Max Continuous Service Temperature

What is maximum continuous service temperature?

The maximum continuous use temperature of plastics is the maximum acceptable temperature above which the mechanical properties or electrical properties of a part made from the material are significantly degrading over the reasonable lifetime of the tested product. These properties include tensile strength, impact strength, and dielectric strength linked to insulation.

What are the units of continuous service temperature?

The maximum continuous temperature is measured in:

Degree Celsius (°C)
Degree Fahrenheit (°F)
Degree Kelvin (K)

What are the factors on which CST depends?

In reality, the true maximum continuous use temperature depends on:

The time involved in testing.
The loading levels can affect the value.
Additives and reinforcements used in the formulation.

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What is relative thermal index (RTI)?

Relative Thermal Index (RTI) is a parameter to compare the continuous use temperature of materials. The RTI is based on a loss of properties of the plastic versus time. In general, when the plastic is exposed to maximum continuous use temperature - good, long-term performance is observed. On the other hand, it does not consider short-term thermal spikes.

RTI gives an indication of the aging temperature that a material can endure for 100,000 hours and still retain at least half of the initial property being measured. However, it does need to be noted that different properties of materials decay at dissimilar rates. This is the primary reason why often RTI values are associated with a particular property and the related continuous use temperatures are given as a range of values rather than as a single value.

What are the types of relative thermal index (RTI)?

The RTI values depend on the property that is being examined. There are three general classes of properties that are associated with the RTI.

1. **RTI Electrical** for insulating properties.
2. **RTI Mechanical Impact** for impact resistance, elongation, toughness, and flexibility.
3. **RTI Mechanical Strength** for mechanical properties or the structural integrity of the plastics.

The three values for a particular polymer are often different from each other.

What is the test method to measure the RTI values?

UL 746 is the test method to determine the RTI values.

> Place the sets of test specimens in ovens at four different pre-set temperatures.
> At certain time intervals, remove the specimens from the ovens. Determine the specific mechanical or electrical properties of interest.
> Plot the obtained results on a property versus a time graph. This is done until the property that is being tested declines to 50 percent or less of its initial value.

In this analysis, the 50 percent value of the half-life of that particular property. The half-life values are then, plotted against the reciprocal of the absolute aging temperature. This plot results in a straight line that can be extrapolated, if needed, to indicate the half-life of the property at other temperatures.

We can also compare the results obtained in this testing procedure with a material of known aging performance.

What are the maximum CST values of several plastics?

Click to find polymer you are looking for:

A-C | E-M | PA-PC | PE-PL | PM-PP | PS-X

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Polymer Name	Min Value (°C)	Max Value (°C)
ABS - Acrylonitrile Butadiene Styrene	86.0	89.0
ABS Flame Retardant	65.0	95.0
ABS High Heat	75.0	110.0
ABS High Impact	65.0	100.0
ABS/PC Blend - Acrylonitrile Butadiene Styrene/Polycarbonate Blend	70.0	110.0
ABS/PC Blend 20% Glass Fiber	70.0	110.0
ABS/PC Flame Retardant	70.0	110.0
ASA - Acrylonitrile Styrene Acrylate	80.0	90.0
ASA/PC Blend - Acrylonitrile Styrene Acrylate/Polycarbonate Blend	90.0	110.0
ASA/PC Flame Retardant	90.0	110.0
ASA/PVC Blend - Acrylonitrile Styrene Acrylate/Polyvinyl Chloride Blend	80.0	90.0
CA - Cellulose Acetate	45.0	95.0
CAB - Cellulose Acetate Butyrate	60.0	105.0
CP - Cellulose Propionate	60.0	105.0
CPVC - Chlorinated Polyvinyl Chloride	80.0	100.0
ECTFE - Ethylene Chlorotrifluoroethylene	140.0	150.0
ETFE - Ethylene Tetrafluoroethylene	140.0	155.0
EVA - Ethylene Vinyl Acetate	45.0	70.0
EVOH - Ethylene Vinyl Alcohol	80.0	100.0
FEP - Fluorinated Ethylene Propylene	205.0	205.0
HDPE - High Density Polyethylene	100.0	120.0
HIPS - High Impact Polystyrene	60.0	80.0
HIPS Flame Retardant V0	60.0	80.0
Ionomer (Ethylene-Methyl Acrylate Copolymer)	34.0	48.0
LCP - Liquid Crystal Polymer	200.0	240.0
LCP Carbon Fiber-reinforced	200.0	240.0
LCP Glass Fiber-reinforced	200.0	240.0
LCP Mineral-filled	200.0	240.0
LDPE - Low Density Polyethylene	80.0	100.0

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LLDPE - Linear Low Density Polyethylene	90.0	110.0
MABS - Transparent Acrylonitrile Butadiene Styrene	75.0	80.0
PA 46 - Polyamide 46	110.0	150.0
PA 46, 30% Glass Fiber	130.0	160.0
PA 6 - Polyamide 6	80.0	120.0
PA 6-10 - Polyamide 6-10	80.0	150.0
PA 66 - Polyamide 6-6	80.0	140.0
PA 66, 30% Glass Fiber	100.0	150.0
PA 66, 30% Mineral filled	120.0	140.0
PA 66, Impact Modified, 15-30% Glass Fiber	110.0	140.0
PA 66, Impact Modified	80.0	130.0
Polyamide semi-aromatic	88.0	135.0
(1) PAI - Polyamide-Imide	220.0	280.0
PAI, 30% Glass Fiber	220.0	220.0
PAI, Low Friction	220.0	220.0
PAR - Polyarylate	130.0	130.0
PBT - Polybutylene Terephthalate	80.0	140.0
PBT, 30% Glass Fiber	80.0	140.0
PC (Polycarbonate) 20-40% Glass Fiber	90.0	125.0
PC (Polycarbonate) 20-40% Glass Fiber Flame Retardant	90.0	125.0
PC - Polycarbonate, high heat	100.0	140.0
PC/PBT Blend - Polycarbonate/Polybutylene Terephthalate Blend	60.0	121.0
PC/PBT blend, Glass Filled	121.0	193.0
PCL - Polycaprolactone	45.0	45.0
PCTFE - Polymonochlorotrifluoroethylene	150.0	175.0
PE - Polyethylene 30% Glass Fiber	100.0	130.0
PEEK - Polyetheretherketone	154.0	260.0
PEEK 30% Carbon Fiber-reinforced		240.0
PEEK 30% Glass Fiber-reinforced		240.0
PEI - Polyetherimide	170.0	170.0
PEI, 30% Glass Fiber-reinforced	170.0	170.0

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PEI, Mineral Filled	170.0	170.0
PESU - Polyethersulfone	175.0	180.0
PESU 10-30% glass fiber	180.0	180.0
PET - Polyethylene Terephthalate	80.0	140.0
PET, 30% Glass Fiber-reinforced	100.0	140.0
PET, 30/35% Glass Fiber-reinforced, Impact Modified	80.0	140.0
PETG - Polyethylene Terephthalate Glycol	63.0	63.0
PFA - Perfluoroalkoxy	240.0	260.0
PHB - V (5% valerate)	95.0	95.0
PI - Polyimide	260.0	360.0
PMMA - Polymethylmethacrylate/Acrylic	70.0	90.0
PMMA (Acrylic) High Heat	100.0	150.0
PMMA (Acrylic) Impact Modified	70.0	90.0
PMP - Polymethylpentene	90.0	110.0
PMP 30% Glass Fiber-reinforced	90.0	110.0
PMP Mineral Filled	90.0	110.0
POM - Polyoxymethylene (Acetal)	80.0	105.0
POM (Acetal) Impact Modified	80.0	100.0
POM (Acetal) Low Friction	80.0	105.0
POM (Acetal) Mineral Filled	80.0	105.0
PP - Polypropylene 10-20% Glass Fiber	100.0	130.0
PP, 10-40% Mineral Filled	100.0	130.0
PP, 10-40% Talc Filled	100.0	130.0
PP, 30-40% Glass Fiber-reinforced	100.0	130.0
PP (Polypropylene) Copolymer	100.0	130.0
PP (Polypropylene) Homopolymer	100.0	130.0
PP, Impact Modified	90.0	115.0
PPA - Polyphthalamide	140.0	140.0
PPA, 30% Mineral-filled	154.0	156.0
PPA, 33% Glass Fiber-reinforced	184.0	186.0
PPA, 45% Glass Fiber-reinforced	184.0	186.0
PPE - Polyphenylene Ether	80.0	110.0

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PPE, 30% Glass Fiber-reinforced	80.0	110.0
PPE, Flame Retardant	80.0	110.0
PPE, Impact Modified	80.0	110.0
PPE, Mineral Filled	80.0	110.0
PPS - Polyphenylene Sulfide	200.0	220.0
PPS, 20-30% Glass Fiber-reinforced	200.0	220.0
PPS, 40% Glass Fiber-reinforced	200.0	220.0
PPS, Conductive	200.0	220.0
PPS, Glass fiber & Mineral-filled	200.0	220.0
PPSU - Polyphenylene Sulfone	149.0	210.0
PS (Polystyrene) 30% glass fiber	75.0	122.0
PS (Polystyrene) Crystal	65.0	80.0
PS, High Heat	75.0	90.0
(1) PSU - Polysulfone	150.0	180.0
PSU, 30% Glass finer-reinforced	150.0	180.0
PSU Mineral Filled	150.0	150.0
PTFE - Polytetrafluoroethylene	260.0	290.0
PTFE, 25% Glass Fiber-reinforced	260.0	260.0
PVC (Polyvinyl Chloride), 20% Glass Fiber-reinforced	50.0	80.0
PVC, Plasticized	50.0	80.0
PVC, Plasticized Filled	50.0	80.0
PVC Rigid	50.0	80.0
PVDC - Polyvinylidene Chloride	70.0	90.0
PVDF - Polyvinylidene Fluoride	70.0	150.0
SAN - Styrene Acrylonitrile	65.0	95.0
SAN, 20% Glass Fiber-reinforced	65.0	95.0
SMA - Styrene Maleic Anhydride	75.0	100.0
SMA, 20% Glass Fiber-reinforced	75.0	100.0
SMA, Flame Retardant V0	75.0	100.0
SMMA - Styrene Methyl Methacrylate	94.0	100.0
UHMWPE - Ultra High Molecular Weight Polyethylene	110.0	130.0
XLPE - Crosslinked Polyethylene	67.0	82.0

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