

Product portfolio

# Architectural Glazing

**kuraray**

**Trosifol<sup>®</sup> SentryGlas<sup>®</sup>**



## Introduction

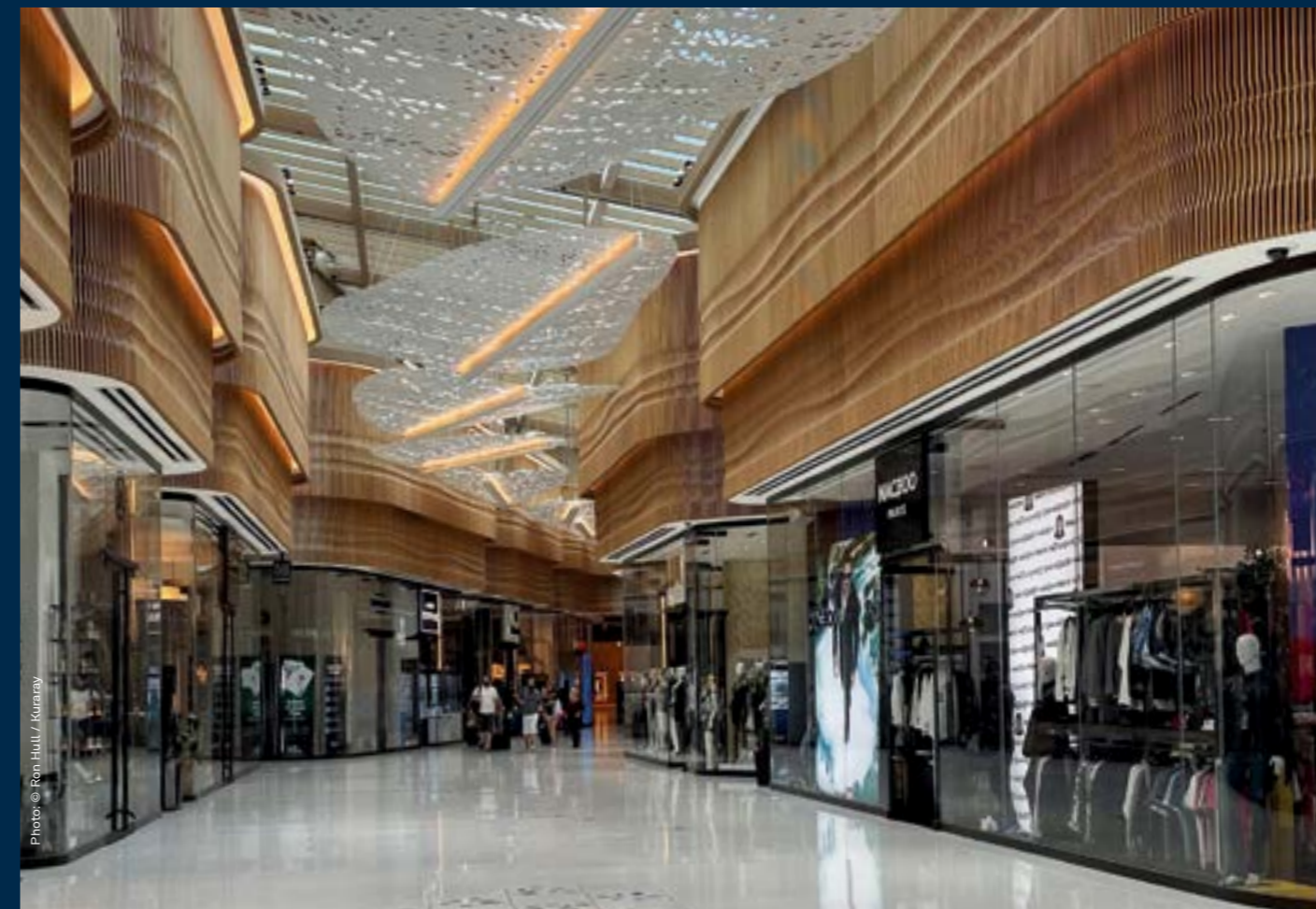
# Interlayer strength, depth and capabilities

Delivering your window into the world of advanced interlayers for laminated safety glass, Kuraray's Advanced Interlayer Business is underpinned by decades of innovation, application knowledge, domain experience and market success.

**OUR ADVANCED INTERLAYER PORTFOLIO** – comprising Trosifol® PVB and SentryGlas® ionoplast interlayers – has continually revolutionized aesthetic, structural and functional design, fabrication and installation in the architectural and automotive/transportation segments.

Designed to benefit consumers, society and industry, our products are advancing the functionality of glass, while our engineers and consultants are setting new application benchmarks by collaborating on solutions that both sustain and inspire.

We are committed to helping you transform your mindset and take your applications to the next level – aesthetically, functionally and structurally. Enjoy greater design freedom and give your glazing strength, clarity, character and purpose with solutions that cover safety, security, sound insulation, UV/solar/energy management, color and print.



• Seminole Hard Rock Hotel & Casino, Hollywood, Florida

**OUR DIVERSE PRODUCT RANGE,** the broadest on the global market and our domain expertise create strength; and we channel this strength into helping you succeed. We strive to be your strongest ally and supporter and will help you navigate and conquer the ever-changing demands of the global glass industry. Worldwide production, R&D and support, means we are always by your side... no matter where you are.



• Lakhta Tower, Saint Petersburg, Russia





• Guilin Wanda Cultural Tourism Exhibition Center, China

Product lines

# Contents

➔ **CHAPTER 1** 06-07  
Safety Glazing



➔ **CHAPTER 2** 08-11  
Structural & Security Glazing



➔ **CHAPTER 3** 12-15  
Sound Control Glazing



➔ **CHAPTER 4** 16-17  
UV Control Glazing



➔ **CHAPTER 5** 18-19  
Decorative Glazing



➔ **CHAPTER 6** 20-33  
Technical Data



➔ **CHAPTER 7** 34  
Tools & Apps



➔ **CHAPTER 8** 35  
Contact



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Safety Glazing

# Transparency and safety

## SAFETY HIGHLIGHTS

- **High adhesion:** Specially designed for laminated safety glass, made with heat strengthened or tempered glass. *It reduces the risk of edge delamination.*
- **Highest light transmittance and lowest Yellowness Index:** the thicker the interlayer and the clearer the glass, the more you benefit from *the UltraClear performance.*
  - **Trosifol® UltraClear interlayer highlights the benefits of low iron glass**
  - **Trosifol® UltraClear ensures best color fastness (e. g. white screen-printing)**
- **Open edge performance:** Salt spray test demonstrates the outstanding open edge performance with Trosifol® UltraClear (in this test as good as SentryGlas®).



Photo: © David Mitchell  
 • The Sunken Lounge, TWA Hotel, JFK Airport, New York City, USA



Photo Flower: © Lotus Images/shutterstock.com  
 • Trosifol® Clear Trosifol® UltraClear

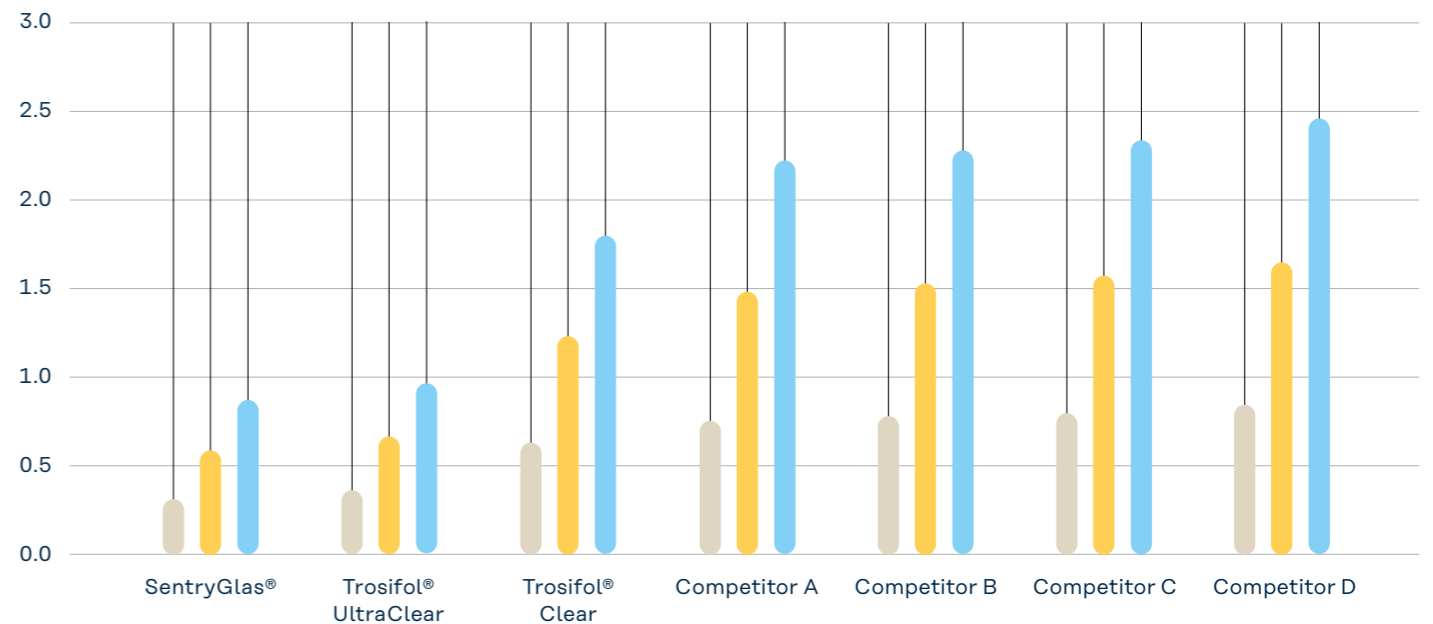
### External yellowness specification for architects and engineers

| Film thickness [mm] [mil] | Trosifol® UltraClear | Trosifol® Clear | SentryGlas® |
|---------------------------|----------------------|-----------------|-------------|
| 0.76 30                   | ≤ 0.4                | < 1.0           | ≤ 0.3       |
| 1.52 60                   | ≤ 0.8                | < 2.0           | ≤ 0.6       |
| 2.28 90                   | ≤ 1.2                | < 3.0           | ≤ 1.0       |
| 7.6 300                   | ≤ 4.0                | < 10.0          | < 3.0       |

TAB 1 • Measured between 2 x 2 mm low iron glass

### Yellowness Index for Trosifol®, SentryGlas® and competitors

Yellowness Index ● 0.76 mm (30 mil) ● 1.52 mm (60 mil) ● 2.28 mm (90 mil)



GRAPH 1 •



Photo: © papmap/shutterstock.com





American Dream Mall, East Rutherford, New Jersey

Structural and Security Glazing

# Exceptional strength up to 330 cm (130 in)

## STRUCTURAL AND SECURITY HIGHLIGHTS

- Extraordinary post-breakage strength
- High film shear modulus
- Excellent edge stability
- Outstanding clarity
- Open edge design thanks to SentryGlas®

## APPLICATIONS & RECOMMENDATIONS

- SentryGlas® is the best choice, with over 20 years of outdoor exposure, for open edge applications that require the very best edge durability and optics.
- SentryGlas® is recommended for applications that require the highest structural performance over a broad range of temperatures and loads.
- SentryGlas® Translucent White provides full structural performance along with a translucent white effect for privacy.
- For moderate design temperature we recommend Trosifol® Extra Stiff.
- For elevated design temperature we recommend SentryGlas®.
- SentryGlas® Xtra™ interlayers have the best optical performance in very thick laminates.
- We recommend SentryGlas® Xtra™ for multi-ply laminate assemblies as an adhesion promoter is no longer required.
- Trosifol® Spallshield® CPET hard-coated PET film helps to stop the showering of small glass particles.
- Trosifol® PET adds strength to the PVB improving both safety and security of the glass laminate.



King Power Mahanakhon, Bangkok, Thailand

## Interlayer performance comparison

| Properties   | Trosifol® Clear / UltraClear |          |          | Trosifol® Extra Stiff |          |          | SentryGlas® ionoplast |          |          |
|--|------------------------------|----------|----------|-----------------------|----------|----------|-----------------------|----------|----------|
|  | Good                         | Advanced | Superior | Good                  | Advanced | Superior | Good                  | Advanced | Superior |
| Post breakage performance at room temperature                  | ✓                            |          |          |                       |          | ✓        |                       |          | ✓        |
| Post breakage performance at elevated temperature              | ✓                            |          |          |                       | ✓        |          |                       |          | ✓        |
| Structural properties/ coupling effect at room temperature     | ✓                            |          |          |                       |          | ✓        |                       |          | ✓        |
| Structural properties/ coupling effect at elevated temperature | ✓                            |          |          |                       | ✓        |          |                       |          | ✓        |
| Clarity  |                              | ✓*       | ✓**      |                       | ✓        |          |                       |          | ✓        |
| Sealant compatibility/ edge stability                          | ✓*                           | ✓**      |          |                       | ✓        |          |                       |          | ✓        |

TABLE 2 • \* Valid for Trosifol® Clear \*\* Valid for Trosifol® UltraClear



People on Zhangjiajie Glass Bridge, China



Structural and Security Glazing – severe weather

# Interlayers for extreme security needs

## HURRICANE

- Hurricane impact windows provide protection from wind borne debris
- The use of hurricane impact windows greatly reduces building damage
- First 9 meters (30 feet) of building elevation requires glazing system to pass large missile impact testing
- SentryGlas®, SentryGlas® Xtra™ and Trosifol® PVB pass large missile impact test and have obtained Miami Dade County Product Control Notice of Acceptance (NOA)
- SentryGlas® is best for Level E (essential facility) protection
- SentryGlas® recommended for large glass, high wind loads, or dry glaze systems



Photo: © 3dphoto/shutterstock

## TYPHOON

- Typhoons are synonymous with hurricanes, capable of the same damaging wind borne debris, the only difference is location
- Currently the building codes for window systems in typhoon regions are not very strong or enforced
- Our cooperation with the CTBUH to investigate how to expand hurricane window solutions to this region

## TORNADO

- Tornadoes are capable of wind speeds in excess of 250 mph (425 kph)
- Tornadoes strike with little warning
- Window systems using SentryGlas® and Trosifol® Spallshield® CPET are capable of passing FEMA 361 EF5 tornado test



Photo: © Kuranay

• Miami Courthouse, USA

Structural and Security Glazing – man made

## ANTI-INTRUSION GLAZING

- Security and protection against attacks, vandalism and property theft
- No need to use unsightly bars or roll down gates. Clear transparent protection
- SentryGlas®, Trosifol® PVB and Trosifol® Spallshield® CPET inter-layer comply with global security glazing standards

## BALLISTIC RESISTANCE

- Protection from a wide range of ballistic threats
- Trosifol® Spallshield® CPET provides a durable spall protection layer
- SentryGlas® certified by the US Department of State for FE (forced entry) BR (bullet resistance)
- Construction using SentryGlas®, Trosifol® PVB, and Trosifol® Spallshield® CPET can meet ballistics-resistance test standards that are thinner, light-weight, and more durable than alternative solutions



Photo: © futurisman/shutterstock.com

## BOMB-BLAST GLAZING

- Trosifol® PVB, Trosifol® Spallshield® CPET and SentryGlas® are used in systems for bomb blast protection, both low and high level protection
- SentryGlas® is specified by the US State Department for higher bomb blast requirements of US Embassies
- Embassies, government buildings and high risk buildings



Sound Control Glazing

# Customized sound insulation

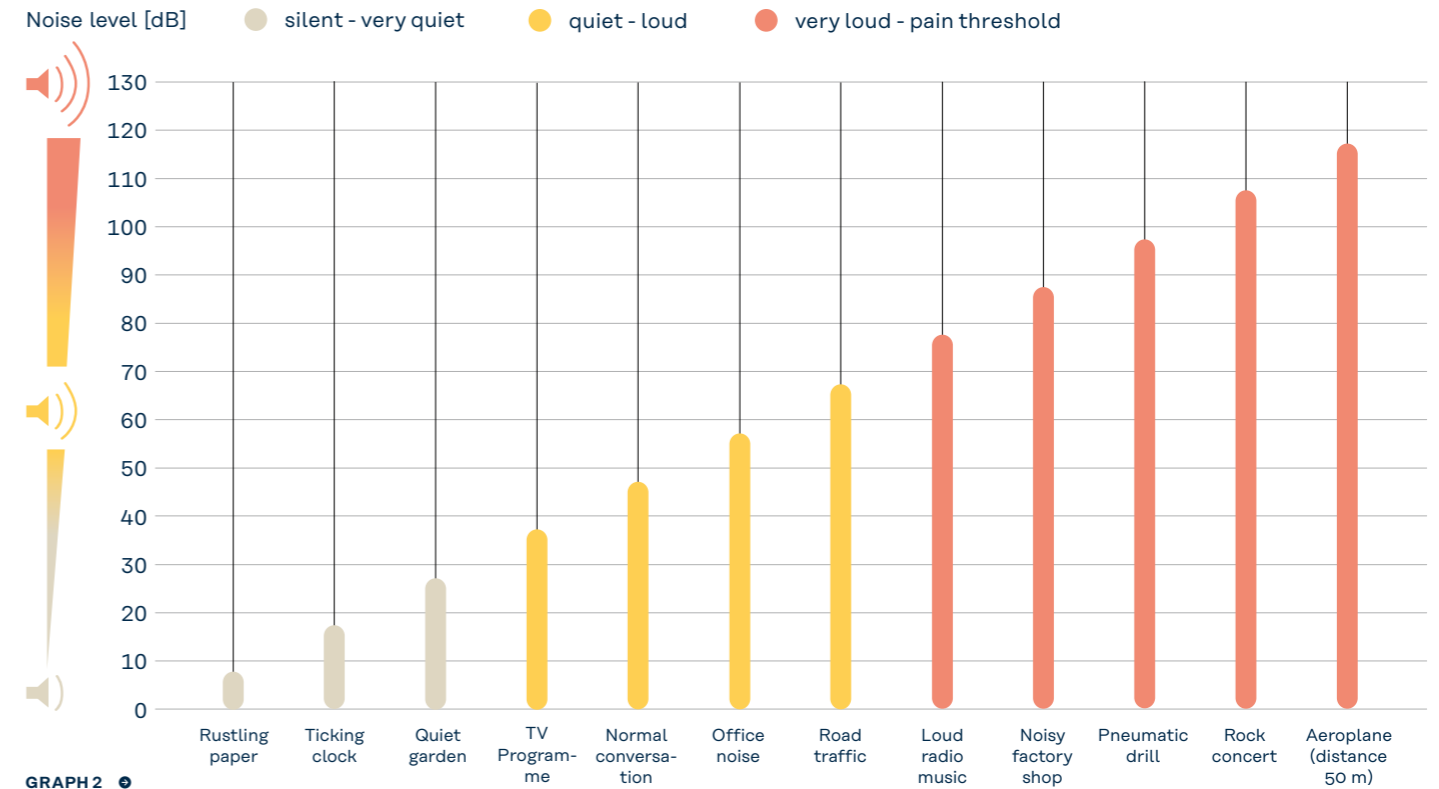
## ACOUSTIC HIGHLIGHTS

- Sole supplier of mono- and multilayer PVB for the Acoustic Glazing market.
- $R_w$  or STC/OITC values of 50 dB and better in insulated glass.

## APPLICATIONS & RECOMMENDATIONS

- Thanks to its high adhesive strength, Trosifol® SC Monolayer is particularly suitable for laying between plies of heat-strengthened or fully tempered glass.
- Trosifol® SC Multilayer is ideal for achieving impact resistance level P2A conforming to EN 356.
- Trosifol® SC Multilayer can be combined with other Trosifol® products.
- Best optical properties in terms of "orange peel" with Trosifol® SC Monolayer.
- Laminated safety glass containing a Trosifol® SC Monolayer / Trosifol® SC Multilayer has up to 3 dB better sound insulation than the same construction with standard PVB film.

## Noise sources and perception



GRAPH 2 •

## Sound Control – select the right interlayers for acoustic and optical performance

| Property               | Trosifol® Clear/UltraClear | Trosifol® SC Multilayer | Trosifol® SC Monolayer |
|------------------------|----------------------------|-------------------------|------------------------|
| Acoustic performance   | some                       | excellent               | excellent              |
| Optic                  | great good                 | risk for orange peel    | great good             |
| Films' combination     | yes, standard and color    | yes, standard and color | no                     |
| Ball drop performance* | P2A                        | P2A                     | P1A                    |

TAB 3 • \* Between 2 x 4 mm + 0.76 mm (30 mil) interlayer

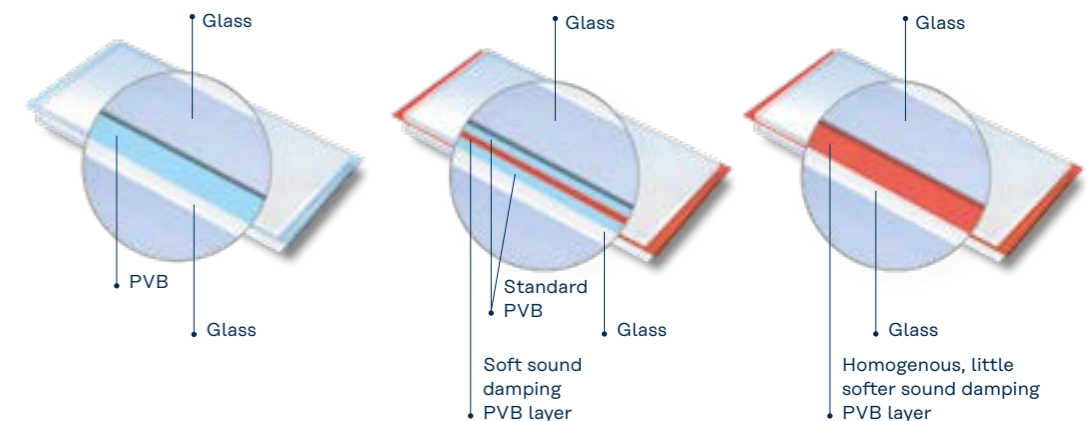






Photo: © AZA Corp

• Marco Polo Airport, Venice, Italy






Photo: © Fraiport Brasil

• Pinto Martins International Airport, Fortaleza, Brazil

### How can I achieve noise insulation, reduce weight of the construction and save costs?

| Monolithic glass  | Laminated glass   | Acoustic laminated glass  |   |
|---|---|---|---|
|  |  |  |  |
| 10 mm glass   | 5 mm glass  | 3 mm glass  | 5 mm glass  |
| <b>R<sub>w</sub> = 33 dB</b>  | <b>R<sub>w</sub> = 35 dB</b>  | <b>R<sub>w</sub> = 36 dB</b>  | <b>R<sub>w</sub> = 38 dB</b>  |
| STC 30  | STC 35  | STC 36  | STC 38  |
| OITC 33   | OITC 33   | OITC 30   | OITC 34   |

|   |   |   |
|---|---|---|
|  |  |  |
| 6 mm glass / 4 mm glass   | 6 mm glass / 3 mm glass   | 6 mm glass / 4 mm glass   |
| <b>R<sub>w</sub> = 38 dB</b>  | <b>R<sub>w</sub> = 40 dB</b>  | <b>R<sub>w</sub> = 41 dB</b>  |
| STC 38  | STC 40  | STC 41  |
| OITC 31   | OITC 31   | OITC 33   |

TAB 4 • 0.76 mm = 30 mil



UV Control Glazing

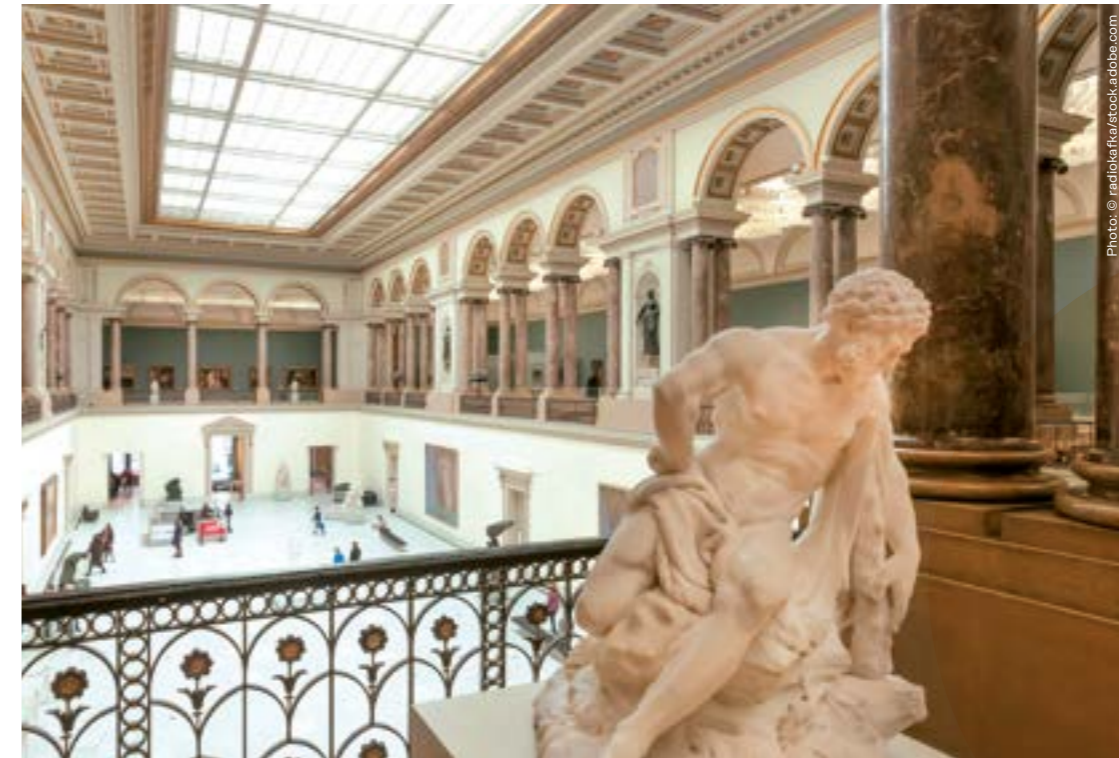
# Intentional UV Control

## UV CONTROL HIGHLIGHTS

- Trosifol® UV Extra Protect
- Trosifol® Natural UV
- SentryGlas® Natural UV
- Trosifol® UV Extra Protect is crucial in protecting against the sun's harmful UV rays and protects sensitive items against fading due to sun exposure.
- Both Natural UV products allow sunlight to provide essential vitamin D through the glass to promote wellness of animals and marine life.
- Trosifol® Natural UV and SentryGlas® Natural UV for total UV permeability.

## APPLICATIONS & RECOMMENDATIONS

- Museums, archives, galleries
- Greenhouses/botanical gardens
- Restaurants, hotels, holiday resorts
- Hospitals
- Shop windows
- Children's day care centers
- Schools and universities
- Libraries
- Switchable glazing
- Zoo
- Flora
- Fauna
- Smart glazing

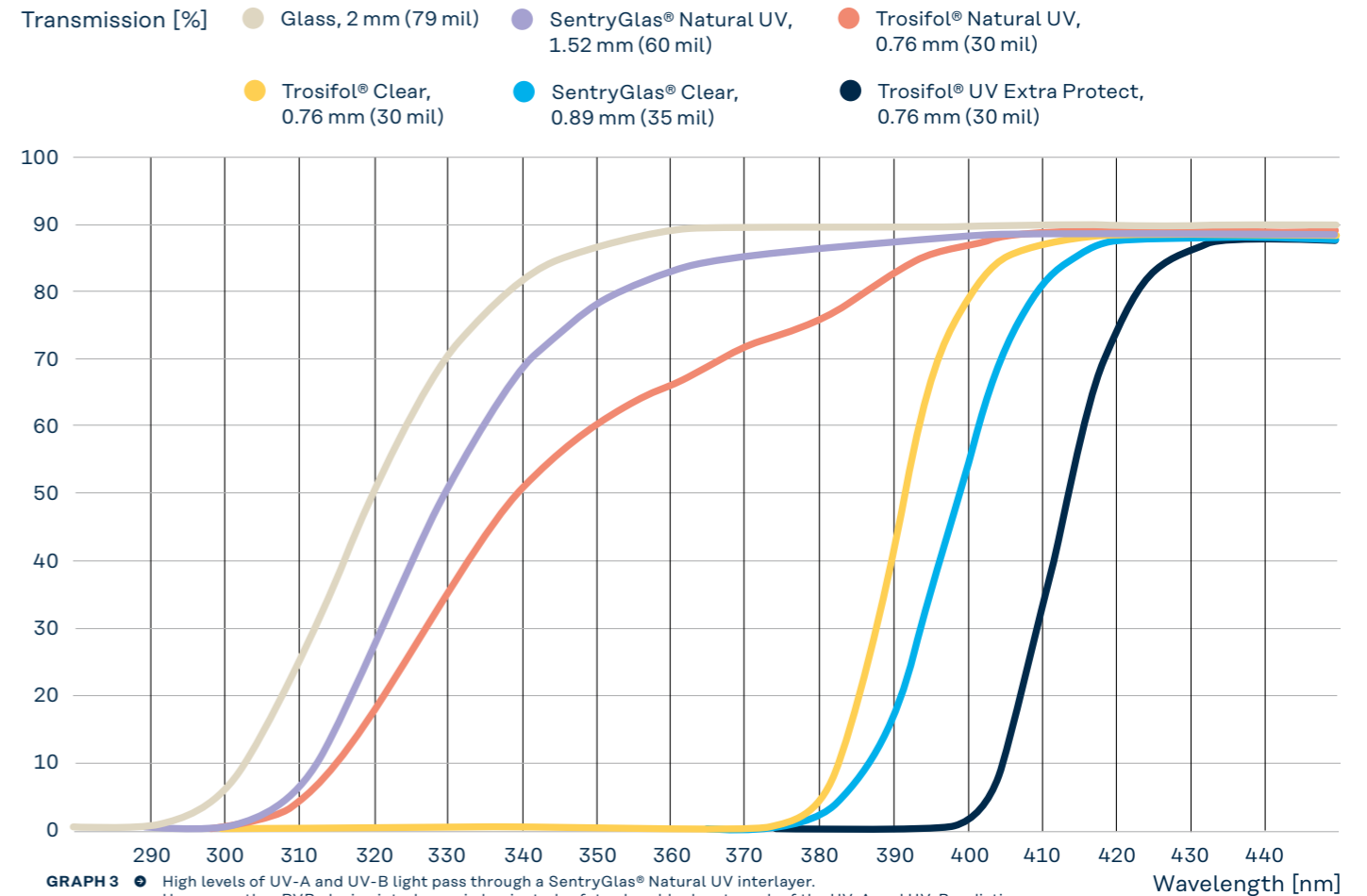


• Old sculpture in a museum



• Botanical garden, Berlin, Germany

## UV Light transmittance curves



**GRAPH 3** • High levels of UV-A and UV-B light pass through a SentryGlas® Natural UV interlayer. However, other PVB glazing interlayers in laminated safety glass block out much of the UV-A and UV-B radiation.  
 • LSG with 2 x 2 mm glass





Photo: © Kuraray

• New Headquarters Building, Seattle, USA

Decorative Glazing

# Brilliant colors

## DECORATIVE HIGHLIGHTS

- Interior and exterior applications thanks to outstanding color fastness
- Opaque Trosifol® Diamond White
- Totally opaque Trosifol® Brilliant Black
- Different degrees of translucency in the white color range
- Combination of colors possible

## APPLICATIONS & RECOMMENDATIONS

- For total opacity, we recommend Trosifol® Brilliant Black.
- With strong colors, high color intensity is achieved with just a single film in the glass module, making further layers unnecessary.
- To achieve the same effects as body tinted glass, we recommend the tinted colors.

## Decorative products

| Color                 | Tints                      | Black & White                 |
|-----------------------|----------------------------|-------------------------------|
| Trosifol® Red         | Trosifol® Light Blue-Green | Trosifol® Brilliant Black     |
| Trosifol® Light Green | Trosifol® Ocean Blue       | Trosifol® Diamond White       |
| Trosifol® Sky Blue    | Trosifol® Bronze           | Trosifol® Shining White       |
| Trosifol® Medium Blue | Trosifol® Medium Bronze    | Trosifol® Translucent White   |
| Trosifol® Violet      | Trosifol® Light Brown      | Trosifol® Sand White          |
|                       | Trosifol® Medium Brown     | Trosifol® Coconut White       |
|                       | Trosifol® Grey             | SentryGlas® Translucent White |
|                       | Trosifol® Asahi Grey       |                               |
|                       | Trosifol® Solar Grey       |                               |

TAB 5 • Not all products are available in all regions.



Photo: © Peera\_stockfoto/shutterstock.com

• Shanghai Pearl Tower, China



Photo: © Bettina Koch / Kuraray

• Trosifol® Color samples





Seattle Space Needle

# Technical data

This chapter summarizes the technical data for all of our products, measured as laminated safety glass of 6 or 8 mm thickness. In case technical data for specific designs are needed please use our WinSLT App:

## Combined interlayers

| Product                    | Trosifol® UltraClear | Color/Tints | Trosifol® UV Extra Protect | Trosifol® Natural UV | Trosifol® Extra Stiff | Trosifol® SC Monolayer | Trosifol® SC Multilayer | Trosifol® HR |
|----------------------------|----------------------|-------------|----------------------------|----------------------|-----------------------|------------------------|-------------------------|--------------|
| Trosifol® Ultra Clear      | ✓                    | ✓           | ✓                          | –                    | ✓                     | –                      | ✓                       | ✓            |
| Color/Tints                | ✓                    | ✓           | ✓                          | –                    | ✓                     | –                      | ✓                       | ✓            |
| Trosifol® UV Extra Protect | ✓                    | ✓           | ✓                          | –                    | ✓                     | –                      | ✓                       | ✓            |
| Trosifol® Natural UV       | –                    | –           | –                          | ✓                    | –                     | –                      | –                       | –            |
| Trosifol® Extra Stiff      | ✓                    | ✓           | ✓                          | –                    | ✓                     | –                      | ✓                       | ✓            |
| Trosifol® SC Monolayer     | –                    | –           | –                          | –                    | –                     | ✓                      | –                       | –            |
| Trosifol® SC Multilayer    | ✓                    | ✓           | ✓                          | –                    | ✓                     | –                      | ✓                       | ✓            |
| Trosifol® HR               | ✓                    | ✓           | ✓                          | –                    | ✓                     | –                      | ✓                       | ✓            |

TAB 6

## TECHNICAL DATA SAFETY

### Safety Interlayers – physical properties

| Type                 | Adhesion | Film thickness [mm] | [mil] | Color      | Light transmittance* [%] | UV transmittance* [%] | Solar absorption* [%] |
|----------------------|----------|---------------------|-------|------------|--------------------------|-----------------------|-----------------------|
| Trosifol® Clear      | medium   | 0.38                | 15    | Clear      | 88                       | < 2                   | 18                    |
| Trosifol® Clear      | low      | 0.76                | 30    | Clear      | 88                       | < 1                   | 19                    |
| Trosifol® Clear      | medium   | 1.14                | 45    | Clear      | 88                       | < 1                   | 20                    |
| Trosifol® Clear      | medium   | 1.52                | 60    | Clear      | 88                       | < 0.5                 | 21                    |
| Trosifol® Clear      | medium   | 2.28                | 90    | Clear      | 88                       | < 0.5                 | 22                    |
| Trosifol® UltraClear | high     | 0.76                | 30    | UltraClear | 88                       | < 1                   | 20                    |
| Trosifol® UltraClear | high     | 1.14                | 45    | UltraClear | 88                       | < 1                   | 20                    |
| Trosifol® UltraClear | high     | 1.52                | 60    | UltraClear | 88                       | < 0.5                 | 21                    |

TAB 7

## TECHNICAL DATA STRUCTURAL & SECURITY

### Structural & Security Interlayers\* – physical properties

| Type                          | Adhesion  | Film thickness [mm] | [mil] | Color             | Light transmittance*1 [%] | UV transmittance*1 [%] | Solar absorption*1 [%] |
|-------------------------------|-----------|---------------------|-------|-------------------|---------------------------|------------------------|------------------------|
| Trosifol® Extra Stiff         | high      | 0.76                | 30    | Clear             | 88                        | < 1                    | 20                     |
| SentryGlas®                   | high      | 0.76                | 30    | Clear             | 88                        | < 1                    | 19                     |
| SentryGlas®                   | high      | 0.89                | 35    | Clear             | 88                        | < 1                    | 19                     |
| SentryGlas®                   | high      | 1.52                | 60    | Clear             | 88                        | < 1                    | 20                     |
| SentryGlas®                   | high      | 2.28                | 90    | Clear             | 88                        | < 1                    | 21                     |
| SentryGlas® Translucent White | high      | 0.80                | 31    | Translucent White | 76                        | 43                     | 26                     |
| SentryGlas® Xtra™             | high      | 0.89                | 35    | Clear             | 88                        | < 1                    | 20                     |
| SentryGlas® Xtra™             | high      | 1.52                | 60    | Clear             | 88                        | < 1                    | 21                     |
| SentryGlas® Xtra™             | high      | 2.28                | 90    | Clear             | 88                        | < 1                    | 22                     |
| SentryGlas® Xtra™             | high      | 2.53                | 100   | Clear             | 88                        | < 1                    | 22                     |
| Trosifol® XT UltraClear       | med.-high | 2.28                | 90    | UltraClear        | 88                        | < 1                    | 22                     |
| Trosifol® Spallshield® CPET   |           | 0.18                | 7     | Clear             | 91                        | 0.50                   |                        |
| Trosifol® PET                 | high      | 0.18                | 7     | Clear             | 87                        | 0.0                    | 28                     |

TAB 8 \* LSG with 2 x 4 mm Floatglass according EN 410/ISO 9050

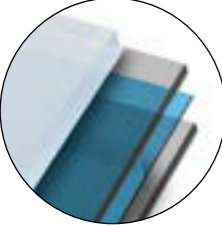
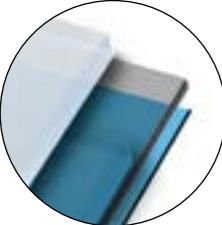

\*1 Values calculated using Lawrence Berkeley National Laboratory Optics5 and Windows5 software. Not all products are available in all regions.





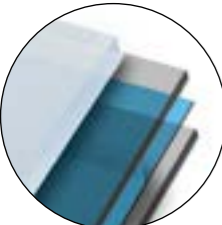
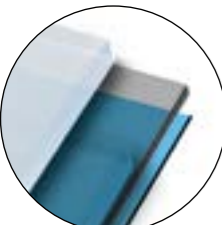



**Trosifol® Extra Stiff 0.76 (30 mil) and Trosifol® PVB combinations – Shear Relaxation Modulus G(t)/MPa**

| Combination   | Temperature                            | Load duration |       |       |        |        |       |       |        |        |        |         |          |       |        |        |        |         |         |        |          |          |       |
|---|--|---------------|-------|-------|--------|--------|-------|-------|--------|--------|--------|---------|----------|-------|--------|--------|--------|---------|---------|--------|----------|----------|-------|
|   |  | 1 sec         | 3 sec | 5 sec | 10 sec | 30 sec | 1 min | 5 min | 10 min | 30 min | 1 hour | 6 hours | 12 hours | 1 day | 2 days | 5 days | 1 week | 3 weeks | 1 month | 1 year | 10 years | 50 years |       |
|   | Trosifol® Extra Stiff 0.76 mm (30 mil) | 10°C (50°F)   | 370   | 330   | 310    | 280    | 240   | 210   | 140    | 120    | 81     | 61      | 23       | 15    | 10     | 6.4    | 3.7    | 3.1     | 1.7     | 1.5    | 0.82     | 0.66     | 0.58  |
|   | Trosifol® PVB 0.38 mm (15 mil)         | 20°C (68°F)   | 220   | 180   | 160    | 130    | 92    | 71    | 33     | 22     | 11     | 7.0     | 2.5      | 1.8   | 1.4    | 1.2    | 0.97   | 0.92    | 0.80    | 0.77   | 0.63     | 0.52     | 0.42  |
|   | Trosifol® Extra Stiff 0.76 mm (30 mil) | 25°C (77°F)   | 98    | 65    | 51     | 36     | 19    | 12    | 4.5    | 3.0    | 1.8    | 1.4     | 0.93     | 0.84  | 0.78   | 0.73   | 0.68   | 0.67    | 0.62    | 0.60   | 0.46     | 0.31     | 0.19  |
|   |  | 30°C (86°F)   | 23    | 12    | 8.4    | 5.5    | 2.9   | 2.1   | 1.2    | 1.0    | 0.86   | 0.79    | 0.68     | 0.64  | 0.61   | 0.58   | 0.53   | 0.51    | 0.45    | 0.43   | 0.25     | 0.11     |       |
|   |  | 35°C (95°F)   | 4.3   | 2.4   | 1.9    | 1.5    | 1.1   | 0.95  | 0.77   | 0.73   | 0.67   | 0.64    | 0.55     | 0.51  | 0.47   | 0.43   | 0.36   | 0.34    | 0.26    | 0.24   | 0.09     |          |       |
|   |  | 40°C (104°F)  | 1.5   | 1.1   | 0.99   | 0.88   | 0.77  | 0.73  | 0.65   | 0.61   | 0.56   | 0.52    | 0.41     | 0.36  | 0.32   | 0.27   | 0.20   | 0.18    | 0.12    | 0.11   |          |          |       |
|   |  | 50°C (122°F)  | 0.76  | 0.69  | 0.67   | 0.63   | 0.58  | 0.55  | 0.45   | 0.41   | 0.33   | 0.28    | 0.16     | 0.12  | 0.093  |        |        |         |         |        |          |          |       |
|   |  | 60°C (140°F)  | 0.62  | 0.57  | 0.54   | 0.50   | 0.44  | 0.39  | 0.28   | 0.23   | 0.16   | 0.12    |          |       |        |        |        |         |         |        |          |          |       |
|   |  | 70°C (158°F)  | 0.51  | 0.44  | 0.41   | 0.36   | 0.29  | 0.24  | 0.14   | 0.10   |        |         |          |       |        |        |        |         |         |        |          |          |       |
|   | 80°C (176°F)                           | 0.41          | 0.33  | 0.29  | 0.24   | 0.17   | 0.13  |       |        |        |        |         |          |       |        |        |        |         |         |        |          |          |       |
|   | Trosifol® Extra Stiff 0.76 mm (30 mil) | 10°C (50°F)   | 330   | 290   | 280    | 250    | 210   | 190   | 130    | 100    | 68     | 50      | 17       | 11    | 7.0    | 4.5    | 2.7    | 2.3     | 1.5     | 1.3    | 0.78     | 0.64     | 0.56  |
|   | Trosifol® PVB 0.38 mm (15 mil)         | 20°C (68°F)   | 200   | 160   | 140    | 120    | 82    | 62    | 27     | 18     | 8.3    | 5.2     | 2.0      | 1.5   | 1.2    | 1.0    | 0.86   | 0.82    | 0.72    | 0.70   | 0.58     | 0.46     | 0.37  |
|   |  | 25°C (77°F)   | 89    | 57    | 45     | 31     | 16    | 10    | 3.5    | 2.4    | 1.5    | 1.2     | 0.83     | 0.76  | 0.71   | 0.67   | 0.63   | 0.61    | 0.56    | 0.55   | 0.41     | 0.27     | 0.17  |
|   |  | 30°C (86°F)   | 21    | 10    | 6.9    | 4.4    | 2.4   | 1.8   | 1.1    | 0.93   | 0.78   | 0.73    | 0.62     | 0.59  | 0.57   | 0.53   | 0.49   | 0.47    | 0.41    | 0.39   | 0.22     | 0.094    |       |
|   |  | 35°C (95°F)   | 3.7   | 2.1   | 1.7    | 1.3    | 1.0   | 0.88  | 0.72   | 0.68   | 0.62   | 0.59    | 0.50     | 0.47  | 0.43   | 0.39   | 0.33   | 0.31    | 0.24    | 0.22   | 0.081    |          |       |
|   |  | 40°C (104°F)  | 1.4   | 1.0   | 0.92   | 0.82   | 0.72  | 0.68  | 0.60   | 0.57   | 0.52   | 0.49    | 0.38     | 0.33  | 0.29   | 0.25   | 0.19   | 0.17    | 0.11    | 0.096  |          |          |       |
|   |  | 50°C (122°F)  | 0.71  | 0.65  | 0.62   | 0.59   | 0.54  | 0.51  | 0.42   | 0.38   | 0.31   | 0.26    | 0.15     | 0.11  | 0.083  |        |        |         |         |        |          |          |       |
|   |  | 60°C (140°F)  | 0.58  | 0.53  | 0.51   | 0.47   | 0.41  | 0.36  | 0.26   | 0.21   | 0.15   | 0.11    |          |       |        |        |        |         |         |        |          |          |       |
|   |  | 70°C (158°F)  | 0.48  | 0.41  | 0.38   | 0.34   | 0.27  | 0.22  | 0.13   | 0.093  |        |         |          |       |        |        |        |         |         |        |          |          |       |
|   | 80°C (176°F)                           | 0.37          | 0.30  | 0.27  | 0.22   | 0.16   | 0.12  |       |        |        |        |         |          |       |        |        |        |         |         |        |          |          |       |
|  | Trosifol® Extra Stiff 0.76 mm (30 mil) | 10°C (50°F)   | 290   | 260   | 240    | 210    | 170   | 150   | 93     | 73     | 45     | 32      | 11       | 6.8   | 4.6    | 3.1    | 2.0    | 1.8     | 1.3     | 1.2    | 0.74     | 0.61     | 0.53  |
|   | Trosifol® PVB 0.76 mm (30 mil)         | 20°C (68°F)   | 110   | 77    | 63     | 47     | 27    | 17    | 6.3    | 4.2    | 2.3    | 1.8     | 1.0      | 0.91  | 0.82   | 0.75   | 0.68   | 0.66    | 0.61    | 0.60   | 0.47     | 0.33     | 0.22  |
|   |  | 25°C (77°F)   | 35    | 18    | 13     | 8.6    | 4.4   | 3.0   | 1.5    | 1.2    | 1.0    | 0.86    | 0.68     | 0.65  | 0.61   | 0.58   | 0.54   | 0.52    | 0.47    | 0.45   | 0.29     | 0.14     | 0.068 |
|   |  | 30°C (86°F)   | 6.7   | 3.5   | 2.7    | 2.0    | 1.4   | 1.1   | 0.83   | 0.75   | 0.67   | 0.64    | 0.55     | 0.52  | 0.49   | 0.45   | 0.39   | 0.37    | 0.30    | 0.28   | 0.12     |          |       |
|   |  | 35°C (95°F)   | 1.9   | 1.3   | 1.2    | 1.0    | 0.83  | 0.75  | 0.64   | 0.61   | 0.56   | 0.53    | 0.43     | 0.39  | 0.35   | 0.30   | 0.24   | 0.22    | 0.15    | 0.13   |          |          |       |
|   |  | 40°C (104°F)  | 1.1   | 0.86  | 0.80   | 0.73   | 0.66  | 0.63  | 0.55   | 0.52   | 0.46   | 0.42    | 0.30     | 0.26  | 0.21   | 0.17   | 0.12   | 0.10    |         |        |          |          |       |
|   |  | 50°C (122°F)  | 0.66  | 0.61  | 0.59   | 0.55   | 0.50  | 0.46  | 0.37   | 0.32   | 0.25   | 0.20    | 0.098    | 0.070 |        |        |        |         |         |        |          |          |       |
|   |  | 60°C (140°F)  | 0.55  | 0.50  | 0.47   | 0.43   | 0.36  | 0.32  | 0.21   | 0.16   | 0.10   | 0.075   |          |       |        |        |        |         |         |        |          |          |       |
|   |  | 70°C (158°F)  | 0.43  | 0.37  | 0.33   | 0.29   | 0.21  | 0.17  | 0.085  |        |        |         |          |       |        |        |        |         |         |        |          |          |       |
|   | 80°C (176°F)                           | 0.32          | 0.25  | 0.22  | 0.17   | 0.11   | 0.079 |       |        |        |        |         |          |       |        |        |        |         |         |        |          |          |       |

TAB 11

**Trosifol® Extra Stiff 0.76 (30 mil) and Trosifol® PVB combinations – Young Relaxation Modulus E(t)/MPa**

| Combination  | Temperature                            | Load duration |       |       |        |        |       |       |        |        |        |         |          |       |        |        |        |         |         |        |          |          |      |
|--|--|---------------|-------|-------|--------|--------|-------|-------|--------|--------|--------|---------|----------|-------|--------|--------|--------|---------|---------|--------|----------|----------|------|
|  |  | 1 sec         | 3 sec | 5 sec | 10 sec | 30 sec | 1 min | 5 min | 10 min | 30 min | 1 hour | 6 hours | 12 hours | 1 day | 2 days | 5 days | 1 week | 3 weeks | 1 month | 1 year | 10 years | 50 years |      |
|  | Trosifol® Extra Stiff 0.76 mm (30 mil) | 10°C (50°F)   | 1100  | 970   | 910    | 830    | 700   | 610   | 420    | 350    | 240    | 180     | 68       | 44    | 29     | 19     | 11     | 9.1     | 4.9     | 4.3    | 2.4      | 1.9      | 1.7  |
|  | Trosifol® PVB 0.38 mm (15 mil)         | 20°C (68°F)   | 660   | 520   | 460    | 390    | 270   | 210   | 96     | 64     | 32     | 21      | 7.3      | 5.4   | 4.2    | 3.5    | 2.9    | 2.7     | 2.3     | 2.3    | 1.9      | 1.5      | 1.2  |
|  | Trosifol® Extra Stiff 0.76 mm (30 mil) | 25°C (77°F)   | 290   | 190   | 150    | 110    | 56    | 36    | 13     | 9.0    | 5.4    | 4.2     | 2.7      | 2.5   | 2.3    | 2.2    | 2.0    | 2.0     | 1.8     | 1.8    | 1.4      | 0.90     | 0.57 |
|  |  | 30°C (86°F)   | 69    | 34    | 25     | 16     | 8.6   | 6.2   | 3.5    | 3.0    | 2.5    | 2.3     | 2.0      | 1.9   | 1.8    | 1.7    | 1.6    | 1.5     | 1.3     | 1.3    | 0.74     | 0.33     |      |
|  |  | 35°C (95°F)   | 13    | 7.1   | 5.6    | 4.3    | 3.2   | 2.8   | 2.3    | 2.1    | 2.0    | 1.9     | 1.6      | 1.5   | 1.4    | 1.2    | 1.1    | 1.00    | 0.77    | 0.71   | 0.28     |          |      |
|  |  | 40°C (104°F)  | 4.4   | 3.2   | 2.9    | 2.6    | 2.3   | 2.1   | 1.9    | 1.8    | 1.6    | 1.5     | 1.2      | 1.1   | 0.93   | 0.78   | 0.60   | 0.54    | 0.36    | 0.31   |          |          |      |
|  |  | 50°C (122°F)  | 2.2   | 2.0   | 2.0    | 1.9    | 1.7   | 1.6   | 1.3    | 1.2    | 0.98   | 0.83    | 0.47     | 0.36  | 0.27   |        |        |         |         |        |          |          |      |
|  |  | 60°C (140°F)  | 1.8   | 1.7   | 1.6    | 1.5    | 1.3   | 1.2   | 0.82   | 0.68   | 0.47   | 0.36    |          |       |        |        |        |         |         |        |          |          |      |
|  |  | 70°C (158°F)  | 1.5   | 1.3   | 1.2    | 1.1    | 0.84  | 0.70  | 0.40   | 0.30   |        |         |          |       |        |        |        |         |         |        |          |          |      |
|  | 80°C (176°F)                           | 1.2           | 0.97  | 0.86  | 0.72   | 0.51   | 0.39  |       |        |        |        |         |          |       |        |        |        |         |         |        |          |          |      |
|  | Trosifol® Extra Stiff 0.76 mm (30 mil) | 10°C (50°F)   | 970   | 860   | 810    | 740    | 620   | 540   | 370    | 300    | 200    | 150     | 51       | 32    | 21     | 13     | 7.8    | 6.7     | 4.3     | 3.9    | 2.3      | 1.9      | 1.7  |
|  | Trosifol® PVB 0.38 mm (15 mil)         | 20°C (68°F)   | 590   | 480   | 420    | 350    | 240   | 180   | 79     | 52     | 25     | 15      | 5.7      | 4.4   | 3.6    | 3.0    | 2.5    | 2.4     | 2.1     | 2.1    | 1.7      | 1.4      | 1.1  |
|  |  | 25°C (77°F)   | 260   | 170   | 130    | 91     | 46    | 29    | 10     | 7.1    | 4.5    | 3.6     | 2.4      | 2.2   | 2.1    | 2.0    | 1.8    | 1.8     | 1.7     | 1.6    | 1.2      | 0.78     | 0.49 |
|  |  | 30°C (86°F)   | 60    | 29    | 20     | 13     | 7.1   | 5.3   | 3.2    | 2.7    | 2.3    | 2.1     | 1.8      | 1.7   | 1.6    | 1.4    | 1.4    | 1.4     | 1.2     | 1.1    | 0.65     | 0.28     |      |
|  |  | 35°C (95°F)   | 11    | 6.2   | 5.0    | 3.9    | 3.0   | 2.6   | 2.1    | 2.0    | 1.8    | 1.7     | 1.5      | 1.4   | 1.3    | 1.1    | 0.98   | 0.91    | 0.70    | 0.65   | 0.24     |          |      |
|  |  | 40°C (104°F)  | 4.0   | 3.0   | 2.7    | 2.4    | 2.1   | 2.0   | 1.8    | 1.7    | 1.5    | 1.4     | 1.1      | 0.98  | 0.86   | 0.72   | 0.55   | 0.49    | 0.32    | 0.28   |          |          |      |
|  |  | 50°C (122°F)  | 2.1   | 1.9   | 1.8    | 1.7    | 1.6   | 1.5   | 1.2    | 1.1    | 0.90   | 0.77    | 0.43     | 0.33  | 0.24   |        |        |         |         |        |          |          |      |
|  |  | 60°C (140°F)  | 1.7   | 1.6   | 1.5    | 1.4    | 1.2   | 1.1   | 0.76   | 0.63   | 0.44   | 0.33    |          |       |        |        |        |         |         |        |          |          |      |
|  |  | 70°C (158°F)  | 1.4   | 1.2   | 1.1    | 0.99   | 0.78  | 0.65  | 0.37   | 0.27   |        |         |          |       |        |        |        |         |         |        |          |          |      |
|  | 80°C (176°F)                           | 1.1           | 0.89  | 0.79  | 0.66   | 0.46   | 0.35  |       |        |        |        |         |          |       |        |        |        |         |         |        |          |          |      |
|  | Trosifol® Extra Stiff 0.76 mm (30 mil) | 10°C (50°F)   | 860   | 750   | 700    | 620    | 500   | 430   | 270    | 210    | 130    | 95      | 31       | 20    | 14     | 9.2    | 5.9    | 5.2     | 3.7     | 3.4    | 2.2      | 1.8      | 1.6  |
|  | Trosifol® PVB 0.76 mm (30 mil)         | 20°C (68°F)   | 320   | 230   | 190    | 140    | 78    | 51    | 19     | 12     | 6.9    | 5.2     | 3.0      | 2.7   | 2.4    | 2.2    | 2.0    | 1.9     | 1.8     | 1.7    | 1.4      | 0.97     | 0.65 |
|  |  | 25°C (77°F)   | 100   | 54    | 39     | 25     | 13    | 8.8   | 4.5    | 3.7    | 2.8    | 2.5     | 2.0      | 1.9   | 1.8    | 1.7    | 1.6    | 1.5     | 1.4     | 1.3    | 0.85     | 0.41     | 0.20 |
|  |  | 30°C (86°F)   | 20    | 10    | 7.9    | 5.8    | 4.0   | 3.3   | 2.4    | 2.2    | 2.0    | 1.9     | 1.6      | 1.5   | 1.4    | 1.3    | 1.2    | 1.1     | 0.88    | 0.82   | 0.35     |          |      |
|  |  | 35°C (95°F)   | 5.7   | 4.0   | 3.4    | 2.9    | 2.4   | 2.2   | 1.9    | 1.8    |        |         |          |       |        |        |        |         |         |        |          |          |      |



## TECHNICAL DATA – SOUND CONTROL

### Acoustic Interlayers – physical properties

| Type                    | Adhesion | Film thickness<br>[mm] [mil] |    | Color | Light transmittance* [%] | UV transmittance* [%] | Solar absorption* [%] |
|-------------------------|----------|------------------------------|----|-------|--------------------------|-----------------------|-----------------------|
| Trosifol® SC Monolayer  | high     | 0.76                         | 30 | Clear | 88                       | < 1                   | 19                    |
| Trosifol® SC Monolayer  | high     | 1.52                         | 60 | Clear | 88                       | < 0.5                 | 21                    |
| Trosifol® SC Multilayer | low      | 0.50                         | 20 | Clear | 88                       | < 1                   | 20                    |
| Trosifol® SC Multilayer | low      | 0.76                         | 30 | Clear | 88                       | < 1                   | 20                    |

TAB 13 • \* LSG with 2 x 4 mm Floatglass according EN 410/ISO 9050

Not all products are available in all regions.

### 0.76 mm (30 mil) Monolayer products – test results

| Glass [mm] | Cavity air or argon [mm] | Glass [mm] | Cavity [mm] | Glass [mm] | R <sub>w</sub> [dB] | C, C <sub>tr</sub> [dB] | STC              | OITC |         |    |    |
|------------|--------------------------|------------|-------------|------------|---------------------|-------------------------|------------------|------|---------|----|----|
| 3          | SC Mono*                 | 0.76       | 3           |            | 35                  | (-1/-4)                 | 35               | 30   |         |    |    |
| 4          | SC Mono                  | 0.76       | 4           |            | 37                  | (-1/-3)                 | 37               | 32   |         |    |    |
| 5          | SC Mono                  | 0.76       | 5           |            | 38                  | (0/-2)                  | 38               | 34   |         |    |    |
| 6          | SC Mono                  | 0.76       | 6           |            | 39                  | (0/-2)                  | 39               | 35   |         |    |    |
| 8          | SC Mono                  | 0.76       | 8           |            | 41                  | (-1/-3)                 | 41               | 37   |         |    |    |
| 10         | SC Mono                  | 0.76       | 10          |            | 42                  | (0/-3)                  | 42               | 38   |         |    |    |
| 12         | SC Mono                  | 0.76       | 12          |            | 43                  | (0/-3)                  | 43               | 39   |         |    |    |
| 4          | SC Mono                  | 0.76       | 4           | 16         | 4                   | (-1/-5)                 | 39               | 31   |         |    |    |
| 4          | SC Mono                  | 0.76       | 4           | 16         | 6                   | (-2/-6)                 | 41               | 33   |         |    |    |
| 4          | SC Mono                  | 0.76       | 4           | 16         | 8                   | (-3/-8)                 | 42               | 31   |         |    |    |
| 6          | SC Mono                  | 0.76       | 6           | 16         | 8                   | (-2/-6)                 | 43               | 34   |         |    |    |
| 4          | SC Mono                  | 0.76       | 4           | 16         | 10                  | (-2/-6)                 | 44               | 35   |         |    |    |
| 4          | SC Mono                  | 0.76       | 4           | 16         | 6 SC Mono 0.76 6    | (-2/-6)                 | 47               | 37   |         |    |    |
| 4          | SC Mono                  | 0.76       | 4           | 20         | 6 SC Mono 0.76 6    | (-2/-7)                 | 49               | 38   |         |    |    |
| 4          | SC Mono                  | 0.76       | 4           | 12         | 4                   | 12                      | 6                | 41   | (-2/-6) | 41 | 32 |
| 4          | SC Mono                  | 0.76       | 4           | 12         | 4                   | 12                      | 8                | 42   | (-2/-6) | 42 | 33 |
| 4          | SC Mono                  | 0.76       | 4           | 12         | 6                   | 12                      | 4 SC Mono 0.76 6 | 47   | (-2/-7) | 47 | 38 |

TAB 14 • \*SC Mono = Trosifol® SC Monolayer

### SOUNDLAB

For calculating acoustic performance of monolithic, double and triple glazed units.

### SOUNDLAB AI

First global acoustic calculator based on artificial intelligence for calculating/estimating acoustic performance of monolithic, double and triple glazed units.

### 0.50 mm (20 mil) Multilayer products – test results

| Glass [mm] | Cavity air or argon [mm] | Glass [mm] | Cavity [mm] | Glass [mm] | R <sub>w</sub> [dB] | C, C <sub>tr</sub> [dB] | STC | OITC |
|------------|--------------------------|------------|-------------|------------|---------------------|-------------------------|-----|------|
| 3          | SC Multi**               | 0.50       | 3           |            | 36                  | (-1/-4)                 | 35  | 30   |
| 4          | SC Multi                 | 0.50       | 4           |            | 37                  | (0/-2)                  | 37  | 33   |
| 5          | SC Multi                 | 0.50       | 5           |            | 39                  | (-1/-3)                 | 38  | 35   |
| 6          | SC Multi                 | 0.50       | 6           |            | 40                  | (-1/-3)                 | 40  | 36   |
| 8          | SC Multi                 | 0.50       | 8           |            | 41                  | (0/-2)                  | 41  | 38   |

TAB 15 • \*\*SC Multi = Trosifol® SC Multilayer



• Marco Polo Airport, Venice, Italy



0.76 mm (30 mil) Multilayer products – test results

| Glass [mm] | Cavity air or argon [mm] | Glass [mm] | Cavity [mm] | Glass [mm] | R <sub>w</sub> [dB] | C, C <sub>tr</sub> [dB] | STC        | OITC    |    |         |         |     |    |
|------------|--------------------------|------------|-------------|------------|---------------------|-------------------------|------------|---------|----|---------|---------|-----|----|
| 3          | SC Multi**               | 0.76       | 3           |            | 36                  | (-1/-4)                 | 36         | 30*     |    |         |         |     |    |
| 4          | SC Multi                 | 0.76       | 4           |            | 37                  | ( 0/-2)                 | 37         | 33      |    |         |         |     |    |
| 5          | SC Multi                 | 0.76       | 5           |            | 38                  | (-1/-3)                 | 38         | 33*     |    |         |         |     |    |
| 6          | SC Multi                 | 0.76       | 6           |            | 40                  | (-1/ 3)                 | 39         | 36*     |    |         |         |     |    |
| 8          | SC Multi                 | 0.76       | 8           |            | 41                  | (-1/-3)                 | 41         | 37*     |    |         |         |     |    |
| 10         | SC Multi                 | 0.76       | 10          |            | 42                  | (-1/-3)                 | 42         | 38      |    |         |         |     |    |
| 12         | SC Multi                 | 0.76       | 12          |            | 43                  | (-1/-3)                 | 43         | 39      |    |         |         |     |    |
| 3          | SC Multi                 | 0.76       | 3           | 16         | 4                   |                         | 36         | (-2/-6) | 36 | 28      |         |     |    |
| 3          | SC Multi                 | 0.76       | 3           | 16         | 6                   |                         | 40         | (-2/-6) | 40 | 31      |         |     |    |
| 3          | SC Multi                 | 0.76       | 3           | 16         | 8                   |                         | 42         | (-3/-7) | 42 | 32      |         |     |    |
| 4          | SC Multi                 | 0.76       | 4           | 16         | 4                   |                         | 39         | (-3/-7) | 37 | 30*     |         |     |    |
| 4          | SC Multi                 | 0.76       | 4           | 16         | 6                   |                         | 41         | (-2/-6) | 41 | 33*     |         |     |    |
| 4          | SC Multi                 | 0.76       | 4           | 16         | 8                   |                         | 42         | (-3/-8) | 42 | 31*     |         |     |    |
| 6          | SC Multi                 | 0.76       | 6           | 16         | 8                   |                         | 43         | (-2/-6) | 43 | 34      |         |     |    |
| 4          | SC Multi                 | 0.76       | 4           | 16         | 10                  |                         | 44         | (-2/-6) | 44 | 36      |         |     |    |
| 4          | SC Multi                 | 0.76       | 4           | 20         | 10                  |                         | 46         | (-2/-6) | 46 | 37      |         |     |    |
| 6          | SC Multi                 | 0.76       | 6           | 16         | 10                  |                         | 44         | (-1/-5) | 44 | 36      |         |     |    |
| 4          | SC Multi                 | 0.76       | 4           | 16         | 6 SC Multi          | 0.76                    | 6          |         | 48 | (-2/-7) | 48      | 38* |    |
| 4          | SC Multi                 | 0.76       | 4           | 20         | 6 SC Multi          | 0.76                    | 6          |         | 49 | (-2/-7) | 49      | 38* |    |
| 8          | SC Multi                 | 0.76       | 6           | 16         | 6 SC Multi          | 0.76                    | 6          |         | 51 | (-2/-6) | 51      | 42  |    |
| 8          | SC Multi                 | 0.76       | 8           | 16         | 6 SC Multi          | 0.76                    | 6          |         | 51 | (-1/-6) | 51      | 42  |    |
| 8          | SC Multi                 | 0.76       | 8           | 24         | 4 SC Multi          | 0.76                    | 6          |         | 52 | (-2/-6) | 51      | 44* |    |
| 4          | SC Multi                 | 0.76       | 4           | 12         | 4                   | 12                      | 6          |         | 42 | (-3/-8) | 41      | 30  |    |
| 4          | SC Multi                 | 0.76       | 4           | 14         | 4                   | 14                      | 6          |         | 43 | (-2/-7) | 44      | 33  |    |
| 4          | SC Multi                 | 0.76       | 4           | 12         | 4                   | 12                      | 8          |         | 43 | (-2/-7) | 43      | 33  |    |
| 4          | SC Multi                 | 0.76       | 4           | 16         | 4                   | 16                      | 8          |         | 45 | (-3/-7) | 45      | 34  |    |
| 5          | SC Multi                 | 0.76       | 5           | 12         | 6                   | 12                      | 8          |         | 44 | (-2/-7) | 44      | 35  |    |
| 6          | SC Multi                 | 0.76       | 6           | 12         | 6                   | 12                      | 8          |         | 45 | (-1/-5) | 46      | 37  |    |
| 6          | SC Multi                 | 0.76       | 6           | 14         | 6                   | 14                      | 8          |         | 46 | (-2/-6) | 46      | 38  |    |
| 4          | SC Multi                 | 0.76       | 4           | 12         | 4                   | 12                      | 4 SC Multi | 0.76    | 4  | 46      | (-2/-7) | 47  | 35 |
| 4          | SC Multi                 | 0.76       | 4           | 12         | 6                   | 12                      | 4 SC Multi | 0.76    | 6  | 47      | (-2/-7) | 47  | 37 |
| 6          | SC Multi                 | 0.76       | 6           | 12         | 6                   | 12                      | 4 SC Multi | 0.76    | 4  | 49      | (-1/-7) | 50  | 39 |
| 6          | SC Multi                 | 0.76       | 6           | 14         | 6                   | 14                      | 4 SC Multi | 0.76    | 4  | 50      | (-2/-7) | 51  | 40 |

TAB 16 • Internally calculated according ASTM 1332-10a based on the originally measurement results \*\*SC Multi = Trosifol® SC Multilayer

TECHNICAL DATA – UV CONTROL

UV Control Interlayers – physical properties

| Type                                 | Adhesion | Film thickness [mm] [mil] | Color      | Light transmittance* [%] | UV transmittance* [%] |
|--------------------------------------|----------|---------------------------|------------|--------------------------|-----------------------|
| Trosifol® UV Extra Protect           | high     | 0.76 30                   | Clear      | 90                       | 0.0                   |
| Trosifol® Natural UV* <sup>1</sup>   | high     | 0.76 30                   | UltraClear | 89                       | 48                    |
| SentryGlas® Natural UV* <sup>1</sup> | high     | 0.89 35                   | UltraClear | 89                       | 46                    |
| SentryGlas® Natural UV* <sup>1</sup> | high     | 1.52 60                   | UltraClear | 88                       | 40                    |

TAB 17 • \* LSG with 2 x 4 mm Floatglass according EN 410/ISO 9050

<sup>1</sup> Values calculated using Lawrence Berkeley National Laboratory Optics5 and Windows5 software

Not all products are available in all regions.

























• Botanical garden



## TECHNICAL DATA – DECORATIVE

### Decorative Interlayers – physical properties

| Product  | Adhesion   | Film thickness    |                 | Pantone code | RAL code | Light transmittance* [%] | UV transmittance* [%] | Solar absorption* [%] | g-value EN 410 [%] | g-value ISO [%] |
|--|------------|-------------------|-----------------|--------------|----------|--------------------------|-----------------------|-----------------------|--------------------|-----------------|
|  |            | [mm]              | [mil]           |              |          |                          |                       |                       |                    |                 |
| <b>Color</b>   |            |                   |                 |              |          |                          |                       |                       |                    |                 |
|  Trosifol® Red                   | medium     | 0.38              | 15              | 710          | 3018     | 23                       | < 1                   | 44                    | 60                 | 62              |
|  Trosifol® Light Green           | medium     | 0.38              | 15              | 631          | 6027     | 81                       | < 1                   | 25                    | 75                 | 75              |
|  Trosifol® Sky Blue              | medium     | 0.38              | 15              | 307          | 5012     | 60                       | < 1                   | 32                    | 69                 | 70              |
|  Trosifol® Medium Blue           | medium     | 0.38              | 15              | 3015         | 5015     | 36                       | < 1                   | 45                    | 60                 | 61              |
|  Trosifol® Violet                | medium     | 0.38              | 15              | 689          | 4008     | 31                       | < 1                   | 39                    | 64                 | 65              |
| <b>Tints</b>   |            |                   |                 |              |          |                          |                       |                       |                    |                 |
|  Trosifol® Light Blue-Green      | medium     | 0.38 <sup>1</sup> | 15 <sup>1</sup> | 624          | 6034     | 71                       | < 1                   | 29                    | 72                 | 72              |
|  Trosifol® Ocean Blue            | medium     | 0.38              | 15              | 628          | 5024     | 73                       | < 1                   | 26                    | 73                 | 74              |
|  Trosifol® Bronze                | medium     | 0.76              | 30              | 478          | 8002     | 36                       | < 1                   | 55                    | 53                 | 54              |
|  Trosifol® Medium Bronze         | medium     | 0.38 <sup>1</sup> | 15 <sup>1</sup> | 4705         | 8025     | 55                       | < 1                   | 42                    | 63                 | 64              |
|  Trosifol® Light Brown           | medium     | 0.38              | 15              | Warm Gray 10 | 7002     | 54                       | < 1                   | 44                    | 61                 | 62              |
|  Trosifol® Medium Brown        | medium     | 0.38              | 15              | 4695         | 8014     | 22                       | < 1                   | 69                    | 43                 | 45              |
|  Trosifol® Grey                | medium     | 0.38 <sup>1</sup> | 15 <sup>1</sup> | 446          | 7015     | 42                       | < 1                   | 47                    | 59                 | 60              |
|  Trosifol® Asahi Grey          | medium     | 0.38              | 15              | 445          | 7031     | 38                       | < 1                   | 51                    | 55                 | 57              |
|  Trosifol® Solar Grey          | medium     | 0.76              | 30              | 432          | 7024     | 42                       | < 1                   | -                     | 60                 | 61              |
| <b>Black &amp; White</b>   |            |                   |                 |              |          |                          |                       |                       |                    |                 |
|  Trosifol® Brilliant Black     | high       | 0.76              | 30              | Black 4      | 9005     | 0                        | < 1                   | 96                    | 23                 | 26              |
|  Trosifol® Diamond White       | high       | 0.76              | 30              | 705          | 9003     | 0                        | < 1                   | 95                    | 23                 | 27              |
|  Trosifol® Shining White       | high       | 0.38              | 15              | 420          | 9002     | 21                       | < 1                   | 73                    | 40                 | 42              |
|  Trosifol® Translucent White   | medium/low | 0.76 <sup>2</sup> | 30 <sup>2</sup> | 420          | 9002     | 70                       | < 1                   | 36                    | 67                 | 68              |
|  Trosifol® Translucent White   | high       | 0.76              | 30              | 420          | 9002     | 70                       | < 1                   | 36                    | 67                 | 68              |
|  Trosifol® Sand White          | medium     | 0.38              | 15              | 420          | 9002     | 78                       | < 1                   | 27                    | 73                 | 73              |
|  Trosifol® Coconut White       | medium     | 0.38              | 15              | 420          | 9002     | 16                       | < 1                   | 77                    | 36                 | 39              |
|  SentryGlas® Translucent White | high       | 0.80              | 31              | 420          | 9002     | 76                       | 43                    | 26                    | 74                 | 77              |

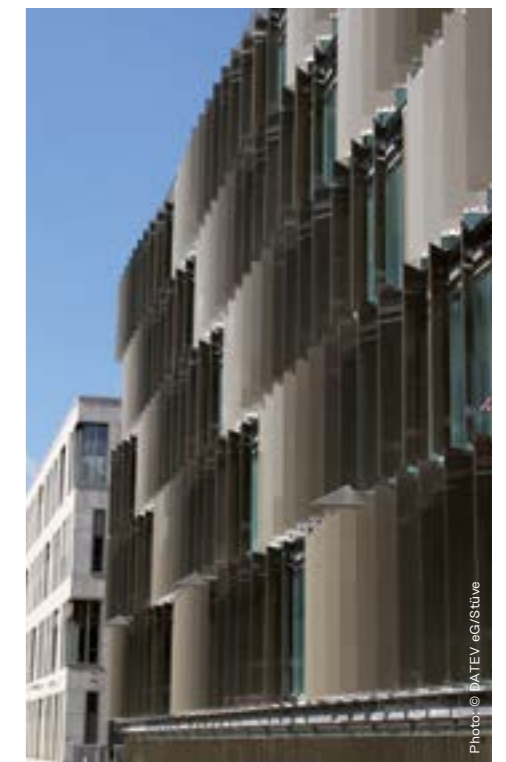
**TAB 18** • <sup>1</sup> Product also available as 0.76 mm (30 mil) version with comparable optics and enhanced safety features.

<sup>2</sup> Product also available as 0.38 mm (15 mil) version with comparable optics.

The Color samples are merely intended as illustration and inadequately represent the real colors. Custom colors are available on request.

\* All data measured in accordance with EN 410 (2011)/ISO 9050 on laminated safety glass with 4 mm – 0.38 mm PVB – 4 mm float glass. All Color types meet the requirements of EN ISO 12543. If used in exterior applications or combined with radiation sources, the energy absorption of the glass combination must be borne in mind.

Not all products are available in all regions.



• DATEV IT Campus, Nürnberg, Germany

Photo: © DATEV eG/Stube



## TECHNICAL DATA – PRODUCTS

### Technical data

| Property                      | Test method       | Unit              | Trosifol® Clear    | Trosifol® UltraClear | Trosifol® SC Monolayer | Trosifol® SC Multilayer | Trosifol® Extra Stiff | Trosifol® XT UltraClear | Trosifol® Natural UV | Trosifol® UV Extra Protect | SentryGlas®         | SentryGlas® Xtra™   |
|-------------------------------|-------------------|-------------------|--------------------|----------------------|------------------------|-------------------------|-----------------------|-------------------------|----------------------|----------------------------|---------------------|---------------------|
| Density                       | DIN EN ISO 1183-1 | g/cm <sup>3</sup> | 1.07               | 1.07                 | 1.06                   | 1.06                    | 1.08                  | 1.07                    | 1.07                 | 1.07                       | 0.97                | 0.97                |
| Refractive index              | DIN EN ISO 489    | -                 | 1.480              | 1.480                | 1.477                  | 1.480                   | 1.486                 | 1.480                   | 1.480                | 1.482                      | 1.499               | 1.497               |
| Thermal conductivity          | DIN EN 993-15     | W/mK              | 0.21               | 0.21                 | 0.20                   | 0.20                    | 0.22                  | 0.21                    | 0.21                 | 0.21                       | 0.26                | 0.25                |
| Thermal expansion coefficient | ISO 11359-2       | 1/K               | 1.7E <sup>-4</sup> | 1.7E <sup>-4</sup>   | 2.0E <sup>-4</sup>     | 2.0E <sup>-4</sup>      | 1.2E <sup>-4</sup>    | 1.7E <sup>-4</sup>      | 1.7E <sup>-4</sup>   | 1.7E <sup>-4</sup>         | 1.30E <sup>-4</sup> | 1.30E <sup>-4</sup> |
| Specific heat capacity        |                   | J/g K             | 1.9                | 1.9                  | 1.9                    | 1.9                     | 1.9                   | 1.9                     | 1.9                  | 1.9                        | 1.5                 | 1.5                 |
| Surface resistivity           | DIN 53482         | Ω                 | > 10 <sup>12</sup> | > 10 <sup>12</sup>   | 1 x 10 <sup>11</sup>   | > 10 <sup>12</sup>      | > 10 <sup>12</sup>    | > 10 <sup>12</sup>      | > 10 <sup>12</sup>   | > 10 <sup>12</sup>         | > 10 <sup>12</sup>  | > 10 <sup>12</sup>  |
| Tensile strength              | ISO 527-3         | N/mm <sup>2</sup> | > 20               | > 20                 | > 13                   | > 20                    | > 30                  | > 20                    | > 20                 | > 20                       | -                   | -                   |
| Elongation at break           | ISO 527-3         | %                 | > 250              | > 250                | > 300                  | > 250                   | > 180                 | > 250                   | > 250                | > 250                      | -                   | -                   |
| Tg                            | DMA, 3K/min, 1 Hz | °C                | 32                 | 32                   | 21                     | -                       | 47                    | 32                      | 32                   | 32                         | -                   | -                   |

TAB 19 •



Photo: © Lena Serditova / shutterstock.com

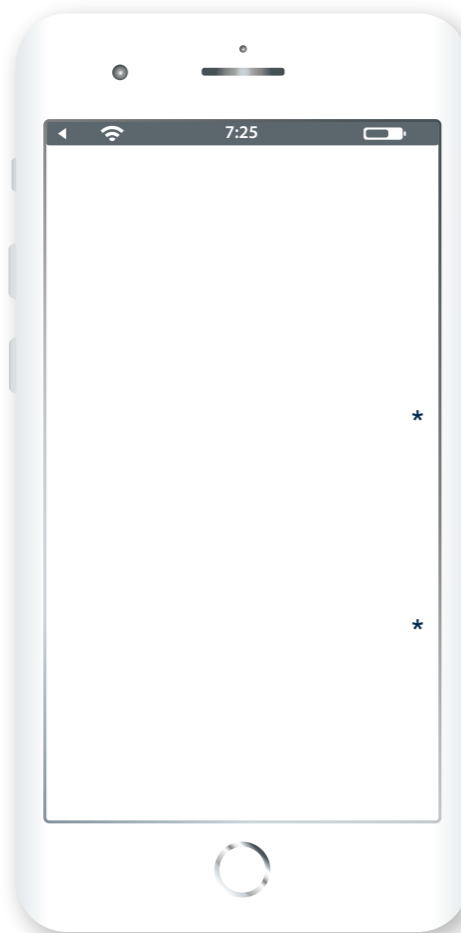
### Trosifol® Spallshield® CPET and Trosifol® PET

| Product                     | Property                            | Unit       | Value    | Minimum  | Maximum | Test         |
|-----------------------------|-------------------------------------|------------|----------|----------|---------|--------------|
| Trosifol® Spallshield® CPET | Calculated mean thickness           | mil        | 7.0      | 6.80     | 7.20    |              |
|                             | Haze                                | %          | 0.8      | None     | 1.0     | ASTM D1003   |
|                             | MD shrinkage at 190°C for 5 minutes | %          | 2.5      | 1.0      | 4.0     | Unrestrained |
|                             | TD shrinkage at 190°C for 5 minutes | %          | 2.0      | 1.0      | 3.0     | Unrestrained |
|                             | MD tensile strength                 | Kpsi (MPa) | 25 (172) | 20 (138) | None    | ASTM D882A   |
|                             | TD tensile strength                 | Kpsi (MPa) | 29 (200) | 22 (152) | None    | ASTM D882A   |
| Trosifol® PET               | Calculated mean thickness           | mil        | 7.0      |          |         |              |
|                             | Haze                                | %          |          |          | 1.0     | ASTM D1003   |
|                             | MD shrinkage at 190°C for 5 minutes | %          | 2.5      |          |         | Unrestrained |
|                             | TD shrinkage at 190°C for 5 minutes | %          | 2.0      |          |         | Unrestrained |
|                             | MD tensile strength                 | Kpsi (MPa) | 25 (172) | 20 (138) |         | ASTM D882A   |
|                             | TD tensile strength                 | Kpsi (MPa) | 29 (200) | 22 (152) |         | ASTM D882A   |

TAB 20 •



# Tools & Apps



**WINSLT**

For calculating the light, solar and heat parameters of glazing specifically containing films from the Trosifol® & SentryGlas® product range:

**SOUNDLAB**

For calculating acoustic performance of monolithic, double and triple glazed units.

**SOLUTION FINDER**

For finding the right product of your project

\*

\*

\* Only available as web app

**GLASGLOBAL**

For performing structural analysis for glass:

**SOUNDLAB AI**

First global acoustic calculator based on artificial intelligence for calculating/estimating acoustic performance of monolithic, double and triple glazed units.

**STRENGTH OF GLASS CALCULATOR**

The easy-to-use Calculator is designed to help designers and architects accurately model a variety of glass-mounting solutions in combination with glass types, interlayer materials and external factors such as loads, load duration and temperatures.

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