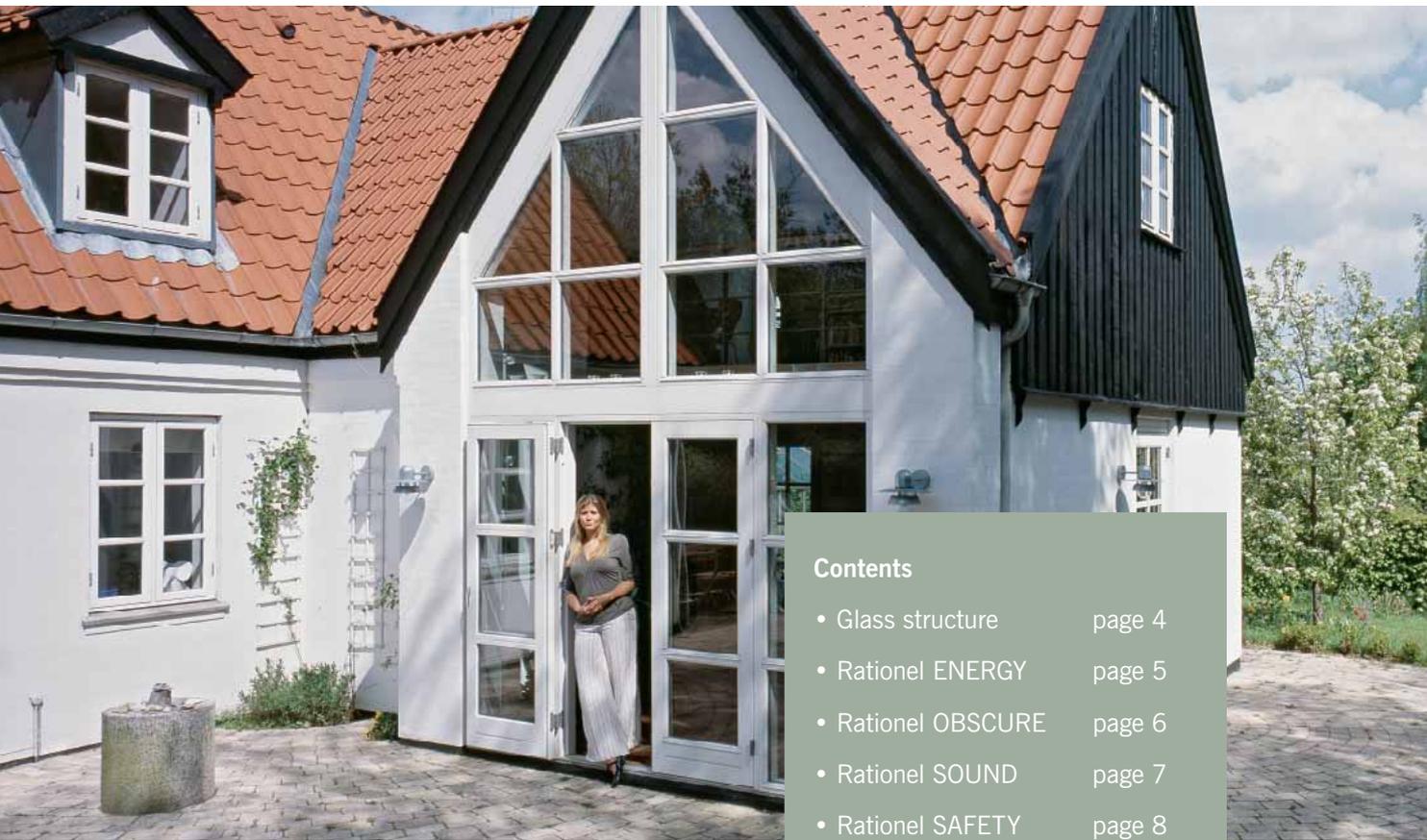


rational[®]
WINDOWS & DOORS



The right glass

Valuable information before choosing your glass



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Rationel – glass for different purposes

Choosing the right glass for new as well as old windows is often just as complicated as choosing a new window. Many factors have to be considered and it is therefore essential to determine the purpose of the new glass from the outset.

Determining the function and property of the glass are two important factors: Is solar reflection required? Or energy-efficient properties? Should the possibility of looking in or out of the window be reduced? Are noise-reducing properties required? Or is increased security / safety an issue? Rationel can offer glass for most situations. The various types are described in the following pages. The glass can also be combined so that, for example, you can have solar reflecting glass with both noise-reducing and burglary inhibiting properties.

Rationel Vinduer A/S is certified according to ISO 9001. All our glass is approved according to the requirements of EN 1279; therefore, you can be certain that all the products that leave our production facility live up to the most stringent quality standards.

Together with the window, the glass is an essential part of the exterior appearance of the house, and thus an important part of everyday indoor life. You should therefore consider things carefully before choosing your glass. We hope that the following pages will help you to make the right choice.

Welcome to a world of glass!

The structure of the Rationel glass is illustrated to the right. The structure determines both the quality and properties of the glass.

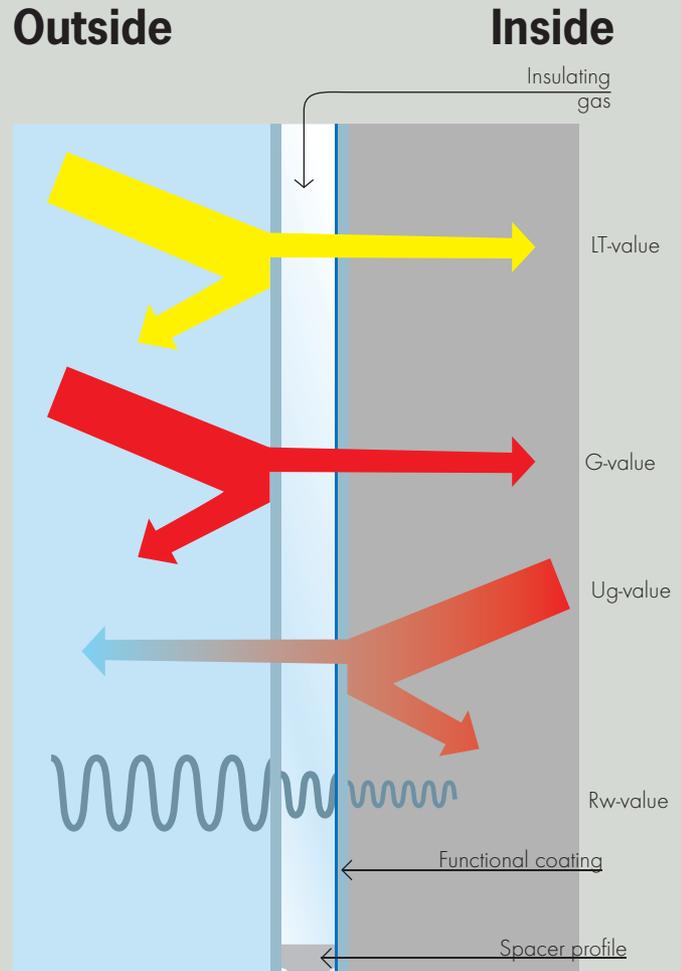
LT-value: – An expression of the light transmission rate. The higher the LT-value of the glass, the more sunlight passes through the glass into the house. (EN 410)

G-value: – An expression of free, added solar energy. The higher the g-value, the more solar heat passes through the glass into the house. (EN 410)

Ug-value: – An expression of the thermal loss through the centre part of the pane. The lower the Ug-value, the less heat is lost. (EN 673)

Rw-value: – An expression of the noise reducing effect of the pane. The higher the Rw-value, the better the noise reduction. For the human ear, a noise reduction of 8-10 dB is experienced as a 50% reduction of the noise; however, a noise reduction of no more than 3 dB reduces the damaging load on the ear by 50%.

The structure of Rationel's glass

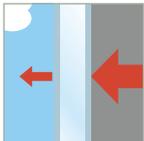


Rationel ENERGY – when the heat is to remain indoors

Energy-efficient glass means lower heating bills since it reduces not only the thermal loss but also the extent of cold waves dropping down into the room. The inner glass layer of an energy-efficient pane has a thin metal coating that reflects the heat back into the room. This coating is neutral, allowing maximum transference of sunlight, thus providing the room with additional heat, free of charge.

Rationel ENERGY panes not only create a bright, pleasant indoor environment but also reproduce the colours as neutrally as technically possible.

Rationel ENERGY panes fulfil the requirements of energy class A.



The space between the glass sheets is filled with argon which is a better insulator than air.

Rationel ENERGY (in figures)

| Pane type | Structure | U _g -value | LT-value | G-value | Noise reduction |
|-------------------------|-----------|-----------------------|----------|---------|-----------------|
| Clear/Energy with argon | 4-18-4 | 1,2 | 80,1 | 66,3 | 32 dB |
| | 4-24-4 | 1,2 | 80,1 | 66,3 | 32 dB |
| Clear/Energy with argon | 6-16-4 | 1,2 | 79,7 | 65,0 | 35 dB |
| | 6-22-4 | 1,2 | 79,7 | 65,0 | 35 dB |
| Clear/Energy with argon | 6-14-6 | 1,2 | 79,2 | 64,9 | 34 dB |
| | 6-20-6 | 1,2 | 79,2 | 64,9 | 34 dB |
| Clear/Energy with argon | 8-14-4 | 1,2 | 79,2 | 64,0 | 35 dB |
| | 8-20-4 | 1,2 | 79,2 | 64,0 | 35 dB |

Values according to EN 410 and EN 673 (dT = 15K filling degree = 90%). Rationel ENERGY panes are also available with a grey WarmEdge spacer profile. The table values apply only to the glass.

Rational OBSCURE – reducing the view



Rational OBSCURE is used primarily to reduce the possibility of looking into, for example, a bathroom.

OBSCURE glass is available in different patterns and in a frosted, laminated version that not only makes it harder to look in and out through the pane but also improves safety in case of burglary.

When combined with Rational ENERGY, the OBSCURE glass is used as the outer layer of the pane; when combined with Rational SOLAR, OBSCURE is used as the inner layer. The patterns are located inside the cavity which means that an OBSCURE pane is smooth and can be cleaned as any ordinary pane of glass.

Rational OBSCURE (in figures)

| Pane type | Structure | Ug-value | Noise reduction |
|--|---------------|----------|-----------------|
| Small Cathedral/Energy with argon | 4-18-4 | 1,2 | 32 dB |
| | 4-24-4 | 1,2 | 32 dB |
| Stippled Klarglass C/Energy with argon | 4-18-4 | 1,2 | 32 dB |
| | 4-24-4 | 1,2 | 32 dB |
| Silvit/Energy with argon | 4-18-4 | 1,2 | 32 dB |
| | 4-24-4 | 1,2 | 32 dB |
| Listral D/Energy with argon | 4-18-4 | 1,2 | 32 dB |
| | 4-24-4 | 1,2 | 32 dB |
| Satin Acid Etched/Energy with argon | 4-18-4 | 1,2 | 32 dB |
| | 4-24-4 | 1,2 | 32 dB |
| Cotswold/Energy with argon | 4-18-4 | 1,2 | 32 dB |
| | 4-24-4 | 1,2 | 32 dB |
| Matt Foil LAM/Energy with argon | 3/0,38/3-16-4 | 1,2 | 35 dB |
| | 3/0,38/3-22-4 | 1,2 | 35 dB |

Values according to EN 410 and EN 673 (dT = 15K filling degree = 90%).
Table values apply only to the pane. LAM=laminated.



Small Cathedral, white



Stippled Klarglass C



Silvit, white



Listral



Satin, acid etched glass, (has a surcharge)



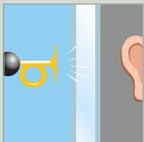
Cotswold

Rational SOUND – reduces noise effectively

Noise is an environmental problem. Many houses are affected so much by noise that their environment can be characterised as unsatisfactory. It is therefore often necessary to use panes with sound and noise reducing properties.

Sound moves through the air as waves.

Such waves continue through one layer of glass without being impeded too much, but not with two layers, as in a modern double-glazed unit. The bigger the difference in thickness between the two glass sheets and the larger the distance between them, the better they break the sound waves. Whether the glass is coloured, toughened or coated, this will almost never affect the noise reduction properties of the glass.



Sound is impeded by two glass sheet layers as in a modern double-glazed unit.

Rational SOUND (in figures)

| Pane type | Structure | Ug-value | LT-value | G-value | Noise |
|-------------------------|---------------|----------|----------|---------|-------|
| Clear/Energy with argon | 4-18-4 | 1,2 | 80,1 | 66,3 | 32 dB |
| | 4-24-4 | 1,2 | 80,1 | 66,3 | 32 dB |
| Clear/Energy with argon | 6-16-4 | 1,2 | 79,7 | 65,0 | 35 dB |
| | 6-22-4 | 1,2 | 79,7 | 65,0 | 35 dB |
| Clear/Energy with argon | 8-14-4 | 1,2 | 79,2 | 64,0 | 35 dB |
| | 8-20-4 | 1,2 | 79,2 | 64,0 | 35 dB |
| Sound/Energy with argon | 4/0,38/4-14-4 | 1,2 | 79,3 | 61,3 | 36 dB |
| | 4/0,38/4-20-4 | 1,2 | 79,3 | 61,3 | 38 dB |
| Sound/Energy with argon | 4/1,52/4-16-6 | 1,2 | 78,8 | 59,4 | 41 dB |

Values according to EN 410 and EN 673 (dT = 15K filling degree = 90%).
Table values apply only to the glass.

Rational SAFETY – for added assurance



Safety glass reduces the risk of personal injuries. The Rational SAFETY pane can be made of toughened or laminated glass. Both are difficult to break. If toughened glass breaks, it falls out of the sash and is shattered into small, harmless pieces. Laminated glass when broken remains in one piece held together by an interlayer.

Injuries from broken glass are unlikely when using either of the two types of safety glass.

Rational SAFETY has been tested and marked according to several national and European standards. The safety glass can be combined with other properties, such as low-energy, solar reflecting and reduced visibility properties.

Rational SAFETY (in figures)

| Pane type | Structure | Ug-value | LT-value | G-value | Noise |
|---------------------------------|---------------|----------|----------|---------|-------|
| Clear TGH/Energy LAM with argon | 4-16-3/0,38/3 | 1,2 | 78,5 | 64,5 | 35 dB |
| | 4-22-3/0,38/3 | 1,2 | 78,5 | 64,4 | 35 dB |
| Clear TGH/Energy LAM with argon | 6-14-3/0,38/3 | 1,2 | 78,0 | 63,1 | 32 dB |
| | 6-20-3/0,38/3 | 1,2 | 78,0 | 63,1 | 32 dB |
| Clear LAM/Energy with argon | 3/0,38/3-16-4 | 1,2 | 79,0 | 62,5 | 35 dB |
| | 3/0,38/3-16-4 | 1,2 | 79,0 | 62,5 | 35 dB |

Values according to EN 410 and EN 673 (dT = 15K filling degree = 90%).
Table values apply only to the glass. TGH=toughened. LAM=laminated.



The pane can be made of toughened or laminated glass. Both are difficult to break.

Rational SECURE – gives the burglar a hard time

For a burglar, the pane is often the easiest way into the house if, for example, the burglar can work undisturbed and the sound of breaking glass does not attract attention. In such places, it is a good idea to use laminated glass. Thanks to the properties of laminated glass, a great deal of effort and time is required to break through it.

The Rational SECURE glass has been tested and marked according to several national and European standards. The security glass can be combined with other properties, such as low-energy, solar shielding and reduced visibility properties.

Rational has a SECURITY programme that includes most of the range of windows and doors (pane, frame and sash), adding to the protection of the home.



Rational SECURE (in figures)

| Pane type | Structure | Ug-value | LT-value | G-value | Noise |
|-----------------------|---------------|----------|----------|---------|-------|
| P2A/Energy with argon | 4/0,76/4-12-6 | 1,3 | 78,0 | 60,5 | 35 dB |
| | 4/0,76/4-18-6 | 1,2 | 78,0 | 60,5 | 35 dB |
| P4A/Energy with argon | 4/1,52/4-10-6 | 1,5 | 77,9 | 59,2 | 35 dB |
| | 4/1,52/4-16-6 | 1,2 | 77,9 | 59,2 | 35 dB |

Values according to EN 410 and EN 673 (dT = 15K filling degree = 90%). SECURE classification according to EN 356. Table values apply only to the glass.

Rationel FACADE – a stylish addition to the house



Rationel FACADE is used for buildings where a visually coherent façade is required, or simply a façade where special colour effects are required. Façade glass is well suited for parapet sections, ventilated and insulated areas and for storey divisions.

The type most used is enamelled glass. Available in 10 standard colours; however, it is also available in custom colours according to individual wishes, at an extra cost.

Rationel FACADE (in figures)

| Pane type | Structure | Standard colours |
|---------------|-----------|------------------|
| Façade Enamel | 6 mm | RAL 7011 |
| | 6 mm | RAL 7016 |
| | 6 mm | RAL 7024 |
| | 6 mm | RAL 7026 |
| | 6 mm | RAL 7031 |
| | 6 mm | RAL 7035 |
| | 6 mm | RAL 9005 |
| | 6 mm | RAL 9007 |
| | 6 mm | RAL 9016 |
| | 6 mm | RAL 9018 |

The colours are approximated RAL colours and slight colour differences may occur.

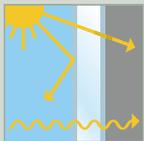
Rational SOLAR – reduces heat from sunlight

With Rational SOLAR panes it is possible to design large glass façades – also south or west facing façades. SOLAR limits the amount of sunlight and heat and is available in five pane types, depending on the degree of required light and heat shielding.

SOLAR 70, 51 and 40 consist of coated glass sheets with a neutral repro-

duction of colours when looking from the inside out. This means that the colours seen outside the window look almost like the original colours.

SOLAR Green and Grey have through-coloured glass (green and grey). It is cheaper than coated glass and reduces the amount of both light and heat, but distorts the colour experience slightly.



SOLAR glass – a good solution for large south and west facing façades.

Rational SOLAR (in figures)

| Pane type | Structure | Ug-value | LT-value | G-value | Noise reduction |
|-------------------------------|-----------|----------|----------|---------|-----------------|
| Solar 70/Clear with argon | 6-16-4 | 1,1 | 69,9 | 40,9 | 35 dB |
| | 6-22-4 | 1,1 | 69,9 | 40,9 | 35 dB |
| Solar 51/Clear with argon | 6-16-4 | 1,1 | 50,9 | 28,0 | 35 dB |
| | 6-22-4 | 1,2 | 50,9 | 28,0 | 35 dB |
| Solar 40/Clear with argon | 6-16-4 | 1,1 | 40,0 | 23,6 | 34 dB |
| | 6-22-4 | 1,1 | 40,0 | 23,6 | 34 dB |
| Solar Green/Energy with argon | 6-16-4 | 1,2 | 64,6 | 38,6 | 35 dB |
| | 6-22-4 | 1,2 | 64,6 | 38,6 | 35 dB |
| Solar Grey/Energy with argon | 6-16-4 | 1,2 | 38,0 | 37,0 | 35 dB |
| | 6-22-4 | 1,2 | 38,0 | 37,0 | 35 dB |

Values according to EN 410 and EN 673 (dT = 15K filling degree = 90%).
Table values apply only to the pane.



Rational – the original window

Rational develops, manufactures and markets vertical windows and entrance doors for the North European markets.

Our products are made of the finest wood from Scandinavian forests and are designed and manufactured with a view to ensuring maximum functionality and aesthetic value. Simply quality in every detail.

For more than 50 years we have lived up to our customer's requirements for high-quality products. If you have any questions or require further information about Rational and our products, please contact our office below for sound advice and professional guidance. Or visit www.rational.co.uk for more information about Rational's wide range of windows and doors.

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