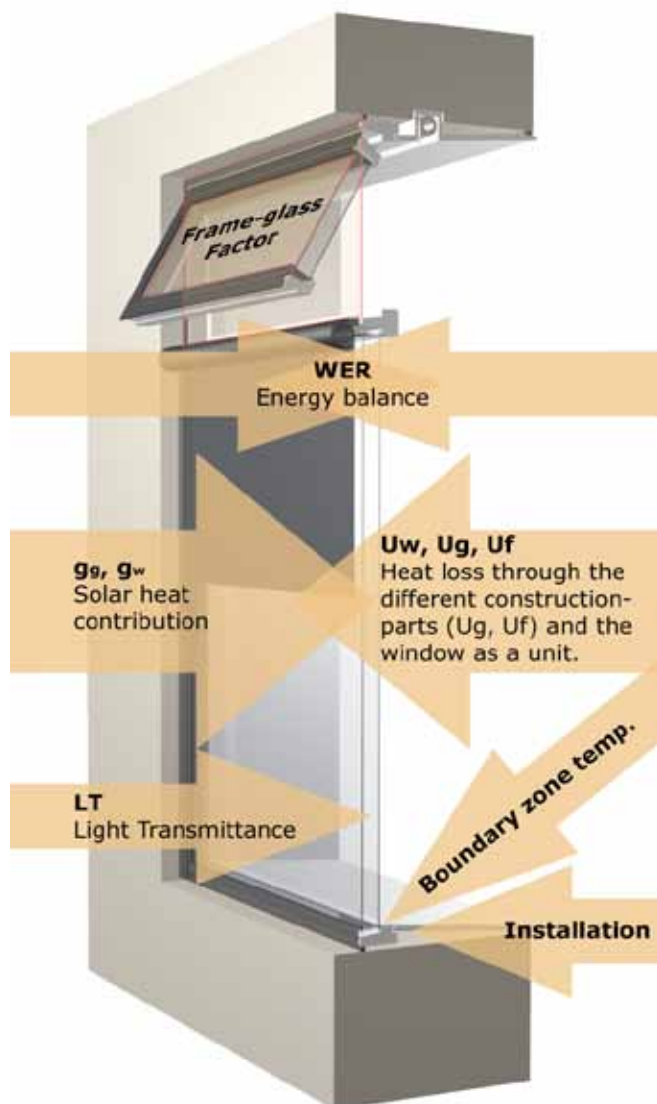




Energy

- reaching Passive House level



Every part of a window influences the thermal performance.

In contrast to the wall, windows have the ability to let in solar heat and daylight.

In Low Energy Buildings the window choice is even more crucial – meeting Passive House level makes the interdependence between building design and energy concept even stronger.



Rational Windows

- Your partner for low energy buildings

Rational Windows and Doors can offer both products and guidance on how to reach Passive House level.

We have participated in several low energy builds and thereby achieved great experience in energy optimisation of windows and doors for dwellings and institutions.

The 5 main topics to address in order to get the best out of your windows are:

1) Placement on site

The orientation of your home, shading conditions and the type of windows play an important role in your heating bill. The choice of window pane should reflect the amount of sun light available and the heat needed during winter.

2) Building shape

Compact buildings have the greatest potential, when it comes to energy optimisation, this means fewer extensions, bays and joints in general.

3) Windows - amount, type and placement

The right window choice depends on where in the facade the window is placed. Towards east, west and south we recommend that the windows are optimised according to potential direct sunlight, to utilise as much free heat as possible. Towards north the key is to focus on the U-value.

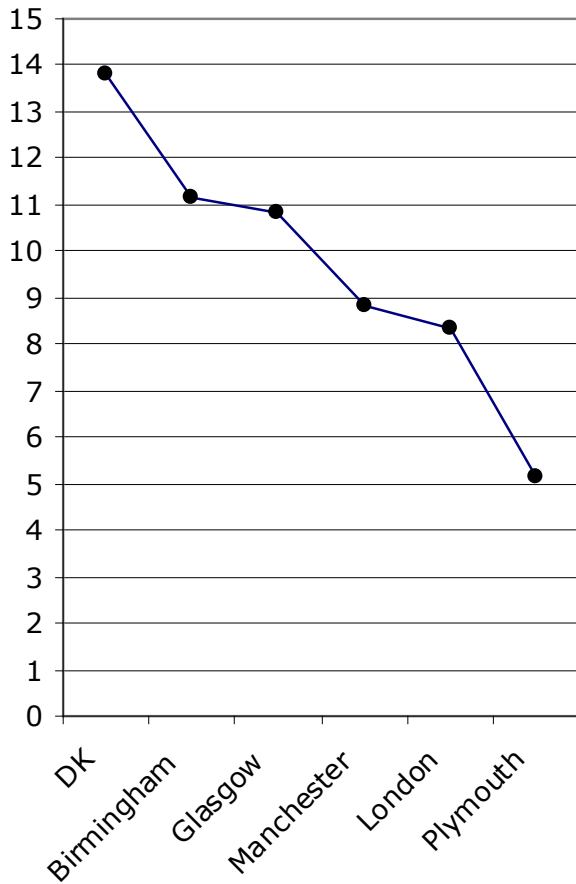
4) Solar shading

When you utilise the free solar heat to the utmost, there is a risk that you will experience unpleasant over heating during the summer. Solar shading can prevent this.

5) Window installation

An optimised solution can save up to 25% on your heating bill!

Average
kWh/m²/year



Heating demand is location dependent

The geographic position of a Passive House can greatly affect the calculated heating demand - even within the UK.

The graph shows the average heating demand for a number of Passive Houses theoretically moved to different locations within the UK.

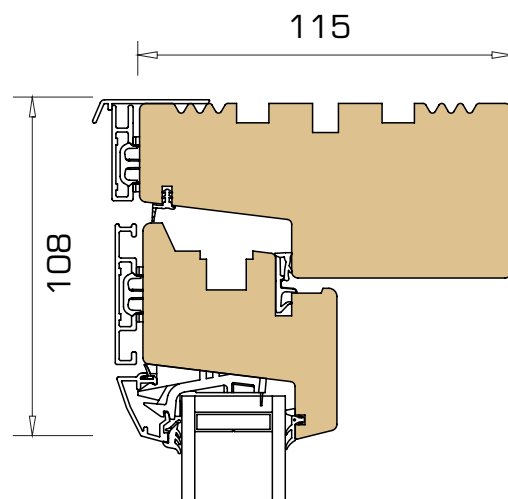
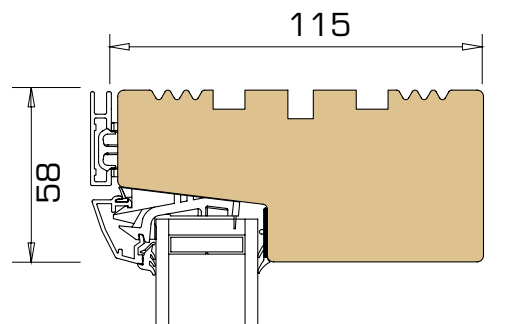
NOTE: Be aware of what is climate data used in your PHPP-calculation!

Rational's design team will help you find the best windows and doors for your building at your specific location.

ALDUS technical details

Construction height fixed: 58 mm
Construction height opening: 108 mm

- Warm edge spacer
- Triple glazing is possible
- U-value as low as 0,79 W/m²K
- Positive energy balance (WER)
- Energy glazing bars
- Opening outwards
- Sound package
- Safety package





Window pane and orientation

South:

The most important factor on the south façade is to utilise the available solar energy to heat the building. Choose modern double or triple-glazed energy windows with a low U-value and a high g-value to make use of the free solar heat. South façades get more sun light than the other three - however you have to be aware of the risk of over heating with large windows facing south. This can be avoided by using solar shading such as sun blinds and roller blinds.

East / West:

On these façades the sun also contributes with solar heating. Choose modern double or triple-glazed energy windows with a low U-value and a high g-value to make use of the free solar heat. Be careful with large windows toward east in terms of risking over heating.

North:

If the façade faces north or is fully shaded, there is limited sun light. This calls for focus on insulation - the windows should have as low a U-value as possible. Rationaler offers a triple-glazed window with a U-value down to 0.79. It can be a good solution even to place large windows towards the north, to ensure a healthy indoor climate and to avoid risk of over heating.

Rational Windows

- cutting the heat bill

The free solar heat that passes through the windows is often the main heat supplier in low energy buildings.

Choosing the right windows is both cost efficient and often crucial in order to meet the heating demands in the Passive House criteria.

The table shows heat loss and heat gain through the windows in a specific Passive House. Gross energy gain is common in the Passive Houses we have participated in.

Window Area Orientation	Transmission Losses	Heat Gains Solar Radiation
maximum:	kWh/a	kWh/a
North	198	27
East	183	182
South	1514	2454
West	281	118
Horizontal	306	125
	2482	2906

The figures are from one of the many Passive Houses with Rational windows installed.

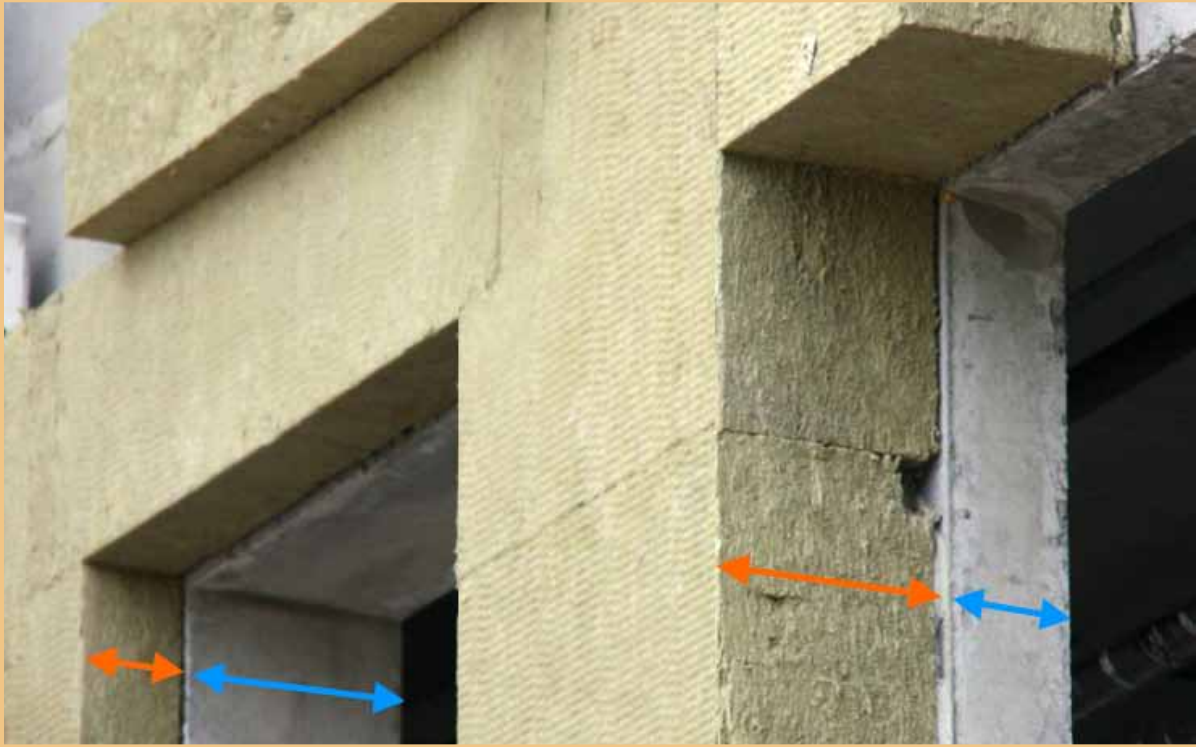


Installation

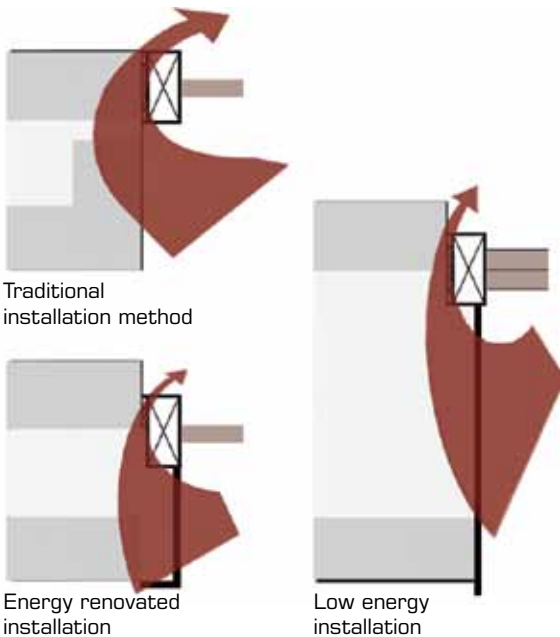
- can be a weak link!

When energy optimising all building components, the linear heat loss through joints suddenly stands for a notable heat loss in the overall energy calculation - unless they, as with the rest of the building, are carefully detailed with energy consumption in mind.

Continuous insulation and window placement in the wall opening has a substantial influence on potential heat gain and heat loss.



Installation principles



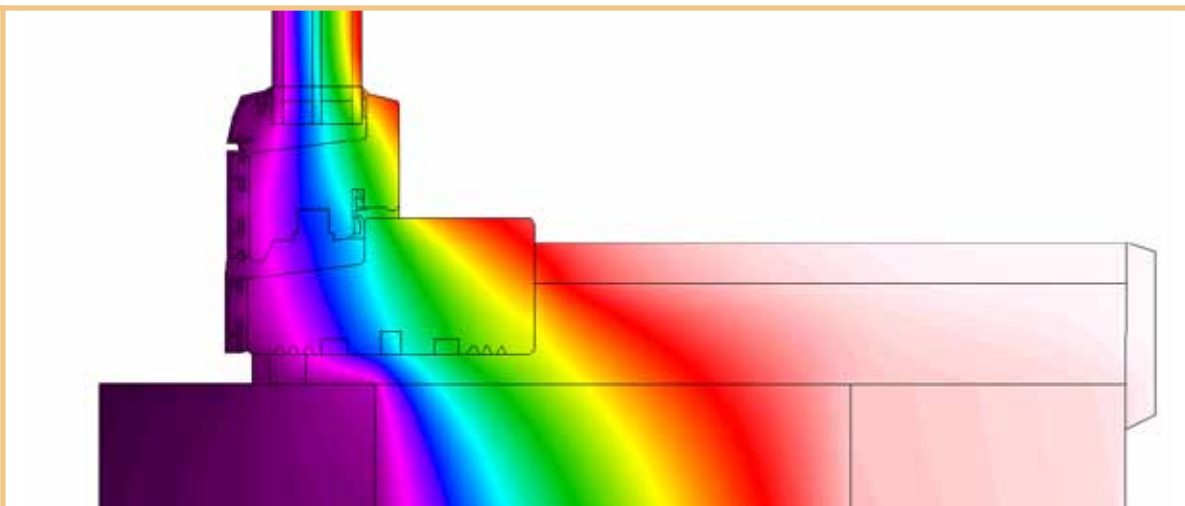
We recommend that the window is installed near the outer surface of the wall. This has the following benefits:

- The optimum placement for utilising the free solar heat
- Extra living space
- A lighter building expression, the facades will seem like surfaces rather than thick castle wall with deep holes



We can support you with Passive House suitable solutions.

A regular installation method compared with an energy optimised solution can mean up to 25% on the heating bill.



Installation details for Passive Houses

When building low energy buildings - even small details can have a significant influence both in the calculation and on the building cost.

The installation detail is a cost efficient place to optimise!



Renovation

When renovating to low energy level the existing construction can be a challenge.

Check if the existing wall construction around the window opening contains a thermal bridge that can be eliminated.

Passive House School

The project contains both retrofitting of an existing building and 1200 square meter new build. They both comply with the demands in the Passive House standard, which means that in terms of energy heating it is close to self-sufficient by utilising the free solar heat that passes through the windows.



Main scandinavian window supplier to **Passive Houses**

Passive House day-care

Three nearly identical day-care centres, placed at different locations in the same city. Individual orientation and shading conditions required extra care in the design phase to utilize the solar gain and reach Passive House level.



Single family homes

When designing small building units, orientation, shading conditions, building shape and density becomes even more crucial.



Retro fitting

In general quite a task - but with large saving potentials

