Technical TEXTILES international

Winter 2025
Volume 34, Number 4

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Developing applications for hemp fibres in technical textiles

INSIDE:

ANNUAL BUYER'S GUIDE FOR THE INDUSTRY

Highly elastic fibre sensors for smart textiles

Aerodynamic properties of fabric can be adjusted on-demand

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In the Editor's opinion

As 2025 comes to a close, the technical textiles industry, and the industry in Europe in particular, still faces some unprecedented economic, political and regulatory challenges. These challenges include fragile global supply chains, fluctuating prices for raw materials and high prices for energy, and a persistent shortage of skilled labour. The international business climate, with evolving trade policies and tariffs, adds another layer of complexity, putting pressure on profit margins and forcing companies to rethink sourcing strategies. As always, the demand for high-performance materials often translates to high costs for research and development, and the manufacture of the resulting product, which can slow the widespread adoption of new technologies.

Perhaps both the most significant driver and challenge to the industry, however, is the imperative of sustainability. Regulatory frameworks, particularly in Europe, are steering the textiles industry toward a circular economy model, demanding products that are durable, repairable and recyclable from the outset. Consumers and end-markets are also more eco-conscious, demanding greater supply chain transparency.

How much more consumers and end-use industries are willing to pay for sustainable products remains to be seen. Further, there is evidence that European legislators are starting to realise that they need to balance their lofty ideals with the realties of doing business in a global marketplace. At the *64th Dornbirn Global Fiber Congress (GFC)*, held on 10–12 September 2025 in Dornbirn, Austria, fibre-to-fibre recycling again dominated discussions. Increasingly, however, questions were being asked about how far the European Union (EU)'s sustainability agenda can go before the industrial resilience of manufacturers in the region is endangered.

Globally, the EU has long been at the forefront of implementing environmental legislation and its Green Deal, announced in 2019, sets-out a raft of new measures aimed at establishing a fully circular economy in Europe. These measures have major implications for the textiles and nonwovens industries, and are already creating headaches. The separate collection of textile waste, for example, became mandatory in all EU member states on 1 January 2025, yet the infrastructure to sort and recycle these discarded garments is yet to be fully put in place.

The conference opened on the same day that the President of the European Commission (EC), Ursula von der Leyen, delivered her State of the Union address in Brussels, Belgium, and while her speech inevitably focused on Europe's geopolitical challenges, she also reaffirmed an unwavering commitment to the Green Deal.

As was evident in Dornbirn, there is now a detectable sense of a new pragmatism; a recognition that since the Green Deal was announced, the world has changed significantly.

In 2026, the technical textiles industry will likely be defined by its ability to navigate these complexities. Success stories will be written by those companies that can seamlessly weave together efficiency, technology and environmental responsibility. Companies investing in clean technology and digital production techniques could gain a competitive edge, making sustainability a core business strategy.

The technical textiles industry is not just manufacturing a product; it is engineering the very foundation of our modern, high-performance world. As it enters its 35th year of continuous publication, *Technical Textiles International*, together with its sister website technical-textiles.net, will be here to keep you informed.

Technical TEXTILES international

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Winter 2025

On the cover:

At Dornbirn Global Fiber Congress, questions were asked about how demands for sustainability can be balanced with commercial necessities. Starting on page 15, Adrian Wilson reports.

Hemp fibres could play a significant role in the manufacture of technical textiles and nonwovens and, in the USA, as John McCurry reports on page 21, IND Hemp is working to exploit this potential.

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Further information at https://www.technical-textiles.net

Liquid metals enable highly elastic fibre sensors for smart textiles

A fibre-based electronic sensor that remains functional even when stretched to over ten times its original length is being developed by researchers at the Swiss Federal Institute of Technology Lausanne (EPFL), who say that it could be used to create smart textiles, physical rehabilitation devices and soft robotics.

The core of the fibre comprises a liquid metal made from indium and gallium incorporated into a soft elastomer matrix of styrene–isoprene–styrene (SIS). This core is clad with a sheath of styrene-ethylene-butylene-styrene (SEBS).

The fibre is produced using a thermal drawing technique. The process begins with the construction of a macroscopic preform that contains the liquid-metal components carefully arranged in a three-dimensional (3D) pattern and clad with SEBS.

The preform is then drawn through a narrow opening to produce a fibre that contains all of the components, in their same relative positions, but greatly reduced in diameter.

The researchers say that the process allows them to control which areas of an individual fibre are active (electrically conductive) or inactive (insulating).

A PhD student at EPFL, Stella Laperrousaz, explains: "When the liquid metal is mixed with a soft elastomer matrix, it forms many small droplets. The process of heating and stretching the preform breaks these droplets and activates the liquid metal. This means that we can finely tune the functionality of a single fibre by controlling which areas become active through the shear stress caused by the preform stretching process."

Experiments conducted by the researchers have shown that capacitive fibre sensors produced using the method remain highly sensitive, even when stretched to over ten times their original length, giving the technique a significant advantage over other methods for producing such fibres, which struggle to guarantee electrical performance, elasticity and ease of processing.

As a proof-of-concept, the researchers integrated their electronic fibres into a soft knee brace and then recorded the device's performance while a subject walked, ran, squatted and jumped.

The brace reliably monitored the bending angle of the wearer's knee and was even able to reconstruct accurately their gait during running.

The Head of the Laboratory of Photonic Materials and Fiber Devices (FIMAP) in EPFL's School of Engineering, Fabien Sorin[1], says: "Thanks to its ease of integration, our fibre could easily be used to monitor motion and detect anomalies in other joints, such as the ankle, shoulder or wrist". He adds that the thermal drawing process is also potentially highly scalable.

The core of this elastic conductive fibre, under development at the Swiss Federal Institute of Technology Lausanne, comprises a liquid metal made from indium and gallium incorporated into a soft elastomer matrix. This core is clad with a sheath of styrene-ethylene-butylene-styrene.

Sorin concludes: "Conventional electronic devices can be too fragile or too rigid to be integrated into textiles, but our fibre could be integrated into metres – or even kilometres – of fabric with sufficient scale-up, which is what we are working on next.

"Such fabric could then be used to produce wearables, soft prostheses, or sensors for robotic limbs."

The EPFL researchers integrated their electronic fibres into this soft knee brace.

See also: [1]*Thermally-drawn route to new performance fibres*, https://www.technical-textiles.net/node/74137

Nature Electronics, Electronic fibres via the thermal drawing of liquid-metal-embedded elastomers, https://doi.org/10.1038/s41928-025-01485-0

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Leak-proof phase-change fibre absorbs heat

A spun fibre that can autonomously absorb and release heat is being developed by researchers at Shaanxi University of Science and Technology in Xi'an, China.

The researchers use a one-step coaxial wet-spinning method to encapsulate a polyurethane-modified polyethylene glycol (PUH) core inside a thin cellulose skin.

When the fibre is warmed above 50°C, the PUH chains rearrange and absorb heat; when the surroundings cool, they crystallise and release that energy—yet the porous core slows the exchange, prolonging it from minutes to hours.

Unlike conventional solid-liquid phase-change fibres, which can leak paraffin or polyethylene glycol (PEG) after repeated cycles, the PUH formulation undergoes only molecular rearrangement, remaining solid throughout.

After 50 heating cycles at 100°C, the fibres retain more than 90% of their original 105 $J.g^{-1}$ latent heat and lose less than 1% mass. Scanning-electron microscopy has revealed a sponge-like interior with 47% porosity that cuts thermal conductivity to 0.115 $W.m^{-1}.K^{-1}$, roughly half that of commercial polyethylene terephthalate (PET).

Mechanical tests show the fibres tolerate 10 MPa of tensile stress and 38% elongation—robust enough for knitting, weaving and braiding. In laboratory demonstrations, a 3 × 5-cm swatch created from the fibres shielded an electric heater so effectively that its surface stayed 40°C cooler than an uncovered control.

The swatch also prolonged heat release by up to 450 s compared with paraffin-based textiles, suggesting that it could be suitable for use in protective clothing, building insulation and battery-cooling sleeves.

Although the team currently relies on N-dimethylacetamide and lithium chloride (DMAc/LiCl) to dissolve cellulose, they note that solvent recycling can mitigate the environmental impact of the process they use to produce the fibres.

The next steps, says corresponding author Chao Duan, are to scale the process so that it can be used on industrial wet-spinning lines and to explore the use of bio-derived isocyanates for the fibre's production.

See also: *Journal of Bioresources and Bioproducts, Hierarchically porous coaxial wet-spun cellulose/polyurethane based hexamethylene diisocyanate (PUH) solid-solid phase change fiber for enhanced thermal management*, https://doi.org/10.1016/j.jobab.2025.07.005

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Alliance to promote European carbon fibre

Representatives of the founder members of Carbon Fiber Europe.

An alliance dedicated to supporting the growth of Europe's carbon-fibre industry has been established by the European Composites Industry Association (EuCIA), of Brussels, Belgium.

The founding members of the alliance, called Carbon Fiber Europe, are:

- Hexcel Composites SASU, of Dagneux, France;
- Mitsubishi Chemical Europe, of Düsseldorf, Germany;
- Teijin Ltd, which has its European headquarters in Arnhem, The Netherlands;
- Toray Industries, which has its European headquarters in Neu-Isenburg, Germany.

Carbon Fiber Europe will promote the production and use of carbon fibres in Europe by advocating for European carbon-fibre manufacturers, developing technologies and standards, and through activities focused on sustainability and circularity, and health and safety.

At a recent meeting in Brussels, members of Carbon Fiber Europe elected Senior Director for Research and Development at Mitsubishi Chemical Group, Raf Bussels, as the Chair of the alliance, and the Head of the EU Sustainability Group at Teijin Ltd, Axel Leuchter, as Vice Chair.

The President of EuCIA, Roberto Frassine, says: "Carbon fibre is an integral part of Europe's composites industry and it is essential for realising the [European Union] EU Clean Industrial Deal's objectives for decarbonisation, innovation and industrial resilience. We are committed to assisting Carbon Fiber Europe members in their efforts to reinforce carbon fibre's role in Europe's sustainable industrial development."

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Spider silk to be trialled in sportswear

Spider silk produced by transgenic silkworms is to be used in a pilot development programme by a global sportswear manufacturer.

The manufacturer of the recombinant spider silk, Kraig Biocraft Laboratories Inc, of Ann Arbor, Michigan, USA, says that the specific details of the project are confidential, but the customer is renowned for the technologies that it develops and adopts.

Kraig Biocraft is currently converting a portion of its inventory of recombinant spider silk into yarns tailored to the precise specifications provided by the customer's development team. It plans to deliver these yarns to the customer in early 2026. The company adds that, even at this limited scale, the project provides a good opportunity for it to demonstrate the capabilities and commercial potential of its spider silk in the sportswear industry.

The Founder and Chief Executive Officer (CEO) of Kraig Biocraft Laboratories, Kim Thompson, says: "We are excited to support this project and a customer whose commitment to innovation aligns with our own. We look forward to showcasing what our spider silk can deliver at the elite level of apparel design and performance."

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Laser-resistant sewing thread for denim

A sewing thread that is resistant to the heat generated by the lasers used to finish denim has been launched by Durak Tekstil, of Bursa, Turkey.

Laser-finishing systems are being used increasingly in place of mechanical and chemical methods to finish denim, by removing pigment to create shading effects, or to introduce such as rips and abrasions.

Durak Tekstil's Board of Directors Vice President, Yiğit Durak, says: "Considering the burden of the old etching method on both human health and the environment, laser technology represents a significant advancement. Lasers, which create etching/abrasion effects and patterns on denim, often cause burns, seam breaks, and deterioration in standard sewing threads due to high heat and energy."

Durak Tekstil claims that its thread, called Durak Laser Safe and made from a blend of polyester (PES) and cotton, maintains more of its strength after exposure to a wide range of laser intensities than conventional alternatives, is wash-fast and does not shrink much.

Yiğit Durak states that his company will initially target the Turkish, Egyptian and Pakistani markets with Durak Laser Safe. He concludes: "We believe this new product, with its high laser-resistance and long-lasting structure, will become a benchmark product for the denim industry. With the rapidly changing nature of denim fashion and the ever-expanding scope of laser applications, the need for our new thread will increase daily. Manufacturers can freely apply laser applications without worrying about seams, creating high-value-added products."

Durak Tekstil was founded in 1971 to provide Turkey with fishing-net twine, which at that time was entirely imported. The company now manufactures approximately 350 different products.

Durak Tekstil.
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Email: durak@durak.com.tr;
https://durak.com

Producing fibres from fermentation waste

The proteins in yeast left over from brewing beer, making wine or producing pharmaceuticals can be repurposed to manufacture affordable, strong fibres, according to researchers at The Pennsylvania State University (Penn State) in University Park, USA.

The researchers have manufactured approximately 450 kg (one thousand pounds) of the fibre from yeast biomass – composed of proteins, lipids (fatty molecules) and sugars – in a factory in Germany and have used this data to conduct a life-cycle analysis. They found that the commercial-scale production of the yeast-based fibre used considerably fewer resources, including far less land, than the production of wool fibre.

Pearce Professor of Engineering and Huck Chair in Biomimetic Materials at Penn State, Melik Demirel, says: "We successfully demonstrated that this material can be made cheaply – for US$6 or less per kilogramme, compared with wool's US$10–12 per kilogramme – with significantly less water and land, but improved performance compared with any other natural or processed fibres, while also nearly eliminating greenhouse-gas emissions. The saved resources could be applied elsewhere, like repurposing land to grow food crops."

Demirel's team has spent over a decade developing a process to produce a fibre from proteins. "We can pull the proteins as an aggregate – mimicking naturally occurring protein accumulations called amyloids – from the yeast, dissolve the resulting pulp in a solution, and push that through a device called a spinneret that uses tiny spigots to make continuous fibres", Demirel says, explaining that the fibres are then washed, dried and spun into yarn that can then be woven into fabric. He also notes that the fibres are biodegradable. He continues: "The key is the solution used to dissolve the pulp. This solvent is the same one used to produce lyocell, the fibre derived from cellulose, or wood pulp. We can recover 99.6% of the solvent used to re-use it in future production cycles."

Demirel and his team plan to investigate further the viability of yeast-based fibres at a commercial scale. He concludes: "By leveraging biomanufacturing, we can produce sustainable, high-performance fibres that do not compete with food crops for land, water or nutrients. Adopting biomanufacturing-based protein fibres would mark a significant advancement towards a future where fibre needs are fulfilled without compromising the planet's capacity to nourish its growing population. We can make significant strides towards achieving the 'Zero Hunger' goal, ensuring everyone can access nutritious food while promoting sustainable development goals."

See also: *PNAS, Impact of biomanufacturing protein fibers on achieving sustainable development*, https://doi.org/10.1073/pnas.2508931122

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Teijin Frontier to increase capacity for high-performance polyester yarns

Teijin Frontier is to increase capacity for the production of high-tenacity recycled polyester (PES) filament yarn at its subsidiary, Teijin Polyester (Thailand) Limited (TPL) in Pathumthani, Thailand[1].

Starting in November 2025, Teijin Frontier will upgrade equipment at the TPL facility so that a further 620 t of the PES yarns – used in tyre cords, reinforcements for rubber products and seat belts – can be manufactured there each year. The company, of Osaka, Japan, says that demand for recycled PES filament yarn for industrial applications is increasing owing to the implementation of regulations such as the European Union (EU)'s *End-of-Life Vehicles (ELV)* directive, which was announced in 2023. Further, safety regulations are driving demand for PES yarns with enhanced functionalities, such as high tenacity and flame-resistance.

Teijin Frontier currently produces high-tenacity PES yarns at TPL, but the current equipment at the facility is unable to produce both recycled and virgin variants in sufficient quantities. In 2024, Teijin Frontier announced plans to increase capacity for the production of conjugate filaments at TPL[2].

See also: [1]*Teijin Frontier opens Thai facility for production of polyester filaments*, https://www.technical-textiles.net/node/76950

[2]*Teijin Frontier increases capacity for conjugate filaments*, https://www.technical-textiles.net/node/77578

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Wearable Expo
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March 2026

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Intertextile Shanghai Home Textiles
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April 2026

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May 2026

Railway Interior Innovation Summit USA
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Textile Rental Services Association (TRSA) 113th Annual Conference
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FESPA Global Print Expo
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http://www.dornbirn-gfc.com

Introduction to Textiles
22–24 September 2026
Manchester, UK
Robyn Ingham,Events Coordinator, The Textiles Institute;
Tel: +44 (161) 237-1188
ringham@textileinst.org.uk;
https://www.textileinstitute.org

Outlook
22–24 September 2026
Cascais, Portugal
Delphine Rens, Marketing and Communications Coordinator, EDANA;
Tel: +32 (2) 740-1822;
Fax: +32 (2) 733-3518;
delphine.rens@edana.org;
https://www.edana.org/events/outlook/outlook-2022

October 2026

Milipol Qatar
20–22 October 2026
Doha, Qatar
Comexposium
sales@milipol.com;
https://en.milipol.com

FiltXPO
28–29 October 2026
Miami Beach, Florida, USA
Lori Reynolds, Director of Events, INDA (Association of the Nonwoven Fabrics Industry);
Tel: +1 (919) 459-3716;
Fax: +1 (919) 459-3701;
lori@filtxpo.com;
https://www.filtxpo.com

November 2026

Advanced Textiles Expo
3–5 November 2026
Orlando, Florida, USA
Amy Collins, Advanced Textiles Association;
Tel: +1 651 225 6970
amy.collins@textiles.org;
https://www.textiles.org/event/ifai-expo-2023

Advanced Engineering
4–5 November 2026
Birmingham, UK
Alison Willis, Divisional Director, Easy Fairs;
Tel: +44 (20) 3196-4303
alison.willis@easyfairs.com;
https://www.advancedengineeringuk.com

ITMA Asia + CITME
20–24 November 2026
Shanghai, China
Daphne Poon, ITMA Services;
Tel: +65 9478-9543
daphnepoon@itma.com;
https://www.itmaasia.com

March 2027

IDEA
23–25 March 2027
Kansas City, Missouri, USA
Misty Ayers, INDA (Association of the Nonwoven Fabrics Industry);
Tel: +1 (919) 459-3712;
Fax: +1 (919) 459-3701;
mayers@inda.org;
https://www.ideashow.org

May 2027

NPE: The Plastics Show
3–7 May 2027
Orlando, Florida, USA
Ashley Stoney, Plastics Industry Association;
Tel: +1 (202) 974-5210;
Fax: +1 (202) 296-7005;
astoney@plasticsindustry.org;
http://www.npe.org

September 2027

ITMA
16–22 September 2027
Hannover, Germany
ITMA Services;
Tel: +65 6849-9368
info@itma.com; -https://itma.com

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Suppliers Directory

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Technical Textiles International 2026 Suppliers Directory

Listed below is a selection of some of the most important companies operating in the technical textiles industry. The listings include textile machinery manufacturers, fibre producers, yarn manufacturers, fabric knitters, nonwovens producers, dyers, finishers, chemical suppliers and other suppliers of goods and services, both to the industry and to end-users.

Advances in Textiles technology

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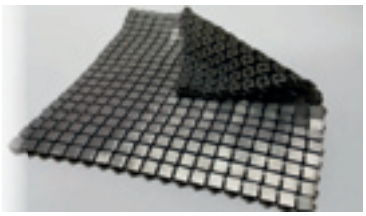
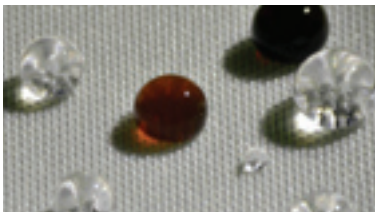

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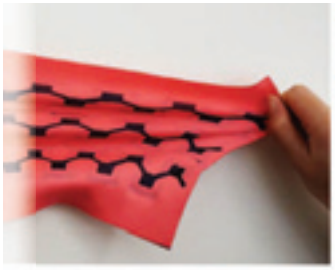

Advances in Textiles technology

February 2022

An international newsletter on textiles technology edited by: James Bakewell

Fibres, filaments and yarns

Artificial silk door-pulls feature on Mercedes-Benz concept car

Novel, sustainable door-pulls made from artificial silk fibre are being used by Mercedes-Benz of Stuttgart, Germany, in its latest concept car, the Vision EQXX.

The carmaker has designed Vision EQXX to highlight ways in which luxury vehicles can be produced using technologies that are more environmentally sustainable than conventional approaches.

The artificial silk fibre is called Biosteel and is produced by AMSilk of Planegg, Germany. The company says that the fibres are biodegradable and recyclable, and no waste is generated during their manufacture. It adds that Biosteel demonstrates mechanical properties

The door pulls for the Vision EQXX concept car from Mercedes-Benz are made from Biosteel artificial silk fibres.

Highlights this month: full contents listing on page 2...

Methods for determining the effects of strains and stresses on carbon nanotube fibres are being developed by researchers at Rice University 2

A single vented tumble dryer can discharge up to 120 million microfibres into the air each year, according to a pilot study 5

A range of durable fabrics made from pre-consumer recycled polyamide (PA) 66 fibres has been launched by Invista through its Cordura brand 3

A fibre-laying process that enables the efficient production of composite footplates and toe caps for use in footwear has been launched by Coats 7

A dual-action thermoregulating finish that reduces the temperature of surfaces to which it is applied by up to 3°C has been launched by HeiQ 4

A long, fibre-based lithium-ion battery that could be woven into fabrics is being developed by researchers at the Massachusetts Institute of Technology 10

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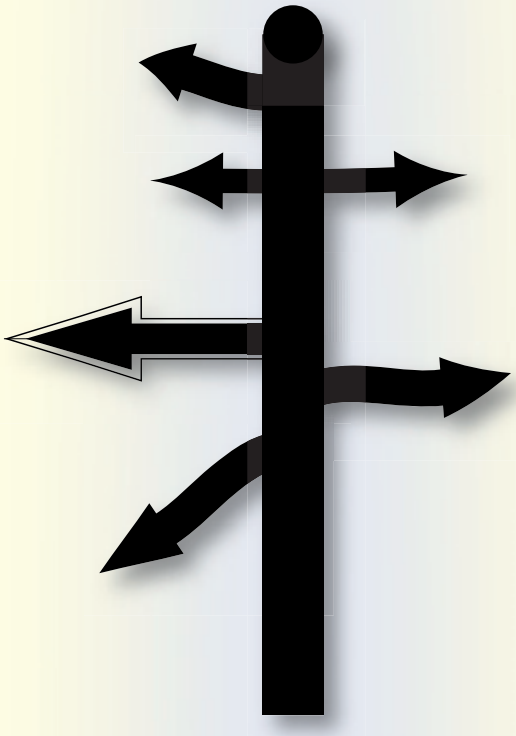

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