

# Driving Innovation

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## The World in 2030



**Grado Zero Espace**  
Innovazione in 3D



**BMW**  
Plastics  
Performance  
and Security

# Grado Zero Espace Innovazionissimo!

When space technology comes down to Earth, the results are amazing – as is demonstrated by this small-size Italian company that has turned innovation into its reason for being

Founded in 2001 by Filippo Paglia, its current CEO, Grado Zero Espace initially operated as a R&D centre for its parent company, the high-end Italian clothing brand Carpo Nove. The company's initial objective was to provide a link between applied research and the corporate world to create new materials based on complex textile structures. Fairly soon, a vision imposed itself: for a technology transfer to succeed, it is necessary to master such of its stages – R&D, design, prototyping, engineering, manufacturing... Then, this multidisciplinary competence came to support a simple marketing strategy: delivering a global service to clients (360° design service) to help them develop the appropriate technical solutions for their needs. Having quickly acquired significant know-how in the field of intelligent textiles, the company, which today has 10 employees, started to work with the Italian design houses of Hugo Boss and Dolce&Gabbana to create high performance technical clothing. In parallel, the company also turned its attention towards other industrial sectors such as sports and safety equipment, industrial design, building and construction, health care and transportation.

## Successfully Placed in Orbit

Grado Zero Espace owes much of its successful launch to the European Space Agency (ESA) and to its technology transfer programme, in which the company had participated from the very beginning. In fact, this cooperation has given rise to numerous projects. An example is the research carried out on shape memory textiles. Taking advantage of the ability of these material alloys to react to heat, Grado Zero Espace created "Oricidair", a

prototype shirt whose sleeves vary in length depending on the temperature. In fact, this astounding technology received the highly coveted "Invention of the Year 2001" title awarded by Time Magazine. Another success story was the creation in 2002 of overalls designed by Hugo Boss and worn by the mechanics of the high-profile Formula 1 McLaren Team. Based on the transfer of a technology initially developed for the space suits worn by astronauts, this personal protection equipment incorporates in the fabric of the garment a portable cooling system (Anatomic Intercoller System) consisting of ultra-light batteries and pumps and of a miniaturised array of PVC tubing (a 30 m circuit with a diameter of 2 mm) in which flows an aerogel based liquid. One of these suits was also used in 2004 by Spanish motorcycle racer Sete Gibernau at the Qatar Grand Prix, the hottest race in the season. "The research related to this technology was a turning point because it enabled us to develop various miniaturised temperature control systems capable of being incorporated into different types of clothing", summarises Gilda Danusso, Head of the Product Design Department. In June of 2007, the winners of the 47th Paris International Air Show at Le Bourget were liable to see and feel two new prototypes developed from this research. Created for the Paris Fire Brigade, "Hydro Jacket" is a firefighting suit in a multi-layer sandwich material with a lining that incorporates small quantities of hydrogel. This active polymer has an intelligent molecular structure that enables it to adjust the body's temperature depending on the outside temperature.



## Extreme Clothing

With multiple technologies in its portfolio, the company has specialised in the development of intelligent thermoregulation textiles. In the case of the shape memory membranes, when the garment's temperature increases above a preset threshold, the microcapsule polymer membrane is activated to allow the water vapour and the body's heat to exit towards the outside. Conversely, if the temperature stays below the activation threshold, the molecular structure of the fabric remains rigid and the garment preserves body heat while remaining waterproof. The "Absolute Zero Jacket" is made of an anti-abrasion synthetic material with a 100% polyester lining. Its exceptional temperature control performance is due to the addition of aerogel-filled patches to the lining. Aerogels are highly porous materials initially developed to insulate instruments on board the space vessels and probes sent to Mars. The mastery of this technology enabled Grado Zero Espace to develop several projects, including the "Absolute Frontiers II" model, a light, comfortable and highly insulating jacket worn by explorers as protection against the extreme low

temperatures of Antarctica. It consists of 80% polyamide and 20% polyurethane for the outer shell and a renewable aerogel layer for the lining.

## The Nano Revolution

Over the long term, these innovations should find mass market applications such as car seats or city chilling lines capable of auto-adjusting to ambient temperature conditions. At present, Grado Zero Espace is already preparing the future by focusing a significant part of its research resources on carbon nanotubes. Nanotubes are microscopic particles capable of linking with different materials in order to enhance their strength, elasticity and lightweight properties. While they are still confidential, the first developments on the integration of these nanotubes into composite matrices are reported to have awakened the interest of a yacht manufacturer. "Regardless of the field of application, our vision of the future will remain faithful to our original mission: to use technology to find new materials likely to improve our safety, comfort, and, more generally, our quality of life", says Gilda Danusso in conclusion.

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- 1. "Oricidair", shape memory textile
- 2. "Hydro Jacket", prototype of firefighting jacket for Brussels
- 3. "Absolute Zero", lightweight jacket with warming heat control performance
- 4. A thin, light and resistant leather
- 5. Anatomic Inter-cooler System, an integrated cooling system