

Advanced Polymer Films

RowTec®
Polycarbonate Film

SolaTuf®
Impact Modified Acrylic Film

RowLux®
Illusion Film



Engineered to Deliver Variety™

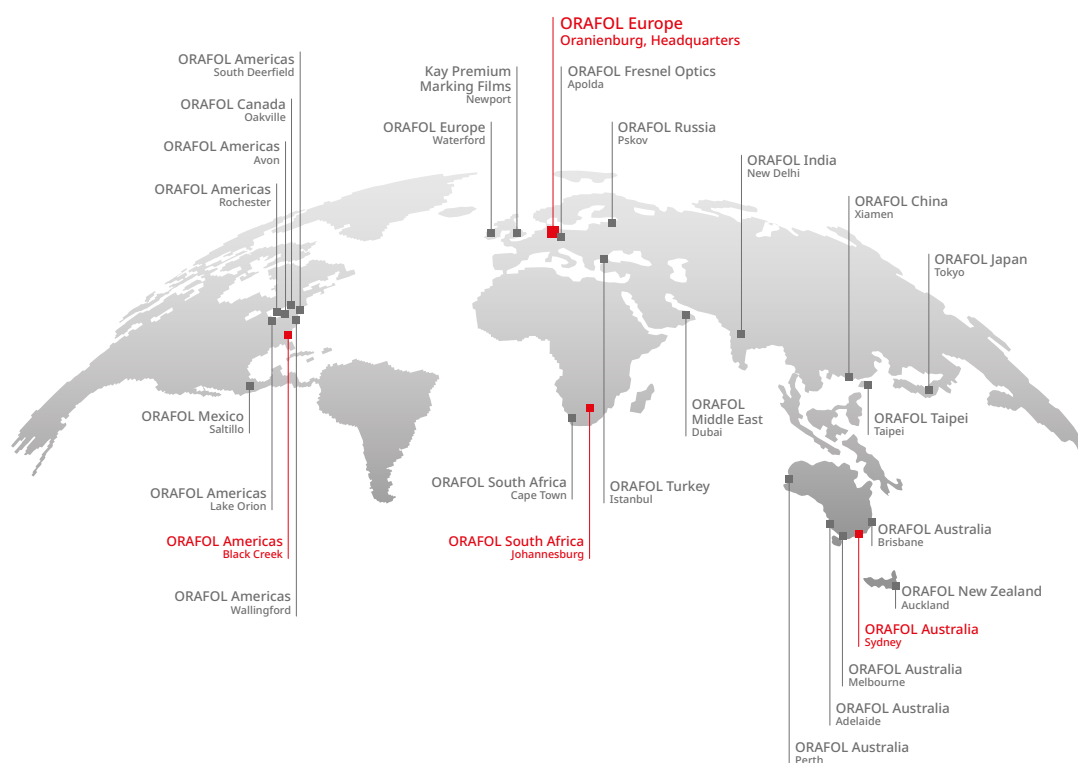


ORAFOL Europe GmbH

Headquarters and production facility

ORAFOL Europe GmbH is one of the market leading manufacturers worldwide of innovative self-adhesive graphic materials, and adhesive tape systems. Rowland's technical excellence together with ORAFOL's worldwide distribution network make the newly created Advanced Polymer Films Division the first choice in outstanding film quality and reliable local service.

ORAFOL's Worldwide Locations



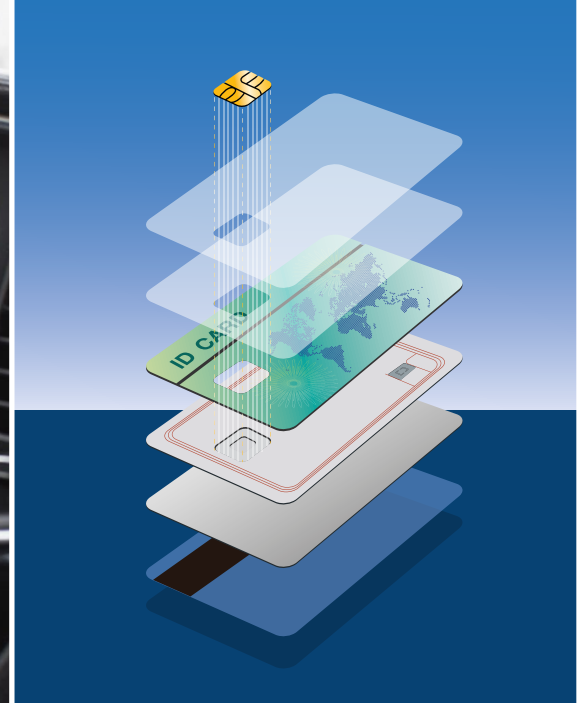
Advanced Polymer Films

The ORAFOL Advanced Polymer Films line includes the high-quality extruded film and sheet product families RowTec® Polycarbonate Films (PC), SolaTuf® Acrylic Films (AC) and RowLux® Multi-lensed Polycarbonate Films (PC).

Made in Germany.

4	RowTec®	PC1 Standard Range
4	RowTec® FDA	PC3 Direct Food Contact
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PLEASE NOTE: Properties reported in this brochure are typical of average lots. ORAFOL makes no representation that the material in any particular shipment will conform exactly to the value given herein nor is ORAFOL responsible for the performance of this material for a given application. The user of the material should perform their own testing to determine the suitability of the material for the intended use. Applications depicted herein are not specifications. They are provided as information only.



RowTec® Polycarbonate Film – PC1

RowTec® PC1 Polycarbonate Film is extruded from the finest quality resin and to the highest quality for graphic arts grade films. Key performance properties include superior optical, thermal, mechanical and electrical characteristics. RowTec® film is available in a variety of custom colours, textures, and thicknesses for the ultimate in design freedom. It is easily printed, die-cut, embossed, thermoformed, and hot stamped. RowTec® film delivers the clarity, dimensional stability, and impact resistance properties you demand.

RowTec® FDA Polycarbonate Film – PC3

RowTec® FDA Polycarbonate Film is a specialty grade of film that complies with the U.S. Food, Drug and Cosmetic Act and Food Additive Regulations 21 CFR 177.1580. Typical applications include food applications which require this compliance. RowTec® FDA clear film is available in a variety of textures and thicknesses for optimum design freedom.

For Secure Cards and Documents

RowTec® SC Polycarbonate Film - PC1, PCH

RowTec® SC Polycarbonate Films, PCX-XXX-2600, meet the growing demand for durable performance, precision and reliability required by manufacturers of security and identity cards, passports, licenses and many other Secure Card applications.

RowTec® SC Films are an extension of the RowTec® family of Polycarbonate Films that for many years have been highly valued by customers around the world for the most demanding precision graphic applications.

RowTec® SC is well-known for consistent quality and stability. RowTec® SC consists of three types of films: clear, white and laser markable. The clear films are available in thicknesses from 0,051 mm - 0,762 mm and deliver excellent clarity while the white films provide extremely high opacity for their thickness, which also ranges from 0,051 mm - 0,762 mm. The laser markable films are available in thicknesses from 0,051 mm - 0,635 mm.

RowTec® SC Films have a unique surface texture designed specifically for Secure Card applications.

Technical Data - Overview

Typical bulk properties for clear films unless otherwise noted

Property	Test Method	Unit	Value
Physical			
Specific Gravity	ASTM D-792	g / cm ³	1,20
Area Factor	ASTM D-590	m ² / kg / μm	833
Water Absorption at Equilibrium	ASTM D-570	%	0,32
Rockwell Hardness	ASTM D-785	R Scale	118
Pencil Hardness	ASTM D-3363	Scratch Hardness	B
Optical			
Refractive Index @ 25 °C	ASTM D-542	N _D	1,586
Light Transmission	ASTM D-1003	%	89
Haze ⁴	ASTM D-1003	%	0,5
Yellowness Index	ASTM D-1925	---	< 1
Mechanical			
Tensile Strength, Break	ASTM D-638	MPa	72
Tensile Strength, Yield	ASTM D-638	MPa	60
Tensile Elongation, Break	ASTM D-638	%	150
Tensile Modulus of Elasticity	ASTM D-638	MPa	2.400
Tear Strength, Initial	ASTM D-1004	N / μm	0,25 - 0,32
Tear Strength, Propagation	ASTM D-1922	g / μm	1,18 - 2,15
Burst Strength ¹	ASTM D-774	Mullen, MPa	0,275 - 0,310
Fold Endurance ²	M.I.T.	Double Folds	200
Impact Strength, Gardner ³	ASTM D-5420	J	13
Thermal			
Deflection Temperature under Flexural Load @ 1,8 MPa	ASTM D-648	°C	142
Tensile Heat Distortion @ 0,34 MPa	ASTM D-1637	°C	150
Specific Heat Capacity @ 25 °C	ASTM C-351	J / g / °C	1,26
Thermal Conductivity	ASTM C-177	W / m °C	0,20
Coefficient of Thermal Expansion	ASTM D-696	cm / cm / °C	68,4 x 10 ⁻⁶
Strain Relief @ 135 °C	ASTM D-1204	%	< 0,2
Brittleness Temperature	ASTM D-746	°C	-135
Vicat Softening Temperature	ASTM D-1525	°C	152
Electrical			
Dielectric Strength @ 22 °C in oil, short time ²	ASTM D-149	kV / cm	670
Dielectric Constant 60 Hz / 1 MHz	ASTM D-150	---	3,00 / 3,00
Dissipation Factor 60 Hz / 1 MHz	ASTM D-150	---	0,001 / 0,002
Volume Resistivity	ASTM D-257	Ω-cm	10 ¹⁷
Surface Resistivity	ASTM D-257	Ω-cm ²	10 ¹⁵

Footnotes: (1) Value for 0,025 mm film (2) Value for 0,250 mm film (3) Value for 0,762 mm film (4) Value measured for Gloss / Gloss film



RowTec® UV Polycarbonate Film – PC9

RowTec® UV Film utilises a specialty UV modified resin which enables improved ultraviolet stability in outdoor environmental conditions. This film will exhibit less yellowing when compared to standard non-UV modified polycarbonate film. Applications include overlays, outdoor menu boards, nameplates, labels, and decals where UV stability is desired.

RowTec® UV Enhanced Polycarbonate Film – PC1

The first surface of our PC1-001-AM00 Film is made of a high performance UV Resistant Film that provides excellent UV blocking for the RowTec® polycarbonate film base. The first surface is a glare-free velvet texture while the second surface is fine matt. Standard thicknesses range from 0,178 mm - 0,762 mm. Common applications include outdoor nameplates, labels and decals as well as gas pump graphics.

Technical Data - Overview

Typical bulk properties for clear films unless otherwise noted

Property	RowTec® UV			RowTec® UV Enhanced		
	Test Method	Units	Value	Test Method	Units	Value
Physical						
Specific Gravity	ASTM D-792	g / cm ³	1,20	ASTM D-792	---	1,20
Area Factor	ASTM D-590	m ² / kg / μm	832	ASTM D-590	m ² / kg / μm	832
Water Absorption at Equilibrium	ASTM D-570	%	0,35	ASTM D-570	%	0,32
Rockwell Hardness	ASTM D-785	R Scale	118	ASTM D-785	M Scale	40
Optical						
Refractive Index @ 25 °C	ASTM D-542	N _D	1,587	---	---	---
Light Transmission	ASTM D-1003	%	89	ASTM D-1003	%	> 89
Haze	ASTM D-1003	%	< 1	---	---	---
Yellowness Index	ASTM D-1925	---	< 1	ASTM D-1925	---	< 1
Weatherability						
Yellowness Index, control	ASTM D-2565	---	< 1	---	---	---
Yellowness Index, PC9 after 1000 hours Xenon Arc	ASTM D-2565	---	< 1,5	---	---	---
Yellowness Index, PC9 after 2000 hours Xenon Arc	ASTM D-2565	---	< 3	---	---	---
Yellowness Index, regular PC after 1000 hours Xenon Arc	ASTM D-2565	---	< 13	---	---	---
Yellowness Index, regular PC after 2000 hours Xenon Arc	ASTM D-2565	---	< 18	---	---	---
Mechanical						
Tensile Strength, Break	ASTM D-638	MPa	60	ASTM D-882	MPa	65
Tensile Strength, Yield	ASTM D-638	MPa	60	ASTM D-882	MPa	60
Tensile Elongation, Break	ASTM D-638	%	120 - 150	ASTM D-882	%	170
Tensile Modulus of Elasticity	ASTM D-638	MPa	2.400	ASTM D-882	MPa	1.450
Tear Strength, Initial	ASTM D-1004	N / μm	0,25 - 0,32	---	---	---
Tear Strength, Propagation	ASTM D-1922	g / μm	1,18 - 2,15	---	---	---
Impact Strength, Gardner ²	ASTM D-5420	J	13	---	---	---
Thermal						
Deflection Temperature under Flexural Load @ 1,8 MPa	ASTM D-648	°C	137	---	---	---
Coefficient of Thermal Expansion	ASTM D-696	cm / cm / °C	68,4 x 10 ⁻⁶	---	---	---
Brittleness Temperature	ASTM D-746	°C	-135	---	---	---
Vicat Softening Temperature	ASTM D-1525	°C	152	---	---	---
Electrical						
Dielectric Strength @ 22 °C in oil, short time ¹	ASTM D-149	kV / cm	670	---	---	---
Dielectric Constant 60 Hz / 1 MHz	ASTM D-150	---	3,00 / 3,00	---	---	---
Dissipation Factor 60 Hz / 1 MHz	ASTM D-150	---	0,10 / 1,11	---	---	---
Volume Resistivity	ASTM D-257	Ω-cm	10 ¹⁷	---	---	---
Surface Resistivity	ASTM D-257	Ω-cm ²	10 ¹⁵	---	---	---
UV Stability¹ Xenon Arc Accelerated Weathering - ASTM G15 Cycle 2 "UV ENHANCED ONLY"						
Yellowness Index - Baseline Film	---	---	---	ASTM D-1925	---	0,16
Yellowness Index - 500 Hours	---	---	---	ASTM D-1925	---	-0,13
Yellowness Index - 1.000 Hours	---	---	---	ASTM D-1925	---	-0,02
Yellowness Index - 1.500 Hours	---	---	---	ASTM D-1925	---	0,12
Yellowness Index - 2.000 Hours	---	---	---	ASTM D-1925	---	0,38
Yellowness Index - 3.000 Hours	---	---	---	ASTM D-1925	---	0,36
Chemical Resistance - Surface Contact for 1 Hour @ 73o F "UV ENHANCED ONLY"						
Acetone - Fail	Methylene Chloride - Fail	Formula 409® - Pass				
Butyl Cellosolve - Fail	Toluene - Fail	Premium Unleaded Gasoline - Pass				
Ethyl Acetate - Fail	Xylene - Fail	Windex® with Amonia-D® - Pass				
Isopropanol - Fail						

Footnotes: (1) Value for 0,380 mm Film

RowTec® V Polycarbonate Film – PC7 (UL94, VTM-2)

RowTec® V Polycarbonate Film is a clear thin gauge film which carries a UL-94 VTM-2 rating for 0,127 mm - 0,254 mm thicknesses. It is available in a variety of textures. Common uses include backlit panels, membrane switches, nameplates, labels and decals. It is easily prined, die-cut, embossed, thermoformed and hot stamped. RowTec® film delivers the clarity, dimensional stability and impact resistance properties you demand.

RowTec® FR Flame Retardant Polycarbonate Film – PC8 Flame Retardant (UL94, VTM-0)

RowTec® FR is a thin gauge, flame retardant polycarbonate film available in clear and black. It carries a UL-94 VTM-0 rating for 0,076 mm - 0,102 mm clear film. Beginning at 0,127 mm up to 0,762 mm, RowTec® FR carries a UL-94 V-0 rating for clear film. For black film, the UL-94 V-0 rating applies to a thickness range of 0,406 mm - 0,609 mm. It is available in a variety of textures. Common uses include barrier insulation, backlit panels, commercial business equipment, electronic shielding, and flame retardant nameplates and labels.

Technical Data - Overview

Typical bulk properties for clear films unless otherwise noted

Property	Test Method	Units	Value
Physical			
Specific Gravity	ASTM D-792	g / cm ³	1,32
Water Absorption at 24 hours	ASTM D-570	%	0,28
Optical			
Refractive Index @ 25 °C	ASTM D-542	ND	1,60
Light Transmission ¹	ASTM D-1003	%	89
Yellowness Index ¹	ASTM D-1925	---	< 1
Mechanical			
Tensile Strength, Break ¹	ASTM D-882	MPa	60
Tensile Strength, Yield ¹	ASTM D-882	MPa	70
Tensile Elongation, Break ¹	ASTM D-882	%	130
Tensile Modulus of Elasticity ¹	ASTM D-882	MPa	2.200
Tear Strength, Initial ¹	ASTM D-1004	N / μm	0,3
Tear Strength, Propagation ¹	ASTM D-1922	g / μm	2
Impact Strength, Gardner ²	ASTM D-5420	J	28
Thermal			
Deflection Temperature under Flexural Load @ 1,8 MPa	ASTM D-648	°C	142
Specific Heat Capacity @ 25 °C	ASTM E-1269	J / g / °C	1,26
Thermal Conductivity	ASTM D-5470	W / m °C	0,20
Coefficient of Thermal Expansion	ASTM E-831	cm / cm / °C	5,8 x 10 ⁻⁵
Glass Transition Temperature	ASTM D-3418	°C	152
Brittleness Temperature	ASTM D-746	°C	-135
Vicat Softening Temperature	ASTM D-1525	°C	152
Electrical			
Dielectric Strength @ 22°C in oil, short time ¹	ASTM D-149	kV / cm	590
Dielectric Constant @ 60 Hz / 1MHz	ASTM D-150	---	2,9 / 2,8
Dissipation Factor @ 60 Hz / 1MHz	ASTM D-150	---	0,0026 / 1,17
Volume Resistivity	ASTM D-257	Ω-cm	10 ¹⁷
Surface Resistivity	ASTM D-257	Ω-cm ²	10 ¹⁵
Arc Resistance, Tungsten Electrodes	ASTM D-495	sec	62
Flammability			
RowTec® V			
Flammability Classification (Clear 125 - 250 μm)	UL 94	---	VTM-2
RowTec® FR			
Flammability Classification (Clear 75 - 100 μm)	UL 94	---	VTM-0
Flammability Classification (Clear 125 - 762 μm)	UL 94	---	V-0
Flammability Classification (Black 410 - 610 μm)	UL 94	---	V-0

Footnotes: (1) Value for 0,025 mm film (2) Value for 0,762 mm film

SolaTuf® Acrylic Film – AC1

SolaTuf® AC1 Impact Modified Acrylic Film offers seven to ten times the impact strength of conventional acrylics. It has good chemical resistance, superb weatherability, UV resistance and transparency that far exceeds polycarbonate film. Printing, die cutting, hot stamping, thermoforming, and insert molding are the most common process techniques for this film. Key applications include laminates, signage, thermoformed parts, and coating applications where weatherability, UV resistance, and chemical resistance are essential.

SolaTuf® Acrylic Film – AC2

SolaTuf® AC2 Impact Modified Acrylic Film is less modified than SolaTuf® AC1 and SolaTuf® AC6, which equates to a higher modulus and higher tensile strength. SolaTuf has transparency that far exceeds polycarbonate film.

SolaTuf® Acrylic Film – AC6

SolaTuf® AC6 Impact Modified Acrylic Film is a graphic arts quality film which offers seven to ten times the impact strength of conventional acrylics. It has good chemical resistance, superb weatherability, UV resistance and transparency that far exceeds polycarbonate film. Printing, die cutting, hot stamping, thermoforming and insert molding are the most common process techniques for this film.

Technical Data - Overview

Typical bulk properties for clear films unless otherwise noted

Property	AC1 / AC2 / AC6 Test Method	AC1 / AC2 / AC6 Units	AC1	AC2	AC6
Physical					
Specific Gravity	ASTM D-792	g / cm ³	1,15	1,17	1,16
Water Absorption, 24 hours	ASTM D-570	%	0,40	0,30	0,42
Rockwell Hardness	ASTM D-785	M Scale	45	62	40
Optical					
Refractive Index @ 25 °C	ASTM D-542	N _D	1,49	1,49	1,49
Light Transmission	ASTM D-1003	%	90,0	92,0	91,7
Haze	ASTM D-1003	%	< 4.0	< 4.0	< 4.0
Mechanical					
Tensile Strength, Break	ASTM D-638	MPa	38	47	45
Tensile Elongation, Break	ASTM D-638	%	45	35	40
Tensile Modulus of Elasticity	ASTM D-638	MPa	1.860	2.580	1.760
Flexural Strength	ASTM D-790	MPa	70	75	60
Flexural Modulus	ASTM D-790	MPa	1.860	2.270	1.790
Notched Izod Impact @ 23 °C	ASTM D-256	J / m of notch	59	37	64
Thermal					
Deflection Temperature under Flexural Load @ 18 MPa - Annealed	ASTM D-648	°C	79	85	80
Coefficient of Thermal Expansion	ASTM D-696	cm / cm / °C	8 x 10 ⁻⁵	8 x 10 ⁻⁵	8 x 10 ⁻⁵
Vicat Softening Temperature - Unannealed	ASTM D-1525	°C	98	99	108
Glass Transition Temperature, T _g	ASTM D-3418	°C	103	104	107
Maximum Continuous Service Temperature	---	°C	63 - 74	68 - 79	66 - 77





RowLux® - a multi-lensed polycarbonate-base film

RowLux® is a multi-lensed thermoplastic film that manipulates light to create a variety of unique and interesting visual effects. These remarkable motion and dimensional effects are obtained from thousands of minute parabolic lenses that are molded into the surface on both sides of the film. These lenses create a pattern of absorption and reflection of light which result in unique and highly dramatic optical characteristics.

Shimmering silk, stardust sparkles, geometric repetition and 3D effects are some of the ways to describe the Illusion Films. The material lends itself to many downstream processing methods. Printability is the key feature of RowLux®. RowLux® Illusion Film can also be easily die cut and adhesively bonded to many different substrates.

Applications for RowLux® are as varied as the imagination allows. It has been used in architectural interiors, point-of-purchase displays, gaming machines, clothing, apparel and accessories, foot-wear, business cards, decals, home furnishings, musical instruments and more. There are virtually limitless possibilities available to your designers and engineers.

Technical Data - Overview

Typical bulk properties for clear films unless otherwise noted

Property	Test Method	Units	Value
Physical			
Specific Gravity	ASTM D-792	g / cm ³	1,20
Water Absorption at Equilibrium	ASTM D-570	%	0,32
Rockwell Hardness	ASTM D-785	R Scale	118
Pencil Hardness	ASTM D-3363	Scratch Hardness	B
Mechanical			
Tensile Strength, Break	ASTM D-638	MPa	72
Tensile Strength, Yield	ASTM D-638	MPa	60
Tensile Elongation, Break	ASTM D-638	%	150
Tensile Modulus of Elasticity	ASTM D-638	MPa	2.400
Tear Strength, Initial	ASTM D-1004	N / μm	0,25 - 0,32
Tear Strength, Propagation	ASTM D-1922	g / μm	1,18 - 2,15
Impact Strength, Gardner	ASTM D-5420	J	13
Thermal			
Deflection Temperature under Flexural Load @ 1,8 MPa	ASTM D-648	°C	142
Tensile Heat Distortion @ 0.34 MPa	ASTM D-1637	°C	150
Coefficient of Thermal Expansion	ASTM D-696	cm / cm / °C	68,4 x 10 ⁻⁶
Brittleness Temperature	ASTM D-746	°C	-135
Vicat Softening Temperature	ASTM D-1525	°C	152



RowTec®
Polycarbonate Film

ORAFOL Advanced Polymer Films

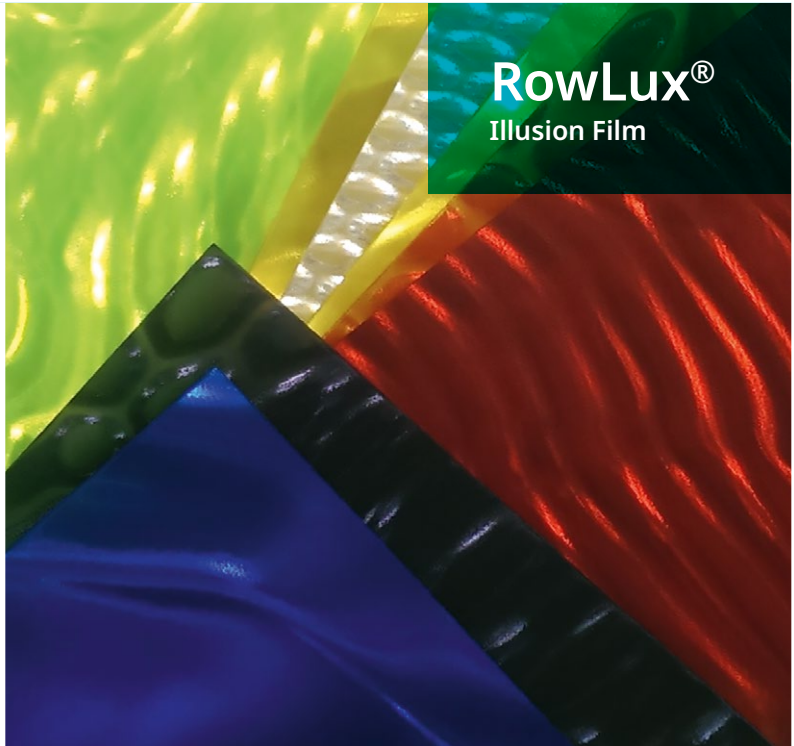
- High quality plastic film and sheet solutions

ORAFOL acquired Rowland Technologies Inc. of Wallingford, CT, USA in 2017. Rowland® Advanced Polymer Films, formerly Rowland Technologies, is a specialty manufacturer of high-quality polymeric films with a unique extrusion process and proprietary in-house tooling techniques. Rowland's technical excellence together with ORAFOL's worldwide distribution network make the newly created Advanced Polymer Films Division the first choice in outstanding film quality and reliable local service.

Engineered to Deliver Variety™



SolaTuf®
Impact Modified
Acrylic Film



RowLux®
Illusion Film



Related Products - Adhesive Tape Systems

ORABOND® 1375 (60µm) and **ORABOND® 1377** (120µm) are highly transparent pure acrylic adhesive transfer tapes with a moisture stable PE coated brown craft liner. These products have excellent slitting and die cutting capabilities, giving good lay-flat and slip properties for handling of printed plastic and metal sheets when used in sheet feed conversion equipment.

These products offer high temperature and shear performance, reducing slipping or lifting. In addition, both transfer tapes exhibit excellent aging, UV and chemical resistance.

Both are also available in sheets with the product number **ORABOND® 1375S** or **ORABOND® 1377S**.

ORABOND® 1375 and **ORABOND® 1377** are well balanced products, specially suited for lamination and bonding of:

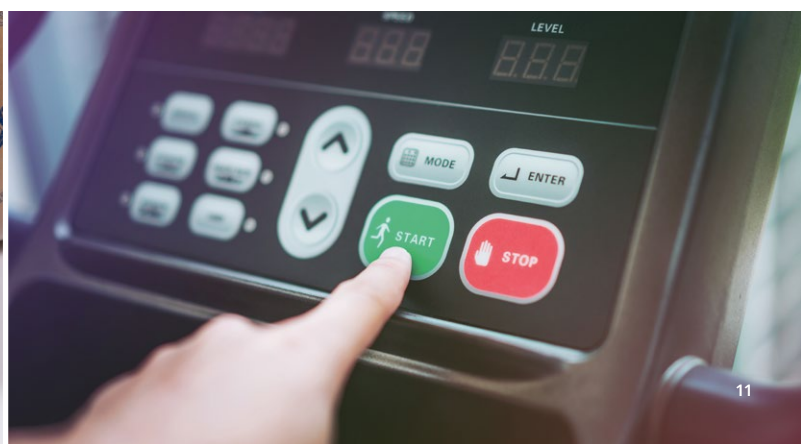
- Polycarbonate
- Polyesters
- Metal
- Other high surface energy materials

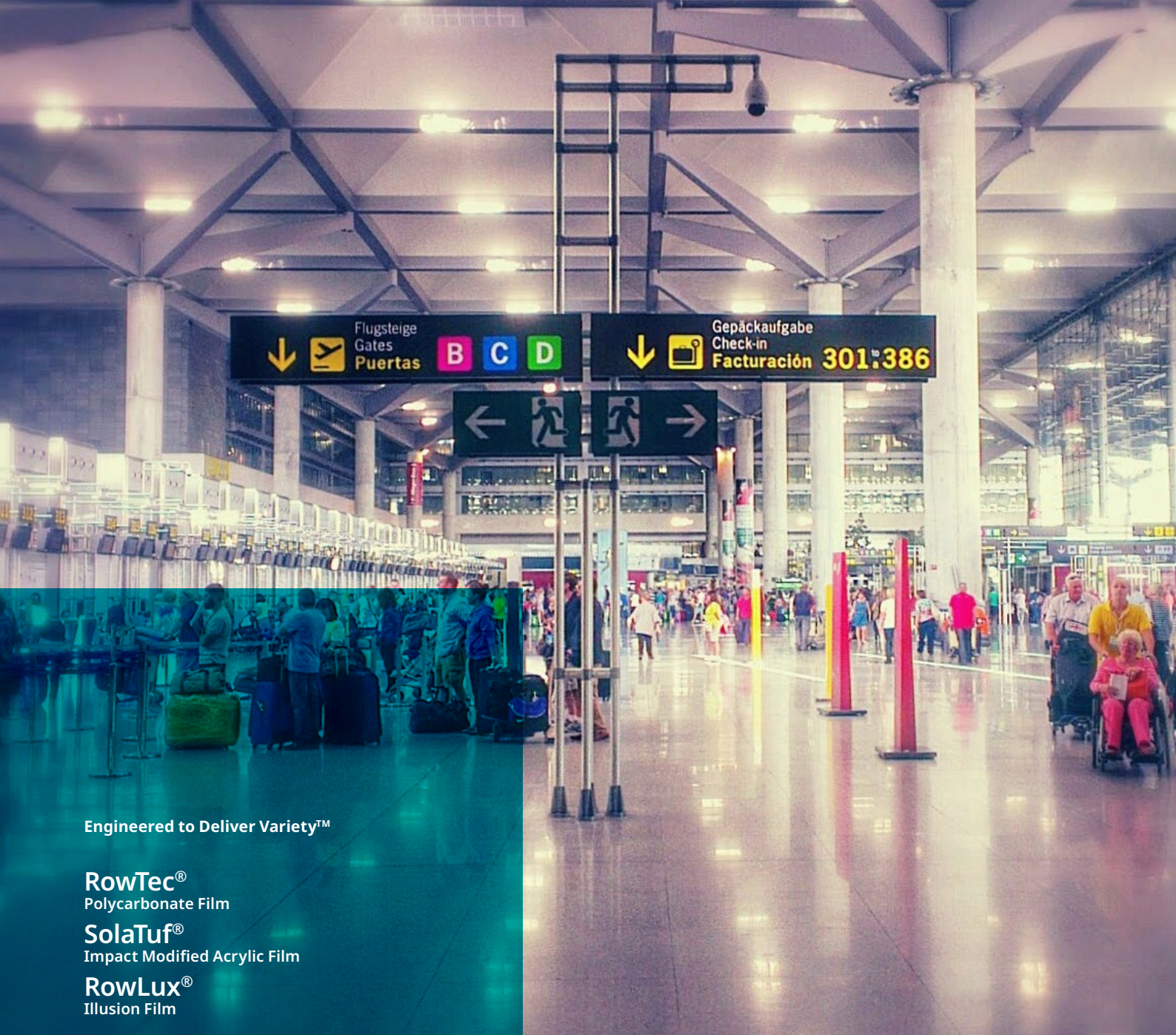
It is also the product of choice when working with:

- Membrane switches and keyboards
- Labels and decals
- Nameplates



More information about **ORABOND® 1375** and **ORABOND® 1377**





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Polycarbonate Film

SolaTuf®

Impact Modified Acrylic Film

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Illusion Film

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