

## Gel Liners

A gel liner is an interface that goes directly against the residual limb. A gel liner can provide cushioning, provide even pressure distribution, and reduce friction. The gel liner can also provide suspension (the way the prosthesis remains attached to the limb). There are many different styles of gel liners available that can be used with various types of prosthetic sockets. Gel liners can be used with above knee, below knee, and upper extremity amputations.

Some gel liner materials are silicone, urethane, or a mineral based material. These substances are known to be *bio-inert*, which means that they rarely react with skin. Liners vary in thickness and stiffness and usually have some type of fabric on one or both sides.

## How They Work

In thermoplastic elastomer and urethane gel liners, the gel flows from areas of high pressure to areas of lower pressure. When there is pressure within the prosthetic socket, the gel moves away from the pressure.



In silicone gel liners, the liner distributes pressure along the entire limb, effectively reducing the pressure felt in any one specific spot. The gel also helps to reduce friction against the skin that may occur while walking.

Gel liners used to suspend the prosthesis will have a pin or a strap attached to the bottom that fastens to the prosthetic socket with a clip or a locking mechanism.

## Types of liners

Many styles of gel liners are available. The following describes some common models.

**Alpha® Liners** are made by the Ohio Willow Wood Company. There are locking and cushion versions and they can be single or 2-colored. Alpha® liners are made from thermoplastic elastomer with mineral oil incorporated into the gel. The gel gently adheres to the skin to protect against abrasion and breakdown while also proving to be extremely skin-friendly. The Alpha® gel is covered in a layer of durable fabric that helps to extend the life of the




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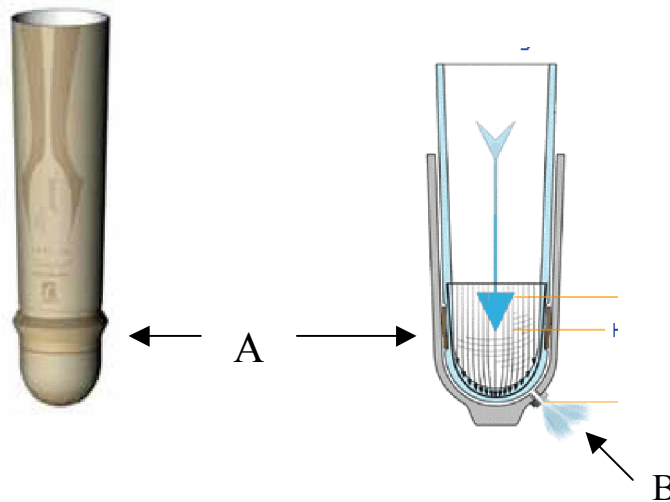
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liners and makes it very easy for amputees to slide into the socket. Alpha® Liners are available in three gel thicknesses as well as six sizes to accommodate the amputee's limb circumference. Additionally, the medium, medium-plus, and large sizes are available in three distinct styles of gel patterns to accommodate various limb shapes with additional comfort.

**Iceross® liners** are made by Ossur, a company based in Iceland. A wide variety of Iceross® liners are available such as the *seal-in™*, *comfort™*, *dermo™* and *stabilo®*.

The **Seal-In™ Liner** is a recent development in liner technology. It is a suction suspension liner incorporating a hypobaric sealing membrane that provides a firm, comfortable suspension without an external sleeve.

The Hypobaric Sealing Membrane (A) conforms to the shape of the internal socket wall, providing an airtight seal. When the liner is applied and the socket is stepped into, air is expelled through a valve (B) in the bottom of the socket, creating suction below the seal. A release button on the valve allows equalization of air pressure for easy removal of the prosthesis. Additionally, the fabric matrix minimizes pistoning (up and down motion) above and below the seal.



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**Iceross® Dermo** is designed for amputees with a low or medium level of activity. It provides softness, gentle skin contact, and unique Active Skin Care ingredients including aloe vera, which has moisturizing and softening benefits. The DermoGel® relieves pressure and discomfort due to bony prominences and pressure sensitive areas. The combination of the tear-resistant DermoGel® and the Supplex® outer cover make the liner very durable.



**Iceross Comfort®** is also designed for low to moderately active amputees. The liner has Ossur's patented stabilizing matrix, a size-specific end attachment, and a nylon outer cover. Iceross Comfort® is beneficial for residual limbs with fragile and exposed tissues, bony prominences prone to pressure points, and conical shaped limbs.



Iceross Comfort® is available in two wall profiles: The Iceross Comfort® has a 3 mm wall thickness at the bottom tapering to 2 mm at the top.

Iceross *Comfort Plus*® has a uniform wall thickness of 6 mm. This thickness provides maximum comfort and protection of bony prominences and scarred, sensitive areas. The Comfort Plus® is better suited for long residual limbs.

The **Iceross® Stabilo® Liner** provides excellent stability and comfort, making it appropriate for moderate to highly active amputees. It is a durable liner that minimizes movement in the socket and maximizes stabilization of soft tissue (skin and muscle), while Active Skin Care's special ingredients help to keep the skin healthy. The Iceross® Stabilo® liner offers a stable and intimate fit.



New silicone formulation enhances comfort and eases donning, further increasing user comfort. The active skin care promotes skin health, moisturizes, and soothes. The Supplex® outer cover, non-ravel stitching and superb abrasion tolerance makes the liner very durable.

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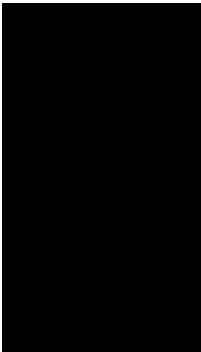
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**Otto Bock** makes the **Profile® Liner**, which is usually used with the *Harmony® System* or Vacuum Assisted Suspension System (VASS). The liner is made of urethane, which has “flow” characteristics providing excellent pressure distribution. It is common to apply vitamin E cream, A&D ointment, or other creams to the skin to ensure adequate contact with the skin when using this liner.

Otto Bock makes custom urethane liners for those limbs that do not fit in their standard sizes.



**Otto Bock** also has **Silicone Gel Liners** that provide excellent cushioning, comfort, and ease of application.

Custom silicone gel liners can also be fabricated for those limbs that do not fit in their standard sizes.



**Otto Bock’s** newest silicone gel liner is the **TF Adapt™ Liner**. The TF Adapt™ liner is designed specifically for above knee amputees. The liner is designed with a unique external fabric to provide a long liner life. The fabric is made with the same fibers used to make bulletproof vests.

The TF Adapt™ liner also has features that maximize patient comfort. Its unique matrix allows for zero pistoning but has horizontal elasticity so it conforms to the shape of the residual limb.



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The **Otto Bock Sirona™** liner is a prefabricated extra soft urethane liner, available in two wall thickness formats - tapered and uniform. The Sirona™ has a non-stick interior surface, available with or without a locking mechanism and with or without a seamless nylon tan cover.



The **Otto Bock Simplicity®** liner is a prefabricated liner made of soft urethane with extra padding around the bottom for added protection. The Simplicity® is available in five sizes with or without a locking mechanism and with or without a cover in black or tan.



**Silipos** makes several gel liner products used with prosthetic devices. Silipos' hypoallergenic **Silosheath™** and **Silosheath Active™** incorporate medical-grade mineral oil in their transparent nylon material. Available in eight sizes for those with regular to very active lifestyles, the Silosheath™ reduces skin breakdown and disperses shock and vibration. Variations of the Silosheath™ include the **Double Cushion Silosheath™**, with an extra distal layer of gel, and the **Extra Life Silosheath™** with a second sheath to extend the life of the product.



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**Single and Double Socket and Ultra Cushion Gel Liners™** are also available through Silipos. The Single and Double Socket Gel Liners™ are made with Du Pont's Coolmax® material, which wicks away moisture from the residual limb, thereby reducing potential for skin breakdown.



The Ultra Cushion Gel Liner™ for trans-tibial amputees is covered with a cotton/lycra fabric and has a reinforced nylon toe. Each of Silipos' gel liners is available in three sizes.

**Note: Only a few manufacturers of liners have been mentioned in this document. There are many manufacturers, liner types, and liner materials.**

## Application

Aside from the silosheath, and other products like it, gel liners are essentially all applied in the same manner.

1. Turn the liner inside out. Make sure the liner is clean and dry and has no substance on it that may irritate the skin.
2. **If instructed**, apply vitamin D or other ointment on the skin.
3. Make sure a good portion of the bottom end of the liner is exposed and place it against the limb. With light pressure, roll it up over the limb. Make sure no air is trapped in the liner. If there is fabric on the outside of the liner, be sure not to tear it with fingernails or jewelry.
4. If there is a pin at the end of the liner, be sure to align it properly.




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## Care and Maintenance

Since some liners tend to absorb bodily odors and perspiration, the wearer must keep the liner clean. Proper hygienic protocol can also reduce the chance of skin irritation.

- Check the liner for signs of damage and clean daily.
- Use a mild, non-allergenic soap and warm water. Do not use bleach, or soaps with perfumes, lotions, or deodorants. Blot dry with a towel and hang to dry overnight.
- Be sure to return the liner to its normal position as soon as possible after cleaning. Do not store the liner inside out.
- Store the liner away from direct heat.
- Never expose the liner to glass, carbon fibers, chemicals or any “foreign objects” as they can become embedded in the liner and irritate the skin. If you suspect the liner has been damaged, meet with your prosthetist to correct the problem.

For some amputees, finding the proper liner has made a huge improvement in ability by diminishing limitations. More information on these and other skin-device interfaces can be obtained through your prosthetist.

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