

High Performance Films

**WESTLAKE
PLASTICS COMPANY**

High Performance Films

Extruded from a broad range of resins, Westlake high performance films have unique combinations of properties that include high temperature resistance, high strength, good chemical resistance and a variety of specialized properties that enable you to match a specific film's capabilities to your application needs. All of the films discussed in this brochure are standard, in-stock products available for immediate shipment. They include films made from:

- Polyetheretherketone (PEEK)
- Polyethersulfone (PES)
- Polymethylpentene (PMP)
- Ethylene-chlorotrifluoroethylene (ECTFE)
- Polyetherimide (PEI)
- Polysulfone (PSO)
- Polyvinylidene Fluoride (PVDF)

In addition to high performance films, Westlake also extrudes on a custom basis engineered and specialty films from resins such as ABS, acetal, ASA, static dissipative and conductive polycarbonate, PBT, Stanyl 4,6, Thermoplastic Polyimide, and Radel R.

Whatever your high performance, engineered or specialty film needs are, Westlake stands ready to work with you to meet them.

Thicknesses and Widths Available

| | Thicknesses | Widths |
|---|---------------|-------------------------|
| Westlake PEEK Film made from VICTREX PEEK Tempalux Film made from ULTEM PEI | .001" - .010" | up to 27½" up to 26" |
| Westlake PES Film made from ULTRASON E PES Thermalux Film made from UDEL PSO | .011" - .029" | |
| Westlake PMP Film made from TPX PMP Westlake PVDF Film made from KYNAR PVDF Westlake ECTFE Film made from HALAR ECTFE | .002" - .029" | up to 26" |

Finishes Available

All films are polished one side, dull one (P/M). Haircell one side, dull one side finish is available on films .008" and thicker (H/M). Polish/polish is available .005" and thinner. Matte/matte is available .010" and thicker.

Tolerances

Plus or minus 10% (+/- 10%) on all films in all gauges.

Film Conversion Table

Number of square feet per pound

| | Thickness | | | | |
|---|-----------|-------|-------|-------|-------|
| | .001" | .003" | .005" | .010" | .020" |
| Westlake PEEK Film made from VICTREX PEEK (1.256) | 151.0 | 50.0 | 30.0 | 15.1 | 7.5 |
| Tempalux Film made from ULTEM PEI (1.27) | 151.5 | 50.5 | 30.3 | 15.2 | 7.6 |
| Westlake PES Film made from ULTRASON E PES (1.37) | 139.0 | 46.3 | 27.8 | 13.9 | 7.0 |
| Thermalux Film made from UDEL PSO (1.24) | 154.0 | 51.3 | 30.8 | 15.4 | 7.7 |
| Westlake PMP Film made from TPX PMP (.835) | 227.0 | 75.7 | 45.4 | 22.7 | 11.4 |
| Westlake PVDF Film made from KYNAR PVDF (1.78) | 107.5 | 35.8 | 21.5 | 10.8 | 5.4 |
| Westlake ECTFE Film made from HALAR ECTFE (1.68) | 114.0 | 38.0 | 22.8 | 11.4 | 5.7 |

Westlake Film Properties (for standard in-stock products)

| | Westlake® PEEK® Film Made from VICTREX® Polymer | | Tempalux® Film Made from ULTEM® Polyetherimide Resin | | Westlake® PES Film Made from ULTRASON® E Polyethersulfone Resin | | Thermalux® Film Made from UDEL® Polysulfone Resin | | Westlake® PMP Film Made from TPX® Polymethylpentene Resin | | Westlake® PVDF Film Made from KYNAR® Polyvinylidene Fluoride Resin | | Westlake® ECTFE Film Made from HALAR® Ethylene-chlorotrifluoroethylene Resin | |
|-----------------------------------|--|--------------------------------|--|--------------------------------|---|--------------------------------|--|--------------------------------|---|--------------------------------|--|--------------------------------|--|--------------------------------|
| | Test Method | Value | Test Method | Value | Test Method | Value | Test Method | Value | Test Method | Value | Test Method | Value | Test Method | Value |
| MECHANICAL | | | | | | | | | | | | | | |
| Tensile Strength | ASTM D 882 | 17,400 psi | ASTM D 882 | 14,200 psi | ASTM D 882 | 10,500 psi | ASTM D 882 | 10,600 psi | ASTM D 882 | 4,110 psi | ASTM D 882 | 7,550 psi | ASTM D 882 | 4,940 psi |
| Elongation @break | ASTM D 882 | 50% | ASTM D 882 | 52% | ASTM D 882 | 52% | ASTM D 882 | 110% | ASTM D 882 | 10% | ASTM D 882 | 160% | ASTM D 882 | 220% |
| Tensile Modulus | ASTM D 882 | 391,500 psi | ASTM D 882 | 475,000 psi | ASTM D 882 | – | ASTM D 882 | 360,000 psi | ASTM D 882 | 280,000 psi | ASTM D 882 | 250,000 psi | ASTM D 882 | 284,000 psi |
| Flexural Modulus | ASTM D 790 | 531,000 psi | ASTM D 790 | 480,000 psi | ASTM D 790 | 370,000 psi | ASTM D 790 | 390,000 psi | ASTM D 790 | 210,000 psi | ASTM D 790 | 260,000 psi | ASTM D 790 | 240,000 psi |
| Tear Strength-prop. | ASTM D 1004 | 35 g/mil | ASTM D 1004 | 381 g/mil | DIN 53363 | 96 g/mil | ASTM D 1004 | 16 g/mil | ASTM D 1004 | 125 g/mil | ASTM D 1004 | 735 g/mil | ASTM D 1004 | 513 g/mil |
| THERMAL | | | | | | | | | | | | | | |
| Continuous Use Temp. | UL | 464°F | UL | 338°F | UL | 356°F | UL | 302°F | UL | 212°F | UL | 265°F | UL | 302°F |
| Heat Deflection Temp. @264 psi | ASTM D 648 | 330°F | ASTM D 648 | 394°F | ASTM D 648 | 383°F | ASTM D 648 | 345°F | ASTM D 648 | 212°F @66 psi | ASTM D 648 | 244°F | ASTM D 648 | 145°F |
| Melt Temp. | DSC | 644°F | DSC | – | DSC | – | DSC | – | DSC | 455°F | DSC | 329-338°F | DSC | 464°F |
| Glass Transition Temp. | ASTM D 3418 | 289°F | ASTM D 3418 | 420°F | ASTM D 3418 | 437°F | ASTM D 3418 | 374°F | ASTM D 3418 | – | ASTM D 3418 | – | ASTM D 3418 | – |
| FLAMMABILITY | | | | | | | | | | | | | | |
| UL rating | UL94 | VTM-1 | UL94 | VTM-0 | UL94 | – | UL94 | HB | UL94 | HB | UL94 | VTM-0 | UL94 | VTM-0 |
| Limiting Oxygen Index | ASTM D 2863 | 23% | ASTM D 2863 | 47% | ASTM D 2863 | 38% | ASTM D 2863 | 30% | ASTM D 2863 | <25% | ASTM D 2863 | 43% | ASTM D 2863 | 60% |
| NBS Smoke | ASTM E 662 | 1 Dmax | ASTM E 662 | 6 Dmax | ASTM E 662 | – | ASTM E 662 | – | ASTM E 662 | – | ASTM E 662 | – | ASTM E 662 | – |
| ELECTRICAL | | | | | | | | | | | | | | |
| Surface Resistivity | ASTM D 257 | 1.8 x 10 ¹⁵ Ohms | ASTM D 257 | >10 ¹⁵ Ohms | ASTM D 257 | >10 ¹⁴ Ohms | ASTM D 257 | 3.0 x 10 ¹⁶ Ohms | ASTM D 257 | >10 ¹⁵ Ohms | ASTM D 257 | >10 ¹⁵ Ohms | ASTM D 257 | >10 ¹⁵ Ohms |
| Dielectric Strength | ASTM D 149 | 3,200 V/mil @.003" | ASTM D 149 | 3,050 V/mil @.003" | ASTM D 149 | 4,600 V/mil @.004" | ASTM D 149 | 2,400 V/mil @.004" | ASTM D 149 | 3,710 V/mil @.003" | ASTM D 149 | 1,930 V/mil @.003" | ASTM D 149 | 2,670 V/mil @.003" |
| Dielectric Constant | ASTM D 150 | 3.30 @1 kHz | ASTM D 150 | 3.15 @1 kHz | ASTM D 150 | 3.5 @1 kHz | ASTM D 150 | 3.14 @1 kHz | ASTM D 150 | 2.12 @1 kHz | ASTM D 150 | 8.15-10.46 @1 kHz | ASTM D 150 | 2.56 @1kHz |
| Dissipation Factor | ASTM D 150 | 0.0026 @10 kHz | ASTM D 150 | 0.0013 @1 kHz | ASTM D 150 | 0.0011 @1 kHz | ASTM D 150 | 0.0013 @1 kHz | ASTM D 150 | 0.000025 @1kHz | ASTM D 150 | 0.005-0.019 @1 kHz | ASTM D 150 | 0.0025-0.005 @1 kHz |
| OTHER | | | | | | | | | | | | | | |
| Specific Gravity | ASTM D 792 | 1.256 | ASTM D 792 | 1.27 | ASTM D 792 | 1.37 | ASTM D 792 | 1.24 | ASTM D 792 | .835 | ASTM D 792 | 1.78 | ASTM D 792 | 1.68 |
| Water Absorption | ASTM D 570 | 0.4% @24 hours | ASTM D 570 | 0.25% @24 hours | ASTM D 570 | 0.7% @24 hours | ASTM D 570 | 0.3% @24 hours | ASTM D 570 | 0.01% @24 hours | ASTM D 570 | 0.01% @24 hours | ASTM D 570 | <0.1% @24 hours |
| Refractive Index | – | – | – | 1.658 | – | 1.65 | – | 1.633 | – | 1.463 | – | 1.42 | – | – |
| Haze | ASTM D 1003 | 0.5% | ASTM D 1003 | – | ASTM D 1003 | – | ASTM D 1003 | 0.6% | ASTM D 1003 | 2% | ASTM D 1003 | – | ASTM D 1003 | – |
| Area Factor | – | 20,900 in ² /lb/mil | – | 21,888 in ² /lb/mil | – | 20,000 in ² /lb/mil | – | 22,360 in ² /lb/mil | – | 32,725 in ² /lb/mil | – | 15,480 in ² /lb/mil | – | 16,364 in ² /lb/mil |
| | <ul style="list-style-type: none"> Extremely high temperature resistance and continuous use temperature Excellent flexural and tensile properties Good abrasion and rain erosion resistance Excellent chemical resistance Excellent electrical properties | | <ul style="list-style-type: none"> High heat deflection and continuous use temperature Inherent flame resistance Extremely low NBS smoke evolution & superior limiting oxygen index Exceptional tensile & flexural strength High dielectric strength Low dissipation factor Exceptional mechanical properties Dimensionally stable at varying temperatures Inherent UV stability FDA compliant | | <ul style="list-style-type: none"> High heat deflection and continuous use temperature Exceptional tensile & flexural strength High dielectric strength Exceptional mechanical properties Dimensionally stable at varying temperatures Transparency | | <ul style="list-style-type: none"> Exceptional electrical properties over varying conditions Excellent mechanical properties Good chemical resistance Hydrolytically stable Transparency FDA compliant | | <ul style="list-style-type: none"> Lowest specific gravity of any known thermoplastic Exceptional electrical properties Good chemical resistance High heat resistance Excellent acoustical properties Transparency FDA compliant | | <ul style="list-style-type: none"> Excellent chemical resistance Stable to UV and the effects of weather Low NBS smoke generation and superior LOI Excellent transmittance of solar energy Excellent dielectric strength High heat resistance Excellent physical & mechanical properties for a fluoropolymer FDA compliant | | <ul style="list-style-type: none"> Excellent purity Excellent chemical resistance Low permeability Excellent abrasion resistance Excellent temperature resistance | |

The Company

Westlake Plastics Company is the world leader in extrusion and compression molding technologies of high performance thermoplastics. Our advanced technologies allow us to convert the full range of thermoplastic resins into stock shapes and film.

New product development is the hallmark of Westlake Plastics. Our six business groups (Chemical Resistance, Engineering, Film, High Performance, Medical and Static Control) work in close conjunction with resin suppliers and end users to develop new products that meet the critical needs of customer applications as well as industry specific standards.

Our field and in-house technical experts provide you with excellent resources for product application and recommendations. Our industry focused expertise includes:

- **Analytical Instrumentation**
- **Automotive**
- **Aviation and Aerospace**
- **Chemical Processing**
- **Computer**
- **Electrical/Electronics**
- **Food Handling**
- **Medical**
- **Nuclear Energy**
- **Pharmaceutical**
- **Semiconductor**
- **Telecommunications**

In addition to our knowledge on specific industries, Westlake also offers over 40 years of manufacturing experience. With both compression molding and extrusion technologies, we are able to offer small runs of customized products with short turn around times as well as generous samples.

If it's product or application knowledge you seek, Westlake is ready to respond to your challenges.

Other Westlake Products

Many of our standard products are also available in different grades including: FDA compliant, fire retardant and glass fiber reinforced.

Made from:

- **Engineered and Other Thermoplastic Resins**
 - Acetal Copolymer (ULTRAFORM[®], CELCON[®])
 - Acrylonitrile-Butadiene-Styrene (CYCOLAC[®])
 - Modified Polyphenylene Oxide (NORYL[®])
 - Polycarbonate (LEXAN[®], MAKROLON[®])
 - Low-Density Polyethylene
 - High-Density Polyethylene
 - Ultra-High Molecular Weight Polyethylene
 - Polymethylpentene
 - Polypropylene
 - Crystal Polystyrene (STYRON[®])
 - High Impact Polystyrene (STYRON[®])
- **Fluoropolymer Resins**
 - Ethylene-Chlorotrifluoroethylene (HALAR[®])
 - Ethylene-Tetrafluoroethylene (TEFZEL[®])
 - Polyvinylidene Fluoride (KYNAR[®])
 - TFE/PVDF/HFP Terpolymer
- **High Performance Resins**
 - Polyetheretherketone (VICTREX[®])
 - Polyethersulfone (RADEL[®]A, ULTRASON[®] E)
 - Polyetherimide (Ultem[®])
 - Polysulfone (UDEL[®])
 - Polyphenylsulfone (RADEL[®] R)

Westlake Product

Pomalux[®]
Absylux[®]
Norylux[™]
Zelux[®]
Ethylux[®]
Ultra Ethylux[®]
Lennite[®]
TPX[®]
Propylux[®]
Styraclear[®]
HIPS

ECTFE
ETFE
PVDF
Clariflex[™]

PEEK
PES
Tempalux[®]
Thermalux[®]
PPSU

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Trade Names:

ABSYLUX[®] – Westlake Plastics Co.
CELCON[®] – Ticona
CYCOLAC[®] – GE Plastics
CLARIFLEX[™] – Westlake Plastics Co.
ETHYLUX[®] – Westlake Plastics Co.
HALAR[®] – Ausimont USA, Inc.
KYNAR[®] – Elf Atochem North America, Inc.
LENNITE[®] – Westlake Plastics Co.
LEXAN[®] – GE Plastics
MAKROLON[®] – Mobay

NORYL[®] – GE Plastics
NORYLUX[™] – Westlake Plastics Co.
POMALUX[®] – Westlake Plastics Co.
PROPYLUX[®] – Westlake Plastics Co.
RADEL[®] – Amoco Performance Products, Inc.
STANYL[®] – DSM Engineering Plastics
STYRACLEAR[®] – Westlake Plastics Co.
STYRON[®] – Dow U.S.A.
TEFZEL[®] – Du Pont Co.
TEMPALUX[®] – Westlake Plastics Co.

THERMALUX[®] – Westlake Plastics Co.
TPX[®] – Mitsui Plastics, Inc.
UDEL[®] – Amoco Performance Products, Inc.
ULTEM[®] – GE Plastics
ULTRAFORM[™] – BASF Corp.
ULTRA ETHYLUX[®] – Westlake Plastics Co.
ULTRASON[®] – BASF Corp.
VICTREX[®] – Victrex, Inc.
WESTLAKE[®] – Westlake Plastics Co.
ZELUX[®] – Westlake Plastics Co.

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