NSG GROUP

Global Glass Handbook 2012

Architectural Products

PILKINGTON

Global Glass Handbook 2012
Architectural Products

Contents

Introduction

Our Global Glass Handbook is an easy-to-use reference document providing consistent information on our range of architectural products worldwide.

We have tried to highlight the benefits of the product as well as the technical specifications to the user.

This handbook covers the global range of products as it applied in March 2012; changes to the product range since then have not been incorporated. Although presented in this handbook, some of the products will not be available in all markets. Our publication is also not exhaustive, and therefore does not cover all products, combinations and applications. For additional information or advice, please get in contact with your local Pilkington representatives or for the latest information, visit our website at www.pilkington.com/products/bp/.

Guide for Use:
Our Global Glass Handbook is organised into benefit-led categories. Please note that some of our products have multiple benefits and therefore may be found in more than one benefit-led category. If you are searching for a solution to a particular problem, you may need to consider products in more than one category.

Disclaimer:
This publication provides only a general description of the product. Further, more detailed information may be obtained from your local supplier. It is the responsibility of the user to ensure that the use of any product is appropriate for any particular application and that such use complies with all relevant legislation, standards, code of practice and other requirements.

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Visible Light

Light Transmittance (LT) or **Visible Transmittance** (VLT) is the proportion of visible light at near normal incidence that is transmitted through the glass.

Light Reflectance (LR) is the proportion of visible light at near normal incidence that is reflected by the glass.

Colour Rendering Index (R_a) expresses the colour rendering properties of glass in transmission (on a scale of 0 to 100, with a value of 100 representing optimum color as seen in direct visible sunlight).

Solar Energy

Glass manages solar radiation from the sun by three mechanisms: transmittance, reflectance and absorptance, which for solar control purposes are defined in terms of the following parameters:

Direct Solar Energy Transmittance (ET) is the proportion of solar radiation at near normal incidence that is transmitted directly through the glass.

Solar Energy Reflectance (ER) is the proportion of solar radiation at near normal incidence that is reflected by the glass back into the athmosphere.

Solar Energy Absorptance (EA) is the proportion of solar radiation at near normal incidence that is absorbed by the glass.

Total Solar Energy Transmittance (TET) or **Solar Heat Gain Coefficient** (SHGC), also known as g value or solar factor, is the fraction of solar radiation at near normal incidence that is transferred through the glazing by all means. It is composed of the direct transmittance, also known as the short wave component, and the part of the absorptance dissipated inwards by longwave radiation and convection, known as the longwave component. The proportions of the absorbed energy that are dissipated either inside or outside depend on the glazing configuration and the external exposure conditions.

Selectivity index S: light to heat ratio (S = LT/TET) or (S = LT/SHGC).

The solar control mechanism is illustrated in Figure 0.1.

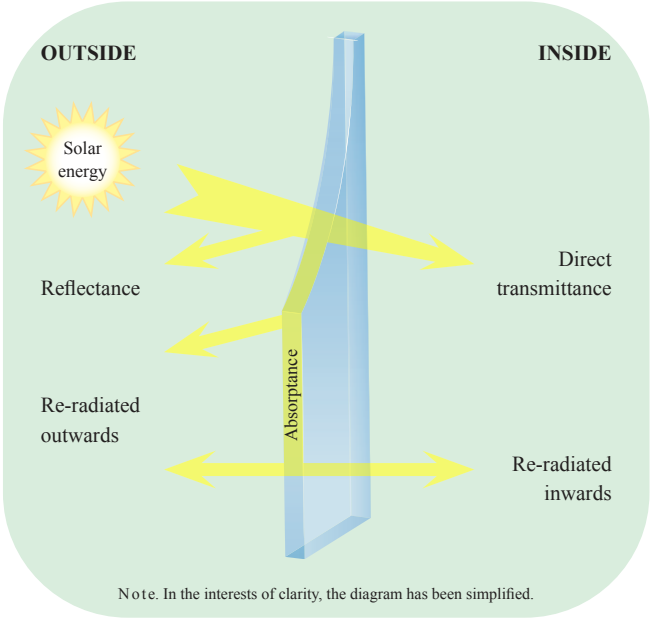
The solar radiant heat admission properties of glasses can be compared by their shading coefficients.

The Total Shading Coefficient (TSC) is derived by comparing the properties of any glass with a clear float glass having a total energy transmittance of 0,87 (such a glass would have a thickness of about 3 mm). It comprises a short wavelength and long wavelength shading coefficient. In certain instances, it is simply referred to as Shading Coefficient.

The Short Wavelength Shading Coefficient (SWSC) is the direct energy transmittance divided by 0,87.

The Long Wavelength Shading Coefficient (LWSC) is the fraction of the absorptance released inwards, again divided by 0,87.

Figure 0.1. Performance data



Thermal Insulation

Heat loss is quantified by the thermal transmittance or U value (U). The U value, usually expressed in S.I. units (Système Internationale d'Unités) of W/m^2K, is the heat flux density through a given structure divided by the difference in environmental temperatures on either side of the structure in steady state conditions. It is more generally referred to as the rate of loss of heat per square metre, under steady state conditions, for a temperature difference of one Kelvin (or degree Celsius) between the inner and outer environments separated by the glass, or other building element.

The Summer U value and Winter U value (also known as U-Factor) are calculated using LBNL Windows 5.2. The Summer U value is based on an outdoor temperature of 90°F (32°C), an indoor temperature of 75°F (24°C), a solar intensity of 248 Btu/hr ft^2 °F (783 W/m^2) and a 6,3 mph (2,8 m/s) wind velocity. This is referred to as NFRC 100-2001 Summer. The Winter U value is based on an outdoor temperature of 0°F (–18°C), an indoor temperature of 70°F (21°C) and a 12,3 mph (5,5 m/s) wind velocity with no sun. This is referred to as NFRC 100-2001 Winter.

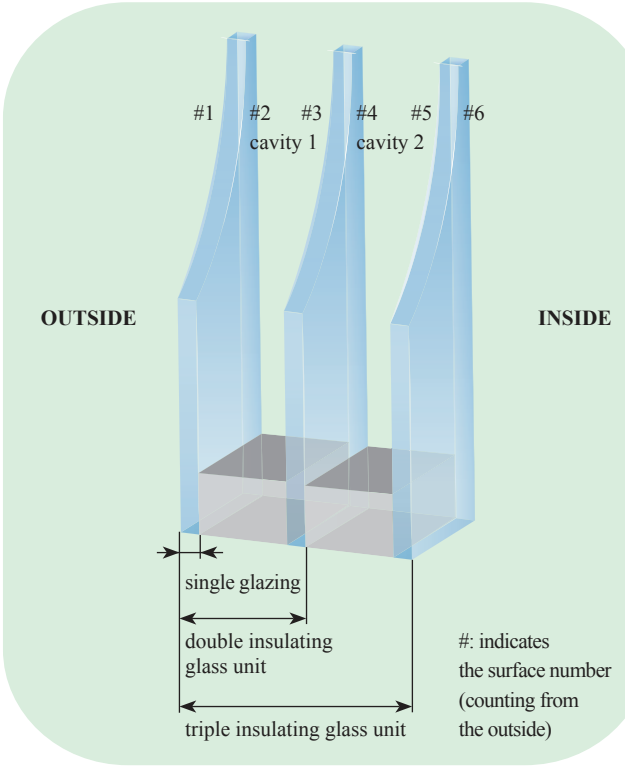
Performance data for Pilkington products

Performance data given in the following tables has been determined in accordance with European Standards (EN) or North American standards (ASTM/NFRC) as appropriate. Corresponding data can be determined in accordance with the standards of other regions upon request.

Where applicable, Pilkington products sold in the EU meet the requirements of the relevant harmonised European product standard and are CE Marked. For more information on this, please refer to www.pilkington.com/ce.

The performance of products from Pilkington North America, sold in and from the US, is certified by NFRC (U.S. National Fenestration Rating Council) to ASTM/NFRC standards and is listed in the LBNL IGDB (Lawrence Berkeley National Laboratories International Glass Data Base) as published with the LBNL Window 5 and 6 computer programs which are used by NFRC certifiers.

Figure 0.2. Glass surfaces.



For naming convention of glass surfaces, please refer to Figure 0.2.

For details of the standards referred to in this handbook please refer to the Appendix.

Coating process

There are two different coating technologies used to manufacture high performance glass: on-line and off-line coatings.

On-line coatings are applied during manufacture. Generally speaking, on-line coated products offer lower performance levels than off-line coated products. However, they have a range of other benefits; they are easier to handle and process, and can be toughened or laminated without difficulty. They are also far more durable and achieve a higher degree of passive solar heat gain (g value, the proportion of solar radiation transmitted through the glass by all means) which is beneficial in cool but sunny conditions.

Off-line coatings are applied after manufacture. Most off-line coated products are able to give higher performance levels, but they do require extra care in handling and processing. We can supply them in toughened and laminated form by applying the coating to pre-processed glass. Some of them can also be provided in toughenable form.

Table 0.1. On-line / off-line product summary.

Benefit-led category	Brand name	On-line	Off-line
Solar Control	Pilkington **Eclipse Advantage™**	✓	
	Pilkington **Eclipse™** Gold	✓	
	Pilkington **Reflite™**	✓	
	Pilkington **Solar-E™**	✓	
	Pilkington **Suncool™**		✓
	Pilkington **SunShade™** Silver		✓
Thermal Insulation	Pilkington **Energy Advantage™**	✓	
	Pilkington **K Glass™**	✓	
	Pilkington **Optitherm™**		✓
	Pilkington **Spacia™**	✓	
Self-cleaning	Pilkington **Activ™** Blue	✓	
	Pilkington **Activ™** Clear	✓	
	Pilkington **Activ™** Neutral	✓	✓
	Pilkington **Activ Suncool™**	✓	✓
Special Applications	Pilkington **OptiView™**	✓	

Calculation tools

To help you when specifying glass, we have developed some useful tools. These are accessible from our website.

Pilkington Spectrum is a Windows-based glass performance model which enables you to quickly and efficiently calculate key properties of single glazing and insulating glass units in accordance with European Standards. It is available in different languages and is accessible at the following link: www.pilkington.com/spectrum

There is also a range of tools available to calculate the performance of our products according to North American standards:

- Pilkington **Sun Management™** provides solar, optical and thermal properties of our most popular glazing combinations
- Pilkington Thermal Stress Calculator helps you determine the need to heat treat different types and combinations of glass under different conditions to resist breakage from solar-induced thermal stress.

These tools are available at the following link:
www.pilkingtoncalculators.com

1. Solar Control

Solar control is a key issue in terms of energy saving. In hot conditions or for buildings with high internal loads, solar control glass is used to minimise solar heat gain by rejecting solar radiation and help control glare. In more temperate conditions, it can be used to balance solar control with high levels of natural light.

The topic of air-conditioning is becoming a major concern to building designers and architects. Often, more energy is used to operate air-conditioning systems during the summer months than to heat the building in winter thereby increasing the carbon footprint. It is therefore essential to improve the energy efficiency of buildings during the summer as well as the winter.

During the winter, low-emissivity glass can reduce heat loss while allowing high levels of valuable free solar gain to heat buildings with no significant loss in natural light. However, unless combined with solar control glass, in the summer it can become uncomfortably hot. The correct choice of glass can help to reduce the capital outlay, running costs and associated carbon emissions of a building throughout the year.

Note: The potential for solar control glass to cut CO_2 emissions from buildings has been analysed by the Dutch scientific institute TNO in a study undertaken for Glass For Europe. The study concludes that between 15 and 80 million tonnes of CO_2 emissions annually – roughly between 5% and 25% of the EU's target – could be saved by the year 2020 by optimal use of solar control glass. Reference: "Impact of Solar Control Glazing on energy and CO_2 savings in Europe" (TNO Report 2007-D-R0576/B by TNO Built Environment and Geosciences, Delft, The Netherlands). www.glassforeurope.com.

Given the variety of building designs and climatic conditions and the different levels of exposure to solar radiation during the year, the choice of glass must be able to protect the inside of the building to ensure maximum comfort, minimise energy consumption, guarantee safety and, not least, provide the optical and aesthetic qualities that satisfy the designer.

We are continually innovating and developing products that satisfy the full range of architectural requirements. Over the years we have developed a wide range of energy management solutions for large and small glazed areas on all types of building.

Our innovative solar control products cover the whole range:

- from the highest performing, off-line coated, solar control and low-emissivity products within the Pilkington **Suncool™** range;
- through on-line environmental control glasses that combine good performance solar control with low-emissivity such as Pilkington **Eclipse Advantage™** and Pilkington **Solar-E™**;
- to medium performance reflective glasses such as Pilkington **Eclipse™** Gold, Pilkington **SunShade™** Silver, Pilkington **Reflite™** and high performance tinted glasses such as Pilkington **Arctic Blue™**;
- to low-performance, body-tinted glass in the Pilkington **Optifloat™** Tint range;
- and even to solar control glass combined with the revolutionary self-cleaning Pilkington **Activ™**.

In addition to the above ranges, our solar control products can be used with many other Pilkington solutions, to achieve countless benefits in terms of safety, functionality and cost-efficiency.

How it works – Glass manages solar heat radiation by three mechanisms: transmittance, reflectance and absorptance, which for solar control purposes are defined in terms of the following parameters:

- **Direct transmittance** – the proportion of solar radiation transmitted directly through the glass.
- **Reflectance** – the proportion of solar radiation reflected back into the atmosphere.
- **Absorptance** – the proportion of solar radiation absorbed by the glass.
- **Total transmittance** (also known as g value, solar factor, or SHGC) – the proportion of solar radiation transmitted through the glass by all means. This is composed of the direct transmittance and that which is absorbed by the glass and re-radiated inwards.

Further parameters given to glass are as follows:

- **Light Transmittance** or **Visible Light Transmittance** – the proportion of the light that is transmitted by the glass.
- **Light Reflectance** – the proportion of the light that is reflected by the glass.
- **Total Shading Coefficient** or **Shading Coefficient** – the ratio between total solar heat transmittance of the glass and that of a single 3 mm thick clear float glass.
- **Shortwave Shading Coefficient**

$$SWSC = \frac{ET}{\text{total solar heat transmittance of standard 3 mm glass}}$$

- **Longwave Shading Coefficient**

$$LWSC = TSC - SWSC$$

- **Total Shading Coefficient**

$$TSC = \frac{TET \text{ (or } SHGC)}{\text{total solar heat transmittance of standard 3 mm glass}}$$

where:
SWSC – Shortwave Shading Coefficient
LWSC – Longwave Shading Coefficient
TSC – Total Shading Coefficient
ET – Direct Solar Heat Transmittance
TET – Total Solar Heat Transmittance
SHGC – Solar Heat Gain Coefficient

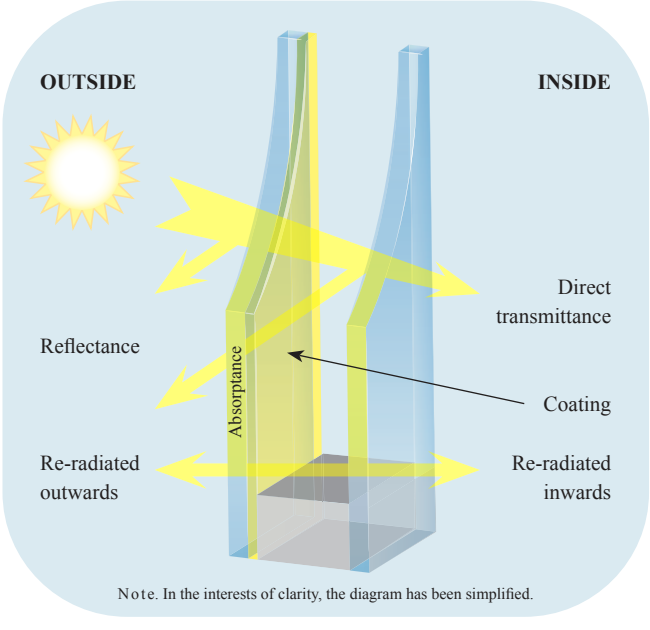
Example for Pilkington **Optifloat™** Green 6 mm glass:

$$TSC = \frac{0{,}59}{0{,}87} = 0{,}68$$

- **Selectivity index** – the ratio between light transmittance and total solar heat transmittance

$$S = \frac{LT}{TET \text{ or } SHGC}$$

Figure 1.1. Insulating glass unit incorporating coated solar control glass.



Note. In the interests of clarity, the diagram has been simplified.

Thermal breakage

Due to their high solar heat absorptance, some glasses may be subject to thermal breakage. The risk of thermal breakage may occur on façades exposed to the sun, and in situations where high temperature differences across the glass pane are expected. In such cases it is advisable to specify toughened or heat strengthened glass. A thermal safety check is advisable for all applications.

High performance body-tinted solar control glass

Description

Pilkington **Arctic Blue™** is a unique blue body-tinted float glass for high daylight transmittance, solar control and cool comfortable colour without the use of a surface coating. Its solar control properties and colour density vary with each thickness so that glass with properties appropriate to a particular application can be chosen.

Applications

Pilkington **Arctic Blue™** is ideally suited to both hot and cold climates and can be specified as toughened or laminated glass.

Features and benefits

- Improved solar performance compared to traditional tinted float glass, reducing the need for air-conditioning.
- Solar control performance and colour density vary with the thickness.
- Cool and distinctive rich blue colour, offering possibility for unique aesthetics and innovative design.
- High visibility properties providing a crisp, undistorted, natural view from the interior.
- High daylight transmittance, reducing the need for artificial lighting.
- Low internal and external reflection.
- Low UV transmittance.
- Additional thermal insulation performance when combined in an insulating glass unit with a low-emissivity glass.
- Can be laminated, toughened, bent and enamelled using standard techniques.
- Can be used in monolithic form or incorporated in insulating glass units.
- Available in 4 mm, 5 mm, 6 mm, 8 mm and 10 mm thicknesses.

Pilkington **Arctic Blue™**

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glass configuration	performance code			light				energy						S, UV	
1	W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	%
	U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	S	UV
	U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	selectivity index	UV transmittance
monolithic glass															
4 mm	**5,8**	**64**	**60**	64	6	6	86	48	6	46	60	0,55	0,14	0,69	1,07	24
6 mm	**5,7**	**54**	**52**	54	6	6	80	37	5	58	52	0,43	0,17	0,60	1,04	16
8 mm	**5,7**	**45**	**46**	45	5	5	73	29	5	66	46	0,33	0,20	0,53	0,98	12
10 mm	**5,6**	**38**	**42**	38	5	5	67	23	5	72	42	0,26	0,22	0,48	0,90	8

Notes:
Performance values determined in accordance with EN 410 and EN 673.

Pilkington **Arctic Blue™**

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glass configuration			performance code			light				energy							S, UV		
II	II	II	U	LT	g	%	%	%	—	%	%	%	%	—	—	—	—	%	
			W/m²K	%	%	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV	
			U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance	
⇨			**2,8**	**48**	**41**	48	8	13	78	31	6	63	41	0,36	0,11	0,47	1,17	13	insulating glass unit, Pilkington **Optitherm™** S3 #3
	⇨		**1,9**	**44**	**36**	44	9	15	80	27	7	66	36	0,31	0,10	0,41	1,22	10	insulating glass unit, Pilkington **K Glass™** #3
		⇨	**1,6**	**48**	**34**	48	8	12	78	26	8	66	34	0,30	0,09	0,39	1,41	8	insulating glass unit, primary product outside

Notes:
1. Based on 6 mm glass thickness.
2. Based on 12 mm air filled cavity.
3. Performance values determined in accordance with EN 410 and EN 673.

High performance body-tinted solar control glasses

Description

Pilkington **EverGreen™** and Pilkington **Emerald Green™** establish new standards of quality, aesthetics and performance for green body-tinted glass.
These products offer solar control characteristics and high selectivity, in two different shades of green.

Pilkington **EverGreen™** provides high light transmittance (66% in 6 mm) whilst still providing solar control, resulting in a high selective glass.
Pilkington **Emerald Green™** provides comparatively lower light transmittance (51% in 6 mm) with solar control, resulting in a glass with a good selectivity index.

The solar control properties and colour densities of both products vary with each thickness, so that glass with properties appropriate to a particular application can be chosen.

Applications

Pilkington **EverGreen™** and Pilkington **Emerald Green™** are ideally suited to both hot and cold climates.
These products absorb much of the sun's heat and UV rays while still letting through a high level of daylight. Where a safety glass is required, they can be specified as toughened or laminated glass.

Features and benefits

- Improved solar control performance compared to traditional tinted float glass, reducing the need for air-conditioning.
- Solar control performance and colour density vary with the thickness.
- Refreshing soft green colours, offering a crisp, clean view of the outside.
- High daylight transmittance, reducing the need for artificial lighting.
- Low internal and external reflection.
- Low UV transmittance.
- Additional thermal insulation performance when combined in an insulating glass unit with a low-emissivity glass.
- Can be laminated, toughened, bent and enamelled using standard techniques.
- Can be used in monolithic form or incorporated in insulating glass units.
- Pilkington **EverGreen™** is available in 6 mm thickness / Pilkington **Emerald Green™** is available in 5 mm and 6 mm thicknesses.

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Pilkington **EverGreen™**

glass configuration		performance code				visible light				solar energy					S, UV, U value			
1						%	%	%	—	%	%	%	—	—	—	%	W/m²K
		U W/m²K	U W/m²K	LT %	SHGC —	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U
	monolithic glass	**U.S. summer**	**U.S. winter**	**light**	**solar heat gain coefficient**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	solar heat gain coefficient	total shading coefficient	selectivity index	UV transmittance	European
5 mm		**5,30**	**5,85**	**73**	**0,58**	73	7	7	90	42	5	53	0,58	0,67	1,27	21	5,8
6 mm		**5,26**	**5,81**	**66**	**0,52**	66	6	6	87	33	5	62	0,52	0,60	1,27	14	5,7

Notes:
1. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions
2. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards
3. European U value is based on EN 410 and EN 673 standards

Pilkington **EverGreen™**

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glass configuration			performance code			visible light				solar energy					S, UV, U value			
			U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U
			W/m²K	W/m²K	%	—	%	%	%	—	%	%	%	—	—	—	%	W/m²K
II	II	II	U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U
⇨			**2,82**	**2,69**	**58**	**0,40**	58	10	13	85	28	6	66	0,40	0,46	1,47	11	2,8
	⇨		**1,86**	**1,88**	**54**	**0,35**	54	11	14	86	24	7	69	0,35	0,40	1,56	9	1,8
		⇨	**1,55**	**1,65**	**58**	**0,32**	58	9	13	85	24	7	69	0,32	0,37	1,81	7	1,6

insulating glass unit,
Pilkington **Optitherm™** S3 #3

insulating glass unit,
Pilkington **Energy Advantage™** #3

insulating glass unit,
primary product outside

Notes:
1. Based on 6 mm glass thickness 2. Based on 1/2" (12,7 mm) air filled cavity 3. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions 4. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards 5. European U value is based on EN 410 and EN 673 standards

Pilkington **Emerald Green™**

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glass configuration		performance code			light				energy						S, UV		
1		W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	—	%
	monolithic glass	U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
		U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance
5 mm		**5,8**	**56**	**49**	56	6	6	80	33	5	62	49	0,38	0,18	0,56	1,14	29
6 mm		**5,7**	**51**	**46**	51	6	6	77	29	5	66	46	0,33	0,20	0,53	1,11	24

Notes:
Performance values determined in accordance with EN 410 and EN 673.

Pilkington **Emerald Green™**

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glass configuration			performance code			light				energy						S, UV		
II	**II**	**II**	U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
			W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	—	%
			U value	**LT**	**energy**	LT transmittance	LRo reflectance outside	LRi reflectance inside	Ra colour rendering index	ET direct transmittance	ER reflectance	EA absorptance	TET total transmittance	SSC shortwave shading coefficient	LSC longwave shading coefficient	TSC total shading coefficient	S selectivity index	UV UV transmittance
➪			**2,8**	**46**	**34**	46	8	12	75	24	6	70	34	0,28	0,11	0,39	1,35	17
	➪		**1,9**	**42**	**30**	42	9	14	76	21	6	73	30	0,24	0,10	0,34	1,40	13
		➪	**1,6**	**45**	**29**	45	7	12	75	21	6	72	29	0,24	0,09	0,33	1,55	11

insulating glass unit,
Pilkington **Optitherm™** S3 #3

insulating glass unit,
Pilkington **K Glass™** #3

insulating glass unit,
primary product outside

Notes:
1. Based on 6 mm glass thickness
2. Based on 12 mm air filled cavity
3. Performance values determined in accordance with EN 410 and EN 673.

High performance body tinted solar control glasses

Description

Pilkington **SuperGrey™** and Pilkington **Dark Grey™** are low-reflective body-tinted glasses which offer dramatic, deep cool-grey appearance, increasing visual privacy and dramatically reducing read-through from interior shading devices.

Pilkington **SuperGrey™** combines stunning exterior aesthetics and unsurpassed interior glare control with the best solar control performance of any tinted float glass in the industry.
In a different shade of grey, Pilkington **Dark Grey™** offers higher light transmission whilst providing solar control performance. Both products soften bright daylight and reduce glare, making them perfect for applications near computers and video display screens.

Applications

Pilkington **SuperGrey™** and Pilkington **Dark Grey™** are ideal where architectural designs or restrictions prohibit structures with high reflectance. Common applications include low, mid and hi-rise buildings, such as hospitals, educational institutions, offices and retail skylight applications. Where a safety glass is required, they can be specified as toughened or laminated glass.

Features and benefits

- Uncoated glasses which provide the performance of reflective glass.
- Enhanced visual privacy and reduced read-through from interior shading devices.
- Pilkington **SuperGrey™** is the best solar control of any uncoated glass, providing the lowest shading coefficient of any float glass and a better shading coefficient than many reflective glasses.
- Unsurpassed light and glare control, improving visual privacy and reducing the need for blinds or shades.
- Distinctive aesthetics inside and outside, offering a deep, cool-grey tint from the exterior, while providing a remarkably crisp, comfortable view from the interior as they offer a neutral colour from the inside.
- Uniform, no read-through look between spandrel and vision glass areas eliminating the need for an opacifier in the spandrel glass.
- Pilkington **SuperGrey™** offers low UV transmittance, significantly outperforming other tinted and coated glass products (in 6 mm it blocks 99% of the sun's damaging UV rays).
- Additional thermal insulation performance when combined in an insulating glass unit with a low-emissivity glass.
- Can be laminated, toughened, bent and enamelled using standard techniques.
- Can be used in monolithic form or incorporated in insulating glass units.
- Available in 5 mm and 6 mm thicknesses.

Pilkington **SuperGrey™**

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glass configuration		performance code				visible light				solar energy					S, UV, U value			
1																		
		U W/m²K	U W/m²K	LT %	SHGC —	LT %	LRo %	LRi %	Ra —	ET %	ER %	EA %	SHGC —	TSC —	S —	UV %	U W/m²K	
monolithic glass		**U.S. summer**	**U.S. winter**	**light**	**solar heat gain coefficient**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	solar heat gain coefficient	total shading coefficient	selectivity index	UV transmittance	European	
	5 mm	**5,30**	**5,85**	**12**	**0,37**	12	4	4	89	11	4	85	0,37	0,44	0,33	2	5,8	
	6 mm	**5,27**	**5,82**	**9**	**0,35**	9	4	4	86	8	4	89	0,35	0,41	0,24	1	5,7	

Notes:
1. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions
2. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards
3. European U value is based on EN 410 and EN 673 standards

Pilkington **SuperGrey™**

PILKINGTON

glass configuration			performance code				visible light				solar energy				S, UV, U value			
			U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U
			W/m²K	W/m²K	%	—	%	%	%	—	%	%	%	—	—	—	%	W/m²K
II	**II**	**II**	**U.S. summer**	**U.S. winter**	**light**	**solar heat gain coefficient**												
⇨			**2,83**	**2,69**	**8**	**0,21**	8	4	11	85	6	4	90	0,21	0,25	0,36	1	2,8
	⇨		**1,86**	**1,88**	**7**	**0,15**	7	4	13	85	5	4	91	0,15	0,18	0,46	1	1,8
		⇨	**1,55**	**1,65**	**8**	**0,13**	8	4	11	84	4	4	91	0,13	0,15	0,59	1	1,6

		insulating glass unit, Pilkington **Optitherm™** S3 #3
		insulating glass unit, Pilkington **Energy Advantage™** #3
		insulating glass unit, primary product outside

Notes:
1. Based on 6 mm glass thickness 2. Based on 1/2" (12,7 mm) air filled cavity 3. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions 4. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards 5. European U value is based on EN 410 and EN 673 standards

Pilkington **Dark Grey™**

PILKINGTON

glass configuration		performance code			light				energy						S, UV		
1		U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
		W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	—	%
	monolithic glass	**U value**	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance
5 mm		**5,8**	**20**	**55**	20	5	5	93	41	5	54	55	0,47	0,16	0,63	0,36	50
6 mm		**5,7**	**15**	**51**	15	4	4	92	35	5	60	51	0,40	0,19	0,59	0,29	47

Notes:
Performance values determined in accordance with EN 410 and EN 673.

Pilkington **Dark Grey™**

PILKINGTON

glass configuration			performance code			light				energy						S, UV		
II	II	II	U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
			W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	—	%
			U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance
⇨			**2,8**	**13**	**39**	13	5	11	90	27	6	67	39	0,31	0,14	0,45	0,33	34
	⇨		**1,9**	**12**	**35**	12	5	14	92	23	7	70	35	0,26	0,14	0,40	0,34	26
		⇨	**1,6**	**13**	**28**	13	5	11	91	19	11	70	28	0,22	0,10	0,32	0,46	21

insulating glass unit,
Pilkington **Optitherm™** S3 #3

insulating glass unit,
Pilkington **K Glass™** #3

insulating glass unit,
primary product outside

Notes:
1. Based on 6 mm glass thickness
2. Based on 12 mm air filled cavity
3. Performance values determined in accordance with EN 410 and EN 673.

Pyrolytic on-line coated reflective solar control glasses

Description

Pilkington **Reflite™** is a range of medium solar control performance on-line coated clear or body-tinted glasses, available in a range of attractive colours (Clear, Grey, Bronze, Arctic Blue and Emerald Green). The products offer low light transmittance and medium light reflectance.

Application

Pilkington **Reflite™** products may be used in single glazing applications (with coating on surface #2), as well as in insulating glass units. Pilkington **Reflite™** products can be used in a wide range of residential and commercial applications. Where a safety glass is required, the products can be specified as toughened or laminated glass.

Features and benefits

- Medium solar control performance, reducing the need for air-conditioning.
- Attractive colours (Clear, Grey, Bronze, Arctic Blue and Emerald Green) providing a solution for a wide variety of design requirements.
- Colour stability whether toughened or annealed.
- Medium reflectivity providing privacy whilst still allowing a clear view to the outside.
- Additional thermal insulation performance when combined in an insulating glass unit with a low-emissivity glass.
- Can be laminated, toughened, bent and enamelled using standard techniques.
- Can be used in monolithic form or incorporated in insulating glass units.
- Available in 4 mm, 5 mm and 6 mm thicknesses.

Pilkington **Reflite™** Arctic Blue

PILKINGTON

glass configuration		performance code			light				energy						S, UV	
I																
		U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
		W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	—	%
	monolithic glass #2	**U value**	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance
6 mm		**5,7**	**16**	**32**	16	21	56	92	13	13	74	32	0,15	0,22	0,37	0,50	1

Notes:
Performance values determined in accordance with EN 410 and EN 673.

Pilkington **Reflite™** Arctic Blue

PILKINGTON

glass configuration			performance code			light				energy						S, UV		
II	II	II	U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
			W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	—	%
			U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance
⇨			**2,8**	**15**	**22**	15	21	54	91	11	13	76	22	0,13	0,13	0,25	0,68	1
			1,9	**14**	**18**	14	21	50	91	9	13	78	18	0,10	0,10	0,21	0,78	1
			1,6	**14**	**15**	14	21	52	91	8	14	78	15	0,09	0,08	0,17	0,93	1

		insulating glass unit, Pilkington **Optitherm™** S3 #3
	⇨	insulating glass unit, Pilkington **K Glass™** #3
		insulating glass unit, primary product outside #2

Notes:
1. Based on 6 mm glass thickness.
2. Based on 12 mm air filled cavity.
3. Performance values determined in accordance with EN 410 and EN 673.

Pilkington **Reflite™** Clear

PILKINGTON

glass configuration		performance code			light				energy						S, UV		
	I	U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
		W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	—	%
	monolithic glass #2	**U value**	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance
	6 mm	**5,7**	**31**	**48**	31	47	53	80	40	31	29	48	0,46	0,09	0,55	0,65	5

Notes:
Performance values determined in accordance with EN 410 and EN 673.

Pilkington **Reflite™** Clear

PILKINGTON

glass configuration			performance code				light				energy						S, UV		
II	**II**	**II**																	
			U	LT	g		LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
			W/m²K	%	%		%	%	%	—	%	%	%	%	—	—	—	—	%
			U value	**light**	**energy**		transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance
⇨			**2,8**	**29**	**40**		29	47	51	82	32	33	35	40	0,37	0,09	0,46	0,73	4
	⇨		**1,9**	**27**	**37**		27	48	48	81	27	34	39	37	0,31	0,12	0,43	0,73	3
		⇨	**1,6**	**28**	**29**		28	47	50	82	23	41	36	29	0,26	0,07	0,33	0,97	3

insulating glass unit,
Pilkington **Optitherm™** S3 #3

insulating glass unit,
Pilkington **K Glass™** #3

insulating glass unit,
primary product outside #2

Notes:
1. Based on 6 mm glass thickness.
2. Based on 12 mm air filled cavity.
3. Performance values determined in accordance with EN 410 and EN 673.

Pilkington **Reflite™** Bronze

PILKINGTON

glass configuration		performance code			light				energy						S, UV	
I		U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
		W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	—	%
monolithic glass		**U value**	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance
4 mm		**5,8**	**24**	**46**	24	23	49	—	34	17	49	46	—	—	0,53	—	—
6 mm		**5,7**	**19**	**42**	19	16	49	—	28	13	59	42	—	—	0,48	—	—

Notes:
Performance values determined in accordance with EN 410 and EN 673.

Pilkington **Reflite™** Bronze

PILKINGTON

glass configuration			performance code			light				energy						S, UV		
II	**II**	**II**	W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	—	%
			U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
			U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance
➪			**2,8**	**18**	**32**	18	17	48	—	22	13	65	32	—	—	0,37	—	—
	➪		**1,9**	**17**	**28**	17	17	45	—	18	14	68	28	—	—	0,32	—	—
		➪	**1,6**	**17**	**22**	17	17	46	—	16	18	66	22	—	—	0,25	—	—

insulating glass unit,
Pilkington **Optitherm™** S3 #3

insulating glass unit,
Pilkington **K Glass™** #3

insulating glass unit,
primary product outside #2

Notes:
1. Based on 6 mm glass thickness.
2. Based on 12 mm air filled cavity.
3. Performance values determined in accordance with EN 410 and EN 673.

Pilkington **Reflite™** Grey

PILKINGTON

glass configuration		performance code			light				energy						S, UV	
1		U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
	monolithic glass	W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	—	%
		U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance
4 mm		**5,8**	**22**	**45**	22	20	49	—	33	16	51	45	—	—	0,52	—	—
6 mm		**5,7**	**17**	**41**	17	14	49	—	26	12	62	41	—	—	0,47	—	—

Notes:
Performance values determined in accordance with EN 410 and EN 673.

Pilkington **Reflite™** Grey

PILKINGTON

glass configuration			performance code			light				energy						S, UV		
I	II	II	U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
			W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	—	%
			U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance
⇨			**2,8**	**16**	**31**	16	14	48	—	21	12	67	31	—	—	0,36	—	—
	⇨		**1,9**	**15**	**27**	15	14	45	—	17	13	70	27	—	—	0,31	—	—
		⇨	**1,6**	**15**	**21**	15	14	46	—	15	16	69	21	—	—	0,24	—	—

insulating glass unit,
Pilkington **Optitherm™** S3 #3

insulating glass unit,
Pilkington **K Glass™** #3

insulating glass unit,
primary product outside #2

Notes:
1. Based on 6 mm glass thickness.
2. Based on 12 mm air filled cavity.
3. Performance values determined in accordance with EN 410 and EN 673.

Pilkington **Reflite™** Emerald Green

PILKINGTON

glass configuration		performance code			light				energy						S, UV	
	1															
	monolithic glass #2	U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	S	UV
		W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	%
		U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	selectivity index	UV transmittance
	6 mm	**5,7**	**20**	**31**	20	21	49	90	11	11	78	31	0,13	0,23	0,65	1

Notes:
Performance values determined in accordance with EN 410 and EN 673.

Pilkington **Reflite™** Emerald Green

PILKINGTON

glass configuration			performance code			light				energy						S, UV		
II	II	II																
			W/m²K	%	g	%	%	%	—	%	%	%	%	—	—	—	—	%
			U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
			U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance
⇨			**2,8**	**19**	**20**	19	21	48	89	10	11	79	20	0,11	0,11	0,23	0,95	1
	⇨		**1,9**	**18**	**17**	18	21	45	89	8	11	81	17	0,09	0,10	0,20	1,06	1
		⇨	**1,6**	**18**	**15**	18	21	47	89	8	11	81	15	0,09	0,08	0,17	1,20	0

insulating glass unit,
Pilkington **Optitherm™** S3 #3

insulating glass unit,
Pilkington **K Glass™** #3

insulating glass unit,
primary product outside #2

Notes:
1. Based on 6 mm glass thickness.
2. Based on 12 mm air filled cavity.
3. Performance values determined in accordance with EN 410 and EN 673.

High Performance Tint

Description

Pilkington **Eclipse**™ Gold and Pilkington **Eclipse**™ Sunset Gold are medium solar control performance on-line coated glasses in rich gold colors. They provide a glamorous appearance unlike any other product of its kind. Pilkington **Eclipse**™ Gold and Pilkington **Eclipse**™ Sunset Gold allow high natural daylight transmittance which enhances visual performance and lowers artificial lighting requirements. Both glasses can be combined with Pilkington **Energy Advantage**™ to provide additional low-emissivity and improve passive solar heat gain.

Application

Pilkington **Eclipse**™ is ideal in applications demanding high reflective glass in a rich glamorous color. Common applications include low, mid and hi-rise buildings, financial institutions, offices and retail skylights, both in interior and exterior applications.

Features and benefits

- Medium solar control performance with high daylight transmittance
- Medium reflectivity providing privacy whilst still allowing a clear view to the outside
- Rich gold color providing a stunning look to the building
- Highly durable coated product easy to handle and process
- Can be laminated, toughened, bent and enamelled using standard techniques
- Additional thermal insulation performance when combined in an Insulating Glass Unit with a low-emissivity glass
- Ceramic frit or silk screen can be applied to the coated surface
- Available in a wide range of sizes and thicknesses.

Pilkington **Eclipse™** Gold

PILKINGTON

glass configuration		performance code				visible light				solar energy					S, UV, U value			
1																		
		U W/m²K	U W/m²K	LT %	SHGC —	LT %	LRo %	LRi %	Ra —	ET %	ER %	EA %	SHGC —	TSC —	S —	UV %	U W/m²K	
monolithic glass #2		**U.S. summer**	**U.S. winter**	**light**	**solar heat gain coefficient**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	solar heat gain coefficient	total shading coefficient	selectivity index	UV transmittance	European	
	6 mm	**5,26**	**5,81**	**40**	**0,54**	40	36	45	82	45	25	30	0,54	0,62	0,74	9	5,7	
	8 mm	**5,20**	**5,74**	**40**	**0,52**	40	34	44	82	42	23	35	0,52	0,61	0,76	8	5,7	

Notes:
1. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions
2. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards
3. European U value is based on EN 410 and EN 673 standards

Pilkington **Eclipse™** Gold

PILKINGTON

glass configuration			performance code				visible light				solar energy					S, UV, U value			
			U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U
			W/m²K	W/m²K	%	—	%	%	%	—	%	%	%	—	—	—	%	W/m²K
I1	**I1**	**I1**	**U.S. summer**	**U.S. winter**	**light**	**solar heat gain coefficient**												
⇨			**2,82**	**2,69**	**36**	**0,45**	36	38	45	83	35	27	38	0,45	0,52	0,81	7	2,8
	⇨		**1,86**	**1,88**	**34**	**0,41**	34	38	42	82	30	28	42	0,41	0,48	0,83	5	1,8
		⇨	**1,55**	**1,65**	**36**	**0,32**	36	37	43	83	25	36	38	0,32	0,37	1,10	4	1,6

		insulating glass unit, Pilkington **Optitherm™** S3 #3
		insulating glass unit, Pilkington **Energy Advantage™** #3
		insulating glass unit, primary product outside #2

Notes:
1. Based on 6 mm glass thickness 2. Based on 1/2" (12,7 mm) air filled cavity 3. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions 4. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards 5. European U value is based on EN 410 and EN 673 standards

Pilkington **Eclipse**™ Sunset Gold

PILKINGTON

glass configuration		performance code				visible light				solar energy					S, UV, U value			
1		U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U	
		W/m²K	W/m²K	%	—	%	%	%	—	%	%	%	—	—	—	%	W/m²K	
monolithic glass #2		**U.S. summer**	**U.S. winter**	**light**	**solar heat gain coefficient**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	solar heat gain coefficient	total shading coefficient	selectivity index	UV transmittance	European	
6 mm		**0,93**	**1,02**	**—**	**0,55**	24	16	44	—	30	12	—	—	—	—	3	—	
8 mm		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	

Notes:
1. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions
2. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards
3. European U value is based on EN 410 and EN 673 standards

Pilkington **Eclipse**™ Sunset Gold

PILKINGTON

glass configuration			performance code			light				energy						S, UV		
II	II	II	U W/m²K	LT %	g %	LT %	LRo %	LRi %	Ra —	ET %	ER %	EA %	TET %	SSC —	LSC —	TSC —	S —	UV %
			U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance
⇩			—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
	⇩		—	—	—	21	16	41	—	19	14	—	—	—	—	0,36	—	—
		⇩	—	—	—	22	16	44	—	24	13	—	—	—	—	0,42	—	3
			insulating glass unit, Pilkington **Optifloat**™ Clear															
			insulating glass unit, Pilkington **Energy Advantage**™ #3															
			insulating glass unit, primary product outside #2															

Notes:
1. Based on 6 mm glass thickness.
2. Based on 12 mm air filled cavity.
3. Performance values determined in accordance with EN 410 and EN 673.

Pyrolytic on-line coated solar control glasses with low-emissivity properties

Description

Pilkington **Eclipse Advantage™** is a range of good solar control performance on-line coated clear or body-tinted glasses, with medium light transmittance, low, medium or high light reflectance and low-emissivity. The products come in unique colour appearances – Clear, Blue-Green, EverGreen, Bronze, Grey and Arctic Blue.

Applications

Pilkington **Eclipse Advantage™** products can be used in single glazing applications provided that the coating faces the interior of the building. They provide a versatile and attractive solution to all applications where a brightly coloured glass is needed, with enhanced solar control performance. They are equally suited to all applications, from the small refurbishment to the largest prestige commercial development, where a comparatively low cost but high impact solution is demanded. Where a safety glass is required, the products can be specified as toughened or laminated glass.

Features and benefits

- Good solar control performance with low-emissivity properties, reducing the need for heating and cooling the building.
- Choice of colours, light transmittance, reflectivity and appearance, providing increased design flexibility.
- Further improved thermal insulation performance when combined in an insulating glass unit with a low-emissivity glass.
- Can be laminated, toughened, bent and enamelled using standard techniques.
- Can be used in monolithic form or incorporated in insulating glass units.
- Colour stability whether toughened or annealed.
- Achieves Class B to EN 1096 for coated glass.
- Achieves ASTM C 1376 standard specification.
- Harmonising spandrel panels available.
- All colours available in 6 mm thickness;
  Pilkington **Eclipse Advantage™** Arctic Blue also available in 8 mm thickness.

Pilkington **Eclipse Advantage™** Clear

PILKINGTON

glass configuration		performance code				visible light				solar energy					S, UV, U value			
1																		
		U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U	
		W/m²K	W/m²K	%	—	%	%	%	—	%	%	%	—	—	—	%	W/m²K	
		U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U	
		U.S. summer	**U.S. winter**	**light**	**solar heat gain coefficient**													
6 mm	monolithic glass #2	**3,01**	**3,83**	**67**	**0,62**	67	25	28	98	58	19	23	0,62	0,72	1,07	30	3,8	

Notes:
1. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions
2. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards
3. European U value is based on EN 410 and EN 673 standards

Pilkington **Eclipse Advantage™** Clear

PILKINGTON

glass configuration			performance code				visible light				solar energy					S, UV, U value			
			U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U	
			W/m²K	W/m²K	%	—	%	%	%	—	%	%	%	—	—	—	%	W/m²K	
II	**II**	**II**	**U**	**U**	**LT**	**SHGC**													
⇨			**1,97**	**1,96**	**60**	**0,55**	60	29	31	99	46	21	33	0,55	0,63	1,09	24	1,9	
	⇨		**1,72**	**1,78**	**56**	**0,53**	56	30	30	98	41	22	37	0,53	0,61	1,07	19	1,7	
		⇨	**1,54**	**1,65**	**59**	**0,44**	59	28	30	98	37	28	35	0,44	0,51	1,34	15	1,5	

		insulating glass unit, Pilkington **Optitherm™** S3 #3
		insulating glass unit, Pilkington **Energy Advantage™** #3
		insulating glass unit, primary product outside #2

Notes:
1. Based on 6 mm glass thickness 2. Based on 1/2" (12,7 mm) air filled cavity 3. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions 4. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards 5. European U value is based on EN 410 and EN 673 standards

Pilkington **Eclipse Advantage**™ Arctic Blue

PILKINGTON

glass configuration		performance code				visible light				solar energy					S, UV, U value			
1						%	%	%	—	%	%	%	—	—	—	%	W/m²K
		U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U
		W/m²K	W/m²K	%	—	%	%	%	—	%	%	%	—	—	—	%	W/m²K
		U.S. summer	**U.S. winter**	**light**	**solar heat gain coefficient**												
monolithic glass #2	6 mm	**3,01**	**3,83**	**39**	**0,36**	39	12	27	83	23	8	69	0,36	0,42	1,07	10	3,8
	8 mm	**2,99**	**3,79**	**32**	**0,32**	32	10	27	76	17	7	76	0,32	0,38	1,00	7	3,8

Notes:
1. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions
2. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards
3. European U value is based on EN 410 and EN 673 standards

Pilkington **Eclipse Advantage™** Arctic Blue

PILKINGTON

glass configuration			performance code				visible light				solar energy					S, UV, U value			
			U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U
			W/m²K	W/m²K	%	—	%	%	%	—	%	%	%	—	—	—	%	W/m²K
II	**II**	**II**	**U**	**U**	**LT**	**SHGC**												
⇨			**1,97**	**1,96**	**35**	**0,29**	35	13	30	81	19	9	72	0,29	0,33	1,22	9	1,9
	⇨		**1,72**	**1,78**	**33**	**0,27**	33	14	29	81	17	9	74	0,27	0,31	1,22	7	1,7
		⇨	**1,54**	**1,65**	**35**	**0,25**	35	13	29	81	17	9	74	0,25	0,28	1,41	6	1,5

		insulating glass unit, Pilkington **Optitherm™** S3 #3
		insulating glass unit, Pilkington **Energy Advantage™** #3
		insulating glass unit, primary product outside #2

Notes:
1. Based on 6 mm glass thickness 2. Based on 1/2" (12,7 mm) air filled cavity 3. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions 4. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards 5. European U value is based on EN 410 and EN 673 standards

Pilkington **Eclipse Advantage™** Blue-Green

PILKINGTON

glass configuration		performance code				visible light				solar energy					S, UV, U value			
1		U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U	
		W/m²K	W/m²K	%	—	%	%	%	—	%	%	%	—	—	—	%	W/m²K	
		U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U	
		U.S. summer	**U.S. winter**	**light**	**solar heat gain coefficient**													
6 mm	monolithic glass #2	**3,01**	**3,83**	**56**	**0,45**	56	19	27	93	35	11	54	0,45	0,53	1,25	16	3,8	European

Notes:
1. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions
2. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards
3. European U value is based on EN 410 and EN 673 standards

Pilkington **Eclipse Advantage™** Blue-Green

PILKINGTON

glass configuration			performance code				visible light				solar energy					S, UV, U value			
II	**II**	**II**	U W/m²K	U W/m²K	LT %	SHGC —	LT %	LRo %	LRi %	Ra —	ET %	ER %	EA %	SHGC —	TSC —	S —	UV %	U W/m²K
			U.S. summer	**U.S. winter**	**light**	**solar heat gain coefficient**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	solar heat gain coefficient	total shading coefficient	selectivity index	UV transmittance	European
⇨			**1,97**	**1,96**	**51**	**0,38**	51	21	29	91	29	12	59	0,38	0,44	1,34	13	1,9
	⇨		**1,72**	**1,78**	**48**	**0,36**	48	22	29	91	26	13	62	0,36	0,41	1,33	10	1,7
		⇨	**1,54**	**1,65**	**50**	**0,32**	50	21	29	91	25	13	62	0,32	0,37	1,56	8	1,5

⇨ insulating glass unit, Pilkington **Optitherm™** S3 #3

⇨ insulating glass unit, Pilkington **Energy Advantage™** #3

⇨ insulating glass unit, primary product outside #2

Notes:
1. Based on 6 mm glass thickness 2. Based on 1/2" (12,7 mm) air filled cavity 3. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions 4. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards 5. European U value is based on EN 410 and EN 673 standards

Pilkington **Eclipse Advantage™** Bronze

PILKINGTON

glass configuration		performance code				visible light				solar energy					S, UV, U value			
1																		
		U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U	
		W/m²K	W/m²K	%	—	%	%	%	—	%	%	%	—	—	—	%	W/m²K	
		U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U	
		U.S. summer	**U.S. winter**	**light**	**solar heat gain coefficient**													
6 mm	monolithic glass #2	**3,01**	**3,83**	**38**	**0,45**	38	11	27	90	35	10	55	0,45	0,53	0,84	11	3,8	
																		European
																		UV transmittance
																		selectivity index

Notes:
1. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions
2. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards
3. European U value is based on EN 410 and EN 673 standards

Pilkington **Eclipse Advantage™** Bronze

PILKINGTON

glass configuration			performance code				visible light				solar energy					S, UV, U value			
			U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U	
			W/m²K	W/m²K	%	—	%	%	%	—	%	%	%	—	—	—	%	W/m²K	
II	**II**	**II**	**U**	**U**	**LT**	**SHGC**													
⇨			**1,97**	**1,96**	**34**	**0,38**	34	13	29	92	28	11	61	0,38	0,44	0,90	9	1,9	
	⇨		**1,72**	**1,78**	**32**	**0,36**	32	13	29	91	24	11	65	0,36	0,41	0,90	7	1,7	
		⇨	**1,54**	**1,65**	**34**	**0,30**	34	12	28	91	22	13	65	0,30	0,35	1,12	6	1,5	

	insulating glass unit, Pilkington **Optitherm™** S3 #3
	insulating glass unit, Pilkington **Energy Advantage™** #3
	insulating glass unit, primary product outside #2

Notes:
1. Based on 6 mm glass thickness 2. Based on 1/2" (12,7 mm) air filled cavity 3. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions 4. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards 5. European U value is based on EN 410 and EN 673 standards

Pilkington **Eclipse Advantage™** EverGreen

PILKINGTON

glass configuration	performance code					visible light				solar energy				S, UV, U value			
1	U W/m²K	U W/m²K	LT %	SHGC —		LT %	LRo %	LRi %	Ra —	ET %	ER %	EA %	SHGC —	TSC —	S —	UV %	U W/m²K
	U.S. summer	**U.S. winter**	**light**	**solar heat gain coefficient**		transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	solar heat gain coefficient	total shading coefficient	selectivity index	UV transmittance	European
6 mm	**3,01**	**3,83**	**48**	**0,36**	monolithic glass #2	48	15	27	90	23	8	68	0,36	0,43	1,32	7	3,8

Notes:
1. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions
2. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards
3. European U value is based on EN 410 and EN 673 standards

Pilkington **Eclipse Advantage™** EverGreen

PILKINGTON

glass configuration			performance code				visible light				solar energy					S, UV, U value			
II	**II**	**II**	U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U
			W/m²K	W/m²K	%	—	%	%	%	—	%	%	%	—	—	—	%	W/m²K
			U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U
			U.S. summer	**U.S. winter**	**light**	**solar heat gain coefficient**												
⇨			**1,97**	**1,96**	**43**	**0,29**	43	17	30	88	20	9	71	0,29	0,33	1,49	6	1,9
	⇨		**1,72**	**1,78**	**40**	**0,27**	40	18	29	88	18	9	73	0,27	0,31	1,49	5	1,7
		⇨	**1,54**	**1,65**	**43**	**0,25**	43	17	29	88	18	9	73	0,25	0,29	1,69	4	1,5
			insulating glass unit, Pilkington **Optitherm™** S3 #3															
			insulating glass unit, Pilkington **Energy Advantage™** #3															
			insulating glass unit, primary product outside #2															

Notes:
1. Based on 6 mm glass thickness 2. Based on 1/2" (12,7 mm) air filled cavity 3. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions 4. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards 5. European U value is based on EN 410 and EN 673 standards

Pilkington **Eclipse Advantage™** Grey

PILKINGTON

glass configuration		performance code				visible light				solar energy				S, UV, U value			
1																	
		U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U
		W/m²K	W/m²K	%	—	%	%	%	—	%	%	%	—	—	—	%	W/m²K
		U.S. summer	**U.S. winter**	**light**	**solar heat gain coefficient**												
6 mm	monolithic glass #2	**3,01**	**3,83**	**32**	**0,41**	32	10	27	97	29	8	62	0,41	0,48	0,78	10	3,8

Notes:
1. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions
2. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards
3. European U value is based on EN 410 and EN 673 standards

Pilkington **Eclipse Advantage™** Grey

PILKINGTON

glass configuration			performance code				visible light					solar energy					S, UV, U value			
			U	U	LT	SHGC	LT	LRo	LRi	Ra		ET	ER	EA	SHGC	TSC	S	UV	U	
			W/m²K	W/m²K	%	—	%	%	%	—		%	%	%	—	—	—	%	W/m²K	
I	II	II	**U.S. summer**	**U.S. winter**	**light**	**solar heat gain coefficient**														
⇨			**1,97**	**1,96**	**29**	**0,33**	29	10	29	96		23	9	68	0,33	0,39	0,87	8	1,9	
	⇨		**1,72**	**1,78**	**27**	**0,31**	27	11	29	96		20	9	70	0,31	0,36	0,86	7	1,7	
		⇨	**1,54**	**1,65**	**29**	**0,27**	29	10	29	96		18	11	71	0,27	0,31	1,07	6	1,5	

insulating glass unit,
Pilkington **Optitherm™** S3 #3

insulating glass unit,
Pilkington **Energy Advantage™** #3

insulating glass unit,
primary product outside #2

Notes:
1. Based on 6 mm glass thickness 2. Based on 1/2" (12,7 mm) air filled cavity 3. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions 4. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards 5. European U value is based on EN 410 and EN 673 standards

Pyrolytic on-line coated solar control glasses with low-emissivity properties

Description

Pilkington **Solar-E™** is a range of good solar control performance on-line coated glasses with low SHGC, low reflectivity, reduced glare and low-emissivity. The products are available in a range of colours – Clear, Blue-Green, EverGreen, Grey and Arctic Blue.

Application

Pilkington **Solar-E™** products can be used in single glazing applications provided that the coating faces the interior of the building. They provide attractive solutions to various applications where good light transmittance with enhanced solar control performance is required. Thanks to their low exterior light reflectance the products are widely used for modern glass façades where high reflectance is prohibited or undesirable. Where a safety glass is required,the products can be specified as toughened or laminated glass.

Features and benefits

- Good solar control performance with low-emissivity, reducing the need for heating and cooling the building.
- Medium light transmittance and low light reflectance for undistorted, natural views.
- Available in a range of colours (Clear, Blue-Green, EverGreen, Grey, Arctic Blue).
- Further improved thermal insulation performance when combined in an insulating glass unit with a low-emissivity glass.
- Can be laminated, toughened, bent and enamelled using standard techniques.
- Can be used in monolithic form or incorporated in insulating glass units.
- Colour stability whether toughened or annealed.
- Achieves Class B to EN 1096 for coated glass.
- Achieves ASTM C 1376 standard specification.
- All colours available in 6 mm and in 8 mm thicknesses.

Pilkington **Solar-E™** Clear

PILKINGTON

glass configuration		performance code				visible light				solar energy					S, UV, U value			
	1																	
	monolithic glass #2	U W/m²K	U W/m²K	LT %	SHGC —	LT %	LRo %	LRi %	Ra —	ET %	ER %	EA %	SHGC —	TSC —	S —	UV %	U W/m²K	
		U.S. summer	**U.S. winter**	**light**	**solar heat gain coefficient**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	solar heat gain coefficient	total shading coefficient	selectivity index	UV transmittance	European	
	6 mm	**2,83**	**3,68**	**60**	**0,52**	60	8	9	94	44	7	49	0,52	0,61	1,14	44	3,7	
	8 mm	**2,81**	**3,65**	**59**	**0,51**	59	8	9	93	42	7	51	0,51	0,59	1,16	41	3,7	

Notes:
1. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions
2. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards
3. European U value is based on EN 410 and EN 673 standards

Pilkington **Solar-E™** Clear

PILKINGTON

glass configuration			performance code				visible light				solar energy					S, UV, U value			
II	**II**	**II**	W/m²K	W/m²K	%	—	%	%	%	—	%	%	%	—	—	—	%	W/m²K
			U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U
			U.S. summer	**U.S. winter**	**light**	**solar heat gain coefficient**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	solar heat gain coefficient	total shading coefficient	selectivity index	UV transmittance	European
⇨			**1,88**	**1,89**	**53**	**0,45**	53	11	15	92	35	9	56	0,45	0,51	1,20	33	1,9
		⇨	**1,70**	**1,76**	**50**	**0,43**	50	12	16	92	32	9	59	0,43	0,49	1,16	26	1,7
		⇨	**1,54**	**1,64**	**53**	**0,38**	53	10	15	92	30	11	59	0,38	0,44	1,37	20	1,5

insulating glass unit,
Pilkington **Optitherm™** S3 #3

insulating glass unit,
Pilkington **Energy Advantage™** #3

insulating glass unit,
primary product outside #2

Notes:
1. Based on 6 mm glass thickness 2. Based on 1/2" (12,7 mm) air filled cavity 3. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions 4. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards 5. European U value is based on EN 410 and EN 673 standards

Pilkington **Solar-E™** Blue-Green

PILKINGTON

glass configuration		performance code				visible light				solar energy					S, UV, U value			
	I	U W/m²K	U W/m²K	LT %	SHGC —	LT %	LRo %	LRi %	Ra —	ET %	ER %	EA %	SHGC —	TSC —	S —	UV %	U W/m²K
	monolithic glass #2	**2,84**	**3,68**	**51**	**0,41**	51	7	8	87	29	6	65	0,41	0,48	1,26	21	3,7
6 mm		**2,82**	**3,65**	**45**	**0,37**	45	7	9	84	24	6	70	0,37	0,43	1,22	15	3,6
8 mm																	

solar heat gain coefficient
light
U.S. winter
U.S. summer
selectivity index
UV transmittance
European
total shading coefficient
solar heat gain coefficient
absorptance
reflectance
direct transmittance
colour rendering index
reflectance inside
reflectance outside
transmittance

Notes:
1. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions
2. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards
3. European U value is based on EN 410 and EN 673 standards

Pilkington **Solar-E™** Blue-Green

PILKINGTON

glass configuration			performance code				visible light				solar energy					S, UV, U value			
II	II	II	U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U	
			W/m²K	W/m²K	%	—	%	%	%	—	%	%	%	—	—	—	%	W/m²K	
			1,88	**1,89**	**46**	**0,33**	46	9	15	85	24	7	69	0,33	0,38	1,38	17	1,9	
			1,70	**1,76**	**42**	**0,31**	42	9	16	86	22	7	71	0,31	0,36	1,35	13	1,7	
			1,54	**1,64**	**45**	**0,30**	45	8	14	85	21	7	72	0,30	0,34	1,53	11	1,5	

⇨	insulating glass unit, Pilkington **Optitherm™** S3 #3
⇨	insulating glass unit, Pilkington **Energy Advantage™** #3
⇨	insulating glass unit, primary product outside #2

Notes:
1. Based on 6 mm glass thickness 2. Based on 1/2" (12,7 mm) air filled cavity 3. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions 4. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards 5. European U value is based on EN 410 and EN 673 standards

Pilkington **Solar-E™** EverGreen

PILKINGTON

glass configuration		performance code				visible light				solar energy					S, UV, U value			
	I																	
		U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U	
		W/m²K	W/m²K	%	—	%	%	%	—	%	%	%	—	—	—	%	W/m²K	
	monolithic glass #2	**U**	**U**	**LT**	**SHGC**													
		U.S. summer	**U.S. winter**	**light**	**solar heat gain coefficient**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	solar heat gain coefficient	total shading coefficient	selectivity index	UV transmittance	European	
6 mm		**2,84**	**3,68**	**45**	**0,34**	45	6	9	84	20	5	75	0,34	0,40	1,33	8	3,7	
8 mm		**2,82**	**3,65**	**40**	**0,31**	40	7	9	81	16	5	79	0,31	0,36	1,30	5	3,6	

Notes:
1. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions
2. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards
3. European U value is based on EN 410 and EN 673 standards

Pilkington **Solar-E™** EverGreen

PILKINGTON

glass configuration			performance code				visible light				solar energy					S, UV, U value			
II	II	II	U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U	
			W/m²K	W/m²K	%	—	%	%	%	—	%	%	%	—	—	—	%	W/m²K	
			U.S. summer	**U.S. winter**	**light**	**solar heat gain coefficient**													
⇨			**1,88**	**1,89**	**40**	**0,26**	40	8	15	82	17	6	77	0,26	0,30	1,52	7	1,9	
	⇨		**1,70**	**1,76**	**37**	**0,25**	37	9	16	83	16	6	78	0,25	0,29	1,50	5	1,7	
		⇨	**1,54**	**1,64**	**40**	**0,24**	40	8	14	83	16	6	78	0,24	0,28	1,66	4	1,5	

⇨ insulating glass unit, Pilkington **Optitherm™** S3 #3

⇨ insulating glass unit, Pilkington **Energy Advantage™** #3

⇨ insulating glass unit, primary product outside #2

Notes:
1. Based on 6 mm glass thickness 2. Based on 1/2" (12,7 mm) air filled cavity 3. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions 4. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards 5. European U value is based on EN 410 and EN 673 standards

Pilkington **Solar-E™** Grey

PILKINGTON

glass configuration		performance code				visible light				solar energy					S, UV, U value			
	I	U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U
		W/m²K	W/m²K	%	—	%	%	%	—	%	%	%	—	—	—	%	W/m²K
	monolithic glass #2																
6 mm		**2,84**	**3,68**	**30**	**0,36**	30	5	8	92	23	6	71	0,36	0,42	0,83	13	3,7
8 mm		**2,82**	**3,65**	**23**	**0,32**	23	5	8	91	17	5	78	0,32	0,37	0,73	9	3,6
		U.S. summer	**U.S. winter**	**light**	**solar heat gain coefficient**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	solar heat gain coefficient	total shading coefficient	selectivity index	UV transmittance	European

Notes:
1. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions
2. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards
3. European U value is based on EN 410 and EN 673 standards

Pilkington **Solar-E™** Grey

PILKINGTON

glass configuration			performance code				visible light				solar energy					S, UV, U value			
II	II	II	U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U	
			W/m²K	W/m²K	%	—	%	%	%	—	%	%	%	—	—	—	%	W/m²K	
			U.S. summer	**U.S. winter**	**light**	**solar heat gain coefficient**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	solar heat gain coefficient	total shading coefficient	selectivity index	UV transmittance	European	
⇨			**1,88**	**1,89**	**27**	**0,28**	27	6	14	90	19	6	75	0,28	0,33	0,94	10	1,9	
			1,70	**1,76**	**25**	**0,27**	25	6	15	91	17	7	77	0,27	0,31	0,92	8	1,7	
			1,54	**1,64**	**26**	**0,24**	26	6	14	91	16	7	77	0,24	0,28	1,09	7	1,5	

insulating glass unit,
Pilkington **Optitherm™** S3 #3

⇨

insulating glass unit,
Pilkington **Energy Advantage™** #3

⇨

insulating glass unit,
primary product outside #2

⇨

Notes:
1. Based on 6 mm glass thickness 2. Based on 1/2" (12,7 mm) air filled cavity 3. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions 4. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards 5. European U value is based on EN 410 and EN 673 standards

Pilkington **Solar-E™** Arctic Blue

PILKINGTON

glass configuration		performance code				visible light				solar energy					S, UV, U value			
	I																	
		U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U	
		W/m²K	W/m²K	%	—	%	%	%	—	%	%	%	—	—	—	%	W/m²K	
		U	**U**	**LT**	**SHGC**	**LT**	**LRo**	**LRi**	**Ra**	**ET**	**ER**	**EA**	**SHGC**	**TSC**	**S**	**UV**	**U**	**U.S. winter / U.S. summer / light / solar heat gain coefficient**
	monolithic glass #2																	
6 mm		**2,84**	**3,68**	**36**	**0,33**	36	6	8	76	20	5	75	0,33	0,33	1,08	13	3,7	European
8 mm		**2,82**	**3,65**	**30**	**0,30**	30	6	8	70	16	5	79	0,30	0,36	0,99	8	3,6	UV transmittance / selectivity index

Notes:
1. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions
2. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards
3. European U value is based on EN 410 and EN 673 standards

Pilkington **Solar-E™** Arctic Blue

PILKINGTON

glass configuration			performance code				visible light				solar energy				S, UV, U value			
II	II	II	U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U
			W/m²K	W/m²K	%	—	%	%	%	—	%	%	%	—	—	—	%	W/m²K
			U.S. summer	**U.S. winter**	**light**	**solar heat gain coefficient**												
➪			**1,88**	**1,89**	**32**	**0,26**	32	7	14	74	17	6	78	0,26	0,30	1,24	10	1,9
	➪		**1,70**	**1,76**	**30**	**0,24**	30	7	15	75	15	6	79	0,24	0,28	1,22	8	1,7
		➪	**1,54**	**1,64**	**32**	**0,23**	32	6	14	75	15	6	79	0,23	0,27	1,38	7	1,5

	insulating glass unit, Pilkington **Optitherm™** S3 #3
	insulating glass unit, Pilkington **Energy Advantage™** #3
	insulating glass unit, primary product outside #2

Notes:
1. Based on 6 mm glass thickness 2. Based on 1/2" (12,7 mm) air filled cavity 3. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions 4. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards 5. European U value is based on EN 410 and EN 673 standards

Pilkington **Solar-E™** 47 Blue-Grey

Description

Pilkington **Solar-E™** 47 Blue-Grey is a perfect solution for meeting cooling load requirements and other energy code programs. Pilkington **Solar-E™** 47 Blue-Grey features an integral pyrolytic surface which provides superior fabricating and handling qualities. As a result, the glass can be handled, cut and tempered, and offers virtually unlimited shelf life. In addition, no edge deletion or special handling is required.

Applications

When glazed on the #2 surface, Pilkington **Solar-E™** 47 Blue-Grey provides both solar and thermal control. The solar control portion of the Pilkington **Solar-E™** 47 Blue-Grey surface absorbs solar energy, which the low-emissivity insulating portion then retransmits to the outside.

Features and benefits

- Optimizes Solar Control and energy efficiency of clear insulating glass units to create an excellent Pilkington **Sun Management™** Glass System.
- Reduces Heat Gain, with an insulating glass unit Shading coefficient (SC) of only 0,47, compared to SCs of 0,81 for clear float and 0,71 for Pilkington **Energy Advantage™**.
- Durable Pyrolytic Surface offers all the benefits of pyrolytic coating, including virtually unlimited shelf life, excellent availability for reduced lead times, easy fabrication and heat treatment – and is so durable, it can be used in monolithic applications. Please see Pilkington Technical Bulletin ATS-162 for specific instructions on monolithic applications.
- Consistent Color Aesthetics maintained when Pilkington **Solar-E™** 47 Blue-Grey is combined with tints or reflective glasses.
- Good Light Transmittance for a solar control product. When glazed on the #2 surface in an insulating glass unit, Pilkington **Solar-E™** 47 Blue-Grey provides 47% visible daylight transmittance for undistorted, natural views.
- Low Exterior Reflectance makes Pilkington **Solar-E™** 47 Blue-Grey ideal for use where high reflectance is prohibited or undesirable.
- Excellent Availability for significantly reduced lead times, which translates into lower project costs.

Pilkington **Solar-E™** 47 Blue-Grey

PILKINGTON

glass configuration		performance code				visible light				solar energy					S, UV, U value			
1																		
		U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U	
		W/m²K	W/m²K	%	—	%	%	%	—	%	%	%	—	—	—	%	W/m²K	
		U.S. summer	**U.S. winter**	**light**	**solar heat gain coefficient**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	solar heat gain coefficient	total shading coefficient	selectivity index	UV transmittance	European	
6 mm	monolithic glass #2	**2,93**	**3,77**	**52**	**0,49**	52	7	9	92	38	7	55	0,49	0,56	1,06	33	3,7	

Notes:
1. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions
2. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards
3. European U value is based on EN 410 and EN 673 standards

Superior off-line coated solar control performance glasses with outstanding thermal insulation

Description

Pilkington **Suncool™** is a range of superior solar control performance off-line coated glasses, with high light transmittance and low, medium or high light reflectance. Due to their very low-emissivity coating, the products also offer outstanding thermal insulation. The wide range of products is available in clear or neutral appearance and in two distinctive colours, blue and silver.

All products from the Pilkington **Suncool™** range are available in combination with self-cleaning properties, Pilkington **Activ Suncool™**, as well as they are available on low-iron substrate, Pilkington **Suncool™** OW, to maximise light transmittance and reduce the risk of thermal breakage.

Table 1.1. The appearance of the Pilkington **Suncool™** product range.

Product	IGU construction (6 mm external pane - 16 mm - 4 mm Pilkington **Optifloat™** Clear)		
	Appearance in reflection (external view)	**Level of reflection***	**Appearance in transmission (internal view)**
Pilkington **Suncool™** 70/40	neutral	low	neutral
Pilkington **Suncool™** 70/35	neutral/blue	medium	neutral
Pilkington **Suncool™** 66/33	neutral	medium	neutral
Pilkington **Suncool™** 60/30	neutral	medium	neutral
Pilkington **Suncool™** Silver 50/30	silver	high	neutral
Pilkington **Suncool™** Blue 50/27	blue	medium	neutral
Pilkington **Suncool™** 50/25	neutral/blue	medium	neutral
Pilkington **Suncool™** 40/22	neutral/blue	medium	neutral
Pilkington **Suncool™** 30/17	neutral/blue	medium	neutral

* Level of reflection: low <15%, medium 15-25%, high >25%.

For additional thermal insulation, Pilkington **Suncool™** insulating glass units can be filled with an inert gas such as argon.

Applications

Pilkington **Suncool™** products can only be used in insulating glass

units. Designed to achieve optimum performance in large glazed areas, Pilkington **Suncool™** products are suitable for commercial and residential applications that demand high light transmission properties. The high selectivity index (light-to-heat ratio) combined with outstanding thermal insulation makes the range ideally suited to large areas of glazing, where the need is to control solar gains without significantly reducing the internal light levels.
Where a safety glass is required, the products can be specified as toughened or laminated glass. This product is only available in certain markets, please consult your local sales representative for further information.

Benefits

- Superior solar control performance with the highest level of thermal insulation (U value down to 1,0 W/m^{2}K in a double insulating glass unit with 90% argon filled), reducing the need for cooling and heating the building.
- High selectivity index (light transmittance divided by total solar heat transmittance), offering low solar gains without significantly reducing the internal light levels.
- Wide choice of colours and appearances, providing solutions for the most demanding designs.
- Range of light transmission and reflection.
- Pilkington **Activ Suncool™** available, reducing the need for manual cleaning as well as providing high performance solar control and low-emissivity.
- Pilkington **Suncool™** OW (on Pilkington **Optiwhite™** low-iron substrate) available to maximise light transmittance and reduce the risk of thermal breakage.
- Can be enhanced when combined with other Pilkington products to provide additional benefits such as noise control, safety or security properties.
- Harmonising spandrel panels available, allowing freedom in design of complete glass façades.
- Can only be used in insulating glass units; gas filling (e.g. argon) can be used to achieve higher thermal insulation.
- Available in annealed, toughened or toughenable form (depending on the product) – all products available in laminated form.
- Available in 6 mm, 8 mm and 10 mm thickness in annealed and toughened form (4 mm available in some products, 12 mm may be available on special request).

Pilkington **Suncool™** 70/40

PILKINGTON

glass configuration			performance code			light				energy							S, UV		
II	II	II	U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV	
			W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—			
			U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance	
⇩			**1,1**	**70**	**43**	70	10	11	95	38	28	34	43	0,44	0,05	0,49	1,63	17	
	⇩		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
		⇩	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
			insulating glass unit, Pilkington **Optitherm™** S3 #3																
			insulating glass unit, Pilkington **K Glass™** #3																
			insulating glass unit, primary product outside #2																

Notes:
1. Based on 6 mm glass thickness
2. Based on 16 mm (double glazed units) argon filled (90%) cavities
3. The primary product shall only be used in insulating glass units

Pilkington **Suncool™** 70/35

PILKINGTON

glass configuration			performance code			light				energy						S, UV		
II	II	II	W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	—	%
			U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
			U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance
⇨			**1,0**	**69**	**37**	69	16	16	96	34	35	31	37	0,39	0,04	0,43	1,86	10
			—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	⇨		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		⇨	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

insulating glass unit,
Pilkington **Optitherm™** S3 #3

insulating glass unit,
Pilkington **K Glass™** #3

insulating glass unit,
primary product outside #2

Notes:
1. Based on 6 mm glass thickness
2. Based on 16 mm (double glazed units) argon filled (90%) cavities
3. The primary product shall only be used in insulating glass units

Pilkington **Suncool™** 66/33

PILKINGTON

glass configuration			performance code			light				energy							S, UV		
II	II	II	W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	—	%	UV
			U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV	
			U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance	
⇩			**1,0**	**65**	**36**	65	16	18	93	32	35	33	36	0,37	0,04	0,41	1,81	10	
	⇩		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
		⇩	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	

insulating glass unit,
Pilkington **Optitherm™** S3 #3

insulating glass unit,
Pilkington **K Glass™** #3

insulating glass unit,
primary product outside #2

Notes:
1. Based on 6 mm glass thickness
2. Based on 16 mm (double glazed units) argon filled (90%) cavities
3. The primary product shall only be used in insulating glass units

Pilkington **Suncool™** 60/30

PILKINGTON

glass configuration			performance code			light				energy						S, UV		
II	II	II	W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	—	%
			U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
			U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance
⇩			**1,0**	**60**	**32**	60	19	21	94	30	36	34	32	0,34	0,03	0,37	1,88	9
			—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
			—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

insulating glass unit,
Pilkington **Optitherm™** S3 #3

insulating glass unit,
Pilkington **K Glass™** #3

insulating glass unit,
primary product outside #2

Notes:
1. Based on 6 mm glass thickness
2. Based on 16 mm (double glazed units) argon filled (90%) cavities
3. The primary product shall only be used in insulating glass units

Pilkington **Suncool™** 50/25

PILKINGTON

glass configuration			performance code			light				energy								S, UV		
II	II	II	U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV		
			W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—				
			U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance		
⇩			**1,0**	**49**	**27**	49	18	19	91	24	33	43	27	0,28	0,03	0,31	1,81	7		
			—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
			—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
		⇧	insulating glass unit, Pilkington **Optitherm™** S3 #3																	
	⇧		insulating glass unit, Pilkington **K Glass™** #3																	
⇧			insulating glass unit, primary product outside #2																	

Notes:
1. Based on 6 mm glass thickness
2. Based on 16 mm (double glazed units) argon filled (90%) cavities
3. The primary product shall only be used in insulating glass units

Pilkington **Suncool™** Silver 50/30

PILKINGTON

glass configuration			performance code			light				energy						S, UV		
II	II	II																
			W/m²K	%		%	%	%	—	%	%	%	%	—	—	—	—	%
			U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
			U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance
⇩			**1,1**	**49**	**31**	49	39	32	93	28	42	30	31	0,32	0,04	0,36	1,58	16
			—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	⇩		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		⇩	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

insulating glass unit,
Pilkington **Optitherm™** S3 #3

insulating glass unit,
Pilkington **K Glass™** #3

insulating glass unit,
primary product outside #2

Notes:
1. Based on 6 mm glass thickness
2. Based on 16 mm (double glazed units) argon filled (90%) cavities
3. The primary product shall only be used in insulating glass units

Pilkington **Suncool™** Blue 50/27

PILKINGTON

glass configuration			performance code			light				energy							S, UV		
II	II	II	U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV	
			W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—		%	
⇩			**U value**	**light**	**energy**	transmittance				direct transmittance							selectivity index		
			1,1	**50**	**28**	50	19	19	94	25	35	40	28	0,29	0,03	0,32	1,79	6	
			—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
			—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	

insulating glass unit,
Pilkington **Optitherm™** S3 #3

insulating glass unit,
Pilkington **K Glass™** #3

insulating glass unit,
primary product outside #2

Notes:
1. Based on 6 mm glass thickness
2. Based on 16 mm (double glazed units) argon filled (90%) cavities
3. The primary product shall only be used in insulating glass units

Pilkington **Suncool™** 40/22

PILKINGTON

glass configuration			performance code			light				energy						S, UV		
II	**II**	**II**	U W/m²K	LT %	g %	LT %	LRo %	LRi %	Ra —	ET %	ER %	EA %	TET %	SSC —	LSC —	TSC —	S —	UV %
			U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance
⇩			**1,1**	**39**	**23**	39	20	22	90	19	35	46	23	0,22	0,04	0,26	1,70	7
	⇩		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		⇩	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

insulating glass unit,
Pilkington **Optitherm™** S3 #3

insulating glass unit,
Pilkington **K Glass™** #3

insulating glass unit,
primary product outside #2

Notes:
1. Based on 6 mm glass thickness
2. Based on 16 mm (double glazed units) argon filled (90%) cavities
3. The primary product shall only be used in insulating glass units

Pilkington **Suncool™** 30/17

PILKINGTON

glass configuration			performance code			light				energy							S, UV		
II	II	II	U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV	
			W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—		%	
			U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance	
⇩			**1,1**	**30**	**19**	30	26	16	87	15	37	48	19	0,17	0,05	0,22	1,58	6	
	⇩		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
		⇩	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	

insulating glass unit, Pilkington **Optitherm™** S3 #3

insulating glass unit, Pilkington **K Glass™** #3

insulating glass unit, primary product outside #2

Notes:
1. Based on 6 mm glass thickness
2. Based on 16 mm (double glazed units) argon filled (90%) cavities
3. The primary product shall only be used in insulating glass units

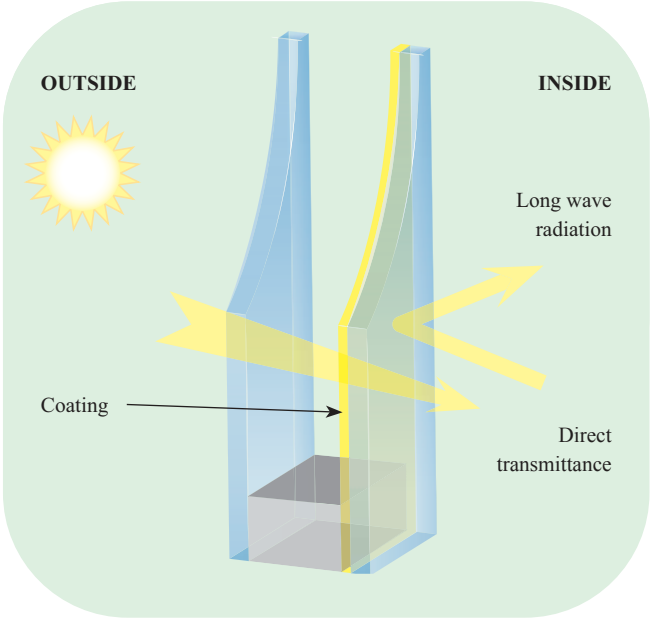
2. Thermal Insulation

Low-emissivity

Advances in low-emissivity (low-e) glass technology have made windows an essential contributor to energy conservation and comfort, minimising heat loss and internal condensation.
The measure of heat flow is usually expressed in terms of U value (or U-factor), which is the rate of heat flow in Watts per square metre per degree Kelvin temperature difference between inside and outside (expressed as W/m²K). The lower the U value, the better the insulation of the product.

How it works – Effectively, low-emissivity glass will reflect energy back into a building, to achieve much lower heat loss than ordinary float glass. Additionally, different types of low-emissivity glass allow different amounts of free energy from the sun, passive solar heat gain, helping to reduce heating requirements and costs, especially in colder months.

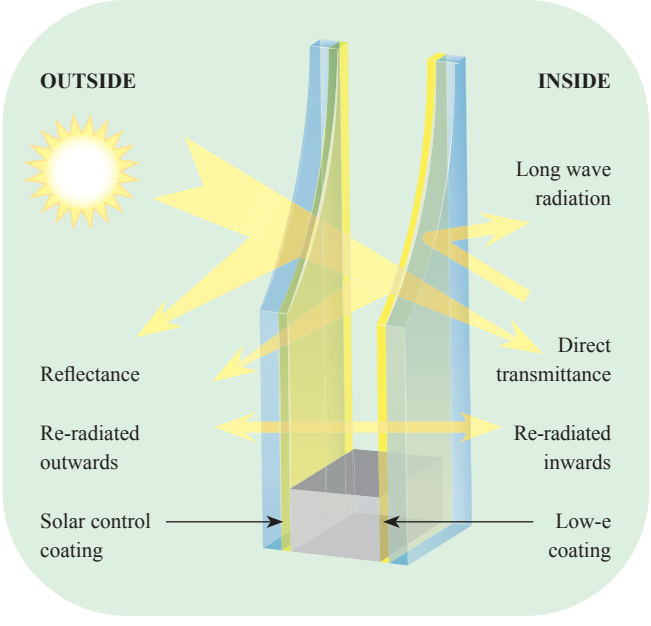
Figure 2.1. Insulating glass unit incorporating low-e glass.



In hot weather conditions, low-e glass should be combined with solar control glass in an insulating glass unit to enhance the performance, by reducing:
– heat gain from direct solar radiation into the building due to the lower g value, and
– conduction gains through the insulating glass unit from the hot outside environment to the air-conditioned inside

The combination of solar control and low-e in an insulating glass unit can help to reduce air-conditioning loads, save energy and reduce CO_2 emissions.

Figure 2.2. Double insulating glass unit with coated solar control glass outer pane and low-e coated inner pane.



Note: The potential for low-e glass (double and triple glazing) to cut CO_2 emissions from new and existing buildings has been analysed by the Dutch scientific institute TNO in a study undertaken for Glass For Europe. Up to 90 million tonnes of CO_2 emissions could be saved annually by 2020 if all Europe's buildings (existing and new residential and non-residential buildings) were fitted with double-glazed low-e insulating glass units. An additional 7 million tonnes of CO_2 emissions could be cut thanks to the greater use of triple-glazed low-e insulating glass units for new buildings, where appropriate. Reference: "Potential impact of Low-Emissivity Glazing on energy and CO_2 savings in Europe" (TNO Report 2008-DR1240/B by TNO Built Environment and Geosciences, Delft, The Netherlands). www.glassforeurope.com.

To maximise energy efficiency all year round and in all climates, often the ideal glazing solution balances both solar control and low-emissivity performance. Our products offer two ways in which this can be achieved:

- by using a single glass which provides both solar control and low-emissivity on one pane of the insulating glass unit,
- by using both a solar control glass and a separate low-emissivity glass within the insulating glass unit.

The ability to do this gives us great flexibility to meet energy management criteria.

Our low-emissivity range covers all levels of requirements:

- from on-line products such as Pilkington **Energy Advantage™** and Pilkington **K Glass™**,
- to extremely low U value off-line solutions in the Pilkington **Optitherm™** range,
- through to Pilkington **Suncool™**, Pilkington **Solar-E™** and Pilkington **Eclipse Advantage™** which provide both low-emissivity and solar control properties in a single product.

Description

Pilkington **Optifloat™** Clear is a high quality clear float glass manufactured by the float process.

Applications

Pilkington **Optifloat™** Clear can be used in wide variety of applications, often representing a practical and stylish alternative to opaque materials. It may be used in the exterior and interior of buildings to allow the transmission of daylight, thus reducing the cost of artificial lighting and allowing occupants to view their surroundings. In thicknesses above 6 mm, it can be used for a variety of commercial applications where superior strength, greater spans, reduced deflection, high daylight transmission and enhanced noise suppression are required. Where a safety glass is required, Pilkington **Optifloat™** Clear can be toughened or laminated.

Features and benefits

- High quality float glass.
- Very high light transmission.
- Extremely durable material.
- Low maintenance and easily cleaned.
- Can be used in insulating units in combination with other glasses.
- Can be toughened or laminated for safety and security.
- Available in a wide range of thicknesses, from 2 mm to 19 mm.

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Pilkington **Optifloat™** Clear

glass configuration	performance code			light				energy							S, UV	
I	W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	—	%
	U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
2 mm	**5,8**	**91**	**89**	91	8	8	100	88	8	4	89	1,01	0,01	1,02	1,02	76
3 mm	**5,8**	**91**	**88**	91	8	8	99	87	8	5	88	1,00	0,01	1,01	1,03	72
4 mm	**5,8**	**90**	**87**	90	8	8	99	85	8	7	87	0,98	0,02	1,00	1,03	68
5 mm	**5,7**	**89**	**84**	89	8	8	98	81	7	12	84	0,93	0,04	0,97	1,06	60
6 mm	**5,7**	**88**	**82**	88	8	8	98	79	7	14	82	0,91	0,03	0,94	1,07	57
8 mm	**5,6**	**87**	**80**	87	8	8	97	76	7	17	80	0,87	0,05	0,92	1,09	52
10 mm	**5,6**	**87**	**77**	87	8	8	97	73	7	20	77	0,84	0,05	0,89	1,13	49
12 mm	**5,5**	**85**	**74**	85	8	8	96	68	7	25	74	0,78	0,07	0,85	1,15	46
15 mm	**5,4**	**83**	**70**	83	8	8	94	63	6	31	70	0,72	0,08	0,80	1,19	42
19 mm	**5,3**	**81**	**66**	81	7	7	92	57	6	37	66	0,66	0,10	0,76	1,23	38

Notes:
Performance values determined in accordance with EN 410 and EN 673

Pilkington **Optifloat™** Clear

PILKINGTON

glass configuration			performance code			light				energy							S, UV	
II	II	II	W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	—	%
			U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
			U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance
⇨			**2,8**	**79**	**72**	79	14	14	96	64	12	24	72	0,74	0,09	0,83	1,10	38
	⇨		**1,9**	**72**	**68**	72	17	16	97	55	15	30	68	0,63	0,15	0,78	1,06	29
		⇨	**1,6**	**78**	**59**	78	13	14	96	50	23	27	59	0,57	0,10	0,68	1,32	23

⇨ insulating glass unit, Pilkington **Optitherm™** S3 #3

⇨ insulating glass unit, Pilkington **K Glass™** #3

⇨ insulating glass unit, primary product outside

Notes:
1. Based on 6 mm glass thickness
2. Based on 12 mm air filled cavity
3. Performance values determined in accordance with EN 410 and EN 673

Pyrolytic on-line coated clear low-emissivity glass

Description

Pilkington **Energy Advantage™** is durable, on-line coated, neutral coloured, low-emissivity glass with high solar gain. The product provides improved thermal insulation to multiple-glazed windows thereby reducing condensation and maximising comfort.

Applications

Extremely versatile, Pilkington **Energy Advantage™** is recommended for new buildings and renovations/modernisations.

Features and benefits

- Substantially improved thermal insulation compared to conventional double glazing; U value of 1,5 W/m^2K in 4-16-4 standard constructions with argon (90%), reducing the need for heating the building.
- High solar heat gain offering overall energy saving performance.
- Substantially reduced condensation.
- High light transmission, reducing the need for lighting the building.
- Neutral colour in transmission and reflection.
- Can be combined with a body-tinted or reflective solar control glass in an insulating glass unit to provide both thermal insulation and solar control. Pilkington **Energy Advantage™** OW – The original coating is now available on extra-clear, low-iron float glass, resulting in a clearer product with good thermal insulation.
- Can be laminated, toughened and bent using standard techniques.
- Can be used in monolithic form or incorporated in insulating glass units.
- Pilkington **Energy Advantage™** is available in 3 mm, 4 mm, 5 mm, 6 mm, 8 mm, 10 mm and 12 mm.
- Achieves Class A to EN 1096 for coated glass.
- Achieves ASTM C 1376 standard specification.

Pilkington **Energy Advantage**™

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glass configuration		performance code				visible light				solar energy					S, UV, U value			
1		U W/m²K	U W/m²K	LT %	SHGC —	LT %	LRo %	LRi %	Ra —	ET %	ER %	EA %	SHGC —	TSC —	S —	UV %	U W/m²K
monolithic glass #2																	
	6 mm	**2,80**	**3,65**	**82**	**0,70**	82	10	11	98	66	10	24	0,70	0,81	1,17	49	3,6
	8 mm	**2,78**	**3,62**	**81**	**0,67**	81	10	11	98	62	9	29	0,67	0,77	1,21	45	3,6
		U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U
		W/m²K	W/m²K	%	—	%	%	%	—	%	%	%	—	—	—	%	W/m²K
		U.S. summer	**U.S. winter**	**light**	**solar heat gain coefficient**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	solar heat gain coefficient	total shading coefficient	selectivity index	UV transmittance	European

Notes:
1. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions
2. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards
3. European U value is based on EN 410 and EN 673 standards

Pilkington **Energy Advantage**™

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glass configuration			performance code			visible light				solar energy					S, UV, U value		
			U	U	LT	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U
			W/m²K	W/m²K	%	—	%	%	—	%	%	%	—	—	—	%	W/m²K
II	II	II	**U.S. summer**	**U.S. winter**	**light**	**solar heat gain coefficient**	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	solar heat gain coefficient	total shading coefficient	selectivity index	UV transmittance	European
⇧			—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	⇧		**1,86**	**1,88**	**73**	**0,67**	17	16	96	52	14	33	0,67	0,77	1,09	37	1,8
		⇧	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

insulating glass unit,
Pilkington **Energy Advantage**™ #2+3

insulating glass unit,
Pilkington **Energy Advantage**™ #3

insulating glass unit,
primary product outside

Notes:
1. Based on 6 mm glass thickness 2. Based on 1/2" (12,7 mm) air filled cavity 3. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions 4. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards 5. European U value is based on EN 410 and EN 673 standards 6. A lower U value can be achieved with the coating on surfaces #2 and #4 instead of #2 and #3

Pilkington **Energy Advantage**™ OW

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glass configuration	performance code			light				energy						S, UV	
1	W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	%
	U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	S	UV
	U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	selectivity index	UV transmittance
monolithic glass #2															
4 mm	**3,7**	**85**	**80**	85	11	12	98	78	12	10	80	0,90	0,02	1,06	66
6 mm	**3,6**	**84**	**79**	84	11	12	98	78	11	11	79	0,90	0,01	1,06	64
8 mm	**3,6**	**84**	**79**	84	11	12	98	77	11	12	79	0,89	0,02	1,06	62

Notes:
Performance values determined in accordance with EN 410 and EN 673

Pilkington **Energy Advantage™** OW

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glass configuration			performance code			light				energy						S, UV		
II	**II**	**II**	U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
			W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	—	%
			U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance
⇩			—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	⇩		**1,9**	**75**	**69**	75	17	17	99	62	15	23	69	0,71	0,08	0,79	1,09	40
		⇩	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
insulating glass unit, primary product outside #2																		
	insulating glass unit, Pilkington **K Glass™** OW #3																	
		insulating glass unit, Pilkington **K Glass™** OW #2+3																

Notes:
1. Based on 6 mm glass thickness
2. Based on 12 mm air filled cavity
3. Performance values determined in accordance with EN 410 and EN 673

Pyrolytic on-line coated clear low-emissivity glass

Description

Pilkington **K Glass™** is durable, on-line coated, neutral coloured, low-emissivity glass with high solar gain. The product provides improved thermal insulation to multiple-glazed windows thereby reducing condensation and maximising comfort.

Applications

Extremely versatile, Pilkington **K Glass™** is recommended for new buildings and renovations/modernisations.

Features and benefits

- Substantially improved thermal insulation compared to conventional double glazing; U value of 1,5 W/m²K in 4-16-4 standard constructions with argon (90%), reducing the need for heating the building.
- High solar heat gain offering overall energy saving performance.
- Substantially reduced condensation.
- High light transmission, reducing the need for lighting the building.
- Neutral colour in transmission and reflection.
- Can be combined with a body-tinted or reflective solar control glass in an insulating glass unit to provide both thermal insulation and solar control.
- Can be laminated, toughened and bent using standard techniques.
- Can be used in monolithic form or incorporated in insulating glass units.
- Pilkington **K Glass™** is available in 3 mm, 4 mm, 5 mm, 6 mm and 8 mm.
- Achieves Class B to EN 1096 for coated glass.
- Achieves ASTM C 1376 standard specification.

Pilkington **K Glass™**

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glass configuration	performance code			light				energy						S, UV	
1	U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	S	UV
	W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	%
monolithic glass #2	**U value**	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	selectivity index	UV transmittance
3 mm	**3,7**	**83**	**76**	83	11	12	99	73	11	16	76	0,84	0,03	0,87	1,09	52
4 mm	**3,7**	**82**	**74**	82	11	12	99	71	10	19	74	0,82	0,03	0,85	1,11	48
5 mm	**3,7**	**82**	**73**	82	11	12	99	70	10	20	73	0,80	0,04	0,84	1,12	46
6 mm	**3,6**	**81**	**71**	81	11	12	99	68	10	22	71	0,78	0,04	0,82	1,14	43
8 mm	**3,6**	**80**	**69**	80	11	12	99	65	9	26	69	0,75	0,04	0,79	1,16	39

Notes:
Performance values determined in accordance with EN 410 and EN 673

Pilkington **K Glass**™

Group	Unit	Code	Parameter	II insulating glass unit, primary product outside #2	II insulating glass unit, Pilkington **K Glass**™ #3	II insulating glass unit, Pilkington **K Glass**™ #2+3
performance code	W/m²K	U	**U value**	–	**1,9**	–
	%	LT	**light**	–	**73**	–
	%	g	**energy**	–	**68**	–
light	%	LT	transmittance	–	73	–
	%	LRo	reflectance outside	–	17	–
	%	LRi	reflectance inside	–	16	–
	–	Ra	colour rendering index	–	97	–
energy	%	ET	direct transmittance	–	55	–
	%	ER	reflectance	–	15	–
	%	EA	absorptance	–	30	–
	%	TET	total transmittance	–	68	–
	–	SSC	shortwave shading coefficient	–	0,63	–
	–	LSC	longwave shading coefficient	–	0,15	–
	–	TSC	total shading coefficient	–	0,78	–
S, UV	–	S	selectivity index	–	1,07	–
	%	UV	UV transmittance	–	32	–

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Notes:
1. Based on 6 mm glass thickness
2. Based on 12 mm air filled cavity
3. Performance values determined in accordance with EN 410 and EN 673

Toughenable off-line coated high performance clear low-emissivity glass

Description

Pilkington **Optitherm™** S3 Pro T is a toughenable high quality clear glass with a specially formulated off-line low-emissivity coating applied to one surface after glass manufacture. The effect of the low-emissivity coating is to reflect the long wavelength energy (generated by heating systems, lighting and building occupants) back into the building. However, the transparent coating still permits the transmission of short wavelength energy originating from the sun. This solar energy is absorbed by the internal surfaces of the building and re-radiated at the longer wavelengths that are then reflected by the coating into the building. The visual appearance of Pilkington **Optitherm™** S3 Pro T is almost identical to that of ordinary clear glass. As the coating is transparent and neutral in colour, its effect on light transmission and reflection is barely perceptible. Pilkington **Optitherm™** S3 Pro T has to be toughened to achieve its low-emissivity properties.

Applications

Pilkington **Optitherm™** S3 Pro T can only be used in insulating glass units. It is a popular low-emissivity glass because of its neutral colour, high light transmission and excellent thermal insulation characteristics. It can be used from the smallest installation to the most prestigious curtain wall applications – anywhere where there is concern for reduced energy consumption and heat loss. Available in 4, 6, 8 and 10 mm thicknesses, it is often used in combination with other environmental control glasses.

Pilkington **Optitherm™** S3 Pro T is used for applications requiring a toughened glass due to risk of thermal breakage. For applications requiring annealed or laminated glass, Pilkington **Optitherm™** S3 is offered. Toughened Pilkington **Optitherm™** S3 Pro T and Pilkington **Optitherm™** S3 are colour matched and so can be glazed side by side.

In hot weather conditions, the combination of solar control glass and Pilkington **Optitherm™** S3 Pro T in an IGU can help to reduce air-conditioning loads, save energy and reduce CO_2 emissions.

Features and benefits

- High to very high thermal insulation performance with U-value down to 1,1 W/m²K in 4-16-4 standard constructions with argon (90%), reducing the need for heating the building.
- Has to be toughened to achieve its low-emissivity properties.
- Substantially reduced internal condensation.
- High light transmission, reducing the need for lighting the building.
- Neutral colour in transmission and reflection.
- Can only be used in insulating glass units (coating generally on surface #3); argon gas filling can be used to achieve higher thermal insulation.
- Can be combined in an insulating glass unit with solar control glass to improve both solar control and thermal insulation performance.
- Can be enhanced when combined with other Pilkington products to provide additional benefits such as self-cleaning, noise control, safety or security properties.
- Colour matched annealed and laminated Pilkington **Optitherm™** S3 available.
- Available in 4, 6, 8 and 10 mm thicknesses.
- Achieves Class C to EN 1096 for coated glass.

Pilkington **Optitherm™** S3 T

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glass configuration			performance code			light				energy							S, UV	
II	II	II																
			U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
			W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	—	%
		U value	**1,6**	—	—	78	13	14	96	50	23	27	59	0,57	0,10	0,68	1,32	23
		light	—	**78**	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		energy	—	—	**59**	—	—	—	—	—	—	—	—	—	—	—	—	—
⇧	⇩	insulating glass unit, primary product outside																
	⇧	insulating glass unit, Pilkington **Optitherm™** S3 T #3																
	⇩	insulating glass unit, Pilkington **Optitherm™** S3 T #2+3																

Notes:
1. Based on 6 mm glass thickness
2. Based on 12 mm air filled cavity
3. Performance values determined in accordance with EN 410 and EN 673

On-line coated low-emissivity vacuum glazed extra thin glass

Description

Pilkington **Spacia™** is the world's first commercially available vacuum glazing. It offers the thermal performance of conventional double glazing in the same thickness as single glass (6 mm). Pilkington **Spacia™** provides a real solution to the problems of balancing historical preservation with modern comfort and environmental requirements.

Application

Pilkington **Spacia™** has low overall thickness (6 mm) and good acoustic performance making it ideal for use in historic buildings, offering replacement windows more in keeping with the original design. It may even allow the use of the original frames if these are in a reasonable or repairable condition. Until now, the only choices were to sacrifice thermal performance and comfort, or to compromise the appearance of the building by using bulkier modern frames with double glazing. Pilkington **Spacia™** is also suitable for other applications where the use of thinner, low-weight glazing is desirable, for example in sliding box sashes, secondary glazing, or as one pane of a triple glazed "super-window".

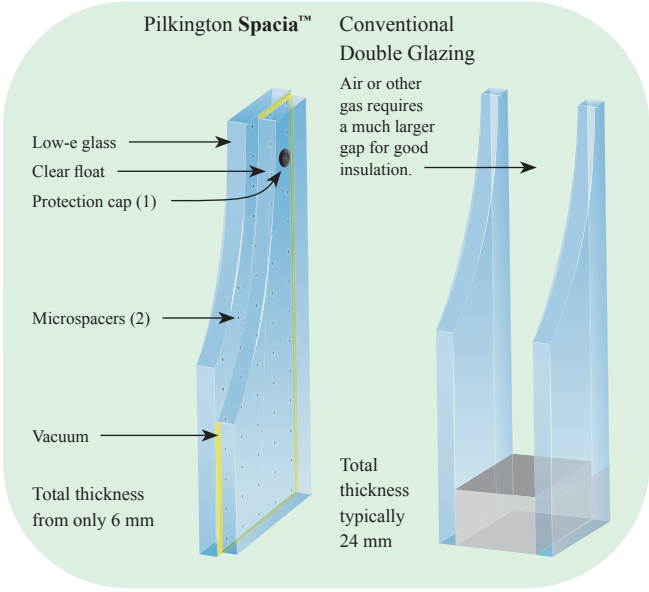
How it works

Conventional double glazing consists of two glass panes placed up to 20 mm apart, with the cavity between the panes filled with either dry air or an inert gas such as argon or krypton. This gas reduces heat transfer through the glass due to its lower thermal conductivity. The wider the gap between the panes, the lower the heat transfer, up to an optimum level above which circulation patterns in the gas reduce the benefit. This means that the overall thickness of thermally-efficient double glazing is typically 24 mm. Double glazing with a krypton-filled cavity as low as 4 mm is technically possible, but it is difficult to ensure that such units are sufficiently stable and gas tight to maintain their integrity to keep acceptable levels of thermal performance over the desired life of the glazing.

Pilkington **Spacia™** is different; the air between the two panes of glass is extracted, creating a vacuum. A vacuum, even a small one, is much more effective at minimising conduction and convection

heat losses, so the gap between the two panes can be reduced to just 0,2 mm, giving an overall thickness of just over 6 mm. Heat flow through radiation is limited through one of the glass panes having a low-emissivity coating, similar to that used in modern conventional double glazing. Pilkington **Spacia™** offers the same thermal performance as conventional double glazing in one quarter of the thickness and two thirds of the weight.

Figure 2.3. Pilkington **Spacia™** construction versus conventional insulating glass unit



(1) Protection cap

The vacuum creation process in Pilkington **Spacia™** results in a hole in the inner pane, which is sealed afterwards. This seal is covered by a small permanent plastic cap (12 mm diameter), which is located 50 mm from the glass edge. It must remain on the glass surface after glazing and should be glazed towards the inside of the building. The cap can be positioned in any corner of the pane.

(2) Microspacers

With an individual diameter of only 0,5 mm, the microspacers (20 mm apart) ensure that the two glass panes are kept a fixed distance apart.

Features and benefits

- Substantially improved thermal insulation compared to conventional double glazing; U value of 1,4 W/m^{2}K in 3-0,2-3 vacuum glazed construction.
- Thermal performance of modern double glazing in the same thickness as single glass, offering the opportunity to improve energy efficiency in older traditional buildings.
- Minimum disruption, can be retro-fitted into existing frames designed for single glazing.
- Cost effective method of improving the energy efficiency of older homes where glazing choice is restricted or where the original frames are a desirable feature.
- Significantly improved acoustic performance over single glazing, enhancing the living and working environment.
- Has been successfully used in Japan for over ten years and is a proven solution.

PILKINGTON	Pilkington **Spacia™**															
glass configuration		**performance code**			light			energy						S		
II		U	LT	g	LT	LRo		ET	ER	EA	TET			S		
		W/m²K	%	%	%	%		%	%	%	%			—		
	Pilkington **Spacia™**	U	**U value**	LT	**light**	g	**energy**	LT	transmittance	LRo	reflectance outside	ET	direct transmittance	ER	reflectance	EA	absorptance	TET	total transmittance	S	selectivity index	
6 mm		**1,4**		**78**		**67**		78		13		62		17		21		67		1,16	

Notes:
1. Actual thickness: 6,5 +/- 0,1mm
2. Performance values determined in general accordance with EN 410
3. U value determined in accordance with EN 674.

3. Fire Protection

The wide range of modern functional glazings now available has opened up remarkable scope for creative design in today's architecture. Transparent design from façades and roofs right through to the core of the building is no longer a vision, it is a reality.

State-of-the-art glazing can now be used in high performance designs to provide a protected, yet comfortable and versatile building environment, providing daylight, brightness and clear vision, replacing solid roofs, doors and partitions which block out views and natural light. Our fire-resistant glasses, Pilkington **Pyrostop®** for superior level of insulation (EI), Pilkington **Pyrodur®** for enhanced integrity (EW), Pilkington **Pyroclear®** for basic integrity (E), combine fire resistance and design flexibility, for peace of mind, elegant and functional buildings.

All our fire-resistant glass types are CE Marked building products and are labelled according to the relevant CE Marking guidelines.

Why fire-resistant glass?
New and existing buildings according to regulations in force should provide suitable level of fire safety. The ordinary clear float glass widely used in buildings does not provide any fire resistance properties in case of fire. It tends to break at a temperature difference equal to about $\Delta T = 40°C$. Ordinary laminated safety glass also has little resistance to fire – the glass breaks almost as quickly as clear float. Furthermore, at a temperature of about 250°C, when the PVB foil melts and fails to retain the glass fragments, the glass collapses and flames, smoke and hot gases can pass through the glazing. Whilst standard toughened glass is more resistant to high temperatures and temperature differences than an ordinary float glass, it generally cannot survive temperature differences higher than about $\Delta T = 200°C$. All these glasses have, therefore, no reliable performance in fire.

That is why it was necessary to introduce glass products that could withstand typical high temperatures in fire of approximately 1000°C for a defined time (see also figure 3.2), and additionally in the event of fire, would be able to give people the maximum amount of time for a safe escape. Pilkington **Pyrostop®**, Pilkington **Pyrodur®** and Pilkington **Pyroclear®** meet these criteria at different levels.

How does it work?

Pilkington **Pyrostop®** and Pilkington **Pyrodur®** are clear, multi-layered fire-resistant glasses made of clear or extra clear float glass (Pilkington **Optifloat™** or Pilkington **Optiwhite™**), laminated with special transparent intumescent interlayers. When exposed to fire, the pane facing the flames fractures but remains in place, and the interlayer immediately foams up to form a thick, resilient and tough insulating shield that absorbs the energy of the blaze. This takes place at only modest temperatures of around 120°C, so that protection is provided right from the early stages of a fire. The resilient sandwich structure of Pilkington **Pyrostop®** and Pilkington **Pyrodur®** ensures that they stay in place and continue to act as an insulating fire-resistant barrier for the required time periods, as defined in the relevant test standard.

Pilkington **Pyrostop®** and Pilkington **Pyrodur®** have successfully been tested in many fire doors, partitions and façade systems, covering vertical, horizontal and inclined glazing applications all over the world.

Pilkington **Pyroclear®** completes the range as a clear, monolithic fire-resistant and safety glass for up to 60 minutes basic integrity performance. Pilkington's fire-resistant glasses can be combined with other functional glasses into insulating glass units.

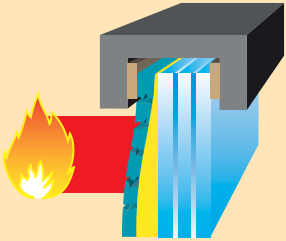
Classification for fire-resistant glass

The internationally recognised EN-standards for the classification of fire-resistant glass have defined the following three classes (EN13501-2):

- **Insulation (class EI)** – Pilkington **Pyrostop®**
  In addition to the integrity, the ability of glazed screens or doors to limit the average temperature rise on the non-fire side to 140°C and the maximum temperature rise to 180°C above ambient temperature.
- **Radiation (class EW)** – Pilkington **Pyrodur®**
  In addition to the integrity, the ability of fire-resistant systems to limit the radiant heat on the non-fire side to15 kW/m² at a distance of 1 m to the surface, in order to prevent for example the ignition of goods on the protected side.
- **Integrity (class E)** – Pilkington **Pyroclear®**
  The ability of the system to keep back flames, smoke and fumes. No flaming on the non-fire side is permitted within the approved time classification.

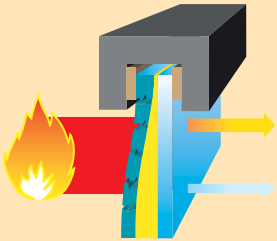
Figure 3.1. The behaviour of Pilkington **Pyrostop®**, Pilkington **Pyrodur®** and Pilkington **Pyroclear®** in case of fire

Pilkington **Pyrostop®** for superior level of insulation (EI)



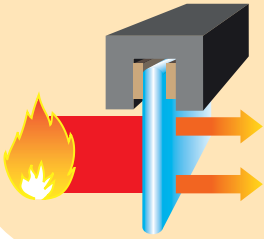
- Multi-layer intumescent laminated glass
- Full thermal insulation (Basic Integrity + Thermal Insulation) for up to 180 minutes

Pilkington **Pyrodur®** for enhanced integrity (EW)



- Multi-layer intumescent laminated glass
- Enhanced Integrity (Basic Integrity + Reduced Heat Radiation) for up to 60 minutes

Pilkington **Pyroclear®** for basic integrity (E)

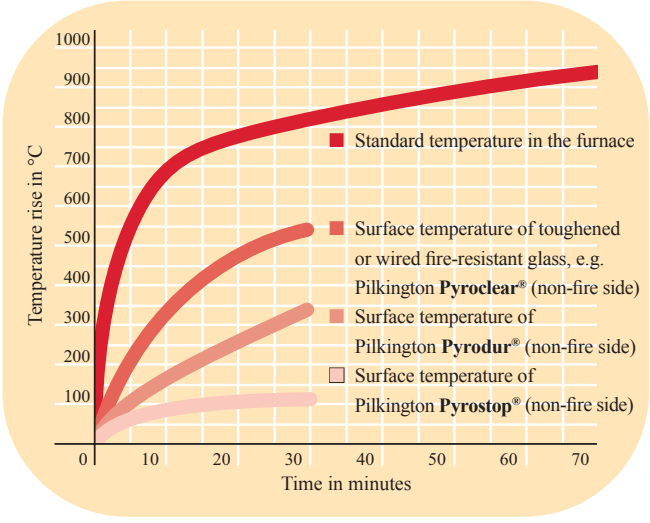


- Modified super toughened clear glass
- Basic Integrity (barrier against smoke, flames and fumes) for up to 60 minutes

Safety

Pilkington **Pyrostop**® and Pilkington **Pyrodur**® have been successfully tested for impact safety according to EN 12600 and provide safety up to the highest class for laminated safety glass 1(B)1.
Pilkington **Pyroclear**® achieves class 1(C)1, the highest level for toughened glass.

Figure 3.2. Temperature Curves in Standard Fire Tests.



Combinations

Pilkington **Pyrostop**® and Pilkington **Pyrodur**® are designed to be combined with the full range of Pilkington glasses in either insulating glass units or as monolithic glass for all glazing applications.
Pilkington **Pyroclear**® – the latest development of clear transparent fire-resistant glasses – offers several solutions for modern applications. This gives full scope to design glazing with thermal insulation, solar control, noise control, safety and security properties – all with built-in high fire resistance performance.

How to specify fire-resistant glass?
Subject to confirmation of:

- Fireresistance class
- Fire tested glazing system
- Safety requirement
- Additional checks required for use in external applications:
  – ambient temperature does not exceed recommended temperature range (−40 °C/+50 °C)
  – thermal stress
  – wind loading

Please refer to system specific glazing recommendations and Pilkington's Glazing and Handling Guidelines (available on special request) for further details.

Please verify compliance with local regulations and building codes.

It is the installer's responsibility to ensure that the glasses are installed in fully tested and certified glazing systems, and that the assemblies meet local regulatory requirements.

All Pilkington **Pyrostop®**, Pilkington **Pyrodur®** and Pilkington **Pyroclear®** products have permanent marking on the glass surface.

More information to be found on www.pilkington.com/fireprotection and visit www.pilkington.com/ce for product certificate.

For further sales support please contact our International Sales Team (email: sales.fire@nsg.com).

Figure 3.3. Description of product code for Pilkington **Pyrostop®**, Pilkington **Pyrodur®** and Pilkington **Pyroclear®**. How ro read the product code using as an example Pilkington **Pyrostop®** 90-102 for fire resistance class EI.

Pilkington **Pyrostop®** 90-102

- **First number**
  - 90 Time of fire resistance in minutes
- **First digit of second number**
  - 0 Internal/external application (relevant only for Pilkington **Pyroclear®**)
  - 1 Internal application
  - 2 External application without coating
  - 3 External application with coating
  - 4 External application with coating for horizontal or sloped installation (Insulating glass unit)
  - 5 Internal application for horizontal or sloped installation
- **Second digit of second number**
  - 0 Monolithic glass
  - 2 Monolithic glass in combination with patterned glass
  - 5 Insulating glass unit in combination with float glass as outer pane
  - 6 Insulating glass unit in combination with toughened safety glass as outer pane
  - 7 Insulating glass unit in combination with acoustic laminated safety glass as outer pane
  - 8 Insulating glass unit in combination with laminated safety glass as outer pane
- **Third digit of second number**
  - 0, 1… Index number of different product compositions (not relevant for some product compositions).

Important note:
Maximum size of a fire resistant-glass is depending on national approval or test evidence.
Product is permanently marked with relevant product information (on glass and spacer bar).

Fire-resistant glass for basic integrity

Description
Pilkington **Pyroclear®** is a clear high performance monolithic fire-resistant and safety glass designed to provide basic integrity performance.

Applications
It is suitable for internal and external applications where basic integrity performance is required. Pilkington **Pyroclear®** has been approved in single and double glazed units for use in steel and aluminium systems. Pilkington **Pyroclear®** can be installed in doors, screens and partitions in line with national regulations and building codes as an effective barrier against fire, smoke and fumes.

Features and benefits
- Designed for fire-resistant glazing where basic integrity only is required.
- Tested with varying edge cover from 10 mm up to 15 mm and therefore suitable for common fire-resistant glazing systems (recommended edge cover 13 mm +2/−3 mm).
- Safe and consistent performance due to special edge strength providing high degree of resilience against thermal stress in case of fire.
- Uniquely developed edge technology for basic integrity fire-resistant performance.
- Special edge protection tape as a clear indicator for any damage to the glass edge.
- Available in monolithic form with up to 60 minutes integrity performance.
- Available in insulating glass units with 30 minutes integrity performance.
- High optical quality.
- Available in laminated form up to 30 minutes integrity performance.
- Cost-effective product.

PILKINGTON

Pilkington **Pyroclear®** for internal/external use (class E…)

Glass type (other combinations on request)	Fire resistance class	Supply form [1]	Nominal thickness [mm]	Thickness tolerance [mm]	Light transmittance LT [%] approx.	Weight [kg/m²] approx.	R_w-value [dB] approx.	U value [W/m²K] approx.
Pilkington **Pyroclear®** 30-001 (integrity 30 min)	E 30	SGU	6	±0,2	88	15	32	5,7
Pilkington **Pyroclear®** 30-002 (integrity 30 min)	E 30	SGU	8	±0,3	88	20	33	5,7
Pilkington **Pyroclear®** 30-003 (integrity 30 min)	E 30	SGU	10	±0,3	87	25	34	5,6
Pilkington **Pyroclear®** 30-007 (integrity 30 min)	E 30	SGU	13	±1,0	85	31	39	5,5
Pilkington **Pyroclear®** 30-008 (integrity 30 min)	E 30	SGU	13	±1,0	85	31	37	5,5
Pilkington **Pyroclear®** 60-002 (integrity 60 min)	E 60	SGU	8	±0,3	88	20	33	5,7
Pilkington **Pyroclear®** 60-003 (integrity 60 min)	E 60	SGU	10	±0,3	87	25	34	5,6

[1] SGU – Single Glazed Unit; DGU – Double Glazed Unit

Notes: Size tolerance of edge length: ≤2000 mm → ±2,5 mm
>2000 - ≤3000 mm → ±3,0 mm
>3000 mm → ±4,0 mm

Pilkington **Pyroclear®** for internal/external use (class E…)

PILKINGTON

Glass type (other combinations on request)	Fire resistance class	Supply form [1]	Nominal thickness [mm]	Thickness tolerance [mm]	Light transmittance LT [%] approx.	Weight [kg/m²] approx.	R_w-value [dB] approx.	U value [W/m²K] approx.
Pilkington **Pyroclear®** 30-361 with coated toughened glass (integrity 30 min)	E 30	DGU	20 (8 spacer) or 24 (12 spacer) or 28 (16 spacer)	±1,5	depends on coating[2]	30	32 (8 spacer) or 33 (12 spacer) or 33 (16 spacer)	depends on coating[2]
Pilkington **Pyroclear®** 30-381 (unidirectional) (integrity 30 min)	E 30	DGU	23 (8 spacer) or 27 (12 spacer) or 31 (16 spacer)	±1,5	depends on coating[2]	36	38 (8 spacer) or 39 (12 spacer) or 39 (16 spacer)	depends on coating[2]
Pilkington **Pyroclear®** 30-401 (integrity 30 min)	E 30	DGU	27 (12 spacer)	±1,5	depends on coating[2]	36	39	depends on coating[2]

[1] SGU – Single Glazed Unit; DGU – Double Glazed Unit

[2] Insulating glass units may include various types of glass, i.e. Pilkington **Optitherm™** S3 or Pilkington **Suncool™**. They can provide additional functions such like thermal insulation (U value) solar control (g value), or change colour and reflection of the product

Notes: Size tolerance of edge length: ≤2000 mm → ±2,5 mm
>2000 - ≤3000 mm → ±3,0 mm
>3000 mm → ±4,0 mm

Fire-resistant glass for integrity and reduced heat radiation

Description

Pilkington **Pyrodur®** is a clear laminated fire-resistant and safety glass (for types thicker than 9 mm) designed to provide basic integrity fire protection, but also offering limitation of radiant heat transfer. It relies on the same generic technology as Pilkington **Pyrostop®** comprising fewer interlayers.

Applications

Suitable for internal and external applications where fire-resistant glasses are required to provide integrity and a prescribed level of insulation up to class EW 60. Pilkington **Pyrodur®** is available in single and double glazed form, for use in steel, aluminium, softwood and hardwood timber frames. It can be combined with functional glasses to produce a wide range of products for numerous applications. Pilkington **Pyrodur®** is particularly suited for use in doors, screens and partitions where lightweight, narrow profiles are important and ease of glazing is a priority. Further applications include insulating glass units in façades and roof glazing (special compositions for inclined applications).

Features and benefits

- Provides proven integrity for up to 60 minutes when used in a suitable, tested glazing system, restricting the spread of flames, smoke and hot gases.
- It relies on the same generic technology as Pilkington **Pyrostop**® comprising thinner and fewer interlayers.
- Special clear intumescent interlayers, reacting to form a rigid, opaque, visual barrier to flames, helping to reduce panic and fear during evacuation of the building.
- Added benefit of reducing the transmission of conductive and radiant heat from the fire.
- Totally clear, unobstructed vision.
- Provides effective noise control.
- Can provide impact safety performance (thicker than 9 mm).
- Can be combined in insulated glass units with other functional glasses for greater flexibility in applications.
- Available in different thicknesses and compositions for internal or external applications.

PILKINGTON

Pilkington **Pyrodur®** for internal use (class E…/EW…)

Glass type	Fire resistance class	Supply form [1]	Nominal thickness [mm]	Thickness tolerance [mm]	Light transmittance LT [%] approx.	Weight [kg/m²] approx.	R_w-value [dB] approx.	U value [W/m²K] approx.
Pilkington **Pyrodur®** 30-10 (integrity 30 min; limited heat radiation 30 min)	E/EW 30	SGU	7	± 1	89	17	34	5,6
Pilkington **Pyrodur®** 60-10 (integrity 60 min; limited heat radiation 60 min)	E/EW 60	SGU	10	± 1	87	24	35	5,4

[1] SGU – Single Glazed Unit; DGU – Double Glazed Unit

Notes: Size tolerance of edge length: ≤2000 mm → ±2 mm
>2000 mm → ±3 mm

Pilkington **Pyrodur®** for internal/external use (class E…/EW…)

PILKINGTON

Glass type (other combinations on request)	Fire resistance class	Supply form [1]	Nominal thickness [mm]	Thickness tolerance [mm]	Light transmittance LT [%] approx.	Weight [kg/m²] approx.	R_w-value [dB] approx.	U value [W/m²K] approx.
Pilkington **Pyrodur®** 30-201 (integrity 30 min; limited heat radiation 30 min)	E/EW 30	SGU	10	±1	87	24	36	5,4
Pilkington **Pyrodur®** 30-200 (integrity 30 min; limited heat radiation 30 min)	E/EW 30	SGU	14	±1	86	32	38	5,2
Pilkington **Pyrodur®** 30-361 with coated toughened glass (integrity 30 min; limited heat radiation 30 min)	E/EW 30	DGU	24 (8 spacer) or 28 (12 spacer)	±2	depends on coating[2]	40	38	depends on coating[2]
Pilkington **Pyrodur®** 60-20 (integrity 60 min; limited heat radiation 60 min)	E/EW 60	SGU	13	±1	85	31	38	5,3
Pilkington **Pyrodur®** 30-401 with coated toughened glass (integrity 30 min; limited heat radiation 30 min) inclined glazing	E/EW 30	DGU	40	±2	depends on coating[2]	67	40	depends on coating[2]

[1] SGU – Single Glazed Unit; DGU – Double Glazed Unit

[2] Insulating glass units may include various types of glass, i.e. Pilkington **Optitherm™** S3 or Pilkington **Suncool™**. They can provide additional functions such like thermal insulation (U value) solar control (g value), or change colour and reflection of the product

Notes: Size tolerance of edge length: ≤2000 mm → ±2 mm
>2000 mm → ±3 mm

Fire-resistant glass for integrity and insulation

Description

Pilkington **Pyrostop®** is a clear, multi-laminated fully insulating fire-resistant safety glass that offers the highest level of fire protection, effectively blocking the transmission of conductive and radiant heat, while maximising the transmission of natural light and transparency.

Applications

Pilkington **Pyrostop®** is designed for interior and exterior use where thermal insulation is required in the case of fire up to class EI 180. It is suitable for use in steel, aluminium and timber frames in monolithic form or insulating glass units. Pilkington **Pyrostop®** is ideal for use in transparent compartmentation walls, windows (special application), doors, screens, partitions and façades as well as for horizontal applications (roof and inclined glazing).

Features and benefits

- Extensively tested in a variety of framing materials and systems.
- Provides proven integrity and insulation for up to 180 minutes when used in a suitable, tested glazing system, restricting the spread of flames, smoke and hot gases and effectively blocking the transmission of conductive and radiant heat from the fire.
- Special clear intumescent interlayers, reacting to form a rigid, opaque, visual barrier to flames, helping to reduce panic and fear during evacuation of the building.
- Maximum light transmission for thicker compositions achieved by use of Pilkington **Optiwhite™** low-iron glass.
- Totally clear, unobstructed vision.
- Impact safety.
- Provides effective noise control.
- Can be combined in insulating glass units with other functional glasses for greater flexibility in applications.
- Available in different thicknesses and compositions for internal or external use.

Pilkington **Pyrostop®** for internal use (class EI…)

PILKINGTON

Glass type (other combinations on request)	Fire resistance class	Supply form [1]	Nominal thickness [mm]	Thickness tolerance [mm]	Light transmittance LT [%] approx.	Weight [kg/m²] approx.	R_w-value [dB] approx.	U value [W/m²K] approx.
Pilkington **Pyrostop®** 30-10 (insulation 30 min, integrity 30 min)	EI 30	SGU	15	±1	86	35	38	5,1
Pilkington **Pyrostop®** 60-101 (insulation 60 min, integrity 60 min)	EI 60	SGU	23	±2	87	55	41	4,8
Pilkington **Pyrostop®** 90-100 (insulation 90 min, integrity 90 min)	EI 90	DGU	44	±3	75	89	42	2,8
Pilkington **Pyrostop®** 90-102 (insulation 90 min, integrity 90 min)	EI 90	SGU	37	±2	84	86	44	4,2
Pilkington **Pyrostop®** 120-10 (insulation 120 min, integrity 120 min)	EI 120	DGU	58	±3	74	117	43	2,5
Pilkington **Pyrostop®** 120-104 (insulation 120 min, integrity 120 min)	EI 120	DGU	52	±3	75	106	42	2,6
Pilkington **Pyrostop®** 120-106 (insulation 120 min, integrity 120 min)	EI 120	DGU	55	±3	75	112	43	2,6
Pilkington **Pyrostop®** 60-50 (insulation 60 min, integrity 60 min) inclined glazing	EI 60	SGU	33	±3	85	75	41	4,5

[1] SGU – Single Glazed Unit; DGU – Double Glazed Unit

Notes: Size tolerance of edge length: ≤2000 mm → ±2 mm
>2000 mm → ±3 mm

PILKINGTON

Pilkington **Pyrostop®** for internal/external use (class EI…)

Glass type (other combinations on request)	Fire resistance class	Supply form [1]	Nominal thickness [mm]	Thickness tolerance [mm]	Light transmittance LT [%] approx.	Weight [kg/m²] approx.	R_w-value [dB] approx.	U value [W/m²K] approx.
Pilkington **Pyrostop®** 30-20 (insulation 30 min, integrity 30 min)	EI 30	SGU	18	±1	85	42	38	5,0
Pilkington **Pyrostop®** 30-18 with coated laminated glass (insulation 30 min, integrity 30 min)	EI 30	DGU	32 (8 spacer) or 36 (12 spacer)	±2	depends on coating[2]	56	39 (8 spacer) or 40 (12 spacer)	depends on coating[2]
Pilkington **Pyrostop®** 30-36 with coated toughened glass (insulation 30 min, integrity 30 min)	EI 30	DGU	32 (8 spacer) or 36 (12 spacer)	±2	depends on coating[2]	58	39 (8 spacer) or 40 (12 spacer)	depends on coating[2]
Pilkington **Pyrostop®** 60-201 (insulation 60 min, integrity 60 min)	EI 60	SGU	27	±2	86	61	41	4,7
Pilkington **Pyrostop®** 60-181 with coated laminated glass (insulation 60 min, integrity 60 min)	EI 60	DGU	40 (8 spacer) or 44 (12 spacer)	±2	depends on coating[2]	75	43	depends on coating[2]
Pilkington **Pyrostop®** 60-361 with coated toughened glass (insulation 60 min, integrity 60 min)	EI 60	DGU	41 (8 spacer) or 45 (12 spacer)	±2	depends on coating[2]	77	41	depends on coating[2]
Pilkington **Pyrostop®** 90-361 with coated toughened glass (insulation 90 min, integrity 90 min)	EI 90	DGU	54 (8 spacer) 58 (12 spacer)	±2	depends on coating[2]	108	44	depends on coating[2]
Pilkington **Pyrostop®** 120-380 with coated toughened glass (insulation 120 min, integrity 120 min)	EI 120	DGU	64	±2	depends on coating[2]	120	46	depends on coating[2]
Pilkington **Pyrostop®** 30-401 with coated laminated glass (insulation 30 min, integrity 30 min) inclined glazing	EI 30	DGU	44	±2	depends on coating[2]	77	40	depends on coating[2]

[1] SGU – Single Glazed Unit; DGU – Double Glazed Unit

[2] Insulating glass units may include various types of glass, i.e. Pilkington **Optitherm™** S3 or Pilkington **Suncool™**. They can provide additional functions such like thermal insulation (U value) solar control (g value), or change colour and reflection of the product

Notes: Size tolerance of edge length: ≤2000 mm → ±2 mm
>2000 mm → ±3 mm

4. Noise Control

We all suffer from the intrusion of noise at some time or another. With an increasing population density, factory production and transport, the noise seems to get worse with fewer opportunities to escape. Along with the increase in noise is a growing awareness of the effect on health due to the stress caused by everyday sounds intruding into once quiet environments. The trend for the future suggests that traffic and noise in general is going to get worse as living space declines. There is an increasing interest in ways to protect people from noise to avoid the considerable stress that it causes and in some cases serious illness.

A considerable amount of work has been done to control noise intrusion into a building and between adjoining areas, and whilst this is valuable we want to concentrate on the contribution that the careful selection of glass has to offer in managing the problem.

Figure 4.1. Sound spreads out in a similar manner to waves in water.

There are five factors that can be combined, which can positively influence the sound insulation of a window.

1. Glass mass.
2. Asymmetric structure.
3. Large gap between panes.
4. Use of alternative gases.
5. Use of Pilkington **Optiphon™** special laminated safety glasses or Cast In Place (CIP) products.

For the higher sound insulation requirements, modern sound insulating laminated safety glass products such as Pilkington **Optiphon™**, are becoming increasingly prevalent in comparison to the cast-in-place resin products because R_W values of even more than 50 dB can be achieved and they can be supplied in large sizes. The compatibility of PVB with other materials is well understood and safety benefits such as impact protection / safer overhead glazing can also be achieved.

Figure 4.2. Sound reduction illustration.

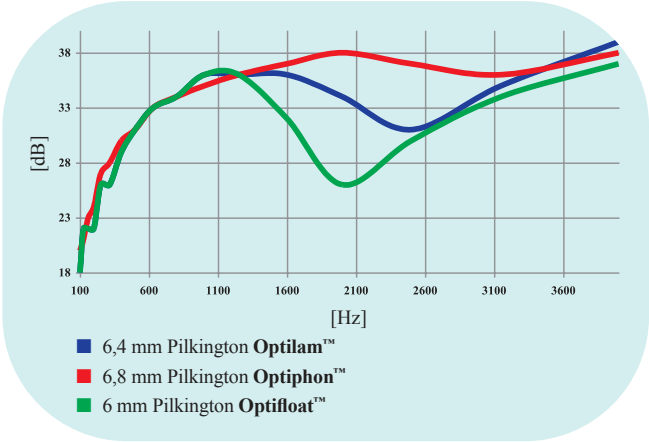
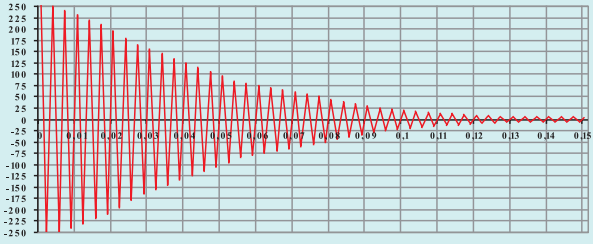


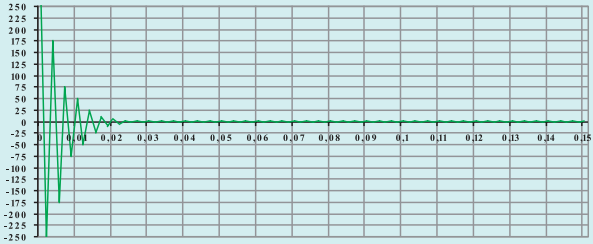
Figure 4.3. The illustration shows the impressive damping differences between Pilkington **Optilam™** and Pilkington **Optiphon™** from the sound engineering point of view.

Pilkington **Optilam™**



Time in seconds

Pilkington **Optiphon™**



Time in seconds

Technical definitions

Sound Reduction Index
R_w is the weighted sound reduction, in decibels, which incorporates a correction for the ear's response. C and C_{tr} are the spectrum adjustments, which are the values added to R_w to take account of the characteristics of particular sound spectra. Typical noise sources for each spectrum adaptation terms are given below.

Relevant spectrum adaptation term C
Type of noise source:
- Living activities (talking, music, radio, TV)
- Children playing
- Railway traffic at medium and high speed
- Jet aircraft, short distance away
- Motorway traffic >50 mph
- Factories emitting mainly medium and high frequency noise.

Relevant spectrum adaptation term C_{tr}
Type of noise source:
- Urban road traffic
- Railway traffic at low speeds
- Aircraft, propeller driven
- Jet aircraft, long distance away
- Disco music
- Factory emitting mainly low and medium frequency noise.

Laminated glass with high sound insulation

Description

Pilkington **Optiphon**™ is a high quality acoustic laminated glass with a special PVB (PolyVinylButyral) interlayer that offers excellent noise reduction without compromising on light transmittance or impact performance.

The desired acoustic performance can be achieved through combining various thicknesses of glass with a PVB interlayer. With a large variety of product combinations, Pilkington **Optiphon**™ offers the opportunity to achieve specific noise reduction requirements.

Pilkington **Optiphon**™ can be combined with other Pilkington products for a multi-functional noise-reduction monolithic glass or a multi-functional noise-reduction insulating glass unit providing additional benefits, such as thermal insulation, solar control or self-cleaning.

Pilkington **Optiphon**™ is also available on Pilkington **Optiwhite**™ offering outstanding visual clarity and excellent noise reduction.

Applications

Pilkington **Optiphon**™ is the ideal choice of glass in situations where there is excess noise from road, rail or air traffic, or other sources such as factories or nightclubs.

Benefits

- Provide a range of noise control levels.
- A thin and lightweight solution to noise problems.
- Achieve safety class 1(B)1 (EN 12600) and is available to meet security glass classifications in accordance with EN 356.
- In case of breakage remains intact, minimising the risk of injury.
- Widely tested.
- Easy to process, and can be incorporated into insulating glass units.
- Can be single, double or triple glazed.
- Can be combined with other Pilkington products for a multi-functional noise-reduction monolithic glass or a multi-functional noise-reduction insulating glass unit providing additional benefits, such as thermal insulation, solar control or self-cleaning.
- Available thicknesses: 6,8 mm; 8,8 mm; 9,1 mm; 10,8 mm; 12,8 mm; 13,1 mm.

Pilkington **Optiphon™**

PILKINGTON												
type	acoustic performance data			light			energy					
	R_w (dB) EN ISO 717-1	C (dB) EN ISO 717-1	C_{tr} (dB) EN ISO 717-1	LT % EN 410	LR_o % EN 410	LR_i % EN 410	g % EN 410	ET % EN 410	ER % EN 410	EA % EN 410	TSC = g/87
8,8	37	–1	–4	87	8	8	76	70	7	23	0,87
9,1	37	–1	–3	87	8	8	76	69	7	24	0,87
10,8	38	–1	–2	86	8	8	74	67	7	26	0,85
12,8	39	0	–2	85	8	8	72	65	6	29	0,83
13,1	40	0	–2	85	8	8	71	64	6	30	0,82
4*-16-8,8	39	–1	–5	78	14	12	58	48	28	24	0,67
5*-16-8,8	40	–3	–7	77	13	14	60	46	24	30	0,69
6*-16-8,8	41	–3	–7	77	14	12	56	47	26	27	0,64
6*-16-9,1	41	–2	–6	77	14	12	56	47	26	27	0,64
6*-16-10,8	42	–3	–7	76	14	12	56	46	26	28	0,64
6*-16-12,8	42	–3	–8	75	14	12	56	44	26	30	0,64
6*-16-13,1	43	–1	–5	75	14	12	56	44	26	30	0,64
8*-16-8,8	42	–3	–7	76	14	12	55	46	24	30	0,63

Notes:
The performance data for insulating glass units have been determined with Pilkington **Optitherm™** S3 coating on glass marked with* and with argon (90%) gas filling

PILKINGTON	Pilkington **Optiphon**™										
type	**acoustic performance data**			light			energy				
	R_w (dB) EN ISO 717-1	C (dB) EN ISO 717-1	C_{tr} (dB) EN ISO 717-1	LT % EN 410	LR_o % EN 410	LR_i % EN 410	g % EN 410	ET % EN 410	ER % EN 410	EA % EN 410	TSC = g/87
8*-16-9,1	43	–3	–7	76	14	12	55	46	24	30	0,63
8*-16-10,8	43	–2	–6	76	14	12	55	45	24	31	0,63
8*-16-12,8	43	–2	–7	75	14	12	55	43	24	33	0,63
10*-16-8,8	44	–2	–6	76	14	12	54	45	23	32	0,62
10*-16-9,1	45	–2	–5	76	14	12	54	45	23	32	0,62
10*-16-10,8	44	–1	–5	75	14	12	54	44	23	33	0,62
10*-16-12,8	45	–2	–6	74	13	12	54	42	23	35	0,62
6,5-16-4*	36	–1	–5	78	13	14	57	50	20	30	0,66
6,5-16-6*	39	–1	–5	78	12	14	57	49	20	31	0,66
8,5-16-4*	38	–1	–5	78	12	14	55	48	18	34	0,63
8,5-16-6*	41	–2	–6	77	12	14	55	47	18	35	0,63
8,5-16-8*	42	–2	–6	76	12	14	55	46	18	36	0,63
8,5-16-10*	45	–2	–6	76	12	14	55	45	18	37	0,63

Notes:
The performance data for insulating glass units have been determined with Pilkington **Optitherm**™ S3 coating on glass marked with* and with argon (90%) gas filling

PILKINGTON	Pilkington **Optiphon™**										
type	**acoustic performance data**			light			energy				
	R_w (dB) EN ISO 717-1	C (dB) EN ISO 717-1	C_{tr} (dB) EN ISO 717-1	LT % EN 410	LR_o % EN 410	LR_i % EN 410	g % EN 410	ET % EN 410	ER % EN 410	EA % EN 410	TSC = g/87
8,5*-16-12,5	49	–3	–8	74	13	12	51	41	19	40	0,59
8,5*-20-12,5	50	–3	–8	74	13	12	51	41	19	40	0,59
8,8*-16-12,8	47	–2	–7	74	13	12	51	41	19	40	0,59
9,1*-16-13,1	49	–3	–8	74	13	12	51	41	18	41	0,59
9,1*-20-13,1	50	–3	–8	74	13	12	51	41	18	41	0,59
10,5*-16-8*	43	–2	–6	76	12	14	53	45	17	38	0,61
10,5*-16-10*	45	–1	–5	75	12	14	53	44	17	39	0,61
12,5-16-8*	43	–1	–5	75	12	14	52	43	15	42	0,60
12,5-16-10*	45	–1	–5	74	12	13	52	42	15	43	0,60
6*-12-4-12-9,1*	41	–2	–7	68	17	17	48	37	30	33	0,55
13,1*-12-6-12-9,1*	49	–1	–6	65	16	17	42	32	18	50	0,48
13,1*-12kr-6-12kr-9,1*	50	–2	–7	65	16	17	41	32	18	50	0,47

Notes:
The performance data for insulating glass units have been determined with Pilkington **Optitherm™** S3 coating on glass marked with* and with argon (90%) gas filling

5. Safety/Security

Demanding safety legislation has highlighted the critical areas where modern safety glazing must comply with the relevant safety requirements. Innovations in the development of Safety/Security glass have opened up new avenues of design, which allows people to be protected from personal injury and, in the most extreme cases, protect buildings from various forms of attack.

With this in mind, we have developed a wide range of sophisticated products, in order to meet these ever increasing demands, without compromising on design criteria of natural light and visibility. We are always at the forefront in further developing the products and the industry standards, so that personal accident and serious injuries resulting from glass impact are further prevented or minimized.

What does “Safety” and “Security” mean?

Although Safety and Security are closely linked topics, it is important to understand the distinction between the two terms, to ensure the right glass is specified.

The term “Safety” is applied to glazing used to reduce the risk of accident by impact, fracture, shattering, or in a fire. The term “Security” is applied to glazing, which in addition to “Safety”, is able to withstand a variety of deliberate attacks such as physical, armed or blast.

Using only the right type of glass is not enough to secure the necessary resistance to the severe loads. The glass, once impacted, behaves differently in different framing systems, it is therefore imperative to combine high performance glazing with high performance framing systems.

The standards

EN 12600 Glass in building – Pendulum test – Impact test method and classification for flat glass

The pendulum impact test is the standard for classifying flat glass products by performance under impact and by mode of breakage. Similar in principle to previously used swing bag tests, EN 12600 utilises a dual rubber tyre impactor to strike the glass at three drop heights.

The classifications are summarised below.

Classification	Mode of breakage types	Drop height [mm]
3	A, B, C	190
2	A, B, C	450
1	A, B, C	1200

The classification has three components:

- The first is the class (i.e. 1, 2 or 3) at which the glass has either not broken or broken safely.
- The second is the mode of breakage defined as:
  Type A: numerous cracks appear forming separate fragments with sharp edges, some of which are large – typical of annealed glass.
  Type B: numerous cracks appear, but the fragments hold together and do not separate – typical of laminated safety glass.
  Type C: disintegration occurs, leading to a large number of small particles that are relatively harmless – typical of toughened glass.
- The third is the highest drop height (i.e. 1, 2 or 3) at which the product did not break (e.g. for toughened glass) or where it broke, but no shear or opening bigger than 76 mm in diameter appeared.

EN 356 Glass in building – Security glazing – Testing and classification of resistance against manual attack
This specifies the requirements and test methods for glass designed to be resistant to manual attack. The glass is subjected to impact from a hard body impactor of mass 4,11 kg for classes P1A to P5A and an axe for classes P6B to P8B.

These classes of resistance are summarised below.

Class of resistance	Drop height [mm]	The number of strikes	Code designation of resistance class
P1A	1500	3 in a triangle	EN 356 P1A
P2A	3000	3 in a triangle	EN 356 P2A
P3A	6000	3 in a triangle	EN 356 P3A
P4A	9000	3 in a triangle	EN 356 P4A
P5A	9000	3×3 in a triangle	EN 356 P5A
P6B	—	from 30 to 50	EN 356 P6B
P7B	—	from 51 to 70	EN 356 P7B
P8B	—	more than 70	EN 356 P8B

EN 1063 Glass in building – Security glazing – Testing and classification of resistance against bullet attack
This specifies performance requirements and test methods for the classification of bullet resistant glass, based on attack by handguns, rifles and shotguns.

The test consists of 3 shots fired on the vertices of a 100 mm equilateral triangle glass sample with a weapon corresponding to the required class.

If the glass sample has not been pierced by the shots then the required class is achieved. Behind the glass sample is an aluminium witness sheet. If after the shots have been fired there are some perforations on it, then the resistance class must have the suffix S (splinters), otherwise it is classified NS (no splinters).

These classes of resistance are summarised below.

Class of resistance	Type of weapon	Calibre	Bullet mass [g]	Bullet velocity [m/s]	Test range [m]
BR1-S BR1-NS	Rifle	0,22 LR	2,6	360	10
BR2-S BR2-NS	Hand gun	9 mm × 19	8,0	400	5
BR3-S BR3-NS	Hand gun	0,357 Magnum	10,25	430	5
BR4-S BR4-NS	Hand gun	0,44 Magnum	15,55	440	5
BR5-S BR5-NS	Rifle	5,56×45	4,0	950	10
BR6-S BR6-NS	Rifle	7,62×51	9,45	830	10
BR7-S BR7-NS	Rifle	7,62×51	9,72	820	10
SG1-S SG1-NS	Shot gun	0,22 LR	2,6	360	10
SG2-S SG2-NS	Shot gun	9 mm × 19	8,0	400	5

Description

Pilkington Toughened Safety Glass is manufactured by subjecting the final glass size to a heating and cooling treatment which sets up high compressive stresses at the surface and balancing tensile stresses in the centre of the glass, which increases glass strength. The result is a glass that is 5 times stronger than ordinary glass of the same thickness.

The high compressive surface stresses give the glass its increased resistance to mechanical and thermal stresses. It can, however, break under extreme loads or by severe impact. When broken, toughened glass shatters into small, blunt-edged fragments, reducing the risk of personal injury.

Most Pilkington products are available in toughened form.

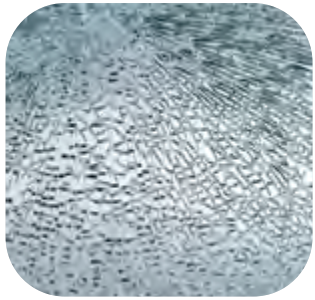


Figure 5.1. Typical fragmentation pattern of toughened glass.

Applications

Pilkington Toughened Safety Glass provides an economical and proven solution where national standards or Codes of Practice specifically require the use of safety glazing material.
Examples include passageways, areas of high pedestrian traffic, in doors and adjacent panels, shower and bath enclosures, balconies, barriers, staircases and other structural glazing applications.

Heat soaking is an additional process that can be carried out on Pilkington Toughened Safety Glass to reduce the remote risk of breakage due to inclusions within the glass.

Features and benefits

- Achieves up to Class 1(C)1 according to EN 12600, dependent upon glass type and thickness.
- Up to 5 times stronger than ordinary glass of the same thickness, offering a proven solution to safety and strength concerns.
- Can be heat soaked for extra confidence in use.
- Reduces the risk of thermal stress breakage of glass exposed to solar radiation.
- Available in a wide range of sizes and thicknesses.

Glass sizes

Thickness [mm]	Maximum size [mm]	Minimum size [mm]
4	1500×2500	200×350
5	2000×3000	200×350
6-19	2800×6000	200×350

Technical data

Hardness	6 on Mohs Scale according to EN 572-1:1999
Density	2500 kg/m³ according to EN 572-1
Resistance to temperature	ΔT 200 K according to EN 12150-1
U value	5,7-5,8 W/m²K according to EN 673
Bending strength	120 N/mm² according to EN 12150-1

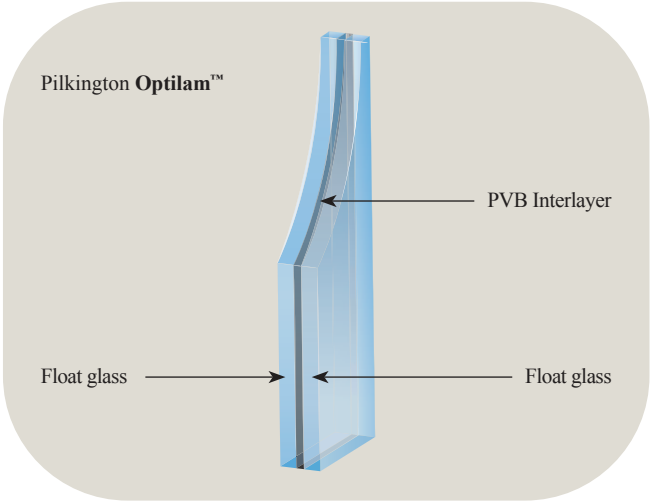
All types of Pilkington Toughened Safety Glass will be readily identified by the simple use of 'T' following the product brand name.

Pilkington **Optifloat™** T	toughened Pilkington **Optifloat™**
Pilkington **Optiwhite™** T	toughened Pilkington **Optiwhite™**
Pilkington **K Glass™** T	toughened Pilkington **K Glass™**
Pilkington **Activ™** T	toughened Pilkington **Activ™**
Pilkington **Optifloat™** Grey T	toughened Pilkington **Optifloat™** Grey
Pilkington **Suncool™** 70/40 T	toughened Pilkington **Suncool™** 70/40
Pilkington **Optitherm™** S3 T	toughened Pilkington **Optitherm™** S3

Description

Pilkington **Optilam™** is a laminated safety glass which consists of two or more panes of glass bonded together by heat and pressure with one or more sheets of flexible PVB (PolyVinylButyral) interlayer, sandwiched permanently between the glasses. The interlayers ensure the integrity of the glass, by holding the broken pieces in place should damage occur. In fact, glass fragments adhere strongly to the interlayer, while the resistant cushioning effect dissipates the energy. The performance of Pilkington **Optilam™** can be influenced simply by changing the number and thickness of each layer of glass and PVB interlayer. By doing this, we can offer a wide range of products suitable for many applications.

Figure 5.2. Laminated glass



Applications

Pilkington **Optilam™** offers the specifier a wide choice of products fulfilling a multitude of functional requirements. For a given application, Pilkington **Optilam™** can be specified to offer one or more of the following attributes: safety, security, noise control, solar control, bullet resistance, blast resistance, UV screening, privacy or decoration. The manufacturing method allows a wide variety of styles, shapes, colours and glass types to be incorporated.

Pilkington **Optilam™** can be used wherever safety or security is important, in commercial, public and domestic applications. Recommended applications are skylights, full height windows, balustrades, low level glazing, tables and counter tops. It is particularly suited for use in hazardous situations, such as doors, partitions, balconies, sloped glazing and other overheard glass applications.

When there is a risk of thermal stress, Pilkington **Optilam™** glass can be manufactured with heat strengthened or toughened glass.

Features and benefits

- Class 2(B)2 performance to EN 12600 achieved through Pilkington **Optilam™** 6,4, which is the most widely used thickness for protecting people against risk of accidental injury. Can achieve up to Class 1(B)1, dependent upon thickness.
- Reduced light transmission when made with a matt obscure interlayer.
- Available incorporating Pilkington **Optifloat™** Tint and Pilkington **Suncool™** range of glasses, or a tinted PVB interlayer (Pilkington **Optilam™** I) to provide both safety and solar control properties.
- Available in combination with Pilkington **K Glass™** or Pilkington **Optitherm™** to enhance thermal insulation whilst providing safety.
- Can be used with textured glass and polished wired glass.
- May be single glazed or incorporated in an insulating glass unit.
- Available in a wide range of thicknesses.

Pilkington **Optilam™** (safety glass)

PILKINGTON			**performance code**			light				energy						S, UV	
glass	class according to EN 12600	class according to EN 356															
1			U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	S	UV
			W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	%
monolithic glass			**U value**	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	selectivity index	UV transmittance
4,4 mm	3(B)3		**5,8**	**89**	**82**	89	8	8	99	78	7	15	82	0,90	0,04	0,94	1,09	3
6,4 mm	2(B)2		**5,8**	**88**	**79**	88	8	8	98	74	7	19	79	0,85	0,06	0,91	1,11	3
6,8 mm	1(B)1	P2A	**5,7**	**88**	**78**	88	8	8	98	73	7	20	78	0,84	0,06	0,90	1,13	1
8,4 mm	2(B)2		**5,7**	**87**	**77**	87	8	8	97	71	7	22	77	0,82	0,07	0,89	1,13	3
8,8 mm	1(B)1	P2A	**5,7**	**87**	**76**	87	8	8	97	70	7	23	76	0,80	0,07	0,87	1,14	1
12,4 mm	1(B)1		**5,5**	**85**	**73**	85	8	8	96	66	6	28	73	0,76	0,08	0,84	1,16	3

Notes:
Above data are given for laminated glass made of 2 sheets of clear float glass and PVB interlayer 0,38 mm or 0,76 mm

Description

Pilkington **Optilam™** (security glass) is produced by combining layers of glass with PVB interlayers to form sandwiches of material with specific design properties ensuring security in addition to its safety properties.

Applications

Pilkington **Optilam™** (security glass) offers the specifier a wide choice of products fulfilling a multitude of functional requirements in buildings such as shops which display valuable goods, banks, building societies, museums, as well as in hospitals and prisons. For a given application, Pilkington **Optilam™** can be specified to offer one or more of the following attributes: safety, security, noise control, solar control, bullet resistance, blast resistance, UV screening, privacy or decoration.

Features and benefits

- Conforms to security glazing standards (e.g. EN 356) in addition to safety glass requirements (EN 12600).
- Retains its overall integrity and continues to act as a barrier even if the glass breaks, protecting from vandalism, burglary or ballistic attack.
- Able to withstand repeated blows from heavy objects such as bricks, hammers or crowbars.
- Provides UV protection, which may help to reduce fading.

Pilkington **Optilam**™ (security glass)

PILKINGTON

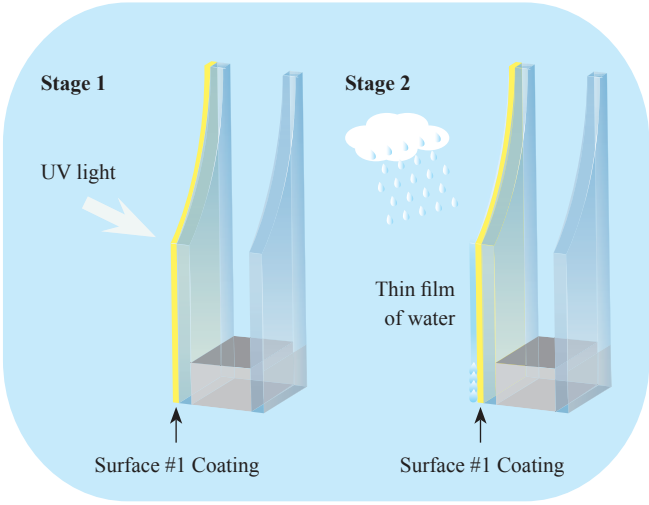
glass	class according to EN 1063	class according to EN 356	performance code			light				energy							S, UV	
I			W/m²K	%	%	%	%	%	–	%	%	%	%	–	–	–	–	%
			U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
monolithic glass			**U value**	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coeff.	longwave shading coeff.	total shading coefficient	selectivity index	UV transmittance
7,5 mm	–	P4A	**5,7**	**88**	**77**	88	8	8	–	71	7	22	77	0,82	0,07	0,89	1,14	0,1
9,5 mm	–	P4A	**5,6**	**87**	**75**	87	8	8	–	69	7	24	75	0,79	0,07	0,86	1,16	0,1
11,5 mm	BR1S	P4A	**5,6**	**86**	**73**	86	8	8	–	66	6	28	73	0,76	0,08	0,84	1,18	0,1
13,5 mm	–	P4A	**5,5**	**85**	**71**	85	8	8	–	63	6	31	71	0,72	0,10	0,82	1,20	0,1
19,5 mm	BR1S	P6B	**5,3**	**82**	**66**	82	8	8	–	56	6	38	66	0,64	0,12	0,76	1,24	0,1
20,6 mm	BR2S	P6B	**5,3**	**83**	**66**	83	8	8	–	56	6	38	66	0,64	0,12	0,76	1,26	0,0
27,5 mm	BR2S	P6B	**5,1**	**79**	**61**	79	7	7	–	49	6	45	61	0,56	0,14	0,70	1,30	0,1
29,8 mm	BR3S	P7B	**5,0**	**79**	**60**	79	7	7	–	47	6	47	60	0,54	0,15	0,69	1,32	0,0
39,0 mm	BR4S	P8B	**4,8**	**74**	**55**	74	7	7	–	41	5	54	55	0,47	0,16	0,63	1,35	0,0

Notes:
1. Above data are given for laminated glass made of 2 or more sheets of clear float glass and PVB inter-layer 0,38 mm or its multiple versions
2. Product thicknesses should be compared with most typical glass constructions

6. Self-cleaning

Pilkington made a significant step in the glass industry with the development of Pilkington **Activ™**, the first dual-action self-cleaning glass. The unique dual-action of the Pilkington **Activ™** coating uses the forces of nature to help keep the glass free from dirt, giving not only the practical benefit of less cleaning, but also clearer, better-looking windows. The Pilkington **Activ™** coating, located on surface #1 of the glass, works in two stages. Firstly, it reacts with natural daylight to break down and loosen organic dirt. Secondly, when it rains, instead of forming droplets, the water spreads evenly over the surface of the glass, forming a thin film and helping to wash any dirt away, preventing the formation of drying spots and streaks, and helping the glass to dry very quickly. In installations where condensation is a problem, it reduces its visibility and helps it to evaporate more quickly.
The Pilkington **Activ™** coating works also on cloudy days and during the night. During dry spells the glass can be cleaned by simply hosing it down with clean water.

Figure 6.1. Self-cleaning glass.



Pyrolytic on-line coated self-cleaning glass

Description
Pilkington **Activ™** Clear is an on-line coated self-cleaning glass with photo-catalytic and hydrophilic properties.

Applications
Pilkington **Activ™** Clear is the perfect choice for situations where cleaning is difficult or costly, such as high-rise buildings, glass roof structures, conservatories and atria, or in housing for use by elderly residents. It is also ideal where good visibility is important, for example, in sports stadiums, commentary boxes, airports and external walkways.

Pilkington **Activ™** Clear must always be processed, installed and maintained in accordance with our specialist Handling and Processing instructions for Pilkington **Activ™**.

Features and benefits

- Self-cleaning properties reduce the need for manual cleaning, saving water and eliminating potentially harmful run-off from expensive detergents, also increasing personal safety.
- Works even on cloudy days and during the night.
- Highly durable pyrolytic on-line coating that lasts the lifetime of the glass.
- Can be laminated, toughened, bent and enamelled using standard techniques.
- Can be used in its monolithic form or incorporated in insulating glass units (coating on surface #1), for instance with Pilkington **K Glass™** or Pilkington **Energy Advantage™** to offer additional thermal insulation properties.
- Available in combination with Pilkington **Optilam™** for impact resistance or increased security, Pilkington **Optiphon™** for improved noise reduction, Pilkington **Optitherm™** S3 and Pilkington **Optitherm™** S1 for additional thermal insulation properties.
- Available in a range of different sizes and thicknesses (4, 6, 8 and 10 mm).
- Achieves Class A to EN 1096 for coated glass.
- Achieves ASTM C 1376 standard specification.

Pilkington **Activ™** Clear

PILKINGTON

glass configuration	performance code			light				energy							S, UV	
1				%	%	%	—	%	%	%	%	—	—	—	—	%
	U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
	W/m²K	%	%	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance
	U value	**light**	**energy**													
monolithic glass #1																
4 mm	**5,8**	**84**	**81**	84	14	14	98	79	13	8	81	0,91	0,02	0,93	1,04	40
6 mm	**5,7**	**83**	**79**	83	14	14	99	76	13	11	79	0,87	0,04	0,91	1,05	36
8 mm	**5,7**	**82**	**76**	82	14	14	99	72	13	15	76	0,83	0,04	0,87	1,08	33
10 mm	**5,6**	**82**	**78**	82	14	14	99	75	13	12	78	0,86	0,03	0,89	1,05	35

Notes:
Performance values determined in accordance with EN 410 and EN 673

Pilkington **Activ**™ Clear

PILKINGTON

glass configuration			performance code			light				energy						S, UV	
II	**II**	**II**	U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
			W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	—	%
			U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance
⇨			**2,8**	**76**	**70**	76	20	19	98	64	18	18	70	0,74	0,07	0,80	1,09	29
	⇨		**1,9**	**69**	**65**	69	22	20	98	53	20	27	65	0,61	0,14	0,75	1,06	21
		⇨	**1,6**	**74**	**56**	74	18	18	97	48	29	23	56	0,55	0,09	0,64	1,32	17

insulating glass unit,
Pilkington **Optitherm**™ S3 #3

insulating glass unit,
Pilkington **K Glass**™ #3

insulating glass unit,
primary product outside #1

Notes:
1. Based on 6 mm glass thickness
2. Based on 12 mm air filled cavity
3. Performance values determined in accordance with EN 410 and EN 673

Pyrolytic on-line coated self-cleaning body-tinted solar control glass

Description

Pilkington **Activ™** Blue is an on-line coated self-cleaning body-tinted medium performance solar control glass, with an attractive blue colour. Its surface #1 self-cleaning coating has photo-catalytic and hydrophilic properties. The unique blue colour helps to keep internal temperatures cool whilst still maintaining excellent light transmittance, low light reflection and high energy absorption. For optimum self-cleaning and thermal performance, Pilkington **Activ™** Blue can be combined with Pilkington **K Glass™**, Pilkington **Energy Advantage™** or Pilkington **Optitherm™** in an insulating glass unit.

Applications

Specially designed for the optimum roof unit, Pilkington **Activ™** Blue is perfect for use in conservatories and winter gardens. Its self-cleaning properties make it ideal for use in hard to reach places that are difficult to clean.

Pilkington **Activ™** Blue must always be processed, installed and maintained in accordance with our specialist Handling and Processing instructions for Pilkington **Activ™**.

Features and benefits

- Self-cleaning properties reduce the need for manual cleaning, saving water and eliminating potentially harmful run-off from expensive detergents, also increasing personal safety.
- Additional medium performance solar control properties, reducing solar heat entering the building, enhancing comfort and reducing the need for cooling the building.
- Attractive blue colour of the glass is perfect for roof glazing, enhancing the view from inside to outside.
- Good light transmission.
- Low exterior reflection, improving aesthetics of the building.
- Works even on cloudy days and during the night.
- Highly durable pyrolytic on-line coating that lasts the lifetime of the glass.
- Can be laminated, toughened, bent and enamelled using standard techniques.
- Can be used in its monolithic form or incorporated into insulating glass units (self-cleaning coating on surface #1), for instance with Pilkington **K Glass™** or Pilkington **Energy Advantage™** to offer additional thermal insulation properties.
- Available in a range of different sizes and thicknesses (4, 6 and 10 mm).
- Achieves Class A to EN1096 for coated glass.
- Achieves ASTM C 1376 standard specification.

Pilkington **Activ™** Blue

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glass configuration	performance code			light				energy						S, UV	
1															
	U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	S	UV
	W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	%
monolithic glass #1	**U value**	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	selectivity index	UV transmittance
4 mm	**5,8**	**59**	**55**	59	15	11	89	44	13	43	55	0,51	0,12	0,63	1,07	15
6 mm	**5,7**	**49**	**47**	49	14	9	82	33	13	54	47	0,38	0,16	0,54	1,04	11
10 mm	**5,6**	**35**	**38**	35	13	7	70	21	12	67	38	0,24	0,20	0,44	0,92	6

Notes:
Performance values determined in accordance with EN 410 and EN 673

Pilkington **Activ**™ Blue

PILKINGTON

glass configuration			performance code			light				energy						S, UV	
II	II	II	U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
			W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	—	%
			U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance
⇨			**2,8**	**44**	**37**	44	16	15	80	28	14	58	37	0,32	0,10	0,43	1,19	9
	⇨		**1,9**	**40**	**33**	40	17	17	82	24	14	62	33	0,28	0,10	0,38	1,21	7
		⇨	**1,6**	**43**	**30**	43	16	15	80	23	15	62	30	0,26	0,08	0,34	1,43	5

⇨	insulating glass unit, Pilkington **Optitherm**™ S3 #3
⇨	insulating glass unit, Pilkington **K Glass**™ #3
⇨	insulating glass unit, primary product outside #1

Notes:
1. Based on 6 mm glass thickness
2. Based on 12 mm air filled cavity
3. Performance values determined in accordance with EN 410 and EN 673

Dual coated self-cleaning, solar control and low-emissivity glass

Description

Pilkington **Activ Suncool™** is a range of self-cleaning, superior solar control and thermal insulation performance dual coated glasses:
– surface #1 pyrolytic on-line self-cleaning coating with photo-catalytic and hydrophilic properties;
– surface #2 superior off-line solar control and low-emissivity coating, with high light transmittance, low, medium or high light reflectance and outstanding U value (down to 1,0 W/m²K) in a double insulating glass unit. The external self-cleaning coating breaks down the organic dirt, and rain water washes any loosened dirt away. The internal solar control and low-emissivity coating reflects short wavelength solar radiation out of the building, as well as long wavelength heat radiation (generated by heating systems, lighting and building's occupants) back into the building.
Pilkington **Activ Suncool™** effectively reduces solar heat gain, at the same time providing high level of light transmittance and aesthetic appearance.
Pilkington **Activ Suncool™** is available in a wide range of clear or neutral appearances and in two distinctive colours: blue and silver.
This product is only available in certain markets, please consult your local sales representative for further information.

Table 6.2. The appearance of the Pilkington **Activ Suncool™** range

Product	Appearance in reflection (external view)	Level of reflec-tion*	Appearance in transmission (internal view)
Insulating glass unit construction (6 mm external pane - 16 mm - 4 mm Pilkington **Optifloat™** Clear)			
Pilkington **Activ Suncool™** 70/40	neutral	medium	neutral
Pilkington **Activ Suncool™** 70/35	neutral/blue	medium	neutral
Pilkington **Activ Suncool™** 66/33	neutral/blue	medium	neutral
Pilkington **Activ Suncool™** 60/30	neutral	medium	neutral
Pilkington **Activ Suncool™** 50/25	neutral/blue	medium	neutral
Pilkington **Activ Suncool™** Blue 50/27	blue	medium	neutral
Pilkington **Activ Suncool™** Silver 50/30	silver	high	neutral
Pilkington **Activ Suncool™** 40/22	neutral/blue	medium	neutral
Pilkington **Activ Suncool™** 30/17	neutral/blue	high	neutral

* Level of reflection: low <15%, medium 15-25%, high >25%.

Applications

Pilkington **Activ Suncool™** can only be used in insulating glass units. Designed to achieve optimum performance in large glazed areas, Pilkington **Activ Suncool™** is suitable for commercial and residential applications that demand high light transmission properties.

Features and benefits

- Self-cleaning properties reduce the need for manual cleaning, saving water and eliminating potentially harmful run-off from expensive detergents, also increasing personal safety.
- Additional superior solar control property, reducing the need for cooling the inside of the building.
- Superior low-emissivity, with U values down to 1,0 W/m²K in 6-16-4 standard constructions with argon (90%), making the products highly energy-efficient, through reduced need for heating.
- Range of light transmission and reflection, reducing the need for lighting the inside of the building.
- Wide range of appearance and performance options, providing a solution for the most demanding designs.
- Works even on cloudy days and during the night.
- Highly durable self-cleaning coating lasts the lifetime of the glass.
- Can only be used in insulating glass units (self-cleaning coating on surface #1 / solar control low-emissivity coating on surface #2).
- Available in combination with Pilkington **Optilam™**, for impact resistance or increased security, or Pilkington **Optiphon™**, for improved noise reduction.
- Available in annealed, toughened and laminated forms.
- Selection of harmonising spandrel panels available, allowing freedom in design of complete glass façades.
- Available in a range of different sizes and thicknesses (generally available in 6 and 8 mm; 4 mm is available in some products, 10 mm is available on special request).

Pilkington **Activ Suncool™** 70/40

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glass configuration			performance code			light				energy							S, UV	
II	II	II	U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
			W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	—	%
			U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance
⇩			**1,1**	**66**	**40**	66	15	14	96	35	33	32	40	0,40	0,06	0,46	1,65	13
	⇩		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		⇩	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

insulating glass unit, Pilkington **Optitherm™** S3 #3

insulating glass unit, Pilkington **K Glass™** #3

insulating glass unit, primary product outside #1+2

Notes:
1. Based on 6 mm glass thickness
2. Based on 16 mm (double glazed units) argon filled (90%) cavities
3. The primary product shall only be used in insulating glass units

Pilkington **Activ Suncool™** 70/35

PILKINGTON

glass configuration			performance code			light				energy						S, UV		
II	II	II		W/m²K	%	%		%	%	%	%	%	%	%		—		%
				U	LT	g		LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC		S		UV
			U value	**1,0**	**65**	**35**	transmittance	65	21	20	97	32	40	28	35	0,37	0,03	0,40	selectivity index	1,86		8
			light				reflectance outside	—	—	—	—	—	—	—	—	—	—	—				
			energy				reflectance inside	—	—	—	—	—	—	—	—	—	—	—				
							colour rendering index	—	—	—	—	—	—	—	—	—	—	—				
							direct transmittance	—	—	—	—	—	—	—	—	—	—	—				
							total transmittance	—	—	—	—	—	—	—	—	—	—	—				
							absorptance	—	—	—	—	—	—	—	—	—	—	—				
							reflectance	—	—	—	—	—	—	—	—	—	—	—				
							longwave shading coefficient	—	—	—	—	—	—	—	—	—	—	—				
							shortwave shading coefficient	—	—	—	—	—	—	—	—	—	—	—				
							total shading coefficient	—	—	—	—	—	—	—	—	—	—	—				
							UV transmittance	—	—	—	—	—	—	—	—	—	—	—				
							selectivity index	—	—	—	—	—	—	—	—	—	—	—				
⇩			insulating glass unit, Pilkington **Optitherm™** S3 #3																			
	⇩		insulating glass unit, Pilkington **K Glass™** #3																			
		⇧	insulating glass unit, primary product outside #1+2																			

Notes:
1. Based on 6 mm glass thickness
2. Based on 16 mm (double glazed units) argon filled (90%) cavities
3. The primary product shall only be used in insulating glass units

Pilkington **Activ Suncool™** 66/33

PILKINGTON

glass configuration			performance code			light				energy						S, UV		
II	II	II	U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
			W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	—	%
		insulating glass unit, Pilkington **Optitherm™** S3 #3	**1,0**	**61**	**34**	61	21	21	95	30	40	30	34	0,34	0,05	0,39	1,79	8
		insulating glass unit, Pilkington **K Glass™** #3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		insulating glass unit, primary product outside #1+2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Notes:
1. Based on 6 mm glass thickness
2. Based on 16 mm (double glazed units) argon filled (90%) cavities
3. The primary product shall only be used in insulating glass units

Pilkington **Activ Suncool™** 50/25

PILKINGTON

glass configuration			performance code			light				energy						S, UV		
#1	**#2**	**#3**																
			W/m²K	%	—	%	%	%	—	%	%	%	%	—	—	—	—	%
			U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
			U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance
⇨			**1,0**	**47**	**26**	47	23	21	93	22	38	40	26	0,25	0,05	0,30	1,81	5
	⇨		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		⇨	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

insulating glass unit,
Pilkington **Optitherm™** S3 #3

insulating glass unit,
Pilkington **K Glass™** #3

insulating glass unit,
primary product outside #1+2

Notes:
1. Based on 6 mm glass thickness
2. Based on 16 mm (double glazed units) argon filled (90%) cavities
3. The primary product shall only be used in insulating glass units

Pilkington **Activ Suncool™** Blue 50/27

PILKINGTON

glass configuration			performance code			light				energy						S, UV		
II	II	II	U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
			W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	—	%
		insulating glass unit, Pilkington **Optitherm™** S3 #3	**1,1**	**47**	**27**	47	24	16	93	23	39	38	27	0,26	0,05	0,31	1,74	6
		insulating glass unit, Pilkington **K Glass™** #3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		insulating glass unit, primary product outside #1+2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Notes:
1. Based on 6 mm glass thickness
2. Based on 16 mm (double glazed units) argon filled (90%) cavities
3. The primary product shall only be used in insulating glass units

Pilkington **Activ Suncool**™ Silver 50/30

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	unit			insulating glass unit, primary product outside #1+2	insulating glass unit, Pilkington **K Glass**™ #3	insulating glass unit, Pilkington **Optitherm**™ S3 #3
glass configuration				II	II	II
performance code	W/m²K	U	**U value**	**1,0**	–	–
	%	LT	**light**	**47**	–	–
	%	g	**energy**	**30**	–	–
light	%	LT	transmittance	47	–	–
	%	LRo	reflectance outside	42	–	–
	%	LRi	reflectance inside	34	–	–
	–	Ra	colour rendering index	94	–	–
energy	%	ET	direct transmittance	26	–	–
	%	ER	reflectance	46	–	–
	%	EA	absorptance	28	–	–
	%	TET	total transmittance	30	–	–
	–	SSC	shortwave shading coefficient	0,3	–	–
	–	LSC	longwave shading coefficient	0,04	–	–
	–	TSC	total shading coefficient	0,34	–	–
S, UV	–	S	selectivity index	1,57	–	–
	%	UV	UV transmittance	12	–	–

Notes:
1. Based on 6 mm glass thickness
2. Based on 16 mm (double glazed units) argon filled (90%) cavities
3. The primary product shall only be used in insulating glass units

6

Pilkington **Activ Suncool™** 40/22

PILKINGTON

glass configuration			performance code			light				energy							S, UV		
II	II	II	U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV	
			W/m²K	%	%	%	%	%	—	%	%	%	%	—	—	—	—	%	
		insulating glass unit, Pilkington **Optitherm™** S3 #3	**1,1**	**37**	**21**	37	25	23	91	18	40	42	21	0,21	0,03	0,24	1,76	5	
		insulating glass unit, Pilkington **K Glass™** #3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
		insulating glass unit, primary product outside #1+2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	

Notes:
1. Based on 6 mm glass thickness
2. Based on 16 mm (double glazed units) argon filled (90%) cavities
3. The primary product shall only be used in insulating glass units

Pilkington **Activ Suncool™** 30/17

PILKINGTON

glass configuration		performance code			light				energy							S, UV	
		W/m²K	%	%	%	%	%	–	%	%	%	%	–	–	–	–	%
		U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	S	UV
		U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance
II	insulating glass unit, primary product outside #1+2 ⇧	**1,1**	**28**	**18**	28	30	17	88	15	40	45	18	0,17	0,04	0,21	1,56	5
II	insulating glass unit, Pilkington **K Glass™** #3 ⇧	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
II	insulating glass unit, Pilkington **Optitherm™** S3 #3 ⇧	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Notes:
1. Based on 6 mm glass thickness
2. Based on 16 mm (double glazed units) argon filled (90%) cavities
3. The primary product shall only be used in insulating glass units

6

Glass used today in commercial buildings and offices, has to provide multiple functions. A technical profile of large glazed areas must meet requirements related to solar control, thermal insulation and noise control, as well as strict safety regulations. These requirements can now be combined with self-cleaning properties.

Dual coating technology is used to combine self-cleaning and solar control properties in one product, ensuring a highly cost effective glass combination.

In the commercial sector the glass often needs to provide additional protection features. To meet these requirements, Pilkington offers two product lines of laminated safety glass. When using laminated Pilkington **Activ™** glass for façade elements and on glazed roof and sloping areas which are difficult to access, both safety and self-cleaning can be assured.
The same applies to the combination of self-cleaning properties with noise control of the façade. Functional glass, such as Pilkington **Activ Optiphon™** allows a significant decrease in costs of window cleaning, and at the same time, it has an increased sound reduction index (R_w).

Table 6.1. Pilkington **Activ™** product combinations

Function	Product and combination
Self-cleaning	Pilkington **Activ™** Clear monolithic, single-coated, used as single or in insulating glass units.
Plus solar control	Pilkington **Activ™** Blue monolithic, single coated, body-tinted, used as single or in insulating glass units. Pilkington **Activ™** Neutral and Pilkington **Activ Suncool™** monolithic, dual-coated, used in insulating glass units.
Plus safety	Pilkington **Activ Optilam™** laminated safety glass, coated, used as single or in insulating glass units.
Plus noise control	Pilkington **Activ Optiphon™** sound insulating laminated safety glass, coated, used as single or in insulating glass units.
Plus thermal insulation	Pilkington **Activ Optitherm™** monolithic, dual-coated, used in insulating glass units.

Apart from the above-mentioned combinations, other configurations are possible (e.g. Pilkington **Activ Suncool Optilam™**).

7. Decoration

Our decorative glass is very versatile; it allows total freedom in design and can be customised to fulfill any requirements. Various technologies can be used to create the finished products, whether it is patterned or coloured glass. We can also influence the transparency of the glass surface as well as its light transmittance (i.e. be translucent). Our range of decorative products comprises of transparent or translucent glass such as screen printed glass, laminated glass with tinted or white translucent interlayer, sand blasted or acid etched glass, texture glass, or fully opaque products such as enamelled glass, mirrors, and reflective spandrel panels.

Using decorative glass you can create surroundings with a strong individual identity. In this section you will find our most popular decorative products.

High performance reflective glass

Description

Pilkington **Optimirror™** is a range of high specification mirror products, with excellent protection of the reflective silver layer, without the need for the copper and lead used in the conventional process. In addition to being environmentally friendly to manufacture, the Pilkington **Optimirror™** products offer far greater resistance to natural atmospheric corrosion – thus reducing the unsightly problems of black edges and spot faults. The products are available on clear, (Pilkington **Optimirror™**), bronze (Pilkington **Optimirror™** Bronze) and low-iron substrates (Pilkington **Optimirror™** OW), offering increased light reflection up to 94% on 4 mm thickness.

Pilkington **Optimirror™** Protect has the same features as Pilkington **Optimirror™** with the addition of a special safety film backing that protects against possible injury resulting from breakage.

Applications

Due to their high light reflection performance and superior standard of manufacture, the Pilkington **Optimirror™** products can be utilised across a vast array of buildings and applications, including walls, partitions, doors, displays, ceilings, cupboards, wardrobes and other furniture.

Pilkington **Optimirror™** Protect is the ideal choice for applications anywhere in the home where there is greater risk of accidental damage, e.g. doors, wardrobes and children's rooms.

Features and benefits

- High light reflection of up to 94% in 4 mm thickness.
- Completely lead-free top coat and <0,15% lead in the wet basecoat.
- Excellent resistance to natural atmospheric corrosion.
- Higher corrosion resistance and improved resistance to chemical attack from cleaners and certain adhesives than conventional mirrors.
- Environmentally friendly manufacturing process producing less waste and ensures easier onward recycling.
- Compliant with EN 1036.
- Available in 3 mm, 4 mm and 6 mm thicknesses.

Additional for Pilkington **Optimirror™** Protect

- Incorporates special safety film for added impact protection.
- Achieves impact performance to EN 12600 Class 2(B)2.
- Available in 4 mm and 6 mm thicknesses.

Description

Pilkington Painted Glass is a stylish range of colour backed decorative non-toughened glass, created especially for indoor use. The glass has a sleek, modern lustre thanks to a high quality coating on the back. The result is a highly durable, multi-purpose product with limitless design opportunities. Pilkington Painted Glass is available in black (Pilkington Painted Glass Jet Black) on Pilkington **Optifloat™** Clear substrate and also available in white (Pilkington Painted Glass Ice White) on Pilkington **Optiwhite™** substrate.

Applications

Pilkington Painted Glass can be used in a wide variety of domestic, architectural and commercial indoor applications – almost anywhere a contemporary and practical solution is required to enhance an interior space. These include: bars and restaurants, kitchens and bathrooms, table tops, feature walls, wardrobe, doors and hospitals. Pilkington Painted Glass is currently available in annealed form, however a safety backing film can be added to reduce the risk of possible injury where compliance with building codes is required for impact safety. This is particularly important when using the glass in and around doors and low level glazing applications.

Features and benefits

- Easy to handle, install and process
- Durable
- Hygenic
- Easy to clean
- Requires minimum maintenance
- Can be drilled or shaped to suit kitchen or bathroom schemes
- Can be fitted using traditional mirror fixing techniques
- Available in 4 mm and 6 mm

Rolled patterned glass

Description

A rolled patterned glass, one surface of which has a specific pattern or design impressed into the surface, Pilkington Texture Glass provides obscuration and decoration. The patterned glass allows the passage of light but depending on the depth and configuration of the pattern, varying degrees of obscuration are obtained. All patterns are classified according to their obscuration in relation to each other, the gradation being from 1 (least obscuring) to 5 (most obscuring).

Applications

The designs give scope for combining functional suitability with decorative effect, whilst emphasising the natural light-enhancing properties of glass. The glasses can be supplied in toughened or laminated form for safety and incorporated into insulating glass units for thermal insulation or noise control.

Pilkington Texture Glass is translucent, with diffused light transmitted but privacy is maintained. It offers a wide selection of alternatives, meeting both functional and aesthetic requirements and may be used for privacy in commercial, industrial and residential buildings. It may also be used for decorative purposes in applications such as doors, partitions and balustrades.

Features and benefits

- Provide different degrees of obscuration for privacy of decoration purposes.
- Extensive range of designs and finishes.
- Available with wired glass, and therefore suitable for glazing resistant to fire.
- All patterns can be toughened and some are available in laminated form for safety and/or security purpose.
- Can be single glazed or incorporated in insulating glass units for additional properties.
- Available in a wide range of sizes and thicknesses (4, 6, 8 and 10 mm) depending on design.

Pilkington Texture Glass

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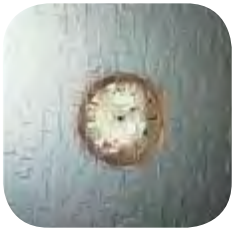
glass configuration	performance code			light				energy						S, UV	
1	W/m^2K	%	%	%	%	%	—	%	%	%	%	—	—	—	%
monolithic glass	U	LT	g	LT	LRo	LRi	Ra	ET	ER	EA	TET	SSC	LSC	TSC	
	U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	
4 mm	**5,8**	**88**	**82**	88	8	8	98	78	7	15	82	0,90	0,04	0,94	S selectivity index 1,07 / UV UV transmittance 55
6 mm	**5,7**	**86**	**78**	86	8	8	97	73	7	20	78	0,84	0,06	0,90	S selectivity index 1,1 / UV UV transmittance 48
10 mm	**5,6**	**84**	**74**	84	8	7	95	67	7	26	74	0,77	0,08	0,85	S selectivity index 1,14 / UV UV transmittance 41

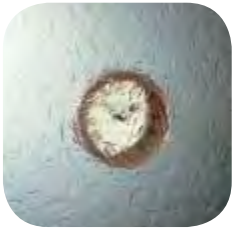
Arctic™

Autumn™

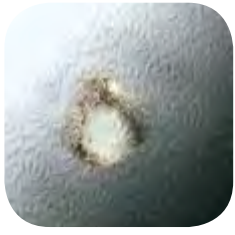


Digital™

Everglade™



Oak™

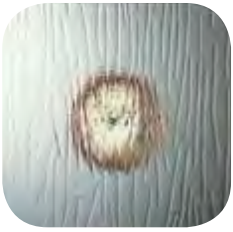


Pelerine™

Warwick™

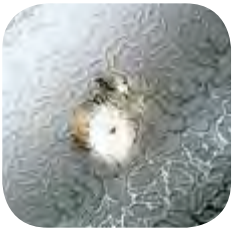
Austral™

Chantilly™



Charcoal Sticks™

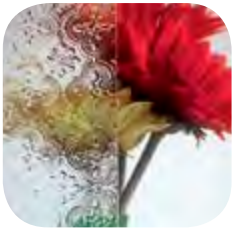
Flemish™



Florielle™

Reeded™

Stippolyte™



Morisco™

Rayado™

Contora™

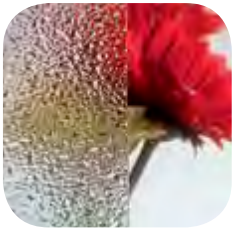
Cotswold™

Mayflower™

Minster™

Sycamore™

Taffeta™



Sparkel™

Yacare™

8. Glass Systems

Glass can be used to create building interiors which connect occupants with the external environment, combining unbroken views of the surrounding nature and high level of natural light with the comfort and safety of the internal environment.

This section presents two of our attractive and practical glass systems, which will allow you, for example, to transform courtyards into cosy interiors, enclose private and public outdoor areas under glass roofs and build stunning glass façades.

Our two major glass systems, Pilkington **Planar™** and Pilkington **Profilit™** are developed for use in glass façades, walls or roofs, and also for internal glazing applications.
Our Pilkington specialists and accredited installers can provide all the support that architects and designers require during their planning and design process.

World's leading structural glazing system

Description
Pilkington **Planar™** has evolved from the original patch plate system pioneered by Pilkington over 40 years ago to become the unrivalled choice of architects. With such a proven track record in some of the most demanding applications and situations, Pilkington **Planar™** offers the opportunity for architects to create a complete glass envelope for buildings working with façades on any plane.

With the flexibility to incorporate most of the vast array of Pilkington glass products, including solar control, low-e as well as Pilkington **Activ™**, it allows clients and architects the ability to build attractive, sustainable and green buildings that produce a greater feeling of light and space, thus, improving the working environments within. Pilkington **Planar™** gives flexibility of performance, appearance and transparency whilst achieving all of the functional and aesthetic requirements of the built environment.

The Pilkington **Planar™** system is a fully engineered system which has been rigorously tested. Pilkington **Planar™** system utilises the minimum amount of structure whilst affording the maximum visual without compromising on performance thus providing safe and attractive glass structures. All aspects of the design are fully engineered, tested and approved to fully comply with the project specific conditions.

The Pilkington **Planar™** system utilises a combination of glass and high grade 316 stainless steel fittings which when combined with a countersunk hole can attain a flush façade with very little distortion.

The Pilkington **Planar™** system glass types are:
- Single glass – fully toughened and heat soaked – flat or curved
- Single Laminated PVB safety glass
- **Planar™**|SentryGlas® Plus System
- Pilkington **Planar™** Integral
- Insulating Units
- Pilkington **Planar™** Intrafix
- Laminated insulating units
- Triple insulating units – Pilkington **Planar™** Triple

A variety of structures can be designed to be used as support for a Pilkington **Planar™** system. The versatility of design allows almost any type of structure to be used. Typical support systems are:

- Glass Fin Mullion
- Steel structures
- Pilkington **Planar™** T.S. (Tension Systems)
- Skylights and canopies.

Applications

The Pilkington **Planar™** system covers a large spectrum of applications and is not limited to size. The system can be utilised from small technically straightforward situations through to major building packages that are technically challenging.

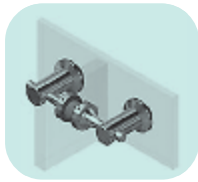
Developments

Recent developments in the Pilkington **Planar™** system include further development in Blast Mitigation façades and also a new photovoltaic system has been developed to architectural trends in security and environmental.

Future aims are to develop the system further following architectural trends and requirements to ensure the Pilkington **Planar™** system retains its "best in class" position as the leading structural glazing system.

Features and benefits

- Offers maximum freedom in design without compromising on performance.
- Flush external surface with little distortion.
- Fully engineered and in-house tested.
- Utilisation of high quality material.
- Incorporation of a 12 year design and materials warranty.
- Incorporates most of the vast array of Pilkington glass types including solar control, low-e and screen printed glass as well as Pilkington **Activ™** self cleaning glass.



U-shaped alkali cast glass

Description

Pilkington **Profilit™** is an alkali cast glass in U-shape, which is produced according to EN 572, Part 7, using the machine rolling process. It is translucent, but not transparent, with or without a patterned surface on the outside and has the quality features of cast glass.

Product range overview

Product names	Description
Pilkington **Profilit™**	Standard: with ornament # 504
Pilkington **Profilit™** Wire	Standard with wires
Pilkington **Profilit™** Plus 1,7	Standard with thermal insulation coating (low-e)
Pilkington **Profilit™** Antisol	Standard with solar control coating
Pilkington **Profilit™** Amethyst	Standard with Amethyst coating
Pilkington **Profilit™** Clear	**without** ornament
Pilkington **Profilit™** Wave	wave-shaped surface (see brochure) with ornament # 504
Pilkington **Profilit™** OW	OW = Pilkington **Optiwhite™**: low-iron
Pilkington **Profilit™** Opal	Opal-view (defined sandblasted)
Pilkington **Profilit™** Macro	ornament Macro
Pilkington **Profilit™** Slim Line	ornament Slim Line
Pilkington **Profilit™** T	thermally toughened glass *also available with Heat Soak-test*
Pilkington **Profilit™** T Color	thermally toughened and coloured enamelled glass *also available with Heat Soak-test*

Thermal insulation

Pilkington **Profilit™** Plus 1,7 is a low-e coated glass with a U value of 1,8 W/m²K when double glazed. Please note that Pilkington **Profilit™** Plus 1,7 has to be assembled according to our guidelines. Physical properties can be further improved by using triple glazing or translucent insulation material. For more information, please contact your local sales representative.

Solar control
Pilkington **Profilit™** Antisol reduces the total solar energy transmittance (g value) of the glazing.
Although the Pilkington **Profilit™** Antisol coating is bronze in colour, high visible light transmittance can be maintained.

Safety
Thermally toughened profiled safety glass Pilkington **Profilit™** T is specially designed to satisfy increased safety requirements within common areas of public buildings. This product variant provides greater mechanical strength compared to its annealed version, allowing the creation of large surfaces that are bright whilst also meeting all safety requirements. In addition it allows for longer installation lengths in comparison with standard Pilkington **Profilit™**. Heat soaked thermally toughened safety glass is available upon request.

Decoration
Thermally toughened and colour coated Pilkington **Profilit™** T Color is a profiled enamelled glass available in a wide range of RAL colours, that gives architects new design possibilities. As the glass is toughened, it also meets higher safety requirements.

Pilkington **Profilit™** is also available in a variety of designs and patterns; Pilkington **Profilit™** Wave, Pilkington **Profilit™** Opal, Pilkington **Profilit™** Macro and Pilkington **Profilit™** Slim Line.

Noise control
Noise ranks among the most unpleasant sensations. The psychological and physical strain resulting from noise is a continuous hazard to human health. The use of Pilkington **Profilit™** glass can greatly reduce the level of noise, to create a more pleasant environment. A double glazed installation with the padding profiles no. 165 and 166 achieves a sound reduction of 42-43 dB. Triple glazing can be used to achieve a sound reduction of 57 dB.

Applications

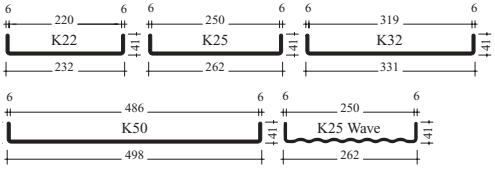
Pilkington **Profilit™** can be used in interior or exterior applications e.g. industrial, commercial or residential buildings. The U-shaped channels can be installed either vertically or horizontally. The glass is available in a variety of colours and textures with varying translucency, allowing for the passage of natural light without the loss of privacy. Pilkington **Profilit™** is energy-efficient, provides excellent sound reduction and is one of the most cost-efficient glass wall systems available. It can be single or double glazed.

Sports centre applications

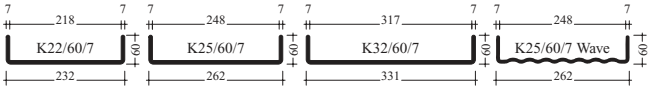
For sports centre glazing subject to ball impact, a double shell application with special profile Pilkington **Profilit™** K22/60/7, K25/60/7 or K32/60/7 construction should be selected, as permitted for ball impact glazing in accordance with DIN 18032, Part 3. The profile should be used without wires. Please consider special application requirements.

Delivery Programme

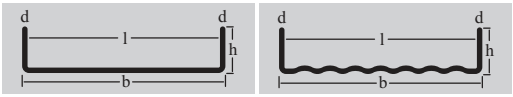
Glass thickness 6 mm, flange height 41 mm



Glass thickness 7 mm, flange height 60 mm



Cross-section



Tolerances: b ±2,0 mm; d ±0,2 mm; h ±1,0 mm. Cutting tolerances of ±3,0 mm are allowed. Tolerances according to EN 572-7. Dimensions are nominal.

For the application of Pilkington **Profilit™** the relevant national and international requirements and standards have to be considered in the various countries.

Pilkington **Profilit™**

Pilkington **Profilit™** thermally toughened	Pilkington **Profilit™** Colours / Patterns / Design	Pilkington **Profilit™** functional glass	Pilkington **Profilit™** with wires	Dimensions	Pilkington **Profilit™ types**	K22	K25	K32	K50	K25 Wave	K22/60/7	K25/60/7	K32/60/7	K25/60/7 Wave
					Width b (mm)	232	262	331	498	262	232	262	331	262
					Flange height h (mm)	41	41	41	41	41	60	60	60	60
					Glass d (mm)	6	6	6	6	6	7	7	7	7
					Weight (single glazing) kg/m²	19,5	19	18,2	17	19	25,5	24,5	22,5	24,5
					max. supply length Lmax (mm) (not max. installation length)	6000	6000	6000	5000	6000	7000	7000	7000	7000
					Number of longitudinal wires	7	8	10	16	8	7	8	10	8
					16 longitudinal wires (mesh function) *	—	●	—	—	—	—	●	—	—
					8+2 wires *	—	—	—	—	—	—	○	—	—
					Plus 1,7 (thermal insulation, low-e)	●	●	●	●	●	●	●	●	●
					Plus 1,7 Wire (thermal insulation, low-e)	○	●	●	○	●	●	●	●	●
					Antisol (solar control)	●	●	●	●	●	●	●	●	●
					Antisol Wire (solar control)	○	●	●	○	●	●	●	●	●
					Amethyst	●	●	●	●	●	●	●	●	●
					Amethyst Wire	○	●	●	○	●	●	●	●	●
					Clear (without ornament) *	—	●	—	○	—	○	●	—	—
					Clear Wire (without ornament) *	—	●	—	—	—	○	●	—	—
					Macro *	○	●	—	—	—	○	●	—	—
					Slim Line *	○	●	—	—	—	○	●	—	—
					Opal ❒	●	●	●	●	●	●	●	●	●
					OW (low-iron) *	○	○	○	○	○	○	○	○	○
					Pilkington **Profilit™** T ❒, * thermally toughened, with or without heat-soak test	●	●	●	●	●	●	●	●	●
					Pilkington **Profilit™** T Color ❒, ◆ thermally toughened and coloured enamelled, with or without heat-soak test	●	●	●	●	●	●	●	●	●

● Production standard
○ Production optional
* with coating available (Amethyst, Antisol, Plus 1,7)
❒ without CE-marking
◆ Lmax = 4,5 m

Sale from stock providing there are sufficient stocks available or from next production run. We would be pleased to examine the possibility of supplying any product combination not mentioned above upon request. Product specifications are available upon request.

9. Special Applications

Extremely thin clear float glass

Description
Pilkington **Microfloat™** is an extremely thin, high-grade float glass manufactured to precise standards. It is made according to the highest specifications with very low thickness tolerances, to ensure flat and uniform products, suitable for a variety of applications. Pilkington **Microfloat™** is manufactured by the standard float glass process.

Applications
Pilkington **Microfloat™** has traditionally been used for the production of microscope slides, cosmetic mirrors, chromatographic plates, LCD photo masks, automotive and technical glass, PC display screens and tablet PC's.

0,95-1,05 mm (microscope slides), 1,0-1,2 mm (microscope slides, cosmetic mirrors), 1,2-1,4 mm (chromatographic plates, cosmetic mirrors, technical glass) and 1,5-1,7 mm (photomasks, automotive, technical glass).

Benefits
- High-grade thin float glass with very low thickness tolerances.
- Flat and uniform products.
- Excellent optical transmission.
- Improved wetability through a silane coating (optional).
- Pre-cut to customer specifications.

Technical Data

Constituents	Typical composition (% by weight)
SiO_2	72,0 - 73,0
Al_2O_3	0,5 - 0,7
Fe_2O_3	0,07 - 0,13
Na_2O	13,0 - 13,5
CaO	8,6 - 8,9
K_2O	0,2 - 0,4
MgO	4,1 - 4,3

Thickness	Thickness tolerances [mm]	Light transmittance (TL) [%]	Solar direct transmittance (Te) [%]
1,0 mm	0,95-1,05	91,2	89,1
1,1 mm	1,00-1,20	91,2	88,8
1,3 mm	1,20-1,40	91,1	88,2
1,4 mm*	1,30-1,50	91,0	87,9
1,6 mm	1,50-1,70	90,8	87,4

* Available upon request

Additional data	
Mean refractive index to visible radiation, n	1,52
Density, ρ [kg/m^3]	2500
Average coefficient of linear expansion between 20°C and 300°C, α [K^{-1}]	9×10^{-6}
Thermal conductivity, λ [W/mK]	0,9
Young's modulus, [GN/m^2]	73
Poisson's ratio, μ	0,2
Alkaline resistance	Class 2
Acid resistance	Class 3
Hydrolytic resistance	Class 3

Size	[mm]
Minimum	400×600
Maximum	1000×1800

Notes:
Performance values determined in accordance with EN 410 and ISO 9050

High reflective pyrolytic on-line coated glass for one-way vision

Description

Pilkington **Mirropane™** is an on-line coated glass developed for use as a one-way mirror where clear vision is required and specific lighting conditions can be achieved. It offers an effective means of providing undetected surveillance and high quality one-way vision to achieve complete privacy.

In order to maintain privacy in the observing area, the ratio of illumination levels between public and private side, or observed and observing side, must be at least 8:1. It is also advisable, if absolute privacy is essential, to have dark furnishings, to wear dark clothing in the area from which observation is taken place, and to ensure the lights on the observed side are not directed at the glass.

Applications

Pilkington **Mirropane™** is the ideal choice for supermarkets, computer rooms, banks or cash offices, where areas need to be kept under observation or hidden from public scrutiny. It is also appropriate for patient monitoring in hospitals or residential care establishments. Pilkington **Mirropane™** is available in 6 mm annealed form.

Pilkington **Mirropane™** is normally only used for internal applications. The glass must be installed with the coating on the subject's (observed person) side. In such position the glass creates a visual barrier between subjects and their observers, performing like an ordinary mirror on one side and a tinted window on the other.

If you would like to use Pilkington **Mirropane™** in external applications, please contact your local Pilkington representative.

PILKINGTON

Pilkington **Mirropane™**

glass configuration				performance code			light					energy							S, UV		
I	II	III	IV	U	LT	g	LT	LRo	LRi	Ra		ET	ER	EA	TET	SSC	LSC	TSC	S	UV	
				W/m²K	%	%	%	%	%	—		%	%	%	%	—	—	—	—	%	
				U value	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index		direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance	
			insulating glass unit, Pilkington **Optitherm™** S3 #3	**5,7**	**11**	**40**	11	17	70	71		23	11	66	40	0,26	0,20	0,46	0,28	2	
		insulating glass unit, Pilkington **K Glass™** #3																			
	insulating glass unit, primary product outside #2																				
primary product, monolithic #2																					

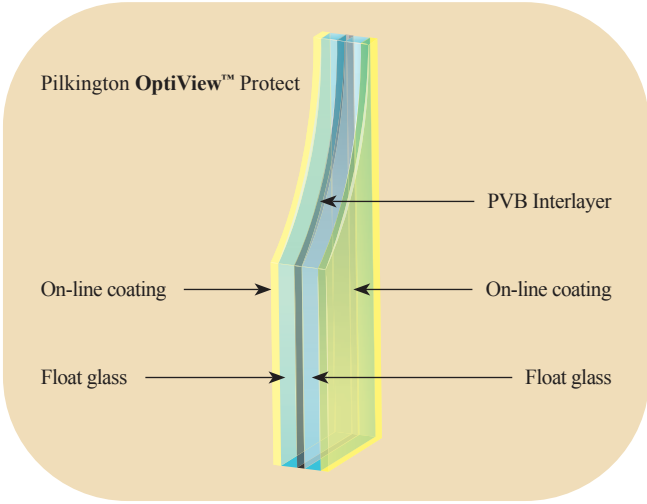
9

Pyrolytic on-line coated low-reflective glass

Description

Pilkington **OptiView™** and Pilkington **OptiView™** Protect are on-line coated low-reflective glasses. Pilkington **OptiView™** is a monolithic glass with the low-reflective coating on one surface. It reduces visible light reflectance and allows more visible light to pass through, when compared to clear float glass (8% light reflectance as standard). Pilkington **OptiView™** Protect is a laminated glass with low-reflective coatings on surfaces #1 and #4 (both outer surfaces of the laminated glass), which reduces interior and exterior visible light reflectance to around 2%. As a consequence, views from both inside and out are clear, un-obscured and virtually reflection-free. Pilkington **OptiView™** Protect offers all the traditional benefits of laminated glass, such as improved safety, enhanced security, durability and acoustic properties. Furthermore, it provides protection from UV radiation (UVA and UVB) by blocking over 99% of UV transmittance, helping to reduce fading of the contents and interiors of a building.

Figure 9.1



Applications

Pilkington **OptiView™** products are ideal for a wide range of traditional and new low-reflective applications in which clarity of view is of paramount importance. Examples include museums and display cases, retail shop fronts and showrooms and a host of other applications such as panoramic restaurants, glass atria and sports stadia where, previously, an low-reflective product was never an option. Pilkington **OptiView™** products can be used in various applications to enhance any view, either looking inwards or out. Adding to their unique properties, the products are available in large sizes and achieve a more neutral colour than any other low-reflective glass, providing architects with greater innovative freedom than before.

Pilkington **OptiView™** Protect **features and benefits**

- Exterior and interior light reflection reduced to around 2%.
- Light transmission greater than 90%.
- Neutral colour.
- Over 99% of UV transmittance blocked.
- Superior safety, security and acoustic properties.
- Highly durable, on-line pyrolytic coatings which achieve Class A to EN 1096-2.
- Performance to Class 1(B)1 EN 12600 and EN ISO 12543-2 respectively.
- Achieves ASTM C 1376 standard specification.

Pilkington **OptiView™** Protect

PILKINGTON	performance code				visible light				solar energy					S, UV, U value			
glass configuration		W/m²K	W/m²K	%	—	%	%	%	—	%	%	%	—	—	%	W/m²K
I		U	U	LT	SHGC	LT	LRo	LRi	Ra	ET	ER	EA	SHGC	TSC	S	UV	U
		U.S. summer	**U.S. winter**	**light**	**solar heat gain coefficient**	transmittance	reflectance outside	reflectance inside	colour rendering index	direct transmittance	reflectance	absorptance	solar heat gain coefficient	total shading coefficient	selectivity index	UV transmittance	European
monolithic glass	6,8 mm[1]	**3,82**	**4,55**	**92**	**0,76**	92	2	2	98	70	4	27	0,76	0,88	1,20	<1	4,6
	12,8 mm[2]	**3,79**	**4,48**	**88**	**0,70**	88	2	2	97	61	3	36	0,70	0,81	1,26	<1	4,5

[1] Pilkington **OptiView™** Protect 6,8 mm: 3 mm Pilkington **OptiView™** (#1) + 0,76 mm clear pvb with 99% UV absorptance + 3 mm Pilkington **OptiView™** (#4)

[2] Pilkington **OptiView™** Protect 12,8 mm: 6 mm Pilkington **OptiView™** (#1) + 0,76 mm clear pvb with 99% UV absorptance + 6 mm Pilkington **OptiView™** (#4)

Notes:

1. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions
2. U.S. U value is based on NFRC/ASHRAE/ISO 15099 standards
3. European U value is based on EN 410 and EN 673 standards

Extra-clear low-iron float glass

Today the use of glass in architecture and design is becoming more and more prevalent, and Pilkington **Optiwhite™** is at the very forefront of making it possible. The reason for this is the sheer variety of benefits which Pilkington **Optiwhite™** can offer, making it an excellent choice for a wide range of applications.

Description

Pilkington **Optiwhite™** is an extra-clear, low-iron float glass; it is practically colourless, and the green cast inherent to other glasses is not present. It is therefore ideal for use where glass edges are visible or where a neutral colour is desired. As its light transmission is 1% and 6% higher than clear float glass in 3 mm and 15 mm thickness respectively, it is perfect for applications where transparency and purity of colour are desired. Available in thicknesses of between 2 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 thermal insulation or self-cleaning.

Applications

INTERNAL GLAZING

Laminated glass used in internal glazing provides safety and security by marrying together multiple layers of standard float glass and PVB interlayers. However, this process also exaggerates any tint of colour inherent to the product. This is much less noticeable when using Pilkington **Optiwhite™** as the substrate for laminated glass. The resulting product is free from inherent darkening conventionally associated with laminated glass incorporating the thicker clear float glass used for enhanced safety and security, making Pilkington **Optiwhite™** the ideal alternative solution for balustrades, balconies, doors, partitions and stairs.

EXTERNAL GLAZING

One of the most attractive features of Pilkington **Optiwhite™** is its ability to achieve greater brilliance and transparency, allowing a clear and true representation of colours when viewed through the glass. These same qualities also allow for great interior daylight, which no doubt explains why Pilkington **Optiwhite™** is the product of choice for architects for buildings where transparency and brightness are of paramount importance. Thanks to these and the many other benefits that Pilkington **Optiwhite™** brings to exterior applications, it is the perfect choice for façades. When used in shop fronts, it enhances true colours and allows maximum light transmission, even in thicker laminated combinations. In domestic windows, Pilkington **Optiwhite™** maximises passive solar gain to reduce the need for heating during cold sunny days.

FURNITURE AND OTHER APPLICATIONS

Pilkington **Optiwhite™** is also ideal for applications where glass is used as a design feature, such as glass tables. The same is true where glass edges are purposely exposed – for example, shelving and shower screens – where its clarity enhances the entire appearance of the furniture. In applications such as display cabinets, the high light transmission of Pilkington **Optiwhite™** allows for a true representation of the potentially high-value products inside. Its inherent ability to make colours appear brighter also means that Pilkington **Optiwhite™** provides an exceptional base glass for tiles, splash-backs and furniture doors, and gives more accurate colour definition when used as a mirror base.

Features and benefits

- Purity of colour with minimum colour cast when viewing through the glass, ensuring a true representation of the designer's vision.
- High light transmission for outstanding visual clarity when an unrestricted view is required.
- High solar heat transmittance providing passive solar gain to allow more heat through, which can save costs on energy bills during the winter.
- Ensures a more natural, brighter view.
- Allows highest transparency for true colour representation, even in thicker laminated combinations.
- Flexibility of application.
- Made to exceptional, consistent quality and performance.
- Can be toughened or laminated for safety and security.
- Can be combined with other products from the Pilkington range to provide additional benefits.
- Available in thicknesses of between 2 mm and 19 mm (the widest range on the market).

Pilkington **Optiwhite™**

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glass configuration		performance code			light					energy							S, UV	
I		U	LT	g	LT	LRo	LRi	Ra		ET	ER	EA	TET	SSC	LSC	TSC	S	UV
		W/m²K	%	%	%	%	%	—		%	%	%	%	—	—	—	—	%
monolithic glass		**U value**	**light**	**energy**	transmittance	reflectance outside	reflectance inside	colour rendering index		direct transmittance	reflectance	absorptance	total transmittance	shortwave shading coefficient	longwave shading coefficient	total shading coefficient	selectivity index	UV transmittance
2 mm		**5,8**	**92**	**91**	92	8	8	100		91	8	1	91	1,05	0,00	1,05	1,01	88
3 mm		**5,8**	**92**	**91**	92	8	8	100		91	8	1	91	1,05	0,00	1,05	1,01	87
4 mm		**5,8**	**92**	**91**	92	8	8	100		91	8	1	91	1,05	0,00	1,05	1,01	86
5 mm		**5,8**	**91**	**91**	91	8	8	100		90	8	2	91	1,03	0,02	1,05	1,00	84
6 mm		**5,7**	**91**	**90**	91	8	8	100		90	8	2	90	1,03	0,00	1,03	1,01	83
8 mm		**5,6**	**91**	**90**	91	8	8	100		89	8	3	90	1,02	0,01	1,03	1,01	81
10 mm		**5,6**	**91**	**89**	91	8	8	99		88	8	4	89	1,01	0,01	1,02	1,02	79
12 mm		**5,5**	**91**	**89**	91	8	8	99		88	8	4	89	1,01	0,01	1,02	1,02	77
15 mm		**5,4**	**90**	**88**	90	8	8	99		87	8	5	88	1,00	0,01	1,01	1,02	75
19 mm		**5,3**	**90**	**87**	90	8	8	99		86	8	6	87	0,99	0,01	1,00	1,03	72

Notes:
1. Special extra clear low iron float glass
2.Performance values determined in accordance with EN 410 and EN 673

Glass Moulds for Acrylic Casting

Description
Pilkington **Plateau™** provides a high tolerance performance by using specially manufactured Pilkington **Optifloat™** to achieve the necessary quality surface and thickness standards demanded by the acrylic casting industry.

Applications
These acrylic sheets are then transformed and incorporated into many forms, including: Signage, Point of Sale displays, Light boxes, LCD screens Sanitary ware and many other items.

Pilkington **Plateau™** glass moulds is available in a range of different finishes to provide a variety of cast acrylic sheet surface finishes.

Technical Data

Maximum sizes [mm] (by arrangement only)			
	Annealed	**Toughened**	**Maximum sizes**
Clear	3540×2650	3540×2650	2200×3300
Silk & satin	3450×2350	3450×2350	2200×3300

Tolerance
Edge length: ±3 mm
Diagonal length: ±5 mm

Thickness
8 mm: ±0,3 mm
10 mm: ±0,13 mm
12 mm: ±0,3 mm

Wedge (maximum difference between 2 points measured on the glass)
8 mm: 0,20 mm
10 mm: 0,13 mm
12 mm: 0,20 mm

Clear glass
For all sizes, bow shall not exceed 1,5 mm/m

Acid etched glass
For all sizes, bow shall not exceed 2 mm/m

Features and Benefits

- Pilkington has been a manufacturer and supplier of high quality glass to the Acrylic casting market for over 70 years.
- A High quality specially toleranced float glass, manufactured solely for Pilkington's use. This gives us the special flatness to the glass which makes it ideal for use in Acrylic Casting manufacture.
- The thickness tolerance of the glass is maintained at a high level along with the wedge of the glass to provide a high tolerance glass mould.
- As the clear glasses can be used on both sides for casting, this allows the Manufacturer of Acrylic sheets greater flexibility.
- Prior to usage, Pilkington can offer the service of providing the Best Match pairing data for the customer to re-pair in order to make extremely high tolerance Acrylic sheets.
- All glasses are Paired in Case ready for immediate use.

Manufacturing

- High strength glass (toughened) is used to ensure improved operator safety during use and also increased longevity of the mould.
- Pilkington has a bespoke manufacturing system to continue to supply the best quality of the product during production.
- Quality control ensures each sheet of glass for the mould is specially inspected for surface defects and also plate shape prior to manufacture and despatch.
- An automatic shape measuring machine, allows for the pairing of similar glasses. This results in a quantifiable pairing tolerance for the glass mould being achieved thus allowing for superior acrylic sheets to be manufactured.
- The Pilkington **Plateau™** Mould's paring data can be supplied as well as the individual plate data should the need arise to re-pair damaged glasses.

Products

- Pilkington **Plateau™** glasses are clear glasses, Annealed form available from 6, 8, 10 and 12 mm, Toughened form available from 8,10 and 12 mm and are supplied from a specially manufactured, high surface quality, tight toleranced float glass.
- Pilkington **Plateau™** also comes with the variety of etches the clear surface. The finishes are Satin, Silk or the New Pilkington **Plateau™** Sheen finish 8, 10 and 12 mm to provide the caster with alternative surface finishes. These products can come with or without a clear border.
- Pilkington **Plateau™** Patterned glasses: 6 and 10 mm (Borealis and Stippolyte) are also available as alternatives (subject to availability) – please contact below for variants, size restrictions.
- The glass edge finish has been developed as a C profile in order to ensure longevity of the glasses during manufacture and reduce damage to the glass edges.
- We have developed a system where we can triple pair the glasses for customers in order to increase the capacity of their production lines – this is in conjunction with a product that you can use both sides.

On-line transparent conductive oxide coated glass

Description

A range of low-emissivity glasses with a pyrolytic on-line electric conductive coating of special qualities. Pilkington **TEC Glass™** offers a wide variety of thermal and heated glass performance properties, whilst increasing light transmittance and optimizing electrical conductivity. The products are specifically tuned to meet the requirements of a wide range of applications.

Applications

Pilkington **TEC Glass™** meets the requirements of a wide range of applications, such as heated glass for commercial refrigeration, heat reflecting, electrochromics, appliance glass, computer screens, touch screens, static control, thin film photovoltaics, EMI/RFI shielding or other electro-optical and insulating applications.

There are a variety of Pilkington **TEC Glass™** products to meet your specific needs, including:

- Pilkington **TEC™** 15
  The best choice for applications requiring passive condensation control and thermal performance with low-emissivity and clear colour-neutral appearance.
- Pilkington **TEC™** 7
  The lowest resistivity value in the Pilkington **TEC Glass™** range. Combined with relatively low haze, it can be used for a wide range of applications including dye solar cells, electromagnetic shielding and thin film photovoltaics.
- Pilkington **TEC™** 35, Pilkington **TEC™** 50, Pilkington **TEC™** 70 and Pilkington **TEC™** 250
  For use in heated glass applications. Compatible with different power sources, these products combine thermal control with superior electro-optical properties.
- Pilkington **TEC™** SB
  For use as a substrate for off-line coated glasses. Provides a barrier layer to prevent sodium migration into the deposited film, particularly at elevated temperatures, leaving the performance of the off-line coating unaffected.

Features and benefits

- Electrically conductive for heated and thermal control, electrostatic dissipation and reduced transmittance of electromagnetic radiation.
- Colour neutral, minimizing reflected colour.
- Excellent availability for reduced lead times and control of costs.
- Will not change colour over time.
- Scratch and abrasion resistant.
- High resistance to heat (unaffected by very high processing temperature).
- Easily fabricated durable pyrolytic surface can be handled, cut, insulated, laminated, heat-strengthened and tempered.
- Can be easily heat processed and bent after production.
- Available in a variety of glass thicknesses and sheet resistances ranging from 6 ohms/sq. up to several thousand ohms/sq.

PILKINGTON	Pilkington **TEC Glass™**				
Product	**Thickness**	**Visible Transmittance**	**Sheet Resistance**	**Haze**	**Hemispherical Emmitance**
	mm	%	Ω/□	%	
Pilkington **TEC™** 7	2,2, 3,0, 4,0	80-82	6-8	5	0,12
Pilkington **TEC™** 8	2,2, 3,2	80-81,5	6-9	12	0,12
Pilkington **TEC™** 15	2,2, 3,0, 3,2, 4,0, 5,0, 6,0	82-84,5	12-14	≤0,74	0,15
Pilkington **TEC™** 35	3,2, 6,0	82-84	32-48	≤0,65	0,34
Pilkington **TEC™** 70	3,2, 4,0	82-84	58-72	0,5	0,45
Pilkington **TEC™** 250	3,2, 4,0	84-85	260-325	0,7	0,67
Pilkington **TEC™** 1000	3,2	88	≤	0,5	0,78
Pilkington **Optifloat™** Clear	3,2	90	—	—	0,84

Substrate = Clear soda lime glass

Notes:
Nominal values shown

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Pilkington **TEC Glass™** – Refrigerator door applications

Glazing (Room / Cool side)	Air cavity	U-value	Room side glass temp.	Condensation RH [1]	RH Improvement	Heat flow through glass	Heat flow reduction	Power density
	mm	W/m^2K	°C	%	%	W/m^2	%	W/m^2
Room-side temperature = 27°C, refrigeration temperature = 4°C.								
Pilkington **Optifloat™** Clear / Pilkington **Optifloat™** Clear	12 mm	2,8	19	62	base case	64	base case	0
Pilkington **Optifloat™** Clear / Pilkington **Optifloat™** Clear / Pilkington **Optifloat™** Clear	2×6 mm	2,2	20	67	8	52	19	0
Pilkington **TEC™** 15 (#2) / Pilkington **Optifloat™** Clear	12 mm	1,9	22	72	16	43	33	0
Room side temperature = 27°C, freezer temperature = –20°C.								
Pilkington **Optifloat™** Clear / Pilkington **Optifloat™** Clear / Pilkington **Optifloat™** Clear	2×6 mm	2,1	15	47	base case	101	base case	0
Pilkington **TEC™** 70 (#2) / Pilkington **Optifloat™** Clear / Pilkington **Optifloat™** Clear	2×6 mm	2	23	77	64	94	7	82
Pilkington **TEC™** 70 (#2) / Pilkington **TEC™** 15 (#3)	12 mm	1,8	24	81	72	86	14	82
Pilkington **TEC™** 70 (#2) / Pilkington **TEC™** 15 (#3) / Pilkington **Optifloat™** Clear	2×6 mm	1,7	25	86	83	82	19	82

[1] Condensation along the room side glass surface away from the frame when the relative humidity (RH) within the room is greater than the value noted.

Notes: 1. All glass 3,2 mm 2. Performance values are calculated using the LBNL Window 5,2 program based on NFRC 100-2002 environmental conditions 3. Demist heater power of 100 Watts (82 W/m^2). Input voltage = 120 volts 4. Unit 800 mm × 1700 mm, bus bars along 800 mm dimensions

Appendix

Standards for Glass in building

Note. This list of standards is not an exhaustive list, but covers the most important ones applicable to the Pilkington product range.

European

EN 356: Glass in building – Security glazing – Testing and classification of resistance against manual attack

EN 410: Glass in building – Determination of luminous and solar characteristics of glazing

EN 572: Glass in building – Basic soda lime silicate glass products –
Part 1: Definitions and general physical and mechanical properties
Part 2: Float glass
Part 3: Polished wired glass
Part 4: Drawn sheet glass
Part 5: Patterned glass
Part 6: Wired patterned glass
Part 7: Wired or unwired channel shaped glass
Part 8: Supplied and final cut sizes
Part 9: Evaluation of conformity/Product standard

EN 673: Glass in building – Determination of thermal transmittance (U value) – Calculation method

E**N 674:** Glass in building – Determination of thermal transmittance (U value) – Guarded hot plate method

EN 1036: Glass in building – Mirrors from silver-coated float glass for internal use
Part 1: Definitions, requirements and test methods
Part 2: Evaluation of conformity/Product standard

EN 1063: Glass in building – Security glazing – Testing and classification of resistance against bullet attack

EN 1096: Glass in building – Coated glass
Part 1: Definitions and classification
Part 2: Requirements and tests method for class A, B and S coatings
Part 3: Requirements and test methods for class C and D coatings
Part 4: Evaluation of conformity/Product standard

EN 1279: Glass in building – Insulating glass units –
Part 1: Generalities and dimensional tolerances
Part 2: Long-term test method and requirements on moisture vapour penetration

Part 3: Initial type testing on gas-filled insulating glass units: gas concentration and gas leakage rate
Part 4: Methods of test for the physical attributes of edge seals
Part 5: Evaluation of conformity / Product standard
Part 6: Factory production control

EN 1363: Fire resistance tests
Part 1: General requirements

EN 1364: Fire resistance tests for non-load bearing elements
Part 1: Walls

EN 1634: Fire resistance tests for door shutter assemblies
Part 1: Fire doors and shutters

EN 1863: Glass in building – Heat strengthened soda lime silicate glass
Part 1: Definition and description
Part 2: Evaluation of conformity / Product standard

EN 12150: Glass in building – Thermally toughened soda lime silicate safety glass
Part 1: Definition and description
Part 2: Evaluation of conformity / Product standard

EN ISO 12543: Glass in building – Laminated glass and laminated safety glass
Part 1: Definitions and description of component parts
Part 2: Laminated safety glass
Part 3: Laminated glass
Part 4: Test methods for durability
Part 5: Dimensions and edge finishing
Part 6: Appearance
(See also EN 14449)

EN 12600: Glass in building – Pendulum test – Impact test method and classification for flat glass

EN 12758: Glass in building – Glazing and airborne sound insulation – Product descriptions and determination of properties

EN 12898: Glass in building – Determination of the emissivity

EN 13022: Glass in building – Structural sealant glazing
Part 1: Glass products for structural sealant glazing systems – Supported and unsupported monolithic and multiple glazing
Part 2: Assembly rules

EN 13501: Fire classification of construction products and building elements
Part 2: Classification using data from fire resistance tests, excluding ventilation services
EN 13541: Glass in building – Security glazing – Testing and classification of resistance against explosion pressure

EN 14179: Glass in building – Heat soaked thermally toughened soda lime silicate safety glass
Part 1: Definition and description
Part 2: Evaluation of conformity / Product standard

EN ISO 14438: Glass in building – Determination of energy balance – Calculation method

EN 14449: Glass in building – Laminated glass and laminated safety glass – Evaluation of conformity / Product standard

EN 15434: Glass in building – Product standard for structural and/or ultra-violet resistant sealant (for use with structural sealant glazing and/or insulating glass units with exposed seals)

North American

ASTM C 1036 Standard Specification for Flat Glass

ASTM C 1048 Standard Specification for Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass

ASTM C 1172 Standard Specification for Laminated Architectural Flat Glass

ASTM C 1376 Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass

ASTM C 1503 Standard Specification for Silvered Flat Glass Mirror

ASTM E 1300 Standard Practice for Determining Load Resistance of Glass in Buildings

ASTM E 2190 Standard Specification for Insulating Glass Unit Performance and Evaluation

ANSI Z97.1 American National Standard for Safety Glazing Materials Used in Buildings – Safety Performance Specifications Method of Test

CPSC 16 CFR 1201 Safety Standard for Architectural Glazing Materials

International (ISO) Standards

ISO 9050: Glass in building – Determination of light transmittance, solar direct transmittance, total solar energy transmittance, ultraviolet transmittance and related glazing factors

ISO 10291: Glass in building – Determination of steady state U values (thermal transmittance) of multiple glazing - Guarded hot plate method

ISO 10292: Glass in building – Calculation of steady state U values (thermal transmittance) of multiple glazing

ISO 10293: Glass in building – Determination of steady state U values (thermal transmittance) of multiple glazing - Heat flow meter method

ISO 15099: Thermal performance of windows, doors and shading devices – Detailed calculations

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Pilkington Group Limited
European Technical Centre
Hall Lane – Lathom Nr Ormskirk L40 5UF – United Kingdom
marketing.communications@nsg.com
www.pilkington.com/products/bp