

Cold facts. Warm clothing.



Ullfrotté
ORIGINAL



Woolpower[®]
ÖSTERSUND

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We know cold weather..

...and we know how you can keep yourself warm. We at Ullfrotté AB in Östersund, in northern Sweden, have a long and intimate understanding of cold weather, harsh winters, and most importantly, the best way to dress to avoid being cold.

We are eager to share not only our knowledge of cold weather, but also how the human body reacts and how best to stay comfortably warm in the cold.

Warm greetings from us at Ullfrotté AB.



Winter and cold



IT CAN BE COLD IN SWEDEN. So Swedes have a long tradition of dealing with cold weather.

WINTERS CAN BE ESPECIALLY COLD IN SWEDEN.

Because of our cold climate, we have a long history and deep understanding of dealing with cold weather. Most of the year, the temperature outside is significantly lower than it is indoors. Sweden is a long, narrow country – 1570 km (976 miles) from top to bottom – with dramatic variations in both climate and weather. In the far north, winter lasts for seven months and is marked by dry, cold air and snowy conditions. Southern Sweden, meanwhile, typically has shorter winters characterized by rain and wind.

Winter, in meteorological terms, is the season when the average 24-hour temperature consistently stays below 0 °C (32 °F).

TEMPERATURE ON EARTH VARIES GREATLY. The average temperature on earth is +15 °C (59 °F). The lowest temperature ever recorded on earth was -89.2 °C (-128.6 °F), seen at Vostok, the Russian Antarctica station, in 1983. The equivalent record for Sweden, -52.6 °C (-62.7 °F), was noted in Vouggatjålme in Lapland in 1966. The highest temperature ever recorded was +57.8 °C (136 °F) in San Luis, Mexico, in 1933.

WIND CHILL. Wind increases the chilling effect of cold temperatures. Wind literally blows away the warm air layer closest to the body. The body then reacts by reheating the now-cold air closest to it. If this process is

repeated too many times, the body becomes dangerously chilled.

At a temperature of -10 °C (14 °F) and winds of 8 m/s (18 mph), the wind chill on bare skin will equal a temperature of -27 °C (-17 °F) with no wind. The additional wind produced while snowmobiling, alpine skiing and other outdoor activities increases the wind chill effect.

WIND-CHILL TABLE

Wind speed

(meters per second)

Air temperature (°C)

0	0	-5	-10	-15	-20	-25	-30	-35	-40
2	-1	-6	-11	-16	-21	-27	-32	-37	-42
5	-9	-15	-21	-28	-34	-40	-47	-53	-59
8	-13	-20	-27	-34	-41	-48	-55	-62	-69
16	-18	-26	-34	-42	-49	-57	-65	-73	-80
25	-20	-28	-36	-44	-52	-60	-69	-77	-85

...The effect of cold on humans has been a hot topic throughout history. Hippocrates claimed that a cold climate would make people cold and lethargic. Aristotle and Vitruvius claimed the opposite, that cold weather traps the body's fluids, causing people who are unusually hot and energetic.

The body in cold weather

27 °C (80 °F) IS IDEAL. Man is a tropical animal who has adapted over thousands of years to be comfortable without clothing at +27 °C (80 °F). At this temperature, the body works optimally, and maintains a steady internal temperature of +37 °C (98.6 °F).

In spite of this, we live and function in cold climates both because of our capacity to adapt, and because we can (and do) make use of clothing to maintain the body's temperature equilibrium.

In order for our bodies to work properly, we need to provide energy in the form of food and water. This enables our hearts to pump, our muscles to work, and our brains to function. Approximately 70% of that energy is needed to maintain a constant core temperature of +37 °C (98.6 °F).

BODY HEAT IS CREATED by burning food, such as fat, carbohydrates and protein. Heat is produced mainly in the muscles, and increases the more muscles are worked. In a cold environment, the body needs external help to maintain its temperature. We have to add extra energy by drinking and eating more, we need to dress right, and to keep active in order to avoid getting cold.

At rest, our bodies' normal heat production is roughly 80 to 100 Watts. During intense physical work, the body can put out 1000 Watts.

WHEN THE BODY GETS COLD it tries to create heat by shivering. The body also decreases blood flow to the hands and feet and in general reduces blood flow to minimize loss of heat in the body's core. This gives priority to the heart, brain and other vital organs, which is why you first feel cold in your hands and feet even though the rest of your body feels warm.

TO PERSPIRE is a normal reaction when the body is too hot and needs to cool down the skin. The skin cools because the moisture – sweat – evaporates. This functions very well in a hot climate, but in cold weather, when you are wearing lots of clothes, heavy sweating can prove disastrous. 0.5 to 1 liter of fluid evaporates from the skin every day. During hard work, the evaporation can reach several liters per hour.

...The need to drink increases in cold weather, when the production of urine increases and moisture evaporates through breathing. During inhalation the body must heat and moisturize the dry air. However we feel less thirsty in cold temperature.



AT 58 °C (-72 °F) BELOW ZERO.

While the Swedish explorers Mikael Strandberg and Johan Ivarsson traveled along the Kolyma River in Siberia, temperatures plunged to -58 °C (-72 °F). They were able to handle the extreme cold thanks largely to Woolpower® garments.



Clothing as
an insulator

CLOTHES DON'T PROVIDE HEAT. But they do allow you to retain and maintain the warmth that you need. Think about how you dress: small details make a big difference when the weather is harsh and your energy level is dropping.

Clothes should insulate and support the body's temperature equilibrium. At the same time that our clothing should help to retain heat that the body produces, it should also transport excess moisture and heat away from the skin.

DRESS IN LAYERS. An efficient way of dressing in a cold climate is to use layers. This provides a versatile and flexible system that not only protects against cold, wind and wetness, but is also easy to ventilate or modify if you get too hot. The layering principle is divided into three main layers.

...In winter, one can dry clothing by "freezing out the moisture." By hanging clothing outside on your skis, for example, moisture in the garments will turn to ice, which can then be shaken or brushed off. When camping in tents or snow caves, one should "freeze out" the moisture in down sleeping bags and jackets every morning if weather permits.

LAYER 1. A base layer, worn closest to the body, which transports moisture away from the skin. It is imperative to wick moisture away from the skin, since water conducts heat 25 times more efficiently than air. A base layer in synthetic fibers or wool is superior to cotton, which absorbs moisture and dries poorly.

LAYER 2. A mid-layer that adds extra insulation, and thus retains body heat. In cold weather or if activity level is low, a thicker layer is needed. The purpose of the second layer is to trap insulating air. The more air in the clothes, the better the insulation.

LAYER 3. A wind and water repellent shell that protects against external cooling and retains the warmth created between the inner layers. Modern shell garments release some moisture through their material. During high activity levels, the garments should allow ventilation at the neck, the cuff or at other special openings to increase the release of warm, moist air.

A **FOURTH LAYER** can be worn during break times or when making camp. Windproof, high loft down or synthetic filled garments are easy to put on over the shell layer.

RETAIN THE HEAT – LET MOISTURE OUT. The purpose of clothing is to retain heat that the body produces. The body puts off heat all the time, for better or for worse. This is a natural process, and it happens in five ways:

CONVECTION (50%)

Air is heated when it is in contact with the skin. This warm air, which is lighter than cold air, rises up and away from the body. Wind increases convection.

HOTTIP: Use windproof shell garments. Use a hood and balaclava to protect your face and head. Take breaks out of the wind. Dress appropriately for higher wind conditions.

RADIATION (30%)

Heat in the form of infrared radiation is released as waves directly from the skin to surrounding colder surfaces.

HOTTIP: Insulate with warming materials that trap air and retain heat nearest the body.

CONDUCTION (5%)

Heat is conducted by material that is in contact with the skin. Metals or cold water conduct heat very rapidly.

HOTTIP: Use a “sit pad” and put insulating soles in your boots or shoes to help prevent heat conduction.

Do not wear jewelry, watches or anything metal in direct contact with your skin.

EVAPORATION (5%)

Body heat is transferred with perspiration on the surface of the skin, and moves away from the body. Wet skin loses heat many times faster than dry skin.

HOTTIP: Keep dry. Avoid getting sweaty by adapting your clothes to the degree of your physical activities. Use a moisture wicking base layer that absorbs and transports moisture away from the skin.

RESPIRATION (10%)

Energy is lost when cold air is inhaled and heated in the respiratory passages before reaching your lungs.

HOTTIP: Breathing through your nose helps protect your lungs, since the air has more time to warm up before entering the lungs themselves.

USE YOUR HEAD. The layering principle does not apply only to the body in general, but also to the feet, hands and head. A head without a hat works like a chimney, funneling a large amount of the body's heat away. If your toes are cold – put on a hat.

COLD FEET. When a body gets cold, blood flow to arms, legs and feet is reduced in order to maintain both the heat level and the blood flow in the head and vital organs.

Many problems with the feet are related to lack of ventilation. Shoes made with excessively impermeable materials, and socks with high synthetic fiber content conspire to prevent the foot's perspiration from evaporating.

The foot first gets damp, and then cold. A foot secretes about 6 cl (2 oz) of water every day. During vigorous activities this quantity is multiplied. To avoid cold feet, it is imperative that moisture is quickly wicked away from the foot. Socks made of cotton grow wet quickly and conduct heat from the feet, leaving you feeling cold.

Winter shoes and boots should be large enough so that you can add an extra sock to absorb the moisture and keep your feet warm. But avoid feeling cramped and don't tighten your boots too much, blood circulation may be hindered and your feet will get cold quickly. Change your socks often.

CHILDREN NEED COMFORT. Children often vary vigorous playing with sitting down, so high demands are put on comfort and the right kind of clothes. They, too, should dress in layers.



Wool is nature's own functional material, insulating against heat as well as cold. Merino sheep produce an exceptionally fine and crimped wool, which increases wool's normal advantages.



Wool – nature’s own functional material

Wool is nature’s own functional material, and so far no one has succeeded in producing a synthetic fiber with the characteristics of wool.

WOOL USUALLY COMES FROM SHEEP. Other types of wool used include camel wool, mohair from the Angora goat, alpaca wool from the Alpaca, cashmere from the Cashmere goat and angora from the Angora rabbit.

For 2.5 million years there have been sheep in Europe and Asia. Before the Ice Age, sheep were as big as oxen. Sheep were tamed by Man around 9000 BC in southeast Asia, and they were the first domestic animals to provide their keepers with food and clothing. Wool is considered our oldest textile material and has been used to make clothes for 10000 years. Wool has been an important commodity, and has signified prosperity and power well into the 19th century.

MERINO SHEEP: Today there are about a billion sheep all over the world, divided into more than 200 breeds. The largest producing countries are Australia and New Zealand, and the most common breeds are Lincoln and Merino. Merino sheep produce exceptionally fine and crimped wool.

Merino sheep has its origins in North Africa, and probably came to Spain at the end of the 12th century. The trade in this soft and fine wool was significant for Spain, a country which controlled the wool market for centuries, and for a long time banned the export of Merino sheep. The breed was named Merino in the 15th century after the royal sheep inspectors ‘los Merinos’.

WOOL INSULATES AGAINST BOTH HEAT AND COLD. Wool has several characteristics that contribute to its excellent insulating properties: the loftiness and scaly surface of the fiber, the fatty substance lanolin that surrounds the fiber, and its degree of moisture absorption.

The crimped structure of the wool fibers trap large quantities of air and provides good heat insulation. Air between the fibers reduces the conduction of heat in the material, and therefore has an insulating effect against both heat and cold. A larger quantity of crimps in the fiber provides better insulation. Merino wool can have up to 40 crimps per centimeter, which provides a high degree of insulation. The crimps of the fibers also mean that there are fewer contact points between the material and the skin, another benefit when it comes to trapping air.

Wool is hydroscopic, meaning that it is capable of absorbing moisture from the atmosphere. An increase in air humidity brings higher humidity to the fiber. Wool can retain moisture both in and between its fibers, while

synthetic material can only retain moisture either in or between fibers.

WOOL WICKS AWAY MOISTURE. During increased levels of activity or in warmer temperatures, the body produces perspiration to cool down, thereby raising the moisture level. The air trapped around the wool conducts heat better and the insulating effect of the wool diminishes. The drier the air in the intersections, the better the wool insulates. The degree of insulation adjusts to body temperature and humidity. The protein nucleus of the fibers has a water repellent shell that prevents fluids from penetrating the fiber. When humidity is higher inside the wool garment than outside, the wool works hard to absorb the moisture and transport it through the material until a balance is reached. Since moisture is transported to the outside of the garment, heat insulation increases and you stay dry.

WOOL WARMS EVEN WHEN MOIST. The heat generated by a textile during moisture absorption is called absorption heat. Energy is released as water molecules slow down when entering the fiber so when a garment gets wet it feels warm. Wool generates very high absorption heat and can absorb up to 30% of its dry weight without feeling damp or losing its shape.

WOOL IS EASY TO CARE FOR AND SELF-CLEANING. Wool garments do not need frequent cleaning, but can rather be aired out with good results in humid weather.

The vapor passing through the garment will remove soil particles and odors.

Moisture on the surface of a textile promotes the growth of bacteria, but the outside of the wool fiber stays relatively dry. The core of the wool fiber absorbs large quantities of moisture in the form of vapor while the shell of the fiber repels liquid.

The core of the wool fiber consists of two types of cells that absorb different quantities of moisture. As a result, one type swells more than the other and they move in constant friction. This gives the wool fiber a mechanical, self-cleaning effect.

TREATED WOOL CAN BE MACHINE WASHED. The surface of the wool fiber is covered with small scales and as a result wool clothes can felt when washed. The scales can be eliminated with treatment and the wool material is then machine washable.

THE FINENESS OF THE WOOL FIBER IS DEFINED IN MICRONS. The number of microns, i.e., the measurement of the wool fiber in thousandths of a millimeter, is used to indicate quality. Fine wool is between 17 and 23 microns. When wool is perceived as itchy, the reason is that there are coarse fibers in the wool, which do not yield to the skin but prick right in. The finer the fibers, the softer the feel of the textiles. Coarse fibers in excess of 28 microns may itch.

A close-up photograph of white wool fibers, showing their natural texture and slight waviness. The fibers are densely packed and have a soft, fibrous appearance. The lighting is even, highlighting the individual strands of wool.

WOOL IS ELASTIC. Wool fiber is naturally resilient and can be stretched up to 70% beyond its normal length and then revert to its original shape.

...Fine Merino wool is up to 20 times more expensive than wool from meat-producing sheep with coarser wool. Wool fibers from Merino sheep can be several hundred times more costly than cheap synthetic oil-based fibers.

Common materials in clothing

Textile fiber materials have different origins and characteristics. Fibers are divided into natural fibers – which come from plants or animals, such as wool – and artificially produced synthetic fibers. Certain materials originate from nature but have been transformed to textile fibers. These are called regenerated fibers.

NATURAL FIBERS

COTTON is a plant whose seeds are surrounded by fibers, 15–45 mm long, that can be spun into yarn. Cotton represents about 30% of the total consumption of fibers in the US and in Western Europe, and about 50% worldwide. Egyptian cotton is considered of superior quality since its fibers are longer than other types. The cotton industry is highly dependent on chemical pesticides and fertilizers.

The uneven surface and spiral form of the fibers means that cotton easily attracts soil and requires washing at high temperature. Cotton is a strong and resilient fiber that endures washing at high temperature, often with good color fastness, albeit with some shrinkage.

The capacity of cotton to insulate heat is poor, partly due to its low elasticity. Cotton yarns are compact and contain little air. Clothes made of cotton are soft and comfortable on the skin but the fiber absorbs a lot of moisture. This makes cotton a pleasant fiber on many occasions but unsuitable for activities where you perspire a great deal.

FLAX is a stem fiber that can reach a height of up to 75 cm. It is extremely strong when pulled but brittle when broken. Linen clothes are cool and comfortable on the skin but easily wrinkled. Linen can be washed at up to 60 °C (140 °F) but should not be spin-dried since the fibers may break.

SILK is a glandular substance secreted by the silkworm as it spins a cocoon around itself. The cocoon can give up to 900 meters of filament fibers. The silk fiber is long and strong considering its fineness, but since the fiber is so thin it is perceived as brittle. Silk absorbs moisture well and feels comfortable on the skin but may be destroyed by salts, such as from perspiration.

SYNTHETIC FIBERS

Synthetic fibers are manufactured in an entirely chemical process using oil, coal, chalk, salt, water and chemicals mixed to a paste, which is then spun into fibers.

POLYAMIDE is a strong elasticized fiber with good abrasion resistance. It absorbs little moisture and is thus quick drying, with good crease-resistance and stability of shape. Polyamide is often called nylon, which is a trade name. Other well-known modified polyamide varieties are Kevlar®, Nomex® and Kermel®.

POLYESTER is a strong elasticized fiber with good abrasion resistance. It is heat resistant but can be heat proofed to retain its shape. It absorbs very little moisture but can also be made to transport moisture and perspiration. Garments of polyester are suitable when humidity control and/or good abrasion resistance is required.

ACRYLIC has been designed to resemble wool. It is a relatively weak and heat sensitive fiber which easily pills. The feeling is soft with very high light resistance.

ELASTANE – SPANDEX is used as a stretch yarn to complement other yarns. It is highly elastic – up to 700% – and it gives garments excellent shape stability, fit and stretch. It is also highly washable and withstands both heat and perspiration. A common trade name is Lycra®.

POLYPROPYLENE is a fiber with very low weight, poor elasticity but high strength. The fiber is used in garments meant to wick away moisture since it does not itself absorb.

REGENERATED FIBERS

VISCOSE (rayon) is a fiber made from cellulose harvested from spruce or other types of trees. The wood chips are dissolved with chemicals to a pulp, which is spun to fibers and regenerated. The fibers easily absorb moisture but are sensitive and weak when wet. Fabrics made of viscose are soft on the skin, hang gracefully and are easy to wash since the dirt comes off easily. The fabric is easily wrinkled and may be deformed whenever wet.

ACETATE is a chemical compound of cellulose and acetic acid. There is both acetate and triacetate, with different quantity of acetic acid added. Both fibers are stronger than viscose, shrink less when washed, but absorb less moisture and have reduced heat insulation capacity. The fabrics are used as linings in jackets and dresses.

MODACRYLIC is produced of the same raw materials and in a similar way as viscose but more closely resembles the cotton fiber. The fiber is stronger and more elastic. It is also called ‘man-made cotton’ since many of its characteristics resemble the look and features of cotton.

LYOCELL is produced of the same raw materials as viscose but uses less harmful chemicals. This is a relatively new fiber that can assume a wide array of characteristics and properties, from silky to cotton looks. The fiber is strong and washes well with minimal risk of shrinkage.

A close-up photograph of a wool fabric, likely a terry cloth, showing the intricate texture of the terry loops. The fabric is dark brown and appears to be made of fine Merino wool. The lighting is dramatic, highlighting the texture of the loops and the softness of the wool. The background is dark, making the fabric stand out.

ULLFROTTÉ ORIGINAL is a material of fine Merino wool, knit with terry loops to trap as much air as possible.

Ullfrotté Original – the material

ULLFROTTÉ ORIGINAL is the material developed by Ullfrotté AB in Östersund in the early 1970's in collaboration with the Swedish military, scientists, doctors and survival experts. The textile is highly wear resistant and consists of fine Merino wool, polyamide/polyester and air. Products manufactured using Ullfrotté Original are sold today under the brand name Woolpower®.

ULLFROTTÉ ORIGINAL IS 80% AIR. The material is knit so that one side is smooth, and the other has terry loops. The material's lofty terry loops, in combination with its crimped wool fibers, forms a knitwear capable of trapping a lot of air. Up to 80% of the material actually consists of air, which means that the material has an excellent capacity to insulate body heat. The more air you can keep still around the body, the more heat you can retain.

Air does not to any large extent transport heat away from the body, but textiles do. The lofty knitwear has few contact points with the body, which reduces the number of points where body heat can be wicked away.

The permeable material easily lets out moisture from the body. As you become hot and perspire, pressure builds up inside the clothes. The moisture molecules strive to get outside where the air is colder and the pressure lower. If the material is loose and the fibers have the right properties, they will help transport moisture away from the body. The capacity to transport moisture facilitates the radiation of heat during physical activities and help keep the body dry and in balance. The soft terry surface of the material can easily be worn on warm skin for maximum benefit of the material retaining body heat, while helping to wick away perspiration from the skin. Ullfrotté Original retains body heat, even when wet.

WOOL IN THE YARN COMES FROM MERINO SHEEP. The Merino wool is known as a very fine, soft and crimped wool and is perfect for garments worn next to the skin. The wool used in Ullfrotté Original is 22 microns, meaning that the thickness of the wool fibers is 22 thousandths of a millimeter. This results in a comfortable material with sufficient tensile strength.

THE MATERIAL IS HARDWEARING. Wool is a material with excellent properties but its wear resistance is not optimal. In order to add maximum wear resistance to the material, the wool has been mixed with one third polyamide. In the thinnest garments, polyester is added on the outside, for best possible wear resistance.

HARDLY ANY SEAMS. Ullfrotté Original is knitted on specially designed machines where everything from the size of the terry loops to the density of the stitch is carefully tested. Each garment part is knitted on circular knitting machines and comes out in tubular shape, completely free of seams that can both abrade and break. The large number of machines and a wide array of tube sizes ensures that garments in many different sizes can be produced.

WASHING. Wool is to some extent self-cleaning and does not retain odor even after long periods of use. This means that you will not have to clean your Woolpower® garments that often.

Woolpower® garments can be machine washed at 60 °C (140 °F) and tumble-dried at medium heat. This is a requirement from the Swedish and Norwegian armies and several major industrial clients. Humid conditions promote bacteria growth at temperatures between 20 °C and 40 °C (68 °F and 104 °F) and certain soil bacteria will not die until the clothes are washed at 60 °C (140 °F). In the case of mid-layer garments in Ullfrotté Original, washing at 40 °C (104 °F) is often sufficient since they are not worn directly on the body and do not absorb as much soil from the skin.

When washing wool garments you can use either a mild soap-based detergent or none at all. The garments

should be tumble-dried or dried flat for best results. The garments will contract a little, but are form fitting and will adjust in a comfortable way.

WOOL IS HARD TO IGNITE and only catches fire at very high temperature. Wool is based on protein, which in itself is a fire deterrent, and its property of trapping vapor also contributes. Once wool catches fire, the flame is not fed, but the fibers are charred and the fire dies.

Since Ullfrotté Original consists mainly of wool, it is not a very flammable material, in contrast to purely synthetic products. This is why Woolpower® garments is used not only by outdoor enthusiasts, but professionals like firemen, welders, smiths, and utility workers to add protection against heat and burn injuries.

A SPECIAL COLLECTION IS PRODUCED in a special blend of Ullfrotté Original material to provide extra flame protection. Aramid fibers have been added to the wool yarn, further emphasizing the ability to resist heat and fire. These products are marked FR (Flame Resistant) and are CE certified in accordance with standards for this type of protective clothing.

ULLFROTTÉ ORIGINAL IS CERTIFIED BY ÖKO-TEX.

Öko-Tex is an international human-ecology label that shows that the garments contain no toxic or harmful substances.

Woolpower® products in Ullfrotté Original knitwear is produced with a minimum of seams.



Ullfrotté AB is based in Östersund in the north of Sweden, 400 km from the Arctic Circle.



Ullfrotté AB

ULLFROTTÉ AB WAS FOUNDED IN ÖSTERSUND IN 1969 to produce nylon stockings. In the early 1970s, Ullfrotté Original was developed in collaboration with the Swedish military. The first Ullfrotté garments were produced in 1972.

Ullfrotté AB is owned by Gränsfors Bruks Moderbolag, a family-owned company consisting of a group of small manufacturing companies. The products manufactured include crowbars, axes and protective clothes for forestry workers.

Ullfrotté AB is fully committed to the production of warm undergarments and mid-layer clothing sold under the brand name Woolpower®. The company employs about 30 people and the entire production is in Östersund, in the northern part of Sweden. Approximately 70% of the sales are exported to about 20 countries all over the world.

...If you have questions or queries regarding the company or the products, please contact Ullfrotté AB. Call +46-(0) 63 14 85 20 or send an e-mail to info@woolpower.se. You may also check our website www.woolpower.se and select the country of your choice.



Manufacturing in Östersund

100% MADE IN SWEDEN. All Woolpower® products are manufactured by Ullfrotté AB in Östersund, from yarn to the finished product. Ever since the start in 1972, the entire production has been situated in Östersund. The wool used in the clothing is fine Merino wool which comes from Australian Merino sheep. The wool is spun and dyed at a spinning mill in Germany.

ALL THE MACHINES ARE SPECIALLY DESIGNED. The machines are used to circular knit the sleeves, the legs and the body. For the best possible fit and comfort, each garment part and size is knitted on individual knitting machines of different needle-bed diameters. The advantages of this technology is that the garments to be worn directly against the skin have a minimum of seams, resulting in a flexible and comfortable garment.

Prior to the manufacturing of the garments, the material is washed and tumble-dried, not in order to clean it, but rather to shrink and stabilize the material. Washing is done in water without the use of detergents.

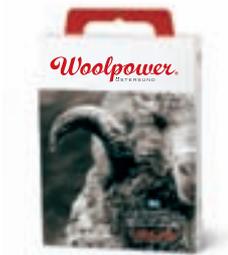
After washing and drying, the material is shaped on metal frames and tenters using heat and steam.

This ensures that the garments will be smooth and have the right form. The shaped pieces are then cut so that all the garment parts will match.

EACH SEAMSTRESS SIGNS HER GARMENTS. Cut and finished pieces are sewn together into a finished garment. Each garment is sewn by a single seamstress. The seamstress checks and is responsible for the garment made and finishes by adding her personal label.

Random checks are made regularly to verify that the garments follow the size and quality standards. The production in Östersund is quality controlled and certified in accordance with ISO 9001:2000.

Once a garment is finished it is packaged and distributed to customers worldwide.



Woolpower® products

ALL WOOLPOWER® GARMENTS ARE PART OF A SYSTEM. Ullfrotté AB has developed an entire collection of garments for the whole body, to be combined differently depending on the temperature and form of activity.

The material, Ullfrotté Original, is produced in varying thickness for different functions and benefits. The thickness of the material is measured in grams per square meter and comes in 200, 400, 600 and 800 g/m².

GARMENTS IN FIVE COLORS. Woolpower® garments are available in five colors, although some are produced in only a selection of them.



Black

Navy

Red

Offwhite

Green

...An individual seamstress sews each garment from start to finish. She signs the product by adding her personal label.

NEAREST THE SKIN: 200 G/M²

The thinner undergarments are designed to be worn directly against the skin as a moisture wicking base layer. They work best when worn closest to the body, since the material keeps the body warm, while at the same time helping to transport perspiration. The thinnest undergarments are ideal at temperatures ranging from +10 °C (50 °F) down to -20 °C (-4 °F), depending on activity.



CREWNECK 200 g/m²
Collarless shirt. Extended back.
Article number: 7112



TURTLENECK 200 g/m²
Zip neck shirt with short zipper.
Extended back.
Article number: 7222



LONG UNDERWEAR 200 g/m²
Pants with or without fly.
Article number: 6342 / 7342

MID-LAYER: 400–600 G/M²

These thicker garments are used as intermediate layers to increase heat insulation between the base layer and the wind and water resistant outer layer. The mid-layer garments are usually used at lower temperatures and lower activity levels.



*TURTLENECK 400 g/m²
Zip neck shirt with short zipper. Extended back.
Article number: 7224*

*LONG UNDERWEAR 400 g/m²
Pants with or without fly.
Article number: 6344 / 7344*



*VEST 400 g/m²
Vest with full-length zipper.
Article number: 7244*

*SWEATER WITH FULL LENGTH ZIPPER
400 g/m² and 600 g/m²
Turtleneck and full length zipper. Cuffs with thumb holes.
Extended back.
Article number: 7234 / 7236*



*OVERALL 400 g/m²
Article number: 7384*

SOCKS

The terry-knitted material has excellent heat-insulating properties and warms even when wet, a crucial factor for feet. The socks absorb and transport away perspiration without losing heat-insulating properties.

Socks are available in four thicknesses: 200, 400, 600 and 800 g/m². The socks can be combined in various ways depending on the temperature and form of activity.

*SOCK 200 g/m²
Article number: 8412*

*SOCK 400 g/m²
Article number: 8424 / 8414*

*SOCK 600 g/m²
Article number: 8416*

*SOCK 800 g/m²
Article number: 8418*

*SOCK KNEE HIGH 200 g/m²
Article number: 8482*

*SOCK KNEE HIGH 600 g/m²
Article number: 8486*



CHILDREN'S CLOTHES

Woolpower® garments made with Ullfrotté Original material are available for children in sizes 98–164 centilong (38–65"). Socks for children are available from size 19–21 (5 $\frac{1}{2}$ –7) in 200, 400 and 600 g/m².

Children's active lives put high demands on their equipment. Their clothes should be comfortable to wear, fully flexible, wear resistant and easy to put on and take off.



TURTLENECK 200 g/m²
Zip neck shirt with short zipper. Extended back.
Article number: 3222

LONG UNDERWEAR 200 g/m²
Article number: 3342



SOCK 200 g/m²
Available from size 19–21
(5 $\frac{1}{2}$ –7).
Article number: 8412

SOCK 400 g/m²
Available from size 19–21 (5 $\frac{1}{2}$ –7).
Article number: 8424 / 8414

SOCK 600 g/m²
Available from size 25–27
(10–12 $\frac{1}{2}$).
Article number: 8416



BALACLAVA 200 g/m²
Article number: 9652



HAT 400 g/m²
Swedish "Luva".
Article number: 9624



HEADBAND 200 g/m²
With or without embroidered logo.
Article number: 9612 / 9613

BALACLAVA 200 g/m²
Article number: 9652

BALACLAVA 400 g/m²
Article number: 9654



HELMET HOOD 400 g/m²
To be used underneath a helmet.
Article number: 9644



MITTENS 400 g/m²
Article number: 9754



FINGERLESS GLOVES 400 g/m²
Article number: 9734

FLAME RESISTANT SERIES

Some Woolpower® mid-layer garments are produced with Aramid fibers added to the wool, further reinforcing the capacity to withstand heat and flames. The flame resistant products are marked FR (Flame Resistant) and are CE marked in accordance with the requirements for this type of protective clothing.

The products comply with the European norms for personal protection equipment in cold work: European standard EN 531 for protection against brief contact with flames and the spread of fire (A), convective heat (B2) and protection against radiated heat (C1).

*TURTLE NECK FR 400 g/m²
Article number: 7264*

*SWEATER WITH FULL LENGTH ZIPPER FR 400 g/m²
Article number: 7274*

*PANTS FR 400 g/m²
Pants with or without fly.
Article number: 6364 / 7364*

*BALACLAVA FR g/m²
Article number: 9664*

*SOCK FR 400 g/m²
Article number: 8464*

*SOCK FR 600 g/m²
Article number: 8466*

*SOCK KNEE-HIGH FR 600 g/m²
Article number: 8496*

SIZE GUIDE

(measures in centimeters)

	XS	S	M	L	XL	XXL	XXXL
Chest	78–86	90–98	98–106	106–114	114–122	122–130	130–138
Waist	66–74	74–82	82–90	90–100	100–110	110–120	120–130
Hips	90–98	98–106	106–114	114–122	122–130	130–138	138–146
Inseam	70–78	72–80	74–82	76–84	78–86	80–88	82–90
Children sizes (centilog)	3–4 years 98/104	5–6 110/116	7–8 122/128	9–10 134/140	11–12 146/152	13–15 158/164	

SIZE GUIDE

(measures in inches)

	XS	S	M	L	XL	XXL	XXXL
Chest	31–34"	35–39"	39–42"	42–45"	45–48"	48–51"	51–54"
Waist	26–29"	29–32"	32–35"	35–39"	39–43"	43–47"	47–51"
Hips	35–39"	39–42"	42–45"	45–48"	48–51"	51–54"	54–57"
Inseam	27–31"	28–31"	29–32"	30–33"	31–34"	31–35"	32–35"
Children sizes	3–4 years 38–41"	5–6 43–46"	7–8 48–51"	9–10 53–56"	11–12 57–60"	13–15 62–65"	

Facts

Ullfrotté Original has been tested in various contexts with rewarding results. A few examples are:

- Test at cold work sites / SINTEF – Norway 1996
- Institute Textile de France – France 1997
- Norska Sjöförsvaret / SINTEF – Norway 1998
- American forestry workers / SINTEF – USA 1998
- TNO Institute of Industrial Technology – Holland 1999
- Arbeitsschutz Deutschland – Germany 2000
- Arbetslivsinstitutet, Insulation test (clo) – Sweden 2000
- W.L. Gore for GORE-TEX® shoes – Great Britain 2001
- IFP Research AB, Material analysis – Sweden 2001
- Labour Scientific Institut Ekaterinenburg – Siberia 2002
- Thelma, Salvation suits Vestfjorden – Norway 2004
- Forskningsstation Svalbard – Norway 2005

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A booklet about the cold – and how to keep warm.

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Woolpower®
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