INNOVATION SPOTLIGHT:
LION ISODRI® Moisture Management System

When you’re wearing SCBA and dragging a fully charged 1 3/4” hose line, the last thing you need is your gear sucking up water and adding more weight to what you’re already lugging around.

And, how many times have you had to work in wet, clammy turnout gear because it hadn’t dried from an earlier run? LION innovated, and continues to lead, with game-changing moisture management systems designed for turnouts. LION’s patented IsoDri Moisture Management System fights the proven problems of wet turnout gear by delivering a superior solution.

Each IsoDri component is engineered to reduce the water intake and transport moisture away from the body. This reduces the heat storage capacity and working weight, promoting both comfort and safety of your turnout gear.

Unlike conventional turnouts, keeping moisture out of the protective envelope takes place in ALL layers of the IsoDri system – the outer shell, moisture barrier and thermal liner. If it doesn’t have these, it isn’t the IsoDri system:

- Thermal liner that reduces moisture regain from sweat and other water sources.
- High-lubricity face cloth that wicks perspiration away from the body
- Semper Dri® in sleeves, lower legs and shoulder/yoke to reduce absorption
- Wristlets treated with Teflon® F to repel moisture from outside sources

The key difference between IsoDri and other systems is IsoDri’s ability to manage moisture in the thermal barrier of your gear. The thermal liner traps air inside of millions of tiny pockets. This trapped air creates a barrier to heat flow. But, if the air pockets are compressed or filled with moisture, the thermal liner’s ability to block heat is compromised.

Optimum moisture management comes from a thermal liner that both wicks and sheds water. IsoDri features a face cloth with advanced wicking technology.

By pulling sweat from undergarments, the moisture is channeled away from the body toward layers of the liner system that refuse to draw in moisture. This allows the thermal barrier to maintain airspace and function properly.

In addition, IsoDri thermal liners using apertured AraFlo® promote higher air permeability than other systems and complement state-of-the-art moisture barriers such as CROSSTECH®.

Firefighters wearing gear with IsoDri report their gear has been dry and comfortable in less than 30 minutes.

HOW ISODRI WORKS

IsoDri is more than just an outer shell that resists water penetration and absorption. It is a complete system of components (outer shell, moisture barrier, thermal barrier and wristlets) that works together to reduce the water in your turnout gear and the dangers that water presents.
The outer shell probably has the most demanding role in the total configuration of a turnout. It has two critical functions: to resist ignition from direct flame impingement and to protect the internal layers from rips, tears, slashes, abrasion, etc. The real test of an outer shell material is its ability to maintain its protective qualities under high thermal loads and to stand up on the fireground.

**PBI Max™ 7.0 oz**
Delivers a combination of unmatched strength, thermal protection, and unbelievable comfort and flexibility

- **Weight:** 7 oz/yd²
- **Blend:** 70% PBI® Dominant PBI® / Kevlar® spun yarns, 30% 600 denier Kevlar® filament
- **Weave:** Comfort Twill
- **Yarn:** Spun/Filament
- **Color:** Natural, Black

**PBI Max™ 6.0 oz**
Provides maximum durability, thermal protection and comfort in a lightweight material

- **Weight:** 6 oz/yd²
- **Blend:** 70% PBI® Dominant PBI® / Kevlar® spun yarns, 30% 400 denier Kevlar® filament
- **Weave:** Comfort Twill
- **Yarn:** Spun/Filament
- **Color:** Natural, Black

**Gemini™ XT**
Features a grid of composite filament and spun yarns that provides strength, durability, and thermal protection

- **Weight:** 7.5 oz/yd²
- **Blend:** 55% Kevlar / 37% PBI / 8% Filament
- **Weave:** Plain
- **Yarn:** Spun/Filament
- **Color:** Natural, Black

**Ultra™**
Unique blend of fibers to create a mix of strength and thermal protection

- **Weight:** 7.5 oz/yd²
- **Blend:** 60% Kevlar / 20% Nomex/ 20% PBO spun
- **Weave:** Ripstop
- **Yarn:** Spun
- **Color:** Light Gold, Dark Gold
Millenia™ XT
Offers high strength and thermal stability

Weight: 7.5 oz/yd²
Blend: 60% Technora / 40% PBO
Weave: Ripstop
Yarn: Spun
Color: Natural

Armor 7.0™
Blends Nomex and Kevlar filament in a comfort twill weave to create a comfortable, durable aramid outer shell with excellent thermal protection

Weight: 7 oz/yd²
Blend: 50% Filament Kevlar / 50% Nomex Kevlar spun
Weave: Comfort Twill
Yarn: Spun/Filament
Color: Gold, Black

Armor AP™
Uses a comfort twill weave of Nomex and Kevlar filament to offer great flexibility, durability, and protection

Weight: 6.5 oz/yd²
Blend: Gold/Black 80% Nomex/Kevlar spun yarns, 20% 400 denier Kevlar filament
Khaki 80% Nomex/Kevlar/Teijin Conex spun yarns 20% 400 denier Kevlar filament
Weave: Comfort Twill
Yarn: Spun/Filament
Color: Gold, Black, Khaki

Fusion™
Low-profile, ripstop weave delivers durable protection and optimal color performance

Weight: 7 oz/yd²
Blend: Gold 60% Kevlar / 40% Nomex
Black 50% Kevlar / 50% Nomex
Weave: Ripstop
Yarn: Spun
Color: Gold, Black
**Advance™**
Provides a balance of strength, durability and thermal protection in a Kevlar/Nomex blend

- **Weight:** 7 oz/yd²
- **Blend:** 60% Kevlar / 40% Nomex spun
- **Weave:** Ripstop
- **Yarn:** Spun
- **Color:** Gold, Yellow, Black, Khaki

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**Nomex® 7.5 oz**
A workhorse fabric with good protection and durability offering a great value

- **Weight:** 7.5 oz/yd²
- **Blend:** 93% Nomex / 5% Kevlar 2% P140
- **Weave:** Plain
- **Yarn:** Spun
- **Color:** Yellow, Black, Tan, Natural (White)

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**Aluminized Para-Aramid**
A para-aramid aluminized knit that is light, but durable with excellent strength retention when exposed to chemicals, solvents and fuels.

- **Weight:** 8.5 oz/yd²
- **Blend:** 100% Para Aramid
- **Weave:** Aluminized Ripstop Knit
- **Yarn:** Spun
- **Color:** Silver

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**OUTER SHELL COMPARISON CHART**

<table>
<thead>
<tr>
<th>Fabric</th>
<th>Working Weight¹</th>
<th>Thermal Damage²</th>
<th>Durability³</th>
<th>Water Resistance⁴</th>
<th>Color Fastness⁵</th>
<th>Cost</th>
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<tbody>
<tr>
<td>PBI Max™ 7.0 oz</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★☆☆☆</td>
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<td>PBI Max™ 6.0 oz</td>
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<tr>
<td>Gemini XT™</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★☆☆☆</td>
<td>$$$$</td>
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<tr>
<td>Ultra™</td>
<td>★★</td>
<td>★★</td>
<td>★★★★</td>
<td>★☆☆☆</td>
<td>★☆☆☆</td>
<td>$$</td>
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<tr>
<td>Millenia™ XT</td>
<td>★★</td>
<td>★★</td>
<td>★★★★</td>
<td>★☆☆☆</td>
<td>★☆☆☆</td>
<td>$$</td>
</tr>
<tr>
<td>Armor 7.0™</td>
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<td>★★★★</td>
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<td>★☆☆☆</td>
<td>★☆☆☆</td>
<td>$$$</td>
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<tr>
<td>Armor AP™</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
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<td>$$</td>
</tr>
<tr>
<td>Fusion™</td>
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<td>★★★★</td>
<td>★★★★</td>
<td>★☆☆☆</td>
<td>★☆☆☆</td>
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</tr>
<tr>
<td>Advance™</td>
<td>★★</td>
<td>★★</td>
<td>★★☆☆</td>
<td>★☆☆☆</td>
<td>★☆☆☆</td>
<td>$</td>
</tr>
<tr>
<td>Nomex® 7.5 oz</td>
<td>★★</td>
<td>★★</td>
<td>★★☆☆</td>
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<td>★☆☆☆</td>
<td>$</td>
</tr>
</tbody>
</table>

1 Dry weight + moisture regain; high ranking = low weight.
2 Strength retention after high-heat exposure.
3 Long-term strength and abrasion characteristics.
4 Sheds liquids, soils and/or ice.
5 Resists change from UV, laundering, heat and abrasion.
LION Turnout Gear Fabrics — MOISTURE BARRIERS

Moisture Barrier Criteria
While the moisture barrier has a number of important functions, one of its main jobs is to keep the thermal protective properties of the system intact by preventing external water from penetrating into the critical air spaces of the garment.

A dry system is safer, more dependable, more comfortable and a lot lighter than a wet one. All moisture barriers will shed external water, but there are significant differences in their breathability, durability, thermal integrity and long-term reliability.

Highly-breathable moisture barriers are intended to prevent water from entering into the thermal layers, while allowing body vapor from sweat to escape outward. A more breathable barrier will usually reduce the amount of moisture and body heat that can be trapped inside the gear. Remember, the body heat in your sweat can only escape through your breathable moisture barrier in vapor form.

CROSSTECH® Black
Delivers proven long-lasting protection and breathability even after exposure to extreme heat

- **Weight:** 4 oz/yd²
- **Substrate:** Nomex woven pajama check
- **Membrane:** Enhanced bi-component ePTFE

STEDAIR® 4000
Provides excellent breathability and durability

- **Weight:** 5 oz/yd²
- **Substrate:** Nomex woven pajama check
- **Membrane:** Enhanced bi-component ePTFE

GORE® RT7100
Offers a reliable combination of performance characteristics of durability, breathability, and thermal and liquid protection unmatched in its price range

- **Weight:** 4 oz/yd²
- **Substrate:** Kevlar / Nomex Needle
  Punched non-woven
- **Membrane:** Bi-component ePTFE

STEDAIR® 3000
Performs well to meet protection and durability needs at a value price

- **Weight:** 5.2 oz/yd²
- **Substrate:** Kevlar/ Nomex E89
  non-woven spunlace
- **Membrane:** Bi-component ePTFE
**LION Turnout Gear Fabrics—MOISTURE BARRIERS**

**GORE® PARALLON™ Liner System (P)**
Takes breathability and thermal protection to the next level in a wide range of conditions with a unique multi-layer combination of the thermal liner and moisture barrier

- **Weight:** 13.9 oz/yd²
- **External Layer (X):** Nomex® IIIA woven pajama check substrate laminated to a ePTFE film
- **Middle Layer (M):** Meta-aramid/Para-aramid three dimensional non-woven batting laminated to a ePTFE film
- **Body Layer (B):** 86% aramid/14% FR rayon twill weave face cloth laminated to an enhanced bicomponent ePTFE film

**STEDAIR Gold**
Delivers lightweight liquid penetration protection with thermal stability and flexibility

- **Weight:** 5.2 oz/yd²
- **Substrate:** PBI / Kevlar / Nomex weave
- **Membrane:** Bi-component ePTFE

**CROSSTECH 3-Layer**
Provides a combination of durability, TPP and THL in a rugged three-layer construction for the most demanding scenarios

- **Weight:** 7 oz/yd²
- **Substrate:**
  - Nomex® woven pajama check and Nomex proprietary weave surrounds the CROSSTECH Membrane
- **Membrane:**
  - Enhanced bi-component ePTFE

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LION Turnout Gear Fabrics—THERMAL LINERS

Air Layers & Thermal Barriers
The ideal thermal insulation system is comfortable, lightweight, captures air and rejects water absorption while promoting the “wicking” of sweat. The best liners also withstand the effects of heat and have high porosity or air permeability.

The protective value of the fabric composite is really found in the air that’s between the firefighter and the heat source. Air layers that are replaced by water can be unpredictably dangerous. Unlike air, water is an amazing conductor of heat.

The Face Cloth Can Make a Big Difference
Another important consideration for thermal barriers relates to comfort and mobility. It is now widely recognized that thermal barriers which use slippery yarns on the “face cloth” next to the wearer are far less likely to bind and restrict the firefighter’s movement. The super-strong filament yarns which create this lubricity add durability to the face cloth, while maintaining the ease of donning and doffing. Adding spun yarns to the mix brings wicking capabilities to a high-performing face cloth.

Glide™ Ice 2L Araflo® (K) IsoDri®
This high-tech liner delivers very high THL values and reduces the risk of water-related burn injuries. The Glide face cloth wicks perspiration quickly, but the entire system carries less water and dries more rapidly than any other traditionally-oriented concept. This liner option uses two layers of spunlace and a low-friction face cloth. Both layers of spunlace are treated with a durable water-repellant finish for high-performance water resistance.

**Weight:** 7.3 oz/yd²
**Face cloth:** 60% Nomex filament / 40% spun twill weave (Nomex, Lenzing FR)
**Thermal Insulation:** Two layers durable water repellant (DWR) Kevlar / Nomex E-89 spunlace (2.3/1.5 aperatured Araflo)

Glide Ice Exhale SRS (X) IsoDri
Uniquely delivers high TPP while maintaining good THL. The orientation of the thermal insulation helps protect the moisture barrier while keeping the gear dry and comfortable.

**Weight:** 10.3 oz/yd²
**Face cloth:** 60% Nomex filament / 40% spun twill weave (Nomex, Lenzing FR)
**Thermal Insulation:** 2.3 oz durable water-repellant (DWR) Kevlar / Nomex E-89 spunlace quilted to the face cloth with a layer of 1.5 oz apertured Araflo (DWR) E-89 spunlace quilted to Nomex DWR Chambray between the moisture barrier and shell

Glide Ice Center Cut (C) IsoDri
A patented breakthrough in orientation of the internal components, this unique system balances optimal TPP and THL levels while helping to protect the moisture barrier and helping to keep the gear dry and comfortable. It also offers a low-friction face cloth.

**Weight:** 8 oz/yd²
**Face cloth:** 60% Nomex filament / 40% spun twill weave (Nomex, Lenzing FR)
**Thermal Insulation:** 1.5 oz apertured Araflo, durable water repellant (DWR) Kevlar / Nomex E-89 spunlace quilted to the face cloth with a layer of Nomex DWR Chambray between moisture barrier and shell

Glide™ Ice PBI G2 (O)
A low friction surface for freedom of movement and less working stress with insulation that provides thermal protection, durability and comfort.

**Weight:** 6.8 oz/yd²
**Face cloth:** 60% Nomex filament / 40% spun twill weave (Nomex, Lenzing FR)
**Thermal Insulation:** 20% PBI / 80% Nomex two layers non-woven apertured spunlace (1.8 / 1.4 oz/yd²)
Combines a high-lubricity, wicking face cloth with virgin fibers to deliver a balance of TPP, THL, and freedom of movement.

**Weight:** 7.5 oz/yd²

**Face cloth:**
60% Nomex filament / 40% spun twill weave (Nomex, Lenzing FR)

**Thermal Insulation:**
50% Kevlar / 50% Nomex needlepunch batt

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Delivers an exceptional balance of TPP and THL at a moderate cost.

**Weight:** 7.6 oz/yd²

**Face cloth:**
68% Aramid/21% FR Viscose / 11% Polyamide ring spun fabric

**Thermal Insulation:**
50% Kevlar / 50% Nomex needlepunch batt

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Offers a good combination of flexibility, THL and durability.

**Weight:** 7.8 oz/yd²

**Face cloth:**
50% Kevlar filament / 50% Kevlar, Lenzing FR and Nylon

**Thermal Insulation:**
two layers Kevlar / Nomex E-89 Spunlace (2.3 / 1.5 oz/yd²)
Reinforcements Add Life to High-Wear Areas
Shoulders, knees, elbows and cuffs should be reinforced to protect the wearer and extend the useful life of your turnout. It’s a lot less expensive to replace a single layer of reinforcement material than it is to try and repair a turnout that has an abraded outer shell, thermal liner and moisture barrier. In addition to reinforcement, high-compression areas such as shoulders, elbows, yoke and knees should be cushioned to provide additional comfort and thermal protection.

**Super Fabric®**
Permeable material delivering durability, flexibility, and thermal stability
Color: Black

**Extra Layer of Outer Shell**
An extra layer of outer shell material is relatively flexible. The cost varies by fabric. “Self-fabric” is the least durable of all the reinforcement options. If the extra layer of outer shell material is either Fusion™, PBI Max™, Armor™, Armor AP™, or another IsoDri fabric, it will have somewhat better durability and water resistance than other outer shell materials.

**Lite-N-Dri™**
Enhances thermal protection and comfort using a lightweight, dry, and flexible material

**Silicone**
Enhances thermal protection and comfort using a dry, padded, highly heat-resistant material

<table>
<thead>
<tr>
<th>Reinforcement materials</th>
<th>Durability1</th>
<th>Thermal Resistance2</th>
<th>Water Resistance3</th>
<th>Flexibility (with padding)</th>
<th>Laundering4</th>
<th>Cost</th>
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<tbody>
<tr>
<td>Leather</td>
<td>★ ★ ★ ★ ★</td>
<td>★ ★ ★ ★ ★</td>
<td>★</td>
<td>★ ★</td>
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<tr>
<td>IsoDri Shell Material</td>
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<td>★ ★</td>
<td>★ ★ +</td>
<td>★ ★</td>
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<td>$$3</td>
</tr>
<tr>
<td>Polymer-Coated Aramid</td>
<td>★ ★ ★</td>
<td>★ ★ ★ ★ ★</td>
<td>★ ★ ★</td>
<td>★ ★</td>
<td>★ ★</td>
<td>$$</td>
</tr>
<tr>
<td>SuperFabric</td>
<td>★ ★ +</td>
<td>★ ★ ★</td>
<td>★ ★ +</td>
<td>★ ★ +</td>
<td>★ ★</td>
<td>$$</td>
</tr>
</tbody>
</table>

1 Abrasion, slash and puncture resistance.  
2 Tolerance to heat exposure and contribution toward contact burn protection.  
3 Low moisture regain and protection of underlayers.  
4 Soil release and ease of cleaning.  
5 Cost is higher for expensive shells.

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**Ventilated Trim Provides Conduit For Vapor Release on Impermeable Reflective Materials**

As vapor escapes your protective envelope, moisture can collect between the reflective trim and the outer shell of your turnout. When the trim is compressed and heated, the trapped moisture can vaporize and transfer heat toward the body.

LION Ventilated Trim is perforated to provide a conduit for the release of vapor and guard against the potential hazards of trapped moisture. These perforations eliminate the need for additional thermal enhancements to meet the Stored Energy Test, as they allow for the release of heat in the system.

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**Ventilated 3M Scotchlite™ (Triple Trim)**

Offers great durability, visibility and reflective properties

**Width:** 3”

**Color:** Lime-Yellow/Silver, Red-Orange/Silver

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**Ventilated Oralite® Brilliance with Stripe**

Delivers excellent visibility and retroreflective properties, even when wet

**Width:** 3”

**Color:** Lime-Yellow/Silver
<table>
<thead>
<tr>
<th>Fabric Description</th>
<th>Weight</th>
<th>Blend</th>
<th>Weave</th>
<th>Yarn</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sigma™ (Versa Pro™)</td>
<td>7 oz/yd²</td>
<td>45% meta-aramid, 32% Lenzing FR, 17% Polyamide, 6% para-aramid</td>
<td>Comfort Twill</td>
<td>Spun</td>
<td>Tan, Black, Yellow</td>
</tr>
<tr>
<td>Nomex® 6 oz (TR51™)</td>
<td>6 oz/yd²</td>
<td>93% Nomex, 5% Kevlar, 2% Anti Static</td>
<td>Plain</td>
<td>Spun</td>
<td>Black, Navy, Royal Blue</td>
</tr>
<tr>
<td>PBI Triguard (TR51)</td>
<td>5.3 oz/yd²</td>
<td>PBI/Lenzing® FR/MicroTwaron™</td>
<td>Ripstop</td>
<td>Spun</td>
<td>Natural</td>
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<tr>
<td>Millenia™ Light (TR51)</td>
<td>5.3 oz/yd²</td>
<td>60% para-aramid / 40% PBO blend</td>
<td>Ripstop</td>
<td>Spun</td>
<td>Natural</td>
</tr>
</tbody>
</table>
Westex® DH (MedPro™)
Ensures comfort and protection against flash fire while maintaining excellent after-wash appearance

- **Weight:** 7.5 oz/yd²
- **Blend:** 48% Tencel / 40% modacrylic / 12% aramid
- **Weave:** Plain
- **Yarn:** Spun
- **Color:** Navy, Hi-Vis Yellow

CROSSTECH® S/R (TR51™)
Provides the best combination of thermal protection and breathability while protecting against blood, body fluids, water, wind, and common chemicals

- **Weight:** 4.9 oz/yd²
- **Substrate:** Nomex Woven Pajama Check
- **Membrane:** Enhanced bi-component ePTFE

CROSSTECH® EMS (MedPro)
Provides the best combination of breathability and durability while protecting against blood, body fluids, water and wind

- **Weight:** 3.5 oz/yd²
- **Substrate:** Polyester Woven
- **Membrane:** Enhanced bi-component ePTFE
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