SHAKESPEARE®

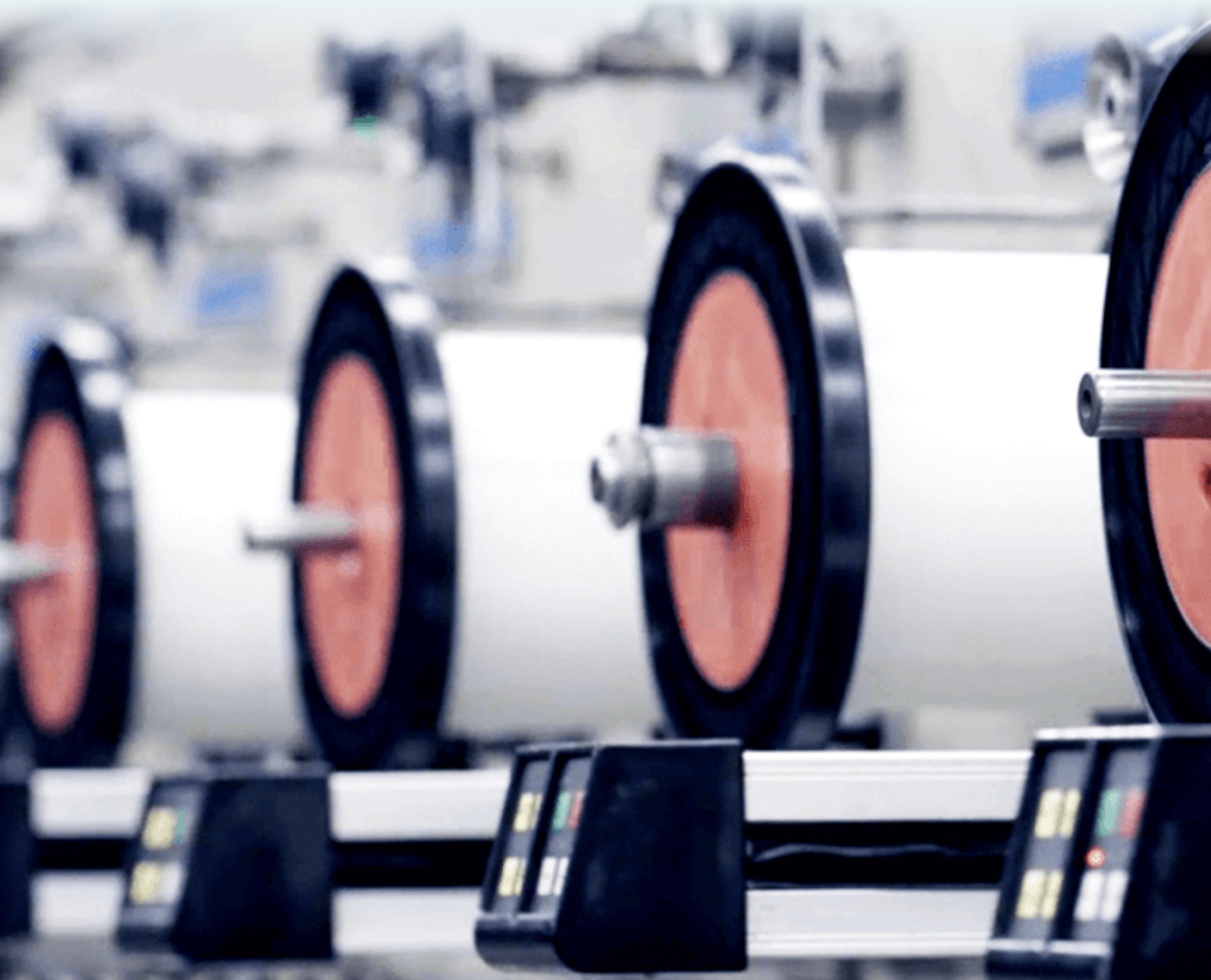
Solutions are in the Science

POLYMERS & FILAMENTS

SOLUTIONS ARE IN THE SCIENCE

Since 1897, Shakespeare®'s commitment to problem solving has made all the difference. Over the decades, we've invested in new talent, new technology, and enhanced R&D capabilities to position our company as a leading material science expert. We create solutions, manufacture high performing product solutions, and deliver best-in-class service.

Through our three product lines – Performance Monofilaments, Engineered Nylons and Conductive Fibres, Shakespeare® Polymers & Filaments is responsible for thousands of products around the world, from custom nylons to unique extrusion products. Since originally manufacturing polyamides in the 1960s, our strategy evolved to develop a polymer business platform serving the needs of both internal and external polymer demands. Now, we're widely known for our diverse portfolio of products supported by proprietary technologies and patent-protected intellectual property.



PERFORMANCE MONOFILAMENTS

Engineered to meet critical specifications and demanding performance requirements, our monofilaments are used in a wide range of applications, including paper machine clothing, industrial filtration, specialty fasteners, Tyre cord reinforcements, and so much more.

Utilising expert material science, we custom engineer monofilaments that meet precise industry specifications and performance requirements. We execute thorough materials testing and stand behind our products. While potential applications of our products are wide and varied, our product performance is not – it's predictable and consistent. Our manufacturing practices utilise ISO 9001:2015 standards to ensure consistency.

Markets

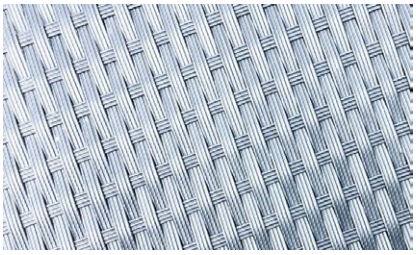
- Pulp & Paper Machine Clothing (PMC)
- Textile
- Automotive
- Consumer Products
- Trimmer Line

Applications

- PMC Process Belting (Forming/Press/Dryer)
- Filtration / Belting
- Specialty Fasteners
- Suspension Seating
- Tyre Cord
- 3D Printer Filaments

Paper Machine Clothing

Monofilaments with unique formulations providing superior properties in forming, press, and dryer applications.



Filtration

Monofilament products featuring excellent biological and chemical resistance properties for filtration applications.

Specialty Fasteners

Shakespeare® has a long history of supplying monofilaments for hook and loop and other fastener applications.

Tyre Cord

An experienced supplier of technical monofilaments for Tyre assemblies.

Trimmer Line

High quality nylon trimmer line scientifically engineered to be more durable.

Suspension Seating

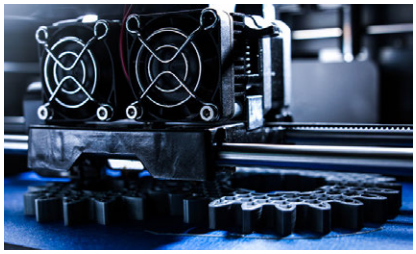
Single and bi-component monofilaments for seating applications.

Sewing Thread

Monofilaments with unique formulations providing superior properties in forming, press, and dryer applications.

Miscellaneous Industrial Applications

Monofilament products tailored for unique applications.



Filaments for Additive Manufacturing

Highly engineered filaments extruded with precision and packaged to meet the highest standards.

Paper Machine Clothing

Monofilaments with unique formulations providing superior properties in forming, press, and dryer applications.

Shakespeare® monofilaments meet the highly technical specifications expected in the PMC (Paper Machine Clothing) industry. Using a variety of polymer types, Shakespeare® custom designs monofilament solutions in our customers' PMC applications in forming, press, and dryer fabrics.

PRODUCT NAME	DIAMETER RANGE (IN)	DIAMETER RANGE (MM)
Nylon	0.004" - 0.050"	0.10mm - 1.27mm
Polyester	0.004" - 0.035"	0.10mm - 0.89mm
PPS	0.016" - 0.035"	0.41mm - 0.89mm

Featured Benefits/Advantages

- Abrasion Resistant
- Contaminant Resistant
- Heat Stabilised
- Hydrolysis Resistant
- Stretch Resistant MD Yarns
- Deformable CMD Yarns
- Edge Curl Control Products
- Reduced Drag Nylon
- Spiral Mesh Monofilaments
- Bi-component Monofilament
- Low Moisture Regain Nylon
- Custom Pigmentation
- Higher Molecular Weight Polymers

Applications

- Forming Fabrics
- Endless Press Felts
- Seam Press Felts
- Fabric Seam Assemblies
- Thru-Air-Dryer Fabrics
- Dryer Fabrics
- Pulp Screens
- Cylinder Roll Covers

Markets

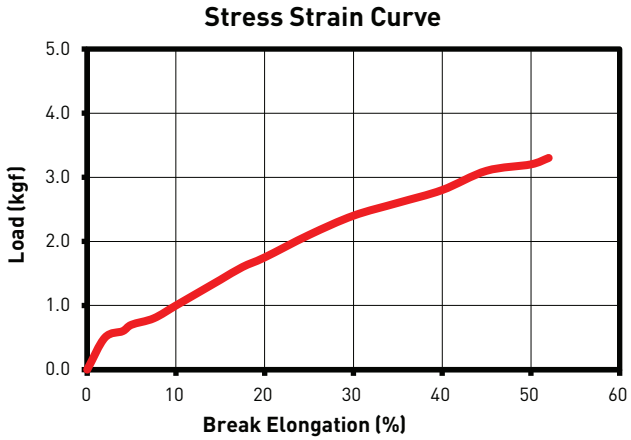
- Pulp Processing
- Paper Industry

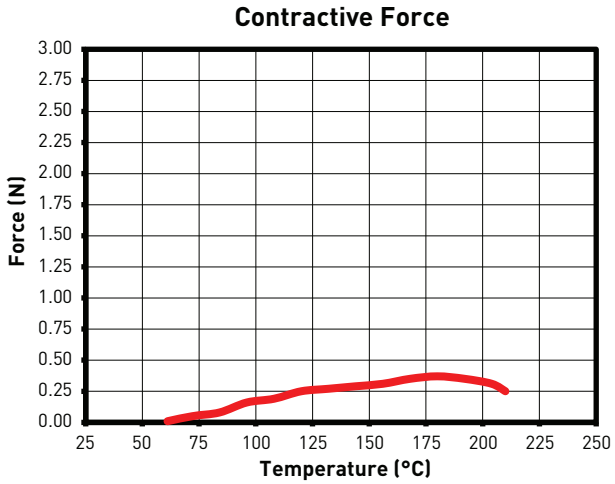
WN-009

- Nylon 6 Polyamide
- Low Free Thermal Shrinkage
- Low Shrink Force
- Low Modulus (Soft/Flexible)
- Forming Weft, good wear resistance and edge curl reduction

Typical Properties:

DIAMETER (MM)	SHRINKAGE AT 200 °C (%)	ELONG AT BREAK (%)
0.300	5.5	45.0



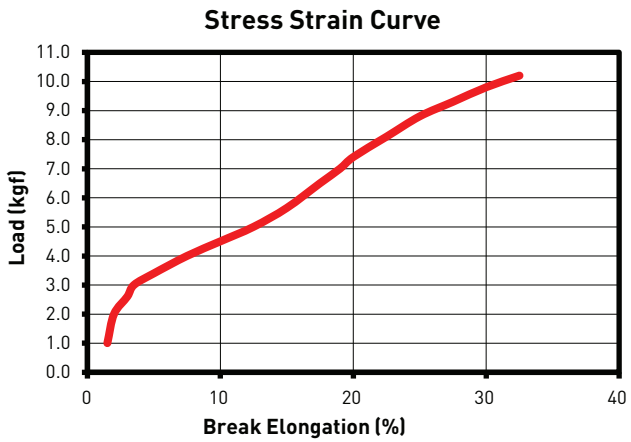


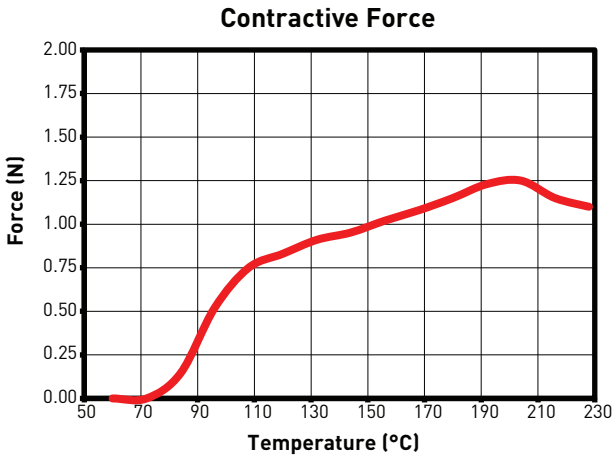
PX-137

- 100% PET Polyester
- Low Free Thermal Shrinkage
- Low Shrink Force
- Low Modulus (Soft/Flexible)

Typical Properties:

DIAMETER (MM)	SHRINKAGE AT 200 °C (%)	ELONG AT BREAK (%)
0.500	6.0	35.0



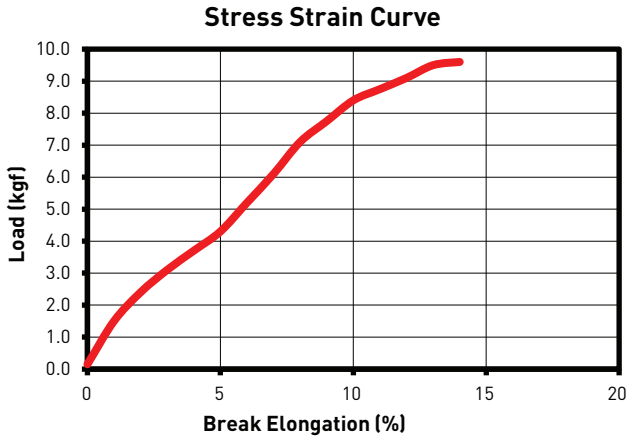


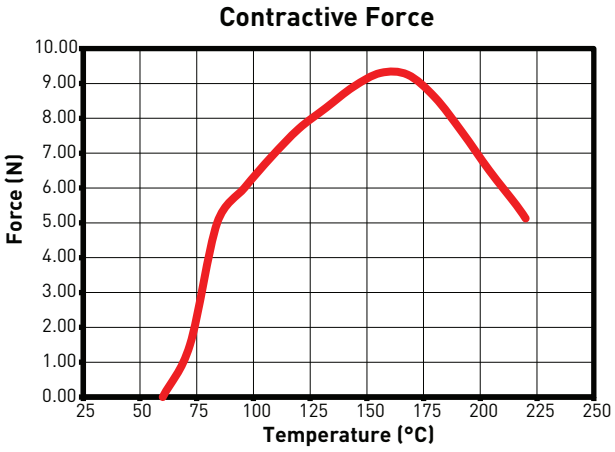
IP-320

- 100% PET Polyester
- High Free Thermal Shrinkage
- High Shrink Force
- High Modulus

Typical Properties:

DIAMETER (MM)	SHRINKAGE AT 200 °C (%)	ELONG AT BREAK (%)
0.400	20.0	15.0



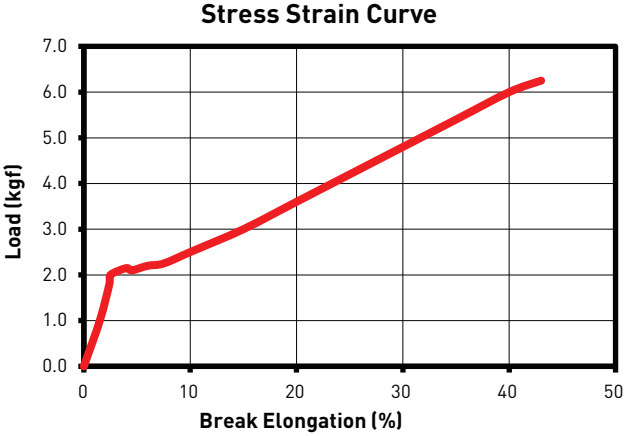


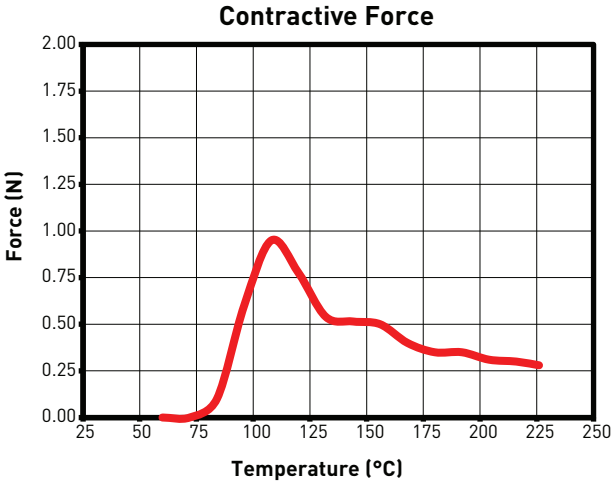
HPA-40

- PPS
- Low Free Thermal Shrinkage
- Low Shrink Force
- Low Modulus (Flexible)

Typical Properties:

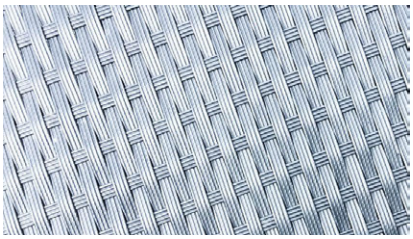
DIAMETER (MM)	SHRINKAGE AT 200 °C (%)	ELONG AT BREAK (%)
0.500	6.5	40.0





Filtration

Monofilament products featuring excellent biological and chemical resistance properties for filtration applications.



A range of both static and dynamic filter fabric applications offering various diameters and configurations with properties to adjust to stringent specifications.

PRODUCT NAME	DIAMETER RANGE (IN)	DIAMETER RANGE (MM)
Nylon	0.004" - 0.020"	0.10mm - 0.51mm
Polyester	0.004" - 0.039"	0.10mm - 0.99mm

Featured Benefits/Advantages

- Abrasion Resistant
- Contaminant Resistant
- Heat Stabilised
- Chemically Stabilised (i.e. Hydrolysis)
- Adjusted Modulus – Low to High
- Very High Thermal Shrinkage
- Flame Retardant
- Impact Modifier
- Custom Pigmentation
- Higher Molecular Weight Polymers
- UV Stabilised

Applications

- Filter Fabrics for Particle/Liquid Separation
- Scrims
- Soil Reinforcement
- Pulp Screens
- Drum Vacuum Filters
- Conveyor Belts
- Food Processing Fabrics
- Stopping Fabrics
- Concrete Forming Belts

Markets

- Paper Industry
- Food Processing
- Geotextiles
- Mining Industry
- Industrial Filtration
- Industrial Conveyance
- Screen Printing

Specialty Fasteners

Shakespeare® has a long history of supplying monofilaments for hook and loop and other fastener applications.

Nylon monofilaments used in hook and loop fasteners and polyolefin monofilaments for mushroom type fasteners. These fasteners are suitable for use in a variety of industrial and commercial applications.

PRODUCT NAME	DIAMETER RANGE (IN)	DIAMETER RANGE (MM)
Nylon	0.008" - 0.034"	0.20mm - 0.86mm
Polyester	0.008" - 0.046"	0.20mm - 1.15mm
Polypropylene	0.007" - 0.015"	0.18mm - 0.38mm

Featured Benefits/Advantages

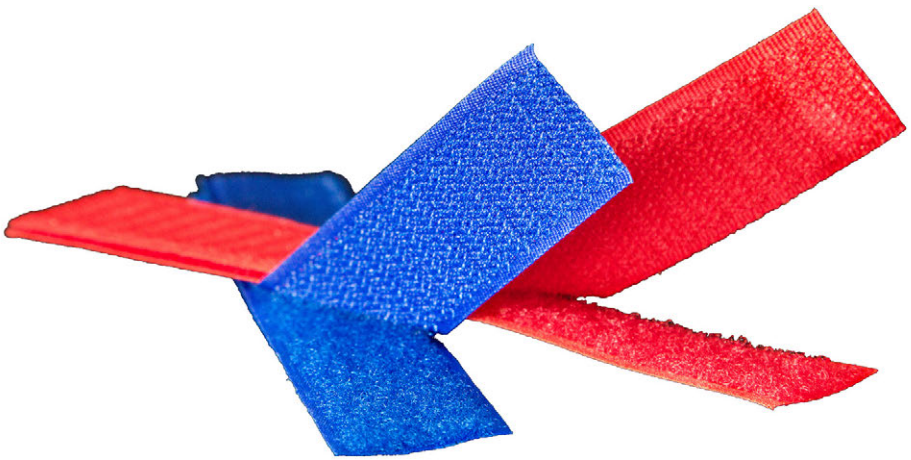
- Optimise Peel Strength
- Yarn Finishes to Ease Processing
- Polymer Tailored for Dyeability
- Pigmented Monofilament
- Shaped Cross Sections
- High Toughness and Knot Strength

Applications

- High Frequency Closures
- High Peel Strength – Limited Closures
- Medical Products
- Automotive Carpeting
- Closure for Clothing
- Signage Hanger
- Wiring Harness and Other Electronic Applications
- Sporting Goods
- Household Fastener
- Monofilament Zippers
- Shoe Lacings

Markets

- Carpet Industry
- Apparel
- Automotive
- Sporting Goods
- Electronics
- Housewares
- Medical
- Footwear



Tyre Cord

An experienced supplier of technical monofilaments for tyre assemblies.

High-performance nylon monofilaments engineered to meet the rigid specifications and extremely demanding performance requirements of tyre cord reinforcements.

PRODUCT NAME	DIAMETER RANGE (IN)	DIAMETER RANGE (MM)
Nylon	0.008" - 0.042"	0.20mm - 1.07mm
Polyester	0.008" - 0.042"	0.20mm - 1.07mm

Featured Benefits/Advantages

- Custom Nylon Formulations for Improved Processing and Tyre Performance
- Custom Sizes and Shapes to Fit Tyre Fabric Engineering Requirements
- Monofilament Compositions Promote Bonding to Rubber

Applications

- Pneumatic Tyres
- Run Flat Tyres
- Passenger Car Tyres
- Light Commercial Vehicle Tyres
- Heavy Commercial Vehicle Tyres
- Aircraft Tyres
- Industrial Tyres

Markets

- Tyre Industry

Trimmer Line

Our material science expertise helps you master your lawn.

It doesn't matter if you're a professional landscaper or simply a proud lawn enthusiast, you can depend on our uniquely formulated, high performance trimmer lines to save you time and money.

PRODUCT NAME	DIAMETER RANGE (IN)	DIAMETER RANGE (MM)
Ugly Twist® Trimmer Line	0.065" - 0.155"	1.65mm - 3.90mm
Ballistic® Twist Trimmer Line	0.065" - 0.155"	1.65mm - 3.90mm
Ugly Line® Trimmer Line	0.065" - 0.155"	1.65mm - 3.90mm
Ballistic® Trimmer Line	0.065" - 0.155"	1.65mm - 3.90mm
Universal Trimmer Line	0.051" - 0.105"	1.30mm - 2.70mm

Ugly Twist® and Ballistic® Twist Trimmer Line

Ugly Twist® and Ballistic® Twist are commercial grade bi-component trimmer lines designed for heavy-duty professional use. Known to outperform other lines on the market and delivering up to 15% longer runtime for cordless trimmers, their unique aerodynamic twist design reduces line resistance and vibration, using less battery energy and providing a cleaner, more level cut. Available in a variety of diameters and lengths, these products are compatible with all trimmer brands.

Ugly Line® and Ballistic® Trimmer Line

Ugly Line® and Ballistic® Trimmer Line by Shakespeare® are both heavy duty trimmer lines scientifically engineered to be more durable and last longer than residential trimmer line. Impact modifiers are embedded within the nylon to keep your line from breaking away when trimming against obstacles. Available in a variety of diameters and lengths, these products are compatible with all trimmer brands.

Universal Trimmer Line

Our Universal Trimmer Line is made of high-quality nylon resin to provide long trimmer line life and is scientifically engineered to be more durable and outperform other residential grade lines. A multi-sided "gear" shape results in great cutting performance to help keep your lawn looking its best. Available in a variety of diameters and lengths, these products are compatible with all trimmer brands.

Suspension Seating

Single and bi-component monofilaments for seating applications.

Single and bi-component monofilaments including polyester, co-polyester elastomers, and other thermoplastic elastomers for various seating applications.

PRODUCT NAME	DIAMETER RANGE (IN)	DIAMETER RANGE (MM)
Elastomer	.010" - .023	0.25mm - 0.58mm

Featured Benefits/Advantages

- Bi-component with Lower Melt Adhesive Sheath
- Heat Stabilised
- UV Stabilised
- Colourants
- Reduced Drag Modification

Applications

- Suspension Seating
- Decorative Wall or Panel Covering
- Reinforcing Scrim Fabric

Markets

- Furniture Industry
- Commercial Wall Coverings
- Sporting Goods

Sewing Thread

Shakespeare® monofilament sewing thread has been the gold standard for over 50 years.

The world's premier monofilament sewing thread known for unmatched strength and softness is suitable for a variety of apparel, home furnishing, outdoor, and other sewing applications.

PRODUCT NAME	DIAMETER RANGE (IN)	DIAMETER RANGE (MM)
Nylon	.003" - .012"	0.08mm - 0.30mm
Polyester	.003" - .012"	0.08mm - 0.30mm

Featured Benefits/Advantages

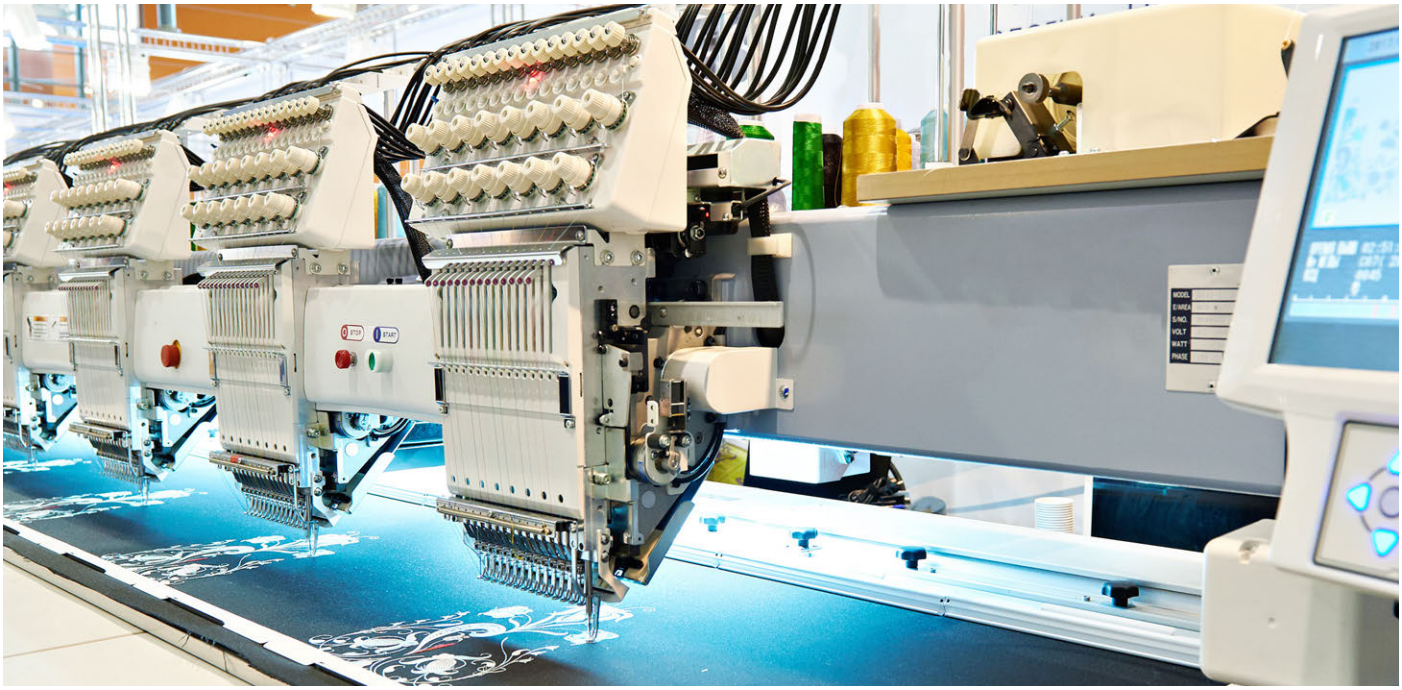
- Soft and High Strength Grades
- Thread Spools: 1.0 & 1.5 lb
- Spools Available with Canister Tops
- Prewound Bobbins (L, G, A, & M styles)

Applications

- Apparel
- Bedspreads
- Blankets
- Caps and Hats
- Comforters, Sleeping Bags
- Curtains and Draperies
- Furniture Upholstering
- Handbags and Other Accessories
- Pillowmakers
- Stuffed Toys

Markets

- Apparel
- Bedding
- Home Furnishings
- Furniture Industry
- Curtain/Drapery Mfrs.
- Accessories
- Toy Industry



Miscellaneous Industrial Applications

Monofilament products tailored for unique applications.

Monofilaments designed with specific technical, physical, and chemical features for demanding applications.

PRODUCT NAME	DIAMETER RANGE (IN)	DIAMETER RANGE (MM)
Nylon	.003" - .180"	0.08mm - 4.60mm
Polyester	.003" - .087"	0.08mm - 2.20mm
Polypropylene	.006" - .038"	0.15mm - 0.97mm
PPS	.008" - .035"	0.15mm - 0.89mm

Featured Benefits/Advantages

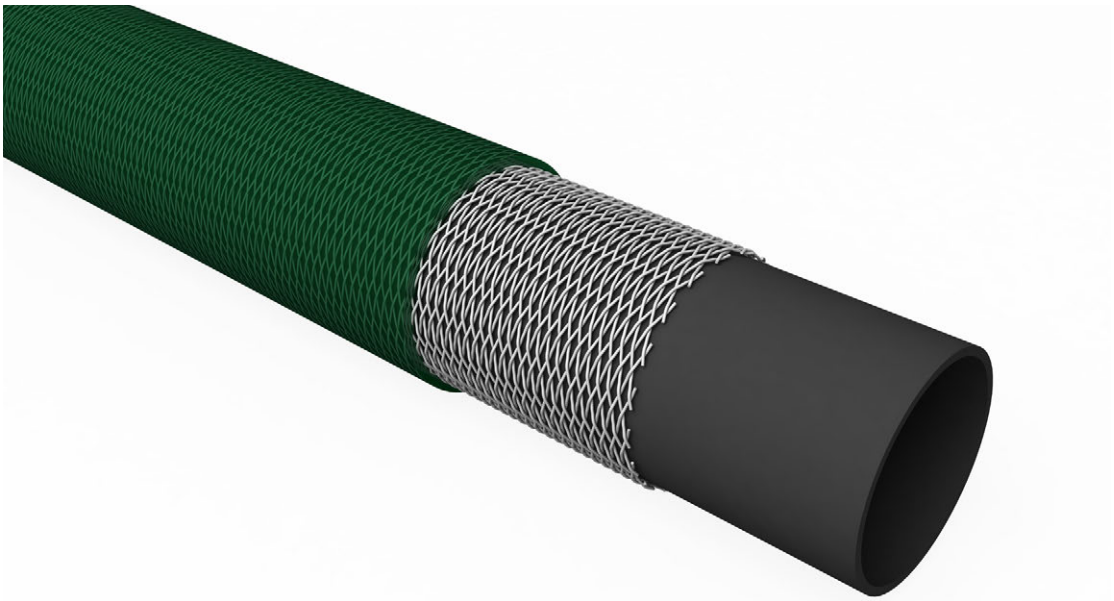
- High Modulus for Load Bearing
- High Tenacity
- High Impact Strength
- High Durability

Applications

- Hose Reinforcement
- Spacer Fabrics
- Fabrics for Wall and Panel Coverings
- Pull Strings
- Shock Cord
- Braided Electrical Harness
- Fish Tape

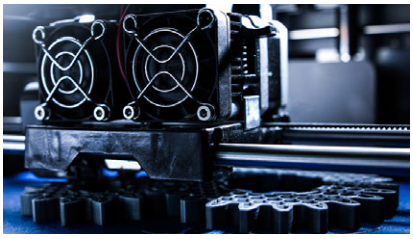
Markets

- Automotive
- Aircraft Industry
- Mining
- Commercial Wall Coverings
- Military
- Toy Industry
- Construction



Filaments for Additive Manufacturing

Highly engineered filaments extruded with precision and packaged to meet the highest standards.



Our experienced development team will work with you to understand the specific needs of your project and customise a solution for a new application or to enhance an existing one.

Handling Recommendations for all Monofilament Fibres

Warp Yarns

- Do not exceed the yield point of the monofilament while warping.
  This can result in tension bands in the finished fabric.
- A general guideline for maximum handling tension is 0.20 grammes per decitex.
- The filament path from the spool to the warping device should be as straight as possible.
  Minimise the number of contact points and guides in the yarn path.
  Each point can multiply the yarn tension by 1.5 to 2.5 times.
- All monofilament contact points from the spool to the warping device should rotate.
  Stationary contact points can cause abrasion.
- Tensioning devices must not have cuts, grooves, or rough spots which cause abrasion.

Weft Yarns

- A general guideline for handling tension is 0.20 grammes per decitex maximum, prior to inserting the weft into the fabric.
- All monofilament contact points from the spool to the insertion point should rotate to prevent abrasion of the monofilament.
- Tensioning devices must not have cuts, grooves, or rough spots which cause abrasion.

Conditioning of Nylon Monofilaments

Nylon monofilaments will absorb varying amounts of moisture, depending on the polymer type and humidity present in the surrounding atmosphere. More information is provided on page 35.

The conditioning effect of nylon must be considered in the weaving of monofilament.

For example, to reduce the potential for filling bands, pirns of nylon monofilament should come to equilibrium with the surrounding atmosphere before being woven. A general guideline would be 48 hours of conditioning time.

Filament properties provided are from typical test data. Laboratory conditions and test methods can have significant effects on values obtained when testing nylon monofilaments.

Shakespeare® will work with customers to satisfy their specific needs.

Conversion Factors

DECITEX

DECITEX = weight in grammes of 10,000 metres of yarn.

TEX

TEX = weight in grammes of 1,000 metres of yarn.

DENIER

DENIER = weight in grammes of 9,000 metres of yarn.

For round monofilaments the denier may be calculated by the formula:

- Denier = d^2K

Where d is the diameter expressed in mils or thousandths of an inch

K is a constant for a particular material

- Nylon 6 and 6,6 K=5.2
- Nylon 610 K=4.92
- Polyester K=6.3
- PEEK K=5.9
- HPA-40 K=6.13
- HPA-80 K=6.12
- HPA-14, HPA-500 K=6.19
- Polypropylene K=4.1

Example: 0.0055" Nylon 6 Denier= (5.5)2 x 5.2 = 157.3

Size Conversion

mils x 0.0254 = mm

mm / 0.0254 = mils

inches x 25.4 = mm

mm / 25.4 = inches

CONDUCTIVE FIBRES

Our anti-static fibres have superior conductivity, strength, and performance thanks to our proprietary manufacturing process. Both our nylon and polyester products are well known globally for their reliability in a wide range of demanding applications, and our carbon suffused nylon technology has been a proven approach for durable, conductive nylon fibres for more than 45 years.

In the commercial and Industrial workplace, static electricity can cause a wide range of problems. Explosions can occur in powder atmospheres, copiers and computer terminals can malfunction and sensitive integrated circuits can be destroyed. To avoid these problems, Shakespeare® offers the RESISTAT and SANSTAT range. Shakespeare®'s fibres will provide a solution to your static problems.

Markets

- Performance Apparel
- Industrial
- Medical
- Paper & Packaging

Applications

- Protective ESD Garments
- Cleanroom and Medical Fabrics
- Industrial Workwear
- Specialty ESD Brushes
- Filtration and Forming Belts
- ESD Carpeting Fibres

Nylon Monofilament

NYLON MONOFILAMENTS (FINE DENIER)						
PRODUCT: F902	**R022**	**J022**	**F044**	**X055**	**R080**	**A013**
Material	PA 6	PA 6,6	PA 6	PA 6,6	PA 6,6	PA 6,6
Colour	Black	Black	Black	Black	Black	Black
Denier	22	22	44	55	84	130
Decitex	24	24	49	61	92	144
Tenacity (grams /denier)	5.0	5.0	4.0	5.0	5.0	5.0
Elongation at Break	41%	41%	55%	30%	40%	34%
Resistivity Average (ohms /cm)	4.0×10^5	2.1×10^5	1.5×10^5	1.0×10^5	5.0×10^4	3.0×10^4
Product Yield (yards /lb)	202,931	202,931	101,466	81,171	53,148	34,343
Product Yield (metres /kg)	409,091	409,091	204,546	163,479	107,040	69,231
Melting Point	220 °C	254 °C	220 °C	254 °C	254 °C	254 °C
Packaging Type	Tube	Tube	Tube	Tube	Tube	Tube
Average weight per tube lbs / (kgs)	2.2 / (1.0)	2.2 / (1.0)	2.2 / (0.9)	2.0 / (0.9)	2.0 / (0.9)	2.0 / (0.9)
Average Carton	17 tubes	20 tubes	17 tubes	17 tubes	16 tubes	16 tubes

*Custom sizes can be developed subject to MOQ.

NYLON MONOFILAMENTS (HEAVY DENIER)							
PRODUCT: CN225	**0.21**	**0.28**	**0.36**	**0.41**	**0.52**	**0.64**	**0.76**
Material	PA 6,6	PA 6,6	PA 6,6	PA 6,6	PA 6,6	PA 6,6	PA 6,6
Colour	Black	Black	Black	Black	Black	Black	Black
Diameter (mm)	0.21	0.28	0.36	0.41	0.52	0.64	0.76
Denier	366	626	1220	1347	2129	3323	4949
Decitex	407	696	1356	1497	2366	3692	5499
Breaking Load (kgs)	1.8	3.8	5.0	6.5	9.0	14.1	19.8
Resistivity Average (ohms /cm)	9.0×10^3	6.0×10^3	4.0×10^3	4.0×10^3	3.0×10^3	2.5×10^3	1.8×10^3
Elongation at Break	38%	34%	32%	30%	30%	29%	30%
Shrinkage at 175 °C for 10 mins	4%	4%	5%	5%	5%	5%	4%
Product Yield (yards /lb)	10,978	6,418	3,293	2,983	1,887	1,209	812
Product Yield (metres /kg)	22,131	12,939	6,639	6,013	3,805	2,438	1,637
Packaging Type	Tube	Tube	Tube	Tube	Tube	Tube	Tube

*Custom sizes can be developed subject to MOQ.

ALL OF THE ABOVE RESISTAT FIBRES HAVE THE FOLLOWING CHEMICAL RESISTANCE PROPERTIES	
Cold Mineral Acids	Good
Hot Mineral Acids	Poor
Concentrated Mineral Acids	Poor
Alkalis	Good
Solvents	Good (except Phenolic)
Formic Acid	Dissolves
Water (Hydrolosis)	Good

Nylon Multifilament and Staple

NYLON MULTIFILAMENTS				
PRODUCT	**F9216**	**F9416**	**F9222**	**F9422**
Material	PA 6,6	PA 6,6	PA 6	PA 6
Colour	Black	Black	Black	Black
Construction	40-Filament Tow	Multifilament	40-Filament Tow	Multifilament
Filament Count	40	40	40	40
Denier per filament	16	16	22	22
Denier Total	670	735	915	915
Decitex Total	744	816	1015	1015
Tenacity (grams /denier)	4.0	3.8	4.0	4.0
Elongation at Break	20%	25%	35%	35%
Twist	---	2.5 TPI	---	2.5 TPI
Twist Direction	---	Z	---	Z
Resistivity Average (ohms /cm)	4.0×10^3	4.0×10^3	5.0×10^3	5.0×10^3
Product Yield (metres /kg)	13,419	14,500	9,837	9,827
Melting Point	254 °C	254 °C	220 °C	220 °C
Packaging Type	Tube	Tube	Tube	Tube
Average weight per tube (kg)	4.5	1.25	4.5	1.25
Average tubes per carton	10 tubes	50 tubes	8 tubes	50 tubes

NYLON STAPLE FIBRES		
PRODUCT	**F9116**	**F9122**
Material	PA 66	PA 6
Colour	Black	Black
Construction	Staple	Staple
Denier per filament	16	22
Decitex per filament	18	24
Tenacity (grams /denier)	4.0	4.0
Elongation at Break	20%	35%
Standard Cut Size (mm)	63 & 100	100
Crimp	---	10 per inch
Resistivity Average (ohms /cm)	4.0×10^3	3.0×10^5
Product Yield (metres /kg)	13,419	14,500
Melting Point	254 °C	254 °C
Carton: average weight (kgs)	20	25
Bale: average weight (kgs)	250 - 300	250

* Custom lengths available subject to MOQ.

Twisted Constructions

TWISTED YARNS: (NYLON RESISTAT TWISTED WITH PA6 OR PA6,6 SUPPORTING YARNS)		
PRODUCT	**DESCRIPTION**	**HEATSET**
F9301	1 end R022 + 1 end 22 dtex PA6	No
F9302	1 end R022 + 2 ends 22 dtex PA6	No
F9303	1 end R022 + 2 ends 33 dtex PA66	Yes
F9304	1 end R022 + 1 end 78 dtex PA66	Yes
F9306	1 end R022 + 1 end 78 dtex PA66 + 1 end 22 dtex PA6	No
F9307	2 ends R022 + 1 end 470 dtex PA66	No
F9308	1 end R022 + 1 end 78 dtex PA66 2 ply	Yes
F9356	1 end R022 + 1 end 78 dtex PA66 + 1 end 22 dtex PA6 (black)	Yes

TWISTED YARNS: (NYLON RESISTAT TWISTED WITH POLYESTER (PET) SUPPORTING YARNS)		
PRODUCT	**DESCRIPTION**	**HEATSET**
F9601	1 end R022 + 1 end 76 dtex PET	Yes
F9602	1 end R022 + 2 ends 50 dtex PET	Yes
F9603	1 end R022 + 2 ends 76 dtex PET	Yes
F9604	1 end R022 + 2 ends 110 dtex PET	No
F9605	1 end J022 + 1 end 76 dtex PET	Yes
F9607	1 end R022 + 1 end 22 dtex PET	Yes
F9608	2 ends J022 + 1 end 330 dtex PET	No
F9612	1 end J022 + 1 end 76 dtex PET 2 ply	Yes

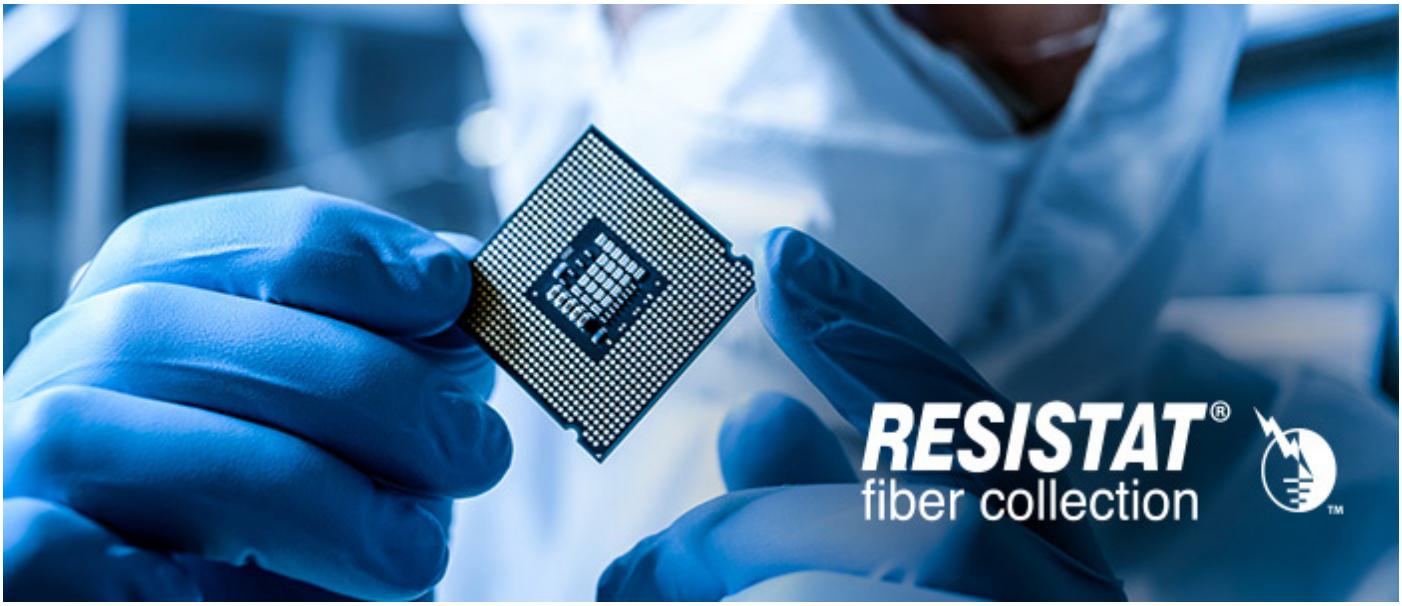
* This is a selection of our most popular standard twist constructions.
We can bespoke twist to your exact requirements subject to MOQ.

Polyester Multifilament and Staple

POLYESTER FILAMENTS				
PRODUCT	**P6204**	**P6203**	**P6203**	**P6204**
Denier / Filament	25/6	40/12	75/24	100/24
Colour	Black	Black	Black	Black
Tenacity (grams /denier)	3.0	3.0	3.0	2.9
Elongation at Break	60%	65%	65%	86%
Resistivity Average (ohms /cm)	7×10^6	5.0×10^6	4.0×10^6	1.5×10^6
Product Yield (yards /lb)	178,580	111,612	59,526	44,644
Product Yield (metres /kg)	360,000	225,000	120,000	90,000
Melting Point - Core	255 °C	255 °C	255 °C	255 °C
Melting Point - Sheath	230 °C	230 °C	230 °C	230 °C
Shrinkage - Boiling Water	7%	8%	8%	8%
Packaging Type	Tube	Tube	Tube	Tube
Average weight per tube: lbs / (kgs)	2.2 / (1.0)	2.2 / (1.0)	2.0 / (0.9)	3.0 / (1.4)
Average Carton	20 tubes	20 tubes	20 tubes	16 tubes

POLYESTER STAPLE FIBRES		
PRODUCT	**P6103**	**P6115**
Denier / Filament	3	15
Colour	Black	Black
Tenacity (grams /denier)	2.0	1.0
Elongation at Break	72%	90%
Resistivity Average (ohms /cm)	1.0×10^6	4.0×10^4
Cut Lengths (crimp available)	38, 50, 75mm	63, 100mm
Melting Point - Core	255 °C	255 °C
Melting Point - Sheath	230 °C	230 °C
Packaging Type	Carton / Bale	Carton / Bale
Average weight per carton	25 kgs	26 kgs
Average weight per bale	250 - 300 kgs	251 - 300 kgs

* Custom lengths available subject to MOQ.



ENGINEERED NYLONS

Shakespeare® offers speciality polyamides custom developed for a broad range of applications, from automotive parts to packaging and extruded filaments.

Ingenuity, flexibility, and creativity drive our well-known success in engineered nylon solutions. Our reliable, uninterrupted supply of raw materials means you can count on us to meet deadlines with the excellent quality our customers have come to expect from Shakespeare®. We develop products with advanced properties that stay one step ahead of the ever-changing requirements demanded by the numerous end-use applications we supply.

Markets

- Automotive
- Consumer Goods
- Flexible and Ridged Packaging
- Brush Filaments
- Monofilaments for Processing Belts
- Performance Textiles

Applications

- Injection & Blow Molding
- Bonding & Adhesion
- Compounding Carriers
- Film, Filament & Profile Extrusion

ASTRADYN™

ASTRADYN™ premium clear amorphous nylon is formulated for high-performance applications.

NOVADYN™

NOVADYN™ transparent amorphous nylon provides higher glass transition temperatures and excellent barrier protection.

VALLADYN™

VALLADYN™ long-chain nylon is formulated for the most demanding applications including automotive parts requiring low moisture absorption and excellent dimensional stability. It offers superior chemical resistance as well as bio-based grade alternatives.

CHROMODYN™

CHROMODYN™ nylon is an optimal carrier of colors and additives. It is also alcohol soluble and enhances the abrasion properties in thread bonding applications.

OTHERS

A range of PA6, 6/66 and 6/69 resins with enhanced processability.

ASTRADYN™

ASTRADYN™ premium clear amorphous nylon is formulated for high-performance applications.

ASTRADYN™ premium nylon is optically clear and formulated to meet the most demanding applications. This family of nylons offer a clear material solution with superior durability and exceptional chemical resistance properties.

PRODUCT NAME	ATTRIBUTES
SVPx-130	High Viscosity Proprietary Nylon

Featured Benefits/Advantages

- Shakespeare® SVPx-130 is Both Strong and Ductile Optically Clear
  (3mm Specimen: Total Transmittance > 91%)
- Superior Surface Tension for Paintability
- Excellent Chemical Resistance to Ethanol (Alcohols)

Applications

- Injection Molding
- Blow Molding
- Extrusion
- Coating

Markets

- Medical
- Performance Apparel
- Consumer

PRODUCT		SVPX-130
Physical Properties	Density g/cm3	1.04
	Melt Flow Rate g/10min	3 to 6
Thermal Properties	Glass Transition Temp °C	113
Mechanical Properties	Tensile Modulus MPa	1846
	Tensile Stress @ Yield MPa	67
	Tensile Strain @ Yield %	6.7
	Tensile Stress @ Break MPa	62
	Tensile Strain @ Break %	>250
	Flexural Modulus MPa	1754
	Flexural Stress MPa	99
	Izod Notched Impact Strength (23 °C) J/m	50 to 100

NOVADYN™

NOVADYN™ transparent amorphous nylon provides higher glass transition temperatures and excellent barrier protection.

NOVADYN™ nylon is designed with superior barrier properties and can be tailored with specific molecular weight distribution and glass transition temperatures to meet specific needs for processing and end use performance. The properties of Shakespeare® amorphous nylons is marginally affected by temperature until the glass transition temperature is reached. It is optically transparent and has higher glass transition temperatures than semi-crystalline nylons.

PRODUCT NAME	ATTRIBUTES
SVPx-129	High Viscosity DT/DI
AR190SI	Low Viscosity N6i/6t
CR144HI	Medium Viscosity N6i/6t
CR149HI	High Viscosity N6i/6t
CR150HM	Healthcare High Viscosity N6i/6t

Featured Benefits/Advantages

- High Glass Transition Temps
- Highly Transparent and High Surface Gloss
- Very Good Chemical Resistance
- Very Good Abrasion Resistance
- Excellent Resistance to Heat Distortion
- Low Transmission of UV-radiation
- Improved Gas and Aroma Barrier at High Temperature and Humidity

Applications

- Functional Additives for Compounding
- Film and Profile Extrusion
- Injection Molding

Markets

- Automotive
- Consumer Goods
- Packaging
- Food and Beverage
- Medical
- Performance Apparel
- Consumer

PRODUCT		SVPX-129 DT/DI	AR190SI	CR144HI	CR149HI	CR150HM
Physical Properties	Density g/cm3	1.18	1.18	1.18	1.18	1.18
	Water Absorption (24hr Immersion) %	0.97	0.52	0.52	0.52	0.52
	Relative Viscosity (96% Sulfuric Acid)	na	na	~1.44	~1.49	~1.49
Thermal Properties	Melt Flow Rate g/10min	17.0	~25.0	~8.5	~5.0	~5.0
	Mold Shrinkage Flow direction %	na	0.68	0.68	0.68	0.68
	Glass Transition Temp °C	145	125	128	129	129
	Heat Deflection Temp (0.45MPa) °C	134	na	113	113	113
Mechanical Properties	Tensile Modulus MPa	na	1532	2860	2340 / 2126	2340 / 2126
	Tensile Modulus GPa	3.0 / 3.5	na	na	na	
	Tensile Strength @ Yield MPa	na	78	101	98 / 94	98 / 94
	Tensile Strength MPa	102 / 111	na	na	na	
	Tensile Strain @ Yield %	na	5.4	7.2	6.8 / 7.7	6.8 / 7.7
	Tensile Stress @ Break MPa	na	79	68	90 / 79	90 / 79
	Tensile Strain @ Break %	na	5.7	>150	210 / 223	>150
	Elongation @ Yield %	7.0 / 6.3	na	na	na	
	Elongation @ Break %	8.3 / 7.4	na	na	na	
	Flexural Modulus GPa	2.9 / 3.2	na	na	na	
	Flexural Strength MPa	128 / 143	na	na	na	
	Flexural Modulus MPa			3040	2733 / 2700	2733 / 2700
	Flexural Stress MPa			130	114 / 108	114 / 108
	Izod Notched Impact Strength (23 °C) J/m	na	na	79	na	79
	Izod Notched Impact Strength (23 °C) kJ/m	6.7 / 4.3	na		na	

VALLADYN™

VALLADYN™ long-chain nylon is formulated for the most demanding applications including automotive parts requiring low moisture absorption and excellent dimensional stability. It offers superior chemical resistance as well as bio-based grade alternatives.

VALLADYN™ PA612 offers excellent melt stability, barrier properties, dimensional stability, low moisture absorption, and chemical resistance. We offer customised variations of Shakespeare® PA612 products to suit specific processing needs and end use applications. Shakespeare® PA610 is approximately 60% bio based as it is derived from castor oil. While this polyamide is commonly used in production of monofilament bristles due to improved bend recovery in wet environments, the combination of stiffness, abrasion resistance, low moisture absorption, chemical resistance, and good dimensional stability makes Shakespeare® PA610 suitable for a wide array of precision extruded and molded applications.

PRODUCT NAME	ATTRIBUTES
HG195SC	Ultra Low Viscosity N612
HG230SC	Low Viscosity N612
HG264SI	Medium Viscosity N612
HG31SI	High Viscosity N612
HW29TL	Low Viscosity N610
HW69SI	Medium Viscosity N610
HW138SI	High Viscosity N610

Featured Benefits/Advantages

- Superior Chemical Resistance
- Low Moisture Regain
- Great Dimensional and Melt Stability
- Excellent Abrasion Resistance
- Good Electrical Insulator

Applications

- Injection Molding
- Compounding
- Extrusion

Markets

- Automotive
- Consumer
- Electronics
- Medical

PRODUCT		HG195SC	HG230SC	HG264SI	HG31SI	HW29TL	HW69SI	HW138SI
Physical Properties	Density g/cm3	1.04	1.04	1.04	1.04	1.07	1.08	1.08
	Water Absorption (24hr Immersion) %	0.40	0.33	0.33	0.36	0.40	0.40	0.40
	Relative Viscosity (96% Sulfuric Acid)	~1.53	~1.61	~1.75	~1.9	~33	~72	~138
	Melt Flow Rate g/10min	na	~17.0	na	na	na	na	na
Thermal Properties	Mold Shrinkage Flow Direction %	1.13	1.30	0.97	1.70	1.33	1.23	1.18
	Melting Temp °C	217	217	215	217	223	221	221
	Heat Deflection Temp (0.46MPa) °C	na	162	155	149	126	126	na
Mechanical Properties	Tensile Modulus MPa	2280 / 1850	1911 / 1676	1760 / 1360	1686 / 1626	2120 / 1430	2500 / 1300	1740 / 970
	Tensile Strength @ Yield MPa	66 / 64	67.1 / 63.0	64 / 61	65 / 58	66 / 63	66 / 60	54 / 51
	Tensile Strain @ Yield %	4.8 / 11.0	6.6 / 13.7	4.8 / 6.5	6.0 / 13.4	4.2 / 6.3	3.5 / 6.2	4.1 / 6.0
	Tensile Stress @ Break MPa	42 / 42	44.4 / 43.0	45 / 44	47 / 46	46 / 45	51 / 67	41 / 42
	Tensile Strain @ Break %	50 / 50	53.0 / 79.0	170 / 210	253 / 322	110 / 140	250 / 310	100 / 230
	Flexural Modulus MPa	na	2093 / 1813	* / 1870	1995 / 1675	na	na	na
	Flexural Stress MPa	na	78 / 69	* / 71	75 / 65	na	* / 23	na
	Izod Notched Impact Strength (-30 °C) J/m	na	48	* / 45	na	na	* / 52	* / 77

CHROMODYN™

CHROMODYN™ nylon is an optimal carrier of colours and additives. It is also alcohol soluble and enhance the abrasion properties in thread bonding applications.

CHROMODYN™ PA terpolymers offer unique solubility and coating capabilities. Due to their superior loading capability and dispersion qualities, they are outstanding carriers of colour pigments and additives (organic and inorganic).

PRODUCT NAME	ATTRIBUTES
TT25TI	Ultra Low Viscosity Nylon Terpolymer
TT52SI	Low Viscosity Nylon Terpolymer
SVP651	Low Viscosity Nylon Terpolymer
TT65SI	Medium Viscosity Nylon Terpolymer
TT88SI	High Viscosity Nylon Terpolymer

Featured Benefits/Advantages

- Alcohol Soluble for Solution Processing
- Superior Loading and Dispersion Capabilities
- Improved Adhesion to Glass and Metal Surfaces

Applications

- Carrier for Color Masterbatches
- Coating and Bonding

Markets

- Colourants
- Adhesion
- Coatings

PRODUCT	SVP 651	TT25TI	TT52SI	TT65SI	TT88SI
RV Ranking	Low	Very Low	Low	Medium	High
Relative Viscosity	54	25	52	65	73
Melt Point °C	137	142	152	143	151
Alcohol Soluble	Yes	Yes	No	Yes	Yes
Comment	Linear Grades with unique solubility characteristics & physical properties. Compatible with other nylons and ideal nylon carrier resins.	Linear Grades with unique solubility characteristics & physical properties. Compatible with other nylons and ideal nylon carrier resins.	Linear Grades with unique solubility characteristics & physical properties. Compatible with other nylons and ideal nylon carrier resins.	Linear Grades with unique solubility characteristics & physical properties. Compatible with other nylons and ideal nylon carrier resins.	Linear Grades with unique solubility characteristics & physical properties. Compatible with other nylons and ideal nylon carrier resins.
Distinguishing Characteristics	Broad acceptance for solution coating / bonding of thread. Less sensitive to variances in process temperatures.	High Flow Polymer. Supple Thread Coating. Suitable as impact modifier. For increased softness and flexibility.	Versatile carrier for pigments and additives. High loadings possible. Polymer additive.	Balanced threads coating polymer. For applications requiring a lower melting point.	Thread coating polymer with highest bond strength. Highest RV terpolymer. For applications requiring a lower melting point.
Applications	Pigment Carrier; Speciality Adhesives; Thread Bonding: Polymer Additives	Pigment Carrier; Speciality Adhesives; Thread Bonding: Polymer Additives	Pigment Carrier; Speciality Adhesives; Thread Bonding: Polymer Additives	Pigment Carrier; Speciality Adhesives; Thread Bonding: Polymer Additives	Pigment Carrier; Speciality Adhesives; Thread Bonding: Polymer Additives

OTHERS

PA6 occupies a prominent place in the engineering thermoplastics family.

Shakespeare® PA6 resins are plasticised, which enhances the processability of the polymer while being specifically suited for applications requiring excellent abrasion resistance, surface appearance, pigmentability, tensile strength, and elongation properties.

PRODUCT NAME	ATTRIBUTES
HZ73SI	Medium Viscosity N6
HZ95SI	High Viscosity N6
CU95SI	High Viscosity N6/66 Copolymer
CV140SI	High Viscosity N6/69 Copolymer

Featured Benefits/Advantages

- Formulated for Specific Melt Behavior
- Excellent Abrasion Properties
- Impact Modifier
- Great Mechanical (Tensile and Elongation) Properties
- Excellent Surface Appearance and Pigmentation

Applications

- Injection Molding
- Functional Additive for Compounding
- Extrusion

Markets

- Consumer
- Performance
- Monofilament
- Carpet

PRODUCT		HZ73SI	HZ95SI	CU95SI	CV140SI
Physical Properties	Density g/cm3	1.11	1.11	1.11	1.12
	Water Absorption (24hr Immersion) %	0.53	0.53	0.74	n/a
	Relative Viscosity (96% Formic Acid)	~73	~95	~100	~140
Thermal Properties	Mold Shrinkage Flow Direction %	1.5	1.5	0.74	0.87
	Glass Transition Temp °C	120	120	n/a	n/a
	Melting Temp °C	213	213	185	193
Mechanical Properties	Tensile Modulus MPa (dry / cond.)	1868 / 1640	1868 / 1640	n/a / 650	n/a / 520
	Tensile Stress @ Break MPa	54 / 53	54 / 53	n/a / 54	n/a / 60
	Tensile Strain @ Break %	n/a	n/a	230	60
	Tensile Stress @ Yield MPa	n/a	n/a	32	32
	Tensile Strain @ Yield %	n/a	n/a	5.5	15.5
	Flexural Modulus MPa	n/a	n/a	620	620
	Flexural Stress MPa	n/a	n/a	23	25
	Izod Notched Impact Strength J/m	135 / 135 (23 °C)	135 / 135 (23 °C)	n/a / >900 (23 °C)	n/a / 43 (-30 °C)
	Gardner Impact (Energy to Failure) (23 °C) J	n/a	n/a	>36	n/a

CHARTS AND CONVERSION TABLES

Thermoplastic Monofilament Fibre Chart

Polymers		Polyolefin			PVDC	PVDF	Polyamide		Polyamide		Polyamide		Polyester		Fluoropolymers		PPS	PEEK
TYPE		LDPE	HDPE	PP	(Saran)	KYNAR®	12	11	6/12	6/10	6	6/6	PBT	PET	FEP	PFA	PPS	PEEK
Melt Temperature	°C	115	130	168	170	170	175	185	206	208	215	254	228	257	290	310	285	334
	°F	240	265	334	338	338	346	365	403	406	420	490	442	495	554	590	545	633
Density	g/cc	0.92	0.95	0.91	1.7	1.78	1.02	1.04	1.07	1.08	1.14	1.14	1.3	1.38	2.15	2.1	1.37	1.3
Max. Cont. Use Temperature (5)	°C	75	80	85	77	150	80	80	80	85	85	85	130	132	204	232	190	240
	°F	167	176	185	171	302	176	176	176	185	185	185	266	270	400	450	374	464
Max. Temp. Short Term (4)	°C	NA	NA	120	NA	NA	135	140	157	173	185	235	185	235	NA	NA	200	260
	°F			248			275	285	315	345	365	465	365	455			392	500
Water Absorp. 24 Hours (23 °C/65%RH)	%	0.01-0.03	0.01-0.03	0.01-0.03	0.1	0.04-0.06	0.25	0.3	0.4	0.4	2.7	2.5	0.1-0.2	0.1-0.2	0.1	0.03	0.02	0.5
Saturation	%	0.03	0.03	0.03	0.1	0.06	1.9	2.5	3	3.2	8.5-10	8.5	0.2	0.2	0.1	0.1	0.02	0.5
Tenacity (Ambient Cond)	gpd	4.0-7.0	4.0-7.0	4.0-7.0	2.0-4.0	1.0-3.5	4.0-7.5	4.0-7.5	4.0-7.5	4.0-7.5	4.0-7.5	4.0-7.5	4.7-7.5	4.7-7.5	1.0-2.0	1.0-2.0	2.5-3.5	3.0-4.0
Support Combust		Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Biological Resist.		Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Alkali Resistance		Excellent	Excellent	Excellent	Good	Excellent	Good	Good	Good	Good	Good	Good	Poor	Poor	Excellent	Excellent	Excellent	Excellent
Resistance to Mineral Acids		Excellent	Excellent	Excellent	Excellent	Excellent	Fair	Fair	Poor	Poor	Poor	Poor	Good	Good	Excellent	Excellent	Excellent	Excellent
Resistance to Organic Acids		Excellent	Excellent	Excellent	Excellent	Excellent	Fair	Fair	Poor	Poor	Poor	Poor	Fair	Fair	Excellent	Excellent	Excellent	Excellent
Resistance to Oxidizing Agent		Good	Good	Good	Excellent	Excellent	Fair	Fair	Fair	Fair	Fair	Fair	Good	Good	Excellent	Excellent	Excellent	Excellent
Effects of Organic Solvent		Fair (1)	Fair (1)	Fair (1)	Excellent	Excellent	Good	Good	Good	Good	Good	Good	Good	Good	Excellent	Excellent	Excellent (2)	Excellent (3)
U/V		Poor (6)	Poor (6))	Poor (6)	Good	Excellent	Poor (6)	Poor (6)	Poor (6)	Poor (6)	Poor (6)	Poor (6)	Good	Good	Excellent	Excellent	Poor	Good

(1.) Except chlorinated hydrocarbon.

(2.) PPS is affected by acme oxidizing acids, some amines and halognes. It is resistant to all solvent below 400 °F.

(3.) PEEK will dissolve in concentrated H_2SO_4 (Sulfuric Acid). It will be degraded by concentrated HNO_3 (Nitric Acid).

(4.) Maximum tempearture with 30 minute exposure having less than 50% loss of tensile.

(5.) Maximum temperature with 1 year exposure having less than 50% loss of tensile.

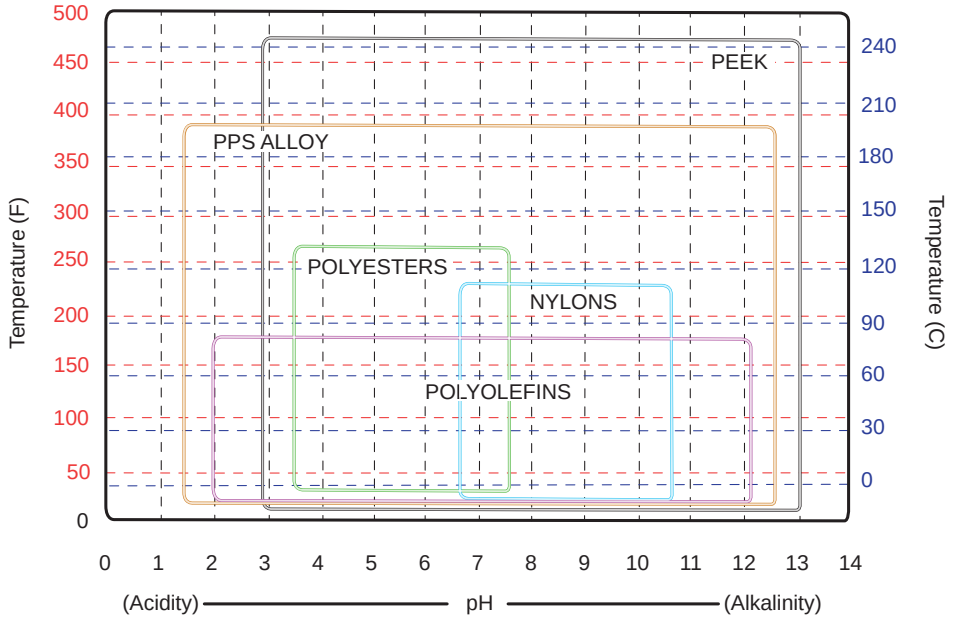
(6.) UV Resistance can be enhanced with additive. KYNAR® is a registered trademark of Pennwalt.

The information contained herein is furnished without warranty of any kind.

Employers should use this information only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use of these materials and the safety and health of employees.

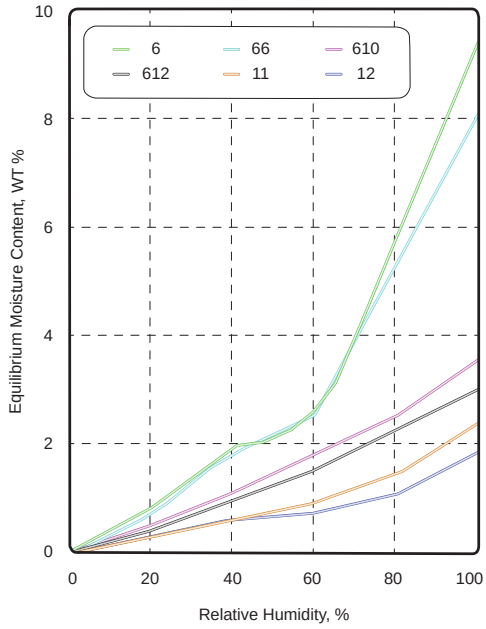
Chemical Resistance of Polymers

General operating ranges shown



Dependence of Moisture Content

on Relative Humidity for Nylons



ABSORPTION OF WATER BY NYLONS (WT% DRY BASIS)[A]			
Nylon Type	**"24hr (0.125in or 0.32cm) ASIM D-570"**	**Equilibrium with 50% R.H.**	**Saturation**
6	1.6	2.7	9.5
66	1.5	2.5	8
610	0.4	1.5	3.5
612	0.4	1.3	3
11	0.25	0.8	1.9-2.9[B]
12	0.25	0.7	1.4-2.5 ext.[B]

[A] Data from Trade Literature

[B] Varies with temperature

Chemical Resistance of Polyester (PET) and Nylon (66)

Tensile Retention (%) at Various Exposure Conditions

CONDITIONS					TENSILE RETENTION (%)	
Medium	**Conc.**	**Temp - (°C)**	**Time - (hr)**	**pH**	**Polyester**	**Nylon**
Air	---	150	1000	---	65	Degraded
Air	---	150	100	---	77	38
Air	---	175	10	---	88	21
Water	---	100	1000	---	27	76
Water	---	120	100	---	80	75
Water	---	120	1000	---	Degraded	37
HCl	1%	20	1000	2.0	97	81
HCl	10%	20	1000	1.0	86	Degraded
HCl	37%	20	100	0.0	86	Degraded
HCl	10%	70	0.1	1.0	100	91
HCl	37%	70	10	0.0	78	Degraded
HNO3	10%	20	10	1.0	100	91
HNO3	70%	20	0.1	0.0	78	Degraded
HNO3	1%	100	10	2.0	100	31
NaOH	1%	20	10	13.0	100	100
NaOH	10%	20	10	14.0	100	100
NaOH	1%	100	1	13.0	100	98
NaOH	1%	100	10	13.0	83	91
NaOH	10%	100	0.1	14.0	100	98
NaOH	10%	100	10	14.0	Degraded	98
NaOH	1%	100	100	13.0	29	76
H2O2	0.40%	20	10	7.0	100	90
H2O2	0.40%	70	10	7.0	100	5
H2O2	0.20%	20	10	11.0	77	96
H2O2	0.20%	70	10	11.0	98	31
H2O2	3.00%	20	10	6.0	92	97
H2O2	3.00%	70	10	10.0	100	26
NaClO	0.01%	20	10	10.0	100	100
NaClO	0.01%	70	10	10.0	100	74
NaClO	0.40%	20	10	11.0	97	95
NaClO	0.40%	70	10	11.0	100	6
NH3	28%	20	1000	11.0	Degraded	95
Phenol	5%	20	10	---	100	43

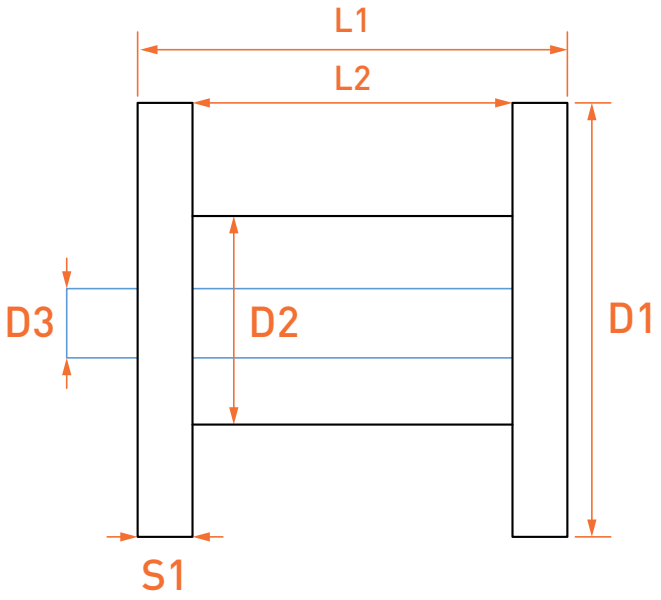
- Chemical resistance is seen to be a function of exposure time, temperature and pH.
- In general, polyester is less resistant to caustic environments (high pH) whereas nylons are more readily degraded in acid conditions (low pH).
- Nylons are degraded by exposure to chlorine (NaOCl, sodium hydrochlorite). This is especially true at low pH.
- Rate of degradation is highly sensitive to temperature as the reaction rate is doubled with every 10 °C temperature.

Size Equivalency Chart

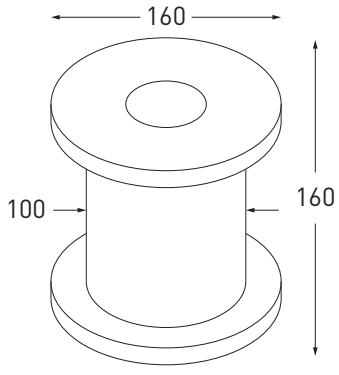
for Nylon, Polyester & HPA Monofilament

Diameter (mm)	Nylon 6 & 6,6			Nylon 6,10			Polyester PET			HPA		
	Denier	Decitex	M/kg	Denier	Decitex	M/kg	Denier	Decitex	M/kg	Denier	Decitex	M/kg
0.11	96	107	93,604	91	101	98,931	116	129	77,260			
0.12	115	128	78,349	109	121	82,808	139	155	64,669			
0.13	135	150	66,541	128	142	70,328	164	182	54,923			
0.14	157	175	57,214	149	165	60,470	191	212	47,225			
0.15	181	201	49,719	171	190	52,549	219	244	41,038			
0.16	206	229	43,606	195	217	46,088	250	278	35,992			
0.17	233	259	38,555	221	245	40,749	283	314	31,823			
0.18	262	291	34,333	248	276	36,287	318	353	28,338			
0.19	293	325	30,769	277	307	32,520	354	394	25,396			
0.20	325	361	27,732	307	341	29,310	393	437	22,890	392	436	22,940
0.21	358	398	25,123	339	377	26,553	434	482	20,737			
0.22	394	437	22,866	372	414	24,167	477	530	18,874			
0.23	431	478	20,900	407	453	22,089	522	580	17,251			
0.24	459	511	19,587	435	483	20,702	557	619	16,167			
0.25	499	555	18,021	473	525	19,047	605	672	14,874			
0.26	541	601	16,635	512	569	17,582	655	728	13,731			
0.27	584	649	15,403	553	614	16,280	708	787	12,714			
0.28	629	699	14,304	595	661	15,118	762	847	11,806			
0.29	676	751	13,317	639	710	14,075	819	910	10,992			
0.30	724	804	12,430	685	761	13,137	877	975	10,260	854	948	10,544
0.31	774	860	11,628	732	814	12,290	938	1,042	9,598			
0.32	826	917	10,902	781	868	11,522	1,000	1,111	8,998			
0.33	879	976	10,241	831	924	10,824	1,065	1,183	8,453			
0.34	934	1,037	9,639	883	982	10,187	1,131	1,257	7,956			
0.35	990	1,100	9,088	937	1,041	9,605	1,200	1,333	7,501	1,167	1,297	7,709
0.36	1,049	1,165	8,583	992	1,102	9,072	1,270	1,411	7,085			
0.37	1,108	1,232	8,119	1,049	1,165	8,581	1,343	1,492	6,702			
0.38	1,170	1,300	7,692	1,107	1,230	8,130	1,418	1,575	6,349			
0.39	1,233	1,370	7,298	1,167	1,296	7,713	1,494	1,660	6,024			
0.40	1,282	1,424	7,022	1,213	1,347	7,421	1,553	1,725	5,796	1,511	1,679	5,956
0.41	1,348	1,498	6,677	1,275	1,417	7,057	1,633	1,814	5,511			
0.42	1,416	1,573	6,357	1,339	1,488	6,719	1,715	1,906	5,247			
0.43	1,485	1,650	6,060	1,405	1,561	6,405	1,799	1,999	5,002			
0.44	1,556	1,729	5,783	1,473	1,636	6,112	1,886	2,095	4,773			
0.45	1,629	1,810	5,524	1,541	1,713	5,839	1,974	2,193	4,560	1,920	2,134	46,869
0.46	1,704	1,893	5,283	1,612	1,791	5,584	2,064	2,293	4,360			
0.47	1,780	1,977	5,057	1,684	1,871	5,345	2,156	2,396	4,174			
0.48	1,857	2,064	4,845	1,757	1,953	5,121	2,250	2,500	3,999			
0.49	1,937	2,152	4,646	1,833	2,036	4,911	2,347	2,607	3,835			
0.50	2,018	2,242	4,460	1,909	2,122	4,713	2,445	2,717	3,681	2,379	2,643	3,783
0.51	2,101	2,334	4,284	1,988	2,209	4,528	2,545	2,828	3,536			
0.52	2,185	2,428	4,118	2,068	2,297	4,353	2,648	2,942	3,399			
0.53	2,271	2,524	3,962	2,149	2,388	4,188	2,752	3,058	3,270			
0.54	2,359	2,621	3,815	2,232	2,480	4,032	2,858	3,176	3,149			
0.55	2,449	2,721	3,675	2,317	2,574	3,885	2,967	3,296	3,034	2,887	3,207	3,118
0.56	2,517	2,796	3,576	2,381	2,646	3,779	3,049	3,388	2,952			
0.57	2,609	2,899	3,449	2,469	2,743	3,646	3,161	3,512	2,847			
0.58	2,703	3,003	3,329	2,558	2,842	3,519	3,275	3,639	2,748			
0.60	2,896	3,218	3,107	2,740	3,045	3,284	3,509	3,899	2,565	3,414	3,793	2,636
0.65	3,408	3,786	2,641	3,224	3,583	2,791	4,129	4,587	2,180	4,017	4,464	2,240
0.70	3,961	4,401	2,272	3,748	4,164	2,401	4,799	5,332	1,875	4,670	5,188	1,927
0.75	4,525	5,028	1,989	4,282	4,757	2,102	5,483	6,092	1,642			
0.80	5,160	5,733	1,744	4,882	5,424	1,844	6,251	6,946	1,440			
0.85	5,801	6,445	1,551	5,489	6,098	1,640	7,028	7,809	1,281			
0.90	6,516	7,240	1,381	6,166	6,851	1,460	4,895	8,772	1,140			
0.95	7,274	8,082	1,237	6,882	7,646	1,308	8,812	9,791	1,021			
1.00	8,031	8,924	1,121	7,599	8,443	1,184	9,730	10,811	925			

Spool Dimensions



Spool Type	Flange Ø	Barrel Ø	Central Bore Ø	Width	Winding Width	Flange Thick-ness	Winding Volume
	D1 (mm)	D2 (mm)	D3 (mm)	L1 (mm)	L2 (m)	S1 (mm)	DM³
DIN 160	160	100	22	160	128	16	0.965
DIN 200	200	125	22	200	160	20	2.108
DIN 250	250	160	16 - 22	200	160	20	3.431
DIN 355	355	224	36	200	160	20	7.376
200 K45	200	112	22	200	106	47	2.842



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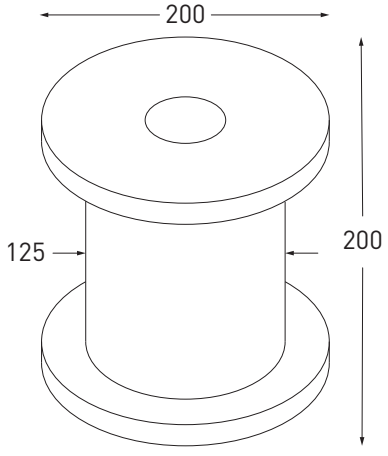

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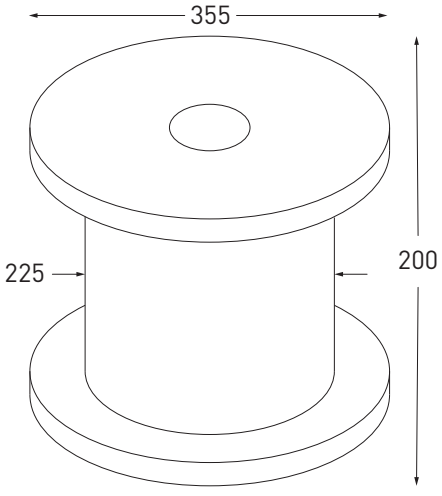

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EURO DIN 355

MONOFILAMENT PRODUCT SELECTION GUIDE

Polyester Forming Products ("MD" - machine direction "CMD" - cross machine direction)

Product	Polymer Formulation			Molecular Weight			Tensile Modulus			Tenacity		Elongation @ Break (%)	Relative Elongation (%)				Free Thermal Shrinkage (%)		Max. Thermal Shrink Force			Comments & Application
	Resin Type	Contam. Resist. Version	Chem. Stab'd for Hydr.	Low	Med	High	Low	Med	High	(gpd) (cN/tex)	(cN/tex)		3.00 gpd Load	26.5 cN/tex Load	1.75 gpd Load	15.5 cN/tex Load	200 °C	175 °C	Force (gpd)	Force (cN/tex)	Temp. (°C)	
WP102	PET				●		●			4.5	39.7	45.0	22.0		8.6		3.0	1.5	0.04	0.35	230	Lowest free shrinkage; used for weft (CMD)
WP104	PET	WP133			●		●			4.5	39.7	45.0	22.0		8.0		3.0	2.0	0.04	0.35	220	Commonly used as standard m/w PET weft yarn
WP120	PET	WP130				●	●			4.5	39.7	48.0	27.0		13.0		3.0	2.0	0.04	0.35	220	Very forgiving, deformable high m/w polyester weft (CMD) Yarn
WP167	A/R PET					●	●			4.0	35.3	55.0	32.0		18.0		4.0	2.0	0.03	0.26	220	Modified PET for increased toughness and wear resistance
WP222	PET					●		●		6.9	61.0	25.0	7.5				11.5		0.12	1.03	204	
WB002 WB008	PET				●		●			3.2	28.0	65.0	68.0		24.0			6.0	0.04	0.32	155	Shrinkage at 180 °C
PX141	PET					●	●			4.0	35.3	45.0	27.0		12.5		3.5	2.8	0.05	0.44	215	Application in industrial filtration fabrics
WP807	PET	PX235				●	●			4.5	39.7	40.0	19.0		7.5		4.5	2.0	0.06	0.53	230	Applications include top weft (CMD) in multiple layer forming fabrics
WP804	PET	PX144				●		●		5.5	48.6	30.0	10.0		4.0		5.5	4.0	0.16	1.41	217	Applications include top weft (CMD) in multiple layer forming fabrics
PX122	PET		●			●	●			4.1	36.2	37.7	20.0		10.0		6.3	3.4	0.06	0.53	216	Typically used for polyester TAD weft or CMD yarn
PX132	PET					●	●			4.5	39.7	40.0	20.0		8.0		6.5	5.0	0.07	0.62	215	Application in industrial filtration fabrics
PX111-5	PET					●		●		7.0	61.8	20.0	6.5		2.5		7.5	3.0	0.15	1.32	220	Application as MD or CMD
PX200	PET					●		●		4.6	40.6	37.0	20.0		8.0		5.5	2.5	0.08	0.71	200	Applications in forming weft and industrial filtration
WP87	PET		●			●		●		6.5	57.4	20.0	4.0		1.8		9.7	6.7	0.30	2.65	210	Medium modulus polyester TAD warp (MD) yarn
WP200	PET	WP233			●			●		6.0	53.0	24.0	5.5		3.5		14.0	10.0	0.17	1.50	190	Application as MD or top weft CMD
PX205	PET		●			●		●		6.0	53.0	19.5	4.4		2.2		11.6	8.0	0.33	2.91	215	Typically used for polyester TAD warp or MD yarn
PX325	PET				●			●		6.5	57.4	20.0	4.0		1.8		17.0	10.0	0.21	1.85	185	Very forgiving, top warp (MD) for triple layer forming fabrics
WP220	PET	WP230				●		●		6.0	53.0	24.0	4.5		2.0		15.0	11.0	0.21	1.85	200	High M/W MD or CMD yarn for forming or filtration
WP315	PET	WP333			●				●	6.0	53.0	15.0	2.5		1.8		21.5	16.5	0.40	3.53	160	Stretch resistant polyester warp (MD) for forming
WP320	PET	WP330				●			●	6.0	53.0	15.0	3.0		1.8		25.0	20.0	0.40	3.53	160	Select for high MD shrinkage and/or lower heatset temperature
PX301	PET	PX340				●			●	7.5	66.2	12.0	3.0		1.8		22.0	14.0	0.50	4.42	190	Stretch resistant high m/w PET warp; heatset temp. <190 °C
PX308	PET	PX321			●				●	6.5	57.4	17.0	3.0		1.8		7.0	6.0	0.26	2.30	230	Stretch resistant, standard m/w polyester warp (MD)
WP89	PET	WP91				●			●	7.0	61.8	14.0	3.0		1.5		10.5	8.0	0.40	3.53	220	Stretch resistant polyester warp; heatset at temperatures >190 °C

Nylon Press/Forming/Filtration Products ("MD" - machine direction "CMD" - cross machine direction)

Product	Polymer Formulation		Molecular Weight			Tensile Modulus			Tenacity		Elongation @ Break (%)	Relative Elongation (%)				Free Thermal Shrinkage (%)		Max. Thermal Shrink Force			Comments & Application
	Resin Type	Heat Stabilised (non-copper)	Low	Med	High	Low	Med	High	(gpd)	(cN/tex)		3.00 gpd Load	26.5 cN/tex Load	1.75 gpd Load	15.5 cN/tex Load	200 °C	175 °C	Force (gpd)	Force (cN/tex)	Temp. (°C)	
BS22R	PA6	●		●		●			5.2	45.9	50.0	19.0		13.0		7.0	4.0				Very good wear resistance; roll side weft (CMD) - forming
BS22	PA6			●		●			5.5	49.0	50.0						Testrite 4.5 @ 180 °C				
BN24R	PA6	●		●		●			6.3	56.0	36.0			4.5			Testrite 16.5 @ 180 °C	0.34	3.00	136	
XA893	Mod PA6	●		●		●			4.5	39.7	50.0						4.0				Low shrink, soft yarn for press & filtration fabrics
NX156	PA6	●			●	●			5.5	48.6	40.0	22.5		12.5			4.0	0.09	0.79	195	
WN009	PA6			M-H		●			4.8	42.4	40.0	18.0		12.0			4.8	0.09	0.79	160	Roll side forming weft; good wear resistance and edge curl reduction
NX157	PA6	●			●	●			6.9	60.9	33.0			10.0			5.0				
WN32	PA6			●		●			5.0	44.2	33.0	20.0		12.0			5.5	0.11	0.97	190	Very soft, deformable yarn for CMD
WN18	PA6			●			●		6.0	53.0	30.0	13.0		8.5			6.5	0.11	0.97	170	Suitable for use in cable construction or stand alone
BM25R	PA6	●		●			●		5.0	44.2	42.0						8.0				Weft yarn for forming fabrics. Helps minimise edge curl (roll side)
NX203	PA6			●			●		5.0	44.2	35.0	20.0		10.5			8.5	0.11	0.97	160	Suitable for use in cable constructions for CMD or MD
NX214	PA6			●		●			4.6	40.6	52.0			16.0			9.5				Suitable for use in cable constructions for MD
BM24R	PA6	●		●			●		6.0	53.0	37.0						12.0				Weft yarn for forming fabrics. Helps minimise edge curl (roll side)
BM20R	PA6	●		●			●		5.5	48.6	37.0						12.0	0.24	2.12	177	Used as pin seam yarn (MD) in seam felts
NX318	PA6	●			●		●		6.3	55.6	26.0			8.0			12.0	0.16	1.41	185	
NX228	PA6	●			●		●		5.5	48.6	30.0			6.5			13.0	0.15	1.32	170	Suitable for use as MD in endless and seamfelt fabrics
NX321	PA6				●		●		6.3	55.6	26.0			6.5			11.0				
BN20R	PA6	●		●			●		5.5	48.6	37.0						15.0				Load bearing yarn (MD) for filtration fabrics
NX210	PA6			●				●	6.0	53.0	25.0	7.5		4.5			15.0	0.23	2.03	170	
WN250	PA6	NX227		●			●		5.5	48.6	30.0	11.0		7.0			18.0	0.19	1.68	140	Roll side weft for forming; helps minimise edge curl

Nylon Press/Forming/Filtration Products ("MD" - machine direction "CMD" - cross machine direction)

Product	Polymer Formulation		Molecular Weight			Tensile Modulus			Tenacity		Elongation @ Break (%)	Relative Elongation (%)				Free Thermal Shrinkage (%)		Max. Thermal Shrink Force			Comments & Application
	Resin Type	Heat Stabilised (non-copper)	Low	Med	High	Low	Med	High	(gpd)	(cN/tex)		3.00 gpd Load	26.5 cN/tex Load	1.75 gpd Load	15.5 cN/tex Load	200 °C	175 °C	Force (gpd)	Force (cN/tex)	Temp. (°C)	
WN20	PA66			●		●			4.0	35.3	45.0	25.0		10.0		4.0	3.0	0.12	1.06	185	Suitable for press felts or as a bottom weft (CMD) in forming
NX115	PA66	NX152 (non-copper)			●	●			5.3	46.8	30.0	13.0		7.5		8.0	3.0	0.14	1.24	200	Higher molecular weight for added toughness and wear resistance
WN102	PA66			●			●		4.4	38.9	30.0	8.5		5.0		5.2	4.0	0.19	1.68	195	
WN21	PA66			●				●	5.5	48.6	20.0	6.0		4.0		10.0	5.5	0.38	3.36	185	
NX305	PA66	● (non-copper)			●		●		5.1	45.0	24.0	11.0		7.3			7.6	0.19	1.68	195	
NX317	PA66	NX327 (non-copper)			●		●		4.8	42.4	24.0	10.5		6.8		9.5	7.8	0.22	1.94	188	
NX320	PA66				●		●		5.0	44.2	28.0			5.5			10.5	0.30	2.65	150	Suitable for use as binder yarn for triple layer forming fabrics
NX315	PA66	NX310 (non-copper)			●			●	4.7	41.5	22.0	8.0		3.5		15.5	12.0	0.36	3.18	150	Suitable for use as binder yarn for triple layer forming fabrics
WN38	PA6/66			●			●		4.0	35.3	23.0	12.5		6.0			8.0	0.18	1.59	195	
NX122	PA610	NX141 (non-copper)		●		●			3.5	30.9	50.0	29.0		11.5			3.0	0.07	0.62	190	
NX174	PA610	● (non-copper)		●		●			4.9	43.3	40.7			11.3		7.0	3.0	0.13	1.16	196	
NX183	PA610	NX182 (non-copper)		●		●			4.6	40.6	34.0			8.4			5.0	0.15	1.32	181	Suitable for seamfelt CMD; very good dimensional stability
XC130	PA610			●				●	6.8	60.0	14.0						Testrite 18.0 @ 180 °C				
XE026	PA610			●			●		4.9	43.0	36.0						Testrite 7.5 @ 180 °C				Shaped 0.20 x 0.40 mm
NX179	PA610	● (non-copper)		●			●		6.0	53.0	29.0			9.0			3.0				Seam Felt Yarn
WN006	PA610			●		●			5.4	47.8	37.0			9.0			3.0				
WN004	PA610			●			●		5.4	47.8	35.0			7.0			5.5				
WN50	PA610	NX217 (non-copper)		●			●		4.5	39.7	30.0	13.5		7.5			5.0	0.21	1.85	182	Suitable for single end or cabled CMD or MD
NX220	PA610			●			●		5.3	46.8	30.0			7.5			8.5	0.23	2.05	168	
NX201	PA610						●		5.7	50.0	23.0			6.0			12.0				Oven Shrinkage at 177 °C Improved Moisture Control
NX316	PA610	● (non-copper)						●	4.1	36.0	26.0			5.5			10.0				Oven Shrinkage at 177 °C
NX206	PA610	NX226 (non-copper)		●			●		5.9	52.1	23.0	9.0		5.7		16.0	8.5	0.28	2.43	175	
NX201	PA610			●				●	5.3	46.8	22.5	10.0		5.5			10.0	0.22	1.94	145	
NX316	PA610	● (non-copper)		●				●	5.4	47.7	23.0			5.5			10.0	0.30	2.65	181	Stretch resistant MD or dimensionally stable CMD in seam felts
NX340	PA610	NX346 (non-copper)			●			●	5.3	46.8	16.0			5.5			12.5	0.31	2.74	184	High molecular weight for added toughness and wear resistance
NX306	PA610			●				●	6.0	53.0	18.0			4.7			11.0	0.36	3.18	175	

Dryer Fabric Products ("MD" - machine direction "CMD" - cross machine direction)

Product	Polymer Formulation			Molecular Weight			Tensile Modulus			Tenacity		Elongation @ Break (%)	Relative Elongation (%)				Free Thermal Shrinkage (%)		Max. Thermal Shrink Force			Comments & Application
	Resin Type	Contam. Resist. Version	Chem. Stab'd for Hydr.	Low	Med	High	Low	Med	High	(gpd)	(cN/tex)		3.00 gpd Load	26.5 cN/tex Load	1.75 gpd Load	15.5 cN/tex Load	200 °C	175 °C	Force (gpd)	Force (cN/tex)	Temp. (°C)	
PX114	PET		●		●		●			4.2	37.1	40.0	20.0		9.0		2.5	1.7	0.05	0.44	225	Lowest free shrinkage; used for weft (CMD)
IP130	PET					●	●			4.4	39.0	33.0					3.0					
PX137	PET					●	●			4.2	37.0	36.0	20.0				Testrite 6.0					
WP500	PET		●			●	●			4.0	35.3	45.0	27.0		12.5		4.0	2.8	0.06	0.53	225	Lowest shrink high molecular weight polyester dryer yarn
WP550	PET	PX143	●			●	●			4.5	39.7	40.0	20.0		9.3		6.0	3.5	0.07	0.62	217	Standard low shrink high m/w polyester dryer yarn; warp or weft
WP551	PET		●			●	●			4.2	37.0	32.0	19.0				Testrite 12.0					
WP760	PET	PX241	●			●		●		4.5	39.7	38.0	20.0		8.0		7.2	4.7	0.06	0.53	219	High m/w PET dryer yarn; suitable for round/ shaped weft or warp
WP775	PET	PX203	●			●		●		5.5	48.6	35.0	19.0		6.0		9.4	5.2	0.07	0.62	211	High m/w PET dryer yarn; suitable for round/ shaped weft or warp
PX405	PET	PX411	●		●			●		4.8	42.4	15.0	6.5		4.0		25.0	21.0	0.22	1.94	150	Coiling yarn for spiral dryer fabrics
IP320	PET					●			●	7.6	67.0	14.0	3.0					20.0				
PX421	PET				●			●		3.8	33.6	22.0	7.5		3.5		25.0	22.0	0.19	1.68	130	FDA compliant coiling yarn for spiral mesh food processing fabrics
WP809	PET		●			●		●		4.3	37.5	15.0	5.0		2.5		33.0	28.0	0.33	2.91	135	High molecular weight polyester coiling yarn for spiral dryer fabrics
WN125	H/S PA66					●	●			5.0	44.2	28.0	13.0		8.0			2.2	0.13	1.15	218	Heat Stabilised with copper-based antioxidant (avoid H2O2 exposure)
WN175	H/S PA66					●		●		5.3	46.8	21.0	8.0		2.0			8.0	0.33	2.91	195	Heat Stabilised with copper-based antioxidant (avoid H2O2 exposure)
NX301	H/S PA66					●			●	5.5	48.6	16.0			3.5			12.0	0.46	4.06	172	Heat Stabilised with copper-based antioxidant (avoid H2O2 exposure)
NX500	H/S PA66					●	●			4.0	35.3	25.0			8.0			2.0				Heat Stabilised w/copper-based antioxidant. Used as pintle yarn
High Temperature / High Performance Monofilaments																						
HPA14	PPS				●			●		2.5	28.0	28.0	Load at 10% Strain = 1.5gpd				15.0	13.0	0.12	1.06	100	PPS coiling yarn for high temperature spiral mesh dryer fabrics
HPA300	PPS				●			●		2.5	28.0	28.0	Load at 10% Strain = 1.5gpd				(204 °C) 15.0	13.0	0.12	1.06	100	Med/high shk/shk force PPS yarn for woven (warp) or spiral fabrics
HPA30	PPS				●		●			3.1	32.0	32.0	Load at 10% Strain = 1.4gpd				2.0	1.5	0.04	0.35	218	Available in round and shaped cross sections
HPA40	PPS				●		●			2.7	32.0	32.0	Load at 10% Strain = 1.1gpd				6.5	4.5	0.03	0.26	250	Available in round and shaped cross sections
HPA43	PPS				●			●		2.8	30.0	30.0	Load at 10% Strain = 1.2gpd				6.5	4.5	0.03	0.26	250	Shaped MD yarn
HPA13	PPS				●		●			2.9	30.0	30.0	Load at 10% Strain = 1.2gpd				6.5	5.0	0.06	0.53	240	PPS available in finer sizes (0.15 to 0.30mm); suitable for cable
HPA501	PPS				●		●			2.3	35.0	35.0	Load at 10% Strain = 1.25gpd				4.0					Low shrink large gauge pintle for spiral mesh fabrics
HPP56	PCTA				●		●			2.7	28.0	28.0					4.0		0.05	0.44	230	Application as high temperature round or shaped stuffer yarn

Industrial Products

Product	Diameter (mm)	Polymer Formulation			Molecular Weight			Tensile Modulus			Tenacity		Elongation @ Break (%)	Relative Elongation (%)				Free Thermal Shrinkage (%)			Testrite Shrinkage (%)		Boiling Water Shrinkage (%)	Max. Thermal Shrink Force		Max. Thermal Shrink Force			Comments & Application
		Resin Type	Contam. Resist. Version	Chem. Stab'd for Hydr.	Low	Med	High	Low	Med	High	(gpd)	(cN/tex)		3.00 gpd Load	26.5 cN/tex Load	1.75 gpd Load	15.5 cN/tex Load	200 °C	175 °C	132 °C	180 °C	200 °C	100 °C	175 °C	132 °C	Force (gpd)	Force (cN/tex)	Temp. (°C)	
IN66 80Den	0.10	PA66				●					6.2	55.0	30.0																
IN66 850Den	0.33	PA66				●					5.4	48.0	27.0								2.5 @ 160 °C								Tyre Cord
NX 229	0.50	PA66		●							4.5	40.0	27.0	14.0					5.5 @ 177 °C										
MX203	0.38	PP			Melt flow- 3g/10min						6.0	53.0	23.0			4.0				11.0									
MX205	0.25	PP																											
MX215	0.24	PP									6.1	54.0	22.5							14.5									Quadralobal
NX301	0.50	PA66		●		●					5.8	51.0	15.0			3.5			12.5 @ 177 °C										
BM10																													
WN200	0.50	PA66				●					3.9	34.0	35.0			10.0	2.5												Hose Reinforcement

PMC - Forming Edge Curl Control Products

Product	Polymer Formulation	Molecular Weight			Tensile Modulus			Tenacity		Elongation @ Break (%)	Relative Elongation (%)				Free Thermal Shrinkage (%)		Max. Thermal Shrink Force			How It Works
		Low	Med	High	Low	Med	High	(gpd)	(cN/tex)		3.00 gpd Load	26.5 cN/tex Load	1.75 gpd Load	15.5 cN/tex Load	200 °C	175 °C	Force (gpd)	Force (cN/tex)	Temp. (°C)	
Higher Shrink Polyester Roll Side Weft (pic/pic with nylon) ↓																				
WP220	Polyester			•		•		6.0	53.0	24.0	4.5		2.0		21.5	16.5	0.4	1.85	200	Compensate for moisture-regain-driven nylon weft filament expansion by pairing it with a higher shrink/shrink force PET weft. The higher shrink force PET weft would provide a compensating counter force to correct the edge curl
WP804	Polyester			•		•		5.5	48.6	30.0	10.0		4.0		5.5	4.0	0.2	1.41	217	
PX200	Polyester			•		•		4.6	40.6	37.0	20.0		8.0		5.5	2.5	0.08	0.71	200	
Low Moisture Regain Nylon Roll Side Weft (pic/pic with polyester) ↓																				
NX122	PA610 (Heat stable version via NX141)		•		•			3.5	30.9	50.0	29.0		11.5			3.0	0.07	0.62	190	Use a low moisture regain nylon 610 product. Reduced moisture regain would reduce the volume expansion that drives edge curl, hence reduced edge curl
WN50	PA610 (Heat stable version via NX217)		•			•		4.5	39.7	30.0	13.5		7.5			5.0	0.21	1.85	182	
WN004	PA610		•			•		4.8	42.4	35.0			7.8		10.0	6.0	n/a	n/a	n/a	
XA136	Heat Stable PA610		•			•		4.8	42.4	35.0	13.0		8.0		12.5	7.5	0.17	1.50	177	
Higher Shrink Nylon Roll Side Weft (pic/pic with polyester) ↓																				
BM20R	Heat Stable PA6		•			•		5.5	48.6	37.0						12.0	0.24	2.12	177	Compensate for moisture-regain-driven expansion by using a higher shrink nylon, providing a counterbalance force to correct edge curl
BN20R	Heat Stable PA6		•			•		5.5	48.6	37.0						15.0	n/a	n/a	n/a	
NX210	PA6 (Recommend heat stable version)		•				•	6.0	53.0	25.0	7.5		4.5			15.0	0.23	2.03	170	
WN250	PA6 (Heat stable version via NX227)		•			•		5.5	48.6	30.0	11.0		7.0			18.0	0.19	1.68	140	
Soft Polyester Roll Side Weft (pic/pic with nylon) ↓																				
WP120	HMW Polyester			•	•			4.5	39.7	48.0	27.0		13.0		3.0	2.0	0.04	0.35	220	Soft polyester weft yarn with good dimensional stability, easy to weave and easy to heatset
WB002	Polyester Blend		•		•			3.2	28.3	53.0						6.5	0.01	0.09	72	Soft, abrasion resistant polyester **Able to control edge curl via:** • Increased knuckle deformation and reduced flexural stiffness • High shrink force on cooling • No moisture regain issues to deal with - hence reduced edge curl
Soft Nylon Roll Side Weft (pic/pic with polyester) ↓																				
WN009	Nylon 6 Blend		M-H		•			3.3	29.1	45.0			18.0			4.8	0.05	0.44	188	Soft, abrasion resistant PA6. Reduced compressive modulus and flexural stiffness **Able to control edge curl via:** • Increased deformation of the knuckle, which would help deflect some of the forces that drive edge curl. • A more deformed knuckle would have lower flexural stiffness due to a reduced cross section, hence reduced stress levels • A softer nylon would have a lower flexural modulus helping to reduce residual stresses that magnify edge curl
WN008	Plasticized PA610		•		•			2.0	17.8	50.0	n/a					7.5	n/a	n/a	n/a	Same attributes as WN009 except in a low moisture regain PA610 base polymer
BS22R	Heat Stable PA6		•		•			5.2	45.9	50.0	19.0		13.0		7.0	4.0	0.13	1.15	178	Soft PA6 weft yarn used as roll side forming weft
WN32	PA6 (Recommend heat stable version)		•		•			5.0	44.2	33.0	20.0		12.0			5.5	0.11	0.97	190	Soft PA6 weft yarn used as roll side forming weft
WN18	PA6 (Recommend heat stable version)		•			•		6.0	53.0	30.0	13.0		8.5			6.5	0.11	0.97	170	Soft PA6 weft yarn used as roll side forming weft


48
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