

Technical Specifications

Carpet Yarn



As the first to market solution-dyed fiber, Universal Fibers is a multiple polymer house with the ability to produce a wide range of fiber types to meet your most exacting carpet yarn specifications.





Appearance Retention (Hexapod ASTM D 5252)



To support better yarn coverage in tufting, Universal Fibers' carpet yarns offer superior bulk that assists in pile height retention (resiliency) during traffic exposure. The entanglement preserves color "placement" so tufts don't "heather out" and look different in traffic lanes. Universal uses small "building blocks" (600 denier per color) that support finer gauge tufting, lower pile height and tighter constructions—all of which deliver better appearance retention. This property is critical to customer satisfaction (see page 3 for further details).

Staining (AATCC TM 175)



In commercial exposure, stains may be categorized as physical or chemical. A number of food/beverage stains are known as "acid stains" because they contain SO₃ (sulfonate) groups that block the available amide/amine groups to stains. If stains on unsulfonated (acid dyeable) nylon 6,6 are allowed to set for 24 hours before cleaning, complete removal in five minutes is difficult. Use of a sulfonated nylon copolymer renders the fiber chemically inert to acid dyes and stains. Universal's sulfonated carpet yarns are inherently acid stain resistant (meets or exceeds a Red 40 dye stain rating of 8).

Soiling



As a leader in the industry for soil/clean performance in fiber, Universal's yarns are treated with advanced low-soil finish technology, specifically formulated to charge the filament surface to repel/minimize initial soiling and promote wet extraction cleaning of deposited soils.

UV Fastness (AATCC TM 16 Option E)



Universal's carpet yarns are formulated to meet or exceed a grey scale rating for color change grade of 3-4 after 200 AFU exposure. In fact, most Universal Color® shades meet transportation interior standards (SAE J1885 to 488.8 kJ/m² exposure). This weatherability also implies greater than 50% physical property retention—tenacity and elongation, after 200 AFU exposure.

Atmospheric Contaminants (AATCC TM 129, AATCC TM 164)



Universal's yarns are designed to meet or exceed a grey scale rating for color change of grade 3 after 5 cycles of exposure to either ozone or oxides of nitrogen under warm and humid conditions.

Flammability (ASTM E 648)



Formulated to achieve a Class I rating under radiant panel testing, Universal's yarns meet or exceed an average critical radiant flux of 0.45 W/cm² as a tufted and latex-backed level-loop construction of about 20 oz. yarn face weight.

Antistatic Protection (AATCC TM 134)



When supplied with standard content, Universal's yarns contain sufficient antistatic filaments to achieve performance <3.5 kV under electrostatic propensity testing—both scuff and step.

Antimicrobial Efficacy (Solutia EPA registration 71645-3, AATCC TM 174)



Universal's carpet yarns contain zinc oxide and pass antimicrobial activity assessment of carpet testing.

EarthSmart Technology®



EarthSmart Technology is Universal's commitment to sustainability. This is evidenced by closed loop waste recovery, energy and carbon footprint reduction, and a culture of continuous innovation—all validated by ISO 14001 certification. EarthSmart Technology, it's smart for the planet and for business.

Testing



Universal's carpet yarn performance is judged routinely by comparative benchmark testing—at independent labs, at customers' test labs and internally. Our performance meets or exceeds that achieved by other industry leading products.



Appearance Retention



KEY DEFINITIONS:

PERFORMANCE

Universal provides a range of yarns designed to give industry-leading wear performance in heavy contract through value-engineered yarns, fully functional in tenant improvement. Universal provides both two-step mechanically crimped textured yarns with the highest bulk and coverage in the industry and one-step hot-air textured yarns in a complete range of colors and lusters. Yarn, pattern design and skillful construction each play significant roles in achieving service life—therefore, all aspects should be considered in specification.

ACCELERATED TESTING

Accepted lab methods, such as Hexapod and Vettermann drum, which rapidly expose carpet to traffic levels seen from residential through heavy contract exposure. Two scenarios with this approach should be considered: 1) that visual grading is subjective and variable, and 2) that rapid exposure exaggerates performance differences between nylon and non-nylon (polyester, polyolefin, PLA) fibers because the latter class recovers more slowly—and would recover to a greater extent in application.

PILE HEIGHT RETENTION

An averaged series of precise measurements indicating present pile height divided by original pile height.

APPEARANCE RETENTION

Comprised of three separate and distinct attributes:

1. Pattern definition—the degree of color clarity and distinctness of

fabric pattern.

2. Percent pile height retention (see first column.)
3. Broken Filaments – How evident are single filament breaks in the yarn (tuft) bundles? Unacceptable quality will appear as “fuzz”—not to be confused with poor tuft bind that causes filaments to visibly delaminate from the backing.

WEATHER AND WEAR

Hazing, frosting or broken filaments evident in areas with higher UV light exposure.

SEAMING

Evident in some modular tile exposed to high traffic. The edges become pronounced/noticeable due to pile distortion, insufficient coverage or accelerated wear.

SERVICE LIFE

The lifetime of a carpet. Careful selection of pattern, face weight and polymer are needed to ensure that the carpet will withstand the expected traffic volume over the desired life span. Certain patterns lose crispness with high traffic, even at high face weights and densities. Conversely, other patterns, especially randomized tile, hide wear well even at lower face weights.

BULK/COVERAGE

Crimp or yarn texture helps carpet face fiber bulk up and fully occupy a maximum of tuft space. This promotes recovery (from foot traffic) retention of original appearance and pattern coverage.

Soil and Cleaning

KEY DEFINITIONS:

CAPABILITY

In the early 1990s, after discovering the carpet cleaning issues caused by high level fluorochemical use, Universal Fibers focused heavily with resources, time and effort on a true solution to the carpet soil/clean problem. After thousands of experiments, a complex formulation of environmentally safe ingredients was combined and applied to the spun filaments as a microemulsion. The chemistry is such that a permanent bond is formed to the nylon surface—and the resulting film is exceptionally durable to wear, UV weathering and harsh chemical treatment. The secret of this chemistry is to both repel soil yet be receptive and synergistic to the full range of carpet cleaning agents used today. Put simply, carpets made with Universal Fibers yarns are slow to soil and easy to clean up – better than the competition.

CARPET SOIL

Foreign material tracked onto the face fiber causing a change in appearance. Composition varies from sand (removable by vacuum) to clay (cleanable with soap and water) to oil and grease (removable only by organic cleaners).

CARPET STAINS

A subset of soil, typically a liquid that is absorbed by the face fiber with a visibly discolored residue.

VACUUMING

The physical extraction of dirt, including pile lifting and tuft placement restoration by brushing/beating.

SPOT CLEANING

The use of chemical sprays on specific soil and stain areas, intended to be immediately followed by wet extraction to prohibit re-soiling.

BLEACH

Ultra regular bleach, containing 6% sodium hypochlorite. Used (by some) on solution-dyed yarns to remove stains or (diluted) as a disinfectant. As a strong oxidizer, bleach attacks nylon and will degrade it, resulting in color fade and deterioration of physical properties.

WET EXTRACTION

The physical and chemical extraction of soil and stain by hot water and detergents. Wet extraction is often called “steam cleaning”. However, the term “steam cleaning” is a misnomer as the steam condenses to hot water before it contacts the carpet pile. It is important that the detergent used leaves only a powdery, nonsticky, vacuumable residue and that the extracted carpet is rinsed at low pH.

ELECTROSTATIC ATTRACTION

Because all fibers, both natural and synthetic, are capable of holding residual static charge. Certain soils are oppositely charged and can be strongly bound to fiber surfaces as long as the opposite charge attraction exists.

FLUOROCHEMICALS

A class of chemicals used by companies other than Universal Fibers to reduce the soil attraction of their yarns. Fragments of these materials show biopersistence, defined as failing to break down in our bodies or in the environment. Also, fluorochemicals present a long-term carpet-cleaning problem when the protective layer is partially compromised, allowing soil to penetrate underneath. For these reasons, Universal’s yarns provide excellent soil protection using better alternative chemistries.



UV Weathering



KEY DEFINITIONS:

CAPABILITY

Universal Fibers has over twenty years of experience in specification of yarns for automotive applications and outdoor fabrics, and continues to innovate in transportation. Using the knowledge of colorants and protective chemistries, Universal's yarns deliver long life across a range of polymer types. For floor covering, accelerated testing methods have been adopted that measure both color fade and strength retention. Universal's BCF yarns test equal to or better than all others.

ACCELERATED TESTING

Various test chambers subject samples to intense UV light at high temperature and high humidity. In rough terms, five years of actual carpet exposure is accomplished in one week. For the United States, it is recognized that conditions in Alaska and Arizona are quite different, but the accelerated tests are quite reproducible and decades of data support real-world experience. Universal Fibers' yarns are routinely tested under controlled accelerated test procedures such as AATCC TM 16 option E and SAE J1885.

UV DEGRADATION

The shorter the wavelength of light, the higher its energy and the greater its potential for damage to a fiber. UV light has a shorter wavelength than visible light and is responsible for sunburn. In fiber, the damage takes place in two very different ways:

1. Color fade—dyes are more susceptible than most pigments to color loss from exposure to UV light. Care should be taken in formulation so that whatever fading occurs is "tone-on-tone"—meaning that if, for example, the red fades from a grey yarn, it will noticeably change to a greener appearance.

2. Polymer degradation—mostly independent of color. Certain bonds in the polymer chain can be attacked and broken by UV light. As the polymer degrades, its physical properties (strength and resilience) greatly diminish. Chemicals known as "stabilizers" trap the UV light and protect the polymer—retaining strength and stress recovery. Stabilizers do NOT protect color.



ATMOSPHERIC CONTAMINANTS

Oxides of nitrogen, such as nitrogen dioxide, and ozone mainly occur as by-products from the burning of fossil fuels (petroleum, coal, gas). For example, propane heaters and propane-powered forklift trucks emit oxides of nitrogen in the industrial environment, often in storage warehouses. Ozone is a typical by-product of industrial and vehicle emissions. Both oxides of nitrogen and ozone can cause yellowing of fibers if certain chemistries are present. For example, it is known that certain pigments and dyes or phenolic-based UV stabilizers should be avoided to minimize yellowing on exposures to oxides of nitrogen. AATCC TM 129 (colorfastness to ozone) and AATCC TM 164 (colorfastness to oxides of nitrogen) are used to expose test materials to such contaminants under warm and humid controlled conditions that might be encountered during the processing, testing, storage or use of the material. Any color change is assessed using an AATCC Grey Scale for Color Change. The scale consists of pairs of standard grey chips numbered from 1 to 5 in half steps, with a grade of 5 being no color change and a grade of 1 being a gross color change.





Flame Resistance



KEY DEFINITIONS:

CAPABILITY

Universal's business is built on the inclusion of materials (colorants and additives) at fiber spinning. Working from a wide range of polymers to give a wide range of market applications, Universal brings a unique expertise to delivering top performance in this area. Of course, all Universal products contain no environmentally hazardous or suspect materials.

TEST METHODS

Mostly based on fire modeling. Ideally, the test reflects how a fire might start in the proximity of the article being tested and what protection would be required to permit safe egress. A good example is when floor covering passes the radiant panel test (see below), but will not pass a vertical burn test, so it is not suitable for wall covering unless specifically made for this use.



ELECTROSTATIC PROPENSITY

In environments where electronic devices are used, antistatic protection is often required to prevent possible damage to such devices. Subsequent static discharge to sensitive electronic equipment may cause irreparable damage. AATCC TM 134 is a laboratory simulation of the static-generating tendency that develops when a person walks across a carpeted area in controlled humidity conditions with both stepping (no scuffing or rubbing) and scuffing (that is, a rubbing or wiping action) procedures. The person is continuously monitored during the test by a voltage indicator. The electrostatic propensity is the maximum voltage generated for each of the two test protocols. An electrostatic propensity of < 3.5 kV has been found to be suitable for most commercial areas. Through the inclusion of conductive filaments or other techniques, carpets may be designed to reduce static buildup that meet the desired electrostatic propensity specification.

ASTM E-648 (Radiant Panel)

The US carpet industry test to determine the critical radiant flux causing specified burn behavior. The key "number" is 0.45 watts/cm². A radiant flux greater than this places the floor covering in "Class I"—no sprinklers required. Below 0.45 confers "Class II"—sprinklers required. As a general rule, nylon face fibers achieve a Class I, while polyolefins (e.g., polypropylene) and polyesters (e.g., PET and PTT) only achieve a Class II. Using suitable additives, polyester can be modified to obtain the Class I rating.

SMOKE TOXICITY

A component in maritime and aviation testing. The chemistry of surface treatments, the polymer and the backing chemistry all play a part in successful performance.

ANTIMONY

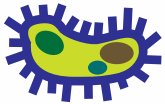
Compounds of this metal are used as effective FR additives, but have come under environmental scrutiny. Replacement chemistry is well established.

HALOGENS

Pentabromine and decabromine compounds that are also under environmental scrutiny. An objectionable demonstrated by-product is dioxin. Again, replacement chemistry is well established.

Antimicrobial Efficacy

KEY DEFINITIONS:



CAPABILITY

Within the United States, law constrains what features and benefits can be communicated concerning antimicrobials. Universal Fibers offers zinc oxide as an EPA registered component of its Universal Color® system. It also offers a premium yarn containing Ionpure® silver chemistry, both EPA registered and achieving Japanese SEK Red Label (most stringent) certification. Health and well-being are two important attributes of living spaces. Universal's technical capabilities and flexible manufacturing make valuable contributions to those attributes.



EPA Registration

In the United States, the EPA must register all antimicrobial agents for intended use. The manufacturer whose article contains an EPA-registered antimicrobial, can only claim protection for the article—no public health or sanitary improvement.

AATCC TM 174

In the United States, the current standard for floor coverings, based on 1) a demonstrated zone of bacterial inhibition, 2) destruction of Gram-positive (*Staphylococcus aureus*) and Gram-negative (*Klebsiella pneumoniae*) bacteria and 3) resistance to fungus (*Aspergillus niger*).

Note – No measurement of permanence is certified by the test. Tests for durability are independently agreed on by seller and purchaser.

SEK (Red, Green, Blue) Label

In Japan, the current standard for fibers and fabrics. Harsher conditions and more aggressive challenges limit approved chemistries compared with US standards.

REACH

A European Union initiative, underway but not complete. All chemical-containing products entering the EU are scrutinized for environmental, health and safety aspects. The list of approved antimicrobials is being greatly diminished.

ORGANIC ANTIMICROBIALS

Typically will not withstand the heat needed to extrude nylon or polyester. They volatilize and migrate. Active debate is ongoing over long-term health, safety and environmental aspects.

INORGANIC ANTIMICROBIALS

Two popular chemistries include insoluble zinc compounds (e.g., zinc oxide) and soluble/insoluble silver compounds (e.g., Ionpure® and AlphaSan®).



ISO 14001 certification means that Universal Fibers' environmental management practices have been thoroughly reviewed and conform to internationally accepted standards for sustainability and ecologically responsibility.



www.universalfibers.com



PO Box 8930
14401 Industrial Park Rd.
Bristol, VA 24202-8930

Phone (800) 457-4759
Fax (276) 669-3304
www.universalfibers.com

