

**VELUX®**

TUEN

Old house, new life



# Fresh air, instant comfort

## Rebuilding a one-family home with roof windows

The yellow brick one-family home built in 1937 is located north of the Danish capital of Copenhagen.

The building is a two-storey house with basement. Roof construction and coverings were replaced in 2013, while rooms and first-floor landing were rebuilt in 2015. As part of the rebuilding, three bedrooms, a bathroom and the hall were equipped with roof windows.

Residents: a family of two parents, Thomas and Charlotte, and their two teenage children.



# Construction process



## The Challenge: old and cold

With a spacious interior, a cosy garden and proximity to good transport links, the family found their perfect home in the year 2000. However, the building had shortcomings. The original roof construction from 1937 was poorly insulated, causing a chilly and unpleasant indoor climate, and the owners decided to have it replaced and rebuilt with additional insulation.

"But after the first rebuilding, the indoor climate still wasn't good enough. We decided to rebuild the first floor with improved insulation, new flooring and a new vapour barrier," says house owner Thomas.

He and his wife, Charlotte, got in contact with a VELUX representative, who presented them with a proposal for rebuilding. At first, the family had reservations. The proposal included eleven roof windows and suggested that all rooms and the hall should be opened to the ridge.

"But then we started to think about it. We could see the advantages of a division of one room into two," says Thomas.

In late 2014, the family embarked on a major rebuilding of the first floor. It included new oak plank flooring, addition of extra insulation, dividing one room into two and installation of eleven roof windows.



Design tips:  
roof windows combined with vertical elements visually makes the room feel even bigger.

Place windows both high and low to maximise stack effect. Placing windows on both sides of the room optimises cross-ventilation.



# Solution: more light, less chill

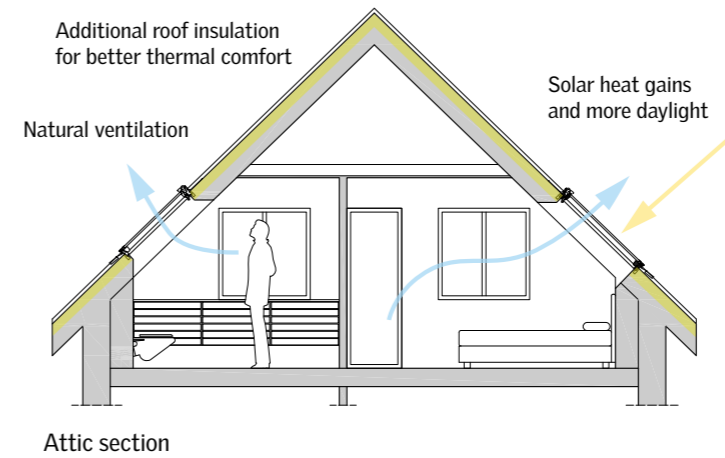
The main purpose of the rebuilding was to improve the indoor climate. At first, the family wondered whether the extensive installation of roof windows contradicted the goal of thermal comfort. However, their fears turned out to be unfounded. When the rebuilding was finished, the windows neither weakened the insulation nor caused any significant temperature changes.

"I was concerned that cold air from the windows would make the rooms feel chilly. But with the VELUX blinds rolled down, you don't feel any cold drafts," says Thomas.

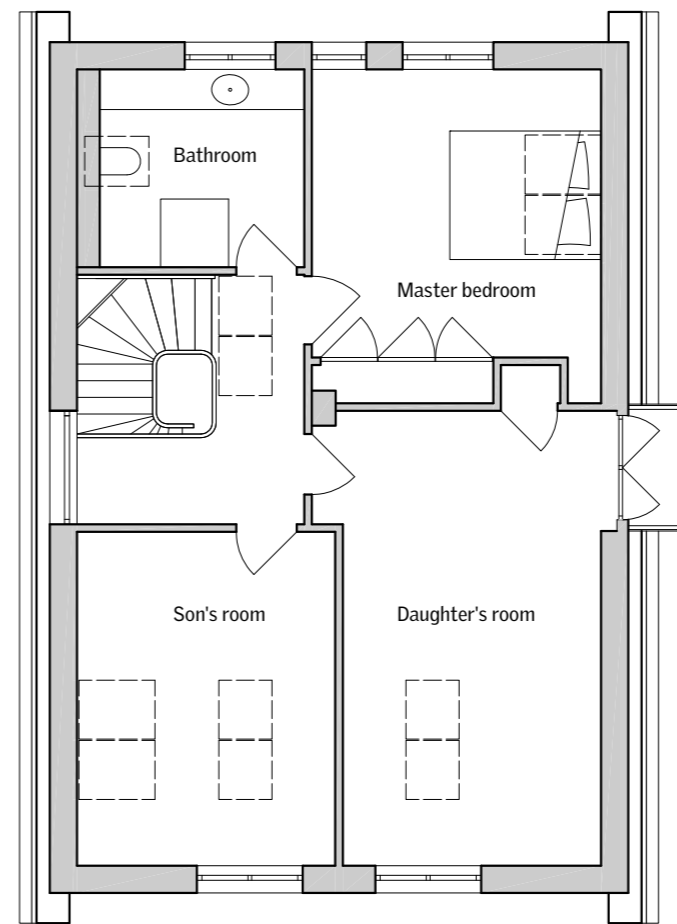
The rebuilding itself also turned out to be more straightforward than the family had anticipated: "Thomas and I were both worried about all the holes that were necessary to install the windows," says Charlotte.

"But it went well. It took two builders about a week to install all the windows," relates Thomas. As part of the rebuilding, ROCKWOOL insulation was added to the walls.

"The house is much warmer now. Previously, we always closed the door to the hall because it felt so cold. We don't do that anymore," says Charlotte, while her husband adds: "The rooms are much more useful now."



Attic section



Attic plan





## Bedrooms with roof windows: sleeping under the stars

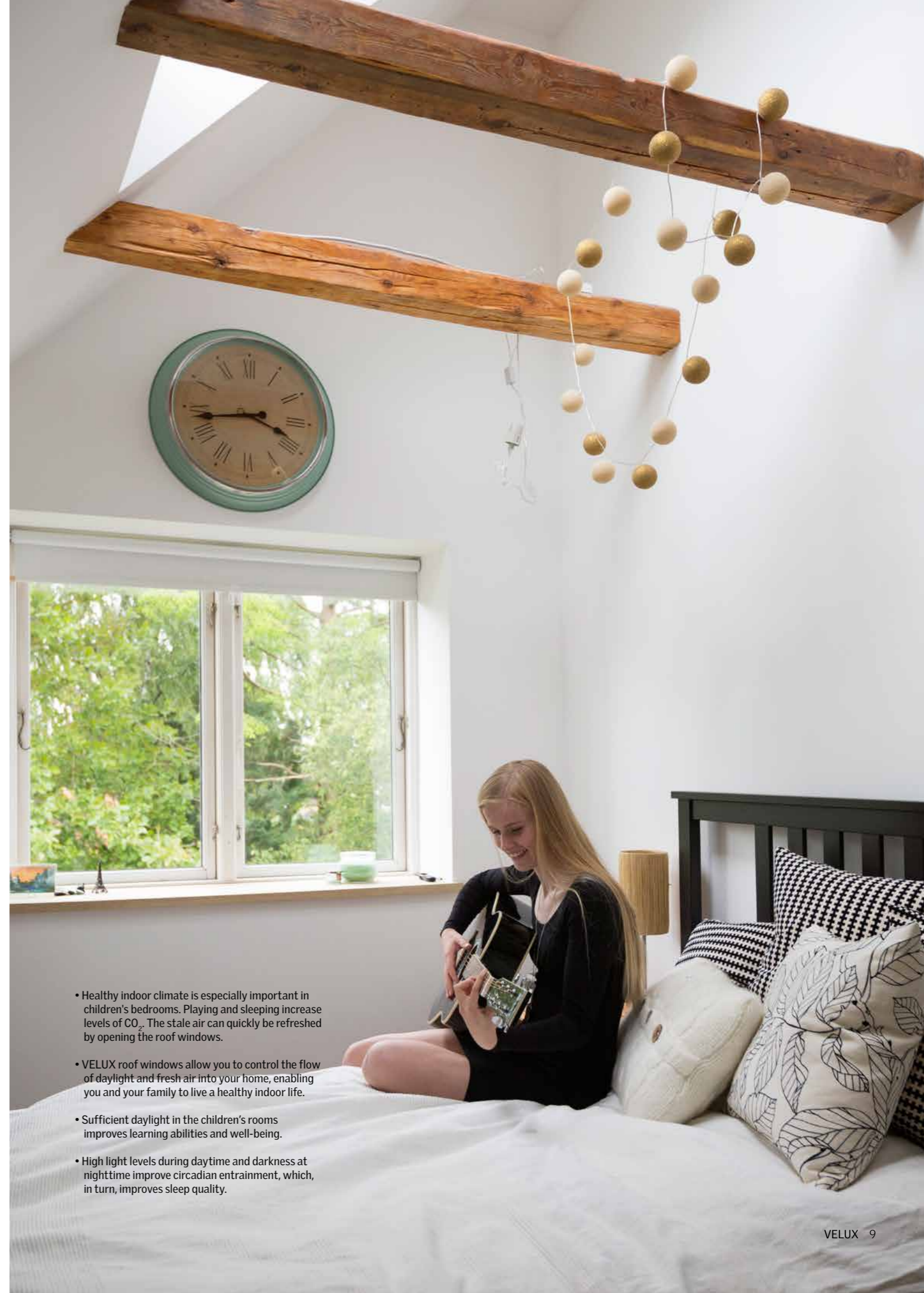
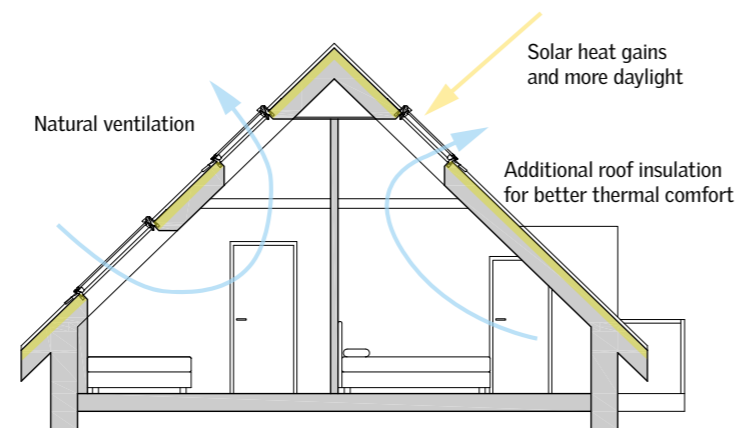
The rebuilding has transformed the look as well as the atmosphere of the first floor.

"The rooms feel more airy. Especially in cloudy weather, you can sense how there is much more light than before. Actually, I appreciate the roof windows most of all when the weather is bad," says Charlotte. The master bedroom and the oldest daughter's bedroom are both equipped with roof windows:

"Our daughter loves spending time in her room. Previously, she preferred to lie on the couch in the living room, but now she is almost always sitting in her room, alone or with friends," explains Charlotte. In the master bedroom, the windows have created a feeling of closeness to nature. In Thomas' experience, the surrounding garden has almost become a part of the house:

"Now, the treetops are quite close to the bedroom." From the outside, the roof windows have changed the connection between the house and its surroundings too. And for the better, according to Thomas. "One of our neighbors actually told us that he finds the light from our daughter's window at night quite cosy. You cannot look into the room from the outside, but you can see the light flowing out. He likes that." Thomas himself also plans to enjoy the benefits of roof windows after dark:

"I am looking forward to lying on my bed at night and looking at the stars. I will program the blinds to roll down during the night, so I won't be woken up by the early morning light."



- Healthy indoor climate is especially important in children's bedrooms. Playing and sleeping increase levels of CO<sub>2</sub>. The stale air can quickly be refreshed by opening the roof windows.
- VELUX roof windows allow you to control the flow of daylight and fresh air into your home, enabling you and your family to live a healthy indoor life.
- Sufficient daylight in the children's rooms improves learning abilities and well-being.
- High light levels during daytime and darkness at nighttime improve circadian entrainment, which, in turn, improves sleep quality.

# Programmable remote control: fresh air at your fingertips

Most of the roof windows in the house are placed close to the ridge line. They can be opened and closed with a remote control that comes with built-in software to program time settings.

"To me, the possibility of time setting makes the whole difference. Especially the fact that you can program your own fixed intervals," says Thomas. He usually chooses an interval of fifteen minutes, depending on weather and season. When the remote control is not in use, it is attached to the wall with a magnet. While the design itself is simple and discreet, the effects of the automatic control have become quite visible in the daily life of the family:

"Thanks to the automatic air change, our teenagers actually care about ventilation. They can sense the benefits of fresh air," says Charlotte.

"The indoor climate aspect of the windows has been a pleasant surprise"



2-4 airings a day is all it takes to achieve optimum indoor air quality.

10 LITER

is the amount of moisture generated by the daily activity of a family of four in their home.



# Daylight

The daylight performance of the house has been specified using the daylight factor (DF) as performance indicator. The results of the daylight analysis show that all rooms that are used actively during the light hours have a daylight factor above 5%. The roof windows deliver high levels of daylight in the centre part of the room.

High levels of daylight in the home are proved to have potential for health benefits and increased alertness and safety.

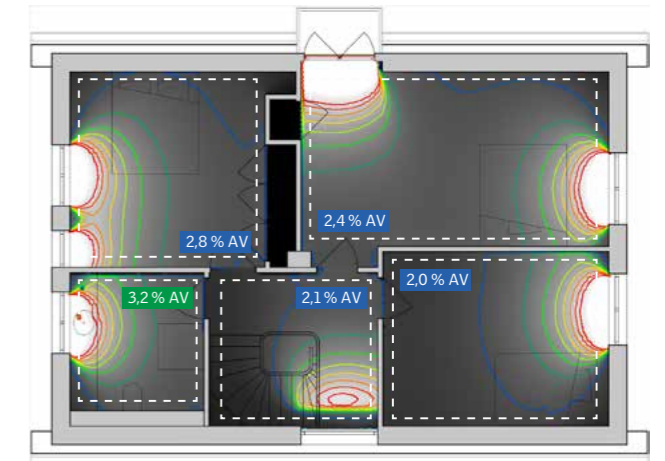
The daylight factor is a common and easy-to-use parameter for the available amount of daylight in a room. It expresses the percentage of daylight available inside, on a work surface, compared to the amount of daylight available outside the building under known overcast sky conditions. The higher the DF, the more daylight is available in the room. Rooms with an average DF of 2% or more are considered adequately daylight. A room will appear strongly daylight when the average DF is above 5%.

Comparisons of the results show the positive effects on the daylight conditions by adding roof windows. The roof windows provide a more even distribution of light in the rooms. Before the renovation the daylight levels were critically low and electrical lighting was needed throughout the whole day.

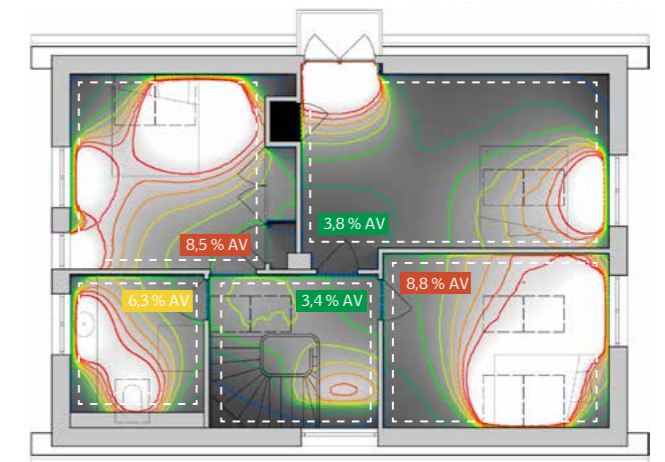
Daylight is vital for our biological rhythm and has a positive impact on our well-being and performance and thus provides the family with a better living environment. In addition, optimised and controlled use of daylight reduces the need for artificial lighting and provides useful solar gains during the winter period. In this respect, intelligent use of daylight can significantly help reduce a building's energy consumption.



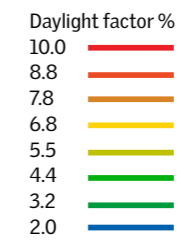
## Daylight factor:



Attic daylight factor plan without VELUX roof windows



Attic daylight factor plan with VELUX roof windows



(AV = average daylight factor)

Simulations were made by the VELUX Daylight Visualizer 2, a software tool dedicated to daylighting design and analysis. For more details and download, visit <http://viz.velux.com>.

# About the VELUX Group

For more than 70 years, the VELUX Group has created better living environments for people around the world. Making the most of daylight and fresh air through the roof. Our product programme includes roof windows and modular skylights as well as a range of decoration and sun screenings, roller shutters, installation solutions and intelligent home controls. These products help to ensure a healthy and sustainable indoor climate. For work and learning. For play and pleasure. We work globally – with sales and manufacturing operations in more than 40 countries and around 10,000 employees worldwide. The VELUX Group is owned by VKR Holding A/S, a limited company wholly owned by foundations and family. For more information, visit [www.velux.com](http://www.velux.com)

## VELUX products

### VELUX INTEGRA® roof windows

If you want ultimate comfort, remote-controlled VELUX INTEGRA® is the answer. This innovative system of remote controlled windows, blinds and shutters lets you open and close them with just one touch of the control pad. VELUX INTEGRA® is the ultimate choice for fresh air and a better indoor comfort.



### Exterior VELUX INTEGRA® suncreening Awning blind model MML - electrically operated.

The exterior awning blind blocks the sun's rays before they hit your window pane and reduces passive heating. It helps keep your room comfortable on a warm, sunny day. Awning blinds are transparent, so you can still enjoy your view out and get light in.



### Interior VELUX INTEGRA® Electrically operated blinds.

Elegantly designed blinds for easy control and blackout effect



## VELUX INTEGRA®

### Fresh air and a better indoor climate

Fresh air helps to feed your brain, and a pleasant indoor temperature can improve your comfort. That's why the VELUX INTEGRA® control pad has pre-set programs that automatically open your roof windows to let in fresh air and lower your blinds to block the heat. This boosts energy levels for everybody in your family.



#### Indoor climate program:

Opens the roof window automatically four times a day for 15 minutes, replacing all the air in a room of 16 m<sup>2</sup>. A rule of thumb is to air out at least three times a day to maintain a healthy indoor climate.

You can easily customise this program to match your daily routine.



#### Ventilation program:

Opens the roof window 50% for 15 minutes and then closes automatically. Activate it after a bath, when cooking or whenever immediate airing is needed and you don't want to think about closing the window again



#### Energy Balance

The Energy Balance program uses historical weather data from 25 different European locations to give you optimal indoor comfort, any time of year.

This data is used to automatically lower or raise your blinds and shutters to avoid overheating in the summer, and to let in passive solar heating during the winter in order to create the best possible indoor climate while saving energy costs in all seasons.



#### Sunscreening program:

Automatically lowers your blinds or shutters during the hottest hours of the day to maintain a comfortable indoor temperature and prevent your furniture from fading. Automatic sun screening also reduces the need for electrical cooling. You can easily customise this program to match your daily routine.

### A good night's sleep

Create the perfect conditions for a good night's sleep. VELUX INTEGRA® automatically airs out your bedroom, lowers your blinds for complete darkness and raises them on command to wake you gently with morning daylight.



#### Goodnight program:

Automatically airs out for 15 minutes just before you go to bed, then lowers your shutters or blinds to provide darkness and privacy.



#### Good Morning:

Opens your shutters or blinds slightly to let in a little morning light. 10 minutes later, the window will open. After another 10 minutes, the shutters will roll completely up and five minutes later, the window will close automatically.

You can easily customise this program to match your daily routine.

### Worry-free home security

Most families have busy mornings. That's why the VELUX INTEGRA® control pad lets you lock all roof windows and doors at the touch of a button before you leave home. When you go on vacation, the system even activates a program to make it look like you're still at home, with blinds going up and down during the day.



#### Leaving Home program

Closes all windows with one touch. Door locks and gates will also automatically close if they are connected to the system. If any other VELUX INTEGRA® programs are running, they are overruled, ensuring that no window, door lock or gate will open automatically once the program is activated.



#### On Vacation program:

Lowers and raises interior and exterior blinds and shutters at different times during the day and week to make it appear as if you're home. And with the KFD adaptor, VELUX INTEGRA® can even turn on electrical appliances (lights, radio, etc.) to a pre-set schedule. The On Vacation program can be customised to do exactly what you want – and be activated with a single touch.

Please note: The On Vacation program allows adjustment of VELUX INTEGRA® blinds, shutters, electric lights and on/off switches at fixed times during the day, typically morning and evenings. Weekdays differ from weekends. All time settings can easily be adjusted to suit your needs.



All VELUX INTEGRA® roof windows are pre-fitted with a rain sensor that closes the window at the first drop of rain. If you try to open the window during a shower of rain, the control pad display will inform you that it is raining. If you still want to open the window, you can override the control, but only to 50% of the maximum opening position.

### Use less energy

Let your VELUX INTEGRA® blinds and shutters play an active role in saving energy in your home. Reduce the need for air conditioning in summer and keep the heat inside during winter. Maintain the temperature you want, no matter what climate you live in.



#### Energy Balance program:

The Energy Balance program uses historical weather data from 25 different European locations to give you optimal indoor comfort, any time of year.

This data is used to automatically lower or raise your blinds and shutters to avoid overheating in the summer, and to let in passive solar heating during the winter in order to create the best possible indoor climate while saving energy costs in all seasons.



#### Sunscreening program:

Automatically lowers your blinds or shutters during the hottest hours of the day to maintain a comfortable indoor temperature and prevent your furniture from fading. Automatic sun screening also reduces the need for electrical cooling. You can easily customise this program to match your daily routine.



VELUX A/S  
Ådalsvej 99  
DK-2970 Hørsholm  
www.velux.com

*Bringing light to life™*

**VELUX®**