



Condensation on the inside

Condensation on the inside of the glass generally occurs at low outdoor temperatures with high relative humidity in the home. The moisture present then condenses against the glass surface. With insulating glazing with a good insulation value, such as High Yield insulated double glazing, the risk of condensation is lower than with glass with a poor insulation value, such as a single glass pane. It also depends on the specific situation. It is important to know that condensation on the inside is not a manufacturing defect. Condensation can be prevented through good ventilation. If you are considering replacing existing glazing, it is therefore important to consider the possibilities for improving ventilation.

Condensation on the outside

Condensation on the outside can occur at low outdoor temperatures and high relative humidity. The risk of condensation is greatest during the early hours of the morning in spring and autumn. This condensation will disappear as soon as the outdoor temperature rises and the humidity level falls. With insulating glazing with good thermal insulation, the heat loss through the glass is limited and the external pane remains relatively cold, increasing the risk of the appearance of condensation on the glass. The better the thermal insulation of the glazing, the higher this risk. Condensation of this kind is not caused by a manufacturing defect, but is in fact the consequence of the excellent thermal insulation of the glazing. As such it is evidence that the glazing is 'doing its job'. Condensation on the outside of the window only occurs in a limited number of

situations, but unfortunately there is no way of preventing it. Wiping the window dry is ineffective. As long as the outdoor temperature is low and the relative outdoor humidity is high, the condensation will return. There are special anti-condensation coatings that delay and in certain cases completely prevent the forming of condensation. Ask your glazier or installation company for details.

The colour perception of glass

Glass is never entirely colourless; depending on its thickness, it is always tinted to some extent. Because it is necessary to use thicker glass in larger windows than in smaller windows, even if the same type of insulating glazing is used, minor colour differences can occur. Although in most cases this is not perceived as a nuisance, you can mitigate this risk by selecting the same model and design for all your glazing, with the same construction and glass thickness.

There may also be colour differences between the coatings that are applied by different manufacturers. Manufacturers are also constantly improving their coatings and the colour of newer coatings may differ slightly from previous generations. When replacing an existing window, there may be a slight colour difference between the new and the old glazing. Make sure you speak to your glazier or installation company about this possibility, in advance.

Distortion in the glass

The window glass in insulating glazing can bend in a concave or convex manner, causing the reflected images in the glass to appear bent or distorted. This phenomenon is unavoidable, and is not a manufacturing error but is a consequence of differences in atmospheric air pressure and temperature. During the manufacturing process, the air in the space between the panes of glass is sealed at the air pressure and temperature at that moment. Although the air pressure and temperature outside changes, the air pressure in the space between the panes of glass does not. As a result, the window can become convex if the outside air pressure is lower (low-pressure area) or the temperature rises (in the summer), or may become concave in high outdoor air pressure (high-pressure area) or lower temperatures (in the winter).

Thermal breakage

Thermal cracking occurs in glass as a result of temperature differences in the surface of the glass. If a temperature difference of more than 30°C occurs in the surface of the glass, the window itself can break in a particular manner. This is known as thermal cracking. A thermal crack has a specific fracture pattern, which cannot be compared with the way glass breaks if for example the window is smashed.

Thermal cracking can be recognised by a single fracture line perpendicular to the edge of the glass that then extends erratically. The presence of thermal cracking can best be confirmed by a specialist.

A thermal crack is not a manufacturing error, but is the consequence of high temperature differences in the glass. You can considerably reduce the risk of thermal cracking by:

- installing louvre blinds, venetian blinds or curtains some distance from the glass;
- not placing heating elements too close to the glass;
- not painting or covering the glass in adhesive film;
- not placing large objects close to the glass, on the inside;
- avoiding activities that can result in a temperature difference in the glass (for example aiming a jet of cold water at a window heated by the sun).

Thermal cracking can be prevented in advance by installing thermally toughened glass. This is glass that is specially treated to resist high temperature differences and is therefore less susceptible to thermal cracking. In situations where the glass is likely to experience high temperature differences in the glass surface, it is advisable to use thermally toughened glass. Another important advantage of thermally toughened glass is that it is a form of safety glass that in the event of breaking shatters into small, safe granules, thereby causing less serious injury. We recommend consulting your glazier or installation company.

➤ What to do if you have a complaint

Make sure you always keep the warranty certificate and the details of the glazier or installation company. If your glazing demonstrates a defect within the warranty period, they can check for you whether your complaint is covered by the manufacturer's warranty. Generally speaking, the product name and production date of the glazing are marked on the spacer between the panes of glass. This information tells you the name of the manufacturer and when the unit was produced.

Before replacing your glazing, make sure you reach a clear agreement on the costs. In this way, you will avoid unpleasant surprises. After all, even defects that are covered by the warranty can involve costs.

➤ Liability

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➤ This brochure is a joint publication of:



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WHAT YOU NEED TO KNOW ABOUT INSULATING GLAZING

Contact your glass specialist affiliated to OnderhoudNL or Vakgroep GLAS about the possibilities of insulating glazing!

> Types of insulating glazing

Insulating glazing today comes in many different types and variants, each with their own performance and properties. If you intend to purchase or maybe have already purchased insulating glazing, it is worthwhile carefully reading the information in this brochure, to gain the maximum benefit from your purchase.

1. Insulated double glazing

Insulated double glazing consists of two panes of glass that are held apart by a spacer (for example a metal frame) at the edge of the glass. The edges of the glass are sealed with a special sealant to create a sealed unit. The space between the glass is then filled with dry air.

2. High Yield (HR++) insulated double glazing

High Yield insulated double glazing offers up to 3x better thermal insulation than insulated double glazing. This is because a very thin thermally reflective coating is applied to one side of the glass (facing the space) and the space itself is not filled with air but with a special gas. The most commonly used gas types are argon or krypton.

3. High Yield (HR+++) insulated triple glazing

Triple insulated glazing or simply triple glazing has a better insulating effect than High Yield insulated double glazing, and offers up to 5x better thermal insulation than standard insulated double glazing.



4. High Yield insulating glazing for listed buildings

Specifically for renovation and replacement projects for glazing in existing window frames where there is no space for High Yield insulated double glazing, High Yield insulating glazing for listed buildings can be the perfect solution. This is a form of insulated double glazing that uses extra thin panes of glass and an extra thin space. A very thin thermally reflective coating is applied to one pane, on the side facing the space. Because the space is filled with a special gas, this glazing can achieve thermal insulation equivalent to that of double glazing or High Yield insulated double glazing.

> What you need to know about insulating glazing

Numerous variants

Within all these types of glazing – depending on the type you choose – there are several possible variants.

The number of glass products that can be used for thermal insulation has become very extensive. Some of these products are still subject to development, leading to further improvements in their thermal insulating performance. In addition, the glass can be combined with other performance properties such as safety (from injury), break-in resistance, noise resistance, sun-resistance, fire resistance, etc. The structure of the insulating glass for these applications can differ from the ‘standard’ design for thermal insulation.

The level of thermal insulation

The loss of heat through glass is expressed in the insulation value which is reproduced as the Ug value, and measured in W/m²K. The lower the Ug value, the lower the heat loss through the glass and the higher the thermal insulating effect of the glass. Single glass has a high Ug value of 5.8 W/m²K. Triple insulating glass can have a Ug value as low as 0.5 W/m²K, thereby insulating 10x better than single glass. The Ug value of the glass is therefore the most important value to take into account when selecting glazing for thermal insulation. Insulating glazing comes in numerous variants, brands and names. The terms HR+, HR++ and even HR+++ glazing are also used, although the meaning of these designations is not defined in law. Determination of the Ug value, however, is defined in law, and must be specified by every manufacturer, in the same way. To enable a good comparison of the various products, it is sensible to above all look at the Ug value.

Ug values of glass

Type of glass	Ug value
Single glass	5,8 W/m ² K
Insulated double glazing	3.0 – 2,7 W/m ² K
HR insulated double glazing	1.9 – 1,6 W/m ² K
HR+ insulated double glazing	1.5 – 1,3 W/m ² K
HR++ insulated double glazing	1.2 – 1,0 W/m ² K
HR+++ insulated triple glazing	0.7 – 0,5 W/m ² K

Factors in making your choice

The various types of insulating glazing all have their own specific properties and applications. The prices of these products also vary widely. However, in addition to insulating performance and price, a number of other factors play a role. For example when replacing existing glazing with new insulating glazing, the quality and fit of the existing window frame are important.

Not every window frame is for example suitable for (High Yield) insulated double glazing or insulated triple glazing and would therefore first have to be adjusted or replaced. Naturally, for new buildings, these aspects can be taken into account from the start. Whatever the case, a lower Ug value means lower heating costs. Remember that the cost saving when replacing single glazing with High Yield insulated double glazing is considerable, but it makes little difference if the new glass has a Ug value of 1.1 or 1.0 W/m²K.

Indication of the potential saving in fuel costs (gas)

Type of glass (Ug value)	Gas saving per m ² of window	Saving in fuel costs per year
Single glazing (5,8 W/m ² K)	–	€ 0
Double glazing (2,7 W/m ² K)	13m ³	€170
HR insulated double glazing (1.0 - 1.2)	23m ³	€ 300
HR insulated triple glazing (0.5 - 0.7 W/m ² K)	30m ³	€ 390

Indication of saving per year in a house with High Yield heating boiler with an average temperature of 18 °C in the living room (daytime and night-time) and with a gas price of € 0.65 per m³ and 20m² window surface area.

Warranty

Almost all manufacturers of insulating glazing offer a warranty. The most common warranty is the 10-year warranty on insulating glazing. This is the warranty issued by the glass manufacturer for the insulating effect of the glass, that the glazing will not ‘leak’ and that the glass will retain its transparency. Warranty is often subject to conditions. In addition to the conditions relating to the installation and composition of the glazing, the owner’s obligation to maintain the glazing correctly is important.

Installing the glazing

To guarantee the quality of insulating glazing, and to ensure that the glazing lives up to the expected properties, it must be correctly installed. In the Netherlands there are standards and practical guidelines for glass installation. In most cases, these are part of the manufacturer’s warranty conditions. Installing glazing requires expertise and craftsmanship. The recommendation is to have your glazing fitted by a professional glazier or installation company affiliated to OnderhoudNL or Vakgroep GLAS of Bouwend Nederland. Ask your glass specialist affiliated to the Vakgroep GLAS or OnderhoudNL for the possibilities in your situation, and seek the advice of this expert, also with regard to the combination with the other properties discussed.

Standards and practical guidelines

Standards and practical guidelines have been drawn up for the maintenance of various types of insulating glazing. For you, it is important that the paintwork, the sealant and/or the rubber surrounds (the seal between the glass and the frame) remain in good condition and that any trickle by condensation vents (openings on the outside of the frame) and the space beneath the glazing beads are kept clean and unblocked. A poorly maintained frame increases the risk of damage to your glazing. It is recommended to carefully inspect the glass and frame during the first

year following installation, and then once every three years, to check the frame including paintwork, sealant and/or rubber surrounds, or to have these aspects inspected for possible defects. In this way, any maintenance or repair work can be carried out in time.

Maintenance

From the moment the glazing is installed you (the client) are responsible for correct maintenance. This will extend the useful life of your insulating glazing, and will maintain your warranty rights.

Manufacturing defect in the glazing

If the manufacturing defect is covered by the warranty conditions for the glazing, the manufacturer will supply a new glazing unit to the glazier or the installation company, including a fixed amount as a contribution to the reinstallation costs. This is all explained in advance in the warranty conditions. In many cases, this fixed payment does not cover all the costs. The additional costs incurred by the glazier or the installation company for replacing the glazing unit are for your account. It is important that these conditions are specified in advance in the agreement and/or warranty provisions.

Installation error

If the person who installed the glazing has made a mistake, which causes the unit to fail within the warranty period, then the installer is fully liable. Both the replacement glazing and the installation work are then for that person’s account.

Poor maintenance and alterations

If insufficient maintenance is carried out, and this poor maintenance is demonstrated to be the cause of the damage to the insulating glazing, the costs for the replacement window and its installation are for your account. Any changes or alterations to the glazing that may be the cause of the damage mean that you are responsible for all costs.