of fluid onto the tubing walls may create inconsistencies in final product results. Tygon® 2275 I.B. is hydrophobic and resists the sorption (absorption/adsorption) of aqueous fluids. This reduction in sorption minimizes the risk of fluid alteration in single-use or repeat-use applications.

Tygon® 2275 I.B. is virtually unaffected by chemical sanitizers and cleaners. As a result, it can be cleaned repeatedly without decreasing its service life. The non-wettable surface of the product facilitates complete drainage of fluid during the cleaning process. In addition, Tygon® 2275 I.B. can be sterilized easily using conventional gamma radiation, gas (ethylene oxide) and autoclave methods.

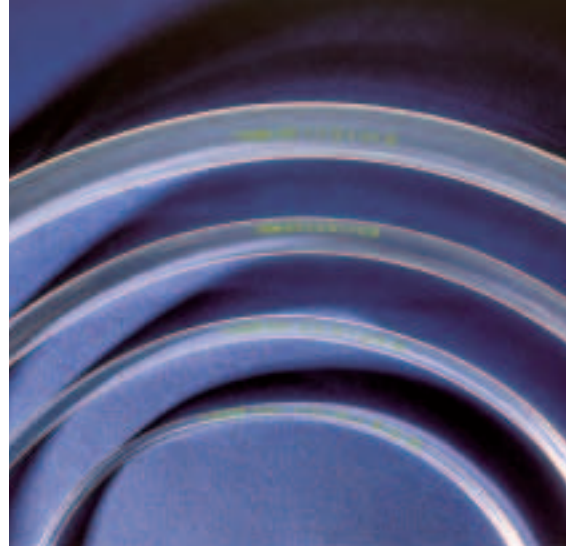




Tygon® 2075 Ultra
Chemical Resistant Tubing

PVC Tubing

After being immersed in aggressive MEK for 16 hours (plus 4 hours drying time), Tygon® Ultra Chemical Resistant Tubing is still clear and flexible while PVC tubing is completely degraded and rendered useless.



An entirely plasticizer-free Tygon® formulation developed for use in applications where extractables are a concern.

TYGON® ULTRA CHEMICAL RESISTANT TUBING

FORMULATION 2075

- Resistant to highly aggressive chemicals
- Plasticizer-free — minimizes risk of fluid contamination
- Exceptionally smooth inner surface inhibits particulate buildup
- Low sorption maintains fluid integrity

Tygon® Ultra Chemical Resistant Tubing offers an unequalled combination of chemical resistance, clarity and flexibility. Tygon® Ultra Chemical Resistant Tubing is virtually unaffected by acids, bases, ketones, salts and alcohols, fitting the requirements of many applications from battery acid filling to hazardous material handling. It's entirely plasticizer-free, eliminating fluid contamination and the premature embrittlement and cracking common with many flexible tubings. Its exceptionally smooth inner surface inhibits particulate buildup and reduces the potential for contamination.



TYGON® PLASTICIZER FREE TUBING

FORMULATION 2001

- Superior flex life in peristaltic pumps
- Chemically resistant to a wide range of fluids
- Temperature resistant from -108°F to 135°F
- Clear for easy visual flow monitoring
- Meets FDA criteria for food contact

Tygon® Plasticizer Free Tubing is a uniquely engineered product that offers the low compression set properties of a thermoset rubber. Tygon® Plasticizer Free Tubing provides the most flexibility, highest temperature resistance and longest pump life available in a clear, plasticizer / oil free tubing. It is ideal for a broad range of applications including peristaltic pump applications, soap and detergent dispensing, water purification lines, food contact applications and chemical transfer. This uniquely engineered tubing will not embrittle or crack prematurely like other tubings that contain plasticizer or extender oils, benefiting the user with less downtime and tubing changes.





With close dimensional tolerances and outstanding elasticity, Tygothane® Precision Polyurethane Tubing provides worry-free attachment to fittings.



Because of its excellent wear properties, Tygothane® frequently outperforms rubber, plastic and metal materials in the most physically demanding applications.

TYGOTHANE® PRECISION POLY- URETHANE TUBING

FORMULATION C-210-A

- Consistently tight dimensional tolerances
- Excellent abrasion and tear resistance
- Fuel and lubricant resistant
- Sub-zero temperature capabilities
- Meets FDA criteria

Our rigidly controlled manufacturing process makes Tygothane® Precision Polyurethane Tubing the flexible polyurethane tubing that has consistently tight tolerances from lot to lot. Precision tolerances and high elasticity provide the user with an easy, worry-free attachment to fittings. Made of a tough, ester-based polyurethane, Tygothane® Precision Polyurethane Tubing's clarity, high tear strength and excellent abrasion resistance make it ideal for many applications, including fuel and lubricant lines, pneumatic lines, abrasive product transfer and cable jacketing. It also offers exceptional resistance to oils, greases, fuels and many chemicals.

Able to withstand rugged daily use, Tygothane® Precision Polyurethane Tubing resists weathering and can be safely used in temperatures ranging from -100°F (-73°C) to 200°F (93°C). It meets FDA criteria for food and beverage use and is also available in ether-based, medical grade and reinforced formulations.



TYGOTHANE® PRECISION POLYURETHANE PRESSURE TUBING

FORMULATION C-544-A I.B.

- Abrasion and tear resistant
- Braid reinforcement for elevated working pressures
- Resistant to oils, greases and fuels
- Flexible even in sub-zero temperatures
- Meets FDA criteria for food contact
- Meets NSF 61 criteria for potable water contact*

More flexible than many other reinforced urethane tubings, Tygothane® Pressure Tubing can be used in the most physically demanding applications, such as those requiring a tight bend radius. Specially formulated from tough, ether-based polyurethane resin, Tygothane® tubing is resistant to a range of chemicals, including oils, greases, solvents and chemicals.

Because of its excellent wear properties, Tygothane® frequently outperforms traditional rubber, plastic and metal materials when exposed to abrasive conditions. Tygothane® also is plasticizer-free, and remains flexible even when cycled through temperature extremes.

*NSF has length restriction, determined by tubing size, for NSF 61 applications.





For extended service in a wide variety of applications, Norprene® Industrial Grade Tubing outlasts virtually all multi-service rubber tubings.



Designed for safe and efficient handling of most petroleum-based products, Tygon® Fuel and Lubricant Tubing resists embrittlement, cracking and swelling.

NORPRENE® INDUSTRIAL GRADE TUBING

FORMULATION A-60-G

- Superior weathering
- Abrasion resistant
- Outstanding flexural fatigue resistance
- Wide temperature range
- Low gas permeability versus rubber tubing

Norprene® Industrial Grade Tubing outperforms neoprene, EPDM and other general-purpose tubings in test after test and application after application. It will not weaken or crack after years of exposure to heat and ozone.* This provides long service in a wide range of applications such as gasketing, abrasion-resistant sleeving and cable insulation. Performance formulated for on-the-job reliability, Norprene® handles temperatures from -75°F (-60°C) to 275°F (135°C), allowing the use of one material with a broad range of temperatures. It is heat sealable and can be joined without fittings. It also has excellent resistance to inorganic (acids and bases) fluids.

With its outstanding flexural fatigue resistance and high temperature capability, Norprene® Industrial Grade Tubing outlasts and outperforms virtually all other general service tubings in peristaltic and vacuum pump applications.

*500 pphm



TYGON® FUEL AND LUBRICANT TUBING

FORMULATION F-4040-A

- Resists embrittlement
- Compatible with most petroleum-based products
- Resists swelling and cracking
- Ozone and UV light resistant

A consistent performer lot after lot, Tygon® Fuel and Lubricant Tubing is the most requested fuel and lubricant tubing for a variety of applications — from small engine fuel lines to coolant transfer. Specifically designed to handle most fuels and industrial lubricants, Tygon® Fuel and Lubricant Tubing resists the swelling and hardening caused by hydrocarbon-based fluids. This significantly reduces the risk of failure due to cracking and leakage. Its minimum extractability safeguards the liquid or vapor being transferred against adulteration.

Extremely flexible (Shore A, 57), Tygon® Fuel and Lubricant Tubing simplifies installation, even in tight places. It is translucent yellow for positive identification and to allow easy flow monitoring. It is routinely used to handle gasoline, kerosene, heating oils, cutting compounds and glycol-based coolants.





Tygon® UV Resistant Tubing protects light-sensitive fluids while resisting degradation from ozone and ultraviolet light.



Resistant to corrosive chemicals and solvents, Fluran® Severe Environment Tubing is designed to handle the most aggressive solutions at temperatures as high as 400°F.

TYGON® UV RESISTANT TUBING

FORMULATION R-3400

- *Black in color, protects light-sensitive fluids*
- *Wide range of chemical resistance*
- *Ozone resistant*
- *Excellent burn resistance*

Ideal for virtually any permanent or temporary chemical transfer application, Tygon® UV Resistant Tubing combines suppleness and flexibility with resistance to a wide range of chemicals. It shows exceptional resistance to strong acids and many alkalis. The flexibility of Tygon® UV Resistant Tubing makes it quick and easy to put into service, providing considerable savings on installation time and cost. Black in color, it is resistant to ultraviolet light, ozone and weathering, making it ideal for many outdoor applications. Standard inventoried sizes of Tygon® UV Resistant Tubing have sufficient wall thickness to block transmission of all UV light.

In-house testing also indicates a UL 94V-O and UL 94HB flammability rating.



FLURAN® SEVERE ENVIRONMENT TUBING

FORMULATION F-5500-A

- *Provides continuous service at temperatures up to 400°F (204°C)*
- *Excellent resistance to corrosive chemicals, oils, fuels and solvents*
- *Resists ozone, sunlight and weathering*
- *Opaque black color helps protect light sensitive fluids*

Made of a proprietary fluoroelastomer, Fluran® Severe Environment Tubing has both the physical and chemical characteristics that make it ideal for severe environments, such as dry cleaning fluid lines and solvent recovery systems, where other flexible tubings fail. Fluran® Severe Environment Tubing can be used in continuous service with temperatures as high as 400°F (204°C) and has excellent resistance to corrosive chemicals, oils, fuels, solvents and most mineral acids.

This opaque, black tubing helps protect light-sensitive materials being transferred and will not prematurely crack and age when exposed to ozone, sun and weather. It is highly flexible and resilient, making it the ideal choice in peristaltic pumping of extremely corrosive materials. A food grade formulation is available on request.





Chemically resistant and non-contaminating, Tygon® Inert Tubing provides the outstanding clarity and flexibility of Tygon® tubing, combined with the inertness of a fluoropolymer.



Chemfluor® tubings are made using fluoropolymers under strictly controlled processing conditions

TYGON® INERT TUBING

FORMULATION SE-200

- Crystal clear for easy visual flow monitoring
- Better flexibility than typical rigid fluoropolymer tubings
- Chemically resistant and inert
- Non-contaminating fluid path
- Meets FDA criteria

Without sacrificing the flexibility, glass-like clarity or outstanding bend radius for which Tygon® tubing is known, Tygon® Inert Tubing can handle many applications where flexible tubing of the past could not be used. Its FEP inner liner provides the ultimate in chemical resistance and can handle a wide variety of fluids from corrosives to MEK-based solvents. The liner is inert, meaning it will not extract or contaminate fluids being transferred. The fluid path will not impart odor or taste, making it well-suited for food and beverage use. It meets FDA criteria for food and beverage applications.

Tygon® Inert Tubing combines all the benefits of Tygon® with the inertness of a fluoropolymer, providing superior performance in many applications and industries.



CHEMFLUOR® TUBING

FEP, PFA, PTFE

- Ultra-pure
- Non-toxic
- Chemically inert
- Wide temperature capabilities
- Meets FDA criteria
- FEP and PFA meet USP Class VI criteria

Chemfluor® fluoropolymer tubings have outstanding chemical and physical properties and can be used in a broad range of temperatures, from -400°F to 500°F, depending on the polymer type. Chemfluor® tubings are available in a variety of different polymer types including FEP, PFA and PTFE. The primary differences among them are use temperature, clarity and mechanical strength, while several chemical and physical properties are common to all.

Chemfluor® tubings are manufactured from resins that meet FDA criteria. No plasticizers, stabilizers or fillers are used, so they are pure and non-contaminating. Unlike metal and rubber alternatives, Chemfluor® tubings are non-corroding and non-oxidizing. Unlike other plastic materials, they are unaffected by solvents, acids and fuels.

Chemfluor® FEP and PFA tubings fully comply with the requirements of USP Class VI criteria and are non-toxic, non-hemolytic and non-pyrogenic.



TYGON®

Custom Products



Custom Services

- Profiles
- Special Lengths
- Multi-Layer Products
- Barrier Tubing
- Antimicrobial Liner
- Custom Colors
- Custom Layline

Excellence...

We strive for it everyday – just like we have been doing for more than 60 years.

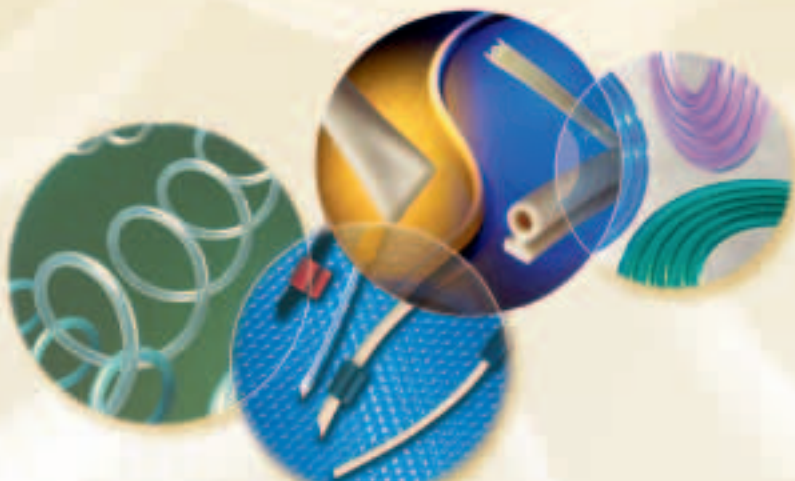
As a world leader in engineered plastics design, and the world's largest processor of advanced polymers, Saint-Gobain Performance Plastics is where industry-leading companies turn for products that deliver performance, quality and innovation.

Saint-Gobain Performance Plastics works closely with leading raw material suppliers to capitalize on the latest polymer innovations and developmental grades of new materials. Because of this, we can develop innovative new products customized to meet specific user needs.

Products can be manufactured in a wide variety of materials, in different sizes and colors or with specified tolerances. We can extrude profiles, antimicrobial tubing, conductive tubing and multi-layer tubing (to improve taste barrier or chemical/ permeation resistance), and also provide coiling and heat sealed ends. We can also meet special packaging requirements, including custom branding on our products.

The following pages describe some of the specific custom products and services we offer.

Contact customer service at (800) 798-1554 to obtain quotations on any of our custom tubing products.



VENDFLOW® TASTE BARRIER TUBING

FORMULATION E-70-V-CE

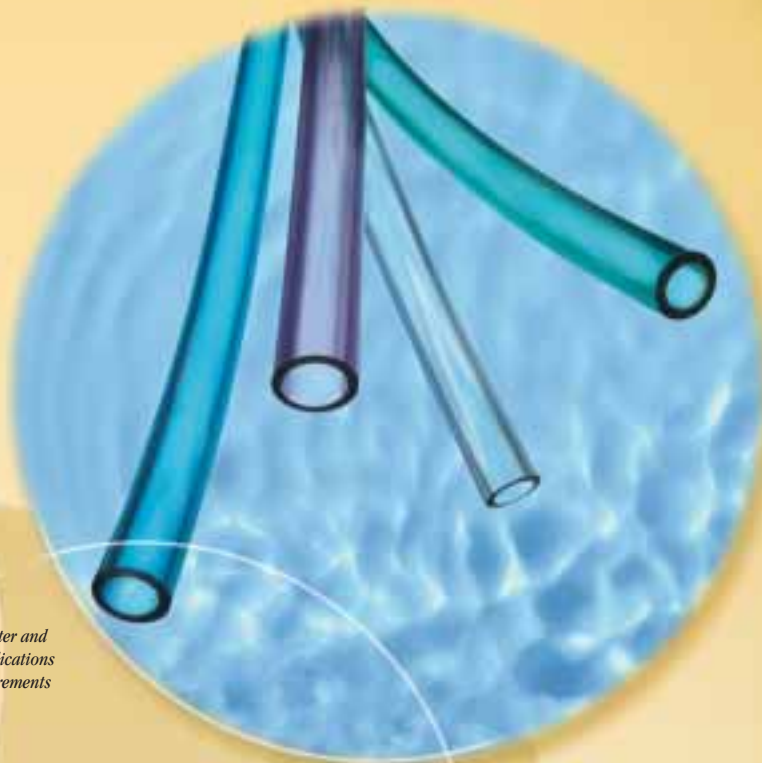
- Plasticizer-free fluid pathway
- Hydrophobic inner surface reduces taste transfer
- Extremely low absorption rate
- Smooth inner surface
- Meets FDA requirements for food contact

Specially formulated to transfer water and beverages, Vendflow® E-70-V-CE will not impart any “plastic” taste, as is sometimes found with other tubing. Its exceptional flexibility allows for tight bends and easy installation. Vendflow® E-70-V-CE can be produced in a variety of hardnesses, colors, sizes and lengths to match user requirements.

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Specially made for water and beverage transfer applications with strict taste requirements



TYGON® PARATUBING

- Available in a wide variety of sizes and durometers
- Can be color-coded with surface inking, in the wall stripe or colored tube
- Heat sealed to allow separation of tubes if necessary

Tygon® Paratubing speeds and simplifies complicated piping jobs by utilizing the electrical “wiring harness” concept in fluid and gas transmission. Fabricated to meet the specific needs of the user, Tygon® Paratubing consists of two or more lengths of Tygon® tubing joined side-by-side. Individual tubes can be of the same or different diameters, and they can be of the same or different formulations. Individual tubes can be easily separated and cut to accommodate varying fitting locations. Tygon® Paratubing can be color-coded to include any combination of desired colors to meet the needs of each individual application.



Available in a nearly infinite range of combinations and configurations

New TYGON® LP 100

**ABOVE DECK AND SMALL ENGINE
LOW PERMEATION FUEL LINE**

- Above deck ratings for the marine industry
- Meets upcoming EPA standards
- SAE J1527 and ISO 8469 ratings
- UL94 V-0 (liner) and UL 94 HB (cover)

Tygon® LP 100 Above Deck and Small Engine Low Permeation Fuel Line is a specially formulated, multi-layer barrier tube, designed to reduce the permeation of fuels yet remain flexible at lower temperatures. With an excellent resistance to hydrocarbons, fuels, greases and oils, this product exceeds all current and proposed permeation standards.



*Specially designed to meet
upcoming EPA standards*



NORPRENE® BARRIER TUBING

- Plasticizer-free bore
- Long flex life in peristaltic pumps
- Excellent chemical resistance
- Available in both food grade and industrial grade

Norprene® Barrier Tubing is a high performance co-extruded product specifically formulated for use in applications where extractables are a concern. Its inert plasticizer-free bore is taste-free and ultra-smooth for improved flushability. Norprene® Barrier Tubing is available in various durometers to meet the needs of your pump application, has excellent chemical resistance to harsh chemicals, and is available in both food grade and industrial grade.



*Provides outstanding chemical
resistance and long flex life*

Custom Products

AUTOANALYZER TUBING

- *Broad selection of formulations to meet specific needs*
- *Technical assistance available to assist in tubing formulation and configuration choices*

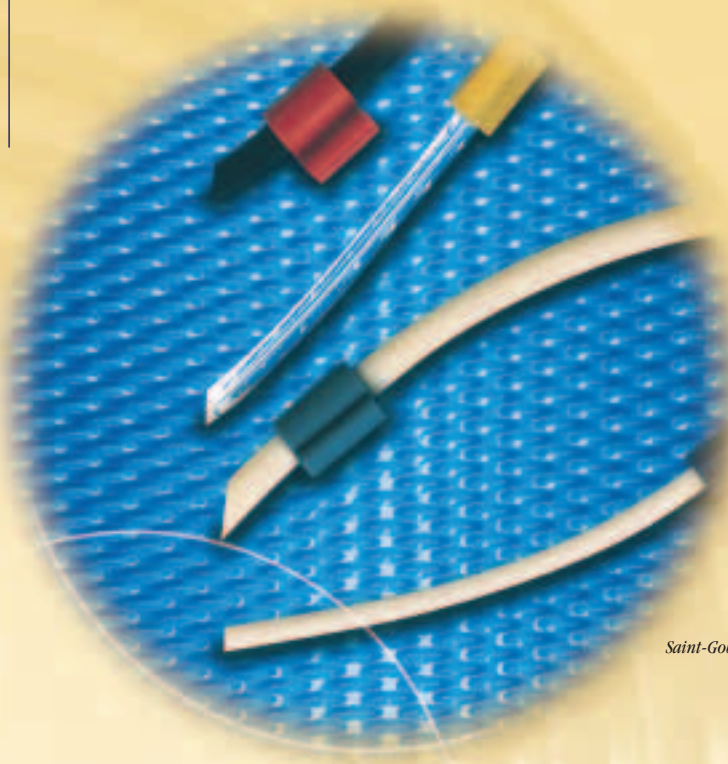
Major autoanalyzer equipment and micro-pump manufacturers rely on Saint-Gobain's knowledge of polymers and extensive experience with the specific demands required of peristaltic pump tubing. To assure optimum tubing formulation and configuration choices are made, Saint-Gobain can provide technical assistance in the early stages of development. Choices can be tailored to your own specifications or selected from hundreds of current formulations.



Saint-Gobain leads the way in Autoanalyzer Tubing



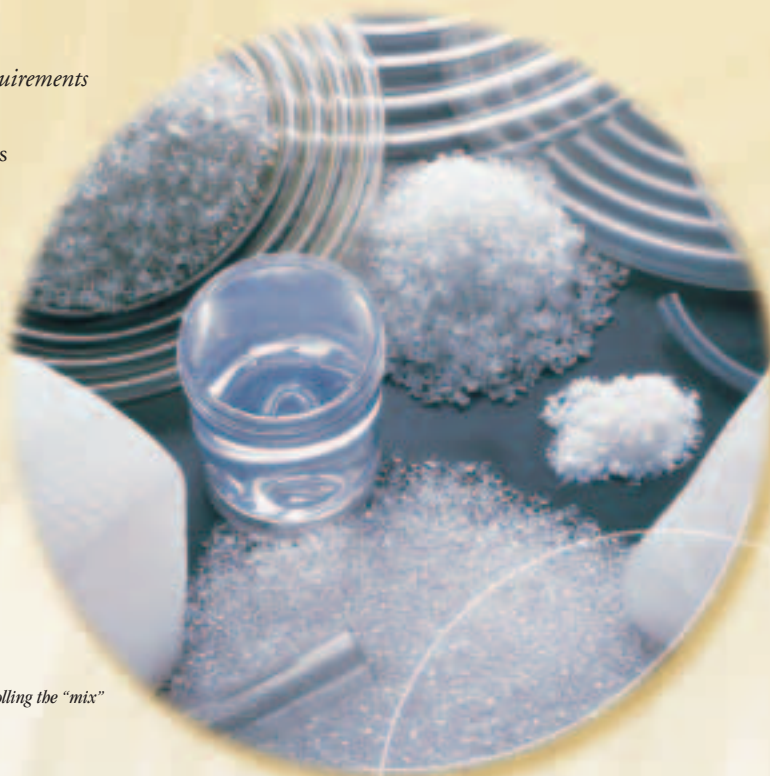
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CUSTOM TUBING FORMULATIONS

- *Over 1,000 formulations currently available*
- *Durometer ranges from Shore A38 to Shore D72*
- *Custom compounds can be formulated to match user requirements*

Saint-Gobain Performance Plastics' commitment to materials research and development continually provides innovative solutions to the challenges of today's applications. Saint-Gobain Performance Plastics compounds its own materials to specific formulation requirements using select ingredients which have been carefully qualified and specified. Final product inspection can include burst testing, flow rate testing or measurement of other key performance characteristics in Saint-Gobain Performance Plastics' own testing laboratory.



Quality begins with controlling the "mix"



KEY

E Excellent
G Good
F Fair
X Not Recommended

Environment, % Conc.*
w-Water alc-Alcohol

Table with 27 columns for different Tygon and Versilic material grades, such as Tygon® B-44-3, Tygon® B-44-4X, Tygon® B-44-4X I.B., Tygon® Silver, Norprene® A-60-F, etc.

Main table with 28 columns (materials) and 100 rows (chemicals). Each cell contains a letter (E, G, F, X) indicating compatibility. Chemicals listed include Calcium Nitrate, Calcium Salts, Carbon Dioxide, Chloroform, Acetic Acid, and many others.

* If concentration is not indicated, assume 100% concentration or the maximum percent solubility in water.
NOTE: Concentrations of room temperature liquids are given in % volume. Concentrations of room temperature solids are given in % weight.

TYPICAL PHYSICAL PROPERTIES OF TYGON® & OTHER TUBINGS

Physical properties of a tubing produced from a specific compound will vary depending on its diameter and wall thickness. The following typical physical properties are average values as measured using test methods of the American Society for Testing and Materials. Unless otherwise noted, all tests were conducted at room temperature (73°F). Values shown were determined on 0.075" thick extruded strip or 0.075" thick molded ASTM plaques or molded ASTM durometer buttons.

IMPORTANT: It is the user's responsibility to ensure the suitability and safety of Saint-Gobain Performance Plastics tubing for all intended uses, including establishing the compatibility of any fluid with the tubing through which it is transmitted. Laboratory, field or clinical tests must be conducted in accordance with applicable requirements in order to determine the safety and effectiveness for use of tubing in any particular application. If intended for medical use, it is the user's responsibility to ensure that the tubing to be used complies with all applicable medical regulatory requirements.

NOTE: The ratings in the charts DO NOT reflect the extent to which extraction may occur, or the extent to which fluids may undergo any physical changes in properties or composition, as a result of coming into contact with the tubing. Saint-Gobain Performance Plastics makes no representation or warranty with respect to the susceptibility of any fluid to become contaminated or undergo changes in properties or composition as a result of possible extraction of tubing ingredients by the fluid to be transmitted. Certain corrosives that would be destructive to tubing with prolonged exposure can be satisfactorily handled for short periods of time if flushed with water after use. All ratings are based on room temperature (73°F). Chemical resistance will be adversely affected by elevated temperatures.

	Durometer Hardness Shore A, 15s	Color	Maximum Recommended Operating Temp. °F (°C)	Tensile Strength psi (MPa)	Ultimate Elongation, %	Tensile Set,† %	Tear Resistance lb.-f/in. (kN/m)	Compression Set ** Constant Deflection, %	Brittle Temperature °F (°C)	Specific Gravity	Water Absorption, %
ASTM Method	D2240-03			D412-98	D412-98	D412-98	D1004-03	D395-03	D746-98	D792-00	D570-98
Tygon® B-44-3	63	Clear	165 (74)	2300 (15.8)	410	81	180 (32)	65	-49 (-45)	1.20	0.13
Tygon® B-44-4X	65	Clear	165 (74)	2100 (14.5)	450	78	200 (35)	62	-47 (-44)	1.21	0.15
Tygon® B-44-4X I.B.	65	Clear (between braid)	165 (74)	2100 (14.5)	450	78	200 (35)	62	-47 (-44)	1.21	0.15
Tygon® Silver	72	Silver	160 (71)	2300 (15.8)	240	65	190 (33.3)	71	-47 (-44)	1.20	<0.01
Norprene® A-60-F	61	Cream	275 (135)	1000 (6.9)	375	57	120 (21)	30	-75 (-60)	0.98	0.30
Norprene® A-60-F I.B.	61	Cream	275 (135)	1000 (6.9)	375	57	120 (21)	30	-75 (-60)	0.98	0.30
Tygotprene® XL-60	60	Translucent	250 (121)	1630 (11.2)	770	100	190 (33.3)	55	-87 (-66)	0.90	0.07
PharMed® BPT Tubing	64	Cream	275 (135)	1000 (6.9)	375	47	120 (21)	27	-75 (-60)	0.98	0.30
Tygon® R-3603	55	Clear	165 (74)	1650 (11.4)	450	107	125 (22)	61	-58 (-50)	1.18	0.24
Tygon®R-3603 Vacuum	55	Clear	165 (74)	1650 (11.4)	450	107	125 (22)	61	-58 (-50)	1.18	0.24
Tygon® R-1000	40	Clear	125 (52)	1200 (8.3)	375	73	52 (9)	57	-103 (-75)	1.12	0.30

* 1-second reading.

† 75% of ultimate elongation

** Test performed at 158°F (70°C) for 22 hours.

	Durometer Hardness Shore A, 15s	Color	Maximum Recommended Operating Temp. °F (°C)	Tensile Strength psi (MPa)	Ultimate Elongation, %	Tensile Set, %	Tear Resistance lb.-f/in. (kN/m)	Compression Set** Constant Deflection, %	Brittle Temperature °F (°C)	Specific Gravity	Water Absorption, %
ASTM Method	D2240-03			D412-98	D412-98	D412-98	D1004-03	D395-03	D746-98	D792-00	D570-98
Tygon® LFL	56	Clear	165 (74)	1550 (10.7)	380	44	122 (21)	64	-65 (-54)	1.16	0.18
Versilic® SPX-50	50	Translucent	350 (177)	1500 (10.3)	450	8	148 (26)	10	-112 (-80)	1.17	0.06
Versilic® SPX-70 I.B.	71	Translucent (between braid)	320 (160)	1200 (8.3)	300	10	130 (22.8)	10	-112 (-80)	1.20	0.08
Tygon® 3350	50*	Translucent	400 (204)	1450 (10.0)	770	13	200 (35)	7	-112 (-80)	1.14	0.11
Tygon® 3370 I.B.	70*	Translucent (between braid)	320 (160)	1200 (8.3)	500	25	250 (44)	3	-112 (-80)	1.18	0.11
Tygon® S-50-HL	66	Clear	165 (74)	2000 (13.8)	350	76	165 (28.9)	53	-55 (-48)	1.20	0.14
Tygon® S-54-HL	80	Clear	185 (85)	2700 (18.6)	320	33	305 (53)	34	-25 (-31)	1.24	0.11
Tygon® 2275	72	Clear	125 (52)	2000 (13.8)	700	187	220 (39)	84	-108 (-78)	0.90	<0.01
Tygon® 2275 I.B.	72	Clear (between braid)	125 (52)	2000 (13.8)	700	187	220 (39)	84	-108 (-78)	0.90	<0.01
Tygon® 2075	72	Clear	125 (52)	2000 (13.8)	700	187	220 (39)	84	-108 (-78)	0.90	<0.01
Tygon® 2001	69	Clear	135 (57)	800 (5.51)	500	110	140 (24.5)	40	-108 (-78)	0.88	0.04
Tygothane® C-210-A	82*	Transparent	200 (93)	6050 (41.7)	500	98	475 (83.1)	68	-100 (-73)	1.20	1.12
Tygothane® C-544-A I.B.	85*	Clear (between braid)	180 (82)	5000 (34.5)	400	45	350 (61.3)	19	-100 (-73)	1.12	1.80
Norprene® A-60-G	61	Black	275 (135)	1000 (6.9)	375	47	120 (21)	30	-75 (-60)	0.98	0.30
Tygon® F-4040-A	57	Translucent Yellow	165 (74)	1820 (12.5)	310	50	167 (29)	65	-35 (-37)	1.26	0.49
Tygon® R-3400	64	Black	165 (74)	2250 (15.5)	350	56	185 (32)	64	-6 (-21)	1.31	0.19
Fluran® F-5500-A	60*	Black	400 (204)	1400 (9.3)	300	13	100 (17.5)	37	-60 (-51)	1.90	0.23
Tygon® SE-200	67***	Clear	170 (77)	2000 (13.8)	350	76	165 (29)	53	-40 (-40)	1.45	<0.01
Chemfluor® FEP	55D*	Translucent	400 (204)	2600 (17.9)	275	N.A.	N.A.	N.A.	-100 (-73)	2.17	<0.01
Chemfluor® PFA	60D*	Translucent	500 (260)	2500 (17.2)	300	N.A.	N.A.	N.A.	-320 (-196)	2.17	<0.03
Chemfluor® PTFE	58D*	Translucent	500 (260)	2650 (18.3)	250	N.A.	N.A.	N.A.	-450 (-268)	2.18	<0.01

* 1-second reading.

** Test performed at 158°F (70°C) for 22 hours.

*** Durometer measured on outer jacket.

† at 75% of ultimate elongation



SUGGESTED MAXIMUM WORKING PRESSURES FOR TYGON® & OTHER TUBINGS

The maximum working pressure of Tygon® tubing varies with the different formulations. In addition, working pressure is affected by temperature, size and wall thickness, time and material transmitted as explained below:

■ TEMPERATURE

Since Tygon® tubing is produced from a variety of polymers, elastomers and rubbers, temperature should be considered in the selection of a Tygon® formulation for an end-use application. As a rule, tubing will stiffen as ambient temperature is reduced from standard room temperature (73°F/23°C). At higher temperatures, the tubing will become more flexible and physical properties such as tensile strength will become lower.

■ SIZE AND WALL THICKNESS

Working pressure increases as the wall thickness increases relative to the bore size.

■ TIME

If pressure exceeding the maximum suggested working pressure is maintained over a period of time, the tubing will gradually swell and eventually rupture.

■ MATERIAL TRANSMITTED

Even materials such as solvents that attack Tygon® tubing can be handled over short periods of time. However, prolonged exposure tends to cause swelling, loss of normal tensile strength and reduced pressure resistance.

IMPORTANT: It is the user's responsibility to ensure the suitability and safety of Saint-Gobain Performance Plastics tubing for all intended uses, including establishing the compatibility of any fluid with the tubing through which it is transmitted. Laboratory, field or clinical tests must be conducted in accordance with applicable requirements in order to determine the safety and effectiveness for use of tubing in any particular application. If intended for medical use, it is the user's responsibility to ensure that the tubing to be used complies with all applicable medical regulatory requirements.

NOTE: The ratings in the charts DO NOT reflect the extent to which extraction may occur, or the extent to which fluids may undergo any physical changes in properties or composition, as a result of coming into contact with the tubing. Saint-Gobain Performance Plastics makes no representation or warranty with respect to the susceptibility of any fluid to become contaminated or undergo changes in properties or composition as a result of possible extraction of tubing ingredients by the fluid to be transmitted. Certain corrosives that would be destructive to tubing with prolonged exposure can be satisfactorily handled for short periods of time if flushed with water after use. All ratings are based on room temperature (73°F). Chemical resistance will be adversely affected by elevated temperatures.

SIZE LISTINGS OF INVENTORIED TUBING

MICROBORE	Inside Diameter (inches)	Outside Diameter (inches)	Wall Thickness (inches)	Tygon® 227/5 I.B.		Tygon® 2075		Tygon® 2001	Tygothane® C-210-A	Tygothane® C-544-A I.B.		Norprene® A-60-G	Tygon® F-40/40-A	Tygon® R-3/400	Fluran® F-5500-A	Tygon® SE-200	Chemfluor® FEP	Chemfluor® PFA	Chemfluor® PTFE
				10'	25'	50'	25'	50'	50'	100'	50'	100'	50'	50'	50'	50'	50'	50'	50'
.020	.145	.062																	
1/32	3/32	1/32																	
1/16	5/32	1/16																	
	1/8	1/32						*						*				*	*
.080	3/16	1/16					*	*				*		*		*	*	*	*
	5/32	1/32											*	*		*	*	*	*
3/32	3/16	3/64											*	*		*	*	*	*
	7/32	1/16											*	*		*	*	*	*
1/8	3/16	1/32											*	*		*	*	*	*
	1/4	1/16					*	*				*	*	*		*	*	*	*
5/32	3/8	1/8									*	▲	*	*		*	*	*	*
	7/32	1/32											*	*		*	*	*	*
3/16	1/4	3/64											*	*		*	*	*	*
	9/32	1/16											*	*		*	*	*	*
1/4	5/16	1/32					*	*				*	*	*		*	*	*	*
	3/8	1/16					*	*				*	*	*		*	*	*	*
	7/16	3/32					*	*				*	*	*		*	*	*	*
5/16	1/2	1/8				*	*	*				*	*	*		*	*	*	*
	9/16	1/8										*	*	*		*	*	*	*
	5/8	1/8										*	*	*		*	*	*	*
3/8	1/2	1/16					*	*				*	*	*		*	*	*	*
	5/8	3/32					*	*				*	*	*		*	*	*	*
7/16	1	1/8				*	*	*				*	*	*		*	*	*	*
	9/16	1/16										*	*	*		*	*	*	*
	5/8	3/32					*	*				*	*	*		*	*	*	*
	11/16	1/8					*	*				*	*	*		*	*	*	*
1/2	5/8	1/16					*	*				*	*	*		*	*	*	*
	11/16	3/32					*	*				*	*	*		*	*	*	*
9/16	3/4	1/8				*	*	*				*	*	*		*	*	*	*
	13/16	5/32										*	*	*		*	*	*	*
	1	1/8					*	*				*	*	*		*	*	*	*
5/8	3/4	1/16					*	*				*	*	*		*	*	*	*
	13/16	3/32					*	*				*	*	*		*	*	*	*
11/16	7/8	1/8				*	*	*				*	*	*		*	*	*	*
	1	1/8					*	*				*	*	*		*	*	*	*
3/4	1	3/8					*	*				*	*	*		*	*	*	*
	7/8	1/16					*	*				*	*	*		*	*	*	*
1	1-1/16	5/32				*	*	*				*	*	*		*	*	*	*
	1-1/8	3/16										*	*	*		*	*	*	*
	1-1/4	1/4					*	*				*	*	*		*	*	*	*
7/8	1-1/2	3/8					*	*				*	*	*		*	*	*	*
	1	1/16					*	*				*	*	*		*	*	*	*
1-1/8	1-1/8	1/8					*	*				*	*	*		*	*	*	*
	1-3/16	5/32					*	*				*	*	*		*	*	*	*
	1-1/8	1/16					*	*				*	*	*		*	*	*	*
1-1/4	1-1/4	1/8					*	*				*	*	*		*	*	*	*
	1-5/8	3/16				*	*	*				*	*	*		*	*	*	*
1-1/2	1.636	.1930					*	*				*	*	*		*	*	*	*
	1-3/4	1/4					*	*				*	*	*		*	*	*	*
1-3/4	1-7/8	3/16					*	*				*	*	*		*	*	*	*
	1.900	.2000				*	*	*				*	*	*		*	*	*	*
2	2	1/4					*	*				*	*	*		*	*	*	*
	2-1/4	1/4					*	*				*	*	*		*	*	*	*
2-1/2	2-1/2	1/4					*	*				*	*	*		*	*	*	*
	2-3/4	3/8					*	*				*	*	*		*	*	*	*
	3	1/2					*	*				*	*	*		*	*	*	*
3	3	1/4					*	*				*	*	*		*	*	*	*
	3-1/4	3/8					*	*				*	*	*		*	*	*	*
4	4	1/2					*	*				*	*	*		*	*	*	*
	5	1/2					*	*				*	*	*		*	*	*	*
6	6-1/2	1/4					*	*				*	*	*		*	*	*	*
	.010	.030																	
.020	.060																		
.030	.090																		
.040	.070																		
.050	.090																		

* Indicates standard off-the-shelf items. ▲ Sizes for vacuum applications; standard off-the shelf item.
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STORAGE, CLEANING & STERILIZATION PROCEDURES

■ STORAGE

Storing Tygon® tubing is simple and presents no unusual problems. Whenever possible, it is desirable to store the tubing in a carton or box to eliminate or minimize its collecting dust. It is a good idea to dry store the tubing after cleaning, with ends open to permit thorough drying. If it is impossible to store Tygon® tubing in cartons, place it loosely coiled or laid out straight on a clean dry shelf, free from contact with painted surfaces, rubber, oils and greases. In any case, avoid kinking by not hanging the tubing over a nail or sharp edge.

■ CLEANING

Generally, cleaning Tygon® tubing is as simple as the flushing of the bore with soap and water, followed by a clear water rinse. Its low surface tension facilitates complete drainage. In addition, Tygon® tubing will withstand virtually all commercial cleaning agents and bactericides without danger of corrosion (as with metals) or oxidation (as with rubber). When using these preparations, do not increase the temperature or the concentration of the solution beyond that recommended by the manufacturer. If the tubing shows excessive swelling during cleaning, reduce pressure and temperature. Contact with paint, rubber, oils, greases, hand creams and perspiration, or prolonged exposure to strong sunlight will also affect clarity. Certain strong sanitizing agents, such as those containing iodine or bromine, also have a tendency to cause some staining. However, these are surface discolorations and in no way affect the performance or life of the tubing. After exposure to moisture, a slight cloudiness will be noted. This is simply a surface film of moisture, and clarity will return shortly if the tubing is allowed to dry and air thoroughly.

■ STERILIZATION

Listed to the right are commonly used methods of sterilization and tubing compatibility. It is required that the user conduct tests using the conditions of the application prior to specifying a particular tubing formulation.

Tubing Formulations	STERILIZATION METHODS		
	Autoclavable ⁽¹⁾	Gas ⁽²⁾	Radiation ⁽³⁾
Tygon® B-44-3	Yes	Yes	No
Tygon® B-44-4X	Yes	Yes	No
Tygon® B-44-4X I.B.	No	Yes	No
Tygon® Silver	No	Yes	No
Norprene® A-60-F	Yes	Yes	Yes
Norprene® A-60-F I.B.	Yes	Yes	Yes
Tygotprene® XL-60	Yes	Yes	Yes
PharMed® BPT Tubing	Yes	Yes	Yes
Tygon® R-3603	Yes	Yes	No
Tygon® R-3603 Vacuum	Yes	Yes	No
Tygon® R-1000	No	Yes	No
Tygon® LFL	Yes	Yes	No
Versilic® SPX-50	Yes	Yes	Yes
Versilic® SPX-70 I.B.	Yes	Yes	Yes
Tygon® 3350	Yes	Yes	Yes
Tygon® 3370 I.B.	Yes	Yes	Yes
Tygon® S-50-HL	Yes	Yes	Yes
Tygon® S-54-HL	Yes	Yes	Yes
Tygon® 2275	Yes	Yes	Yes
Tygon® 2275 I.B.	Yes	Yes	Yes
Tygon® 2075	Yes	Yes	Yes
Tygon® 2001	Yes	Yes	Yes
Tygothane® C-210-A	N.A.	N.A.	N.A.
Tygothane® C-544-A I.B.	N.A.	N.A.	N.A.
Norprene® A-60-G	N.A.	N.A.	N.A.
Tygon® F-4040-A	N.A.	N.A.	N.A.
Tygon® R-3400	N.A.	N.A.	N.A.
Fluran® F-5500-A	N.A.	N.A.	N.A.
Tygon® SE-200	No	Yes	No
Chemfluor® FEP	Yes	Yes	No
Chemfluor® PFA	Yes	Yes	No
Chemfluor® PTFE	Yes	Yes	No

⁽¹⁾ Steam 30 minutes at 15 psi (250°F [121°C]) ⁽²⁾ Ethylene oxide ⁽³⁾ Radiation up to 2.5 MRad.

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