



Thermx® PCT
High-performance Polyester

**Product and
Properties Guide**

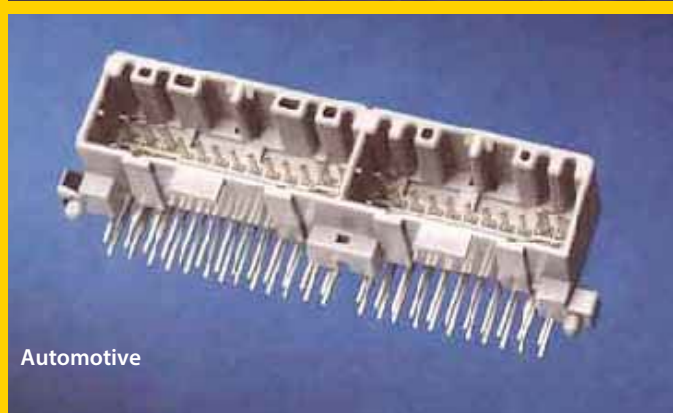
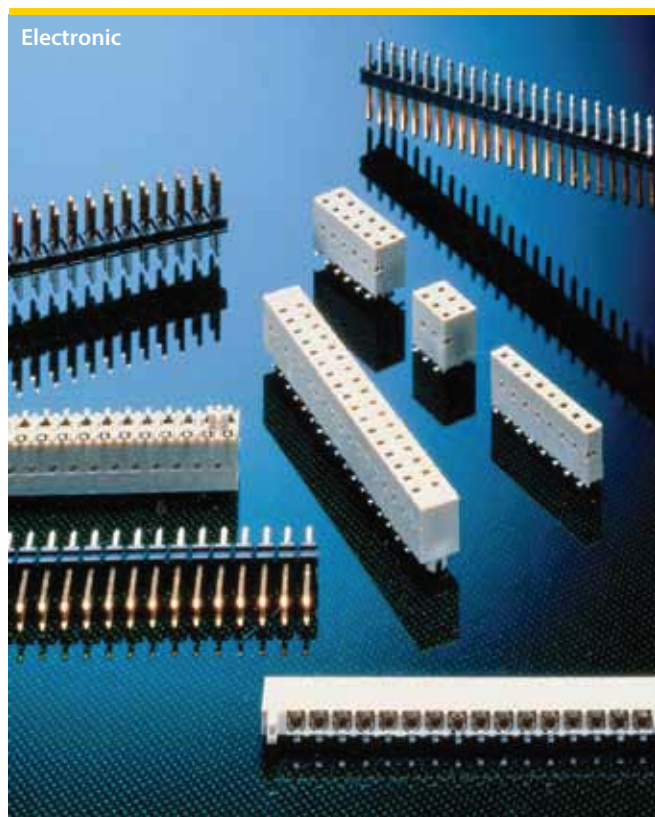
Thermx[®] PCT Overview

- + Chemical resistance
- + Processability
- + Dimensional stability
- + Heat resistance
- + Fast molding cycles

Thermx[®] PCT polyester is a high-temperature polyester based on polycyclohexylene-dimethylene terephthalate chemistry. In addition to offering the desirable chemical resistance, processability and dimensional stability of engineering polyesters like PET and PBT, the added heat resistance of Thermx PCT makes it particularly well suited for demanding automotive and

electrical/electronics applications – even under fluctuating environmental conditions. Customers also benefit from its fast molding cycles and excellent processability.

Thermx PCT joins Vectra[®] and Zenite[®] LCP in a high-temperature thermoplastic product line that meets – and exceeds – industry standards.



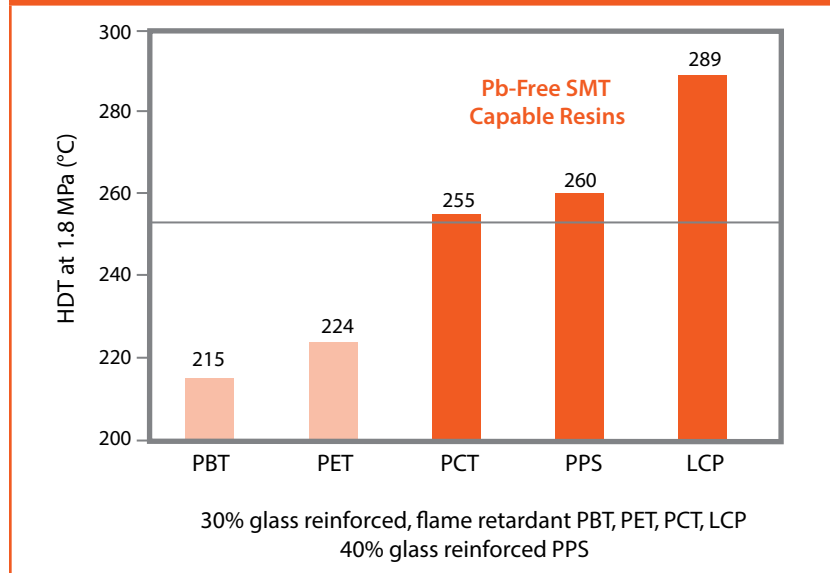
Thermx[®] PCT

Features and benefits

- Low moisture absorption
 - Resistance to blistering
- Long-term heat resistance
- Can be a PBT drop-in replacement
 - Potential high-temperature drop-in with no tooling changes
- Low-flash processing
- Chemical resistance to automotive fluids and printed circuit board cleaning chemicals
- Hydrolysis resistance
 - Relatively good for a polyester without significant modification
- Potential reflow and lead-free soldering resin (see Figure 1)
- High CTI and arc resistance
- Dielectric strength retained to 150°C+
 - CGT33 and CG033 dielectric strength at 150°C = 25 kV/mm (1.5 mm)
- Low dielectric constant and dissipation factor FR grade CG933: dielectric constant = 3.6 dissipation factor = 0.020 at 2.6 GHz, 25°C, 42% RH

Type	Modification	Product
General Purpose (non FR or "HB")	20% Glass	CG023
	30% Glass	CG033
	30% Glass/Toughened	CGT33
Flame Retardant (FR)	20% Glass	CG923
	30% Glass	CG933

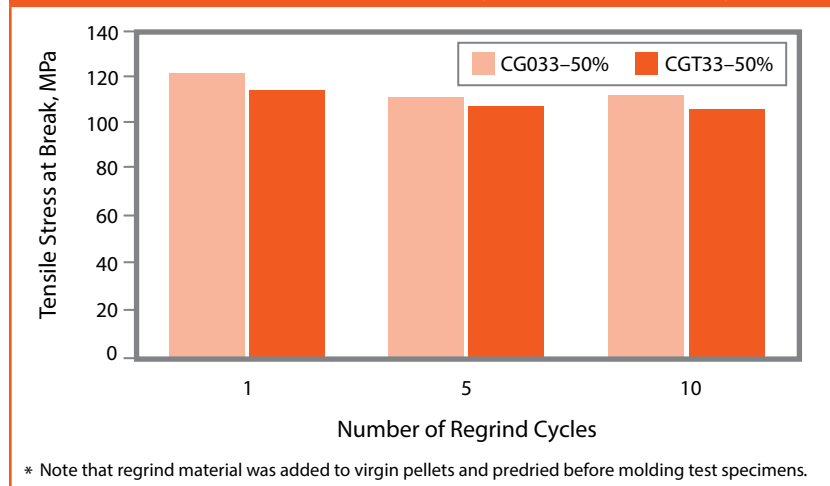
Fig. 1 • Heat Deflection Temperature



Available grades

All Thermx PCT grades are reinforced, semi-crystalline polymers. They can be classified into two types as shown in Table 1. General-purpose products include 20% and 30% glass-reinforced grades, and CGT33, a 30% glass-reinforced grade with added toughness. The second type, flame retardant products, have achieved V-0 flammability classifications. FR grades are available as 20% and 30% glass-reinforced products.

Fig. 2 • Tensile Stress at Break vs. Regrind Cycle for Thermx PCT Polyester*



* Note that regrind material was added to virgin pellets and predried before molding test specimens.

Thermx® PCT

Chemical resistance

Thermx® PCT polyesters are resistant to automotive fluids and chemicals used for printed circuit board cleaning. Table 3 shows the resistance to common automotive fluids after 30 days of immersion. The crystallinity on the surface of parts molded from Thermx PCT resins is determined by mold temperature and section thickness. The amount of crystallinity determines the solvent resistance characteristics. Because of this, the data shown in Table 3 can be used as an indication of the favorable chemical resistance of Thermx PCT, but end-use testing is highly recommended to understand how specific Thermx resins will perform in a particular application.

Condition	CG023, CG033, CGT33, CG923, CG933
Drying temperature*, °C(°F)	95 (200)
Drying time, hr	4-6
Processing melt temperature, °C (°F)	295-310 (565-590)
Mold temperature, °C (°F)	80-120 (175-250)

*Dessicant dryers with an air dew point of -29°C (-20°F) or less should be used.

Processing

Thermx PCT polyesters can be easily processed on conventional injection molding equipment with appropriate desiccant drying systems. The viscosities of Thermx PCT polyesters are similar to comparable PBT, PA and PPS formulas.

Optimum molded parts will achieve 100% of their obtainable crystallinity, resulting in optimum dimensional stability. Specific processing recommendations are shown in Table 2. In addition, to achieve optimum physical properties, preferred barrel residence time for Thermx PCT is less than four minutes.

When Thermx PCT polyesters are properly processed, up to 50% regrind can be utilized without significant property loss (see Figure 2).

Fluid	Temperature °C (°F)	Break Strength, % Retained		Change in Weight, %	
		CG033	CGT33	CG033	CGT33
Calcium chloride (aq, saturated)	23 (73)	102	102	-0.1	0.0
Diesel fuel	23 (73)	99	103	-0.1	0.0
Gasohol (10% ethanol)	23 (73)	99	98	0.3	0.5
Motor oil, 0% strain	150 (302)	97	111	-0.7	-0.3
Motor oil, 1% strain	150 (302)	87	104	-0.6	-0.3
Power steering fluid	49 (120)	99	104	0.0	0.0
Brake fluid	49 (120)	99	101	0.2	0.4
Transmission fluid, 0% strain	150 (302)	100	98	-0.6	0.1
Transmission fluid, 1% strain	150 (302)	91	90	-0.6	0.0
Unleaded gasoline	23 (73)	100	99	0.2	0.3
Windshield washer fluid	23 (73)	97	98	0.6	0.4

*Testing was conducted according to ASTM D543

Thermx[®] PCT

Typical Properties* of Thermx [®] PCT (Metric Units)							
Property	Test Method	Units	CG023	CG033	CGT33	CG923	CG933
MECHANICAL							
Tensile Strength at Break	ASTM D638	MPa	100	117	117	99	120
Elongation at Break	ASTM D638	%	2.7	2.3	2.8	2.1	2
Flexural Modulus	ASTM D790	MPa	5900	8500	7500	6750	9600
Flexural Strength	ASTM D790	MPa	155	180	180	140	180
Izod Impact, 23°C	ASTM D256	J/m	60	75	110	45	90
Unnotched Impact, 23°C	ASTM D4812	J/m	520	730	950	430	690
THERMAL							
HDT 0.45 MPa	ASTM D648	°C				272	276
HDT 1.8 MPa	ASTM D648	°C	256	262	259	234	255
PROCESSING RECOMMENDATION							
Melt Temperature Range		°C	295-310	295-310	295-310	295-310	295-310
Mold Temperature Range		°C	80-120	80-120	80-120	80-120	80-120
Drying Time, Dehumidified Dryer		hours	4-6	4-6	4-6	4-6	4-6
Drying Temperature		°C	95	95	95	95	95
OTHER							
Specific Gravity	ASTM D792		1.39	1.46	1.42	1.58	1.63
Mold Shrinkage, Parallel, 2 mm	ISO 294-4	%			0.3		0.3
Mold Shrinkage, Normal, 2 mm	ISO 294-4	%			0.8		0.8
ELECTRICAL							
Dielectric Strength, Short Time, 500 V/s, 3.2 mm	ASTM D149	kV/mm	19.7	16.1	16.4	20.7	20.4
CTI, 3 mm	IEC	V		560	>600	295	440
FLAMMABILITY							
Flammability Classification, 1.5 mm	UL 94			HB	HB	V-0	V-0
TEMPERATURE INDEX							
RTI, Electrical, 1.5 mm	UL 746B	°C				150	150
RTI, Strength, 1.5 mm	UL 746B	°C				130	150

*Colorants or other additives of any kind may alter some or all of these properties. The data listed is for natural color resins, with the exception of CG923 data which is for a black CG923 grade.

Thermx[®] PCT

Typical Properties* of Thermx [®] PCT (English Units)							
Property	Test Method	Units	CG023	CG033	CGT33	CG923	CG933
MECHANICAL							
Tensile Strength at Break	ASTM D638	kpsi	14.5	16.9	16.9	14	17.4
Elongation at Break	ASTM D638	%	2.7	2.3	2.8	2.1	2
Flexural Modulus	ASTM D790	kpsi	860	1200	1090	980	1400
Flexural Strength	ASTM D790	kpsi	22.5	26.1	26.1	20	26.1
Izod Impact, 23°C	ASTM D256	ft•lb/in	1.1	1.4	2.1	0.8	1.7
Unnotched Impact, 23°C	ASTM D4812	ft•lb/in	9.8	13.7	17.8	8.1	13
THERMAL							
HDT 0.45 MPa	ASTM D648	°F				522	529
HDT 1.8 MPa	ASTM D648	°F	493	504	498	453	491
PROCESSING RECOMMENDATION							
Melt Temperature Range		°F	565-590	565-590	565-590	565-590	565-590
Mold Temperature Range		°F	175-250	175-250	175-250	175-250	175-250
Drying Time, Dehumidified Dryer		hours	4-6	4-6	4-6	4-6	4-6
Drying Temperature		°F	200	200	200	200	200
OTHER							
Specific Gravity	ASTM D792		1.39	1.46	1.42	1.58	1.63
Mold Shrinkage, Parallel, 2 mm	ISO 294-4	%			0.3		0.3
Mold Shrinkage, Normal, 2 mm	ISO 294-4	%			0.8		0.8
ELECTRICAL							
Dielectric Strength, Short Time, 500 V/s, 3.2 mm	ASTM D149	V/mil	500	409	413	526	518
CTI, 3 mm	IEC	V		560	>600	295	440
FLAMMABILITY							
Flammability Classification, 1.5 mm	UL 94			HB	HB	V-0	V-0
TEMPERATURE INDEX							
RTI, Electrical, 1.5 mm	UL 746B	°V				302	302
RTI, Strength, 1.5 mm	UL 746B	°F				266	302

*Colorants or other additives of any kind may alter some or all of these properties. The data listed is for natural color resins, with the exception of CG923 data which is for a black CG923 grade.

Performance Driven Solutions



Celanese, a business of Celanese Corporation, is one of the leading manufacturers of engineering polymers. With the acquisition of Thermx[®] PCT, Celanese has broadened its portfolio of high-performance engineering polyesters.

Celanese is more than just a supplier of raw materials. Celanese is a global company of material scientists, design engineers, technical support experts, account managers and customer service representatives dedicated to helping you achieve your goals in the use of engineering polymers. Celanese is a solutions-driven company that uses advanced

polymer technology to produce high-performance plastic materials that are used in a wide spectrum of industries and applications. Our global reach, extensive product portfolio, and engineering and science capabilities enable us to work with you at any stage in your process – be it at early concept or in full production – anywhere in the world.





ENGINEERED MATERIALS

celanese.com/engineered-materials

Engineered Materials

- Celanex® thermoplastic polyester (PBT)
- Hostaform® and Celcon® acetal copolymer (POM)
- Celstran®, Compel® and Factor® long fiber reinforced thermoplastic (LFRT)
- Celstran® continuous fiber reinforced thermoplastic (CFR-TP)
- Fortron® polyphenylene sulfide (PPS)
- GUR® ultra-high molecular weight polyethylene (UHMW-PE)
- Impet® thermoplastic polyester (PET)
- Riteflex® thermoplastic polyester elastomer (TPC-ET)
- Thermx® polycyclohexylene-dimethylene terephthalate (PCT)
- Vandar® thermoplastic polyester alloy (PBT)
- Vectra® and Zenite® liquid crystal polymer (LCP)

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