

THE SPIRIT OF
MOUNTAIN SPORTS





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Dear VAUDE dealer,

Good salespeople are worth their weight in gold.

Their in-depth knowledge of the products on sale are what makes the difference between them and sales areas where no advice is available, such as the internet or cheap discount stores. Solid, personalised advice, which leads to the customer getting exactly the right product for their needs, creates long-term trust. If customers feel they have received good advice in a shop, they'll come back again.

This training document contains basic information about the VAUDE clothing product range, giving you an overview of the most important designs, materials and applications. There is also a small textile glossary, in which the most important technical terms relating to textiles and materials are explained.

VAUDE's clothing range offers our mountain-sport-loving customers everything they could possibly wish for; no matter what kind of sport it's for, whether high alpine touring, via ferrata, hiking or trekking tours, we have the right product.

But we are not just fully committed to the development of our products; VAUDE is an environmentally friendly mountain sports supplier which has been taking its responsibility towards people and nature seriously for many years, supporting various environmental projects. Since the mid-1990's we have been committed to creating our products in an environmentally sound and sustainable way. With products made from organic cotton, recycled raw materials and bluesign approved fabrics, we've made some real progress toward becoming Europe's most environmentally friendly Outdoor company.

You can find further information about our products on our homepage www.vaude.com or in the order documents.

Have fun advising and selling

Your VAUDE team



1 PERFORMANCE CLOTHING

It doesn't take long to describe the most important features of performance clothing:

- Waterproof and windproof
- Breathable and thermo-regulating
- Durable and hard-wearing
- Flexible and lightweight
- Integrated UV protection
- Easy-care and long-lasting

But really good performance clothing is more than just the sum of its features. The difference between just "good" and "very good" is the details specially designed for specific applications and the clothing's perfect fit. That's why we at VAUDE make doubly sure that every single one of our garments has a well researched design and provides the best possible fit for every kind of mountain sport.

The VAUDE lines – Mountain, Trek & Trail and Urban Life– make clear the divisions in our range between the different mountain sports activities and the demands on the functionality of our products.

MOUNTAIN

This is where ambitious mountaineers will find everything they could wish for. Our Mountain Range includes clothing for nearly every kind of mountain sport, from tough mountaineering trip or a taxing climbing tour in a remote part of the world, via ferrata or sport climbing and bouldering.

TREK & TRAIL | URBAN LIFE

The motto of our Trek & Trail and Urban Life range is "function meets style". We develop stylish top performance clothing for hiking, trekking or travelling. The cut and materials are so inspired

by fashion that with Trek & Trail you'll look great no matter where you are.



2 THE ONION PRINCIPLE

The weather and temperature are rarely constant, and body temperature rises under exertion and drops again during rest periods, so it makes good sense to wear several layers of clothing. If it's too warm you can then take one or more layers off; if it's cold, you can just put something back on. The onion principle is based on three "base layers":

2.1 OUTER LAYER (SHELL LAYER): PROTECTION FROM THE ELEMENTS

Hardshell

Provides protection from wind and weather, is absolutely waterproof, wind-proof and breathable.

Softshell

In all weather conditions apart from heavy rain softshell is ideal because it combines insulation properties with protection from

the weather.

Most softshells are particularly breathable, have an integrated wind protection and are extremely waterresistant, although they are not waterproof.

2.2 MID LAYER: INSULATING BODY HEAT

This layer can be made of different kinds of material. It is best when the clothing is made of synthetic fibres, e.g. polyester fleece materials. They absorb very little moisture, and moisture is quickly transported outwards. Fleece materials also provide good insulation even when wet and dry quickly.

2.3 INNER LAYER: TRANSFER LAYER

This layer is worn in direct contact with the skin. It consists of performance fibres (e.g. polyester) and is designed in particular to transport moisture away from the skin to the next layer.



3 HARDSHELL

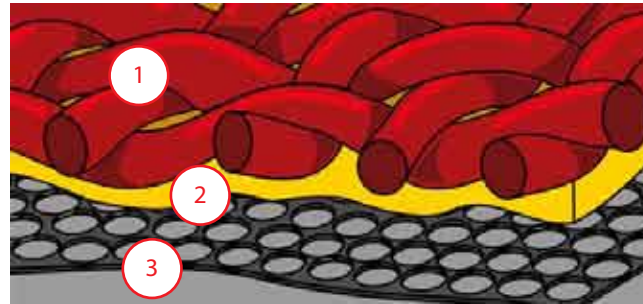
Hardshells are performance jackets which have a membrane or surface coating which makes them both waterproof and breathable at the same time. Before modern membrane or coating technologies existed, clothing was neither waterproof nor breathable. So as to be both of these, jackets are nowadays built up from several layers. On the outside is the shell layer, whilst on the inside of the jacket there is a mesh lining. Depending on the type of hardshell, there may be a coating or a membrane between the outer and inner layers of the jacket.

3.1 EXTERIOR: SHELL LAYER

The shell layer of a hardshell is usually made of nylon (polyamide) or polyester. Nylon and polyester are fairly non-absorbent, which means they don't soak up water like cotton or linen. However they are not waterproof, only waterresistant. In order to make the jacket waterproof another membrane or coating has to be added. The outer material is usually given a water resistant finish too.



COATINGS



- 1 Outer fabric
- 2 Coating
- 3 Plastic coating

The shell layer material can be dyed any colour and gives the jacket its external appearance. The shell layer protects the layer below from dirt, abrasion and UV rays. Depending on the quality of the material, it also makes the jacket tear-proof, durable and stretchable.

3.2 MEMBRANE AND COATING

In order to make the shell layer waterproof and breathable, an extra layer has to be added to it. This layer is either a coating or a fine plastic film (membrane).

3.2.1 COATING

The shell layer undergoes a process in which plastic is liquefied using a solvent and then applied to the shell layer to form a coating. The solvent evaporates leaving a waterproof layer which is firmly sealed to the shell layer – this is the coating. A coating is less breathable and waterproof than a membrane. The reason for this is that the coating is often not applied uniformly. In the places where the coating is thicker the jacket is less

breathable, and when the coating has been applied more thinly the jacket is less waterproof.

Depending on the function the coating is supposed to give the material, and long-lasting the effect should be, different coating materials and processes are applied.

Bottom-of-the-range functional jackets usually have a simple coating, which keeps out the rain but does not let moisture escape.

Advantages of coatings:

- The garment is waterproof.
- Cheaper than a membrane.

Disadvantages of coatings:

- They are usually not permanently integrated into the fabric and can be washed out.
- Less abrasion-resistant than membranes.
- The material becomes stiffer and its tactile characteristics are changed.

3.2.2 MEMBRANE

A membrane on clothing is a semi-permeable, ultra-thin plastic film. The membrane makes the material waterproof, windproof and breathable at the same time.

Function:

Water droplets cannot penetrate the structure of the membrane as the pores are considerably smaller than water molecules. Water vapour can however diffuse through it, as these molecules are smaller than the pores and can therefore pass through them. Dirt, abrasion and body fats can compromise or damage the function of the membrane.

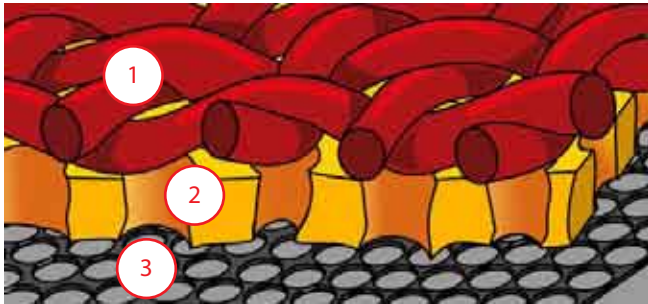
Advantages of membranes:

- Very highly breathable
- Very highly waterproof
- Most membranes are also windproof.

Lasting lamination with material, so a membrane cannot be washed out.

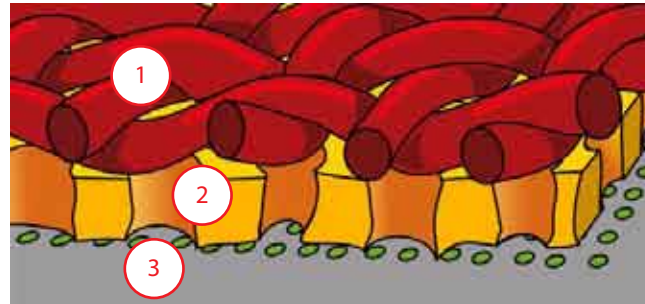


2-LAYERS LAMINATE



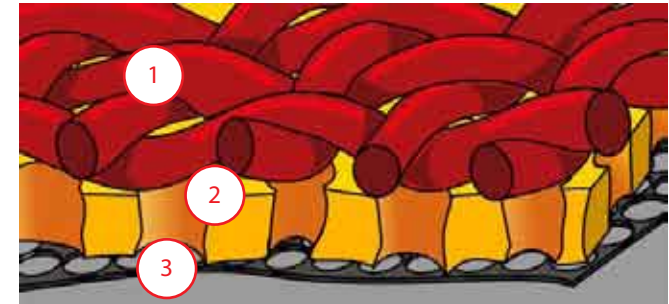
- 1 Outer fabric
- 2 Membrane
- 3 Mesh lining material

2,5-LAYERS LAMINATE



- 1 Outer fabric
- 2 Membrane
- 3 Mesh lining material

3-LAYERS LAMINATE



- 1 Outer fabric
- 2 Membrane
- 3 Mesh lining material

Disadvantages of membranes:

- Tactile characteristics of the material are changed.
- Require more care.
- More expensive than coated materials.

Processing:

The membrane is too delicate to be used alone, so it is combined with a base material (the shell layer) to make it more lasting. This bonding process is called lamination, the result being a laminate

There are three different types of laminate in performance clothing.

2-ply laminate = shell layer laminate

The membrane and the shell layer are laminated together and the lining lies loosely underneath. The lining protects the membrane from the inside against dirt, abrasion and body fats; the shell layer protects it from the outside.

2.5-ply laminate

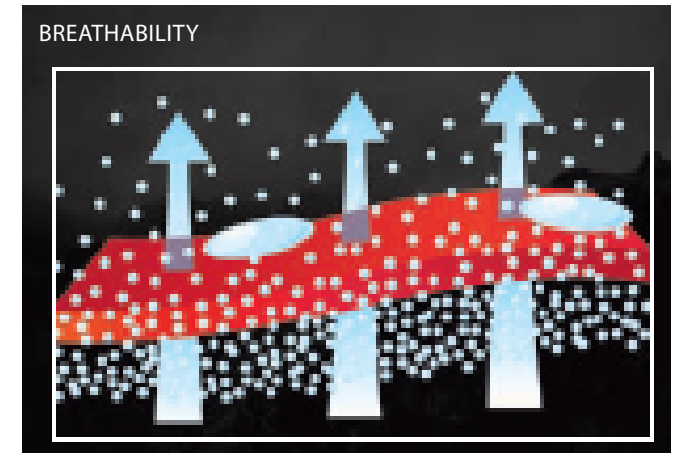
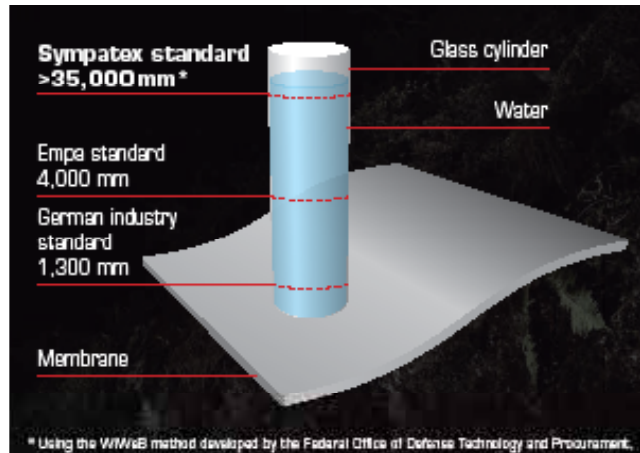
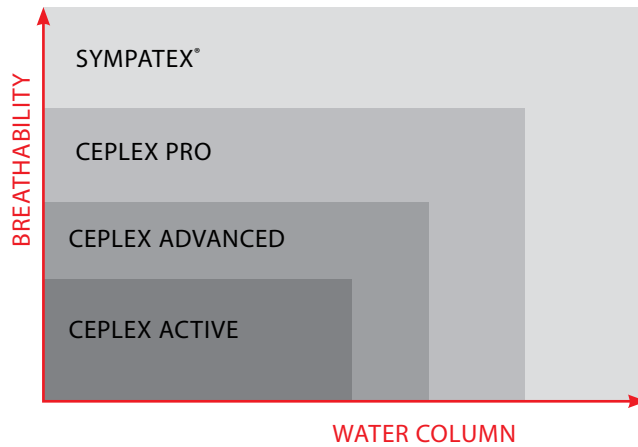
Membrane and shell layer are laminated in the same way as in the 2-ply lamination process. Instead of a loose lining, a small dots of soft plastic are applied to the inside of the membrane. These plastic dots form the half-ply. This reduction in the material used in the lining makes the jacket very light. Depending on the type of main material used and the processing technique, the inside of the jacket may feel 'sticky' on the skin.

Laminate (see lamina "layer") is a multi-layer material made by sticking together at least two like or unlike materials. When the materials are combined their properties complement one other.

3-ply laminate

Shell layer, membrane and lining are laminated together firmly, creating an extremely hard-wearing yet lightweight 3-ply material. The direct combining of the materials means that 3-ply laminates are very breathable and have a very high water column. The lamination of all three layers makes some 3-ply jackets relatively stiff (depending on the membrane used), which may

compromise the wearer's feeling of comfort.



3.3 VAUDE MEMBRANES AND COATINGS

In our hightech garments we only use the highest quality membranes and coatings. We offer the best possible functionality for all mountain sports.

Sympatex® Membrane:
Water column: > 35.000 mm
MVTR up to 35000 g/m²/24 h

Ceplex pro Membrane:
Water column: 25.000 mm
MVTR: 25.000 g/m²/24 h

Ceplex advanced Membrane:
Water column: 20.000 mm
MVTR: 20.000 g/m²/24 h

Ceplex active coating:
Water column: 15.000 mm
MVTR: 15.000 g/m²/24 h

3.3.1 SYMPATEX® MEMBRANE

As one of the world's leading membrane specialists, Sympatex concentrates exclusively on this outer layer. With a membrane that is 100% waterproof and 100% windproof with 100% breathability. In these core aspects, the Sympatex membrane's performance far exceeds the norm, thereby providing optimum wearer comfort.

Sympatex is also a pioneer when it comes to environmental protection because we know that people who enjoy exploring the natural world are also keen to protect it.

100 % WATERPROOF

A material's waterproofness is gauged using the water column (WC) which exerts sufficient pressure for the fabric to start letting water through. If the pressure is above 1,300 mm, the item of clothing is deemed waterproof according to the German industry standard (DIN EN 20811:1992, also known as ISO 811). Textiles that can withstand pressure of 400 to 1,300 mm are merely water-repellent.

The Swiss materials testing institute EMPA in St Gallen stipulates that a functional fabric is actually only waterproof from a

water column of 4,000 mm (e.g. when sitting on damp ground = approx. 2,000 mm WC or when kneeling, crouching down or underneath backpack straps).

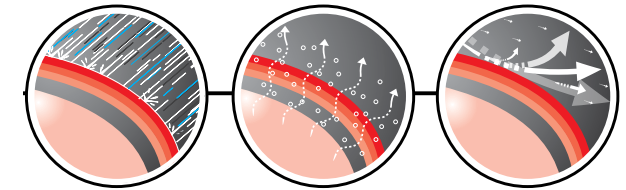
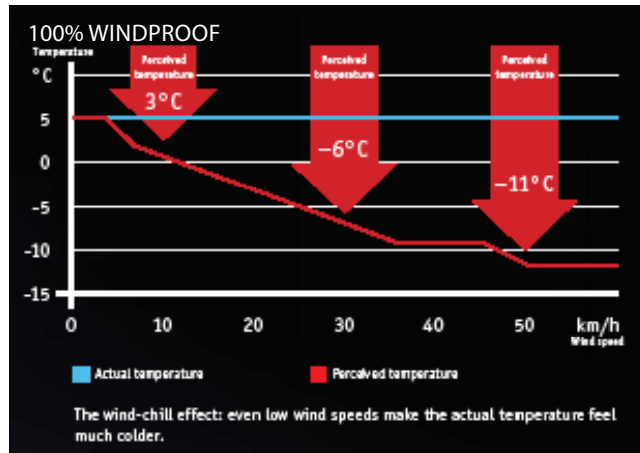
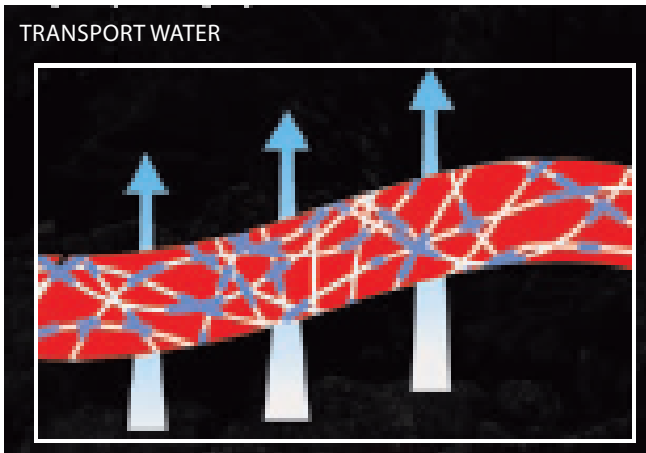
The Sympatex membrane exceeds the EMPA requirements and withstands pressure of over 35,000 mm WC (using the WIWeB method).

100 % BREATHABILITY

The Sympatex membrane works using a physiochemical principle. The water-loving (hydrophilic) component of the membrane absorbs moisture from the body and releases it outwards by evaporation. The water vapor molecules are transported outwards along the chains of molecules as in a billiard system.

Smart Dynamic Membrane Technology:

The more the body perspires, the more moisture the membrane can wick away. This means that its effectiveness increases dynamically as it is needed and the Sympatex membrane adapts flexibly to the relevant sport's requirements. One benchmark used to quantify breathability is the MVTR (moisture vapor trans-



mission rate). The higher the figure, the better: fabrics achieving an MVTR of >10,000 g/m² /24 h are deemed to have very good breathability.

With its compact membrane technology, the Sympatex membrane boasts breathability of up to 35,000 g/m² /24 h MVTR.

100 % WINDPROOF

The Sympatex membrane is absolutely windproof. This functional property is important to prevent the subjective wind-chill effect.

100 % RECYCLABLE

The Sympatex membrane consists of oxygen, carbon and hydrogen and is fully recyclable and reusable, just like a PET bottle. 100% performance – 100% ecologically sound.

The Sympatex membrane is:

- made of perfectly safe polyether ester
- bluesign®-certified*: maximum possible freedom from harmful substances and a safe, resource-friendly manufacturing

process

- Oeko-Tex Standard 100-certified, product class 1: safe textile products, completely free of health risks
- PTFE-free: Unlike many other membranes, the Sympatex membrane is free from PTFE (polytetrafluoroethylene). PTFE has been increasingly criticized in recent years as the production process for PTFE uses fluorides which are suspected of being harmful to health and even causing cancer.
- kind to the skin and the environment
- 100% recyclable, just like a PET bottle

3.3.3 CEPLEX

Ceplex is the generic term for VAUDE's own brand membranes and coatings. Ceplex exists in three different qualities, each of whose breathability and water column properties are designed for particular applications.

CEPLEX PRO MEMBRANE TECHNOLOGY

With a water column of 25,000 mm and a MVTR value of 25.000 g/m²/24 h, Ceplex pro membrane has excellent characteristics. It is completely waterproof, windproof and breathable.

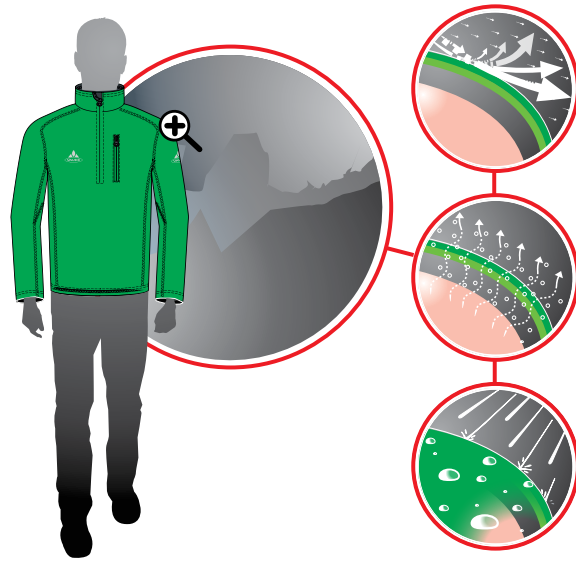
We therefore use Ceplex pro in our technical jackets in the Mountain collection, for extreme mountain conditions.

Ceplex advanced membrane technology

We use Ceplex advanced mainly in our durable jackets and trousers which need to function reliably in all situations. Ceplex advanced is waterproof, windproof and breathable, so we use it both in the Mountain and the Trek & Trail collections. Ceplex advanced membrane has very good values: A water column of 20,000 mm and an MVTR value of 20,000 g/m²/24 h are excellent features for an ambitious mountaineer.

Ceplex active

Ceplex active is a very durable, waterproof and breathable coating. It gives the material a water column of 15,000 mm and has an MVTR value of 15,000 g/m²/24 h. We use Ceplex active for our particularly tough jackets, e.g. our extra-durable children's jackets contain Ceplex active to give little ones the best protection possible against wind and weather.



4 SOFTSHELL

Softshells are multifunctional jackets. They combine characteristics of a hardshell with those of the middle garment layer, i.e. they combine protection against water with insulation. Softshells are durable, have long-lasting water and dirt repellent qualities and the fabric is flexible. Depending on the process used and the material, they may be wind-resistant or even windproof, if they are given a windproof membrane. These characteristics mean that softshells can be worn in almost any weather in the mountains.

4.1 WINDPROOF 100

100% windproof softshell material due to an incorporated membrane. Depending on what the garment is used for e.g. summer softshell or winter softshell, another sandwich construction is used involving a technical outer material and warm inner material. This material is particularly suitable for mountain sports in tough climatic conditions.

4.2 WINDPROOF 80

The processing techniques make this material highly windproof. The Windproof 80 material is constructed in such a way (close weave, finish or processing) to make it 80% windproof. The big advantage of these partly wind-penetrable materials is that they are very breathable. The wind penetrating the jacket is weakened by an incorporated "material barrier". This has a pleasant cooling effect and transports moisture outwards. You just have to be careful in a very cold wind, as the wind chill factor in an 80% windproof jacket can cool the body right down.

Windproof 80 is therefore particularly suitable for active mountaineering in windy but not stormy weather.

4.3 WINDPROOF PRO

Windproof PRO is the combination of two material technologies. We use 100% windproof and 80% windproof materials to give our customers optimum functionality. The 100% windproof materials are placed in the garment at the places where the wind attacks strongest, e.g. at the chest or kidneys. The 80% wind-

proof materials are placed where breathability is most important, e.g. under the arms. This creates a highly technical garment which improves the mountaineers' performance, protecting them where protection is really needed and positively affecting the body climate in the right places.



5 MID LAYER

The mid layer is the second layer of clothing, worn under the first layer wind and weather protection. The main purpose of the mid layer is to provide insulation. The mid layer garment can be made of all different kinds of material. Tops and trousers made of synthetic fibres such as polyester fleece are the most suitable material for this layer, as this transports moisture outwards rapidly and its fibre structure preserves body heat well. Unlike natural fibres such as cotton or linen, the insulating properties are retained even when the material is wet, and synthetic fibres dry much more quickly.

5.1 FLEECE

Fleece is a generally used term for synthetic woven fleece made of polyester or nylon. Clothing made of fleece is lightweight, provides good insulation and transports moisture well. Our fleeces tend not to pill and are tearproof. They are flexible and comfortable, giving you lots of room for movement.

We use almost exclusively fleece made of polyester as this material absorbs very little moisture. Polyester fibres retain only about 1-5% of their own weight in water. This means that a fleece shirt with a dry weight of 300g weighs only about 10g more when wet and wrung out. A cotton shirt of the same weight absorbs about 60g, that is 20%, of its own weight in water.

Processing:

The base of a fleece material is a stretchable knitted fabric (see diagram 1). Multi-fibre threads are looped into the knitted fabric (see diagram 2) and these are then cut open and clipped back (see diagram 3). The individual fibres therefore create a much larger surface area. This is called the pile. The greater the fleece's pile, the more air can be stored between the fibres, creating a greater insulating effect.

Advantages of fleece materials:

- Particularly high insulating properties without compromising on weight
- Hardwearing and therefore long-lasting
- Very quick-drying
- Flexible
- Pleasantly soft on the skin (no scratching like new wool)
- No exploitation of animals (as with natural materials such as leather, fur or down) as synthetic polyester fibres
- Depending on the material components may be recyclable, and some recycled fibres already available in range

Disadvantages of fleece materials:

- not windproof, therefore additional membrane necessary
- not waterproof
- electrostatic charge



6 PERFORMANCE UNDERWEAR – BASE LAYER

Now we are down to the skin. The base layer is the layer of clothing that is worn directly next to the skin. It is therefore particularly important that this layer is skin-friendly and pleasant to wear – it is after all also the basis for the functionality of all further layers. If the bottom layer does not function properly, this can have an effect on the whole clothing system. The inner garment layer has a considerable influence on the body climate and on comfort levels.

The most important functions of the base layer are:

- Skin-friendly and pleasant to wear
- Rapid transport of moisture
- Quick-drying
- Material with little or no harmful substances
- Free of allergenic substances
- Odour-inhibiting

There are different kinds of functional underwear available for different climatic circumstances:

6.1 LIGHTWEIGHT FUNCTIONAL UNDERWEAR - SEAMLESS LIGHT

This underwear is mainly made of a lightweight, quick-drying polyester material which transports sweat away from the body as quickly as possible. This creates a good body climate and at the same time prevents the clothing and thus the wearer from feeling unpleasantly damp.

The lightweight underwear is therefore more than suitable for strenuous activities in warm or hot weather.

6.2 THERMO UNDERWEAR FOR COLD-WEATHER ACTIVITIES - SEAMLESS

Our thermo underwear helps the body to regulate its temperature. It warms and protects the body from overcooling. During strenuous activities such as ski touring or skating it also ensures that moisture is rapidly transferred to the next layer.

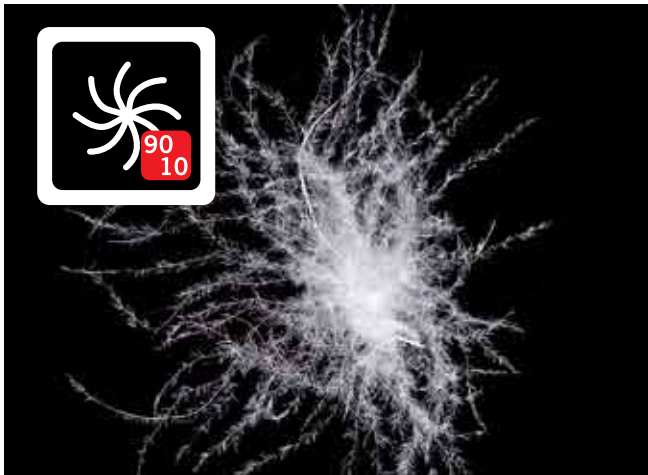
Our thermo underwear is ideal for winter mountain sports. By the way - all of our underwear is being produced in Germany.

6.4 MAXIMALLY FREE FROM HARMFUL SUBSTANCES

Since the base layer is in direct contact with the skin, it is particularly important that the material should be as free of harmful and allergenic substances as possible so it can be tolerated by the skin. In order to guarantee our customers these characteristics, our whole base layer collection complies with the bluesign® standard.

bluesign is the only complete production standard in the textile industry, which includes the whole production process from the start material through to the finished product. This ensures that only components and processes are used which have a minimal influence on the environment and resources.

Meeting bluesign's rigorous standards guarantees that textiles are not only free of harmful substances, but that they have been manufactured in safe factories using production processes which respect resource-use and the environment. The bluesign certified functional underwear therefore makes an active contribution to environmental protection.



7 INSULATION: DOWN AND SYNTHETIC JACKETS

When it's teeth-chatteringly cold, "normal" clothing layers are not enough to protect the body from the low temperatures. Under these circumstances an additional insulating layer is required which "blocks" the body temperature and so, like a sleeping bag, maintains a warming air buffer around the body. This special insulation can be achieved by giving the jacket a down or synthetic fill.

7.1 DOWN

Down is the diva of fills. No other fill has such excellent insulating properties as down, no other fill is so light and can be packed so small, and no other fill is as sensitive.

Down is a special kind of waterbird feather; land-dwelling birds, such as chickens, have no down. Its structure is similar to a snowflake and it has a three-dimensional form. This three-dimensional structure and the ability always to take on this form means that down can contain a large amount of air relative to its weight. A good down feather has about 2 million fluffy down barbs which

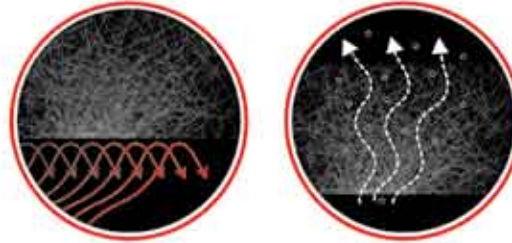
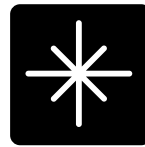
lock into each other. This can form a layer which blocks in warm air, thus providing protection from the cold. Down is very springy and can be squashed or compressed, then shaken vigorously to get back the former shape. This makes it easily compressible. These characteristics mean that down makes the ideal insulating material. Down fills are especially used in clothing which is worn in a dry cold climate.

There are different down fills which each have different warming properties. These differences are made clear by the ratio of each fill, which refers to the percentage of down to supporting feathers of the fill's total weight. Down creates warmth, but not until the supporting feathers create the necessary loft to insulate the warmth in the garment.

A quality characteristic of down is the fill power, expressed in cubic inches (cu.in). This measurement shows volume per ounce (28.35g) of down. The higher the fill power, the better the quality of the down and the higher the thermal rating of the garment. Guide to fill power:

- Fill power > 700 cu.in: top class
- Fill power < 600 cu.in: very good
- Fill power < 500 cu.in: good

Down fills insulate only when dry. When they are wet the down feathers and supporting feathers lump together and the warmth-insulating loft collapses. They also take quite a long time to dry. It's best to dry down clothing in the sun or in a tumble drier with 3-5 tennis balls.



FIBERDOWN



SENSOFIL ECO



SENSOFIL

7.2 SYNTHETIC FIBRES

Synthetic fibres are the hard workers among fills. No other fill insulates as reliably as synthetics, no other fill is as durable and easy to care for. Synthetic fibres are however significantly heavier than down and have a considerably larger pack size.

We use both synthetic fibres and down in our insulating clothing. This means we can combine the advantages of synthetics and down.

Advantages of synthetic fibres:

- Insulate also when wet
- Very durable and easy to care for
- Dry rapidly and create a pleasant inner climate

Disadvantages of synthetic fibres:

- Heavier than down and do not compress as well
- Slightly less insulation

7.2.1 FIBER DOWN

The synthetic down Fiber Down is comprised of super soft polyester microfibres which create a downlike structure. Fiber Down

combines the advantages of down and synthetic fibre fills: It has a similar thermal rating and the loft of an 80/20 down, but is able to insulate when wet, does not go lumpy and dries quickly. It is also as easy to care for as synthetic fibres. The microfibres are slightly odour-neutralising and dirt can be easily washed out. The clothing is just as comfortable as down; garments with a Fiber Down fill are soft and light to the touch and create a comfy inner climate.

In particular they are a good alternative to goose or duck down for people with allergies.

Fiber Down characteristics:

- Same loft as an 80/20 down.
- Good insulation also when damp.
- Low tendency to go lumpy when damp – unlike down.
- Fiber Down dries faster than down – transports moisture from the inside of the jacket 20% faster than a 90/10 down.

7.2.2 SENSOFIL

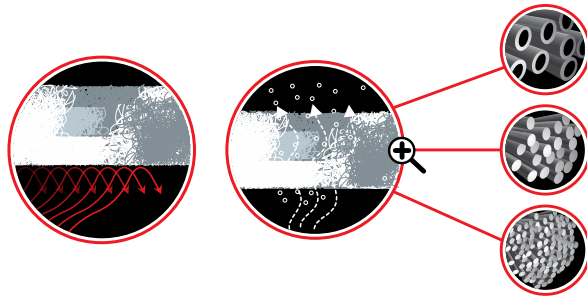
VAUDE's Sensofil fibre technology is based on a well thought-through synthetic fibre construction system that creates an optimum balance between warmth and weight. The fibre system ensures optimum moisture transport and a pleasant climate in the sleeping bag. Like all synthetic fibres, Sensofil provides warmth also when wet, dries quickly, is long-lasting and durable. It is also easy to care for.

Construction

Sensofil is made up of three fibre layers with differing weights and fibre strengths.

The outer layer is a durable hollow fibre which stores warm air. The hollow fibres store more warm air, so cold cannot get through into the clothing via heat dissipation.

The middle fibre layer is a somewhat thicker staple fibre which provides good insulation by blocking the warm air.



SENSOFIL

On the inside a silicon-coated microfibre rapidly transports moisture away from the body and reflects the body's heat radiation.

8 INTEGRATED UV PROTECTION IN FUNCTIONAL CLOTHING

UV rays are electromagnetic rays which are invisible to the human eye. They are a part of the sun's rays. The effects of UV rays are unfortunately not felt until it is too late – you are already sunburnt. UV rays penetrate deep into the skin and can cause cell damage – this results in sunburn and skin ageing. Too much UV exposure can lead to permanent skin damage and skin cancer. It is therefore particularly important to protect yourself properly against the sun's harmful rays .

In the mountains you are particularly exposed to UVA and UVB rays: UV rays increase by 10-15% per 1000m altitude, and snow and ice reflect 40-90% of the rays. This means that mountaineers and ski tourers get a that much higher dose of UV rays. Clothing with integrated UV protection exists which shields and protects the body against these harmful rays. The quality of the protection against the sun afforded by clothing does however depend on the thickness, fibre, colour (dyes and depth) and special features.

The best protection is given by polyester materials, followed by nylon, wool or silk clothing. Cotton, viscose or linen give comparatively less protection than the materials mentioned above.

The UV protection afforded by a particular garment is given as the UPF value (Ultra-violet Protection Factor).

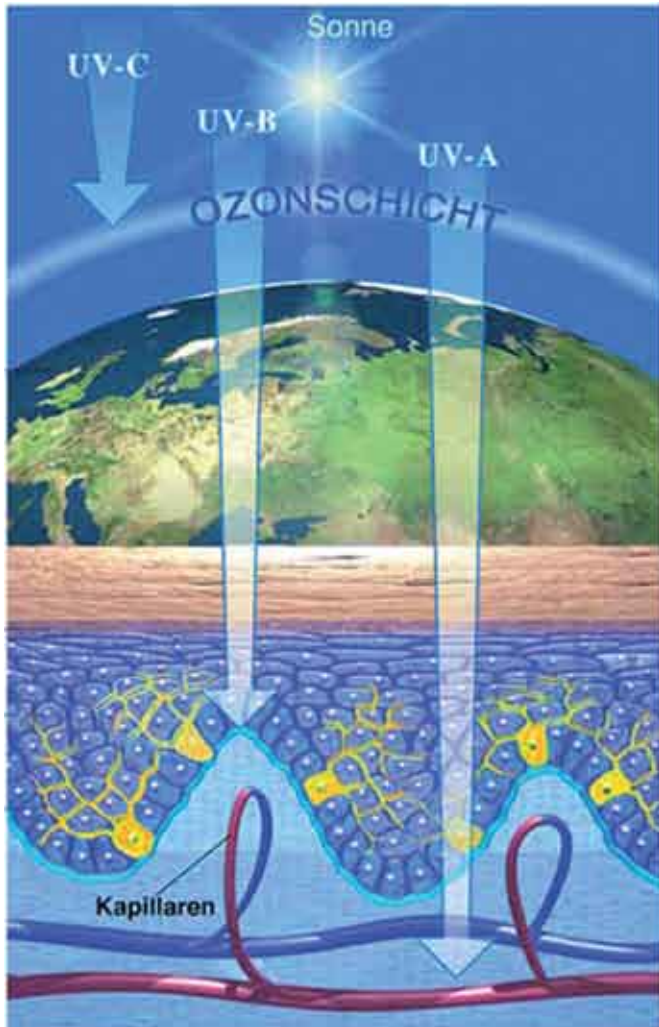
The Australian/New Zealand standard AZ/NZS 4399:1996 is used for stating the UV protection of VAUDE clothing:

UPF 50+*: excellent UV protection, more than 98% of the UV rays are blocked.



UPF 25*: very good UV protection, c. 96% of UV rays are blocked.





If the various protective measures against ultra violet radiation are compared, we can see clearly that clothing with integrated UV protection affords the greatest security against radiation.

UV protection	
UV protection factor	
UV protective clothing	20-80
Thick cotton clothing	c. 20
Sun cream used correctly	0-30
Light cotton clothing	c. 10
Shade of a tree	c. 5-15
Sun hat with broad rim	c. 10
Shade of a sunshade	c. 5
Source: Research Center for Textiles Hohenstein	



9 CARE OF PERFORMANCE CLOTHING

There is no standard recipe for the care of performance clothing. Some garments can be washed without problem in a household washing machine whilst others have to be dry cleaned. It is therefore important to stick to the care instructions on the label.

Tips for household washing

- Before washing, turn the garment inside out. This protects the material from rubbing and wear during the wash cycle.
- Zips and velcro fasteners should always be closed, to prevent small hairs, threads etc. getting stuck in them and reduce wear due to washing.
- Use a mild liquid detergent, preferably a special detergent such as NikWax Tech Wash for performance textiles.
- Do not use fabric softener, as this can reduce the breathability of the membrane.
- Do not fill the washing machine completely.

- Only use the tumble drier when this is clearly stated on the label.
- Never iron fleece jackets, just shake them out after washing with mild detergent.
- Performance shirts and blouses dry quickly, so it is not necessary to tumble dry them. This protects not only the material but also the environment.

Waterproofing

- Heavy rain can wash out the waterproofing in the outer layer of performance jackets. Even if the membrane of these jackets is completely waterproof, the shell layer is usually additionally protected so that it does not soak up water. This is because a wet shell layer can reduce the breathability of the membrane by up to 80%. Clothing should therefore be re-waterproofed when necessary. The right time to do this is as soon as water forms a wet patch on the shell layer instead of rolling off it. The easiest thing to do is to waterproof clothing after washing, then you are sure to be on the safe side.

Clothing with eVent® membrane

- Regular washing maintains the membrane function and re-establishes it once the garment is no longer dirty.
- Wash at 40°C with liquid detergent (e.g. Nikwax Tech Wash), rinse twice to ensure that no detergent is left in the fabric.
- Hang up to dry, don't tumble dry!
- Don't use fabric softener or bleach.
- Ironing eVent® membranes is not recommended as the heat can damage the fabric. If it is absolutely necessary, iron on a warm setting only. To protect the water-proofing substance, treat the garment directly after washing with Nikwax TX Direct.



10 SMALL TEXTILE GLOSSARY

10.1 GENERAL TERMS

Breathability Breathability is usually used as an alternative word for the vapour permeability of a material. The term breathability is unfortunately confusing, because it is not actually air but water vapour which is transported through a fabric. The breathability of a fabric is given either an MVTR or Ret value, depending on the manufacturer.

Denier (D, den) Denier denotes the strength of the threads in textile materials. is the unit denoting the coarseness of textile fibres and yarns. Unlike the tex designation, 1 den refers to 9000 m of fibre or thread. The lower the den value, the finer the thread or fibre. A thread with 10 den means that 9000m of this thread weigh 10g. 1 den = 1g per 9000m; 9 den = 1 tex

Dezitetex (dtex) Dezitetex, just like Denier [den], denotes the strength of the threads in textile materials. „tex“ is the unit denoting the coarseness of textile fibres and yarns. The value refers to the weight of 10,000m of fibre or thread. The lower the dtex value, the finer the thread or fibre, e.g. 73 dtex means that 10,000m of a fibre weigh 73g. Certain microfibres can have values of c. 0.5 dtex, i.e. 10,000m of this fibre weigh a mere 0.5g. „tex“ therefore refers to the weight of 1000m of thread. 1tex = 1g per 1000m; =>1dtex = 1g per 10,000m. 1 tex = 9 den

DWR DWR stands for durable water repellent and is a particular long-lasting textile waterproofing agent. As the name suggests, DWR makes a garment water repellent and means it dries much faster.

MVTR: The MVTR value of a material is often given as the measurement of a material's breathability. MVTR stands for Moisture Vapor Transmission Rate (also known as WVTR - Water Vapor Transmission Rate) and indicates how much water vapour can

permeate a material. This value is established in a laboratory, under precise test conditions which correspond to given standards. The rate is given in grammes per m² per 24h, i.e. the amount of water in grammes which is transported through a square metre of material in 24 hours. The higher the MVTR value of a fabric, the better its breathability, as it is able to transport water vapour more efficiently.

Pill (fluff) Pill is round balls of fluff that can form on the upper surface of fabric when this rubs against other materials (e.g. a woollen jumper or jacket) or on other surfaces (e.g. linen on wood) or when washed. Single threads work their way out of the fabric onto the surface and rub together to form pill. Over time the material wears out, slowly but surely.

Ret The RET value indicates a fabric's resistance to water vapour. It shows how easily or not water vapour can permeate a fabric. The RET value is established in a laboratory under standardised conditions. The lower the RET value of a material, the higher its breathability, as the resistance to water vapour is low.

Textile processing Textile processing is the refining of a base material to give it particular characteristics and functions. Processing includes, for instance, processes which give the fabric antibacterial and odour-reducing characteristics or apply a coating or DWR to make the fabric waterproof.

Water column The water column is a measurement unit which indicates how waterproof technical fabrics (tents, performance and rainwear) are. The water column indicates how much water can fall on a fabric before it lets in moisture. Beyond a defined value (rainwear 1300mm, fly tents 1500mm and tent floors 2000mm according to DIN), the fabric is considered to be waterproof.

Wind Chill Factor The wind chill factor describes the difference between the measured air temperature and how cold it actually

feels due to the wind's speed. The wind chill factor is also a measurement for the body cooling down in the wind. The stronger the wind and the lower the air temperature, the stronger the wind chill, the higher the wind chill, and we experience the actual temperature as being much colder. Wind-resistant materials can eliminate the wind chill effect.

10.2 SYNTHETIC FIBRES

Elastane (also Spandex, Lycra = brand names) Elastane fibres are used when it is particularly important for a garment to have long-lasting flexibility yet keep its shape (e.g. tight-fitting performance underwear, socks, flexible fleece material). Elastane can be stretched by 4-7 times its original length and once the tension has been released, it goes back to this original length. Just 2% of elastane in a fabric is enough to maintain the shape of a finished garment for a long time. Thanks to this stretchiness, garments containing elastane give a lot of freedom of movement and are very comfortable. Elastan is also easy-care.

Microfibres Microfibres are the finest existing fibres, whether synthetic or natural. Microfibre is a term used for all fibres whose individual fibres are finer than 1 dtex. Microfibres are made from polyester, polyamide or polyacryll. They can be twice as fine as silk, 3 times finer than cotton, c. 6 times finer than wool and 60 times finer than a human hair. 3 kg of a single microfibre would be long enough to stretch around the Equator. When these fine fibres are used (also in combination with other synthetic and natural fibres), the volume of a garment increases without changing the weight. This structure allows the skin to breathe better and the body to regulate its own temperature. Clothing made from microfibres is breathable and provides protection from wind and weather. It is easy-use and easy-care.

Polyamide (PA, nylon) Polyamide is better known as nylon. Just like polyester, it is a synthetic fibre and is made using the melt spin technique. In this process the spinning compound is



heated, pumped through a very fine spinning nozzle, cooled, stretched and finally wound on a bobbin - and the polyamide fibre is complete. Polyamide is extremely durable. It is very tear-proof and does not chafe. This durability is however compromised in strong light (UV radiation) which makes it slightly porous and brittle.

Polyester (PES) Polyester is a synthetic material that we come across every-where in our daily lives. Polyester is found not only in textiles but also as PET bottles or CDs. A special spinning process (melt spin technique) is used to create a fine fibre, the 'original polyester', from the raw materials. In this process the so-called spinning compound is heated, pumped through a very fine spinning nozzle, cooled, stretched and finally wound on a bobbin - and the polyester fibre is complete. Polyester is particularly tear-proof and does not chafe. The finished material absorbs very little moisture and dries quickly. Polyester is very resistant to light, hard-wearing and easy-care. Polyester is also very suitable for creating mixes with natural fibres such as cotton.

Viscose Viscose is a natural synthetic fibre. The raw material is cellulose, which is produced from wood. Various processes (viscose processes) turn the cellulose into a viscous spinning solution, which is then pressed through fine nozzles. This creates wafer-thin endless threads, or viscose filaments, from which textiles are produced. The finished viscose fibres are similar in look and use to cotton. Their characteristics can however, in the viscose process, be varied (e.g. matt or shiny, fibre length, thickness or diameter). Viscose is breathable and temperature regulating and therefore particularly skin-friendly. Viscose is highly absorbent and quick-drying. It feels soft and smooth and has a reduced electrostatic charge.

10.3 NATURAL FIBRES

Cotton (CO) Cotton is a natural fibre obtained from the seed hairs of the cotton plant. The fibres are spun to fine threads

which are then processed into textiles. Cotton is very skin-friendly, doesn't scratch and it rarely causes allergies. In comparison with synthetic materials, cotton absorbs a lot of moisture - it can absorb up to 80% of its own weight in water. Cotton fibres are used either pure or in a mix with synthetic fibres such as polyester or viscose.

Linen (Flax) The linen or flax fibre is obtained from the stalks of the flax plant. The fibres are then spun into threads and woven into fabric. Linen fabric is smooth and dense. It absorbs up to 35% of air humidity which can be transferred quickly to the surrounding air. This makes the fabric pleasantly cool on the skin. Dry linen has a warming effect. Linen is strong and does not tear easily. It also has a natural bactericidal characteristic, which helps to inhibit odours, and is antistatic and dirt-repelling. However, linen tends to crease easily and is not resistant to abrasion.

Silk Silk is probably the finest natural fibre of all. It is the only natural endless fibre. The silk fibre comes from the cocoons of the silk worm and is originally from China, where it was being used 5000 years ago. Silk is particularly light and keeps its form well. Despite its low weight, silk is one of the strongest natural fibres. It has excellent thermoregulatory characteristics: it insulates well, keeping us warm in winter and cool in summer. The only disadvantage of silk is that it is quite difficult to take care of.

Wool Wool is the hair of a mammal's coat, in particular a sheep's. Wool is shorn from the animals, washed, carded, dyed or bleached and spun into woollen threads. The thinner and therefore the longer the thread spun from a kilo of raw material, and the finer the thread, the higher the wool quality. Wool has natural thermoregulatory characteristics. It can absorb water vapour inside the fibre whilst the surface repels water. Wool can absorb up to 33% of its dry weight in moisture without feeling wet. It transports moisture considerably faster than e.g. cotton and dries more quickly. Clothing made of wool is very warm as the wool fibres capture air and thus insulate the body's warmth.

Wool is very flexible and creases very little, it is colourfast and does not easily burn. Clothing made of wool tends to form fluff (pill). Coarser wool may scratch the skin unpleasantly.

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MOUNTAIN SPORTS

