



Multi-Comfort  
House

# The ISOVER System for Airtightness and Moisture Protection

**ISOVER**

# Introduction

Today's modern housing needs to provide much more than basic shelter from the elements – it must offer high standards of quality and safety throughout. Just as high standards of energy efficiency have now become the norm, families today require a comfortable thermal environment all year round, and excellent acoustic protection from both internally and externally generated noise. Equally important are issues such as fire protection and the longevity of the property – and, of course the quality of the internal air within the building.

To address these challenges, ISOVER has developed and refined its Multi-Comfort House concept to offer the ultimate combination of solutions to meet the demands of modern living.



## The ISOVER Multi-Comfort House ...

- *is based on the passive house concept, leading to bioclimatic design*
- *is sustainable and takes environmental, economic and social factors into account*
- *offers optimal thermal comfort and related energy savings*
- *offers excellent acoustic and visual comfort, superb air quality internally, fire protection and safety*
- *permits great flexibility in building design, both externally and internally*

*... and forms the keystone of ISOVER's strategy for the sustainable development of buildings*

# Contents

|  |    |
|--|----|
| INTRODUCTION   | 2  |
| WHY IS AIRTIGHTNESS IMPORTANT?                                   | 4  |
| MEASURING AIRTIGHTNESS   | 8  |
| MOISTURE PROTECTION – ESSENTIAL FOR EVERY BUILDING               | 10 |
| VARIO – THE INTELLIGENT RETARDANT THAT ADAPTS<br>TO EVERY SEASON | 12 |
| ISOVER – COORDINATED SOLUTIONS FOR AIRTIGHTNESS                  | 16 |
| AIRTIGHTNESS – DETAIL IS KEY                                     | 20 |
| PRODUCTS FOR AIR AND WIND-TIGHTNESS                              | 28 |

Air quality within in a building is today an important measure of comfort for its occupants. Achieving optimum air quality requires a regulated ventilation system for indoor air, more often than not combined with heat recovery from the exhaust air. The typical short, irregular ventilation provided by opening windows and doors is rarely adequate.

Efficient regulated indoor air ventilation can only be achieved if the building shell is airtight. In a leaky building, air flows through cracks and open joints, but this is uncontrolled and depends largely on wind direction and the prevailing weather. Thus it is vital, when renovating an existing building or building new, that the building shell is airtight: this ISOVER brochure is designed to provide the right systems, solutions and advice to help you do the job correctly.

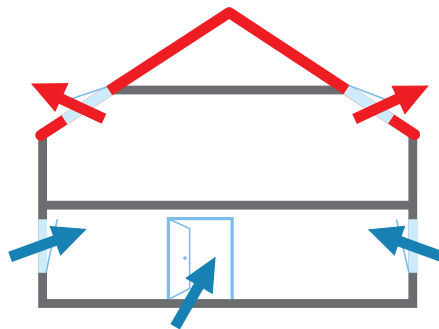
## Important terminology at a glance

**Airtight construction** prevents air moving out of the building and improves the integrity of the building envelope. The airtight membrane is installed on the warm side of the construction and also works as a water vapour retardant. Typical solution: ISOVER VARIO KM or VARIO KM Duplex UV climate membranes and system components.

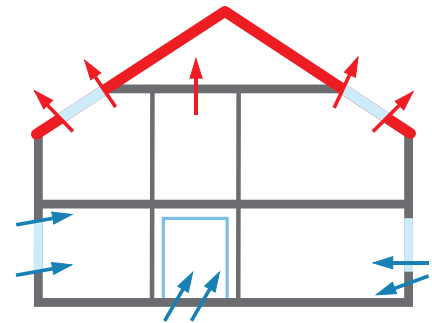
**A wind-tight construction** prevents air moving into the building from outside. The wind-tight membrane is installed in the external part of the construction and protects it from cooling and dampness. Typical solution: ISOVER INTEGRA ZUB.

## Why is airtightness important?

Only when the construction is airtight can warm air be retained within the building and cold air kept outside. Preventing unpleasant draughts means greater living comfort and increased energy efficiency, which in turn leads to lower heating costs. Airtightness also protects the building fabric against damage, helping to maintain its appearance and extending the building's life.



*Controlled ventilation via windows and doors in an airtight building.*



*Uncontrolled air exchange via cracks and gaps in a leaky building shell.*

### Energy efficiency

The trend towards increased energy efficiency has led to house constructions that are thermally and economically optimised, similar to those defined in the passive house standard. Increasing the thermal integrity of a building can reduce transmitted thermal loss, i.e. heat lost through the building envelope, to a tenth of that of a conventional house. An essential step towards increased energy efficiency is the optimization of fresh air supply to the building through regulated indoor air ventilation,

usually combined with heat recovery from exhaust air. This requires the building shell to be airtight, with no uncontrolled and undesirable air exchange through joints and cracks.

The cost of energy almost doubled between 1998 and 2002, and despite possible short term fluctuations, the long-term forecast is for further increases in energy prices, supply shortfalls and insecurity of supply.

#### Comparison of thermal needs of different house standards

|  |                                  |
|--|----------------------------------|
| old restored house                         | approx. 300 kWh/m <sup>2</sup> a |
| average house (post-1980)                  | approx. 100 kWh/m <sup>2</sup> a |
| low-energy house                           | approx. 50 kWh/m <sup>2</sup> a  |
| ISOVER Multi-Comfort House (passive house) | ≤ 15 kWh/m <sup>2</sup> a        |
| uncontrolled leakage                       | ≤ 20 kWh/m <sup>2</sup> a        |

Increased thermal quality and airtightness of buildings will therefore have a significant role to play in the future. Uncontrolled and unwanted air flow can have a dramatic effect on heating requirements, which can increase up to 20 kWh/m<sup>2</sup>a (kilowatt hours per sq. metre per annum). By comparison, an ISOVER Multi-Comfort House (passive house standard) requires no more than 15 kWh/m<sup>2</sup>a of heat input.

## Thermal comfort

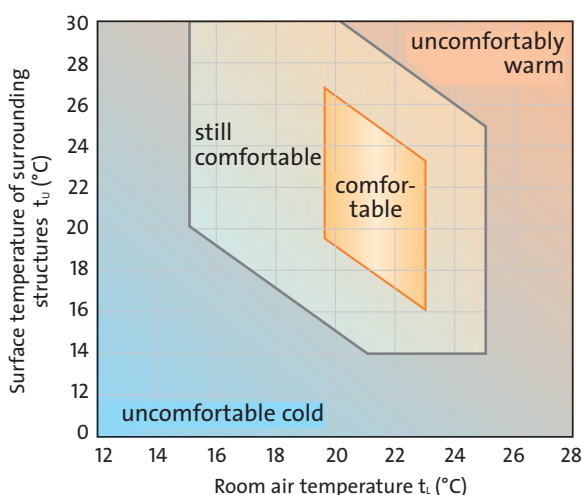
As we spend more and more time indoors, a comfortable interior climate has become increasingly important. It is no longer enough just to have basic protection against cold or heat, families today expect a constant, comfortable living environment and fresh air all year round. This, in turn, makes stringent quality demands on the quality of design and construction of a building. As well as having adequate thermal insulation, the building shell must be airtight to prevent the uncontrolled flow of air in and out of the building. Leaky cracks and joints will invariably cause uncomfortable draughts.

Many factors affect our perception of living comfort, the most important being:

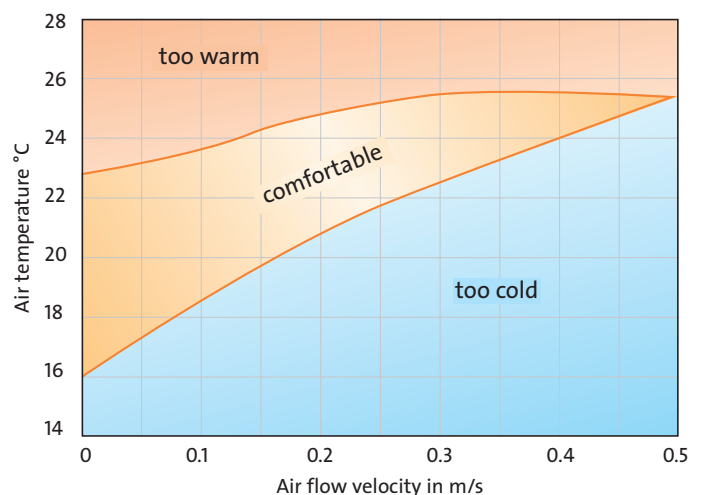
- *air temperature and the relative humidity in the room*
- *surface temperature of the various surrounding external building components (floor, walls, ceiling)*
- *air movement and velocity in the room*
- *difference between indoor and outdoor temperatures*

Even a difference in temperature between the air in the room and the surrounding floor, wall, ceiling and window surfaces can give rise to draughts and unwanted air flow – the smaller this temperature differential, the greater the perception of comfort and well-being in the room.

The body temperature of a healthy human being is approximately 37°C. A person's individual perception of comfort depends on room temperature, the activity they are undertaking and their clothing. An air temperature of approx. 22°C is generally perceived as "comfortable" in sedentary living areas, whereas with physical exercise, air temperatures of between 16-19°C can be perceived as "comfortable".



Thermal comfort related to room temperature and surface temperature of the surrounding building components (floors, walls, windows, ceilings).



Living comfort related to air flow velocity and air temperature.



Roof beams infested  
with mould

## Protecting the building fabric

Leaks are a potential cause of damage in a building. When damp, warm air moves from the interior of a room through gaps and cracks into the colder areas of the building, the water vapour it contains can condense into water. This condensation provides an ideal habitat for moulds and other fungi. Depending on the location and the size of the leak, the material affected can therefore suffer damage. In addition, when moisture penetrates insulation material its insulation performance can be reduced by up to a sixth, when compared to dry material. This reduction in thermal performance leads to further dampness accumulating in the construction, setting in motion a chain reaction that invariably leads to serious damage. An airtight building shell, without leaks, prevents this process and helps to ensure the longevity of the building fabric.

## A widespread myth: “The breathing building”

The “breathing building” myth is sadly still widespread amongst people unfamiliar with constructional engineering. Construction physics and practical experience have long shown the serious consequences of this fallacy. Normal air exchange between inside and outside through the opaque (non-transparent) elements of the building – walls, floors and ceiling – simply cannot provide an adequate supply of fresh air, and rooms there-

fore need to be properly ventilated. Moisture equilibrium generally occurs within the first 8-13 mm of the interior building lining. This process is particularly apparent in plaster, plasterboard and wood cladding, which explains why these materials have long been preferred for use in interiors.

### Ventilate properly

*The best solution is controlled room air ventilation. If this is not available, then rooms must be ventilated by opening windows and doors. This is generally best achieved using a “full ventilation” technique, whereby windows and doors are fully opened for a few minutes at intervals during the day. This ensures that moisture-laden interior air is replaced by oxygen-rich air from outside.*

## Quality of workmanship is even more important than careful planning

Maximum energy efficiency and regulated room ventilation require not just careful planning, but also skilled execution and stringent quality control. It is very important to schedule the various tasks so that the carefully installed airtight layer is not damaged by the work that follows.

## Our most precious resource – our health

When air from outside leaks into a building, it can carry substances that are potentially harmful to health, such as pollen, mould and fungi spores. Even the materials used in the building itself, such as old wood preservatives, can present a hazard. These substances and materials can provoke allergies, and represent a potential or real hazard to the health of the building's occupants.

Human activity in enclosed spaces results in a rise in the concentration of carbon dioxide and humidity, and a fall in oxygen concentration. Controlled ventilation of a building is vital to provide an adequate supply of oxygen-rich fresh air. Numerous studies have shown that this cannot be achieved merely with sporadic or trickle ventilation, particularly during colder months when the outdoor temperature is low and windows are kept shut. The result is “bad, stale air” and high concentrations of harmful substances.

Ensuring excellent air quality in buildings requires a combination of high levels of building airtightness and controlled ventilation to provide a constant supply of fresh, oxygen-rich air. The air must then be passed through a filter to remove dust, pollen, and other harmful substances, significantly improving the quality of life for allergy-sufferers.

### Don't get out of breath

*Our need for fresh air should not be underestimated. Oxygen is our most important nutrient and we can only exist for a very short time without it. Medical and health experts recommend a fresh air supply of 30 m<sup>3</sup> per person per hour. These figures are based on a maximum CO<sub>2</sub> concentration of 0.15% or 1,500 ppm. (parts per million). To maintain such a room climate requires a high rate of proactive fresh air exchange.*



# Measuring airtightness

*Burning tealight candles make air flow visible.*



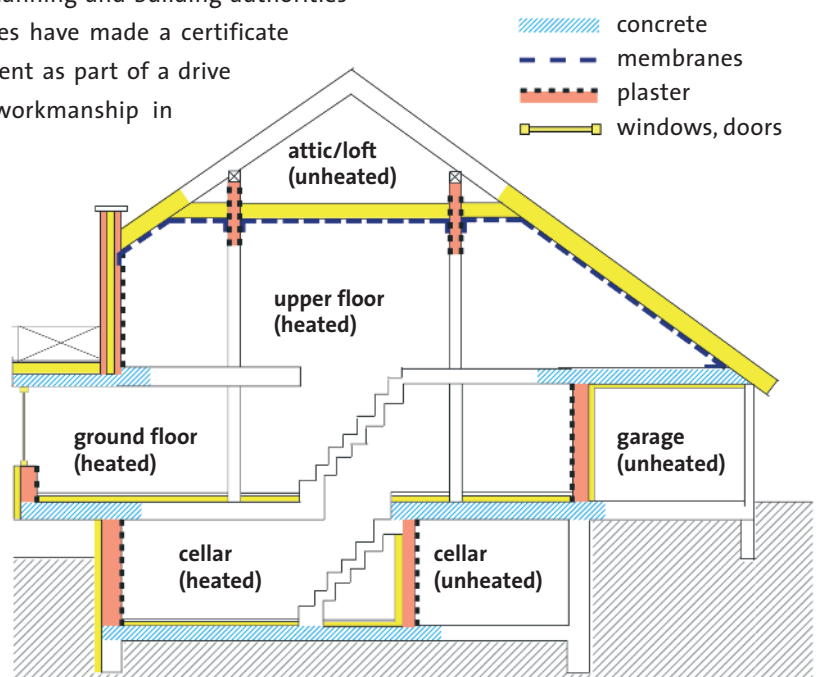
Many weak spots in the building fabric, such as cracks, gaps or holes – are easy to spot. Obvious draughts can also be easily pinpointed by the layperson, either using a wet finger or by the strategic positioning of tealight candles. However, to identify and locate all problem areas requires a more sophisticated approach, using the Blower Door Test.

## The Blower Door Test

Today, the Blower Door Test method of measuring airtightness is included as standard in quality control testing for energy-efficient houses. With new lightweight buildings or renovation projects, this test is done before the cladding is fixed, to allow the rectification of possible weak spots. With solid construction methods, such as brick, concrete and stone, however, the test is done after the building has been rendered. To ensure adequate precision and to authentically simulate real conditions, the measurements are taken at a range of different pressures.

In the past few years, the Blower Door Test has become a standard part of passive house certification. In addition, the planning and building authorities in some European countries have made a certificate of airtightness a requirement as part of a drive to increase quality and workmanship in buildings.

*The elements and components of a building contributing to airtightness: membranes, plasters, concrete, windows and doors.*

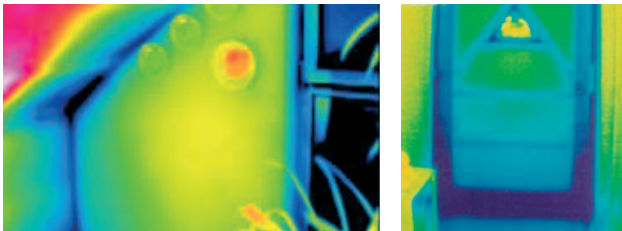


## Blower Door Test procedure

After windows and doors have been closed, the fan creates a pressure difference of 50 Pascal (Pa) between inside and outside the building – and then determines the flow rate needed to maintain this pressure difference.

The blower door detects leakiness, since the volume of air needed to maintain the pressure difference is equal to that leaking out of the building under pressure through the joints and cracks in the structure. The corresponding volume of air indicates the degree of leakiness.

However, in difficult cases, particularly when checking buildings prior to extensive renovation, it is sometimes useful to combine the Blower Door Test with thermography, as the latter directly shows up leaks.



## Airtightness requirements

$n_{50}$  expresses airtightness in numbers, and indicates how often the air volume of the building concerned is exchanged per hour at a pressure difference of 50 Pa.

For buildings with no ventilation system,  $n_{50}$  must not exceed 3.0; for buildings with a ventilation system, no more than 1.0 and for ISOVER Multi Comfort Houses, less than 0.6. The figure of 0.6, for example, means that a maximum of 60% of the complete building air volume can escape per hour – with care, however, this can be reduced to as low as 0.3.

# Moisture protection – essential for every building

One of the main reasons for producing airtight constructions is to protect against moisture and dampness. Within buildings, people, animals and plants continuously release moisture. During the colder months of the year, when the interior temperature of the building is higher than that outside, this moisture is carried outside with the warm air through joints and cracks, and condenses within the building structure. This uncontrolled penetration of moisture is equally damaging for both solid and lightweight constructions, and can only be avoided by making the building shell airtight.

## How wet is air?

*The quantity of water vapour in air is temperature-dependent. The warmer the air, the more water vapour it can contain. At 30 °C, for instance, water vapour content is approximately 30 g/m<sup>3</sup>, whilst at 0 °C it is just 5 g/m<sup>3</sup>, and at -10 °C no more than 2 g/m<sup>3</sup>. In a 10 m<sup>2</sup> room at 30 °C with a 2.5 m ceiling height, approximately 750 g of water vapour is present in the air.*

In solid wall constructions with external thermal insulation, the interior plaster, windows and doors form the airtight layer. In case of renovation and the installation of interior insulation, the airtight layer must be on the inner, warm side of the structure or the thermal insulation material will become damp, leading to possible damage. VARIO products from ISOVER meet all essential requirements, and thereby help to secure the longevity of your property.

In lightweight and timber constructions, it is important that the outer surface of the construction is windproof and the inner surface airtight. For full wind proofing, ISOVER's INTEGRA ZUB is recommended as a particularly stable underlay and sarking membrane. For interior airtightness, use VARIO KM or VARIO KM Duplex UV fixed with matching adhesive and sealing products.

## The requirements of airtightness materials

*Generally, materials like foils, cardboard, boards and plaster, which are used to produce flat surfaces, are airtight. All of the materials used must be compatible and selected to work together, which is particularly important in the case of ceiling membranes and adhesives. UV and moisture resistance are important, as is tear resistance and since, in cold regions, the airtight layer is applied to the warm side, or interior, of the building, the materials must also be water vapour retardant.*

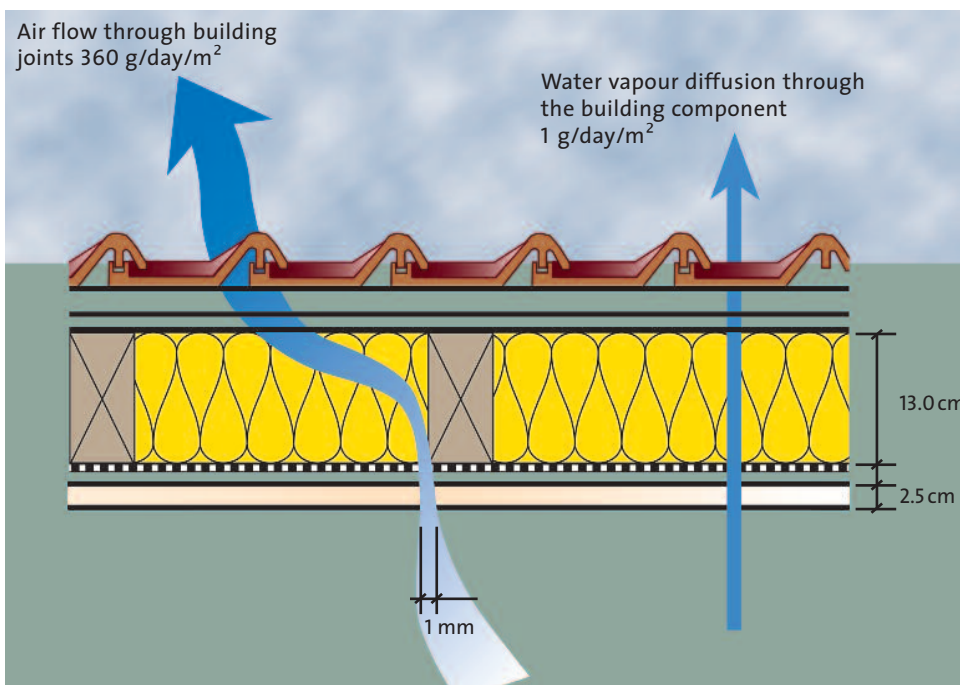
# ISOVER VARIO KM and VARIO KM Duplex UV

Multi-purpose VARIO KM und VARIO KM Duplex UV climate membranes are unique in providing excellent levels of airtightness combined with unparalleled protection against moisture. VARIO is a high quality 'intelligent' product that automatically adapts to changes in climatic conditions. VARIO not only improves living comfort for occupants, but its unique climate membrane also protects exposed pitched roofs and walls from damage caused by moisture. In addition, VARIO KM Duplex UV is extremely tear-resistant and features practical guideline markings to make installation easy.

Almost 15 years of practical use has proven the value of VARIO products, which are now used worldwide to protect countless buildings against damp. Together with carefully matched adhesive tapes and sealants, they provide guaranteed protection for the long-term future.

## Small cause – great effect

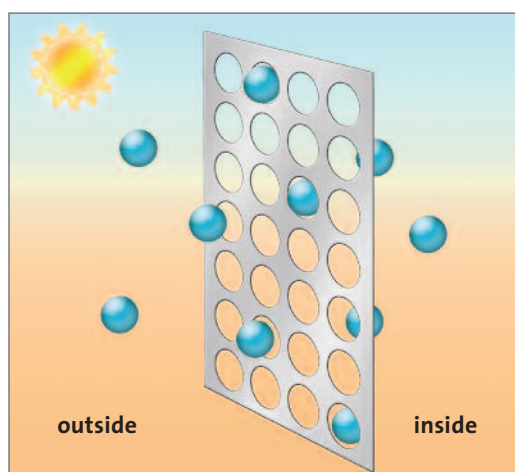
*In the winter months, gaps just 1 mm wide can allow up to 360 g/m<sup>2</sup> of air to penetrate into the construction. Correct and careful installation of matched VARIO system components can avoid this potential source of damage.*



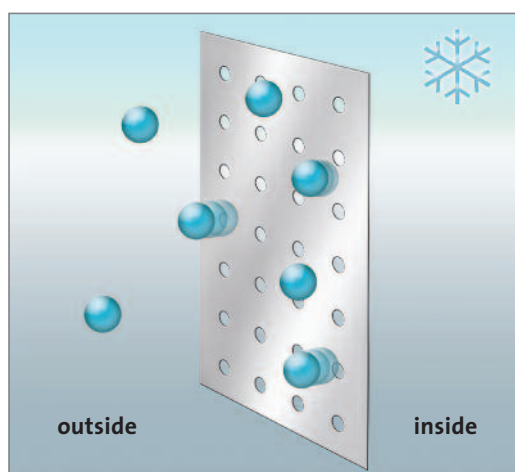
Whilst 1g of water per day can pass into an airtight construction through diffusion, a tiny open joint just 1mm wide can increase this figure to up to 360g water per day.

## VARIO – the intelligent vapour retardant that adapts to every season

Whether it is hot or cold, wet or dry, the innovative VARIO system intelligently adapts to the prevailing climatic conditions. Ideal for all timber and solid construction, the VARIO system blocks moisture diffusing into the structure from inside the building during the cold winter months, whilst in summer the VARIO KM / VARIO KM Duplex UV membrane allows any moisture that is trapped to diffuse back into the building interior. This allows damp building elements in the construction to dry out during the summer months and remain dry, avoiding mould formation and subsequent moisture-related damage to the building structure. All subject, of course, to careful and effective bonding of overlapping seams in the membrane and sealing of junctions with components and around all penetrations, such as chimneys, pipes and services, with appropriate VARIO System products.



**Summer:** With high humidity and temperature during the summer months, the molecular structure changes to reduce the diffusion resistance of VARIO KM and VARIO KM Duplex to an air layer diffusion equivalent of only 0.2 m (VARIO KM) or 0.3 m (VARIO KM Duplex UV). Moisture that had penetrated the structure can now escape, preventing damage to the building.



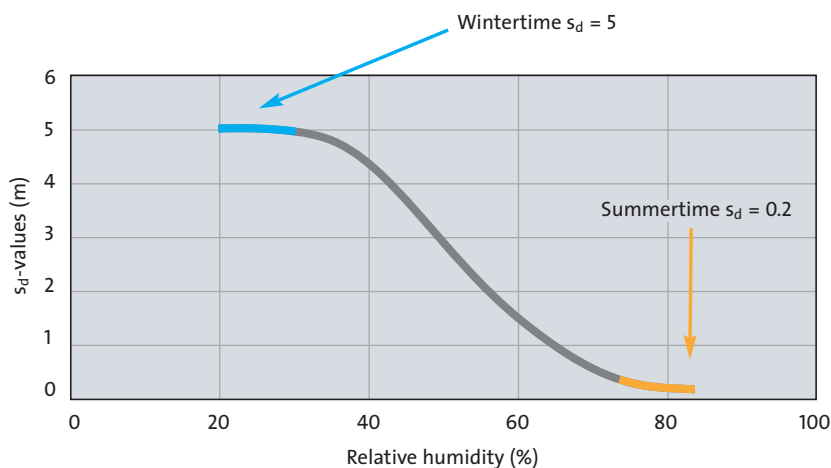
**Winter:** At the relatively low humidity experienced during colder months of the year, the molecular structure of the membrane changes to increase the diffusion resistance of the VARIO KM/ VARIO KM Duplex UV membrane to an air layer diffusion equivalent of 5 m. This prevents moisture in the room from penetrating into the structure.

## VARIO – unique variable diffusion resistance

Conventional water vapour retardant membranes, depending on their specifications, have a diffusion resistance that remains static, regardless of climatic conditions. In contrast to the VARIO climate membranes, that adapt to the prevailing humidity and temperature, conventional membranes function only as a water vapour stop. Moisture that has become trapped or has penetrated into the building structure cannot escape. This prevents the structure from drying out, which can lead to damage.

VARIO KM und VARIO KM Duplex UV membranes adapt to ambient temperature and humidity. At low temperature and humidity, as in winter, the molecules in the membrane close up and stop the diffusion of water vapour, thereby working as an effective water vapour retardant. At higher temperatures and humidity, as in summer, the molecules move apart, opening the VARIO climate membrane, and allowing trapped moisture to pass into the room.

This drying out capacity is a unique feature of VARIO climate membranes. In the warmer months of the year, VARIO allows 25 times more moisture to escape from the building structure into the interior, than in the winter months.



*The diffusion resistance of VARIO climate membranes depends on the mean humidity in the construction and varies between 5 m in winter and 0.2 m in summer.*

### VARIO – environment friendly and aroma-proof

*VARIO KM and VARIO KM Duplex UV membranes are manufactured from a foodstuff-safe special polyamide. They are environment friendly, recyclable and aroma-proof. Being aroma-proof the membranes prevent vapour from old wood preservatives penetrating into the living space – protecting against exposure to substances like Lindane and PCB that are today banned, but were used in the past to preserve wood.*

# VARIO prevents expensive damage to the building

Dampness can cause serious damage in all types of construction. And it occurs more often than one might think. Damp wood, for instance, is often used in the construction of roofs. If the roof has a water vapour retardant outer surface, and a water vapour retardant membrane is also installed on the inner surface, any moisture trapped in the construction cannot escape. This, in turn, can lead to serious damage to the construction, including rotting of roofing timber and serious mould infestation. The reason: the moisture has nowhere to go – it can't diffuse into the building or outside into the fresh air.

With the reverse side drying feature of VARIO KM and VARIO KM Duplex UV climate membranes and system accessories, it is possible to avoid this problem. However, the job has to be carefully planned in detail beforehand, and executed with great care and high standards of workmanship.

## Building damage is expensive!

It can cost up to 20,000 Euros to remove and replace 150 m<sup>2</sup> of roofing damaged by moisture. A one-off investment in the VARIO assurance package will cost approximately 500 Euros more than a conventional airtight system and PE insulation. The advantage is self-evident: consider the consequences and it is obvious the VARIO system wins hands down.



*Damage due to the inclusion of damp wood combined with a conventional water vapour retardant.*

## VARIO – also for roof renovation from outside

VARIO has a number of advantages when the mansard loft is already converted and occupied, and renovation needs to be done from outside. Unlike conventional membranes, VARIO KM and VARIO KM Duplex UV membranes can be laid across and between the rafter battens, which allows any dampness in the roof fabric to dry out.

## The advantages of the VARIO system at a glance

### **For renovation**

- *moisture dries out into the interior through breathable membranes*
- *protection from exposure to wood preservatives such as Lindane and PCB*
- *installation over roof battens is possible*

### **For new buildings**

- *damp construction materials can dry out quickly and reliably into the building interior due to the VARIO effect*
- *wood enjoys long-lasting protection against damp rot*
- *no need for chemical preservatives*
- *no condensation damage in summer*
- *rapid drying, even if rain penetrates into the roof*

## Important airtightness terms

### **Diffusion equivalent air layer thickness, $s_d$**

This describes the resistance of a building material to the penetration of moisture in terms of an air layer thickness. The number is calculated as the product of water vapour resistance and material thickness:

$$\text{Diffusion equivalent air layer thickness } s_d \text{ (m)} = \text{water vapour resistance factor } \mu \times \text{material thickness } d \text{ (m)}$$

Generally a constant diffusion resistance for the building material is used, with the exception of VARIO KM und VARIO KM Duplex UV climate membranes. They have variable  $s_d$  values, depending on humidity and temperature on both sides of the structure. This provides a high guarantee of protection against damp and subsequent structural damage to the building.

### **Water vapour diffusion resistance factor, $\mu$**

This describes how much greater the diffusion resistance of a material is compared to an air layer of the same thickness at the same temperature. Air has a water vapour diffusion resistance of  $\mu = 1$ .

# The ISOVER VARIO-System: Co-ordinated solutions for airtightness and protection against moisture

## VARIO KM Duplex UV

A special water vapour retardant, non-woven, laminated climate membrane for sealing and moisture protection in lightweight and solid construction.

## VARIO TightTec

For simple installation of durable airtight joints at edges and corners.

## VARIO Stos and Mangete Passelec

For producing durable airtight seals around penetrations of all diameters in VARIO KM / VARIO KM Duplex UV.

## VARIO MultiTape

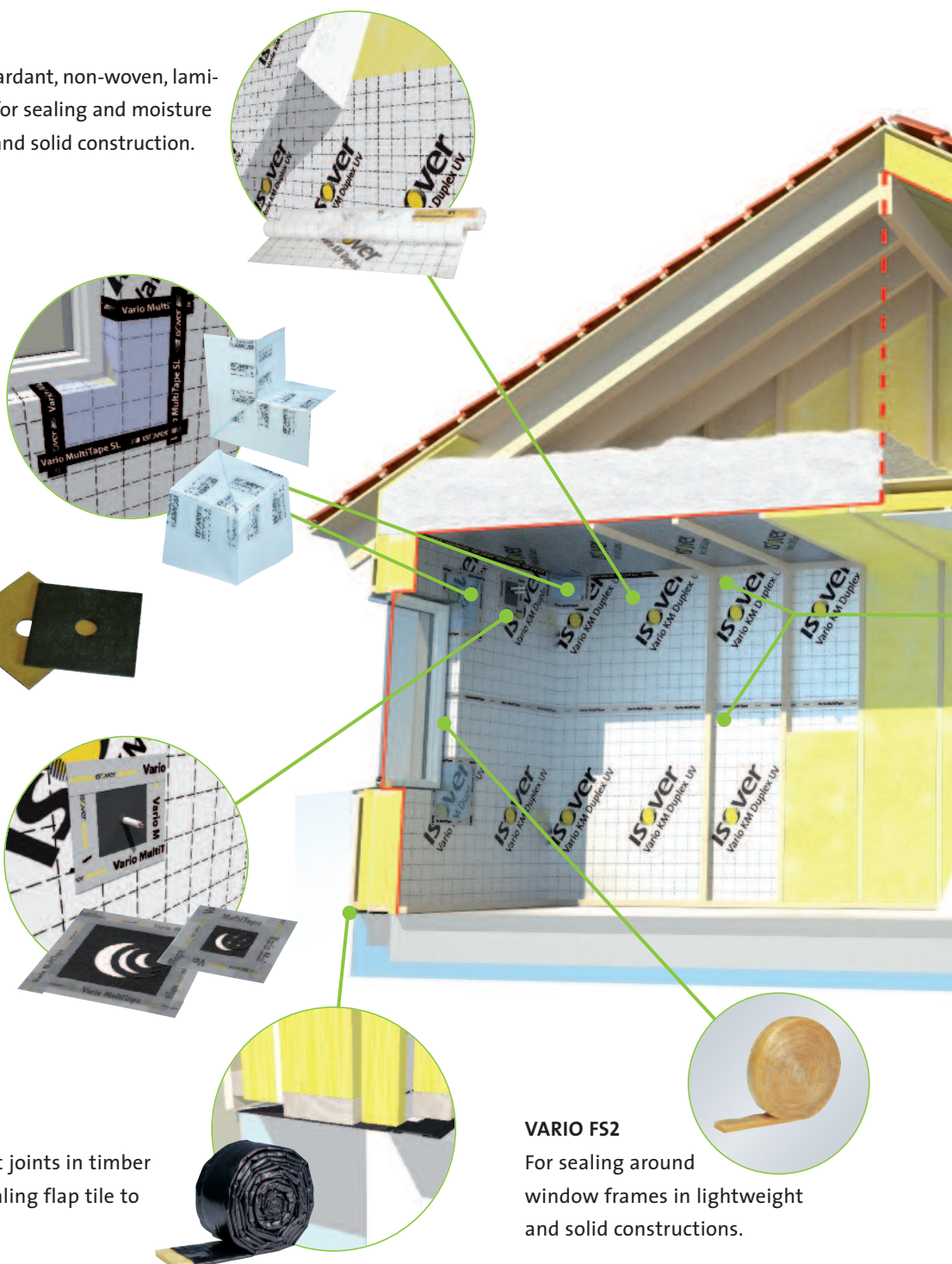
For producing durable airtight joints around roof windows, pipes and penetrations.

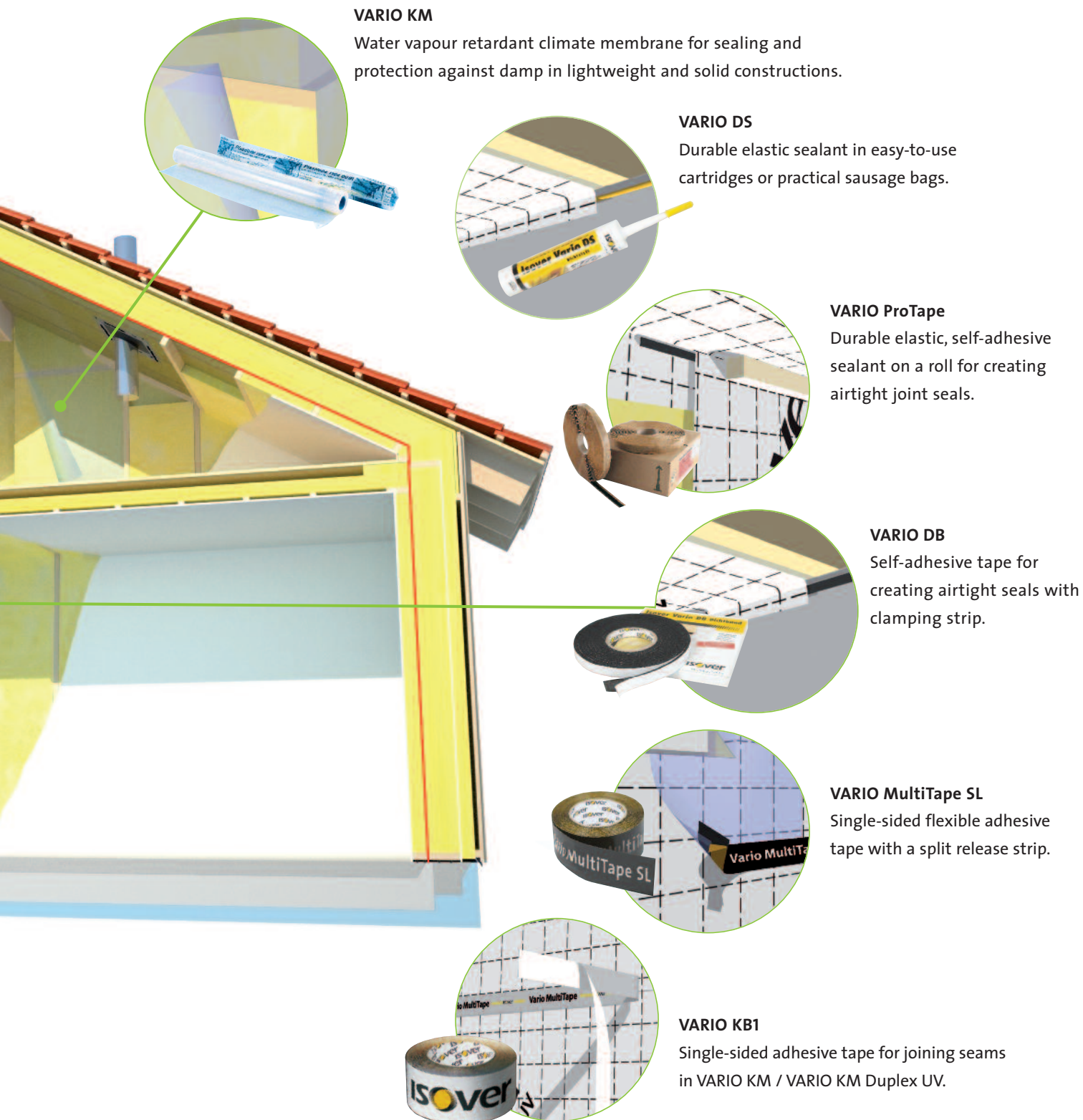
## VARIO FS1

For producing airtight joints in timber constructions, e.g. sealing flap tile to wall plate.

## VARIO FS2

For sealing around window frames in lightweight and solid constructions.





#### **VARIO KM**

Water vapour retardant climate membrane for sealing and protection against damp in lightweight and solid constructions.

#### **VARIO DS**

Durable elastic sealant in easy-to-use cartridges or practical sausage bags.

#### **VARIO ProTape**

Durable elastic, self-adhesive sealant on a roll for creating airtight joint seals.

#### **VARIO DB**

Self-adhesive tape for creating airtight seals with clamping strip.

#### **VARIO MultiTape SL**

Single-sided flexible adhesive tape with a split release strip.

#### **VARIO KB1**

Single-sided adhesive tape for joining seams in VARIO KM / VARIO KM Duplex UV.

## VARIO – Moisture management for new and renovated constructions, perfect down to the finest detail

### Perfectly matched – VARIO System Components

| Climate membrane              | Properties  | Uses  |
|-------------------------------|---|---|
| VARIO KM Duplex UV            | non-woven, reinforced, water vapour regulating climate membrane. variable $s_d$ value 0.3 m to 5.0 m. highly tear resistant and easy to lay, thanks to guideline markings | For sealing the insulation layer in all building elements (floors, walls and roofs). Excellent moisture protection for new buildings and renovation work, of solid and lightweight construction |
| VARIO KM                      | moisture-regulating climate membrane. variable $s_d$ value, 0.2 m to 5.0 m  |   |
| Adhesive and sealing products | Properties  | Adhesive and sealing products   |
| VARIO KB1                     | single-sided adhesive tape with high bonding strength   | Extra-wide for airtight bonding of seam overlaps in VARIO KM / VARIO KM Duplex UV climate membranes   |
| VARIO DB                      | self-adhesive, rollable compressed tapes  | For producing airtight joints in lightweight and solid construction combined with a clamping strip  |
| VARIO DS                      | durable elastic, self-adhesive sealant in a cartridge or sausage bag  | For producing perfect wind and airtight joints in VARIO KM / VARIO KM Duplex UV climate membrane  |
| VARIO ProTape                 | durable elastic, self-adhesive sealant on a roll. 50 % quicker to apply than with a cartridge   |   |
| VARIO MultiTape               | Flexible and ductile adhesive tape with high bonding strength   | For durable airtight joints in VARIO KM / VARIO KM Duplex UV climate membrane around roof windows, pipes, roof penetrations and at membrane overlaps  |
| VARIO MultiTape SL            | Flexible adhesive tape with split release strip   |   |
| VARIO SilverFast              | Waterproof adhesive tape with strong bond for increased stability   | For a range of bonding jobs inside and outside. Main uses include: bonding suspended ceilings, underlay, sarking and facade membranes   |
| VARIO TightTec                | Advanced design and with pre-marked membrane panels 200 x 400 mm 120 x 400 mm   | For airtight seals of all types of corners, such as outer walls, outer walls, window, door, and inner corners   |
| Mangete Passelec              | Strongly adhesive, tear-resistant sleeve, 60 x 60 cm  | For airtight penetration joints for all types of installation, conduits through VARIO KM / VARIO KM Duplex UV   |
| VARIO Stos                    | Flexible pre-forms with strongly adhesive tape, 195 x 195 mm and 285 x 285 mm   |   |
| VARIO FS1                     | Elastic mineral wool, four-layer, faced with black PE film, 16 cm wide  | For producing airtight joints and junctions in pitched roofs, and timber constructions, e.g. sealing tile flap to wall plate  |
| VARIO FS2                     | Elastic mineral wool, four layer, faced with transparent PE film, 6 cm wide   | For sealing windows in lightweight and solid constructions  |

## Three steps to airtightness



VARIO KM / VARIO KM Duplex UV climate membrane is installed on the sub-construction after the insulation. With metal constructions, the climate membrane is bonded.



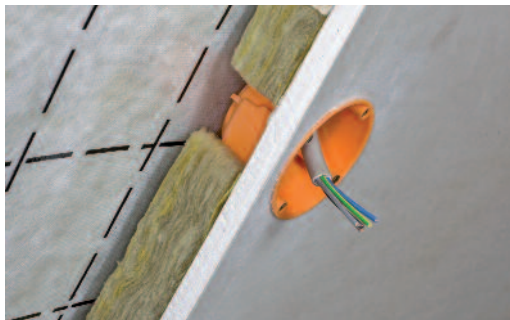
Membrane seams are overlapped by approx. 10 cm and sealed with VARIO KB1 adhesive tape.



To form an airtight bond, junctions and joints with floors, ceiling, gable walls or chimneys are sealed with VARIO DS or VARIO ProTape sealants. VARIO MultiTape or VARIO MultiTape SL is used for long-lasting junctions and joints with roof windows, pipes, and roof penetrations etc.

### Tip

*It is recommended that mains supplies and cabling etc. are run outside the airtight layer. If this is not possible, then penetrations need to be sealed with Mangete Passelec or VARIO Stos.*



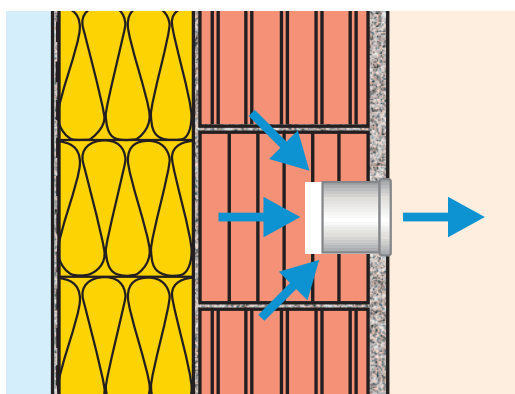
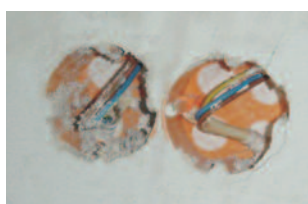
# Airtightness – detail is key

It is easy in principle to produce an airtight building shell, simply by careful workmanship, based on sound planning. The specifications for the airtight construction should include full details of the sealing layers and the various building components needed, paying particular attention to the interfaces between different materials.

## Airtightness in solid constructions

In solid constructions, reliable airtight sealing can be achieved by the correct application of a continuous internal plaster lining. It is particularly important to seal all potential air paths caused by exposed studs and gaps between bricks. In addition, window and door openings in the external wall need to be closed off with a plaster skim and the walls completely plastered from floor to ceiling: screeds alone are not airtight.

It is particularly important to take care in areas where different materials adjoin, such as in the tile flap, gable wall and ashlar facing. All surfaces must be plastered, including the channels and recesses for gas piping or fuse boxes etc. Finally, it is sensible to infill channels cut for mains supplies with mortar to prevent air currents in the wall.



*The electricity fuse box is bedded in plaster, preventing air currents.*

### Leakage

*A distinction is made between constructional leaks, i.e. leaks at junctions between the outer walls and the roof, or through perimeter joints in windows and doors, and so-called service leaks, due to mains installations, chimneys and internal openings, such as interior doors.*



VARIO FS1 is ideal for ensuring long-lasting airtight junctions between the wall plate and the outer wall. The 16 cm wide mineral wool, faced with black PE, is resilient and can be tightly moulded to fit unevenness in the joint, sealing it airtight.



VARIO FS2 has been specially developed for producing long-lasting airtight seals at junctions of window frames and brickwork. The 6 cm wide mineral wool, faced with transparent PE, is resilient and can be moulded to perfectly fit unevenness in the wall.



*A slit is made in the VARIO FS2 to accommodate fixings, ensuring the frame is fully covered with insulation material.*

## Airtightness of interior insulation

Interior insulation provides a quick and effective increase in living comfort, particularly in multi-family housing. This type of insulation has the advantage that the installation process is dry and can be carried out by the occupants. ISOVER has developed the OPTIMA System for this application. It combines a simple-to-fit lightweight metal framework with high levels of thermal insulation, and includes the VARIO airtight system.



After the OPTIMA metal studs have been fixed to the floor, wall and ceiling, support pillars are fitted before VARIO KM Duplex UV is applied.



VARIO KM Duplex UV is overlapped by 10-15 cm, and an airtight bond created using either VARIO KB1 or VARIO MultiTape. Junctions with the wall and floor are bonded using VARIO DS or VARIO ProTape, making the structure airtight



Cable penetrations are made airtight with VARIO MultiTape SL. VARIO Stos or Mangete Passelec are also ideal for sealing off various other installations.

## Airtightness in lightweight constructions

In timber or lightweight constructions, the airtight layer is provided by a membrane installed inside the building shell. ISOVER VARIO KM and VARIO KM Duplex UV are ideally suited for this purpose because they are not only water vapour retardant, to prevent moisture problems when the weather is cold, but also allow the structure to dry out during the warmer months. The VARIO System offers dependable performance, guarantees optimal effectiveness of the insulation material, and ensures the longevity of the building.

Whilst it is important to take great care when planning and installing the VARIO KM or VARIO KM Duplex UV membrane, all aspects of the project must also receive close attention. Overlaps and butt seams have to be fixed with special adhesive tapes, such as VARIO KB1, VARIO Silverfast or VARIO MultiTape; and junctions with surrounding building components require sealing with VARIO DS or VARIO ProTape sealants. Last but not least, it is sensible to run water piping and electrical wiring through a separate insulation layer.

Correct professional execution of the work is just as important as careful design and detailed planning of the construction. It is very important to work to an organised sequence of tasks, so that the carefully installed airtight layer is not damaged by the work that follows.

The most common problem areas in airtight constructions are junctions and penetrations, such as sockets and cable conduits; wall, floor, ceiling, partition and roof junctions; junctions around window and door frames; chimneys and chimney junctions, and all points where different materials meet.

### ISOVER has the right solution for all these problem areas:

| Detail                                       | ISOVER solution   |
|--|---|
| Electrical installations                     | Mangete Passelec, VARIO Stos and VARIO MultiTape            |
| Chimneys                                     | VARIO DS sealant and VARIO ProTape                          |
| Junctions between an outer wall and ceiling  | VARIO DS sealant, VARIO ProTape and VARIO MultiTape         |
| Junctions between an outer wall and floor    | VARIO FS1 joint beading, VARIO DS sealant and VARIO ProTape |
| Junctions between an outer wall and roof     | VARIO FS1 joint beading, VARIO DS sealant and VARIO ProTape |
| Junctions in a gable wall                    | VARIO DS sealant and VARIO ProTape                          |
| Junctions in roof staircase                  | VARIO DS sealant and VARIO ProTape                          |
| Penetrations for ventilation shafts          | Mangete Passelec, VARIO Stos and VARIO MultiTape            |
| Perimeter junctions around windows and doors | VARIO FS2 joint beading and VARIO MultiTape                 |
| Corners on windows, doors and parapets       | VARIO TightTec and VARIO MultiTape                          |
| Overlaps in seams indoors                    | VARIO KB1, VARIO MultiTape and VARIO Silverfast             |
| Overlaps in seams outdoors                   | VARIO Silverfast and VARIO MultiTape                        |

## Attic conversion – airtightness in detail

All common airtightness problems in lightweight or timber construction are invariably found in attic or loft conversions. Converting a loft or attic into high quality living space calls not only for excellent thermal insulation, but also a well-planned and installed airtight layer.



VARIO KM is laid over double-layered thermal insulation installed between and across the rafters, with 3 cm of slack.



VARIO KM Duplex UV is a specially laminated non-woven membrane which is extremely tear-resistant. For this reason it is laid over insulation without slack. The dotted guideline markings make installation much easier.

With metal frame sub-constructs, VARIO KM and VARIO KM Duplex UV are fixed with VARIO DS or VARIO ProTape. In the case of timber sub-constructs VARIO KM or VARIO KM Duplex UV are stapled directly to the timber framework.



VARIO KM and VARIO KM Duplex UV membrane seams are overlapped by 10-15 cm and bonded with VARIO KB1, VARIO MultiTape or VARIO Silverfast.

## Sealing junctions and joints



VARIO ProTape is a self-adhesive sealant on a roll, and is twice as fast to work as cartridge sealants. It is used to produce durable airtight junctions between VARIO KM and VARIO KM Duplex UV climate membranes and all building components.



VARIO DS is a durable elastic, self-adhesive sealant, in cartridge or sausage bag format, that is ideal for use with VARIO KM and VARIO KM Duplex UV climate membranes. It is used to produce long-lasting airtight seals with gable walls, ceilings or chimneys.



VARIO DB is a single-sided, self-adhesive sealant tape specially designed for producing airtight junctions in uneven building components. If the substrate is uneven, VARIO DB, combined with clamping strips, produces long-lasting airtight junctions. Simply bond VARIO DB to the interior plaster, overlay the VARIO KM or VARIO KM Duplex UV and fasten to the wall with clamping strips.



VARIO MultiTape SL is flexible and has a split backing strip, making it easier to work in areas where access is difficult.



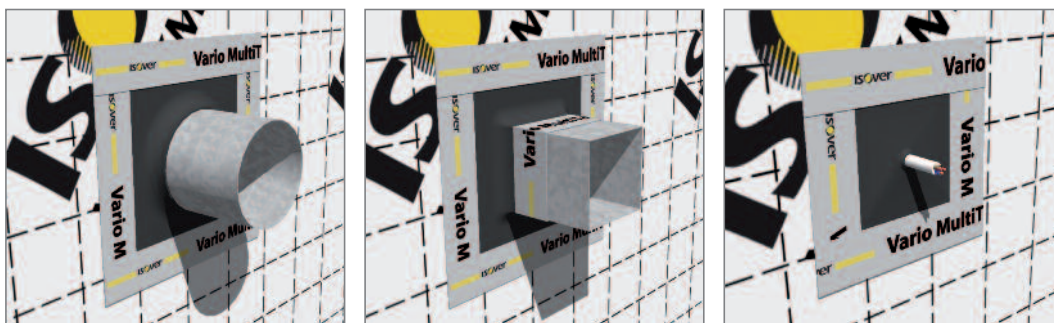
VARIO MultiTape SL is used to produce airtight seals around penetrations and junctions, e.g. around windows and mid-purlins.

### Backgrounds for airtight junctions

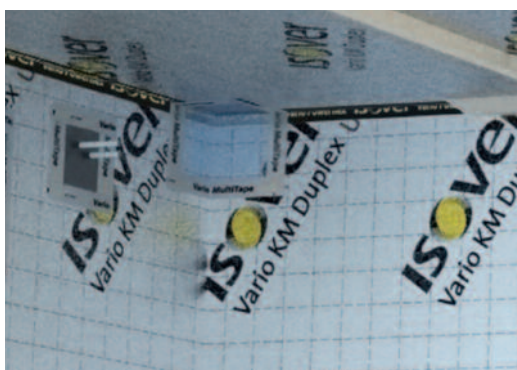
*Regardless of the type of bonding job or materials involved, backgrounds must be dust-free, dry, free of fats and greases, clean and stable, in order to achieve a perfect airtight joint. A quick preliminary trial can often save a lot of time and possibly compromised safety.*



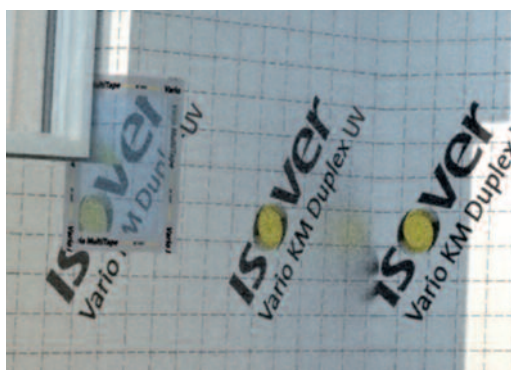
## Penetrations and corners



Some of the most important areas to address for airtight constructions are penetrations for services and cable conduits. ISOVER VARIO Stos profiles or Mangete Passelec have been specially developed for this purpose. They are laid over the penetration and bonded airtight with VARIO MutiTape, VARIO KM or VARIO KM Duplex UV.



VARIO TightTec I



VARIO TightTec X

VARIO TightTec I and VARIO TightTec X have been specially designed for sealing junctions at internal and external corners. The profiles have dotted lines for easier folding, making it possible to fit any corner. Airtight seams with VARIO KM or VARIO KM Duplex UV are achieved by bonding with VARIO MultiTape.

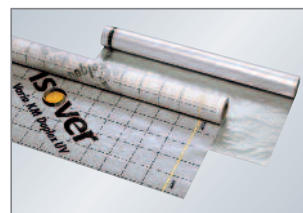
# Products for air and wind-tightness

## VARIO KM Duplex UV

Reinforced, laminated water vapour retardant climate membrane for sealing all construction components (floors, walls, roof) in both lightweight and solid constructions.

Moisture-variable  $s_d$  of 0.3 m to 5 m. Includes a practical installation guide (line markings).

| length – width | packaging unit          |
|----------------|-------------------------|
| 40 m – 1.5 m   | 60 m <sup>2</sup> /roll |



## VARIO KM

Vapour retardant climate membrane for protection against moisture in all construction components (floors, walls, roof) in both lightweight and solid constructions. Moisture-variable  $s_d$  value of 0.2 m to 5 m.

| length – width | packaging unit           |
|----------------|--------------------------|
| 60 m – 2 m     | 120 m <sup>2</sup> /roll |
| 30 m – 2 m     | 60 m <sup>2</sup> /roll  |
| 15 m – 2 m     | 30 m <sup>2</sup> /roll  |



## VARIO KB1

Extra wide, single-sided adhesive tape for sealing overlap seams in membranes. Specially designed for use with VARIO KM / VARIO KM Duplex UV climate membranes.

| length – width | packaging unit   |
|----------------|------------------|
| 20 m – 60 mm   | 12 rolls = 240 m |
| 40 m – 60 mm   | 5 rolls = 200 m  |



### VARIO DB

Self-adhesive sealing tape compressed on a roll. Used, together with clamping strips for producing airtight junctions and joints in lightweight and solid constructions.

| length – width | packaging unit |
|----------------|----------------|
| 8 m – 17 mm    | 6 rolls = 48 m |



### VARIO DS

Durable elastic sealant in a handy cartridge or sausage bag. Used for producing airtight joints and junctions between VARIO KM / VARIO KM Duplex UV climate membranes and floors, ceilings and walls, and for fixing overlapping seams in membranes.

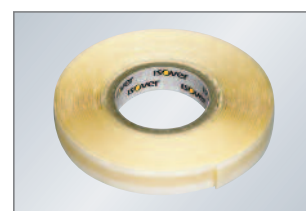
| pack type   | volume | packaging unit |
|-------------|--------|----------------|
| cartridge   | 310 ml | 12 pieces      |
| sausage bag | 600 ml | 12 pieces      |



### VARIO ProTape

Durable elastic, self-adhesive sealant on a roll. Used for producing airtight junctions between VARIO KM / VARIO KM Duplex UV climate membranes and floors, ceilings and walls, and for fixing overlapping seams in membranes.

| length – width | packaging unit |
|----------------|----------------|
| 10 m – 25 mm   | 5 rolls = 50 m |



### VARIO MultiTape

Single-sided, flexible and ductile adhesive tape with high bonding strength. Used for producing durable airtight junctions between VARIO KM / VARIO KM Duplex UV climate membranes and flush roof windows, pipes and roof penetrations. Also suitable for sealing overlapping membrane joints (indoors and outdoors).

| length – width | packaging unit   |
|----------------|------------------|
| 25 m – 60 mm   | 10 rolls = 250 m |



### VARIO MultiTape SL

Single-sided, flexible adhesive tape with a split release strip for producing durable airtight junction seals between VARIO KM / VARIO KM Duplex UV climate membranes and roof windows, pipes and roof penetrations. The split release strip makes it easy to install in corners and difficult-to-access areas.

| length – width | packaging unit   |
|----------------|------------------|
| 25 m – 60 mm   | 10 rolls = 250 m |



### VARIO SilverFast

Single-sided adhesive tape used outdoors for producing durable airtight bonds between the overlapping seams of underlay and sarking membranes, as well as sealing junctions between building components such as roof windows, pipes etc. It is also suitable for bonding overlapping seams in VARIO climate membranes both indoors and outdoors.

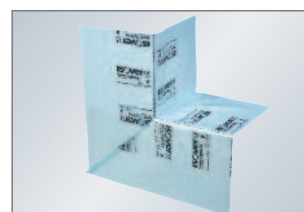
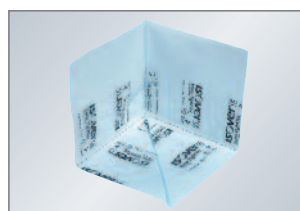
| length – width | packaging unit   |
|----------------|------------------|
| 25 m – 60 mm   | 10 rolls = 250 m |



### VARIO TightTec

VARIO TightTec is the easy way to produce airtight junctions with external walls, windows, doors and interior corners. It is easy to fold and the printed guidelines make matching the corner easy. Junctions with climate membrane are taped over with VARIO MultiTape.

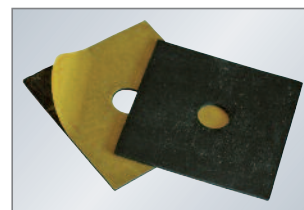
| product    | dimensions   | packaging unit |
|------------|--------------|----------------|
| TightTec X | 200 x 400 mm | 60 pieces      |
| TightTec X | 120 x 400 mm | 60 pieces      |
| TightTec I | 200 x 400 mm | 60 pieces      |



### Mangete Passelec

Strong bonding, self-adhesive and extremely tear-resistant 60 x 60 cm sleeving, for creating durable airtight seals in penetrations of different diameters through VARIO KM / VARIO KM Duplex UV climate membranes.

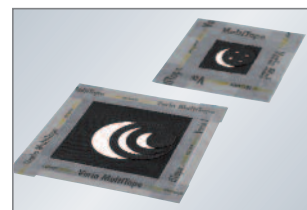
| dimensions    | packaging unit |
|---------------|----------------|
| 60 cm x 60 cm | 100 pieces     |



### VARIO Stos

Flexible membrane profile with a strong adhesive tape in 195 x 195 mm and 285 x 285 mm formats. Used to create durable airtight junctions around service penetrations of different diameter through VARIO KM / VARIO KM Duplex UV climate membranes.

| Product  | packaging unit |
|----------|----------------|
| Stos 195 | 10 pieces      |
| Stos 285 | 5 pieces       |



### VARIO FS1

16 cm wide elastic mineral wool, four-layered, faced with black PE. Ideal for producing airtight joints in pitched roofs and timber constructions, e.g. insulating between tile lap and wall plate.

| length – width – thickness | packaging unit        |
|----------------------------|-----------------------|
| 10 m – 16 cm – 2 cm        | 5 rolls = 50 m length |



### VARIO FS2

6 cm wide elastic mineral wool, four-layered, faced with transparent PE. For insulating windows frames in lightweight and solid constructions.

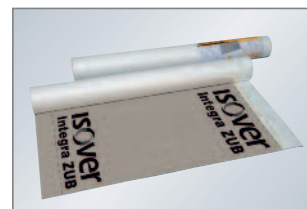
| length – width – thickness | packaging unit          |
|----------------------------|-------------------------|
| 10 m – 6 cm – 2 cm         | 15 rolls = 150 m length |



### ISOVER INTEGRA ZUB

Extremely robust and easy to install underlay and sarking membrane with integrated adhesive tape. Suitable for use in pitched roofs and timber frame constructions. Highly windproof, breathable and rainproof.

| length – width | packaging unit          |
|----------------|-------------------------|
| 50 m – 1.5 m   | 75 m <sup>2</sup> /roll |



Saint-Gobain Insulation  
"Les Miroirs"  
92096 La Défense Cedex  
France  
[www.isover.com](http://www.isover.com)

