# PLASTICS STERILIZATION COMPATIBILITY

Steam Sterilization, also known as autoclaving, involves generating or injecting saturated steam into a pressure chamber at a temperature range of 121-148 °C (250-300 °F) at 15psi for a period of time sufficient to provide sterilization. Some plastics are degraded by autoclaving.

Dry heat sterilization requires a significantly higher temperature than steam sterilization to achieve an equal germicidal effect. Dry heat is generally not suitable for plastics because of their low thermal conductivity as well as the difficulty insuring that the complete part or assembly has been to exposed to enough heat to ensure sterilization.

Ethylene Oxide gas (EtO) is frequently used to sterilize materials that are otherwise too sensitive to heat or radiation sterilization. Many plastics fall into this category and EtO sterilization is frequently used for single use medical devices made of plastic. EtO gas requires careful handling because of its flammability and how poisonous it is. Strict handling requirements and a technically complex sterilization process makes EtO suitable primarily for large volume sterilizations.

Ionizing radiation sterilization generally involves irradiation with either gamma rays or high energy electrons. Ionizing radiation affects every polymer's physical and chemical properties but some plastic materials are more resistant than others to degradation from radiation at sterilization doses. The degree and types of changes to a particular plastic depend on the nature of the polymer, whether or not it has had stabilizers added to it during manufacture, the intensity of the radiation used and how long the parts are irradiated.

Sterilizing radiation dosage is measured in either Grays (Gy) or rads (Radiation Absorbed Dose). Sterilizing radiation intensity for industrial sterilization is usually measured in either Roentgens (R) or else Coulombs (C) per unit mass.

Gamma irradiation is an ionizing radiation sterilization technique that involves exposing materials for sterilization to gamma rays. Cobalt-60 is the most common gamma radiation source used for industrial ionizing radiation sterilization.

Electron beam or E-Beam sterilization is another widely used ionizing radiation sterilization technology. High energy electron beams generate a higher dose rate than gamma irradiation. This reduces exposure time necessary for sterilization which results in less chemical degradation. Electron beam irradiation has significantly lower penetrating power than gamma rays making the density of the material being sterilized an important consideration.

Download PDF

**Plastics Sterilization Compatibility Chart**

| Polymer | Polymer Abbreviation | Autoclave | Dry Heat | Ethylene Oxide (EtO) | Gamma Irradiation | Electron Beam |
|---|---|---|---|---|---|---|

| | | | | | | |
|---|---|---|---|---|---|---|
| **Biopolymers** | | | | | | |
| Polycaprolactone | PCL | Fair | Good | Good | Good | Good |
| Polyglycolic acid | PGA | Good | Good | Good | Good | Good |
| Polyhydroxybutyrate | PHB | Poor | Poor | Good | Fair | Fair |
| Poly(L-lactide) | PLLA | Fair | Good | Good | Good | Good |
| Poly(lactic-co-glycolic acid) | PLGA | Poor | Poor | Good | Fair | Fair |
| Polylactic acid | PLA | Poor | Fair | Good | Good | Good |
| | | | | | | |
| **Elastomers** | | | | | | |
| Copolyester thermoplastic elastomer | TPC | Poor | Good | Good | Good | Good |
| Ethylene propylene (diene-) terpolymer | EPDM | Good | Good | Good | Good | Good |
| Olefinic thermoplastic elastomer | TPO | Poor | Fair | Good | Good | Good |
| Polyamide thermoplastic elastomer | TPA | Poor | Poor | Good | Good | Good |
| Silicones | | Good | Good | Good | Good | Good |
| Styrenic thermoplastic elastomer | TPS | Poor | Poor | Good | Good | Good |
| Urethane thermoplastic elastomer | TPU | Poor | Fair | Good | Good | Good |
| | | | | | | |
| **Fluropolymers** | | | | | | |
| Chlorotrifluoroethylenevinylidene fluoride | FKM / FPM | Poor | Good | Poor | Poor | Poor |
| Ethylene chlorotrifluoroethylene | ECTFE | Good | Good | Good | Good | Good |
| Ethylene tetrafluoroethylene | ETFE | Good | Good | Good | Good | Good |
| Fluorinated ethylene propylene | FEP | Good | Good | Good | Fair | Fair |
| Perfluoro alkoxy | PFA | Good | Good | Good | Good | Good |
| Polytetrafluoroethylene[1] | PTFE | Fair | Fair | Good | Poor | Poor |
| Polyvinyl fluoride | PVF | Good | Good | Good | Good | Good |
| Polyvinylidene difluoride | PVF2 | Good | Good | Good | Good | Good |
| | | | | | | |
| **High-temperature thermoplastics** | | | | | | |
| Liquid crystaline polymer | LCP | Good | Good | Good | Good | Good |
| Polyamide-imide | PAI | Fair | Fair | Good | Good | Good |
| Polyetheretherketone | PEEK | Good | Good | Good | Good | Good |
| Polyetherimide | PEI | Fair | Fair | Good | Good | Good |
| Polyphenylene sulfide | PPS | Good | Good | Good | Good | Good |
| Polysulfones | PSU | Good | Good | Good | Good | Good |
| | | | | | | |
| **Polyamides** | | | | | | |
| Aromatic | | Good | Good | Good | Good | Good |
| Nylon 6, Nylon 66 | PA6, PA66 | Fair | Fair | Good | Fair | Fair |
| Nylon 12, 6/12 | PA12 | Poor | Poor | Good | Fair | Fair |
| | | | | | | |
| **Polyesters** | | | | | | |
| Copolyesters | | Poor | Poor | Good | Good | Good |
| Poly butylene terephthalate | PBT | Fair | Fair | Good | Good | Good |
| Poly ethylene terephthalate | PET | Poor | Poor | Good | Good | Good |
| | | | | | | |
| **Polyolefins** | | | | | | |
| Cyclo olefin copolymer | COC | Fair | Fair | Good | Good | Good |
| High-density polyethylene | HDPE | Poor | Poor | Good | Good | Good |
| Low-density polyethylene | LDPE | Poor | Poor | Good | Good | Good |
| Polypropylene[1] | PP | Good | Fair | Good | Fair | Fair |
| Polypropylene copolymers | | Good | Fair | Good | Fair | Fair |
| Polyvinyl chloride plasticized[1,2] | PVC | Fair | Fair | Good | Good | Good |
| Polyvinyl chloride unplasticized[1,2] | PVC | Poor | Poor | Good | Fair | Fair |
| Ultrahigh molecular weight polyethylene | UHMWPE | Poor | Poor | Good | Good | Good |
| | | | | | | |
| **Polystyrene/styrenics** | | | | | | |
| Acetals | POM | Good | Good | Good | Poor | Poor |
| Acrylics[1,2] | | Poor | Poor | Good | Good | Good |
| Acrylonitrile butadiene styrene copolymer (Abs) | ABS | Poor | Poor | Good | Good | Good |
| Acrylonitrile styrene acrylate | ASA | Poor | Poor | Good | Good | Good |
| High heat polycarbonates | | Good | Good | Good | Good | Good |
| Methacrylate acrylonitrile butadiene styrene copolymer | MABS | Poor | Poor | Good | Good | Good |
| Polycarbonates[1,2] | | Fair | Fair | Good | Good | Good |
| Polystyrene | PS | Poor | Poor | Good | Good | Good |

| | | | | | | |
|---|---|---|---|---|---|---|
| Polyurethanes | | Poor | Poor | Good | Good | Good |
| Styrene-acrylonitrile copolymer (San) | SAN | Poor | Poor | Good | Good | Good |
| Styrene-butadiene copolymer | SBC | Poor | Poor | Good | Good | Good |

[1]Radiation stable grades need to be used for radiation sterilization.
[2]PVC, acrylics and PC require corrective tint to compensate for discoloration.

The information contained in this document is intended to provide guidelines for reference only. We do not make any sort or warranty, express, implied or otherwise as to the performance of any materials with respect to sterilization or any other use. It is the responsibility of the user or engineer to evaluate all materials and processes for suitability of use, from a technical and legal perspective.

Back to Top





800.781.8487
303.761.7939

ISO 9001:2015 Certified Companies
Worldwide Suppliers of Pneumatic, Fluidic & Medical Components

Industrial Specialties Mfg. & IS MED Specialties
4091 So. Eliot St., Englewood, CO 80110-4396