REHAU®

Unlimited Polymer Solutions

# BFRC ENERGY RATING – THE REHAU ABC

## ENERGY EFFICIENT WINDOWS AND DOORS

www.rehau.co.uk

**Building Solutions**

Automotive

Industry

# INTRODUCTION

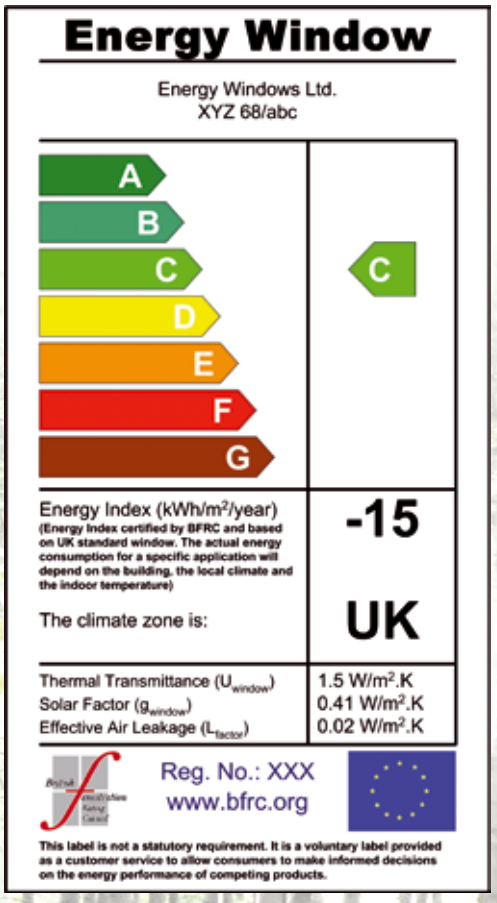
## IMPROVING THE ENERGY EFFICIENCY OF WINDOWS AND DOORS

**This information was put together in order to provide some background information to the BFRC Energy Rating, how to get your windows rated and which ratings are achievable with REHAU window systems. Further information is given on the web site www.bfrc.org**

### Background

Buildings are one of the major users of energy and one of the main areas of energy losses in any building is via the glazing. Improving the energy efficiency of windows and doors gives large improvements in the energy efficiency of buildings. Windows are in place for a long time and efficiency gains achieved by fitting high performance windows are effective for the life of the product. This will significantly reduce fuel bills, improve comfort and reduce greenhouse gas emissions for the life of the window installation.
The UK government has committed itself to huge reductions in $CO_2$ emissions within the Kyoto Agreement. This can only be achieved by significantly reducing the energy use of houses. Government, consumers and specifiers are focusing more and more on the energy efficiency of building products. Windows are one of the prime components of interest.

For consumer purpose, the BFRC Rating value is converted to a rating on an A to G scale, which is known to the public from white good products, like fridges or washing machines.




### What is the Window Energy Rating?

The British Fenestration Rating Council (BFRC) is an independent, government-backed initiative set up to enhance the energy performance of buildings. BFRC in conjunction with the UK glazing industry and European partners has developed a Window Energy Rating to assess the energy performance of domestic windows.

## Building Regulation

The BFRC Rating for windows is now included in the Building Regulation Part L with effect from April 2006. Beside the existing target U-Values for replacement windows, compliance to Part L can be shown using certain Window Energy Ratings. The standard for replacement windows in an existing dwelling should be an energy rating of 'E' or better and the standard for new windows in extensions should be a 'D' Rating or better. For new dwellings the compliance with Part L is proven via a Target $CO_2$ Emission Rate, which needs to be met, without specific BFRC requirements for the windows. For further information please refer to Building Regulation Part L.

| Fittings | Standard for new fittings in extensions | Standard for replacement fittings in an existing dwelling |
|---|---|---|
| Window, roof window and rooflight | $U_w$ = 1.8 W/m²K or<br>BFRC Rating = Band D or<br>$U_g$ = 1.2 W/m²K | $U_w$ = 2.0 W/m²K or<br>BFRC Rating = Band E or<br>$U_g$ = 1.2 W/m²K |

## Energy Saving Trust

C rated windows or better are included in the Energy Saving Trust scheme "Energy Saving Recommended". The "Energy Saving Recommended" certification mark was developed by the Energy Saving Trust to distinguish the most energy efficient products on the market. Only products that meet the strict requirements will be endorsed and given the certification mark. Again this logo is widely known to the public. Further information is given on the web site: www.est.org.uk

energy saving® recommended
www.energysavingtrust.org.uk

Certification mark

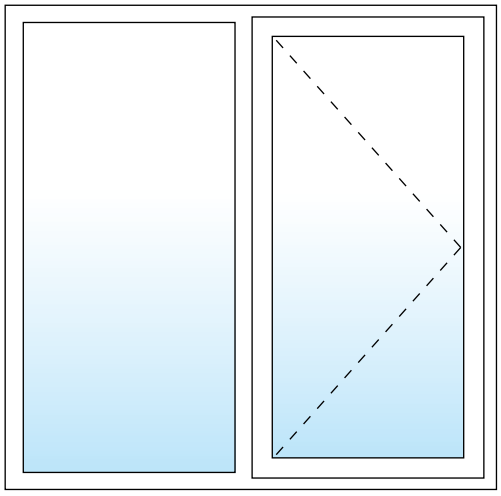
# BFRC RATING CALCULATION
## HOW TO GET YOUR WINDOWS RATED

The BFRC has developed an equation to calculate the BFRC Rating. The value of the rating represents the net useful energy flow through the window throughout the year for a typical UK house. If the rating value is positive, it means that the window is likely to be a net contributor of energy over the year (A-Rating).

The unit of the rating is kilowatt-hours per square metre per year. 10 kWh/m$^2$/a represent a heat loss of about 1 litre oil or 10 m$^3$ gas per square metre window and year.

| BFRC Rating Scale | BFRC Rating kWh/m2/a |
|---|---|
| A | > 0 |
| B | -10 to < 0 |
| C | -20 to < -10 |
| D | -30 to < -20 |
| E | -50 to < -30 |
| F | -70 to < -50 |
| G | < -70 |

For consumer purposes the BFRC Rating value can be converted to a rating on an A to G scale.



The BFRC Rating is based on a standard Fixed beside Side Hung window (1230 mm wide x 1480 mm high).

The rating combines the three key factors, which affects the window energy performance:

– Solar Gain (g-Value)
– Thermal Transmittance (Uw-Value)
– Air Leakage ($L_{50}$-Value)

The three factors are linked by the following equation:

BFRC Rating = 218.6 * g – 68.5 * ($U_w$ + $L_{50}$)

The solar gain is the most important influencing factor within the BFRC Rating. In order to achieve the best ratings the g-Value of the glazing unit should be greater than 60%. Best performance would be achieved by the use of low iron glass. In parallel the visual glazing area should be maximised by using slim sight line profiles.

The thermal transmittance or $U_w$-Value of the overall window is calculated out of the $U_g$-Value of the glazing unit, the ψ-Value of the spacer bar and the $U_f$-Value of the window profile. To improve the $U_g$-Value, gas filling (Argon, Krypton) and low E coating (hard or soft coat) can be used. The ψ-Value can be improved by using warm edge spacer instead of Aluminium. And finally the $U_f$-Value of the profiles can be improved by using the patented REHAU Thermal Sleeves within the reinforcement chamber. REHAU Thermal Sleeves will improve the $U_f$-Value by up to 0.2 W/m$^2$K.

The heat loss because of air leakage is calculated via the $L_{50}$-Factor. The air leakage at 50 Pa pressure difference can be taken from existing air leakage test reports carried out by UKAS approved test laboratories. Out of all three influencing factors (g-Value, $U_w$-Value, $L_{50}$-Factor) the $L_{50}$-Factor contributes the least to the BFRC Rating, but never the less needs to be considered.

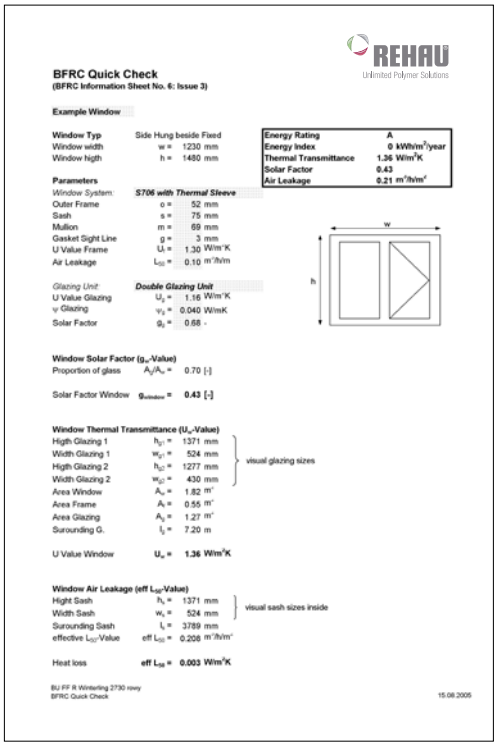
### Getting windows BFRC certified

Either the window fabricator or the installer can apply for BFRC approval as long as they supply both, frames and glazing units. They have to ensure via their quality management system that the purchased window achieves the performance as stated on the BFRC Certificate and must therefore control both frames and glass.

The first step in the BFRC process is the internal preparation. It has to be decided which profile and glazing unit combinations should get certified. For this purpose REHAU has developed a BFRC Quick Check program. With this program achievable BFRC Ratings with different profile and glazing unit combinations can easily be analysed. Once the combinations are specified, the BFRC Quick Check results need to be verified by a BFRC Certified Simulator. Therefore, CAD drawings of the profile and glazing unit combinations together with an UKAS approved air leakage test result need to be provided.

Beside the thermal simulation the BFRC Scheme requires that manufacturers have a recognised quality management system in place. There is no need for a new quality management system, if the manufacturer has an ISO 9001 or similar approval (e.g. BBA, BWF or BM TRADA Q-Mark) then this will be acceptable to the BFRC. Once both thermal simulation and quality management are in place, an Independent Agency (IA) is necessary for the rest of the certification process. The IA is selected by the manufacturer and manages all the contact with the BFRC during the process. The IA checks the thermal simulation and the quality management system. After successful verification the IA informs the manufacturer and requests authorisation to release the results to the BFRC for full formal recognition and listing.

The BFRC will issue the certificate, lists the product on the BFRC web based database and authorises the manufacturer to use the BFRC Window Energy Label on BFRC Certified products and for appropriate publications.



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**BFRC Quick Check**

**(BFRC Information Sheet No. 6: Issue 3)**

**Example Window**

| | | | |
|---|---|---|---|
| **Window Typ** | Side Hung beside Fixed | | |
| Window width | w = 1230 mm | | |
| Window higth | h = 1480 mm | | |
| **Parameters** | | | |
| *Window System:* | ***S706 with Thermal Sleeve*** | | |
| Outer Frame | o = 52 mm | | |
| Sash | s = 75 mm | | |
| Mullion | m = 69 mm | | |
| Gasket Sight Line | g = 3 mm | | |
| U Value Frame | $U_f$ = 1.30 | W/m²K | |
| Air Leakage | $L_{50}$ = 0.10 | m³/h/m | |
| *Glazing Unit:* | ***Double Glazing Unit*** | | |
| U Value Glazing | $U_g$ = 1.16 | W/m²K | |
| ψ Glazing | $\psi_g$ = 0.040 | W/mK | |
| Solar Factor | $g_g$ = 0.68 | - | |

| | |
|---|---|
| **Energy Rating** | **A** |
| **Energy Index** | **0 kWh/m²/year** |
| **Thermal Transmittance** | **1.36 W/m²K** |
| **Solar Factor** | **0.43** |
| **Air Leakage** | **0.21 m³/h/m²** |

**Window Solar Factor ($g_w$-Value)**

| | | | |
|---|---|---|---|
| Proportion of glass | $A_g/A_w$ = | 0.70 | [-] |
| Solar Factor Window | $g_{window}$ = | **0.43** | **[-]** |

**Window Thermal Transmittance ($U_w$-Value)**

| | | | |
|---|---|---|---|
| Higth Glazing 1 | $h_{g1}$ = | 1371 | mm |
| Width Glazing 1 | $w_{g1}$ = | 524 | mm |
| Higth Glazing 2 | $h_{g2}$ = | 1277 | mm |
| Width Glazing 2 | $w_{g2}$ = | 430 | mm |
| Area Window | $A_w$ = | 1.82 | m² |
| Area Frame | $A_f$ = | 0.55 | m² |
| Area Glazing | $A_g$ = | 1.27 | m² |
| Surounding G. | $l_g$ = | 7.20 | m |
| U Value Window | $U_w$ = | **1.36** | **W/m²K** |

visual glazing sizes

**Window Air Leakage (eff $L_{50}$-Value)**

| | | | |
|---|---|---|---|
| Hight Sash | $h_s$ = | 1371 | mm |
| Width Sash | $w_s$ = | 524 | mm |
| Surounding Sash | $l_s$ = | 3789 | mm |
| effective $L_{50}$-Value | eff $L_{50}$ = | 0.208 | m³/h/m² |
| Heat loss | **eff $L_{50}$ =** | **0.003** | **W/m²K** |

visual sash sizes inside

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BFRC Quick Check

15.08.2005

REHAU has developed a BFRC Quick Check program. With this program achievable BFRC Ratings with different profile and glazing unit combinations can easily be analysed.

# BENEFITS
## IMPROVED MARKETING OPPORTUNITIES

There are significant marketing opportunities. The government, consumers and specifiers are focusing more and more on the energy efficiency of building products. By getting your windows BFRC certified you would be able to market the following benefits:

– Window energy rating acts as a driving force for improved window energy efficiency.
– Window energy rating will provide differentiation between good and poor products.
– Window energy rating allows the consumer to accurately assess the relative energy efficiency of competing products and to clearly see the product benefits.
– The use of the BFRC Label will reassure customers of independent testing and approval of the products
– Window energy rating will be a new sales aid for manufacturers of efficient windows.
– It will be a new business opportunity for differentiating your products from price based competition.
– High performance will be clearly rewarded with higher ratings.
– The extra cost to specify and fit high performance windows is small and the savings and benefits are significant in both the short and the long term.
– Energy efficient windows will lead to reduced energy usage and cost to the consumer, improve comfort and contribute significantly to CO2 emission reductions.

### Achievable BFRC Ratings

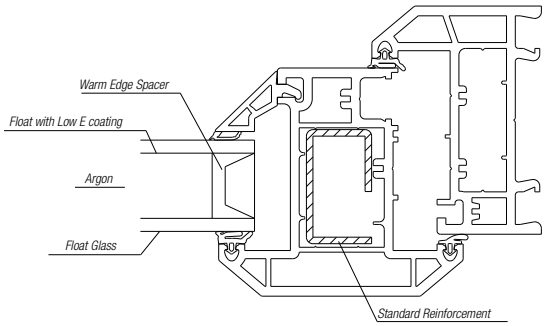
The Solar Gain, the Thermal Transmittance and the Air Leakage influence the BFRC Rating. Because of this each profile and glazing unit combination needs to be simulated. In the following you can find a general guidance how to achieve an A, B and C Rating with REHAU window systems (REHAU Tritec and REHAU S706).

REHAU 70mm Casement Window

## C Rating

C Rating can be achieved with both, REHAU-Tritec and REHAU S706 by using:

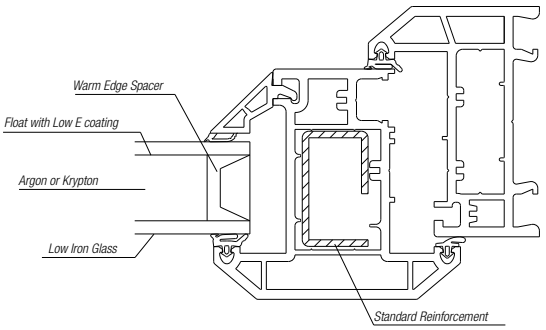
– Slim sight line profiles
– Standard reinforcement
– Double glazing with Argon gas filling, low E coating
– Warm edge spacer




## B Rating

B Rating can be achieved with both, REHAU-Tritec and REHAU S706 by using the specification for the C Rating and changing the outer pane to low iron glass.

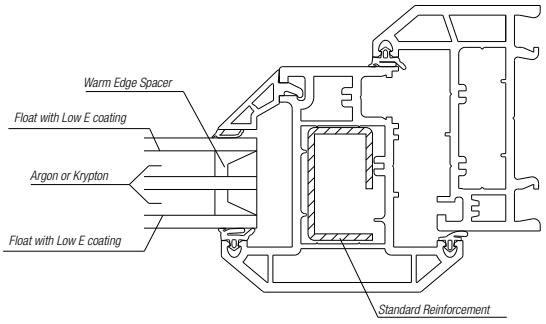
– Slim sight line profiles
– Standard reinforcement
– Double glazing with low iron glass, Argon gas filling and low E coating
– Warm edge spacer




## A Rating (triple glazed)

A Rating can be achieved with both, REHAU-Tritec and REHAU S706 by using the specification for the C Rating and changing the double glazing unit to triple glazing.

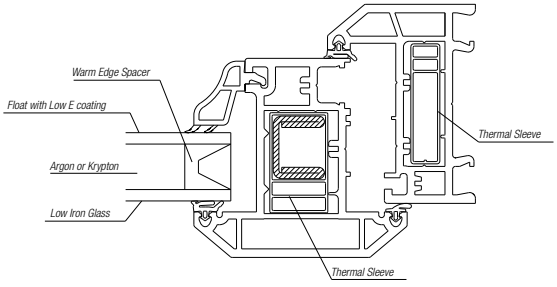
– Slim sight line profiles
– Standard reinforcement
– Triple glazing with gas filling (Argon, Krypton) and low E coating
– Warm edge spacer




## A Rating (double glazed)

In addition a double glazing option for REHAU S706 can be offered, by using the specification for the C Rating and changing the standard reinforcement to patented REHAU Thermal Sleeves.

– Slim sight line profiles
– REHAU Thermal Sleeves standard reinforced
– Double glazing with low iron glass, Krypton gas filling and low E coating
– Warm edge spacer



Instead of competing with the rest of the world about windows, which just comply with the Building Regulation, you can promote your windows by using the BFRC Energy Rating. C Rating, B Rating or even an A Rating is possible. So don't miss this marketing opportunity.

For further information please contact your regional REHAU sales office or visit the web site **www.bfrc.org**

**Statement**

In creating this information, REHAU offers its opinion on various matters and makes certain recommendations, after careful study of the Regulations and consultations with other bodies in the Window Industry.

This has been done in good faith to offer guidance for the benefit of our customers and the customers of our customers.

REHAU has taken every reasonable precaution to ensure the information contained is accurate.

However, REHAU will not be held liable if it has misinterpreted the Regulations in any way or if any of its opinions or recommendations are subsequently challenged. Companies relying on the information in this booklet do so at their own risk.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