



Dyneema[®] Denim explained

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TAKING JEANS INTO THE 21ST CENTURY

Whether it's for more durable apparel that can better withstand the wear-and-tear of an active lifestyle or for full-blown motorcycle protection, Dyneema[®] Denim offers a full range of lightweight strength that maximizes coolness and comfort.

With its 'less is more' properties, Dyneema[®] enhances all aspects of classic denim work wear: durability, toughness, protection and comfort. And while the color of Dyneema[®] Denim fades like traditional jeans, its performance remains intact.

Dyneema[®] Denim can be produced in a full variety of grades – with the more Dyneema[®] fiber you use, the stronger the resulting fabric. Thereby, the performance of a garment can be tailored to its intended function, whether it's for fashion, action sports or motorcycle wear.

Two types of technologies exist to produce Dyneema[®] Denim:

- ◆ By blending smaller amounts (up to 15%) of Dyneema[®] with cotton, a lighter and more comfortable jean is created with enhanced strength and durability.
- ◆ Using larger amounts of Dyneema[®], either as filament or spun yarn reinforcement in combination with a special weaving construction, will result in a much stronger and more durable jean. This type of Dyneema[®] Denim has the potential to become a viable – and more flexible and comfortable – alternative to leather.

“These new fabrics can make you feel safe without being a nuisance,” says David Borrás of the legendary Spanish high-performance custom motorcycle company El Solitario. “Because you don't feel like the technology is there. But it's actually doing good things for you – and that's the beauty of it.”

WHAT IS DYNEEMA[®]?

Dyneema[®] is Ultra High Molecular Weight Polyethylene (UHMWPE). As the world's strongest fiber™, Dyneema[®] offers maximum strength combined with minimum weight. Fifteen times stronger than steel and up to 40% stronger than aramid fibers, Dyneema[®] has long been used to moor oilrigs, sail ships, stop bullets and repair humans ligaments. Lighter than water, Dyneema[®] is water repellent, highly resistant to UV light and chemicals, and highly thermo-conductive.

As a fabric, Dyneema[®] Denim is becoming increasingly used in high-performance sport, from mountain climbing to motorcycling. Depending on the selected technology, Dyneema[®] Denim can offer both unparalleled protection for extreme sports applications, or extra strength and durability for daily wear. Whatever the use, the lightweight fabric remains comfortable, soft and cool to the touch.

HOW MUCH DYNEEMA[®] DO YOU NEED?

Let's start with the baseline: 100% cotton denim with no Dyneema[®]. While denim has a long tradition in use in work and active wear, cotton is a very weak fiber and offers very little protective power – though, obviously, it's better than wearing nothing. Strength-wise, cotton is essentially the opposite of Dyneema[®].

LOOKING FOR INCREASED DURABILITY? INTIMATE BLENDS OF COTTON AND DYNEEMA® (5-15%)

Since cotton is a relatively weak fiber, very little Dyneema® is needed to have a significant influence on a garment's durability. By only adding 4 to 5% Dyneema® to cotton, the tear strength of the resulting blend will already be doubled. In addition, the article's tensile strength and abrasion resistance (as measured by the standard Martindale method) will increase significantly. In short, the life of a pair of jeans can easily be prolonged – a very desirable property for applications such as active sports wears.

Another way to benefit from the extreme strength of Dyneema® is to make jeans lighter without compromising strength and durability. Blending in small amounts of Dyneema® in cotton will significantly increase the strength of the resulting fiber (and thus the jean). For those applications where there is no need for additional strength (e.g. traditional fashion), this extra strength can also be used to produce lighter-weight denim (8-9 oz.) with the same strength and durability properties as a heavier one (12 oz.).

If 10 to 15% Dyneema® is applied to apparel, the strength and durability properties are significantly improved while providing an extra buffer against wear-and-tear while engaging in more active pursuits, such as skate boarding or biking.

The spinning technology using amounts of up to 15% Dyneema®, involves blending cotton and Dyneema® fibers and then pulling and twisting these into a yarn. This yarn can then be applied for both the warp and the weft of the denim – giving it increased torsional strength in every direction. The more Dyneema® you put into this 'intimate blend', the stronger the resulting yarn will be.

However there's a limit to applying this particular technology since Dyneema® is a white fiber (though it is now also available in black). At about 15 to 20% Dyneema®, an aesthetic price begins to be paid: the denim becomes too white and therefore loses its distinctive 'look'.



El Solitario's Dyneema® Denim coverall

ASPIRING FOR FULL-BLOWN PROTECTION? DOUBLE-WEAVE WITH DYNEEMA® (20-60%)

To create an essentially unbreakable technical high-performance denim, more Dyneema® is required – using a unique double warp beam with cotton on the front and Dyneema® on the back and weft. With this technology, performance levels rise exponentially, complete with 360° torsional strength. For example, DSM Dyneema collaborated with Australian moto-clothing label Saint and Italian denim mill Berto E.G. Industria Tessile S.r.l. to come up with such an ultra-strong Dyneema® Denim, with more than 50% Dyneema®, which is almost indestructible and outperforms typical jeans and jackets by a factor of seven in terms of abrasion resistance, durability and tear strength – while still aging like regular denim.

"The experimentation with new yarns and the latest technologies have led us to create new generation products that offer higher performances bridging the gap between fashion and the technical clothing world," says Arianna Morimando, the marketing manager at Berto Industria Tessile.

More recently, a Dyneema® Denim (4Q2016) was developed that will be a changemaker in the motorcycle protection industry. This fabric can be applied to single-layer motorcycle clothing capable of passing the standard impact abrasion test EN13595 – offering protection for over 4 seconds of slide time. Until now, such protection required much heavier fabrics and cumbersome inner linings. Meanwhile, wear comfort was also improved by adding stretch to the fabric.

THE GREAT BEYOND

With double-weaved Dyneema® Denim being the first single-layer denim capable of making garments that can achieve level one CE-certification, the fabric is now in a position to ably replace leather as the material of choice in the motorcycle protective apparel industry.

Of course, for full impact motorcycle protection, extra padding will always be required. But with Dyneema®, the resulting suit will be lighter, less bulky, more flexible and more comfortable than when it's made with any other available technologies.

Dyneema® Denim can also offer increased protection to non-professional riders and commuters. Rider jeans can now be designed that increase safety without losing any sense of freedom or style. Newer versions of this Dyneema® Denim are also currently being developed with different colors and water-repellent finishes.

DYNEEMA® DENIM				
APPLICATION				
PROPERTY	STANDARD DENIM	STRONG DENIM	DURABLE DENIM	MOTORCYCLE DENIM
Fabric Composition	100% Cotton	5% Dyneema®	5-15% Dyneema®	>50% Dyneema®
Tear Resistance	+ -	++	+++	+++++
Tensile Strength	+	++	+++	+++++
Martindale Abrasion	+	++	+++	(not relevant)
Impact Abrasion Acc. EN13595	0.4 sec. (not relevant)	0.6 sec. (not relevant)	0.8 sec. (not relevant)	3.5 - 4.5 sec. or >4 sec.
Technology		 Intimate blend of Dyneema® and cotton in regular denim weave		 Special engineered weave construction combining Dyneema® and cotton

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