

# AUTOSTAT

## Product data sheet

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**Heat stabilised polyester film has low residual shrinkage at elevated temperatures. This is essential when tight registration tolerances need to be maintained during multiple printing operations.**

### 1. PRODUCT DESCRIPTION

Autostat is a high quality stabilised polyester film, with a shrinkage specification of <0.2% MD at 150°C (typically <0.1% at 120°C), and state of the art lay flat and roll formation properties. It is available in sheets and rolls.

**Product Range:**

Autostat CT3, CT4, CT5, CT7  
clear, adhesion treated, 75, 100, 125, 175 micron

Autostat CUS4, CUS5, CUS7  
clear, untreated, 100, 125, 175 micron

Autostat AHU3, AHU4, AHU5, AHU10  
hazy, untreated, 75, 100, 125, 250 micron

Autostat HT5  
hazy, adhesion treated, 125 micron

Autostat WT5  
opaque white satin finish, adhesion treated,  
125 micron

Autostat WU5  
opaque white satin finish, untreated, 125 micron

### 2. PRODUCT APPLICATIONS

Autostat is used for the manufacture of membrane and conventional switch circuitry layers such as computer keyboards.

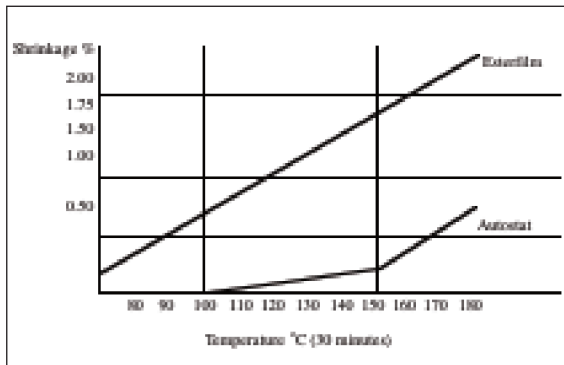
Autostat WT5 and WU5 can be used as general printing substrates where a white background is required, eg labels, insert graphics. As top circuitry layers, Autostat WT5 and WU5 back up colours on the graphics overlay increasing their opacity whilst totally hiding the circuitry underneath. The white colour also acts as an excellent reflector for surface mount LED's.

### 3. Product Performance

Thermal	Autostat	Test Method
<b>Thermal</b> ▶ Dimensional stability Thicknesses >75 $\mu$  ≤75 $\mu$	MD ≤0.2% max @ 150°C/30 mins (typically ≤0.1% max @ 120°C/30 mins) TD ±0.05% max @ 150°C/30 mins  MD ≤0.3% max @ 150°C/30 mins TD ±0.1% max @ 150°C/30 mins  + indicates expansion - indicates shrinkage	Autotype Method <sup>1</sup>

<sup>1</sup> See Test method manual

#### . MD (machine direction) SHRINKAGE VERSUS TEMPERATURE FOR 125 $\mu$ FILMS



#### 5. TD (transverse direction) SHRINKAGE AT 150°C FOR 30 MINUTES

TD shrinkage is much lower than MD shrinkage and may even be completely absent. When the film does not shrink at all a small positive expansion may take place. A typical result for 125 $\mu$  Autostat would be MD -0.2% and TD +0.02%.

### 6. INK ADHESION

The adhesion treatment used on the CT, HT and WT grades uses the industry standard chemistry. This treatment enhances adhesion of UV curable dielectric ink, but may not be fully compatible with certain conductive silver inks. See chart below.

#### 6.1 Autostat ink adhesion summary

A selection of inks tested in our laboratories are shown in the table. This list is not comprehensive, but is representative of inks available from named suppliers.

	Treated Autostat	Untreated Autostat
<b>ACHESON</b>		
Conductive inks		
725A	✓✓	✓✓
PF410(477SS)	✓	✓✓
418SS	✓✓	✓✓
423SS	✓	✗
440A	✓	✓
965SS	✗	✗
PF407A	✓	✓
Dielectric inks		
451SS	✓✓	✗
452SS	✓✓	✓✓
1020SS	✓✓	✗
<b>DUPONT</b>		
Conductive inks		
5000	✓✓	✓✓
5007E	✓✓	✓✓
5025	✓✓	✓✓
5075	✓✓	✓
7102	✓	✗
Dielectric inks		
5018	✓✓	✓
<b>COATES</b>		
Conductive inks		
26-8204	✓✓	✗
26-8203	✓	✗
Dielectric inks		
40-317	✓✓	✗
<b>ENGLEHARD</b>		
Conductive inks		
S100	✓	✓
S170	✗	✗
S190	✓✓	✓✓
S200	✓	✓
C1010	✗	✗
Dielectric inks		
UVD2010	✓✓	✓✓

- 44 Recommended  
 4 Test fully before use, can be subject to variation  
 8 Not recommended

These results are intended as a guide only. Full in-house testing is essential to ensure success under user conditions.

## 7. Chemical Properties

Property	Autostat	Test Method
Chemical Resistance	as for Autotex	DIN 42 115
Coefficient of hygroscopic expansion <sup>1</sup>	MD $8 \times 10^{-6}$ (per 1% RH) TD $7 \times 10^{-6}$ (per 1% RH)	DuPont Teijin Films Method <sup>1</sup> Between 40-80% RH
Moisture vapour transmission rate (MVTR) <sup>1</sup>	3.57g/m <sup>2</sup> /24 hours (2.3g for Autostat WT5)	ASTM F372-73
Oxygen transmission rate <sup>1</sup>	8.2ml/m <sup>2</sup> /24 hours (6.5 ml for Autostat WT5)	ASTM D1434-82 @ 25°C, 77% RH

<sup>1</sup> This data is typical of polyester films and is derived from DuPont Teijin Films literature

## 8. Electrical Properties

Property	Autostat	Test Method
Dielectric strength <sup>1</sup> 125μ 175μ	125kV/mm 105kV/mm	ASTM D149-81 6.35mm electrodes in dry air @ 25°C
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> This data is typical of polyester films and is derived from DuPont Teijin Films literature

## 9. Mechanical Properties

Property	Autostat	Test Method
Elastic modulus <sup>1</sup> 125μ (1% secant)	3600N/mm <sup>2</sup>	ASTM D882-83 23°C, @ 50% RH. Strain rate, 50%/minute
Elongation at break <sup>1</sup> 125μ	90-120%	ASTM D882-83 23°C, @ 50% RH. Strain rate, 50%/minute
Switch life <sup>2</sup>	>5 million flexes	Autotype Method <sup>3</sup>
Tensile strength at break <sup>1</sup> 125μ	150-220N/mm <sup>2</sup>	ASTM D882-83
Yield strength <sup>1</sup>	80-90N/mm <sup>2</sup>	ASTM D882-83

<sup>1</sup> This data is typical of polyester films and is derived from the base manufacturer's literature

<sup>2</sup> Due to high pigment levels in WT5 switch life can be reduced, this is dependent on switch geometry. We therefore recommend testing of this fully. <sup>3</sup> See Test method manual

## 10. Optical Properties

Property	Autostat	Test Method
Gardner Haze	CT3 < 1% CT4 < 1% CT5 < 2% CT7 < 3% HT5 16% ± 2% WT5 100% WU5 100% CUS4 < 2% CUS5 < 2% CUS7 < 2% AHU3 < 3% AHU4 40% ± 2% AHU5 43% ± 2% AHU10 45% ± 2% 88% ± 2%	ASTM D1003-77 <sup>1</sup>
Total luminous transmission	CT 93% ± 2% CUS 91% ± 2% HT 90% ± 2% WT/WU 6% ± 2% AHU3/5 85% ± 2% AHU10 66% ± 2%	ASTM D1003 <sup>1</sup>
Yellowness Index	CT < 2 CUS < 2.5 HT < 2 AHU3 < 4	ASTM D1925-70 <sup>1</sup>

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

## 11. Physical Properties

Property	Autostat	Test Method
Density <sup>1</sup>	1.40g/cm <sup>2</sup>	ASTM D1505-85 modified to DuPont Teijin Films method at 23°C
Thicknesses:  All Autostat grades detailed in Section 1 Page E1	Nominal ± 5% <sup>2</sup>	

<sup>1</sup> This data is typical of polyester films and is derived from DuPont Teijin Films literature

<sup>2</sup> Mean thickness



## 12. Thermal Properties

Property	Autostat	Test Method
Maximum processing temperature	150°C	
Maximum use temperature	120°C flat surface 70-80°C embossed @ 110°C	
Minimum use temperature	-40°C (-40°F)	

## 13. Miscellaneous

Property	Autostat	Test Method
Roll properties: Skew	<0.1% (10mm in 10m)	

## 14. OZONE DEPLETING SUBSTANCES

EC Regulation 594/91 classifies ozone depleting substances into a number of different groups, I-VI. Autostat 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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January 2007

