

DIE ALPEN

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Gliding and holding

Ski skins in field and laboratory tests

Ski skins bring us safely and effortlessly to the summit. So much for the theory. The Outdoor Content Hub has subjected seven models to an intensive field and laboratory test for „the Alps“ and shows which products swing out of the top.

First the work, then the pleasure! This is especially true for ski tours, because before you can indulge in the downhill rush, the ascent is on the agenda. How exhausting it is does not only depend on the altitude meters covered and the distance. Everyone knows this, whose ski skin has already shown weaknesses during the ascent. Whether the adhesive loses its holding power, clogs up or the climbing skins lack the gripping effect and slip - every problem not only

costs nerves and energy, but also represents a potential safety risk.

Mohair or synthetic fibre

The structure of every ski skin today is more or less the same: a base fabric with fibrous pile, a waterproof intermediate layer, the backing and finally an adhesive layer. The basic materials and how they are processed, however, determine the functionality of the end product.

The first and most important decision of the manufacturers is: Mohair or synthetic fibre? Read more about this in the materials section on page 41. How well a skin glides and rises also depends on the weave, fibre quality and pile length and the angle in which angle parallel to the running direction they are fixed. Typical competition ski skins, for example, have particularly short hairs that produce less friction, but have good gliding properties.

Hot melt adhesives remain widespread.

All tested products are so-called adhesive skins. They are fixed to the ski surface by a residue-free and cold-resistant adhesion surface based on acrylate, silicone or hot-melt adhesive and at the same time attached to the tip and end of the ski with special hooks and tail fixations. The widest applications are still found in hot melt adhesives, which have proved their worth in changing conditions and repeated use of the skins. Adhesion surfaces based on silicone or acrylate are becoming increasingly popular. They can be removed from the ski surface with little force and can also be transported without using the nets or foil. Especially during the mounting and removal of the skins, it becomes apparent how well they lie in the hand or how easy it is to pack them away. In the field test, the soft and supple skins swung up. They could be folded or rolled up and stored in a space-saving way in the backpack or in the breast pocket.

How well a ski skin sticks, glides and holds during the ascent: This was measured for seven products.

Photo: Robert Bösch

Joy remains with regular care

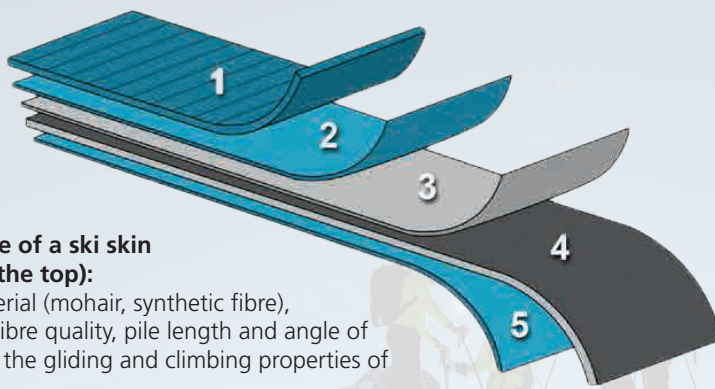
What is taken for granted with skis is usually neglected with ski skins: regular care. In order to maintain the gliding properties and reduce the formation of clogs, skins must be treated regularly with impregnating agents. The adhesion surface should also be cleaned regularly. If the adhesive performance decreases, the hot-melt adhesive should be completely or partially renewed. This keeps the skin reliably on the ski (see >care tips for ski skins> page 43).

Small material science

Mohair is the name given to the fine hair of the Angora goat. In contrast to synthetic fibres, it is hollow inside, which has a positive effect on the total weight. Climbing skins made of 100% mohair are particularly convincing due to their excellent gliding properties over the entire product life cycle. Nevertheless,

they satisfy with good climbing ability on snow and remain supple even in freezing cold. Mohair is therefore still the first choice of many ambitious tourers and racers. However, mohair skins are usually somewhat more expensive, sensitive and require more maintenance than the two alternatives.

Synthetic fibre skins are made of nylon and are very durable and easy to care for. Even stone contacts are usually accepted without complaint. Stress-free in use and maintenance, they are particularly suitable for beginners or occasional tourers, who are less often on the move in the terrain. Even for Freeriders who only have short ascents to master, they are a cost-effective alternative to mohair. In very cold conditions, they glide noticeably worse than skins with a high mohair content. A conscientious impregnation solves the problem at least partially.



Schematic structure of a ski skin (plush material at the top):

1 Fibrous pile: material (mohair, synthetic fibre), The type of weave, fibre quality, pile length and angle of the fibres determine the gliding and climbing properties of the ski skin.

2 The intermediate layer prevents the coat from fraying laterally after cutting.

3 The waterproof intermediate layer protects the backing against moisture.

4 The polyester reinforced cotton backing stabilises the pile and increases the tear resistance of the skin.

5. An adhesion surface based on acrylate, silicone or hot melt adhesive ensures the bond with the ski base.

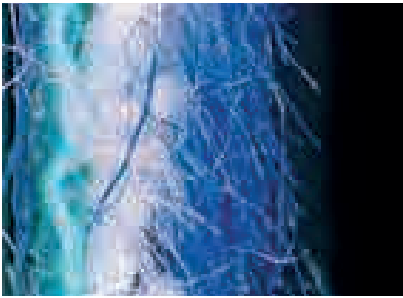
The best of both worlds is promised by the skins made of a **mohair-synthetic mix**. They combine a good climbing ability with a gliding ability that comes ever closer to that of skins with pure mohair. When new, you will hardly notice a difference to the natural fibres. As a rule, they are mixed with about 30% synthetic fibres. This increases the abrasion resistance and thus the service life.

1



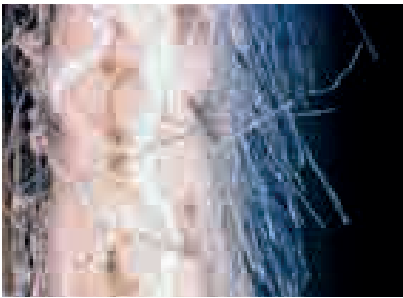
Thorough investigation

2



The ski skins were tested in the terrain, on the ski jump and in the laboratory. Measuring systems such as the tribometer were also used.

3



During the whole winter of 2017/18, the products were put through their paces in practical use on ski tours in a wide range of snow conditions, temperatures and weather conditions. On the numerous tours, almost 15,000 metres of altitude difference came together, which roughly corresponds to the seasonal performance of an average ski tourer. In a second series of practical tests, the gliding characteristics of the skins were tested on the Wildhaus ski jump at various temperatures and snow conditions.

Glide: How much strength does it take for the coat to glide?

In practice, the gliding characteristics were determined by a test person gliding into the flat surface from a defined point in the concave exit area of the ski jump. In the laboratory, the friction force was measured in the tribometer. This means the force and thus the energy required to keep the ski and the ski mountaineer moving. A smooth ski surface has a coefficient of friction of about 4%. If this ski is loaded with 100 Newton (approx. 10 kg), it needs 4 Newton to move in the flat.

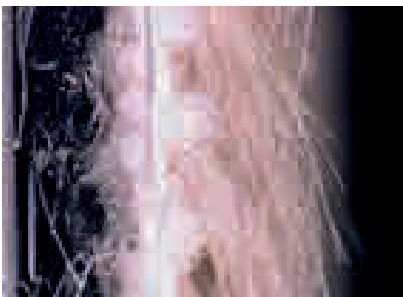
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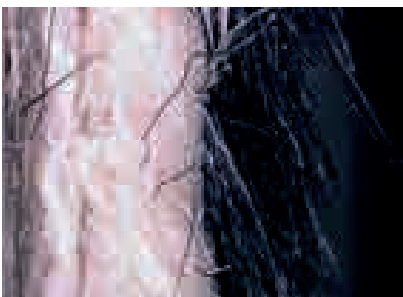
After the practical tests, both the used ski skins and the new products were tested in the **laboratory** at the tribometer facility at the Snow, Skiing and Alpine Sports Research Centre at the University of Innsbruck. We made two different measurements with the tribometer: one for static friction and one for the adhesion friction>, says Michael Hasler: Project manager for sports equipment at the research centre.

The various measurement series have shown that a top skin has a coefficient of 10%, while an unfavourable fur can have a coefficient of up to 28%! This means that a lot of energy is lost during the ascent, which may be missing shortly before the summit or during the descent.

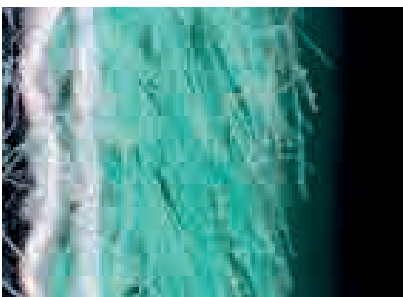
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Microscope images of the skins from the side, 100 x magnified

- 1 Black Diamond - Glidelite Mix STS
- 2 Colltex - Tödi Mix
- 3 Contour - Hybrid Mix
- 4 Fischer - Profoil
- 5 G3 - Alpinist+ Speed
- 6 Montana - Montamix Zebra
- 7 Pomoca - Climb Pro-S Glide

42

Climb: At what steepness does the skin begin to slip?

The tribometer was used to determine the limit force at which the skin begins to slip. It is simulated that a ski tourer climbs uphill on a very steep route> says Hasler.

Clogging, hardly formed

It was also tested whether there was a susceptibility to clog formation in the moist state. There was no clear result. On the test ski tours, none of the skins showed any clogging. Therefore we do not mention this point further in the individual evaluation.

Handling: Is it possible to remove the skin with reasonable effort?

The ski skins should adhere to the ski surface. As durable as possible and under all conditions. But only so strong that it can be removed with little force and completely without residue. In order to test this, the test ski was fixed in the climatic chamber and the skin was removed from the ski at a given angle.

The force required for this was measured. To determine the values, two scenarios were simulated: a ski tour in high winter at -5°C , and a spring ski tour at $+5^{\circ}\text{C}$.

Handling: How practical is the ski skin on the tour?

Other factors were also assessed in the handling. How well does the covering with the skin net or protective foil work? Is it possible to put glue on glue - even if only in case of emergency? How easy are the fasteners to use? Does the skin feel flexible or rigid? Each skin received the maximum possible rating of 10 points at the beginning, then one point was deducted for each negative conspicuity.



Laboratory tests on the tribometer. One of the test skins is fixed on the standard ski.

Care tips for ski skins

Cleaning

Contamination of the skin and adhesive side should be avoided if possible - which is admittedly not so easy if you want to pack away the skins as quickly as possible in stormy winds or extreme sub-zero temperatures. When cleaning, the care instructions of the manufacturer must be observed. Basically, the following applies: Thoroughly rub the soiled skins with a damp cloth. Then impregnate again to prevent water absorption and the formation of clogs. There are various care products such as sprays or application sponges for impregnating ski skins. A gentle cleaning of the adhesive side is possible with a cloth or sponge, depending on the manufacturer (e.g. with the tested Contour Hybrid). With classic hot melt adhesives, coarser dirt such as grass, fir needles or textile fibres can be carefully removed with tweezers.

In case of heavy soiling, only the renewal of the adhesive layer, as offered by specialist dealers and manufacturers, will cure at some point. Who wants to put on hand, finds on manufacturer Websites or on Youtube appropriate Tutorial videos.

Handling

Basic rule: The ski skins must be stored as clean and dry as possible. If they are damp, it is advisable to store them close to the body, for example in the breast pockets, so that they can dry. This is especially important if you have to mount the skins several times on tour. Make sure that the ski surface is always free of dirt, snow or ice. It is absolutely imperative to avoid the contact of two glue surfaces on skins with hot melt adhesives. At home it is best to first dry the skins at room temperature and then store them in a dry and dark place.

Troubleshoot on the go

Adhesive pads can help if the ski skin ends become detached on the way or if the adhesive surface is soiled in some places. They are just as much a part of the basic equipment of the ski touring rucksack as the emergency pharmacy. If the front or end fastenings break or tear out, this can often be fixed with a few cable ties in an emergency.

Five good skins

Of the seven skins tested, five have good climbing or gliding properties, three even a good combination.

During the ascent one wants to spend as little energy as possible. The results of the glide tests are therefore particularly relevant.

Gliding

The various series of measurements in the laboratory have shown that a top skin has a coefficient of 10% (i.e. 2.5 times the force of a normal ski), while an unfavourable skin can have a coefficient of up to 28%, i.e. 7 times the force! So there's a lot of energy that goes astray in the ascent, which may be missing shortly before the summit or in the descent. The coefficients of the tested ski skins in relation to their gliding ability ranged between 16% (Colltex, Contour and Fischer) and 28% (Pomoca), whereby the values varied for old and new snow.

between 16% (Colltex, Contour and Fischer) and 28% (Pomoca), whereby the values varied for old and new snow. There were also considerable differences between the brand new and the ski skins used over a season. The Pomoca skin is a special case here: In new condition we measured a bad value of 28%, in the product tested over a season a very good value of only 15%. This is partly due to the coating of the skin (see microscopic image), which initially has a strong negative influence on the friction between snow and skin, but quickly loses itself. Pomoca writes: >The skins change quickly and after only a few kilometres they develop their full gliding properties.>

Above all the length of the hairs of the skins plays a role for the dynamic friction. Typical racing ski skins such as Colltex or Contour have particularly short hairs which produce less friction. **The practical** test on the ski jump shows the difference very impressively: with the Colltex and Contour skins, the test skier glided 21 and 22 metres on a day with low temperatures, respectively, with the Fischer test skin only 11 metres, with the Black Diamond 13 meters In midfield were the Pomoca with 14 meters and the G3 red with 15 meters. Better was the Montana Montamix Zebra with 19 meters.

This is how the Outdoor Content Hub rated it

Each climbing skin was evaluated on the basis of laboratory and practical tests. The evaluation ranges from 1 to 10, whereby the values are always relative to the smallest and largest value of the test. The higher the number, the better the skin's performance in each test.



The test ski and the seven skins - still freshly packed.

Glide laboratory fresh snow or old snow

- 1: limited, corresponds to an additional force of 28%.
- 10: very good, corresponds to an additional force of 10%.

Gliding practice

- 1: stops after less than 5 meters
 - 10: Ski glides over 20 meters
- ## Climbing laboratory fresh snow or old snow

- 1: holds at least up to 30° slope inclination
- 10: holds at least up to 45° slope inclination

Handling

- 1: completely impractical
- 10: completely problem-free handling

Climbing

The second main characteristic that is of particular interest for ski skins is their climbing ability. The skins should not slip when climbing up steep terrain. Laboratory tests showed that the Pomoca skin could climb up to 34 degrees in fresh snow, the Colltex Tödi Mix would climb up to 38 degrees without slipping. On old snow, the Pomoca skin would already slip at 33 degrees, the Montana Montamix Zebra would bring it here on a mad gradient of up to 50 degrees. Mind you, under laboratory conditions, i.e. with extremely grippy snow and complete contact of the skins on the snow with a ski tourer weighing about 70 kg. Measurements were taken both with narrow gliding bodies (to exclude the effects of different ski models) and with the K2 Wayback 96 test ski.

Which skin?

When choosing a ski skin, one should consider for which terrain one needs it and how often one is on the way. If you prefer easy ski touring, you will be happy with a skin with very good gliding properties and easy handling. Here the Tödi Mix by Colltex, the Hybrid Mix by contour or the Montamix Zebra by Montana offer themselves.

If, on the other hand, you are going on very steep, difficult tours, you should take a closer look at the climbing characteristics. The following skins have achieved some excellent results:

Glidelite Mix STS from Black Diamond, Hybrid Mix from Contour, the Alpinist+ Speed from G3 or the Montamix Zebra from Montana. If the handling is also included in the evaluation, the tested Colltex and Contour skins are at the top of the list, seen across all test results. Shortly after that follows the skin of Montana.

Ski skins in detail

Black Diamond Glidelite Mix STS

Price: CHF 190 Country of manufacture: USA

Weight: 278g* Basis weight: 1.282 kg/m²

Material: 65% Mohair / 35% Nylon

Adhesive: Hotmelt

Mounting only stepped, screwed-on front bracket made of plastic-sheathed steel cable/metal folding bracket

Cut: cutting set

Scope of delivery: Packsack with drawstring and mesh insert, two protective nets

*per skin, incl. front and end fastening

- + good climbing properties in old snow
- fringes selectively at the sides



The Glidelite Mix STS shows itself as an outstanding climbing skin especially on old snow, but in terms of gliding it is in midfield. After cutting it to size, it frayed at the edges. The length adjustment proved to be quite fiddly. The skin can be packed easily and space-saving. The packing bag is unfortunately badly sewn and was inoperable after a short time. Conclusion: The cheapest skin in the test shows a solid performance in laboratory and field tests but reveals weaknesses in detail.

Colltex Tödi Mix

Price: CHF 240 Country of manufacture: Switzerland
 Weight: 207g* Basis weight: 1.085 kg/m²
 Material: 65% Mohair / 35% Nylon
 Adhesive: Hotmelt
 Mounting stepless, metal front bracket/plastic clip
 Cut: custom-tailored (cutting set also available)
 Scope of delivery: Packsack with Velcro closure, two protective nets
 *per skin, incl. front and end fastening

50 years of experience obviously pays off at Colltex. The Tödi-Mix climbing skin convinces with excellent gliding and solid climbing characteristics. The material is very light and supple, which is why it can be rolled up or folded easily and space-savily. After a ski touring winter there are hardly any signs of wear. Conclusion: a real ski touring all-rounder that promises long-lasting function.

- + good climbing properties in old snow
- fringes selectively at the sides



Gliding

Laboratory fresh snow **bad** very good
 Laboratory old snow
 Field test

Climbing

Laboratory fresh snow
 Laboratory old snow

Handling

Contour Hybrid Mix

Price: CHF 200 Country of manufacture: Austria
 Weight: 292g* Basis weight: 1.458 kg/m²
 Material: 65% Mohair / 35% Nylon
 Adhesive: Hybrid adhesive technology (silicone/acrylate)
 Mounting stepless, metal front bracket/plastic clip
 Cut: custom-tailored (cutting set also available)
 Scope of delivery: Packsack with Velcro closure and sewn-in micro-fiber cloth
 *per skin, incl. front and end fastening

The climbing skin has very good climbing and gliding characteristics. After a ski touring winter there are hardly any signs of wear. Special: only skin in the test with adhesive surface on silicone/acrylate basis. Therefore, top marks for handling: the skin can be removed from the ski with little effort. The only difference is that when the skis are mounted several times, the ski surface and adhesive surfaces must be absolutely free of snow and water drops, otherwise the skin will stick poorly or not at all. Conclusion: ski skin with very good climbing and gliding characteristics, which is characterised in particular by its simple handling.

- + good gliding properties
- + easy handling
- relatively heavy



Gliding

Laboratory fresh snow **bad** very good
 Laboratory old snow
 Field test

Climbing

Laboratory fresh snow
 Laboratory old snow

Handling

Fischer Profoil

Price: CHF 229 Country of manufacture: Austria
 Weight: 296g* Basis weight: 1.746 kg/m²
 Material: polyethylene (Surlyn)
 Adhesive: Hotmelt
 Mounting stepless, metal front bracket/plastic clip
 Cut: cutting set
 Scope of delivery: packing bag, protection net, anti-ice cloth
 *per skin, incl. front and end fastening

Fischer takes a new approach with the Profoil and uses a scaled polyethylene coating. This is easy to clean. The only difference is that if the coat still holds up reasonably well in the laboratory glide test, it falls off in the coat test. With regard to climbing characteristics, it is even at the end of the test field. Especially on hard pressed snow or ice plates the coat offers only little hold. A crampon must therefore always be with you. The coat sticks strongly and can only be removed with considerable effort, adhesive residues are to be expected. However, it can be rolled up easily. Conclusion: Fischer solves some problems of conventional skins with the Profoil. However, the price is high: Climbing and gliding characteristics are not convincing.

- + low maintenance
- poor climbing and gliding characteristics
- difficult handling



Gliding

Laboratory fresh snow **bad** very good
 Laboratory old snow
 Field test

Climbing

Laboratory fresh snow
 Laboratory old snow

Handling

G3 Alpinist + Speed

Price: CHF 199 Country of manufacture: Canada
 Weight: 251g* Basis weight: 1.386 kg/m2
 Material: 100% Mohair
 Adhesive: Hotmelt
 Mounting stepless, metal front bracket/plastic clip
 Cut: cutting set
 Scope of delivery: packing bag with drawstring, protective net, cutter
 *per skin, incl. front and end fastening

Climbing and gliding properties have convinced in field- and laboratory test. The front fixation has two movable metal front hooks that adapt to almost any ski tip - the robust solution works very well. Unpleasant: the plastic support part on the skin end has been broken once without any great force being applied. In the front, flaked polyurethane (TPU) is used to reduce the sliding resistance in new snow. TPU material makes the skin relatively rigid, the pack size suffers from it. The plush frays at the edges. Conclusion: The pleasure in the good climbing and gliding properties is reduced by a few, less functional details.

- + good climbing- and gliding characteristics
- fragile fastening of the end hook
- sharp-edged, rigid cover net



Gliding

Laboratory fresh snow	bad	very good
Laboratory old snow	[Progressive bar from bad to very good]	
Field test	[Progressive bar from bad to very good]	

Climbing

Laboratory fresh snow	[Progressive bar from bad to very good]	
Laboratory old snow	[Progressive bar from bad to very good]	

Handling

[Progressive bar from bad to very good]	
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Montana Montamix Zebra

Price: CHF 257 Country of manufacture: Switzerland
 Weight: 243g* Basis weight: 1.309 kg/m2
 Material: 65% Mohair / 35% Nylon
 Adhesive: Hotmelt
 Mounting stepless, metal front bracket/plastic clip
 Cut: custom tailored (also cutting set and plush in rolls)
 Scope of delivery: Packsack with drawstring and mesh insert, two protective nets and Microfibre protective stockings (skinny)
 *per skin, incl. front and end fastening

The Montamix Zebra Climbing Skin is equally convincing with good to very good gliding and climbing properties, even in steep terrain. The material is supple and the skin can easily be packed away to save space. Depending on the ski model, it is attached to the tip with a solidly sewn-in front bar, the piercing developed by Montana or a clip. After a ski touring winter, hardly no traces of wear can be seen. Conclusion: The best climbing skin among the tested products. It can be easily packed away to save space.

- + outstanding climbing properties and good gliding
- + small packing size



Gliding

Laboratory fresh snow	bad	very good
Laboratory old snow	[Progressive bar from bad to very good]	
Field test	[Progressive bar from bad to very good]	

Climbing

Laboratory fresh snow	[Progressive bar from bad to very good]	
Laboratory old snow	[Progressive bar from bad to very good]	

Handling

[Progressive bar from bad to very good]	
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Pomoca Climb Pro S-Glide

Price: CHF 245 Country of manufacture: Switzerland
 Weight: 275g* Basis weight: 1.390 kg/m2
 Material: 70% Mohair / 30% Nylon
 Adhesive: Hotmelt
 Mounting only stepped, metal front bracket/plastic clip
 Cut: cutting set (also available in rolls)
 Scope of delivery: packing bag, protection foil, Microfibre cloth, cutter, 2 front replacement brackets
 *per skin, incl. front and end fastening

Once the skins had been used for a while, they had good glide values in laboratory and field tests. But with the climb values it landed on the last place. There are good marks for handling. It can be packed away in an emergency adhesive surface on adhesive surface. It is attached via a front bracket that is clicked into a plastic holder sewn into the skin. A drop of bitterness: In a practical test, a plastic holder is broken - a problem that cannot be easily solved on tour. Conclusion: an easy-care all-rounder with good gliding but moderate climbing properties.

- + good gliding properties
- + good handling
- relatively heavy
- only reduced climbing properties



Gliding

Laboratory fresh snow	bad	very good
Laboratory old snow	[Progressive bar from bad to very good]	
Field test	[Progressive bar from bad to very good]	

Climbing

Laboratory fresh snow	[Progressive bar from bad to very good]	
Laboratory old snow	[Progressive bar from bad to very good]	

Handling

[Progressive bar from bad to very good]	
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