



REGULATORY

EN ISO 13937-2 & UNE 40413

TEAR STRENGTH

**HOW TEAR PERFORMANCE IMPACTS
GARMENT DURABILITY**

YOU DO. WE PROTECT.

 **IBO[®]**
TEXTILES PROTECTING LIVES

TEAR STRENGTH TESTING

EN ISO 13937-2 & UNE 40413

Textile fabrics are regularly exposed to concentrated mechanical forces during use. Snagging on sharp edges, contact with tools or equipment, punctures, cuts, and accidental damage can create small defects that may rapidly develop into larger tears when the fabric is placed under tension. Tear strength testing evaluates a fabric's ability to resist the propagation of these tears once an initial defect has occurred.

Two widely recognised test methods are commonly used to assess this performance: EN ISO 13937-2, based on the trouser tear method, and UNE 40413, based on the Elmendorf pendulum method. Although both standards measure tear strength, they use different testing principles and provide complementary insights into how a fabric responds to tearing forces. Together, they offer a comprehensive assessment of a fabric's ability to resist tear propagation, supporting material selection, product development, and long term durability.

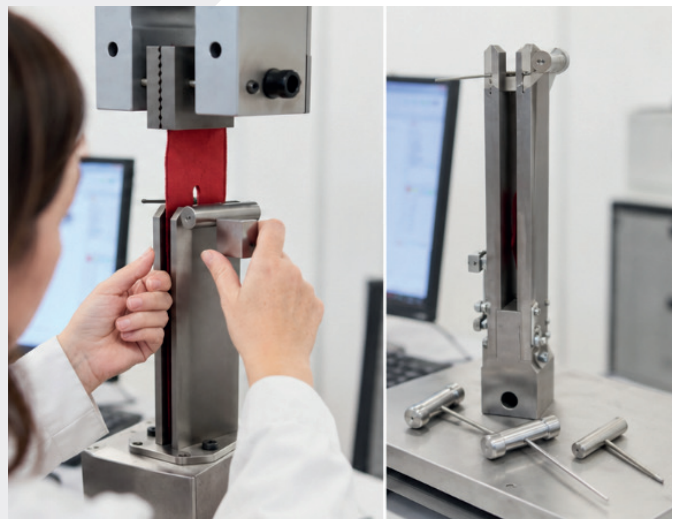
EN ISO 13937-2 TROUSER TEAR STRENGTH

This standard determines the force required to continue tearing a fabric from a pre-cut slit extending from the edge of the specimen. The specimen is divided into two legs which are pulled apart in a tensile testing machine, simulating tear propagation under controlled tensile loading.



UNE 40413 IN TEAR STRENGTH BY PUNCHING ELEMENTS

This standard determines the force required to initiate and continue tearing a fabric from a single hole created in the centre of the specimen by a punching element. The specimen is clamped securely while the clamps move apart, causing the tear to propagate from the punched hole under controlled tensile loading.



THE TEST METHODS

CONTROLLED TEARING, STANDARDISED MEASUREMENT

Both EN ISO 13937-2 and UNE 40413 evaluate a fabric's resistance to tear propagation after damage has been initiated. Although both methods measure tear strength, they differ in how the tear starts. EN ISO 13937-2 measures tear propagation from a pre-cut slit at the edge of the specimen, while UNE 40413 measures tear propagation from a controlled hole created in the centre of the specimen. Together, these standardised methods provide valuable data for material selection, product development, and quality assurance.

EN ISO 13937-2 (Trouser Tear Method) uses a rectangular specimen with a slit extending from one edge, creating two separate legs. These legs are clamped into a tensile testing machine and pulled apart at a constant speed. The average force required to continue the tear is recorded in newtons (N). Higher values indicate greater resistance to tear propagation under controlled tensile loading.

UNE 40413 (Tear Strength by Punching Elements) secures the fabric specimen between two clamps while a punching element creates a controlled hole in the centre of the fabric. As the clamps move apart, the tear propagates from the hole. The test records two values in newtons (N): tear initiation, the force required to start the tear, and tear propagation, the force required to continue it. The initiation value is typically lower because the first yarns fail individually, while the propagation value is higher as multiple yarns share the load and break simultaneously. Together, these values provide a comprehensive assessment of a fabric's resistance to tearing.

WHY TEAR STRENGTH MATTER

DURABILITY, SAFETY, GARMENT PERFORMANCE

In real working environments, fabrics are continuously exposed to conditions that can initiate tears. Contact with machinery, sharp tools, rough surfaces, vegetation, fasteners, equipment, or accidental snagging can create small cuts that may rapidly develop into larger tears under load. Fabrics with high tear strength help prevent this damage from propagating, contributing to longer service life, improved reliability, and reduced repair frequency. This is particularly important in demanding applications such as workwear, military clothing, outdoor apparel, footwear, equipment, emergency services, and industrial protective garments. While EN ISO 13937-2 and UNE 40413 provide valuable information about a fabric's resistance to tear propagation, the results should not be interpreted as a direct prediction of product lifetime, as real world performance also depends on factors such as garment construction, seam design, finishing treatments, maintenance, and the conditions under which the product is used. Together, these standards provide objective, standardised data that supports material selection, product development, quality assurance, and consistent manufacturing.



BEYOND THE NUMBER

BALANCING DURABILITY, APPEARANCE AND COMFORT

High tear strength is an important indicator of textile quality, but it should always be considered alongside other performance characteristics. The ideal fabric balances tear resistance with abrasion resistance, tensile strength, flexibility, weight, breathability, comfort, and the specific requirements of its intended application. A fabric designed solely for maximum tear strength may become heavier or less flexible than required, while a lightweight and comfortable fabric may offer excellent mobility but reduced resistance to tearing in demanding environments. By evaluating the results of EN ISO 13937-2 and UNE 40413 alongside other mechanical performance tests, textile developers can select materials that provide the optimal balance between durability, comfort, functionality, and long term performance.



PERFORMANCE THAT LASTS

EN ISO 13937-2 and UNE 40413 help demonstrate that a fabric is not only strong, but technically prepared to resist tear propagation throughout its service life. Together, these standardised test methods provide measurable data that supports material engineering, garment development, and long term quality assurance.

For IBQ Textiles, tear resistance is part of a broader commitment to technical performance. That is why tear strength testing forms an integral part of our fabric evaluation process, helping brands and manufacturers develop garments designed to maintain their integrity, durability, and performance for longer.

Because lasting protection begins with fabric performance.

