PILKINGTON

NSG GROUP

High Performance Glass Products for
Digital Signage, Digital Displays and Touch Screens

Glass Products for Digital Signage and Displays

Digital signage and displays are one of the media's most powerful sources. The demand for digital signage and displays is steadily growing. Digital displays are being used in many markets and are prevalent in restaurants, hotels, schools, retail, healthcare, and financial institutions.

NSG offers the widest range of robust, pyrolytic, temperable, coated glass products available today. Our products offer solutions to a multitude of industry requirements.

- High light transmission
- Anti-reflection
- Transparent conductive
- Anti-static
- EMI shielding
- Heating

Pyrolytic Coated Cover Glass

NSG **TEC™**

NSG **TEC™** products are a perfect option for touch screen cover lites where a TCO coating is required. Our range of NSG **TEC™** products provide excellent performance at a competitive price point. NSG **TEC™** glass is very durable and robust.

For capacitive and resistive touch screens, a transparent conductor is needed. NSG **TEC™** products use fluorine doped tin oxide as the TCO, and offer an excellent value alternative to ITO.

NSG **TEC™** products are easily fabricated, including cutting, tempering and bending.

Our range of NSG **TEC™** products are available in a variety of substrates and thicknesses, including low iron and clear glass. NSG **TEC™** can be tuned to specific customer requirements.

Benefits

- More cost effective than ITO coatings
- Widest range of TCO sheet resistant products available
- Durable and robust coatings
- Coatings available on a range of glass thicknesses
- Capability of tuning coatings to meet specific requirements
- Large stock sizes (96" x 130")

Features

- Anti-static
- EMI shielding
- Heated glazing
- Active component of touch screens

Applications

- Digital displays
- Touch screens
- Digital signage

Property	Range
Sheet resistance (ohms/sq)	5 - 250
Visible Light transmittance (%)	80 - 85
Haze (%)	0.2 to >50
Thickness (mm)	1.3 - 10

Performance Data

Product	Thickness (mm)	Visible Light Transmittance (%)	Sheet Resistance (Ohms/sq.)	Haze (%)
NSG **TEC**™ 5	3.2	80	5-6	5
NSG **TEC**™ 7	2.2, 3.0, 3.2	80-81.5	6-8	≤2
NSG **TEC**™ 10	2.2, 3.2	83-84.5	9-11	≤1
NSG **TEC**™ 15	1.3, 1.6, 1.8, 2.2, 3.0, 3.2, 4.0	83-84.5	12-14	≤0.45
	5.0, 6.0, 8.0, 10.0	82-83	12-14	≤0.74
NSG **TEC**™ 50	6.0	83-84	43-53	≤0.55
NSG **TEC**™ 70	3.2, 4.0	82-84	58-72	≤0.55
NSG **TEC**™ 100	3.2, 4.0	83-84	125-145	≤0.55
NSG **TEC**™ 250	3.2, 4.0	84-85	260-325	≤0.7

Notes: *Nominal values shown. Specifications subject to change. Substrate = Clear soda lime glass.
*Other glass thickness and sheet resistance options are possible upon request.

Anti-Reflective Glass for Digital Signage

Monolithic Anti-Reflective

Pilkington **OptiView™** and Pilkington **OptAR™** anti-reflective glasses are affordable alternatives for reducing glare that reflects off computer screens, aircraft transparencies, televisions, flat panels and similar electronic displays.

Manufactured on-line with a durable, single-sided pyrolytic coating, Pilkington **OptiView™** and Pilkington **OptAR™** offer all the benefits of on-line coated glass products including, easy handling, fabricating, cutting, tempering, bending and more.

These anti-reflective products reduce glare (reflected light) and provide low reflectivity. As a result, displays are easier to read, eye strain is minimized, and visual acuity is increased.

Available Thickness*

- 2.2 mm
- 3.2 mm
- 4 mm
- 6 mm
- 10 mm

*Only Pilkington **OptAR™** is available in 2.2 mm
*Available on a low iron substrate

Features and Benefits

- Low reflection, less than 1% from front surface
- Electrically conductive
- Improved visual performance with high light transmission
- Easily fabricated
- Bendable
- Durable pyrolytic coating
- Available on low iron substrate
- Durable and robust coating
- Large stock sizes (96" x 130")

Applications

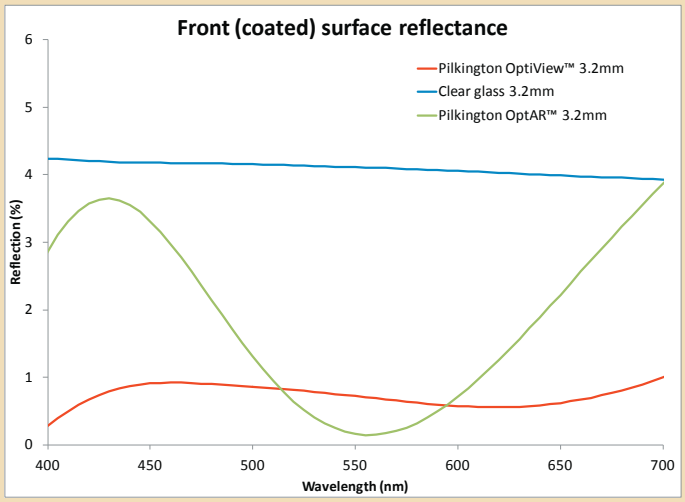
- Digital signage and displays
- Touch panel displays
- Aircraft transparencies
- Flat-panel LCD monitors
- Televisions and HDTV
- Specialty vehicle windshields and instrument panels
- Specialty electronic applications

Performance Data

Product	Nominal Glass Thickness mm	Front Surface Reflection[1] %	Visible Transmittance[2] %	Total Visible Reflectance[4] %
Clear Glass	3.2	<1	90	8
Pilkington **OptAR™**	2.2	<1	91	<5
	3.2	<1	91	<5
Pilkington **OptiView™** monolithic	3.2	<1	91	<5
Pilkington **OptiView™** monolithic	4	<1	91	<5
Pilkington **OptiView™** monolithic	6	<1	90	<5
Pilkington **OptiView™** low iron	6	<1	92	<5

*Sheet resistance (ohms/sq) is <200 for all products listed above

Front (coated) surface reflectance of monolithic Pilkington **OptiView™** and Pilkington **OptAR™** Glass Compared to 3.2mm Clear Glass



Laminated Anti-Reflective

Pilkington OptiView™ for Outdoor Digital Signage

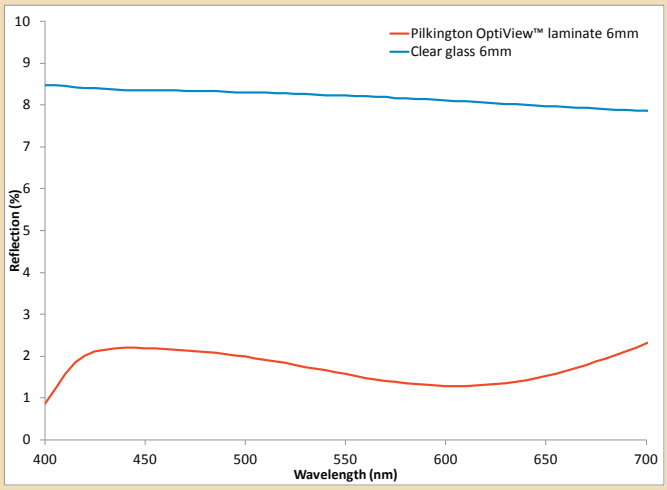
Many signage installations are used outdoors. Outdoor applications require additional strength and security. Laminated Pilkington **OptiView™** offers many of benefits for outdoor signage.

- High light transmission: >90%
- Low reflection: <2%
- Neutral color
- Large sizes available - 96"x130"
- UV Control. UV and IR rays can damage displays. Laminated Pilkington **OptiView™** blocks almost 100% of UV and reduces infrared radiation (see performance chart page 5).
- Available on low iron glass

Safety & Security

Vandal resistant. Pilkington **OptiView™** is a laminated safety glass that performs under impact. Ordinary glass shatters into large pieces when impacted. Laminated lites of Pilkington **OptiView™** may break when impacted, but the glass fragments will remain firmly bonded to the interlayer, minimizing the risk of injury.

Reflectance of Laminated Pilkington **OptiView™**
Compared to 6mm Clear Glass



Anti-reflective Glass for Digital Signage

Laminated Anti-Reflective

Durability

Pilkington **OptiView™** is durable and easy to clean like ordinary glass. Pilkington **OptiView™** meets the requirements of EN1096-2, Class A.

- Acid resistance
- Condensation resistance
- Salt spray resistance
- Abrasion resistance
- Pencil hardness 8H

Design Flexibility

Pilkington **OptiView™** can be bent, tempered, heat-strengthened, painted for spandrel and a ceramic frit can be applied.

Custom designs, images, logos, text, patterns, or tinted interlayers can be laminated into the lites to create a truly customize design or application.

Easy Installation

Pilkington **OptiView™** is easily installed. Most laminated combinations can be easily cut to size and fabricated.

No Visual Distortion

Distortion can occur with heat-strengthened and tempered glass, known as roller wave distortion. Pilkington **OptiView™** provides crisp, clean views, free of distortion.

Available Thicknesses*

- 6.3 mm laminated lites
- 8.3 mm laminated lites
- 12.3 mm laminated lites
- 19.3 mm laminated lites

Laminated Glass Performance Data[1, 10]

	Nominal Glass Thickness		Visible Light[2]			Solar Energy[2]		
	in.	mm	Transmittance[3] %	Reflectance[4] %		Transmittance[3] %	Reflectance[4] %	UV Transmittance[2] %
				Outside	Inside			
Clear Glass (non-laminated)	1/4	6	88	8	8	77	7	63
Pilkington **OptiView™**	1/4	6.3	92	1.7	1.7	70	4	<1
Pilkington **OptiView™**	5/16	8.3	90	1.7	1.7	67	4	<1
Pilkington **OptiView™**	1/2	12.3	88	1.7	1.7	62	3	<1

Clear float glass performance based on non-laminated, monolithic glass. (Note - all thicknesses are nominal)
Thickness of laminated glass = thickness of glass layer + thickness of pvb + thickness of glass layer

- 6.3 mm Pilkington **OptiView™** Single Laminated Glass = 3 mm Pilkington **OptiView™** (#1) + 0.3 mm clear pvb layer + 3 mm Pilkington **OptiView™** (#4)
- 8.3 mm Pilkington **OptiView™** Single Laminated Glass = 4 mm Pilkington **OptiView™** (#1) + 0.3 mm clear pvb layer + 4 mm Pilkington **OptiView™** (#4)
- 12.3 mm Pilkington **OptiView™** Single Laminated Glass = 6 mm Pilkington **OptiView™** (#1) + 0.3 mm clear pvb layer + 6 mm Pilkington **OptiView™** (#4)

Pilkington **MirroView™** digital display mirror, for low light applications

Pilkington **MirroView™** is a highly reflective mirror coating with a clear substrate. Pilkington **MirroView™** gives digital displays and video screens a modern, transitional look.

Pilkington **MirroView™** is ideal for concealing digital displays and video screens for commercial and residential applications.

When the screen is turned 'off' Pilkington **MirroView™** maintains a mirrored appearance, which conceals the screen. When the screen is turned 'on' the picture on the video screen shows through.

Pilkington **MirroView™** is very durable and can be easily handled, transported and processed, including tempering and laminating. Due to the durability of the pyrolytic coating, it does not degrade over time, which gives the product a virtually unlimited shelf-life.

Applications

- Bars and restaurants
- Bathrooms
- Digital signage

Avialable in large stock sizes, which can conceal one or multiple displays. With its highly reflective and durable coating, Pilkington **MirroView™** can be used as a traditional mirror with a small video screen concealed beneath. Ideal for bathroom applications, this allows individuals to easily view themselves in the mirror while watching television.

Pilkington **MirroView™ 50/50** digital display mirror, for high light applications

Pilkington **MirroView™** 50/50 offers the same qualities as the original product, yet it is designed for use in applications with high ambient light.

Applications

- Hotel rooms
- Lobbies and salons
- Retail
- Digital signage

Pyrolytic Coating Advantage

- Durable coating
- Easily handled and transported
- No edge deletion required
- Virtually unlimited shelf-life
- Inventoried locally
- Tempered and laminated

Available Thickness

- 1/8" (3mm) - Pilkington **MirroView™** only
- 1/4" (6mm)

Performance Data

Product	Nominal Glass Thickness		Glass Substrate	Visible[2] Transmittance (%)	Visible[2] Reflectance Coated Side (%)	Visible[2] Reflectance Glass Side (%)	Proper Glazing
	in.	mm					
Pilkington **MirroView™**	1/8	3	Clear	20	76	70	Mirror coating toward viewer-side
	1/4	6	Clear	20	74	66	Mirror coating toward viewer-side
Pilkington **MirroView™** 50/50	1/4	6	Clear	45	53	50	Mirror coating toward viewer-side

*Nominal values shown.

Pilkington **Activ™** self-cleaning glass

Pilkington **Activ™** is the world's first pyrolytic self-cleaning glass. This revolutionary kind of glass actually uses the power of the sun to clean itself.

The Pilkington **Activ™** coating is applied to the surface of the glass via an on-line chemical vapor deposition process. It is an integral part of the surface, and lasts the entire life of the glass.

Pilkington **Activ™** uses daylight, which is abundant even on cloudy days, to keep glass clean with a two-step process.

1. Pilkington **Activ™** loosens dirt, and gradually breaks down organic residue using energy from daylight.

2. The superhydrophilic nature of the Pilkington **Activ™** coating allows water to sheet off its surface, removing organic residue, dust particles and inorganic dirt. Under most conditions, natural rain is sufficient to keep the glass clean but use of a hose will achieve the same result.

In addition to providing an easy to clean surface, the Pilkington **Activ™** range is also oleophobic, acting as an anti-fingerprint coating. The photodecomposition properties of Pilkington **Activ™** break down organic contaminants, e.g. stearic acid, acetone or paraffin wax. Pilkington **Activ™** can also contribute to the destruction of bacteria and ozone.

Available in large sizes, up to 96" x 130", and glass thicknesses of 2.2mm to 6mm.

Pilkington **Optiwhite™** low iron glass

Uncoated Cover Glass for Digital Displays

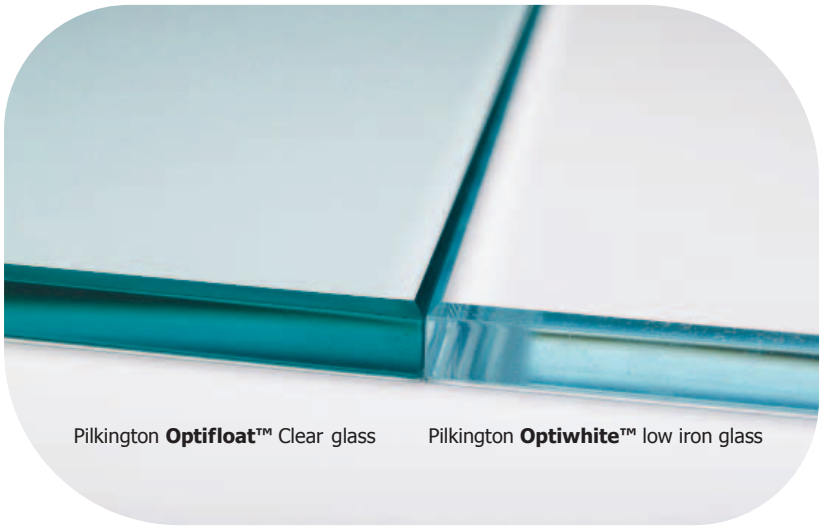
Pilkington **Optiwhite™** offers a variety of benefits for touch screen and digital signage applications. Pilkington **Optiwhite™** is an extra-clear, low iron float glass; it is practically colorless, and the green cast inherent to other clear glasses is not present. It is perfect for applications where transparency and purity of color are desired.

Available in thicknesses between 3 mm and 19 mm (the widest range on the market), Pilkington **Optiwhite™** provides increased design flexibility and, when combined with other Pilkington products, it can offer additional benefits such as anti-reflective or conductivity.

It also comes with all the reassurance of not only being a market-leading product in its own right, but of bearing the market-leading Pilkington name, and with the unrivalled support you would expect from our brand.

Features

- High light transmittance for true color and outstanding visual clarity when an unrestricted view is required
- Purity of color with minimum color cast when viewing through the glass, ensuring a true representation of the designer's vision
- Ensures a more natural, brighter view
- Improves aesthetics of laminated glass
- Brilliant clarity when compared to ordinary standard clear float glass
- Can be toughened or laminated for safety and security
- Can be painted or silk-screened for spandrel or decorative applications
- Can be combined with other products from the Pilkington range to provide additional benefits



Pilkington **Optifloat™** Clear glass Pilkington **Optiwhite™** low iron glass

Performance Data

	Nominal Glass Thickness		Visible Light[2]		
	in.	mm	Transmittance[3] %	Reflectance[4] %	
				Outside	Inside
Pilkington **Optiwhite™**	1/8	3	91	9	9
	5/32	4	91	9	9
	3/16	5	91	9	9
	1/4	6	91	9	9
	5/16	8	91	9	9
	3/8	10	91	9	9
	1/2	12	90	9	9
	5/8	15	90	9	9
	3/4	19	90	8	8

Pilkington **Microfloat**™ and Pilkington **Microwhite**™ thin float glass

Pilkington **Microfloat**™ and Pilkington **Microwhite**™ are extremely thin, high-grade float glass products manufactured to precise standards. They are made according to the highest specifications with very low thickness tolerances, to ensure flat and uniform products, suitable for a variety of applications.

Made to precise standards.

The requirements of larger area touch screens and displays are different from those used in mobile devices. Large digital displays do not always require ultra-thin glass, less than 1mm.

Pilkington **Microfloat**™ and Pilkington **Microwhite**™ are both manufactured by the standard float glass process. Pilkington **Microfloat**™ is the classic version manufactured from clear float, the new Pilkington **Microwhite**™ is a low iron composition which produces a very pure, clear glass and has the added benefit of increased light transmission.

Applications

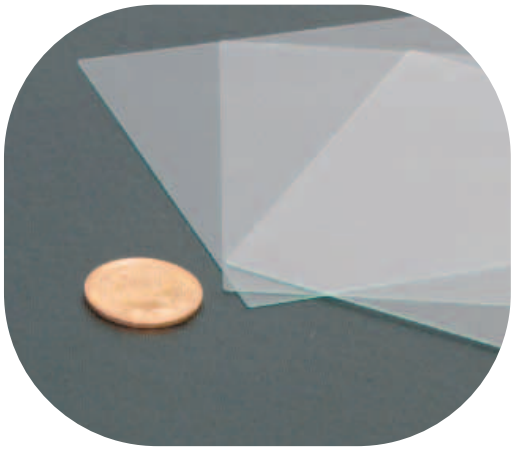
- Digital signage and displays
- Microscope slides
- Cosmetic mirrors
- Chromatographic plates
- LCD photo masks
- Automotive and technical glass
- PC display screens and tablet PC's

Features

- High-grade thin float glass with very low thickness tolerances
- Flat and uniform products
- Excellent optical transmission
- Improved wetability through a silane coating (optional)
- Extended shelf-life
- Cut to customer specifications

Additional features of Pilkington **Microwhite**™:

- Neutral edge color
- Superior light and energy transmission



Performance Data

Product	Thickness Range	Light Transmittance[2] %
Pilkington **Microfloat**™	1.0 - 1.6 mm	91.2% at 1 mm
Pilkington **Microwhite**™	1.0 - 1.6 mm	91.7% at 1 mm

EN 410 and ISO 9050

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