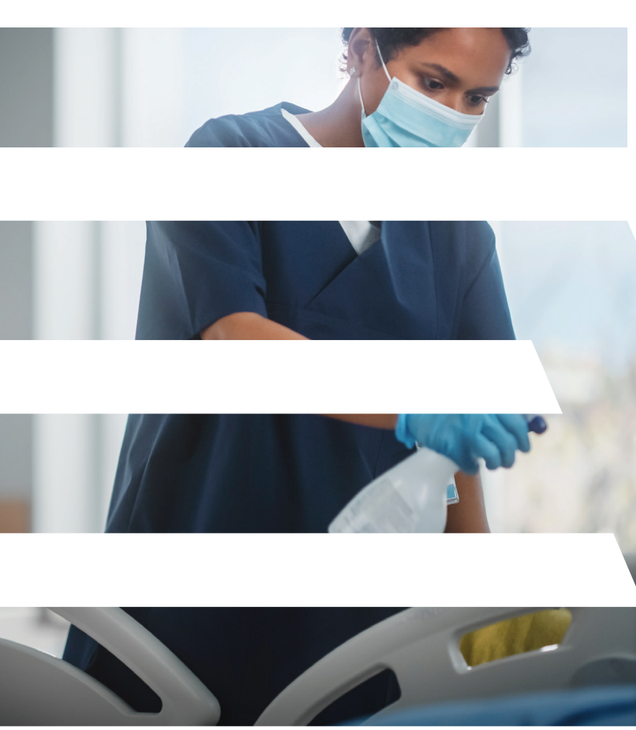
STERILIZATION COMPATIBILITY OF MEDICAL-GRADE RESINS

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In medical device design, selecting the right base resin is critical to ensuring durability after sterilization. This guide summarizes common resin types and their compatibility with today's most widely used sterilization methods — including gamma, EtO, e-beam, autoclave, and others.

Based on industry-accepted data and third-party sources, this overview helps OEMs make informed material selections early in the design process. As a leader in healthcare polymer solutions, Americhem Healthcare offers expert guidance and customized compounds to optimize both performance and compliance.

Typical Sterilization Testing Methods – List testing methods below.

Category	Resin Abbreviation	Dry Heat	Autoclave (121C)	Autoclave (134C)	EtO	VHP	E-beam	Gamma	Plasma	X Ray	Chlorine Dioxide
Elastomer	SILICONES	●	●	●	●	▲	●	●	●	●	●
Elastomer	TPA	■	■	■	●	●	●	●	●	●	■
Elastomer	TPC	▲	■	■	●	●	●	●	●	●	▲
Elastomer	TPO	■	■	■	●	●	●	●	●	●	■
Elastomer	TPS	■	■	■	●	▲	●	●	●	●	■
Elastomer	TPU	■	■	■	●	●	●	●	●	●	■
Elastomer	TPV	■	●	▲	●	●	●	●	●	●	■
Fluoropolymer	ETFE	●	●	●	●	●	●	●	●	●	●
Fluoropolymer	PTFE	●	●	▲	●	●	■	■	●	■	●
Fluoropolymer	PVDF	●	●	●	●	●	●	●	●	●	●
High Temperature	LCP	●	●	●	●	●	●	●	●	●	●
High Temperature	PAEK	●	●	●	●	●	●	●	●	●	●
High Temperature	PEEK	●	●	●	●	●	●	●	●	●	●
High Temperature	PEI	●	●	●	●	●	●	●	●	●	●
High Temperature	PESU	●	●	●	●	●	●	●	●	●	●
High Temperature	PPS	●	●	●	●	●	●	●	●	●	●
High Temperature	PPSU	●	●	●	●	●	●	●	●	●	●
High Temperature	PSU	●	●	●	●	●	●	●	▲	●	●
Olefinic	COC	■	▲	▲	●	●	●	●	●	●	●
Olefinic	PE	■	■	■	●	●	●	●	●	●	●
Olefinic	PP	■	●	●	●	●	▲	▲	●	▲	●
Olefinic	PVC FLEXIBLE	▲	▲	▲	●	▲	●	●	▲	●	▲
Olefinic	PVC RIGID	■	■	■	●	▲	▲	▲	▲	▲	▲
Polyacetal	POM	●	●	▲	●	▲	■	■	▲	■	■
Polyamide	PA (ALIPHATIC)	▲	■	■	●	■	▲	▲	■	▲	■
Polyamide	PA (AROMATIC)	●	▲	▲	●	▲	●	●	▲	●	■
Polyamide	PARA	●	▲	▲	●	●	●	●	▲	●	■
Polyamide	PPA	●	●	●	●	●	●	●	▲	●	▲
Polyester	COPOLYESTER	■	▲	▲	●	●	●	●	●	●	▲
Polyester	PBT	▲	▲	▲	●	●	●	●	●	●	▲
Polyester	PET	■	■	■	●	●	●	●	●	●	▲
Styrenic/Polycarbonate	ABS	■	■	■	●	●	●	●	●	●	■
Styrenic/Polycarbonate	PC	■	▲	▲	●	●	●	▲	▲	▲	■
Styrenic/Polycarbonate	PS	■	■	■	●	▲	●	●	●	●	▲
Styrenic/Polycarbonate	ACRYLIC	■	■	■	●	▲	●	●	●	●	■

● = recommended for use in most cases
▲ = recommended in some cases. May not be good for high cycles, or certain applications
■ = not recommended

Disclaimer 1. Some resins will require stabilization or color tint additives to mitigate degradation and color shift under certain processes. Americhem offers solutions.

Disclaimer 2. The above recommendations are based on natural resin. Fillers, colorants, UV stabilizers, flame retardants, and other additives may change the performance.

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Our materials are engineered to enhance safety, longevity, and brand differentiation, helping your products succeed in high-stakes healthcare environments.

ISO 13485 Compliant Facilities

ISO 10993 Biocompatibility



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Dry Heat Sterilization

Dry heat sterilization works by oxidizing cell components and denaturing proteins of microorganisms, effectively killing them. It requires higher temperatures and longer exposure times than autoclaving. It is suitable for moisture sensitive materials, but not suitable for heat-sensitive materials.

Typical Conditions
- 160°C for 2 hours
- 170°C for 1 hour
- 180°C for 30 minutes

Autoclave Sterilization

Autoclaving uses pressurized steam to kill microorganisms by denaturing proteins and enzymes. It's more efficient than dry heat due to better heat penetration and moisture. However, it is not a suitable method for moisture sensitive materials.

Typical Conditions
- 121°C at 15 psi for 15-20 minutes
- 134°C at 30 psi for 3-5 minutes

EtO Sterilization

EtO sterilization uses ethylene oxide gas to kill microorganisms by alkylating proteins, DNA, and RNA, disrupting their cellular functions. It's highly effective even at low temperatures, making it ideal for heat- and moisture-sensitive materials. However, it does require long cycle times and strict safety controls.

Typical Conditions
- 35°C to 65°C
- 40-80% Relative Humidity
- 450-1200 mg/L EtO concentration
- 2 to 12 hours exposure time
- 8 to 24 hours aeration time

Hydrogen Peroxide (VHP) Sterilization

Vaoprized hydrogen peroxide (VHP) sterilization uses vaporized hydrogen peroxide to kill microorganisms by oxidizing essential cell components, such as proteins and nucleic acids. It's a low-temperature sterilization method ideal for heat-sensitive materials, and faster than EtO. However, it is not suitable for moisture sensitive materials, or materials that are incompatible with hydrogen peroxide.

Typical Conditions
- 30°C to 50°C
- 40-80% Relative Humidity
- 300 to 1200 ppm H2O2 concentration
- 30 minutes to 2 hours exposure time
- 30 minutes to 2 hours aeration time

E-Beam Sterilization

E-beam sterilization uses high-energy electrons to destroy microorganisms by breaking down their DNA and cellular structures. It's a form of ionizing radiation, but unlike gamma rays, it uses electrons generated by an electron accelerator. It is fast, effective, and suitable for a wide range of materials, but has low penetration and can have high equipment cost.

Typical Conditions
- 80 keV to 10 MeV
- Seconds to minutes exposure time

Gamma Radiation Sterilization

Gamma sterilization uses high-energy gamma rays, typically from Cobalt-60, to kill microorganisms by breaking down DNA and other cellular components. It's a form of ionizing radiation, like E-beam, but with deeper penetration. It is suitable for a wide range of materials, but is slower than E-beam methods, and has high equipment, maintenance, and regulatory costs.

Typical Conditions
- 15 to 50 kGy
- Minutes to Hours exposure time

Plasma Sterilization

Plasma sterilization uses vaporized hydrogen peroxide (H_2O_2) followed by the application of radiofrequency energy to create a low-temperature plasma. This plasma generates reactive species that destroy microorganisms by oxidizing cellular components. It's a low-temperature sterilization method ideal for heat-sensitive materials, and faster than EtO. However, it is not suitable for moisture sensitive materials, or materials that are incompatible with hydrogen peroxide.

Typical Conditions
- 40°C to 55°C
- Low Vacuum
- 58-60% H2O2 solution vaporized
- 45 minutes to 2 hours H2O2 exposure time
- Minutes of plasma phase exposure time

X-ray Sterilization

X-ray sterilization uses high-energy photons produced by a linear accelerator. These photons penetrate deeply into materials and sterilize primarily by ionization, similar to gamma irradiation, which damages cell DNA and turning water into reactive radicals.
It is a very quick, low temperature, no residue process, with good efficacy and penetration.
But it does require expensive equipment and shielding.

Typical Conditions
- 15 to 40 kGy
- Seconds to minutes exposure time

Chlorine Dioxide Sterilization

Chlorine Dioxide Sterilization uses a strong oxidizing gas with unique chemistry selectively oxidize fatty acids, proteins, enzymes, and nucleic acids to kill cells. It is a fairly quick, room temperatue process, with good efficacy and low residue.
It is not suitable for all resin types, and does require humidity control for best effect.

Typical Conditions
- 20°C to 30°C
- 5 to 30 minutes of humidification to 60-85% for best effect
- 50-400 ppm concentration of ClO2
- 10 to 60 minutes exposure time 5 to 20 minutes of aeration/ purge time