

# High Performance in Extreme Environments

Electronic displays and membrane touch switches are seen on a wide range of products including flat panel displays, touchscreens, electroluminescent lamp displays, handheld computers and control panels on mechanical equipment. Most applications incorporating electronic displays require the display screen to be tough, durable and capable of operating reliably in a wide range of environments. The clarity and the cosmetic quality of the display screens are also required to meet exacting specifications.

Autotex XE is a textured, hardcoated and screen printable polyester film substrate, designed for use in the most extreme environmental conditions, including high

temperatures and high humidity. It is resistant to UV radiation, humidity, abrasion and a wide range of outdoor temperatures.

Autotex XE is available in fine or velvet textures on the first surface, with an ink receptive second surface. The second surface provides excellent adhesion properties for screen printing inks. Autotex XE also possesses high optical clarity and a flexible hardcoated surface that combines excellent solvent and abrasion resistance. It is designed specifically for use in applications where conventional polycarbonates or polyesters will undergo premature aging due to environmental conditions.

# Autotex XE

Interface Technology Films

## Hardcoated Textured Polyester Film for Outdoor Applications



Autotex XE Product Line				
Product	First Surface (Textured Hardcoat) Finish	First Surface (Textured Hardcoat) Film Gauge	Second Surface (Ink Receptive Coating) For Solvent Based Inks	Second Surface (Ink Receptive Coating) For UV Curable Inks
Autotex XE V200	Velvet	8 mil (200μ)	☒	
Autotex XE F200	Fine	8 mil (200μ)	☒	
Autotex XE V150	Velvet	6 mil (150μ)	☒	
Autotex XE F150	Fine	6 mil (150μ)	☒	
Autotex XE F207	Fine	8 mil (200μ)	☒	☒
Autotex XE V157	Velvet	6 mil (150μ)	☒	☒
Autotex XE V207	Velvet	8 mil (200μ)	☒	☒
Autotex XE V280	Velvet	10 mil (280μ)	☒	

**YES WE CAN** <sup>SM</sup>

It takes more than innovative, high performance products and superior technical service to help our customers compete and win in today's global marketplace. It takes a total commitment to understanding their needs and the ability to provide the right solutions—every time.

When success is your only goal, trust the company that says "Yes We Can."

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**YES WE CAN** <sup>SM</sup>



# Typical Data for Autotex XE

## Environmental Data

Autotex XE contains a UV absorbing chemical which dramatically increases resistance to both yellowing and premature embrittlement in outdoor applications.

Minimum use temperature: -40°C (-40°F);

Maximum use temperature: Autotex XE can withstand the following conditions: High humidity environments (85% RH): at 85°C / 185° F for a continuous period of 10 days.

Autotex XE UV-resistance testing has been carried out using accelerated and real-life aging tests. Accelerated aging uses an Atlas UVCON or Q Panel accelerated aging cabinet utilizing fluorescent sun lamps.

### Accelerated Aging Test Conditions:

Apparatus: Atlas UVCON or Q Panel Accelerated Aging Cabinet  
 Lamps: 8 Phillips UVA 340 sun lamps  
 Cycle: Alternating cycle of 4 hours UV, 4 hours condensation  
 Temperature: 60°C (140°F) UV cycle; 40°C (104°F) condensation cycle.

## Autotex XE: UV Resistance: Accelerated Aging Testing

Product	Yellowness Index		Flexibility
	Initial	After 1600 hour UVCON or Q Panel cycle	
Autotex (Standard)	<2	26.3	16mm (5/8") Poor.
Autotex XE	<5	8.1	Material can be folded completely back on itself (180°) without cracking. Very good.

Typical data for 0.008", 200μ product. After a 1600 hour cycle switch life testing of Autotex V8XE on a non-embossed panel is expected to exceed 5 million actuations with no adverse effect on the product.

## Autotex XE: UV Resistance: Real Life Testing\*

Product	Yellowness Index		Flexibility
	Initial	Final	
Autotex XE	<5	7.5	Material can be folded completely back on itself (180°) without cracking. Very good.

Typical data for 6-mil (0.006") product.

\* See Industrial Films Technical Manual for real life test conditions; 12 months, Miami, FL

## Autotex XE Electrical Properties

Property	Autotex XE	Test Method
Dielectric strength <sup>1</sup> : 125μ / 5 mil	13.5 kV	ASTM D149-81 6.35mm electrodes in dry air @25° C. / 77° F.
Dissipation factor <sup>1</sup>	0.005	ASTM D150-70
Surface resistivity	>10 <sup>13</sup> Ω/sq. 500 Vd.c	ASTM D257-83 @ 20°C./68% RH
Volume resistivity <sup>1</sup>	10 <sup>15</sup> Ωm 100 Vd.c	ASTM D257-83 @ 25°C. / 77° F. / 1000s

<sup>1</sup> Data derived from Dupont Teijin Films literature. The Autotex XE coating slightly enhances most properties.

## Ozone Depleting Substances

EC Regulation 594/91 classifies ozone depleting substances into a number of different groups, I-VI. Autotex XE does NOT contain any substance classified in groups I-VI nor have any of the substances been used by MacDermid Autotype during manufacture.

For details on the content of each of the groups, please see separate Ozone Depleting Substances document.

## RoHS Compliance (EU)

Autotex XE is compliant with the following EU directives regarding the use of polybrominated biphenyl and diphenyl ethers as flame retardant additives. Autotex XE also free of heavy metals specified in the noted Directives (Lead, Mercury, Cadmium and Chromium VI). For further information on handling and safe disposal, please see the Material Safety Data Sheet for each product.

EU Directives 2003/11/EC, 2002/95/EC  
 Octabromodiphenyl Ether CAS 32536-52-0  
 Polybrominated Diphenylether

Restriction on use of: Pentabromodiphenyl Ether CAS 32534-81-9  
 Polybrominated Biphenyls  
 Lead, Mercury, Cadmium, Chromium VI

EU Directive 2002/96/EC related to waste electrical and electronic equipment is not applicable to Autotex XE.

# Typical Data for Autotex XE

## Autotex XE Optical Properties

Property	Autotex XE	Test Method
BYK Gardner Haze Fine Velvet	55% ± 5% 71% ± 5%	ASTM D1003-77 <sup>1</sup>
Gloss Level (60°) Fine Velvet	7.0% ± 0.5% 4.5% ± 0.5%	ASTM D2457-70 <sup>1</sup>
Texture Profile Fine Velvet	Ra 1.6 ± 0.2μ; Rtm 8μ ± 2μ Ra 2.8 ± 0.2μ; Rtm 13.4μ ± 2μ	MacDermid Autotype Method <sup>2</sup>
Total Luminous Transmission	92% ± 2%	ASTM D1003-77 <sup>1</sup>
UV Absorption	2.3 - 3.0	MacDermid Autotype Method <sup>2</sup> (@370nm)
Yellowness Index <sup>3</sup>	4.5 ± 0.5	ASTM D1925-70

1 Adapted to MacDermid Autotype method, see Test Method Manual

2 See Test Method Manual

3 Typical result on 150μm product tested using X-Rite SP68

## Autotex XE Physical Properties

Property	Autotex XE	Test Method
Relative Density <sup>1</sup>	1.39 gm/cm <sup>3</sup>	ASTM D1505-85
Pencil Hardness	2H	MacDermid Autotype Method <sup>2</sup>
Thicknesses	0.006" 150μ ± 10% 0.008" 200μ ± 10% 0.010" 280μ ± 10%	

1 Data derived from Dupont Teijin Films literature.

2 See Test Method Manual

## Autotex XE Mechanical Properties

Property	Autotex XE	Test Method
Burst strength <sup>1</sup>	1.75 Mpa	ASTM D774-67
Elastic modulus (1% secant) 0.008", 200μ	4 - 5.5 Gpa	ASTM D882 23°C. / 73°F. @ 50% RH, Strain rate - 10%/minute
Elongation at break 0.008", 200μ	70%	ASTM D882 23°C. / 73°F. @ 50% RH, Strain rate - 50%/minute
MIT fold durability	>20,000 folds TD	ASTM D2176-69 <sup>2</sup>
Switch Life <sup>3</sup>	>5 million flexes	MacDermid Autotype Method <sup>3</sup>
Tensile strength at break	150 MPa (150N/mm <sup>2</sup> )	ASTM D882
Tensile strength at yield point	100 MPa (100 N/mm <sup>2</sup> )	ASTM D882
Tear strength	350 MPa (350 N/mm <sup>2</sup> )	ASTM D882

1 Data derived from Dupont Teijin Films literature

2 Adapted to MacDermid Autotype Method, see Test Method Manual

3 See Switch Actuation Testing, test conditions

## Autotex XE Chemical Properties

Property	Autotex XE	Test Method
Coefficient of hygroscopic expansion <sup>1</sup>	MD 8x10 <sup>-6</sup> (per 1% RH) TD 7x10 <sup>-6</sup> (per 1% RH)	DuPont Teijin Films Method <sup>1</sup> Between 40-80% RH
Moisture vapor transmission rate (MVTR) <sup>1</sup>	3.57g/m <sup>2</sup> /24 hours	ASTM F372--73
Oxygen transmission rate <sup>1</sup>	8.2 ml/m <sup>2</sup> / 24 hours	ASTM D1434-82 @ 25° C. / 77° F. 77% RH
Chemical resistance	See Solvent Resistance data	

1 Data derived from Dupont Teijin Films literature. The Autotex XE coating slightly enhances most properties.

# Typical Data for Autotex XE

## Switch Actuation Testing

**Apparatus:** Itronic Fuchs Pneumatic A8274 PS/IEC system with A8274 ZB cylinders rated at 10N at 6 Bar (6.08 x 105 Nm-2)

**Actuator finger:** 8.5mm diameter, 45° Shore D hardness rubber.

**Actuation rate:** 120 per minute

All testing is performed on a flat panel with a total spacer thickness of 0.008" / 200µ and a spacer hole diameter of 13mm. Depending on the nature of the emboss and the level of exposure to sunlight, switch life is likely to be reduced compared to an unembossed overlay due to the increased stresses experienced during actuation.

Although conclusions may be drawn, it is important to note that any accelerated aging technique is unique and cannot be related directly to real time performance.

The use of MacDermid Autotype Windotex on Autotex XE will yellow and embrittle when exposed to sunlight over time, contact MacDermid Autotype for further information. (Windotex is a UV-curable clear window lacquer.)

All results published here are offered in good faith, but due to the variations in the environmental conditions, do not constitute a specification and no guarantee is given or implied. Customers are therefore encouraged to carry out their own tests to establish whether the product has sufficient durability for the proposed end use.

## Autotex XE Thermal Properties

Property	Autotex XE	Test Method
Coefficient of thermal expansion <sup>1</sup>	0.002% / degree	DuPont Teijin Films Method between 20-50°C
Dimensional stability	<0.2% at 120°C. / 248°F. MD maximum shrinkage	MacDermid Autotype Method <sup>2</sup>
Maximum and minimum use temperatures	See Environmental Data	MacDermid Autotype Method <sup>2</sup>

<sup>1</sup> Data derived from Dupont Teijin Films literature for 5-mil (0.005") Melinex® OD polyester film.  
<sup>2</sup> See Test Method Manual

## Solvent Resistance Data

With continuous contact, some chemicals will begin to remove the UV absorber, reducing its UV resistance. Autotex XE withstands five hours exposure, under DIN 42 115 Part 2, to the following chemicals, without significant visible change or loss of UV resistance:

- Acetic acid (10%)
- Ammonia (2%)<sup>1</sup>
- Ariel powder in solution<sup>1</sup>
- Bleach<sup>1</sup>
- Caustic soda (2%)<sup>1</sup>
- Cutting oil
- Diesel
- Downey / Lenor<sup>1</sup>
- Glycerine
- Gumption<sup>1</sup>
- Hydrochloric acid (10%)
- Nitric acid (10%)
- Persil powder in solution<sup>1</sup>
- Petroleum spirit<sup>1</sup>
- Potassium carbonate solution<sup>1</sup>
- Potassium ferricyanide
- SBP 60/95<sup>1</sup>
- Sodium carbonate solution<sup>1</sup>
- Sulfuric acid (10%)
- Tomato ketchup
- Water
- White Spirit
- Windex<sup>1</sup>
- Wisk
- Paraffin oil
- Pure turpentine
- Linseed oil
- Castor oil

<sup>1</sup>Extremely faint glossing of the texture was noted.

Exposure to the following chemicals under the above conditions causes slight glossing of the texture and a reduction in the UV resistance of the product. Occasional splashing with the chemicals will not affect the texture or reduce UV resistance.

- Cyclohexanol<sup>2</sup>
- Glycol
- Methanol
- Formic acid (50%)
- Industrial Methylated Spirits
- Formaldehyde solution
- Isopropanol

<sup>2</sup>A white stain was noted.

Exposure to the following chemicals under the above conditions will cause blistering to the texture. However occasional splashing will not affect texture or reduce UV resistance.

- Acetone
- Methyl Ethyl Ketone
- Toluene

Autotex XE is *not* resistant to the following:

- Concentrated mineral acids
- Methylene chloride
- Tetrahydrofuran
- Concentrated caustic solution
- High pressure steam at over 100°C
- Benzyl alcohol
- Dimethylformamide