

## ▶ AUTOTEX XE

**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 Autotype UV resistance go brittle and yellow very quickly when subjected to UV light.

#### Product range:

|                                       |                                      |
|---------------------------------------|--------------------------------------|
| Autotex XE Velvet<br>V150, V200, V207 | Velvet texture<br>150 and 200 micron |
| Autotex XE Fine<br>F150, F200         | Fine texture<br>150 and 200 micron   |

#### Primer:

##### Autotex XE (V150, V200, 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 inconsistent.

##### Autotex XE (7 Series) (V207)

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 Autotype for further information.

### 2. PRODUCT APPLICATIONS

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

#### Markets

- Membrane switch overlays
- Facia 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 <sup>1</sup>     | MD 8 x 10 <sup>-6</sup> (per 1% RH)<br>TD 7 x 10 <sup>-6</sup> (per 1% RH) | DuPont Teijin Films Method <sup>1</sup><br>Between 40-80% RH |
| Moisture vapour transmission rate (MVTR) <sup>1</sup> | 3.57g/m <sup>2</sup> /24 hours   | ASTM F372-73   |
| Oxygen transmission rate <sup>1</sup>                 | 8.2ml/m <sup>2</sup> /24 hours   | ASTM D1434-82 @ 25°C, 77% RH                                 |
| Chemical Resistance                                   | See Autotex XE Solvent Resistance and Environmental data                   |  |

<sup>1</sup> Data derived from DuPont Teijin Films literature for 125µ Melinex OD. The Autotex XE coating slightly enhances most properties.

## 4. Electrical Properties

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

<sup>1</sup> Data derived from DuPont Teijin Films literature for 125μ Melinex OD. The Autotex XE coating slightly enhances most properties.

## 5. Mechanical Properties

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

<sup>1</sup> Data derived from DuPont Teijin Films literature for Melinex OD <sup>2</sup> Adapted to Autotype Method, see Test method manual

<sup>3</sup> See Test method manual <sup>4</sup>Please see section 9.4.1 for information on embossing Autotex XE.

## 6. Optical Properties

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

<sup>1</sup> Adapted to Autotype method, see Test method manual <sup>2</sup> See Test method manual

## 7. Physical Properties

| Property                            | Autotex XE                          | Test Method |
|-------------------------------------|-------------------------------------|-------------|
| Density <sup>1</sup>                | 1.39g/cm <sup>3</sup>               | ASTM D1505  |
| Thicknesses<br>V150<br>V200<br>F200 | 150µ ±10%<br>200µ ±10%<br>200µ ±10% |             |

<sup>1</sup> Data derived from DuPont Teijin Films literature for Melinex OD <sup>2</sup> See Test method manual

## 8. Thermal Properties

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

<sup>1</sup> Data derived from DuPont Teijin Films literature for 125µ Melinex OD <sup>2</sup> 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 hour UVCON cycle |   |
| 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.

## 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<sup>2</sup> (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 |   |
| 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 |  |
| 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 ( $6.08 \times 10^5 \text{ Nm}^{-2}$ )

**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 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 Autotype during manufacture.

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

# Product Data



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The information and recommendations in this publication are believed to be accurate and are offered in good faith but do not constitute specifications. Suggestions concerning uses and applications are only the opinion of Autotype International Limited and users should carry out their own testing procedures to confirm suitability for their purposes. Except in the case of death or personal injury caused by the materials, Autotype International Limited MAKES NO WARRANTY OF ANY KIND AND EXCLUDES ANY STATUTORY WARRANTY EXPRESS OR IMPLIED other than that materials conform to their current applicable standard specification. Statements herein therefore should not be construed as guarantees of satisfactory quality or fitness for purpose. The responsibility of Autotype International Limited for claims arising out of breach of guarantee, negligence, strict liability or otherwise is limited to the purchase price of the material.

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