Healthcare Solutions

DUPONT™

DuPont's solution portfolio for wearable medical devices

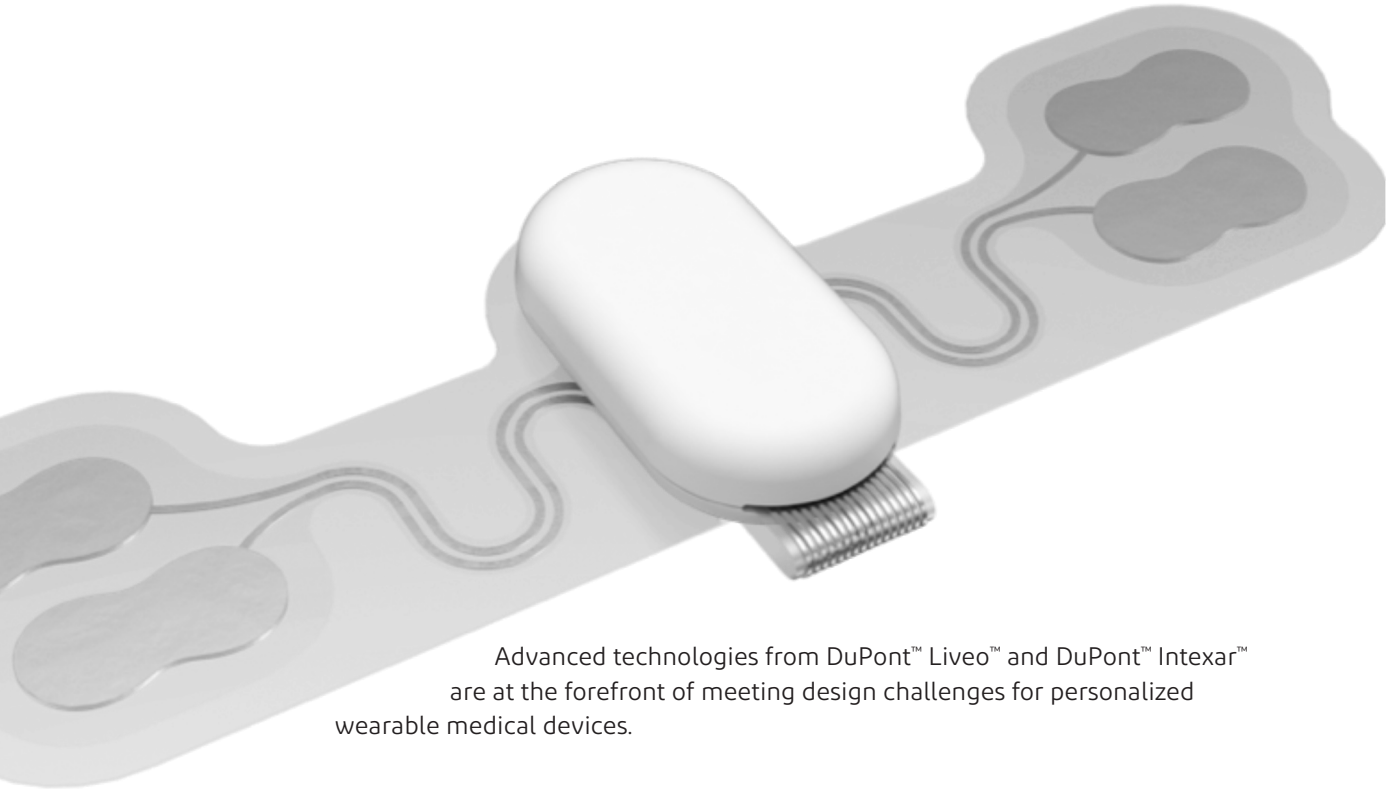
LIVEO™

DuPont™ Liveo™ & Intexar™ technologies meet design challenges for medical wearables

Wearable technology is transforming today's healthcare options and patient experiences. Some of the more notable benefits include remote and longer-term patient-provider interactions, testing and diagnosis capabilities, and even therapies. The growth potential is exceptional, enabled by smarter solutions that are more comfortable, cost-effective and durable. Diverse applications range from an expanding array of skin-worn medical devices to a variety of smart textiles for wellness monitoring.

Growth of these wearables is being driven by megatrends such as population aging, a higher incidence of chronic diseases, more patient interest in self-management, increased attention to maintaining health and fitness, and efforts to control rapidly increasing healthcare costs and reduce stays at hospitals.

Several wearable form factors exist. On skin, wearables present significant potential and challenges. Next-generation wearables will feel like skin and reliably record body signals with miniaturized, conformal and flexible sensing technologies and long-lasting, secure, skin-friendly adhesion to various skin profiles to increase compliance.

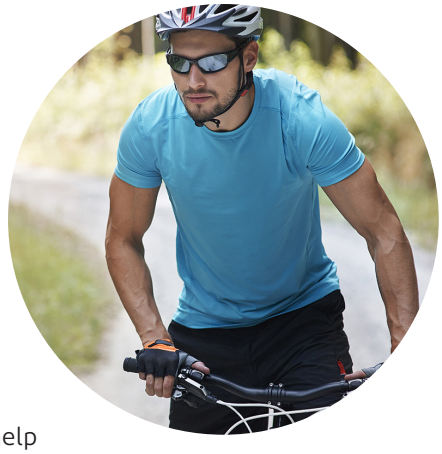


Advanced technologies from DuPont™ Liveo™ and DuPont™ Intexar™ are at the forefront of meeting design challenges for personalized wearable medical devices.

DuPont enables next-generation smart patches for wearables

Transitioning from a consumer market with smartwatches, smart belts, smart shoes and other sensor-equipped wearables, today's diverse healthcare wearables are being driven by next-generation medical smart patches. With a broad range of proven and innovative technologies and a deep understanding of the interface between materials and skin, DuPont Healthcare partners with key industry players to help develop next-generation smart patches for wearables, as well as technology for smart textiles.

- **Liveo™ silicones** are key materials for medical adhesive patches for improved comfort, stretchability and patient safety.
- **Intexar™ silver- and carbon-based inks on thermoplastic polyurethane (TPU) films** provide stretchable inlays for smart textiles and skin contact medical patches.

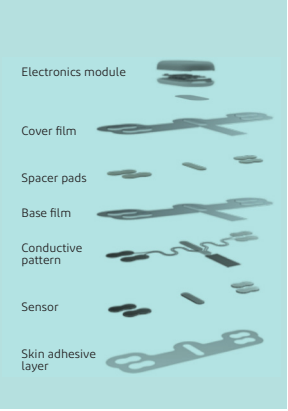


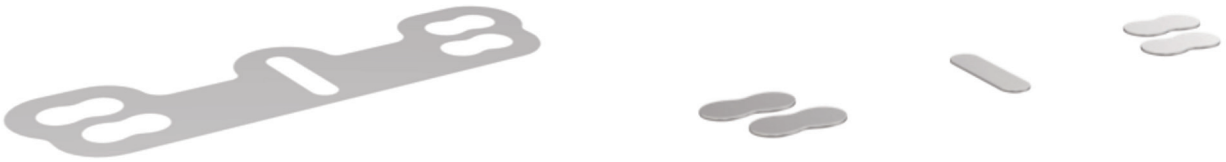
Key benefits provided by DuPont technologies for wearable medical devices include:

- **Protection** with a gentle, breathable, cushioning skin interface
- **Insulation** with inherent silicone dielectric properties to help secure wearables from foreign materials and external signals and avoid shortcuts and crosstalk to achieve optimal signal quality
- **Stable wear** with flexible, soft silicone films that ensure secure, skin-friendly adhesion
- **Comfort and compliance** with biocompatible, flexible, stretchable materials
- **Connection and conductivity** with conductive inks for biosignal reliability

Smarter Healthcare. Positive Patient Outcomes.

Wearables toolbox

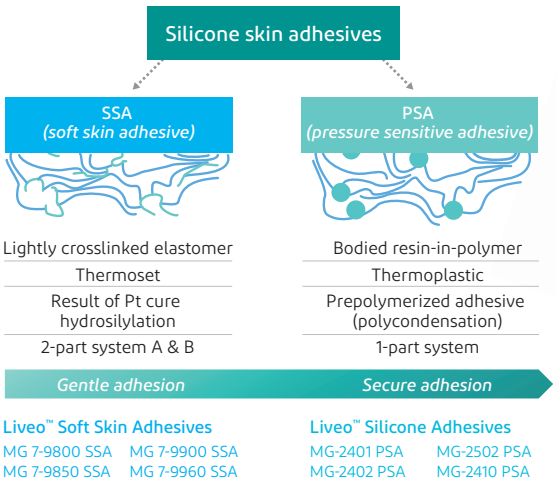




Skin adhesive layer

Soft skin adhesives and pressure sensitive adhesives help to secure long-lasting, skin-friendly wearable device attachment.

DuPont™ Liveo™ silicone-based adhesives can enhance patient comfort and safety to help ensure therapy compliance. Soft skin adhesives (SSA) provide gentle adhesion on sensitive skin and often are used for advanced wound care and scar care. Pressure sensitive adhesives (PSA) provide more robust adhesion on healthy skin and are used with various wearables and prosthetics.



Sensor technology

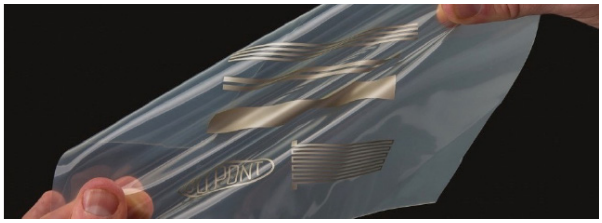
Sensor technology provides highly effective recording of biosignals when integrated into skin patches or textile devices.

DuPont™ Intexar™ screen-printed ink technology can provide a nonadhesive dry electrode for sportswear. For comfort and compliance, the conductive inks are breathable, flexible and stretchable on smart textiles.

Base and cover films

Insulating films protect and support with stretchability and conformability when integrated into sportswear, smart textiles or medical patches.

DuPont™ Liveo™ silicone elastomer or membrane provides a breathable, waterproof, elastic film that offers skinlike flexibility and excellent stress resistance with customized thickness, size and hardness. DuPont™ Intexar™ thermoplastic polyurethane (TPU) films provide stable wear, stress resistance and washable protection of conductive patterns on smart textiles.



Intexar™ TPU film

Liveo™ silicone film

DuPont's encapsulant technologies – with silicone elastomers or polyurethane compounds – provide options for sealing electronics modules and offer both moisture protection and stretchability to meet textile and smart patch requirements.

Spacer pads

Silicone elastomer solutions enhance electrical insulation and connection reliability and smart patch comfort.

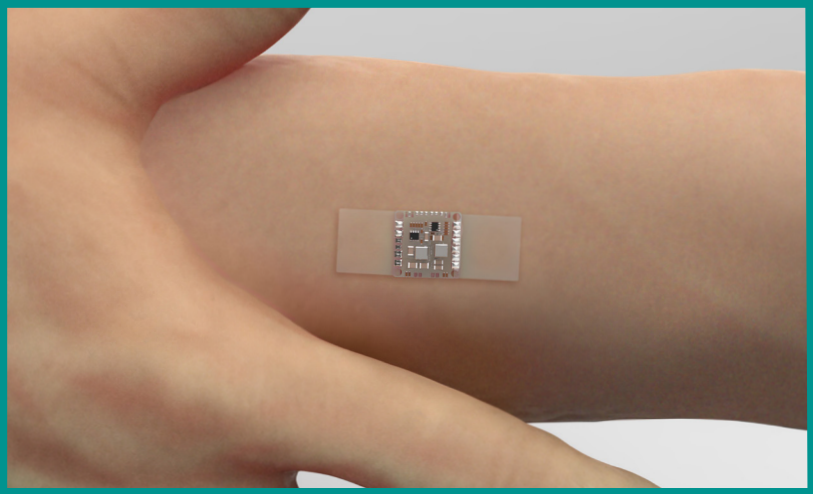
Liveo™ silicone elastomers provide good electrical insulation; improved skin contact; and soft, resilient cushioning for comfort. The different spacer pad materials offer a range of performance properties, physical characteristics and process options.

Photo courtesy of Holst Centre

Looking ahead: DuPont technologies drive continued wearables innovation

As healthcare shifts from treatment and cure to disease prevention with smart solutions, DuPont is at the forefront of developing advanced technologies to help drive continued wearables innovation.

With our technical expertise, transformational science and competencies in connected solutions, DuPont Healthcare will partner with key industry leaders for improved patient comfort and safety.



Through the DuPont™ Liveo™ and DuPont™ Intexar™ brands, DuPont provides a portfolio of commercial solutions to address new medical wearables design opportunities.

Available DuPont technologies for wearable patch applications

ECG patch parts		DuPont technology
Electronics module	Battery and Bluetooth® connection protected with **housing**	**Liveo™ silicone LSRs**
Cover film	External protection and support – **backing**	Intexar™ TPU; **Liveo™ silicone LSRs, HCRs and films**
Spacer pads	Skin contact enhancer – **cushion**	**Liveo™ silicone LSRs and gels**
Printed circuit layers	Printed Ag & C conductive traces – **electrical connection**	Intexar™ ink
Base film	Stretchable and conformable interface – **base**	Intexar™ TPU; **Liveo™ silicone LSRs, HCRs and films**
Sensor	To record electrical biosignals – **dry electrode**	Intexar™ sensor
Skin adhesives	Long-lasting, skin-friendly wearable **device attachment**	**Liveo™ silicone medical PSAs and SSAs**

Liveo™ technologies

Material	Product ID	Description
Device attachment	Liveo™ MG 7-9800 SSA Liveo™ MG 7-9900 SSA Liveo™ MG 7-9960 SSA	• Skin adhesive for gentle patch wear on human body
	Liveo™ MG-2502 PSA Liveo™ MG-2710 PSA Liveo™ MG-2410 PSA	• Skin adhesive for reliable patch wear on human body
Cover film/base film	Liveo™ C6 and Q7 LSR and HCR	• Stretchable, breathable film for printed electronics
Spacer pads		• Resilient silicone elastomer
Housing		• Insulating silicone elastomer

Intexar™ technologies

Material	Product ID	Description
Silver conductor	PE874	• Stretchable conductor for signal transfer • Best stretch recovery • Commercial product
	PE876	• Stretchable conductor for signal transfer • Best washability • Commercially available
Base film	TE-11C	• Polyurethane film designed for stretchable printed electronics • Commercial product • Used for base film and cover layers
Cover film	TE-21C	• Melt adhesive film designed for part packaging • Commercial product • Used to adhere to other fabric or layers
Encapsulant	PE773	• Stretchable encapsulant for wearable applications
Carbon sensor	PE671	• Biopotential sensor and overprint
	PE672	• Low-PTC carbon for heater applications

To learn more about DuPont's healthcare solutions, visit: healthcare.dupont.com

LIVEO™

Smarter Healthcare.
Positive Patient Outcomes.

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