

Nalgene Tubing Selection Guide

Physical Properties		Nalgene Tubing Product Type								
		180	980 Braided	890	870	50/65	Pharma-Grade ^[1]	280	489	689
		PVC	PVC, Reinforced	FEP	PFA	Silicone, PI cured	Silicone, PI cured	PUR, Ester	LLDPE	PP
Material		Tygon® R-3603	Tygon® B-44-4 X LB.							
Equivalence										
Regulatory Compliance ^[1]		Food-Grade USP VI	Food-grade	Food-grade	Food-grade	Food-grade Non-cytotoxic Non-hemolytic USP VI	USP <87> USP <88> ISO 10993-3 ISO 10993-4 non-hemolytic EP 3.1.9 USP <661> Non-cytotoxic		Food-grade	Food-grade
Durometer (Shore)	ASTM D2540	60(A)	65(A)	58(D)	60(D)	50(A)65(A)	50(A)	85(A)	50(D)	75(D)
Specific Gravity	ASTM D792	1.19	1.20	2.17	2.15	1.15	1.15	1.18	0.92	0.90
Operating Temp Range (°F)	ASTM D789	-25 to 160	-5 to 180	-103 to 400	-454 to 500	-80 to 450	-80 to 450	-70 to 185	-100 to 175	25 to 250
Operating Temp Range (°C)	ASTM D2117 D794	-32 to 71	-21 to 82	-270 to 205	-270 to 260	-62 to 232	-62 to 232	-56 to 85	-73 to 79	-4 to 121
Vacuum		Very Low ^[2]	No Vac.	Full Vac.	Full Vac.	No Vac.	No Vac.	Very Low	Full Vac.	Full Vac.
Sterilization ^[3]		Autoclave Gas Chemical	Autoclave Gas Chemical	Autoclave Gas Chemical	Autoclave Gas Chemical	Autoclave Gas Chemical Radiation	Autoclave Gas Chemical Radiation	Autoclave Gas Chemical Radiation	Autoclave Gas Chemical	Autoclave
Tensile Strength, psi	ASTM D638 D412	1650	2000	3000	3000	1250	1250	6000	1700	3700
Color		Crystal Clear	Clear	Transparent	Transparent	Translucent	Translucent	Transparent	Translucent	Translucent
Odor		Slight	Slight	None	None	None	None	Slight	Slight	None
Taste Imparted		None	None	None	None	None	None	None	None	None
Tear Strength		Good	Very Good	Good	Good	Fair	Fair	Excellent	Very Good	Excellent
Bend Radius		4 x O.D.	6 x O.D.	8 x O.D.	10 x O.D.	4 x O.D.	4 x O.D.	6 x O.D.	8 x O.D.	10 x O.D.
Elongation (%)	ASTM D638 D412	450	350	300	300	750	750	550	600	200
Flame Resistance	ASTM D668	Self-ext.	Self-ext.	Self-ext.	Self-ext.	Burns	Burns	Burns	Slow Burn	Slow Burn
Abrasion Resistance		Very Good	Good	Very Good	Very Good	Fair	Fair	Excellent	Good	Excellent
Corrosion Resistance		Excellent	Excellent	Excellent	Excellent	Good	Good	Excellent	Excellent	Excellent
Permeability ^[4]		0.5 - 2	0.5 - 2	20	18	2,765	2,765	0.3 - 5	20	425
N ₂		1 - 6	1 - 6	60	65	7,960	7,960	1 - 10	60	25
O ₂		10 - 35	10 - 35	135	150	20,130	20,130	4 - 25	280	90
CO ₂										

Chemical Resistance ^{[5][6]}		Nalgene Tubing Product Type								
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Acids - Weak		E	E	E	E	E	E	F	E	E
Acids - Strong		F	F	E	E	G	G	N	E	E
Alcohol - Aliphatic		G	G	E	E	G	G	N	E	E
Aldehydes		N	N	E	E	N	N	F	G	G
Bases - Weak		E	E	E	E	E	E	G	E	E
Bases - Strong		G	G	E	E	G	G	F	G	G
Esters		N	N	E	E	F	F	N	G	G
Hydrocarbons - Aliphatic		F	F	E	E	N	N	E	F	G
Hydrocarbons Aromatic		N	N	E	E	N	N	N	F	F
Hydrocarbons -Halogenated		N	N	E	E	N	N	N	N	F
Ketones		N	N	E	E	N	N	N	G	G
Oxidizing Agents - Strong		F	F	E	E	G	G	N	F	F

Recommended Applications		Nalgene Tubing Product Type								
		180	980 Braided	890	870	50/65	Pharma-Grade ^[1]	280	489	689
Dairy		X							X	
Food & Beverage		X				X			X	X
Machinery			X					X		
Dental ^[7]		X	X							
Office Machines/Computers			X	X	X			X		
Refrigeration			X	X	X				X	
Transportation			X					X		
Environmental		X		X	X	X				
Instrumentation		X	X					X	X	X
Biotech/Pharmaceutical ^[7]		X		X	X	X	X			
Peristaltic Pumps		X				X	X			

Dimensional Tolerances (Inches)		Nalgene Tubing Product Type								
		180	980 Braided	890	870	50/65	Pharma-Grade ^[1]	280	489	689
Diameter	1/16 and under 1/8	.003		.003	.003	.005	.005	.005	.007	.007
	1/8 and under 5/16	.008	.012	.003	.003	.005	.005	.009	.007	.007
	5/16 and under 1/2	.010	.012	.004	.004	.008	.008	.012	.007	.007
	1/2 and under 3/4	.010	.015	.005	.005	.015	.015	.018	.010	.010
	3/4 and under 1-1/8	.015	.015			.020	.020	.025	.015	.015
	1-1/8 and under 1-3/4	.020	.020					.035	.020	.020
	1-3/4 and under 2-1/2	.031	.031						.035	.035
Wall Thickness	0 to 1/16	.003		.003	.003	.005	.005	.005	.006	.006
	1/16 to 1/8	.003		.003	.003	.005	.005	.006	.008	.008
	1/8 to 1/4	.005						.009		
	1/4 to 3/8	.010								
	3/8 to 1/2	.015								

Dimensional Tolerances (Metric)		Nalgene Tubing Product Type								
		180	980 Braided	890	870	50/65	Pharma-Grade ^[1]	280	489	689
Diameter	1.6 and under 3.2	.08		.08	.08	.13	.13	.13	.18	.18
	3.2 and under 7.9	.13	.32	.08	.08	.13	.13	.24	.18	.18
	7.9 and under 12.7	.20	.32	.10	.10	.21	.21	.32	.18	.18
	12.7 and under 19.1	.26	.39	.13	.13	.38	.38	.48	.26	.26
	19.1 and under 28.4	.39	.39			.50	.50	.65	.39	.39
	28.4 and under 44.5	.52	.52					.91	.52	.52
	44.5 and under 63.5	.79	.79						.91	.91
	63.5 and under 76.2	1.17								
	76.2 and under 101.6	1.58								
	Wall Thickness	0 to 1.6	.08		.08	.08	.13	.13	.13	.16
1.6 to 3.2		.13		.08	.08	.13	.13	.16	.20	.20
3.2 to 6.4		.20				.21	.21	.24		
6.4 to 9.5		.26								
9.5 to 12.7		.39								

Notes: Bural of tubing is not recommended. Tubing should be enclosed in a pipe. For detailed physical and/or chemical properties information, contact Technical Support by emailing TechnicalSupport@thermofisher.com. Tygon® is a registered trademark of Saint-Gobain Performance Plastics.

Footnotes:
 [1] Regulatory: Not intended for medical or medical device use. Nalgene 180 and 980 PVC Tubing contains DEHP (Bis(2-ethylhexyl)phthalate), a commonly used plasticizer. It is known to the state of California Environmental Protection Agency that this chemical causes cancer or reproductive toxicity. Warning: Cancer and Reproductive Harm - www.P65Warnings.ca.gov
 [2] Ethrel 180 PVC Reusable Tubing
 [3] Sterilization Guidelines:
 • Autoclaving (121°C, 15 psi for 20 minutes) - Clean and rinse item with distilled water before autoclaving. Certain chemicals that have no appreciable effect on items at room temperature may cause deterioration at autoclaving temperatures unless removed with distilled water beforehand.
 • Gas - ethylene oxide, formaldehyde,
 • Oxidation - benzoylperoxide, ethylene, formalin, ethanol, etc.
 • Dry Heat - 170°C (338°F)
 • Radiation - gamma irradiation at 2.5 Mrad with unstabilized plastic.
 [4] $\left(\frac{0.05 \text{ (mm)}}{1000} \right) \times 10^6$
 [5] Before using Nalgene tubing with a particular chemical, it is strongly advised that you test it under your own application conditions. If any doubt exists regarding a particular application, contact Technical Support by emailing TechnicalSupport@thermofisher.com
 [6] Chemical Resistance Code Key:
 E - 30 days of constant exposure causes no damage
 G - Little or no damage after 30 days of constant exposure to the reagent
 F - Some effect after 7 days of constant exposure to the reagent
 N - Not recommended for continuous use
 [7] Nalgene tubing is not a medical device as defined by Class VI criteria set forth in the current US Pharmacopeia
 [8] For additional details, specifications and claims for Nalgene Pharma-Grade Platinum-Cured Silicone Tubing, see Technical Data Sheet or contact TechnicalSupport@thermofisher.com.