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AUTOTEX XE

Product Data Sheet

Autotex XE has been developed for applications where high or widely fluctuating temperatures, excessive humidity and strong levels of ultraviolet light are encountered and is ideal for both flat and tactile membrane switches and keyboards.

XE stands for Extreme Environment and typical applications for the material are as a substrate for instrument, fascia and membrane switch panels that are used in outdoor or harsh industrial conditions.

1. PRODUCT DESCRIPTION

Autotex XE is a polyester based film, with specially constructed hardcoat and primer layers. Unlike conventional films, however, that can delaminate, become brittle or flake under extreme conditions, the various layers in Autotex XE are formulated to resist ultraviolet light, moisture and wide variations in temperature. Conventional films without the special MacDermid Autotype UV resistance go brittle and yellow very quickly when subjected to UV light.

Product range:

Autotex XE Velvet V150, V200, V157, V207	Velvet texture 150 and 200 micron
Autotex XE Fine F150, F200 F157, F207	Fine texture 150 and 200 micron

Primer:

Autotex XE (V150, V200, F150, F200)

Autotex XE has the same ink adhesion primer on the reverse surface as Autotex. This primer confers excellent adhesion to a wide range of solvent based graphic inks. The primer is not recommended for use with UV cured graphic inks or a combination of solvent and UV graphic inks because the adhesion performance will be inconsisent.

Autotex XE (7 Series) (V157, V207, F157, F207)

The primer on Autotex XE (7 Series) offers excellent adhesion to a wide range of solvent inks and improved adhesion to UV graphic inks. We recommend that you carry out your own full printing trials and in-house evaluation.

Please note that some of the electrical and mechanical properties of the 7 Series films differ from the standard product. Please refer to the Autotex (7 Series) product data sheet.

Windows:

Windotex is not a UV resistant product and is therefore not recommended for prolonged use outdoors. Due to the stabilising chemistry used in Autotex XE, the adhesion of Windotex to the surface may be impaired. Contact MacDermid Autotype for further information.

2. Product applications

Autotex XE may be used as a substrate in the following markets:

Markets

Membrane switch overlays

Fascia panels

Signage

Nameplates

Labels/Product marking

Major Benefits

- Increased UV resistance compared to standard Autotex
- Increased humidity resistance
- Increased scratch resistance
- Consistent textured surface
- Attractive appearance

3. Chemical Properties

Property	Autotex XE	Test Method
Coefficient of hygroscopic expansion[1]	MD 8 x 10^{-6} (per 1% RH) TD 7 x 10^{-6} (per 1% RH)	DuPont Teijin Films Method[1] Between 40-80% RH
Moisture vapour transmission rate (MVTR)[1]	3.57g/m^2/24 hours	ASTM F372-73
Oxygen transmission rate[1]	8.2ml/m^2/24 hours	ASTM D1434-82 @ 25°C, 77% RH
Chemical Resistance	See Autotex XE Solvent Resistance and Environmental data	

[1] Data derived from DuPont Teijin Films literature for 125µ Melinex OD. [2] The Autotex XE coating slightly enhances most properties.

4. Electrical Properties

Property	Autotex XE	Test Method
Dielectric strength[-1] 125µ	13.5 kV	ASTM D149
Dissipation factor[1]	0.005	ASTM D150-70
Surface resistivity	>10^{13} Ω/sq 500Vd.c	ASTM D257-83 @ 20°C/54% RH
Volume resistivity[1]	10^{15} Ωm 100 Vd.c	ASTM D257-83 @ 25°C/1000s

[1] Data derived from DuPont Teijin Films literature for 125µ Melinex OD. [2] The Autotex XE coating slightly enhances most properties.

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5. Mechanical Properties

Property	Autotex XE	Test Method
Young's modulus[1]	3700N/mm^2	ASTM D882
Elongation at break	70%	ASTM D1505
Switch life[4]	>5 million flexes	Autotype Method[3]
Tensile strength at break	150N/mm^2	ASTM D882
Tensile strength at yield point	100N/mm^2	ASTM D882
Tear strength	350N/mm^2	ASTM D882

[1] Data derived from DuPont Teijin Films literature for Melinex OD [2] Adapted to Autotype Method, see Test method manual [3] See Test method manual [4]Please see section 9.4.1 for information on embossing Autotex XE.

6. Optical Properties

Property		Autotex XE (150µ)	Test Method
Gardner Haze	Velvet Fine	71% ±5% 55% ±5%	ASTM D1003-77[1]
Gloss Level (60°)	Velvet Fine	4.3% ±0.5% 7.0% ±0.5%	ASTM D2457-70[1]
Texture profile	Velvet Ra Velvet Rtm Fine Ra Fine Rtm	2.8µ ±0.2µ 13.4µ ±2µ 1.6µ ±0.2µ 8µ ±2µ	Autotype method[2]
Total luminous transmission		92% ±2%	ASTM D1003-77[1]
UV absorption		2.5 - 3	Autotype method[2] (370 nm)
Yellowness index		<5	ASTM D1925-70

[1] Adapted to Autotype method, see Test method manual [2] See Test method manual

7. Physical Properties

Property		Autotex XE	Test Method
Density[1]		1.39g/cm^3	ASTM D1505
Thicknesses	V150 V200 F200	150µ ±10% 200µ ±10% 200µ ±10%	

[1] Data derived from DuPont Teijin Films literature for Melinex OD [2] See Test method manual

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8. Thermal Properties

Property	Autotex XE	Test Method
Coefficient of thermal expansion[1]	0.002%/degree	DuPont Teijin Films Method
Coefficient of humidity expansion[1]	0.0009%/%RH	DuPont Teijin Films Method
Dimensional stability	<0.2% at 120°C MD maximum shrinkage	Autotype Method[2]
Maximum processing temperature	120°C	
Maximum and minimum use temperatures	Maximum temperature High humidity (85% RH) 85°C Low humidity (<10%RH) 85°C Minimum temperature -40°C (-40°F)	Autotype Method[2]

[1] Data derived from DuPont Teijin Films literature for 125µ Melinex OD [2] See Test method manual

9. UV RESISTANCE

The testing of Autotex XE has incorporated three separate techniques, one of which is detailed below.

9.1 Accelerated ageing using an Atlas UVCON accelerated ageing cabinet utilising fluorescent sun lamps.

9.1.1 Test Conditions

Apparatus: Atlas UVCON Accelerated ageing cabinet
Lamps: 8 Phillips UVA 340 sun lamps
Cycle: Alternating cycle of 4 hours UV, 4 hours condensation
Temperature: 40°C during condensation cycle
60°C during UV cycle

9.1.2 Results

Product	Yellowness Index		Flexibility
	Initial	After 1600 hou UVCON cycle	Minimum diameter of curvature to which material can be formed before cracking occurs (coating side outwards)
Autotex	1.6	26.3*	16mm (5/8”), Poor
Autotex XE	4.8	8.1	Material can be folded completely back on itself (180°) without cracking, Very Good

Typical results for 150µ product

*Standard Autotex becomes brittle after 100 hours and flaking of the coating occurs later in the UVCON cycle

9.1.3 Switch life testing, see section 9.4 for test conditions

After a 1600 hour cycle switch life testing of Autotex XE on a non-embossed panel exceeded 5 million actuations with no adverse effect on the product.

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9.2 Accelerated ageing by focusing direct sunlight onto test samples

9.2.1 Test Conditions

Apparatus: The South Florida Tests Service Sun Accelerated Weathering Device

Test method: Samples are subjected to Arizona (USA) sunlight (total UV 290-385nm) concentrated via mirrors/lenses into the target area.

No temperature control is performed other than the use of a localised fan. Samples are subjected to a water spray (8 min/hour of active sunlight) to simulate rain.

The samples were exposed to 333 mJ/m^2 (total UV) which is calculated to simulate one year's real time exposure in Arizona.

9.2.2 Results

Product	Yellowness Index		Flexibility
	Initial	Final	Minimum diameter of curvature to which material can be formed before cracking occurs (coating side outwards)
Autotex	1.7	10.6	9.5mm (3/8"), Poor
Autotex XE	4.7	7.5	Material can be folded completely back on itself (180°) without cracking, Very Good

Typical results for 150µ product

9.2.3 Switch life testing, see section 9.4 for test conditions

After exposure, switch life testing of Autotex XE on a non-embossed panel exceeded 5 million actuations with no adverse effect on the product.

9.3 Real time continuous exposure in Miami, Florida

9.3.1 Test Conditions

Apparatus: South facing 45° angled mounting frame in Miami, Florida, USA.

Test method: Samples of Autotex XE were subjected to real time ageing in Florida continuously for 12 months.

9.3.2 Results

Product	Yellowness Index		Flexibility
	Initial	Final	Minimum diameter of curvature to which material can be formed before cracking occurs (coating side outwards)
Autotex XE	4.8	7.55	Material can be folded back on itself (180°) with only slight cracking. Good

9.4 Switch Actuation Testing

9.4.1 Test Conditions

Apparatus: Itronic Fuchs Pneumatic A8274 PS/IEC system with A8274 ZB cylinders rated at 10N at 6 Bar (6.08×10^5 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 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 ageing technique is unique and cannot be related directly to real time performance.

The use of Windotex on Autotex XE is not recommended as it will yellow and embrittle when exposed to sunlight. Due to the stabilising chemistry used in Autotex XE the adhesion of Windotex to the surface may be impaired. Contact MacDermid Autotype for further information.

All results published are offered in good faith but due to the variations in the weather they 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.

10. 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 of the content of each of the groups, please see separate ozone depleting substances document.

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