

# What you need to know about thermal insulation glass



Replace your current insulation glass and immediately save on energy costs

## Types of Thermal Insulation Glass

There is a great variety of thermal insulating glass, or glazing (this is the term used by the industry), available these days. Each type has its own performance and characteristics. When you are planning to purchase, or have already bought, insulating glass, it is wise to carefully read the information in this brochure to make the most of your glazing.

### 1. Insulating Double Glazing

Insulating double glazing consists of two panes of glass separated by a spacer (e.g., a metal frame) at the edges of the glass. These edges are sealed hermetically with a special. The space between the glass panes (the cavity) is filled with dry air.

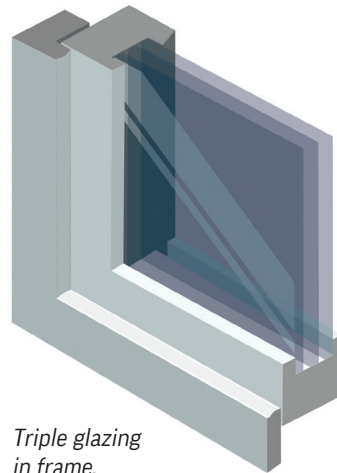
### 2. High-Performance Insulating Double Glazing

High-performance insulating double glazing provides up to three times higher thermal insulation than standard insulating double glazing. This is because one side of the glass (inside the cavity) is coated with a very thin, heat-reflective coating, and the cavity is filled with a special gas instead of air. The gases used are typically Argon or Krypton.

### 3. Insulating Triple Glazing

Insulating triple glazing offers a better insulating performance than high-performance insulating double glazing, with up to five times higher thermal insulation values than standard insulating double glazing.

It consists of three glass panes separated by two spacers. Two of the glass panes have a very thin, heat-reflective coating on the cavity side of the glass, and both cavities are filled with a special gas. The gases used are typically Argon or Krypton.



*Triple glazing in frame.*

### 4. Insulating Heritage Glazing

Specially designed for retrofitting and as a replacement for glass in existing frames where there is no space for standard double glazing, insulating heritage glazing provides an excellent alternative. It is insulating double glazing comprised of ultra-thin glass panes and an extra-thin cavity. One of the glass panes has a very thin heat-reflective coating on the cavity side. Because the cavity is filled with a special gas, the glazing can achieve thermal insulation comparable to that of insulating double glazing or high-performance insulating double glazing.

### 5. Vacuum Glazing

Vacuum glass is glass where the cavity between two panes has been vacuum-sealed. Spacers, also known as pillars, prevent the glass panes from touching each other and losing their insulating properties. The cavity is only 0.1 to 0.2 millimeters thick. Vacuum glass is among the best-performing types of glass in terms of thermal insulation, light transmission, and sound insulation.

Its thinness makes it suitable for use in existing frames, making it ideal for renovation projects requiring insulating glass. This glass has a U-value ranging from 0.7 to 0.4 W/m<sup>2</sup>K.

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### Many variations

Within the scope of these 5 types, there are – depending on the specific kind – many or few variations available. The total number of glass products that can provide thermal insulation has thereby become very extensive. Additionally, various products are continuously being improved, enhancing their thermal insulation performance.

Moreover, the glass can combine other performance features, such as (injury) safety, burglary resistance, sound insulation, sun protection, fire resistance, etc. As a result, the composite of insulating glass may differ from the “standard” version designed solely for thermal insulation.

### The level of thermal insulation

Heat loss through glass is expressed using the insulation value, known as the U-value, measured in W/m<sup>2</sup>K. The lower the U-value, the lower the heat loss through the glass, and the better the glass's thermal insulation performance. Single glazing has a high U-value of 5.8 W/m<sup>2</sup>K. Triple insulating glass can achieve a U-value as low as 0.5 W/m<sup>2</sup>K, providing ten times better insulation performance than single glazing.

The U-value of the glass is therefore the most important factor when selecting glazing for thermal insulation purposes. Insulating glazing comes in many variants, brands, and names. In the Netherlands terms like HR+, HR++, or even HR+++ glazing are still frequently used, but the use of these labels is not legally regulated (HR = Hoog Rendement = High Performance).

However, the determination of the U-value is legally established and must be provided by every supplier in the same way. To accurately compare product performance, it is wise to focus primarily on the U-value.

Ug-value glass	
Type of glass	U-value
Single glazing	5,8 W/m <sup>2</sup> K
Insulating Double Glazing	3,0 - 2,7 W/m <sup>2</sup> K
HP Insulating Double Glazing	1,2 - 1,0 W/m <sup>2</sup> K
Triple Insulating Glass	0,7 - 0,5 W/m <sup>2</sup> K
Vacuum Glass	0,7 - 0,4 W/m <sup>2</sup> K

### Decision factors

The various types of insulating glazing all have their specific properties and application possibilities. The prices of these products also vary significantly. However, in addition to insulating performance and price, other factors are important. For example, when replacing existing glazing with new insulating glazing, the quality and dimensions of the existing frame are crucial considerations.

Not every frame is suitable for (high-performance) insulating double glazing or triple insulating glazing and may therefore need to be adjusted or replaced. In new construction, this can of course be taken into account from the start. A lower U-value will, in any case, result in lower heating costs. It is worth noting that while the cost savings from replacing single glazing with high-performance insulating double glazing can be significant, the difference in savings between a U-value of 1.1 and new glazing of 1.0 W/m<sup>2</sup>K will be minimal.

<b>Indicative overview of energy savings (gas)</b>			
Glass type (U-value)	Annual savings per m <sup>2</sup>	Annual savings at gas price € 3,-	Annual savings at gas price € 1,20
Single glazing (5,8 W/m <sup>2</sup> K)	€ 0,-	€ 0,-	
Double glazing (3,0 - 2,7 W/m <sup>2</sup> K)	13m <sup>3</sup>	€ 780,-	€ 310,-
HP double glazing (1,2 - 1,0 W/m <sup>2</sup> K)	29m <sup>3</sup>	€ 1740,-	€ 690,-
Triple glazing (0,7 - 0,5 W/m <sup>2</sup> K)	33m <sup>3</sup>	€ 1980,-	€ 790,-
Vacuum glazing (0,7 - 0,45 W/m <sup>2</sup> K)	34m <sup>3</sup>	€ 2040,-	€ 810,-

*Indicative annual savings for a house with a high efficiency boiler, at an average living room temperature of 18°C (day and night), and with 20m<sup>2</sup> window area.*

### Warranty

Almost all manufacturers of insulation glass provide a warranty. The most common is a 15-year warranty on insulating glazing. This warranty covers the insulating performance of the glazing, ensuring that the glazing does not "fail" (e.g., develop leaks) and that transparency is maintained. Warranties are often subject to conditions. In addition to requirements related to the installation and composition of the glazing, proper maintenance by the owner is also essential.

### Installing glass units

To guarantee the quality of insulating glazing and ensure that its properties are fully utilized, the glazing must be installed correctly. In the Netherlands, standards and practical guidelines exist for this. These are typically included in the warranty conditions provided by the manufacturer. The installation of glazing requires expertise and craftsmanship. It is recommended to have this done by a professional glazier or installation company affiliated with the Vakgroep Glas of the Dutch association of construction and infrastructure companies Bouwend Nederland.

Consult your glass specialist, affiliated with that same Vakgroep Glas, to explore the options for your specific situation. Seek their advice, especially when considering the combination of glazing with some of the other features mentioned.

### Standards and practical guidelines

For the maintenance of various types of insulating glazing, standards and practical guidelines have been established. It is important to ensure that the paintwork, sealant, and/or glazing rubbers (the seal between the glazing and the frame) remain in good condition, and that any

ventilation holes (openings on the exterior of the frame) and spaces beneath the glazing beads are clean and unobstructed.

Poor maintenance of the frame increases the risk of damage to your glazing. It is recommended to inspect the glass and frame in the first year after installation and subsequently have the frame, including paintwork, sealant, and/or glazing rubbers, inspected every three years for potential defects. This allows you to carry out maintenance or repairs in a timely manner.

### Maintenance

From the moment the glazing is installed, you (the client) are responsible for maintaining it properly. This ensures not only prolonged enjoyment of your insulating glazing but also the retention of warranty coverage.

### Manufacturing defects in the glazing

If there is a manufacturing defect covered by the warranty terms of the glazing, the manufacturer will supply a new pane to the glazier or installation company, including a fixed compensation fee as a contribution towards replacement costs. This compensation is also specified in the warranty terms. However, in many cases, this reimbursement is not sufficient to cover all costs.

The additional costs for replacing the glazing by the glazier or installation company will be at your own expense. It is important that this is clearly stated in advance in the agreement and/or warranty provisions



### Installation error

If the person who installed the glazing made a mistake causing the glazing to become defective within the warranty period, they are fully liable. In such cases, both the replacement glazing and the installation costs will be at their expense.

### Insufficient maintenance and modification

If insufficient maintenance has been carried out, and this is demonstrably the cause of damage to the insulating glazing, the costs for the replacement glazing and its installation will be at your own expense. Similarly, if modifications or changes to the glazing result in damage, you are fully responsible for all associated costs.

### Condensation on the inside

Condensation on the interior side of the glass typically occurs at low outdoor temperatures and high relative humidity inside the home. The moisture in the air condenses on the glass surface. With insulating glazing that has a high insulating value, such as high-performance insulating double glazing, this risk is smaller than with glazing with poor insulating properties, like single glazing. This also depends on the specific situation. It's important to note that condensation on the inside is not a product defect. Condensation can be prevented by proper ventilation. If you are replacing your existing glazing, make sure to carefully consider ventilation options.



*Condensation on the interior side of the glass.*

### Condensation on the outside

Condensation on the exterior side of the glass can occur at low outdoor temperatures and high relative humidity. The risk of condensation is highest in the early morning during spring and autumn. The condensation disappears as the outdoor temperature rises and the humidity decreases. With insulating glazing that has excellent thermal insulation, the heat loss through the glass is limited, keeping the outer pane relatively cold and increasing the possible condensation on the outside of glass.

The better the thermal insulation of the glazing, the higher the probability of condensation. This is not a product defect but rather proof of the glazing's excellent insulation properties, showing that it is "working."

Condensation on the exterior side only occurs under certain circumstances and cannot be prevented. Wiping the pane dry is ineffective, as condensation may return as long as the outdoor temperature is low and humidity is high.

### Glass colour perception

Glass is never completely colourless and always has a slight tint depending on its thickness. For larger panes, thicker glass is required than for smaller panes, which may result in minor colour

differences even when the same type of insulating glazing is used. While this is usually not bothersome, you can minimize this risk by choosing glazing with the same construction and thickness for all panes.

Additionally, minor colour differences can exist between coatings from different manufacturers. Since manufacturers continue to improve coatings, newer coatings of the same manufacturer may have slightly different colours. When replacing a single pane, there may be a small colour difference compared to the other panes. Be sure to discuss this with your glazier or installation company beforehand.

### Distortion in the glass

In insulating glazing, it can happen that a pane appears concave or convex, causing reflections in the glazing to seem distorted or bent. This phenomenon is unavoidable and is not a product defect. It is caused by differences in air pressure and temperature in the atmosphere. During manufacturing, air is trapped in the space between the glass panes at the prevailing air pressure and temperature at that specific time. When the outside air pressure or temperature changes, the air pressure between the glass panes does not adjust. As a result, the pane may bulge outward when the external air pressure decreases (low-pressure systems) or the temperature rises (summer), and it may curve inward when the external air pressure increases (high-pressure systems) or the temperature drops (winter).

### Thermal breakage

Thermal breakage in glass occurs due to temperature differences across the surface of the glass. When a temperature difference of more than approximately 30°C arises within the glass surface, the pane may break in a peculiar way. This is known as thermal breakage. Thermal breakage has a specific fracture pattern that is not comparable to glass breaking from, for example, being struck. Thermal breakage is identifiable by a single fracture line starting perpendicularly to the edge of the glass and then continuing in an irregular shape. Whether or not a crack is a case of thermal breakage can best be assessed by a professional. Thermal breakage is not a product defect but a consequence of significant temperature differences in the glass.

You can significantly reduce the risk of thermal breakage by:

- placing blinds, shutters, or curtains at some distance from the glazing;
- ensuring heating elements are not placed too close to the glazing;
- not painting or applying adhesive film to the glazing;
- avoiding the placement of large objects close to the interior side of the glazing;
- preventing actions that could cause temperature differences within the glazing (for example, a jet of cold water directed at glazing that has been heated by the sun).

Thermal breakage can be prevented all together by using thermally tempered glass. This is specially treated glass that can withstand much larger temperature differences and is less sensitive to thermal breakage. In situations where the glass may be exposed to significant temperature differences on its surface, it is advisable to use thermally tempered glass. Another important advantage of thermally tempered glass is that it is safety glass. In the event of breakage, it shatters into small, safe granules, reducing the risk of serious injury. It is recommended to seek advice from your glazier or installation company on this matter.



## What to do in case of a complaint?

You should always keep the warranty certificate and the details of the glazier or installation company that installed the glazing. If your glazing shows a defect within the warranty period, they can check whether your complaint falls under the manufacturer's warranty. Generally, the spacer between the glass panes displays the product name and production date of the glazing. This information tells you who the manufacturer is and when the glazing was produced.

Be sure to reach a clear agreement, beforehand, on any potential costs of replacing the glass. This will help you avoid unexpected surprises, as even defects covered by the warranty may involve costs.

### LIABILITY

The organizations mentioned in this brochure, as well as those involved in its creation, accept no liability, including direct or indirect damages arising from or related to the application of the information provided in this brochure.

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