



REFLEX

[www.reflex.si](http://www.reflex.si)





## WELCOME TO THE ERA OF GLASS

In modern architecture glass has become a dominant building material. Without the innovations, which the development of the glass industry have made possible, we would not be able at all to imagine the arrival of contemporary architecture. The development of various kinds of soft coatings for glass is the key to the rise of the glass age. The technical formation of multi-functional supports for very old material, glass, is that material that is refined to that stage that it has become the ultimate functional product, which conserves energy or protects against sun and at the same time stays transparent and of a neutral colour. The high level of development of safety glass has made innovation possible for the development of facades, as well as creative solutions for building interiors. Whoever nowadays follows architectural trends cannot ignore glass. High quality products such as RX WARM, RX PHONE, RX SUN and RX SAFE and innumerable combinations of these products offers indisputable quality and unlimited technical possibilities.

This is valuable in particular for the demands of proper use of energy which modern glass completely fulfils. Energy saving for buildings remains, with steep rises in the cost of energy, the greatest challenge of our times. The condition of the majority of buildings offers us a great reserve in the use of energy, but the majority of existing buildings do not nowadays respond to the valid demands in the use of energy. Such products as the RX WARM group add a great share to the protection of the environment. At the same time as you cut your heating costs you improve the comfort of your residence. The literature which you now have in your hands can be carefully studied to enable you to recognise the evolutionary achievements of glass treatments that make a wide palette of top level products possible. Leave the way clear for your own demands for a quality residence and give soul to your own creativity, as the aim of our company is to satisfy the highest demands for quality and insulation. For you, we wish to build the wall of the future.

THERMAL INSULATING GLASS - **RX WARM**



4



SOLAR PROTECTIVE INSULATING GLASS - **RX SUN**



14



ACOUSTIC INSULATING GLASS - **RX PHONE**



20



SAFETY GLASS - **RX SAFE**



26





## Heat.

Embrace, which warms me.

Warm air, which surrounds me.

Cold, which soothes.

Without heating in the room.

With a real temperature difference:

with real warmth protection.

*RX Warm*



THERMAL PROTECTION GLASS CAN BE  
MANUFACTURED IN COMBINATION WITH  
ANY OTHER TYPE OF GLASS

## RX WARM - THERMAL INSULATING GLASS

High-quality thermal insulation glazing reduces heat loss and thus promotes the economical use of energy. Made of RX WARM thermal insulating panes and highly transmissive of the visible spectrum of light, as well as non-transmissive of long-wave solar radiation, this transparent glass has an optimal energy balance and fully meets the requisite criteria. Using Low-e low emission glass, the glazing of large surfaces can be planned economically without any appreciable heat loss, and thus the general well-being of those who live or work within can be improved. This most desirable effect is achieved by ensuring the lowest possible difference between the air temperature within a room and the temperature on the inner side of the glazing, a feature which also enables the more economical use of heating energy.

The total heat transfer through the insulating glass depends on the degree of thermal radiation, as well as the pertaining levels of conductivity and convection. Due to a number of attributes, including a low emissivity coating, use of the noble gas argon and krypton in the inter-glazing cavity, and a selectively effective multi-layer coating, Low-e glass can decrease heat loss considerably.

With the RX WARM family of products, with built-in thermal glass Low-E, we can satisfy a wide range of both architectural and functional wishes and requirements.

The new generation of various low emissivity coatings (Low-e) allows for a wide range of thermal insulating glass RX WARM (RX WARM, RX WARM-e, RX WARM-g, RX WARM-k). They comprise 2-layer or 3-layer thermal insulating glazing with different values of light transmittance (LT) and solar energy transmittance ( $g$ ), in conjunction with good thermal insulation ( $U_g$ ).

The new generation of low-emissivity glass enables relevant products. The innovative glass coatings combine intelligent use of energy with high levels of light transmittance. The trend in residential construction is moving towards natural daylight in living areas and away from artificial lighting. In particular, we should highlight the excellent properties of the 3-layer insulating glass, which has a visible daylight transmittance (LT) of 74%. The colour rendering index (Ra) is 97% for 3-layer insulating glass and 98% for 2-layer insulating glass, assuring a high level of light transmittance, and glass devoid of disturbing reflections.

At the same time, good thermal insulation also provides high yields of solar energy. With a  $U_g$  value of 0.6 W/m<sup>2</sup>K for 3-layer insulating glass and 1.1 W/m<sup>2</sup>K for 2-layer insulating glass, we have achieved a high level of energy saving, with the glass suitable for use in passive and low-energy buildings.





Faculty of Chemistry and Chemical Technology, Ljubljana



[www.reflex.si/en/ce](http://www.reflex.si/en/ce)



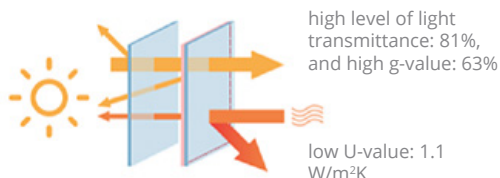
Reflex insulating glass fully meets the requirements of EN 1279 standards. The excellent characteristics and high quality of production have also been vindicated by tests performed by the Institute of Window Technology (IFT) in Rosenheim, Germany, which constantly monitors the quality of REFLEX insulating glass. Based on a favourable appraisal, the GMI Institute has granted us the permission to label our insulating glass with the RAL quality sign, which stands for high and controlled quality.



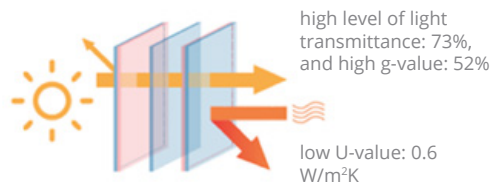
Commercial centre Qlandia, Maribor

*RX Warm*

## 2-layer insulating glass RX WARM 1,1



## 3-layer insulating glass RX WARM 0,6



## Maximum properties of 3-layer insulating glass

Extremely high level of light transmittance: 74%

- more daylight reduces the use of artificial lighting
- high transparency without disturbing reflections
- greater comfort for the user

## Acquisition of passive solar energy

Ensures the best features for passive houses:

- low U<sub>g</sub>-value 0.6s W/(m<sup>2</sup>K) in 3-layer glazing
- energy savings
- greater residential comfort

## Technical data: RX WARM – Thermal insulating glass

Type	Composition (outer pane - inner pane)	U <sub>g</sub> - coefficient EN 673	light and energy properties EN 410					Sound insulation EN ISO 717-1			Shading coefficient (g-value EN410/0.87)	Nominal thickness	Weight
			g-value	Light Transmission	Colour Rendering	Light Reflection	Total Energy absorption	R <sub>w</sub>	C	C <sub>r</sub>			
	mm	W/m <sup>2</sup> K	%	%	%	%	%	dB	dB	dB	%	mm	kg/m <sup>2</sup>
RX WARM 1,1	4/16/4	1,1	64	82	98	12	14	-	-	-	74	24	20
RX WARM 1,1	6/16/6	1,1	63	81	97	12	18	-	-	-	72	28	30
RX WARM/SA 1,1	4/16/4/ESG	1,1	64	81	99	13	14	-	-	-	74	24	20
RX WARM/SA 1,1	6/16/6/ESG	1,1	63	80	98	13	18	-	-	-	72	28	30
RX WARM 0,7	4/12/4/12/4	0,7	53	74	97	16	21	32	-1	-5	61	36	30
RX WARM 0,7	6/12/6/12/6	0,7	52	73	96	16	25	35	-2	-5	59	42	45
RX WARM/SA 0,7	4/ESG/12/4/12/4/ESG	0,7	53	73	98	17	20	32	-1	-5	61	36	30
RX WARM/SA 0,7	6/ESG/12/6/12/6/ESG	0,7	51	72	97	17	25	35	-2	-5	59	42	45
RX WARM 0,6	4/14/4/14/4	0,6	53	74	97	16	21	32	-1	-4	61	36	30
RX WARM 0,6	6/14/6/14/6	0,6	52	73	96	16	25	-	-	-	59	42	45
RX WARM/SA 0,6	4/ESG/14/4/14/4/ESG	0,6	53	73	98	17	20	32	-1	-4	61	36	30
RX WARM/SA 0,6	6/ESG/14/6/14/6/ESG	0,6	51	72	97	17	25	-	-	-	59	42	45
RX WARM-e 1,0	4/16/4	1,0	53	76	96	18	15	-	-	-	60	24	20
RX WARM-e 1,0	6/16/6	1,0	52	75	96	17	19	-	-	-	59	28	30
RX WARM-e/SA 1,0	4/16/4/ESG	1,0	54	75	95	17	15	-	-	-	62	24	20
RX WARM-e/SA 1,0	6/16/6/ESG	1,0	53	74	94	17	19	-	-	-	60	28	30
RX WARM-e 0,9 C	4/10/4	0,9	52	76	96	13	15	-	-	-	59	18	20
RX WARM-e 0,5	4/16/4/16/4	0,5	39	64	94	24	20	32	-1	-5	45	44	30
RX WARM-e 0,5	6/16/6/16/6	0,5	38	63	93	24	24	-	-	-	44	50	45
RX WARM-e/SA 0,5	4/ESG/16/4/16/4/ESG	0,5	40	63	92	24	20	32	-1	-5	46	44	30
RX WARM-e/SA 0,5	6/ESG/16/6/16/6/ESG	0,5	40	62	90	24	25	-	-	-	46	50	45
RX WARM-e 0,4 C	4/12/4/12/4	0,4	39	64	94	25	20	33	-2	-5	45	44	30
RX WARM-g 0,8	4/12/4/12/4	0,8	62	73	96	16	24	32	-1	-5	71	36	30
RX WARM-g 0,7	4/14/4/14/4	0,7	62	73	96	16	24	32	-1	-4	71	40	30
RX WARM-g 0,6	4/18/4/18/4	0,6	62	73	96	16	24	-	-	-	71	48	30
RX WARM-g 0,6	6/18/6/18/6	0,6	60	72	95	16	29	-	-	-	69	54	45
RX WARM-g/SA 0,7	4/ESG/14/4/14/4/ESG	0,7	61	73	97	17	24	32	-1	-4	70	40	30
RX WARM-g/SA 0,7	6/ESG/14/6/14/6/ESG	0,7	59	71	96	17	29	-	-	-	68	46	45
RX WARM-k 0,7	4/12/4/14/4	0,7	56	74	97	16	25	-	-	-	64	38	30
RX WARM-k 0,6	4/14/4/16/4	0,6	56	74	97	16	25	-	-	-	64	42	30
RX WARM-k 0,7	6/12/6/14/6	0,7	55	73	95	16	30	-	-	-	63	44	45
RX WARM-k/SA 0,7	4/ESG/12/4/14/4/ESG	0,7	56	73	98	17	24	-	-	-	64	38	30
RX WARM-k/SA 0,7	6/ESG/12/6/14/6/ESG	0,7	54	72	97	17	29	-	-	-	62	44	45

:Low-e Coating; ESG - tempered safety glass; C-Krypton

The buyer of our products is exclusively responsible for the correct determination of thickness for the ordered glazing.

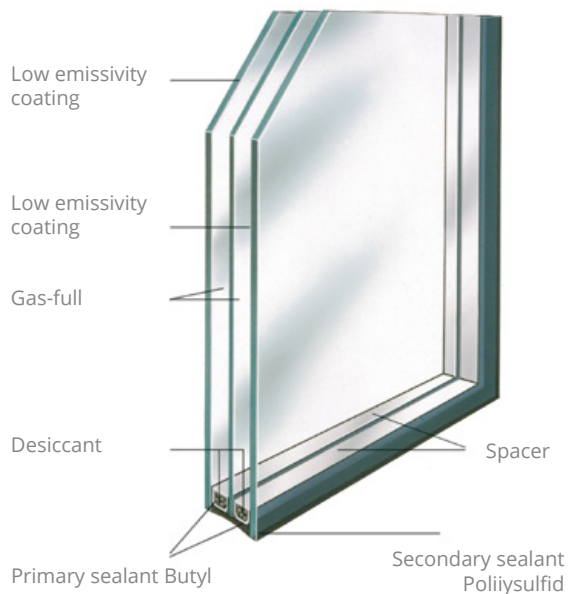
Functional values stated above refer to the size of the glazing as required for measurement by standards. Deviations from vertical leads to changes in value.

# RX Warm





Business Unit Globus, Kranj



Intercontinental Hotel, Ljubljana

**I** INTERCONTINENTAL.

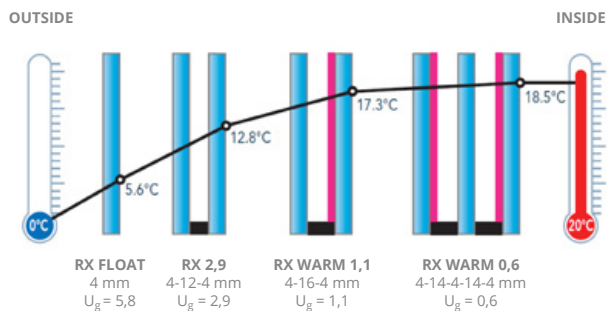
RX Warm

## RESIDENTIAL COMFORT

Alongside economic and environmental aspects, an important objective of construction with glass is also the significant improvement of residential and working atmospheres. Thermal insulating glass (Low-e) built into insulating glazing leads to an increase in temperature on the inside surface of the glass. This minimizes the discomfort of drafts near the glazing.

The modern glass RX WARM increases this temperature to a level close to room temperature, providing a significant improvement in residential comfort. A critical aspect of comfort is the temperature difference between ambient temperature and border walls and window areas. Most people experience space as particularly comfortable if the temperature difference between the wall (including glass) and temperature of the space is not greater than 5 °C and the difference in temperature between the legs and head is not more than 3 °C.

The change in temperature on the inside surface of the glazing depending on the  $U_g$  value



# RX Warm



## INSULATING GLASS WITH A WARM EDGE

The final value of a window's thermal insulation properties ( $U_w$ ) depends primarily on the nominal value of thermal transmission through the glass ( $U_g$ ). However, the nominal value  $U_g$  represents only the value obtained by measuring the heat flow through the central part of the glass.

The edge sealing of modern insulation glass is made up of the aluminium spacer and gaskets. It is well known that the thermal conductivity of aluminium differs substantially from the thermal conductivity of other constituents of insulation glass.

The heat flow through a glass-aluminium-glass junction is much bigger than the heat flow through a glass-air (gas)-glass junction, which results in thermal bridges on such surfaces. The influence of the aluminium spacer extends for 15 cm from the edge of the glazing towards the central part. Hence, it follows that the actual value of the thermal transmission coefficient changes in accordance with dimensions and may – especially with smaller glazings – differ substantially from its nominal value. The calculation shows that heat loss through the aluminium spacer may represent up to 10 % of the total heat loss through the window.

Thermal bridges do not cause only heat loss; they have other deficiencies as well. Due to the increased heat flow through the edge area, the temperature along the glass edge is substantially lower than that in the middle of the glass. Since the casement profile is also narrower in this area, particularly unfavourable conditions, such as low temperature and high relative humidity can cause condensation of vapour on the edge area. This does not represent only an aesthetic problem, but can also lead to mould growth and consequently cause considerable damage to the window.

The linear thermal transmission coefficient  $\Psi$  (psi) is used to describe the thermo-technical characteristic of the heat flows in the window frame-edge sealing-glass system. The extension of the influence of thermal bridges, which appear in the area of edge sealing ("warm edge" effect), is given by the relation  $l_G \times \Psi$ .

The  $\Psi$  coefficient takes into account the thermal transmission resulting from the combined influence of the frame, the glass and the spacer, but depends mainly on the thermal conductivity of the material the spacer is made of. This means that for the reduction of heat loss through the edge area of the insulation glass, the aluminium spacer frame should be replaced with one made of a material with lower thermal conductivity.



National Museum of Slovenia, Ljubljana

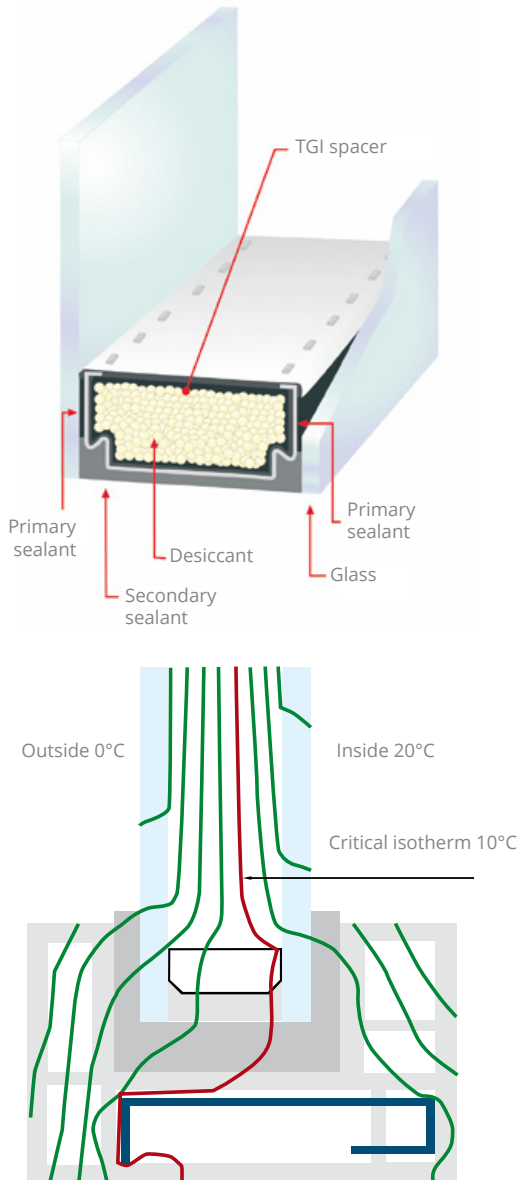


Business, hotel and recreation centre Betnava, Maribor

*RX Warm*

For the manufacture of insulating glass with a warm edge, Reflex uses PVC spacer profiles made by the German company TGI. They are made of durable PVC and are coated with a thin layer of stainless steel on the sides and on the back. Due to its low thermal conductivity, the PVC spacer prevents the formation of thermal bridges.

### Temperature on the insulating glazing with TGI spacer



### Benefits include the following:

- low thermal conductivity
- significant improvement in the  $U_w$ -value
- increased temperature on the inner surface of the glass edge (warm edge)
- significant reduction of condensation on the edges
- reduced air circulation near the window
- good grip of the butyl and secondary sealant due to the inorganic surface of the steel sheet
- thermal heating costs savings

# RX Warm

Zagreb Tower, Zagreb







## Light.

Morning, which rouses me.  
Sun, which invites a lovely day.  
Red evening sky, which lulls me to  
sleep. Without dazzling.  
With a safe view in focus.  
The best of decisions- real light  
protection.



*RX Sun*



SUN PROTECTION GLASS CAN BE  
MANUFACTURED IN COMBINATION WITH  
ANY OTHER TYPE OF GLASS

## RX SUN - SOLAR PROTECTIVE INSULATING GLASS

The architecture of the most demanding offices, commercial premises and industrial facilities increasingly makes use of glass, a characteristic which enables the creation of ever more daring facades - and even the entire exterior cladding of a building - from glass. This has created a host of energy-related challenges which have to be dealt with. For instance, the high flow of light in summer should not cause undesirable overheating, while in winter heat losses must be kept to an absolute minimum. The solution to this problem is solar protective glazing - a range of absorptive, reflective and highly selective types of glass manufactured by REFLEX, which can be used in combination with Low-thermal insulating glazing.

The tinted radiation-absorptive insulating glazing is composed of tinted Planibel Color float glass panes, which reduce the penetration of visible sunlight and solar energy, while at the same time ensuring the low reflection of light.

Reflective clear or tinted glazing has a metallic coating on one of its surfaces - either the outer or inner - which reflects most of the sunlight and solar energy back into the atmosphere. REFLEX now manufactures Stopsol glazing which can have any one of a number of types of metallic coating. There is Stopsol Supersilver which has a silver hue, Stopsol Classic which exhibits a golden brown hue, and the blue-tinted Stopsol Silver Light. The reduced transmission of solar energy through these panes is related to the reduced penetration of visible light.

The solar protective glazings of the highest quality are highly selective glazings which have very thin metallic coatings applied to the inner side of the outer pane using a vacuum cathodic sputter. An adequate combination of layers ensures a high degree of transparency (LT), a low transmission of solar energy ( $U_g$  value), a low level of reflection of light (LR), a low coefficient of thermal transfer through the window ( $U_g$  value), as well as clear, colour-neutral visibility through the panes.



Primary school Jelkovec, Zagreb



Business unit NLB bank Črnuče, Ljubljana

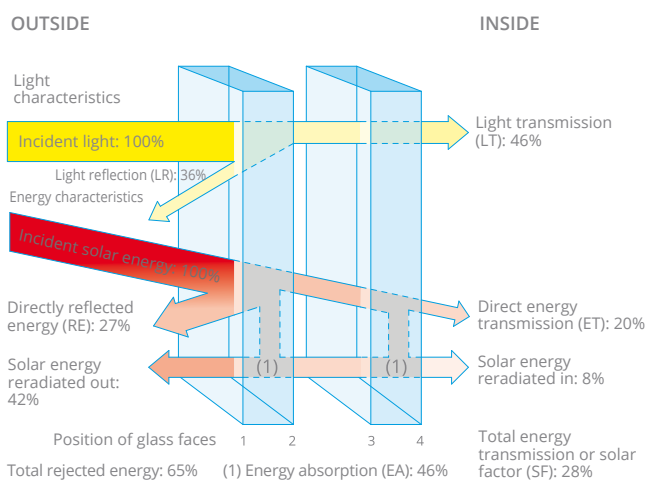
RX Sun



Required characteristics of glazings according to the type of building:

Type of building	LT (%)	U (W/m <sup>2</sup> K)	g (%)
Individual building	max.	min.	max.
Office building	max.	min.	min.

Sun protection glass with hard coating on position 1



Business building Gorenje, Split

Faculty of mathematics and physics, Ljubljana

RX Sun

## Technical data: RX SUN – Sun protection glass

Type	Composition (outer pane - inner pane)	U <sub>g</sub> - coefficient EN 675	light and energy properties EN 410					Sound insulation EN ISO 717-1			Shading coefficient (g-value EN410/0,87)	Nominal thickness	Weight
			g-value	Light Transmission	Colour Rendering	Light Reflection	Total Energy absorption	R <sub>w</sub>	C	C <sub>r</sub>			
	mm	W/m <sup>2</sup> K	%	%	%	%	%	dB	dB	dB	%	mm	kg/m <sup>2</sup>
RX SUN Green	6/16/4	1,1	<b>39</b>	<b>66</b>	88	<b>10</b>	57	36	-2	-5	<b>45</b>	26	25
RX SUN Grey	6/16/4	1,1	<b>36</b>	<b>40</b>	95	<b>6</b>	57	36	-2	-5	<b>41</b>	26	25
RX SUN Bronze	6/16/4	1,1	<b>38</b>	<b>46</b>	93	<b>7</b>	54	36	-2	-5	<b>44</b>	26	25
RX SUN Dark Blue	6/16/4	1,1	<b>36</b>	<b>52</b>	80	<b>8</b>	61	36	-2	-5	<b>41</b>	26	25
RX SUN Priva Blue	6/16/4	1,1	<b>21</b>	<b>31</b>	61	<b>6</b>	79	36	-2	-5	<b>24</b>	26	25
RX SUN Azur	6/16/4	1,1	<b>42</b>	<b>66</b>	87	<b>10</b>	53	36	-2	-5	<b>48</b>	26	25
RX SUN Dark Grey	6/16/4	1,1	<b>10</b>	<b>7</b>	84	<b>4</b>	90	36	-2	-5	<b>11</b>	26	25
RX SUN SSS Clear	16/16/4	1,1	<b>46</b>	<b>57</b>	96	<b>37</b>	18	36	-2	-5	<b>53</b>	26	25
RX SUN SC Clear	16/16/4	1,1	<b>32</b>	<b>35</b>	92	<b>35</b>	32	36	-2	-5	<b>37</b>	26	25
RX SUN SSS Green	16/16/4	1,1	<b>28</b>	<b>47</b>	92	<b>36</b>	47	36	-2	-5	<b>32</b>	26	25
RX SUN SC Green	16/16/4	1,1	<b>19</b>	<b>28</b>	93	<b>35</b>	56	36	-2	-5	<b>22</b>	26	25
RX SUN SSS Grey	16/16/4	1,1	<b>25</b>	<b>27</b>	95	<b>35</b>	48	36	-2	-5	<b>29</b>	26	25
RX SUN SC Grey	16/16/4	1,1	<b>19</b>	<b>17</b>	92	<b>34</b>	53	36	-2	-5	<b>22</b>	26	25
RX SUN SC Bronze	16/16/4	1,1	<b>21</b>	<b>20</b>	83	<b>34</b>	50	36	-2	-5	<b>24</b>	26	25
RX SUN SSS Dark Blue	16/16/4	1,1	<b>25</b>	<b>36</b>	83	<b>35</b>	51	36	-2	-5	<b>29</b>	26	25
RX SUN SSSL Priva Blue	16/16/4	1,1	<b>16</b>	<b>24</b>	63	<b>25</b>	68	36	-2	-5	<b>18</b>	26	25
RX SUN Sunergy Clear	6/16/4	1,1	<b>45</b>	<b>61</b>	96	<b>11</b>	46	36	-2	-5	<b>52</b>	26	25
RX SUN Sunergy Green	6/16/4	1,1	<b>30</b>	<b>50</b>	87	<b>9</b>	68	36	-2	-5	<b>34</b>	26	25
RX SUN Sunergy Azur	6/16/4	1,1	<b>32</b>	<b>50</b>	86	<b>9</b>	65	36	-2	-5	<b>37</b>	26	25
RX SUN Sunergy Dark Blue	6/16/4	1,1	<b>26</b>	<b>37</b>	77	<b>7</b>	73	36	-2	-5	<b>30</b>	26	25
RX SUN Sunergy Grej	6/16/4	1,1	<b>27</b>	<b>30</b>	94	<b>6</b>	70	36	-2	-5	<b>31</b>	26	25
RX SUN S Neutral 67	6/16/4	1,1	<b>48</b>	<b>61</b>	98	<b>19</b>	36	36	-2	-5	<b>55</b>	26	25
RX SUN S Light Blue 52	6/16/4	1,1	<b>36</b>	<b>47</b>	94	<b>14</b>	54	36	-2	-5	<b>41</b>	26	25
RX SUN S Silver Grey 32	6/16/4	1,1	<b>23</b>	<b>29</b>	90	<b>22</b>	60	36	-2	-5	<b>27</b>	26	25
RX SUN HP Neutral 60/40	6/16/4	1,1	<b>40</b>	<b>60</b>	93	<b>25</b>	27	36	-2	-5	<b>46</b>	26	25
RX SUN HP Neutral 50/32	6/16/4	1,1	<b>32</b>	<b>50</b>	95	<b>23</b>	34	36	-2	-5	<b>37</b>	26	25
RX SUN HP Bright Green 40/29	6/16/4	1,1	<b>29</b>	<b>40</b>	96	<b>37</b>	50	36	-2	-5	<b>33</b>	26	25
RX SUN SN 70/41	6/16/4	1,1	<b>41</b>	<b>70</b>	96	<b>11</b>	28	36	-2	-5	<b>47</b>	26	25
RX SUN SN 70/37	6/16/4	1,0	<b>37</b>	<b>70</b>	93	<b>11</b>	27	36	-2	-5	<b>42</b>	26	25
RX SUN SN 70/35	6/16/4	1,0	<b>35</b>	<b>70</b>	94	<b>14</b>	25	36	-2	-5	<b>40</b>	26	25
RX SUN SN 62/34	6/16/4	1,0	<b>34</b>	<b>63</b>	95	<b>14</b>	31	36	-2	-5	<b>39</b>	26	25
RX SUN SN 51/28	6/16/4	1,0	<b>28</b>	<b>51</b>	92	<b>12</b>	37	36	-2	-5	<b>32</b>	26	25
RX SUN SN 40/23	6/16/4	1,0	<b>23</b>	<b>40</b>	91	<b>16</b>	43	36	-2	-5	<b>27</b>	26	25
RX SUN SN 29/18	6/16/4	1,1	<b>18</b>	<b>29</b>	90	<b>17</b>	52	36	-2	-5	<b>21</b>	26	25
RX SUN SNX 60	6/16/4	1,0	<b>29</b>	<b>60</b>	93	<b>13</b>	35	36	-2	-5	<b>34</b>	26	25
RX SUN SNX 50	6/16/4	1,0	<b>24</b>	<b>50</b>	90	<b>10</b>	42	36	-2	-5	<b>28</b>	26	25

:Low-e Coating; I hard coating; ESG - tempered safety glass; C-Krypton

In case of energy absorption >50 % we recommend tempered safety glass.

The buyer of our products is exclusively responsible for the correct determination of thickness for the ordered glazing.

Functional values stated above refer to the size of the glazing as required for measurement by standards.

Deviations from vertical leads to changes in value.



Business unit Altana, Ljubljana



Hotel Mons, Ljubljana

*RX Sun*



## Sound.

Music which relaxes me.

Laughter, which cheers me up.

Lovely silence, when I am thinking.

Without the noise of the roads outside.

Without the bustle of the streets.

The choice is mine – real noise  
protection.

*RX Phone*



SOUND PROTECTION GLASS CAN BE  
MANUFACTURED IN COMBINATION WITH  
ANY OTHER TYPE OF GLASS

## RX PHONE - ACOUSTIC INSULATING GLASS

Because of its detrimental impact on health and well-being, noise is one of the most unpleasant side-effects of the modern way of life. The sounds around us have a negative effect on our concentration, work efficiency and sleep. They can, however, be reduced to a large degree by appropriate passive anti-noise protection and insulation. Modern acoustic insulation glazing – such as REFLEX's RX PHONE products – forms an integral part of this defence.

### Acoustic insulation properties of insulating glass can be improved through:

- Use of thick glass (increased weight)
- Use of laminated glass (increased elasticity)
- Asymmetric structure (the first glazing is at least 50% thicker than the second one)
- Increased width of the inter-glazing cavity
- Gas medium in the inter-glazing cavity

RX PHONE glazing has a broad spectrum of acoustic insulation properties as well the capacity to reduce heat losses through the panes.

The efficiency of RX PHONE acoustic and thermal insulation glazing is based on the asymmetric composition of built-in heat-reflective low thermal emission Low - e glass. Such a composition and type of glazing implementation is denoted by the scheduling class value pair which indicates the degree of acoustic and thermal insulation. Both values are interdependent, whereas a change in one of the values conditions the change of the other.

Through significantly reducing the consumption of primary heating energy, thermal insulation glazing is also environmentally friendly as it leads to the reduction of gas emissions which can contribute to the green-house effect.

Regarding the qualities and composition of acoustic and thermal insulation glazing, there are several possible types available, each of which is based on adequate combinations of low thermal emission RX WARM glass and sound-insulating RX PHONE glass.

RX PHONE glass is characterized by a combination of different glazing thicknesses, a wider inter-glazing cavity which is filled with gas, and the use of laminated glass with special sound insulating foil (SC). The modified form of the foil has additional mechanical properties, enabling the glass to meet all the requirements for laminated safety glass.

In order to meet all the requirements relating to efficient energy use, the glass has a low emissivity coating on at least one of the inner surfaces. The different gas fillings can decrease the heat transfer coefficient up to 0.5 W/m<sup>2</sup>K in 3-layer glass.

### The product designation RX PHONE sound insulating glass consists of the following data:

- measured sound reduction index  $R_w$  in dB
- thickness of the insulating glass in mm
- $U_g$ -value in W/m<sup>2</sup>K

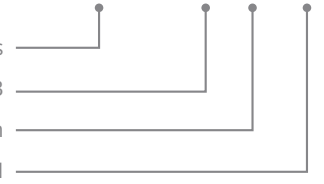


Hotel Osijek, Osijek

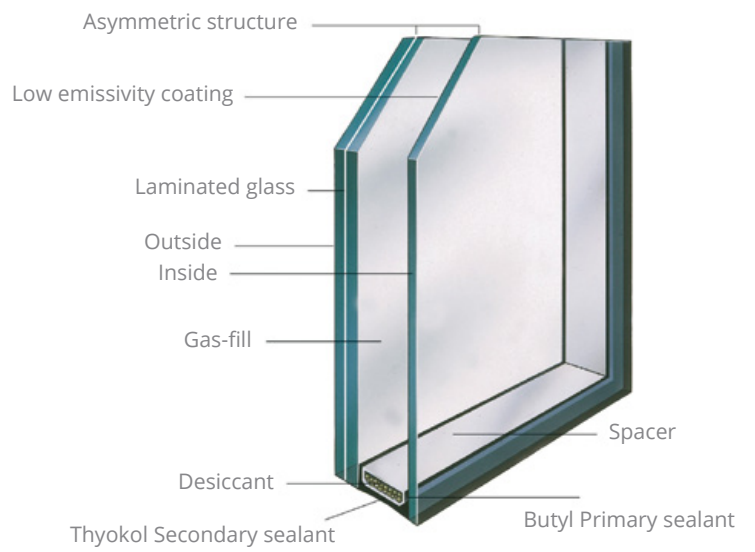
Example: Sounds Insulating Glass

**RX PHONE 36/26 1,1**

- Sound insulating glass
- Sound reduction index  $R_w$  measured in dB
- Thickness of the insulating glass in mm
- $U_g$  value according to EN



Cut through Insulating Glass RX PHONE



Faculty of Agriculture and Life Sciences, Maribor

*RX Phone*

## Technical data: RX PHONE – Sound insulating glass

Type	Composition (outer pane - inner pane)	U <sub>g</sub> - coefficient EN 673	light and energy properties EN 410					Sound insulation EN ISO 717-1			Shading coefficient (g-value EN410(0,87))	Nominal thickness	Weight
			g-value	Light Transmission	Colour Rendering	Light Reflection	Total Energy absorption	R <sub>w</sub>	C	C <sub>r</sub>			
	mm	W/m <sup>2</sup> K	%	%	%	%	%	dB	dB	dB	%	mm	kg/m <sup>2</sup>
RX PHONE 36/26 1,1	6/16/4	1,1	63	81	98	12	17	<b>36</b>	-2	-5	72	26	25
RX PHONE 37/28 1,1	8/16/4	1,1	62	81	97	13	19	<b>37</b>	-2	-5	71	28	30
RX PHONE 37/32 1,1	8/18/6	1,1	62	81	97	13	20	<b>37</b>	-2	-6	71	32	45
RX PHONE 38/30 1,1	10/16/4	1,1	60	81	97	12	23	<b>38</b>	-2	-6	69	30	35
RX PHONE 39/34 1,1	10/20/4	1,1	60	81	97	12	23	<b>39</b>	-2	-6	69	34	35
RX PHONE 40/32 1,1	10/16/6	1,1	60	80	96	12	24	<b>40</b>	-1	-5	69	32	40
RX PHONE 41/31 1,1	6/16/9SC	1,1	62	81	97	12	22	<b>41</b>	-2	-6	72	31	35
RX PHONE 42/33 1,1	8/16/9SC	1,1	61	80	97	12	23	<b>42</b>	-3	-8	70	33	40
RX PHONE 43/37 1,1	8/16/13SC	1,1	61	79	96	12	25	<b>43</b>	-2	-6	70	37	50
RX PHONE 45/35 1,1	10/16/9SC	1,1	60	80	96	12	27	<b>45</b>	-2	-6	69	35	45
RX PHONE 46/39 1,1	10/16/13SC	1,1	60	79	95	12	29	<b>46</b>	-2	-6	58	39	55
RX PHONE 49/38 1,1	9SC/16/13SC	1,1	58	79	96	12	30	<b>49</b>	-3	-8	67	38	50
RX PHONE 50/42 1,1	9SC/20/13SC	1,1	58	79	96	12	30	<b>50</b>	-2	-8	67	42	55
RX PHONE 51/46 1,1	17SC/16/13SC	1,1	55	78	94	12	36	<b>51</b>	-1	-5	63	46	70
RX PHONE 36/38 0,7	6/12/4/12/4	0,7	52	74	97	16	23	<b>36</b>	-2	-6	60	38	35
RX PHONE 37/40 0,7	8/12/4/12/4	0,7	51	73	96	16	26	<b>37</b>	-1	-6	59	40	40
RX PHONE 39/42 0,7	8/12/4/12/6	0,7	51	73	96	16	26	<b>39</b>	-2	-5	59	42	45
RX PHONE 39/45 0,7	6/12/6/12/44.2	0,7	51	73	96	16	28	<b>39</b>	-1	-6	59	45	50
RX PHONE 40/49 0,7	6/12/6/12/66.2	0,7	51	72	95	16	29	<b>40</b>	-1	-4	59	49	60
RX PHONE 41/43 0,7	9SC/12/4/12/6	0,7	49	73	96	16	32	<b>41</b>	-2	-6	56	43	45
RX PHONE 41/45 0,7	6/12/6/12/9SC	0,7	51	73	96	16	28	<b>41</b>	-2	-7	59	45	50
RX PHONE 42/45 0,7	9SC/12/4/12/8	0,7	49	72	96	16	33	<b>42</b>	-2	-6	56	45	50
RX PHONE 43/46 0,7	9SC/12/5/12/8	0,7	49	72	96	15	33	<b>43</b>	-3	-7	56	46	53
RX PHONE 44/46 0,7	9SC/12/4/12/9SC	0,7	49	72	96	16	33	<b>44</b>	-2	-8	56	46	50
RX PHONE 45/51 0,7	13SC/12/4/12/10	0,7	48	71	94	15	38	<b>45</b>	-1	-5	55	51	65
RX PHONE 48/52 0,7	9SC/12/6/12/13SC	0,7	49	71	95	15	36	<b>48</b>	-2	-7	56	52	65
RX PHONE 36/42 0,6	6/14/4/14/4	0,6	52	74	97	16	23	<b>36</b>	-2	-6	60	42	35
RX PHONE 39/50 0,6	33.2/16/4/16/33.2	0,6	50	73	97	16	30	<b>39</b>	-2	-7	57	50	40
RX PHONE 39/51 0,6	6/16/4/16/44.2	0,6	52	73	96	16	27	<b>39</b>	-2	-7	59	51	45
RX PHONE 40/50 0,6	10/14/6/14/6	0,6	50	72	95	15	31	<b>40</b>	-2	-7	57	50	55
RX PHONE 41/53 0,6	55.2/16/4/16/6	0,6	48	72	96	15	34	<b>41</b>	-1	-5	55	53	50
RX PHONE 42/49 0,6	4/16/4/16/9SC	0,6	53	73	96	16	24	<b>42</b>	-2	-7	60	49	40
RX PHONE 43/47 0,6	9SC/14/4/14/6	0,6	49	73	96	16	32	<b>43</b>	-2	-7	56	47	45
RX PHONE 45/57 0,6	8/16/6/16/11SC	0,6	51	72	95	15	30	<b>45</b>	-1	-5	58	57	60
RX PHONE 46/55 0,6	13SC/14/6/14/8	0,6	47	71	94	15	38	<b>46</b>	-2	-6	54	55	65
RX PHONE 48/57 0,6	10/14/6/16/11SC	0,6	49	71	95	15	34	<b>48</b>	-1	-5	57	57	65
RX PHONE 49/59 0,6	10/16/6/16/11SC	0,6	49	71	95	15	34	<b>49</b>	-1	-4	57	59	65
RX PHONE 51/58 0,6	13SC/14/6/14/11SC	0,6	47	71	94	15	39	<b>51</b>	-2	-6	54	58	70
RX PHONE 38/38 0,5 C	6/12/4/12.4	0,5	52	74	97	16	23	<b>38</b>	-2	-6	60	38	35
RX PHONE 39/42 0,5 C	8/12/4/12/6	0,5	51	73	96	16	26	<b>39</b>	-1	-5	59	42	45
RX PHONE 42/45 0,5 C	8/12/4/12/9SC	0,5	51	72	96	16	29	<b>42</b>	-2	-7	59	45	50
RX PHONE 42/43 0,5 C	9SC/12/4/12/6	0,5	49	73	96	16	32	<b>42</b>	-2	-7	56	43	45
RX PHONE 48/50 0,5 C	9SC/12/6/12/11SC	0,5	49	72	95	15	35	<b>48</b>	-3	-8	56	50	60

:Low-e Coating; I hard coating; ESG - tempered safety glass; C-Krypton; SC - sound protection foil

The buyer of our products is exclusively responsible for the correct determination of thickness for the ordered glazing.

Functional values stated above refer to the size of the glazing as required for measurement by standards. Deviations from verical leads to changes in value.

# RX Phone



# *RX Phone*



## Safety.

Contact, which inspires confidence.

A firm step, which leads.

Without feelings of uncertainty.

With qualities of reliability.

Making it possible to have real  
protection and safety.

*RX Safe*



**SAFETY GLASS CAN BE  
MANUFACTURED IN COMBINATION  
WITH ANY OTHER TYPE OF GLASS**

## RX SAFE - SAFETY GLASS

### Tempered Safety Glass

Over recent years, a broad variety of technological innovations have greatly contributed to some major improvements in the thermal, solar and acoustic properties and characteristics of glass, thus resulting in a significant extension in the range of this most versatile material. Ever larger glazed surfaces are constantly changing the countenance of the world, and some people seem to believe that the sole obstacle in the way of accomplishing even most daring visions is the proverbial fragility of glass.

Ordinary window glass is a very brittle material. Although it can bear great compression stress, its tensile strength is extraordinarily low. Tensile stress appears on the surface of the glass when it is bent or exposed to temperature differences: a sudden change of 40-50° K is enough to cause breakage of the glass. Fragments of broken glass are sickle-shaped and sharp-edged. Glass becomes stronger and safer when tempered.

The term "tempered glass" denotes toughened safety glass, which is also known under the technical term of thermally pre-stressed glass. As the name itself denotes, the pre-stressing is achieved by heat treatment of the glass, in which both surfaces of the glass are heated to a predetermined temperature and then suddenly cooled. During this procedure, a typical distribution of stress appears in the glass: surface molecules are permanently exposed to compression stress, while on the inside, molecules are exposed to tensile stress. The balance of the two kinds of stress is necessary for the stability which assures safety properties of tempered glass.

**With such a distribution of stress, tempered glass acquires its safety characteristic, which is noticeable especially in the following parameters:**

- Increased impact resistance (4 to 5 times);
- Greater flexile strength:  
Measured value  $> 120 \text{ N/mm}^2$ ;
- Additional resistance to temperature differences  $\Delta T = 200\text{K}$ ;
- Protection against injuries is also a prominent safety feature of tempered glass;
- The glass breaks with an increased velocity, releasing all the accumulated energy; the pane disintegrates into a fine net of small, non-jagged fragments.

RX Safe



School of Economics, Murska Sobota

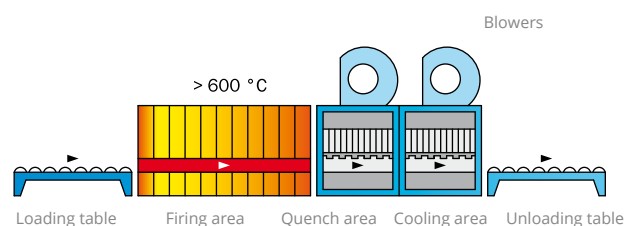
REFLEX tempered safety glass is suitable for both residential and commercial premises (for stairs, stairway balustrades, doors, automatic doors, partitions and movable wall systems); able to withstand ball impact, it can be used in sports facilities, as well as in the proximity of heaters and other hot bodies because of its resistance to thermal stress fractures. Tempered safety glass can also be used in the construction of glass facades as well as in a great variety of other exterior and interior applications (such as road noise protection, bus and similar shelters, display panels, cases, shop windows and the like).

REFLEX tempers both clear and tinted float glass, as well as the complex range of solar protective glass, low-emission glass with a hard or soft coating and most types of patterned glass. The thickness of these glazings can vary from 4 to 19 mm, the maximum ratio of length to width is 10:1, the biggest available dimension is 2400 x 4800 mm and the smallest 100 x 250 mm. Otherwise, the dimensions of tempered glass depend upon the type and the thickness of the glass which also affects the degree of distortion – an effect more pronounced in square formats than in rectangular ones. For all these reasons, it is strongly recommended that you seek advice from Reflex's own technologists prior to placing an order.

## QUALITY

The quality of tempered glass produced by REFLEX meets all the requirements of SIST EN 12150 standards. The quality of REFLEX tempered glass has also been verified in tests performed by the Friedmann & Kirchner Gesellschaft für Material – und Bauteilprüfung mbH.

## Tempered Furnace

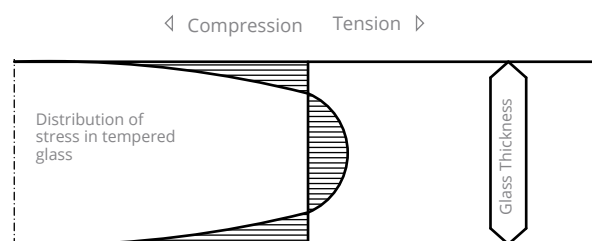


## Mechanical characteristics

Flexile strength (in accordance with the requisites of SIST EN 12150 standard)

Type of glass	Flexible strength
Float glass	120
Patterned glass	90
Enamelled glass*	75

\* the enamelled surface is the tensile zone



Structure after fracture (in accordance with the requisites of SIST EN 12150 standard)



## Tempered Safety Glass with Heat Soak Test (HST)

Tempered glass manufactured by REFLEX is ranked among the very top quality products. It complies with highest standards regarding dimensions, tolerances, fracture patterns and strength. Despite highest standards, a tiny nickel sulphide crystal, which occurs in glass, may cause spontaneous tempered glass breakage. To minimise the risk of spontaneous breakage, REFLEX use HST for tempered glass. During the process, tempered glass is heated up to  $290\text{ }^{\circ}\text{C} \pm 10\text{ }^{\circ}\text{C}$  for 4 hours and those with Nickel sulphide crystal will break. There is a growing tendency, which requires glass used for large projects to be HST tested. HST is subject to the UNI EN 14179 standard, and it is a mandatory test for the panels that will form buildings' facades.

## Heat strenghtened glass

The production process of heat strenghtened (TVG) glass, also called toughened glass, is similar to that of tempered (ESG) glass.

Like tempered (ESG) glass, heat strenghtened glass is also heated rapidly and evenly to a temperature above  $600\text{ }^{\circ}\text{C}$ ; but the cooling process is not the same as the introduction of cold air is carried out in a significantly different manner. This enables the establishment of permanent stress in the glass, thus providing it with a substantially higher resistance to thermal and mechanical stresses in comparison with float glass.

Flexile strength and resistance to temperature differences of heat strenghtened glass are somewhere between those of ordinary nontempered float glass and tempered (ESG) glass. The structure after fracture is equal to that of ordinary float glass.

Because of the low degree of tempering, danger of a spontaneous fracture due to nickel-sulfide inclusions is practically excluded. Thus the heat soak test is not needed.

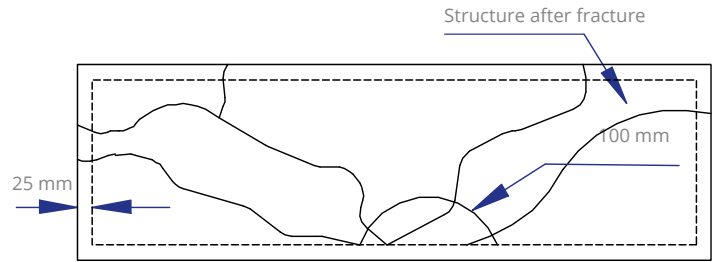
TVG glass gains advantage over ESG glass when the flexile strength and resistance to temperature differences of common float glass are no longer adequate, and due to its structure after fracture (large number of small fragments), ESG glass no longer fulfils safety requirements.

TVG glass is used mostly as safety laminated glass. In this combination, it provides optimal constructional safety, but especially active and passive protection.

The combination of increased flexile strength, increased resistance to temperature differences and the ability to take on stress after fracture assures the ideal choice of glass for:

- movable walls
- overhead glazings
- glass fences
- point-fixed glazing
- supporting glass elements (e.g.: stairs)

## Fracture according to SIST EN 1863



Representative image of the structure after fracture

## Flexile strength according to SIST EN 1863

Type of glass		Flexile strenght** (N/mm <sup>2</sup> )
TVG made of	Float glass	70
	Enemelled float glass	45*
	Patterned glass	55

\* enamelled surface under tensile stress.

\*\* flexile strength is defined as the minimal flexile stress, which with 95 % reliability leads to a 5 % probability of a fracture.

## Mechanical characteristics

	Float	TVG	ESG
Flexile strength $\sigma_B$	45 N/mm <sup>2</sup>	70 N/mm <sup>2</sup>	120 N/mm <sup>2</sup>
Resistance to temperature differences $\Delta T$ on the surface of the plane	40 K	100 K	200 K
Cutting	yes	no	no
Structure after fracture	radial cracks - big fragments	radial cracks - big fragments	net cracks - small fragments
Possibility of spontaneous fracture	no	no	yes

\* 12 N/mm<sup>2</sup> for overhead glazing, or 18 N/mm<sup>2</sup> for vertical glazing;



Intercontinental Hotel, Ljubljana

*RX Safe*

# RX Safe





### Printed Enamelled Glass

Architectural creations in glass would not be so attractive without colour. Besides having a protective function, the possibility of colouring and printing glass opens up new dimensions in creativity to the architect. Enamelled layers of special colours or silk-screen prints have made it possible to augment and enhance normal tempered safety glass with an unlimited range of colour combinations, motifs, shapes and patterns. Because of its safety properties, enamelled glass is most suitable as a facade cladding, while the right choice of colour ensures a perfect match between the window and the surrounding glass cladding. Enamelled glass is in fact tempered safety glass to which a special paint, composed of powdered glass and pigments, has been applied by way of a silk-screen print, rollers or spraying immediately prior to the tempering process. During tempering this paint becomes permanently fused onto the surface of the glass. This colour layer is resistant to mechanical damage and ageing, a feature which makes cleaning and maintenance easier. Furthermore, tempered glass is distinguished by its increased resistance to pressure, impact and temperature fluctuations.

REFLEX enamels and tempers all its transparent and tinted float glass, as well as the Stopsol range of reflective metal-coated solar protective panes. In most cases the whole surface of a pane is enamelled with the colours from the standard palette. Enamelling in other colours of the RAL series is also possible for large orders.

The colours can be applied to the glass also by means of printing screens. Glass silk-screen printing technology now facilitates the choice of any colour, pattern and motif. Indeed, the possibility of creating promotional communications, messages, signs and logotypes are all opened up by glass silk-screen printing. And while there already exists a choice from amongst a wide range of ready-made patterns and shades, the choice of motif and colour is limited only by the customer's wishes and imagination.

Because silk-screen printing reduces the transmission of light and heat, such glass can be used not only for artistic or decorative purposes, but for shading and protection against the sun. REFLEX' standard offer consists of 18 samples and 24 different shades. Since the final appearance of the colour depends on the type of glass and its thickness, the confirmation of the sample is necessary prior to full scale manufacture. By using silk screen printing and a special colour, a perfect imitation of etched glass can be achieved.

Colours with abrasive additives are used as slip resistant printings on floor glass.

Available dimensions of a silk-screen print are dependent on some technical factors which affect production.



### All The Colours You Ever Dreamed Of

Glistening white, delicate yellow or light grey - pick a colour from among the rainbow shades of the Reflex range. We can reproduce almost any shade you desire based on the extensive RAL colour series.

The choice of glass is dependent upon its function as well as where it is to be used, whereas as regards the choice of colour some specific characteristics have to be taken into consideration. The type and thickness of the glass, together with its inherent colour – which is itself dependent on iron oxide content, as well as the reflective capacity of its surfaces, may cause deviations in colour. It is therefore of the utmost importance that a sample is produced prior to full scale manufacture. And since the impression of colour is always evaluated on the tinted side of the glazing, the customer must specify on which surface the colour should be layered.

However, due to some technical factors which effect production, some slight deviations in colour cannot be avoided, especially when it comes to additional or supplementary deliveries.

Furthermore, when this glass is placed in front of a light background or illuminated from behind, a so called “starry sky” may appear - these are tiny specks which have failed to be layered with colour.

And when colour is layered onto particularly large surfaces, the resulting colour may also be a little uneven.

There are also slight blemishes in the form of blurring as well as small imperfections which arise as a result of screen printing. These too are more visible if the glazing is illuminated from behind.

Minor deviations between the ordered colour - i.e. the colour of the approved sample - and the actual colour of delivered glazing cannot be subject to complaint.

RX Safe



Mall of Split, Split

## Digital printing

Digital printing enables individual design options and customised scope of use for flat glass. Irrespective of the size and number of pieces of glass, we can adapt the printing procedure to the wishes of our customers. Digital printing on glass gives individual colour accents to designs for interior and exterior use. This allows you to freely choose between standard décor or your favourite motif in realistic photo quality on glass. The possibilities are endless.

## Possible applications

Possible applications for digital printed glass are limitless. Thus in a luxurious interior design, or on vividly attractive façades or individually designed life motifs. Let your creativity run free with digital glass motif printing. The areas of application of digital printing are listed on the right.

## Areas of application:

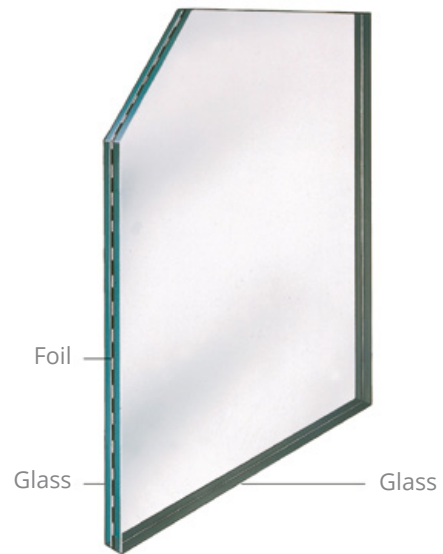
- Façades
- Shop windows
- Doors and partitions
- Showers and bathrooms
- Floor glass
- Wall coverings in the kitchen
- Kitchen worktops
- Front counter panels
- Tables
- Advertising boards
- Coatings
- Ceiling elements
- Balcony glazing
- Wine cabinets
- Glass paintings and wall décor





RX Safe

## Lamisafe – Glass with insulating foil



Glass is a most robust and beneficial material. When suitably engineered, it can, in addition to all its more obvious advantages, prevent personal injury caused by potential breakage as well as safeguard people and their property. Laminated glass, which can be used for such a purpose, is classed amongst tempered glass and glass bricks as one of the most efficient types of safety glass.

Laminated glass is composed of two or several panes of glass, each firmly adhered to the next by agent of variable thickness and quality. The bonding material between the sheets of glass ensures that if breakage occurs any dangerous fragments, which might cause injury, are retained. Multi-pane laminated glass is thus distinguished by its high degree of passive and active safety. Laminated glass has an important advantage over tempered safety glass; upon fracture of tempered glass, coarse particles appear which seldom remain in the frame. Such glazing no longer retains its protective function, since it protects neither against burglary nor against injuries. When fracture occurs, laminated glass does not burst and retains at least partially, its protective function. This is particularly important for intruder proof and bullet-proof glass.

Its strength and capacity to hold broken fragments in place make laminated glass indispensable in the construction of public buildings, sports halls and indoor swimming pools, as well as shops and industrial facilities. Laminated glass can also have a number of important applications in the house and home, where security - safeguard from injury - and intruder protection considerations are of particular importance. Laminated glass is used in the glazing of stairwells, balconies and indeed around any raised or exposed point from which one might fall. And when glazing is used overhead, the use of laminated glass is mandatory for reasons of safety.

*RX Safe*

For laminated glass, special foils (also called silence foils - SC) may be used instead of standard PVB foil; laminated glass produced with this foil possesses significantly higher sound insulation properties. If laminated glass with higher sound insulation also needs to possess security characteristics, foil that combines both qualities – sound insulation and security is used for bonding.

#### Areas of use of laminated safety glass VSG

Ideal areas of use of laminated safety glass is evident particularly in the case of breakage due to its ability to trap the broken pieces, preserving the glazed state and maintaining load capacity.

#### Public buildings

Laminated glass is used for all glazing used in building entrances. Especially in schools and kindergartens, its use is often mandatory.

#### Sports facilities

Laminated glass is (conditionally) resistant to ball impacts. Its use is also mandatory in indoor swimming pools.

#### Commercial and industrial buildings

Laminated glass plays the role of anti-theft glass in such buildings.

#### Residential construction

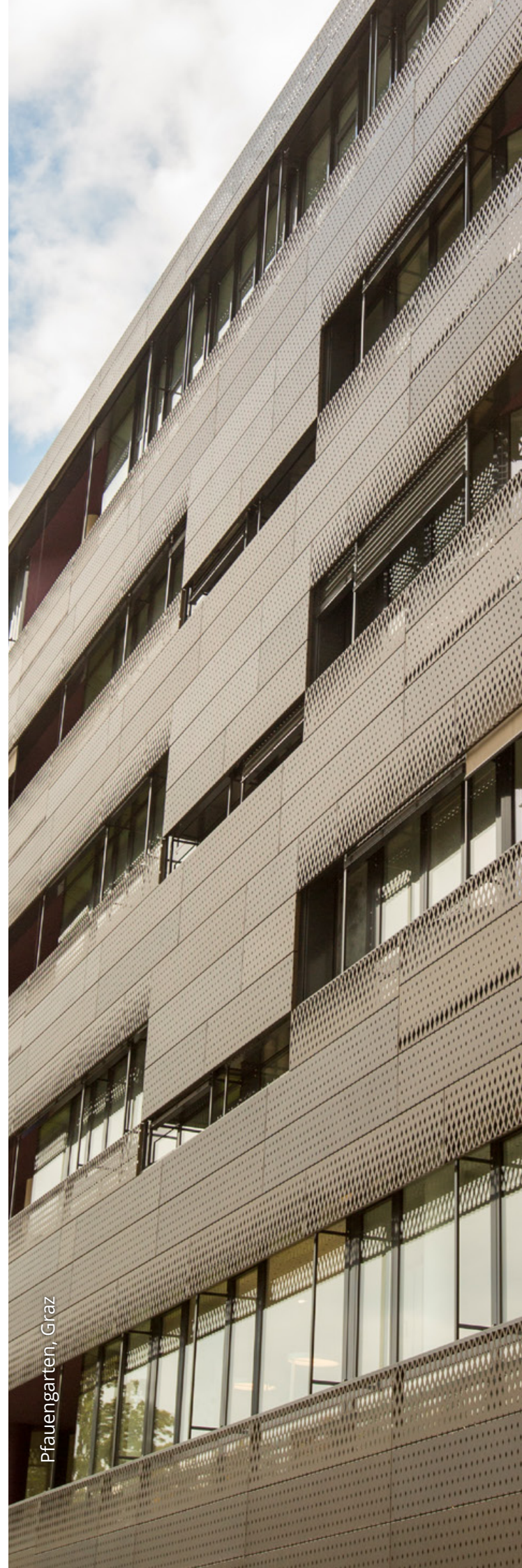
Laminated glass here not only has an anti-theft function, but is also designed to protect people from injury. Its use is mandatory for glazing which extends from floor to ceiling.

#### Fences

Laminated glass is used for glazing staircases, balconies and various platforms, protecting against falls. The anti-breakage feature of laminated safety glass is proven through an oscillating test in accordance with EN 12600.

#### Overhead glazing

For overhead glazing due to safety reasons, use of laminated glass is mandatory for interior glazing.



Pfauengarten, Graz

## QUALITY CONTROL

The priority task of the company REFLEX is the careful monitoring of quality, which will enable us to become and remain a reliable partner for our customers. Such company policy ensures the safety of both architects and designers, as well as the safety of processors and users.

The quality assurance system does not increase, but rather reduces costs for everyone, especially for our consumers. Therefore, we at the company REFLEX have opted for a total quality assurance system that continuously adapts to new findings and requirements.

The result of our efforts are:

- Total quality management certificate pursuant to the ISO 9001:2015 standard
- RAL certificate for continuous and controlled quality of insulating glass
- ift-certificate for continuous and controlled quality of:
  - insulating glass
  - tempered safety glass
  - tempered safety glass with heat test
  - heat strengthened glass
  - laminated safety glass.



Westgate, Split



Situla, Ljubljana



A Bright Future. Literally.

**Reflex d.o.o.**

Podgrad 4  
9250 Gornja Radgona, Slovenia  
t:+386 (02) 564 35 00  
f:+386 (02) 564 35 20  
e:info@reflex.si  
www.reflex.si

