What environmental challenges are confronted in desert operations? Needless to say, hot temperatures, sand and dust. Given this scenario, boots without a functional membrane and a focus on high heat loss would appear to do the job. However, boots with ventilation holes or mesh textile panels in the upper sometimes focus so much on heat loss that sand can get inside the boots causing rubbing and foot injuries, such as blisters and torn skin, to occur.

And what about being exposed to garbage, undesirable liquids and sewage water in urban environments, or mud during patrols outside the towns? Furthermore, the desert can be a cold place — not only at high altitudes and in winter. It is hard to understand the rationale behind compromising on foot protection!

The wide spectrum of scenarios experienced by soldiers on desert missions call for boots which combine outstanding heat loss characteristics with durable protection. All GORE-TEX® Desert Boots are designed to meet these challenges. And all of them successfully fulfil the requirements of GORE-TEX® Extended Comfort Footwear.

GORE-TEX® Extended Comfort Footwear – a new class of climate comfort
At the core of this new line of desert boots are different GORE-TEX® Extended Comfort laminates: thin 3-layer laminates that do without extra insulation. The laminate construction consists of a highly abrasion resistant, quick-drying textile lining material, the microporous GORE-TEX® membrane made of expanded polytetrafluoroethylene and a protective knit.

GORE-TEX® Extended Comfort laminates are therefore highly breathable and notable for their outstanding heat loss characteristics. This means that the wearer’s feet continue to be durably protected from water and problematic liquids, while sweat occurring inside the boot can escape even faster.
Many of the challenges in a desert environment are unique to the desert climate. However the different tasks and missions performed create a wide variety of challenges within the desert scenario. GORE-TEX® Desert Boots are designed to meet three distinct scenarios in the desert:

**Scenario Unlined**
- hot weather
- high activity levels
- standing water

**Scenario Tactical**
- warm and hot weather
- assault, rescue, urban patrol and in camp use
- standing water

**Scenario High Liability**
- warm and hot weather
- heavy loads
- multi-day missions and expeditions
- difficult terrain
Durably waterproof, highly breathable and long-lasting
In all scenarios, GORE-TEX® Extended Comfort Footwear stands for proven protection and physiological comfort.

**Durably waterproof**

Desert boot specifications do not necessarily need to refer to standards for professional safety footwear. However, accepted safety standards can provide a good background to gauge military product features and requirements.

Wet feet are susceptible to bruising and blisters. Hence, EN ISO 20347:2012 and EN ISO 20345, the standards that set performance requirements for professional footwear, require that evidence be provided of the waterproofness of the whole shoe. Alongside the “Trough Test” that has been used up to now to determine the degree of water penetration, the European Committee for Standardization has decided that as of July 2012 an additional “Dynamic Footwear Water Penetration Test” is to be used. The test method is based on the “Walking Simulator” test method developed and patented by Gore back in the 1980s.

This standard permits a water penetration of up to 3 cm² after 4,800 flex movements in shallow water. In contrast to this standard, GORE-TEX® Desert Boots have to withstand up to 500,000 flex movements in ankle-high water – without allowing one single drop of water to reach the inside of the boot.

**Highly breathable**

Wet feet are not always the result of water penetrating from the outside. The sweat produced by our feet, especially in hot environments, is also a common cause of wet feet. GORE-TEX® Desert Boots are designed around GORE-TEX® Extended Comfort laminates that are highly effective at transporting heat and sweat in the form of water vapour to the outside.

The Bottle Test in accordance with EN ISO 20344:2011 tests the water vapour transmission rate (= breathability) of upper leathers, lining materials and interlinings. The materials used in GORE-TEX® Extended Comfort Footwear achieve a breathability value that is up to six times higher than the values specified in the standard. GORE-TEX® Extended Comfort Footwear exhibits the same or even better thermal conductivity characteristics than desert boots without a protective membrane.

This is exemplified in a Hohenstein study, comparing GORE-TEX® Extended Comfort Footwear (red line) with non-membrane shoes (gray line). Relative humidity below 80% is perceived as comfortable. There were no statistically significant differences (difference < 8%). It was concluded that the heat loss characteristics of the shoes compared in the study did not depend on the membrane. It is rather the lining thickness, construction and components that influence heat loss and moisture in a shoe.

The Hohenstein Comfort Rating System classifies the Extended Comfort GORE-TEX® laminate as “highly breathable”. The highest Ret of the laminates is < 8 [m² Pa/W] according to ISO 11092.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Ret [m² Pa/W]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely Breathable</td>
<td>&lt; 6</td>
</tr>
<tr>
<td>Highly Breathable</td>
<td>6 to 13</td>
</tr>
<tr>
<td>Satisfactory</td>
<td>13 to 20</td>
</tr>
<tr>
<td>Unsatisfactory</td>
<td>&gt; 20</td>
</tr>
</tbody>
</table>

GORE-TEX® Desert Boots avoid unnecessary foam layers or other air gaps which hinder heat conduction. Soldiers’ feet are protected against water penetration and feel comfortable in the climates encountered in desert regions. Soldiers whose feet are protected and comfortable can focus on their mission rather than their feet.
Long-lasting

It is not only obvious damage to the upper material that can decide how long boots can be worn for. For instance, if the inner lining starts showing signs of wear that leads to pilling or even hole formation, the boots can also lose their functionality. The rough surface texture created by the pilling might cause the inner lining to rub on the wearer’s feet and it is very possible that the boot is also no longer waterproof.

EN ISO 20344:2011 therefore specifies that the lining material must withstand at least 25,600 abrasion movements when dry and 12,800 abrasion movements when wet. In contrast to this standard, even after some 100,000 abrasion movements when dry and 50,000 abrasion movements when wet, the functionality of the laminates used in GORE-TEX® Extended Comfort Footwear is still in place.

Unlined GORE-TEX® Extended Comfort Footwear

Exceptional heat loss

Designed for hot climate conditions, the Unlined GORE-TEX® Extended Comfort Footwear is at the top end of the breathability scale within this portfolio: it is extremely breathable. The $R_{et}$ of the laminate is $< 6$ [m² Pa/W] acc. ISO 11092. Thin materials and limited use of foams in specific areas (e.g, heel fixation) ensure minimal heat build-up.

At the core of this new line of desert boots is the innovative Unlined GORE-TEX® Extended Comfort laminate. This construction has been engineered to ensure exceptional breathability and quick re-dry without compromising on durable waterproof performance.

These are the world’s first functional military membrane boots without a separate loose lining. Highly abrasion resistant nylon mesh panels and the microporous GORE-TEX® membrane with a protective monofilament knit on the inside are combined in one laminate. The boots need no separate lining!

Quick dry and low water pick-up

The unlined boot construction leads to a very low water pick-up. In addition, these boots use only non-wicking, highly water repellent components (textiles, leathers, laces). Quick-drying, low water pick-up footbeds do not store liquids inside the boot. The patent pending monofilament lining construction ensures minimum water pick-up and quick-drying, if water enters via the top of the boot. The minimal weight gain positively impacts wearer comfort. According to laboratory tests conducted by SATRA these new boots retain 90% less water than other desert boots. This results in faster drying times in and after use.

Extremely lightweight

A pair of Unlined GORE-TEX® Extended Comfort desert boots (based on size 42) weighs less than 1,200 g. This is at least 20% lighter than the lightest GORE-TEX® Desert Boots available so far. The lightweight construction of the boots allows for the most minimalist design ever seen in a waterproof boot. This can contribute to the high performance of the wearer and enhance overall wearer comfort.

Unlined GORE-TEX® Extended Comfort Footwear is

- durably waterproof
- extremely breathable
- non insulated, for the highest possible heat loss
- quickly to dry
- extremely lightweight
- and has a flexible, minimalist design
Tactical GORE-TEX® Extended Comfort Footwear

Many day-to-day military activities call for flexible and sporty footwear, for instance when on longer assault, rescue or urban patrol missions. Tactical GORE-TEX® Extended Comfort Footwear is based on the established construction whereby the GORE-TEX® inner lining is combined with a lightweight textile upper, which allows for a functional, sporty design.

- durably waterproof
- highly breathable
- non-insulated, for high heat loss
- lightweight
- and has a flexible, sporty design

High Liability GORE-TEX® Extended Comfort Footwear

When the terrain gets even tougher and greater foot stability and good ankle support is required, High Liability GORE-TEX® Extended Comfort Footwear provides the solution. The GORE-TEX® inner lining is combined with a more stable textile/leather upper and other construction enhancements.

- durably waterproof
- highly breathable
- non-insulated for high heat loss
- lightweight
- supportive and stabilizing
**Why change?**

Boots without a membrane often cannot provide sufficient protection in versatile (dry-wet versus hot-cold) desert and related urban environments. Currently available GORE-TEX® Desert Boots have a long track record for providing protection and physiological comfort.

- Unlined GORE-TEX® Desert Boots now take this to a new extreme: they are extremely breathable, extremely lightweight, extremely quick to dry and yet durably waterproof.

- Tactical GORE-TEX® Desert Boots are designed for day-to-day military activities in camp, during patrol and in urban environments.

- High Liability GORE-TEX® Desert Boots are designed for enduring missions with a heavy load and greater foot stability.