

Nalgene™ Plastic Labware Chemical Resistance Reference Guide

Thermo Scientific™ Nalgene™ Labware Chemical Resistance Key

In the table at left, the first letter of each pair applies to conditions at 20°C and the second letter applies to conditions at 50°C. Example: 20°C → E G ← at 50°C

- E – No damage after 30 days of constant exposure
- F – Some effect after 7 days of constant exposure
- G – Little or no damage after 30 days of constant exposure
- N – Immediate damage may occur; not recommended for continuous use

Nalgene Labware Chemical Resistant Chart Key		Nalgene Labware Chemical Resistant Chart Key	
Abbreviation	Name	Abbreviation	Name
ETFE	Ethylene Tetrafluoroethylene	PP	Polypropylene
FEP	Fluorinated Ethylene Propylene	PC	Polyethylene Copolymer
FLPE	Fluorinated High Density Polyethylene	PS	Polystyrene
HDPE	High Density Polyethylene	PSF	Polysulfone
LDPE	Low Density Polyethylene	PUR	Thermoplastic Polyurethane
LLDPE	Linear Low Density Polyethylene	PVC	Polyvinyl Chloride
PC	Polycarbonate	ResMer™	ResMer™
PETG	Polyethylene terephthalate copolymer	SILI-g	Silicone - Gaskets
PFA	Perfluoroalkoxy	SILI-t	Silicone - Tubing
PMMA	Polymethylmethacrylate	TPE	Thermoplastic Elastomer
PMP	Polymethylpentene		

Interpretation of Chemical Resistance

The Chemical Resistance Chart on this poster is a general guide and pertains to Thermo Scientific Nalgene products only. Because so many factors can affect the chemical resistance of a given product, you should test under your own conditions. This chart is not intended for use with Nalgene centrifugeware or filterware. Chemical resistance information for Nalgene centrifugeware may be found at thermofisher.com/centrifugeware and chemical resistance information for Nalgene filtration may be found at thermofisher.com/filtration.

Effects of Chemicals on Plastics

Chemicals can affect the strength, flexibility, surface appearance, color, dimensions or weight of plastics. The basic modes of interaction which cause these changes are: (1) chemical attack on the polymer chain, with resultant reduction in physical properties, including oxidation; reaction of functional groups in or on the chain; and depolymerization; (2) physical change, including absorption of solvents, resulting in softening and swelling of the plastic; permeation of solvent through the plastic; dissolution in a solvent; and (3) stress cracking from the interaction of a "stress cracking agent" with internal or external stresses.

Mixing and/or dilution of certain chemicals can be potentially dangerous

The combination of different chemicals or compounds of two or more chemicals including water, may cause an undesirable or reactive chemical effect or increase temperature. This can affect chemical resistance (as temperature increases, resistance to attack decreases). Other factors affecting chemical resistance include pressure and internal or external stresses (e.g. centrifugation), length of exposure, and concentration of the chemical.

Environmental Stress Cracking

Environmental stress cracking is the failure of a plastic material in the presence of certain types of chemicals. This failure is not a result of chemical attack. Simultaneous presence of three factors causes stress cracking: mechanical stress, a stress cracking agent, and the inherent susceptibility of the plastic to stress cracking. Common stress cracking agents are detergents, surface active chemicals, lubricants, oils, ultra-pure water and plating additives such as brighteners and wetting agents. Relatively small concentrations of stress cracking agent may be sufficient to cause cracking.

Care and Precautions

Mixing and/or diluting of certain chemicals may result in reactions which produce heat, which can cause product failure. Pre-test your specific usage and always follow correct lab safety procedures.

Caution: Do not store strong oxidizing agents in plastic labware except that made of FEP or PFA. Prolonged exposure can cause the material to become brittle and fail. While prolonged storage may not be intended at time of filling, a forgotten container will fail in time and result in leakage of the contents.

Prior to each use, inspect plastic labware for signs of plastic aging including but not limited to cracking, crazing (spiderweb cracks), permanent discoloration, and embrittlement (loss of flexibility where it formerly existed). To avoid product failure during use, replace labware when signs of aging become evident.

To extend the usable life of your plastic labware, avoid prolonged exposure to UV light or direct sunlight, and wash with a pH neutral detergent like Nalgene L900 detergent. Repeated autoclaving will shorten the life of plastic labware.

Do not place any plastic labware into a flame.

Nalgene L900 Liquid Detergent

Thoroughly clean all plastic labware, especially polycarbonate, with Thermo Scientific™ Nalgene™ L900™ Liquid Detergent. This environmentally-friendly formula will not cause crazing, stress cracking or clouding of plastic when used as directed.



- For hand or machine use
- Low foaming
- Biodegradable
- Specially formulated for Nalgene plastic labware
- Non-toxic

Physical Properties

Plastics Physical Properties	Sterilization [4]										Permeability (cc-ml/100in ² 24 hr-atm)			Permeability (cc-ml/in ² 24 hr-Bar)			Water Absorption (g/100g)	Non-Cytotoxicity (9)	Suitability for Food and Drug Contact (10)	Regulation (11)					
	Max. Use Temp. (°C)	HOT Use Temp. (°C)	Brittleness Temp. (°C)	Clarity	Micro-weldability (7)	Autoclaving	EO Gas	Dry Heat	Radiation	Disinfectants	UV Light Resistance	Specific Gravity	Flexibility	N ₂	O ₂	CO ₂					N ₂	O ₂	CO ₂		
ETFE	150	104	-105	Translucent	None	Yes	Yes	Yes	Yes	Yes	Good	1.7	Rigid	30	100	250	11.66	38.86	97.14	0.03	Yes	Yes	177-1380		
PE	205	70	-270	Translucent	Marginal [3]	Yes	Yes	Yes	No	Yes	Good	2.15	Excellent	320	750	2200	124.34	291.41	854.82	<0.01	Yes	Yes	177-1550		
FLPE	120	65	-100	Translucent	No	No	No	Yes	Yes	Poor	0.95	Moderate	42	185	580	18.32	71.88	225.36	<0.01	Yes	Yes	177-1615			
HDPE	120	65	-100	Translucent	No	No	Yes	Yes	Yes	Poor	0.92	Moderate	42	185	580	18.32	71.88	225.36	<0.01	Yes	Yes	177-1520			
LDPE	80	40 to 54	-76	Translucent	No	No	Yes	Yes	Yes	Fair	0.92	Good	100	500	2700	69.94	194.28	1049.09	<0.01	Yes	Yes	177-1520			
PC	115 to 138	142	-135	Translucent	Marginal [3]	Yes [5]	Yes	No	Yes	Fair	1.20	Rigid	50	300	1075	114.63	417.69	1417.69	0.35	Yes	Yes	177-1580			
PETG	70	60 to 71	-40	Transparent	Marginal [3]	No	Yes	No	Yes	Some	Fair	1.27	Moderate	10	25	135	3.89	9.71	45.57	0.13	Yes	Yes	177-1315		
PFA	260	73	-270	Transparent	Yes	Yes	Yes	Yes	Yes	Fair	2.17	Excellent	291	882	2960	113.07	342.31	876.13	<0.02	Yes	No	--			
PFMA	50 to 65	84 to 101	20	Transparent	No	No	No	No	Yes	Some	Fair	1.19	Rigid	278	1235	6790	11.00	4.80	26.30	0.35	Yes	Yes	177-1010		
PMP	153 to 174	82 to 90	0 to 20	Transparent	Yes	Yes	Yes	Marginal	No	Yes	Fair	0.835	Rigid	8000	32000	115000	3108.42	12433.68	44683.33	0.01	Yes	Yes	177-1520		
PP	135	107	0	Translucent	Yes	Yes	Yes	Yes	Yes	Fair	0.9	Rigid	48	240	800	18.65	93.25	318.84	<0.02	Yes	Yes	177-1520			
PPD	121	90	-40	Translucent	Marginal [3]	Yes	Yes	No	Yes	Fair	0.9	Moderate	45	200	650	17.48	77.71	262.96	<0.02	Yes	Yes	177-1520			
PS	90	82 to 96	20	Transparent	No	No	Yes	Yes	Yes	Some	Fair	1.05	Rigid	20-25	300-400	1,000-1,500	7.8-9.7	116-155	388-582	0.05	Yes	Yes	177-1640		
PFS	141 to 174	174	-100	Transparent	Yes	Yes	Yes	Yes	Yes	Fair	1.24	Rigid	55	300	700	21.40	117	272	0.3	Yes	Yes	177-1655			
ResMer™	180 to 200	200 to 300	20	Opaque	Marginal [3]	Yes	Yes	No	Yes	Some	--	1.15 to 1.50	Rigid	--	--	--	--	--	--	--	0.01	--	--		
SILI-g	204	-46	-68	Transparent to Opaque	Yes	Yes	Yes	Yes	Yes	Yes	--	1.1	Moderate to Excellent	--	--	--	--	--	--	--	0.1	--	Yes [8]	177-2600	
TPE	121	-23	<-50	Transparent to Opaque	Yes	Yes	Yes	No	Yes	Some	--	0.9	Moderate to Excellent	31-145	85-646	900-8634	12.05-56	33.03-251	350-3355	0.05 to 0.1	Yes	Yes	177-2600		
Tubing:																									
SIL4	232	-46	-62	Translucent	Yes	Yes	Yes	Yes	Yes	Some	--	1.15	Excellent	46116	132762	335741	1918.49	51585	130453	0.1	Yes	Yes	177-2600		
5065	180	130	-32	-32	Transparent	Yes [14]	Yes [15]	Yes	No	No	Fair	1.19	Excellent	8.3-33	16.7-100	167-584	3.2-13	2.6-39	64.8-227	0.15 to 0.75	--	Yes [11]	176-1810 / 175-300		
PURS 280	85	32	-73	Transparent	None	No	No	Yes	No	Some	--	1.18	Moderate	50-85	16.7-167	66.7-417	1.9-32.4	6.5-65	26-162	1.12	--	No	--		
LLDPE 480	79	47	-73	Translucent	Marginal [3]	No	Yes	No	No	Some	Fair	0.92	Moderate	333.60	1000.70	4670.00	129.62	388.82	1814.54	<0.01	--	Yes [8]	177-1520		
PP 680	121	100	-4	Translucent	Yes	Yes	Yes	Yes	No	Some	Fair	0.9	Rigid	66.70	416.90	1501.10	25.62	161.99	583.26	<0.02	--	Yes	177-1520		
PFA 870	260	73	-270	Transparent	Marginal [3]	Yes	Yes	Yes	Yes	Fair	2.17	Excellent	300	1084	2501	116.64	421.23	972.08	<0.02	Yes	Yes	No	--		
FEP 880	205	70	-270	Transparent	Marginal [3]	Yes	Yes	Yes	Yes	Good	2.15	Excellent	320	750	2200	124.34	291.41	854.82	<0.01	Yes	Yes	Yes	177-1550		
PVC 880	82	-32	-21	Transparent	No	No	Yes	No	No	Some	Fair	1.2	Moderate	8.3-33	16.7-100	167-584	3.2-13	2.6-39	64.8-227	0.15 to 0.75	--	Yes [11]	176-1810 / 175-300		

Footnotes:

- Heat Deflection Temperature is the temperature at which an injection molded bar deflects 0.1" when placed under 66 psig (ASTM D648) of pressure. Materials may be used above Heat Deflection Temperatures in non-stress applications; see Max. Use Temp.
- Rated based on 5-minute tests using 600 watts of power on exposed, empty labware. CAUTION: Do not exceed Max. Use Temp., or expose labware to chemicals which heating causes to attack the plastic or be rapidly absorbed.
- The plastic will absorb and retain significant amounts of heat resulting in an unexpectedly hot surface.
- STERILIZATION:**
 - Autoclaving (121°C, 15 psig for 20 minutes) – Clean and rinse items with distilled before autoclaving. (Always completely disengage thread before autoclaving.) Certain chemicals which have no appreciable effect on resins at room temperature may cause deterioration at autoclaving temperatures unless removed with distilled water before hand.
 - EO Gas – Ethylene Oxide: 100% EO, EO/Nitrogen mixture, EO/H2CFC mixture
 - Dry Heat – exposure to 160°C for 120 minutes without stress/load on the polymer parts
 - Disinfectants – Benzalkonium chloride, formalin/formaldehyde, hydrogen peroxide, ethanol, etc.
 - Radiation – gamma or beta irradiation at 25 kGy (2.5 Mrad) with unstabilized plastic.
- Sterilizing residues chemical strength. Do not use PC vessels for vacuum applications if they have been autoclaved. Refer to [Use and Care Guidelines for Nalgene Labware](#) at thermofisher.com/labwarecare, for detailed information on sterilizing.
- "Yes" indicates the resin has been determined to be non-cytotoxic, based on USP Biological Reactivity Tests, in vitro, requirements.
- Resins meet requirements of CFR21 section of Food Additives Amendment of the Federal Food and Drug Act. End users are responsible for validation of compliance for specific containers used in conjunction with their particular applications.
- Acceptable for:
 - Nonacid, aqueous products; may contain salt, sugar or both (pH above 5.0)
 - Dairy products and modifications; oil-in-water emulsions, high or low fat
 - Most bakery products with surfaces containing no free fat or oil
 - Dry solids with the surfaces containing no free fat or oil (no end-test required) and under all conditions as described in Table 2 of FDA Regulation 177.1520 except condition A - high temperature sterilization (e.g. over 100°C / 212°F)
- Acceptable for:
 - Alcoholic foods containing not more than 15% (by volume) alcohol; fill and storage temperature not to exceed 49°C (120°F)
 - Non-alcoholic foods of hot fill to not exceed 82°C (180°F) and 49°C (120°F) in storage.
 - Not suitable for carbonated beverages or beer or packaging food requiring thermal processing.
- Straight-sided jars, beakers and graduated cylinders only.
- Acceptable for aqueous, oil, dairy, acidic, and alcoholic foods up to 71°C/160°F.
- The brittleness temperature is the temperature at which an item made from the resin may break or cracked if dropped. This is not the lowest use temperature if care is exercised in use and handling.
- The tubing will become opaque from absorbed water, see [Use and Care Guidelines for Nalgene Labware](#) at thermofisher.com/labwarecare.
- If microwaved in the presence of water, the tubing will become opaque from absorbed moisture, see [Use and Care Guidelines for Nalgene Labware](#) at thermofisher.com/labwarecare for details.

For additional information about chemical compatibility, physical properties, and the care and use of Nalgene Labware, please contact Nalgene Technical Support. Email (Americas): technicalsupport@thermofisher.com; Tel: 800-625-4327 or 585-585-8800. Email (Countries: A, CH, D, F, BG, IL, J): technicalsupport.labproducts.eu@thermofisher.com; Tel: 49-6184-90-6000

Find out more at thermofisher.com/nalgene/labware