



The logo for JPS Composite Materials. It features a stylized 'JP' monogram in a light gray font, with the letters overlapping. To the right of the monogram, the letters 'JPS' are written in a bold, blue, sans-serif font. Below 'JPS', the words 'COMPOSITE MATERIALS' are written in a smaller, black, all-caps, sans-serif font.



COMPOSITE MATERIALS

A JPS Industries Inc. Company

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Table of Contents

Company.....	1
Locations.....	1
Conditions of Sales.....	2
Parameters for Fabric Selection.....	3
Fiberglass Yarn Nomenclature.....	4
Glass Composition.....	4
Basic Glass Yarn Strands.....	6
Design Consideration for Glass Fabric Selection.....	6
Manufacturing Process: Yarn to Fabric.....	12
Specifications & Standards.....	14
 FIBERGLASS PRODUCTS..... 16	
Physical Properties of E-glass.....	16
Physical Properties of S-2 ® Glass.....	17
Physical Properties of Insulbatte ®, Tempmat ®.....	18
Fiberglass Fabric Applications.....	19
Fiberglass Fabric Finishes.....	20
Finishes for Electrical Laminates.....	21
Finishes for Aerospace, Conform & Advanced Composites.....	22
Finishes for Boat & Tooling / Surf.....	24
Finishes for EIFS.....	24
Finishes for Filtration Fabrics.....	25
Finishes for Insulation & Glastex Fabrics.....	26
Other Finishes & Special Processes.....	27
 FIBERGLASS FABRIC CONSTRUCTIONS..... 28	
Electrical Fiberglass Fabrics.....	28
Aerospace, Conform & Advanced Composite Fabrics.....	33
Fiberglass Reinforced Plastics (FRP) - Boat & Tooling Fabrics.....	37
Filtration Fabrics.....	39
Filtration Finished Fabrics.....	40
Insulation Coating Fabrics.....	41
Insulation GlasTex Fabrics.....	42
EIFS Mesh Fabrics.....	43
Fiberglass Fabric Weight Index.....	44
Fiberglass Fabric Thickness Index.....	47

ASTROQUARTZ® PRODUCTS.....	50
Physical Properties of Astroquartz® II.....	51
Astroquartz® Applications.....	51
Design Considerations for Astroquartz® Fabric Selection.....	52
Astroquartz® II & III Fabric Finishes.....	52
Astroquartz® II Chopped Fiber.....	53
ASTROQUARTZ® II & III FABRICS.....	54
Astroquartz® Mat Style No. 550.....	55
Astroquartz® II Roving.....	55
Astroquartz® II Sewing Thread.....	56
Astroquartz® II Yarn.....	57
Testing Properties of:	
Astroquartz® II 350°F Epoxy Laminates.....	58
Astroquartz® II Toughened Epoxy Laminates.....	58
Astroquartz® II Polyimide Laminates.....	59
Astroquartz® II Lightweight 8 Harness Satin Fabric.....	59
Astroquartz® II Roving.....	59
Astroquartz® II Unidirectional Fabric.....	60
Astroquartz® II Dielectric Properties.....	60
Astroquartz® III Plain Weave Fabric.....	61
Astroquartz® III 8 Harness Satin Fabric.....	61
ADVANCED MATERIALS PRODUCTS.....	62
Physical Properties of Aramid Fibers.....	62
Physical Properties of Selected Advanced	
Performance Fibers.....	62
Advanced Materials Applications.....	63
Advanced Materials Fiber Nomenclature.....	63
Finishes for Advanced Materials.....	64
ADVANCED MATERIALS FABRIC CONSTRUCTIONS....	65
Kevlar® 49 Fabrics.....	65
Twaron® Fabrics.....	66
Kevlar® 29, 129, 159, LT, KM2, KM2+, X300, and	
Comfort XLT Fabrics.....	68
Spectra® Fabrics.....	72
S-2® Glass Rovings and Aramid Hybrid Fabrics.....	73
Technical References - English.....	74
Technical References - Metric.....	75
Technical References - Common Projectile Caliber Sizes....	76
Selected Conversions & Formulae.....	77

Company

1

JPS Composite Materials, a wholly owned subsidiary of JPS Industries Inc., is the world's leading manufacturer of high strength fiberglass, Astroquartz ®, and aramid fabrics and reinforcements. Our materials are used extensively in reinforcing and insulating applications in fields including electronics, aerospace, marine and tooling, advanced composites, ballistics, architecture and construction, and sporting goods. Our materials are readily adaptable to unlimited design opportunities.

Direct customer access to customer service and management personnel:

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Locations

Anderson, South Carolina

Corporate Headquarters

Technical Development Center

Advanced, Aerospace Composite and Ballistic Fabrics

Slater, South Carolina

Technical Development Center

Astroquartz ®, Advanced, Aerospace Composite, Boat, Tooling, Coating, EIFS, Building Products and General Industrial Fabrics

Statesville, North Carolina

Electrical Laminate E-glass Fabrics

Lightweight Advanced and Aerospace Composite Fabrics

Conditions of Sales

All sales of JPS products are subject to the terms and conditions of JPS' standard confirmation of order.

All statements herein are expressions of opinion which the Seller believes to be true and correct, but Seller expressly disclaims liability for factual accuracy of such opinions and hereby advises Buyer to investigate each situation on an individual basis before taking action based on Seller's expression of opinion.

Statements concerning possible use of our products are not intended as recommendations for their use in the infringement of any patent. No patent warranty of any kind, expressed or implied, is made or intended.

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PLEASE NOTE: Because of the many variable associated with producing industrial composite reinforcements (yarn type, fabric construction, widths, finishes and other facts), the technical data and other information contained on these pages are intended as a general guide and are subject to change without notification unless specifically prohibited by specific purchase specifications.



Parameters for Fabric Selection

3

In selecting a woven fabric for industrial applications, a number of design parameters may be considered. These are broken down into four basic variables: Yarn Weight, Thread Count, Weave Pattern, and Fabric Finish. The wide range of fiber glass weights, as well as yarn counts available in aramid and polymer fibers, provide the base for fabric design. Yarn weight, combined with thread count (the number of warp ends (lengthwise) and filling picks (width wise) per inch determines the strength, weight and thickness of the fabric.

Basic weaving concepts are utilized in the manufacture of fiber glass and high performance fabrics. The technology, however, is advanced to incorporate specialized precision equipment to meet the exacting demands of modern applications. Almost any weave can be woven, however for industrial there are seven basic patterns including: Plain, Basket, Leno, Four Harness Satin (Crowfoot), Eight Harness Satin, High Modulus, and Twill.

Yarn

Fiberglass is glass in fiber form. All forms of glass fibers begin with similar manufacturing processes. The various ingredients are mixed in a batch to make a specific formulation and then high temperatures convert the mix into molten glass. Continuous filaments are attenuated (drawn or pulled rapidly) from the molten glass through a precision multihole bushing. A strand is produced by combining many individual continuous filaments (from 51 to 1632) depending on bushing size and end-use requirement. The filaments are coated with a lubricant or binder to protect them from damage during processing and weaving.

Formulations

Glass fibers are made from different formulations: "E" (electrical) being the most common all-purpose glass, while "S" (high-strength) is made for special applications. Astroquartz ® II and III quartz fiber products are the purest form of silica. The chemical composition of these glass formulations is shown on the next page.

COMPOSITION OF TYPICAL GLASSES

(%) by weight

Ingredient	"E"	"S"	"Astroquartz ® II & III"
Glass	Glass	Glass	
Silicon Dioxide	52-60	64-66	99.99
Calcium Oxide	16-25	-	-
Aluminum Oxide	12-16	24-26	-
Boron Oxide	8-13	-	-
Sodium and			
Potassium Oxide	0-1	-	-
Magnesium Oxide	0-6	9-11	-

Filament/Yarn Nomenclature

An exact system for identifying fiberglass textile yarns is required because of the wide variety of types which are produced. The nomenclature is used for filament and yarn identification consists of two basic parts - one alphabetical, the other numerical.

A typical example and the of its letters and numerals follow:

Glass Composition	Filament Diameter	Number of Single Strands in Continuous Filament Yarns
E=Electrical		
S=High Strength		
 	 	
Type of Yarn	Strand Count	Number of Strands Plied Together
C=Continuous Filament	Yardage/Lb (in Hundreds)	

As shown, the letters describe the basic strand by composition, type and diameter. Numbers identify strand weight and yarn construction.

The strand count is the first series of numbers following the letters and indicates approximate yardage per pound, in hundreds (i.e. to compute the number of yards in a pound of strand, multiply the strand count by 100).

The second series of numbers designates the number of plies in continuous filament yarns.

- 5 The first digit indicates the number of single strands twisted together (untwisted single strands are commonly referred to as "singles" yarn and are designated as 1/0).

The second digit, separated from the first digit by a diagonal line, designates the number of strands that are plied together. To find the total number of strands, multiply the two numbers (0 multiplied as 1). A typical nomenclature for a continuous yarn:

ECG 150-2/2 Where:

E = Electrical Glass

C = Continuous Filament

G = Average Filament Diameter (see table, page 6)

150 = 15,000 Yd/Lb (Nominal) of Basic Strand

2/2 = Four Strands in the Twisted and
Plied Yarn (2x2)

Approximate yards per pound of fabricated yarn can be computed by dividing the strand count, multiplied by 100, by the number of strands.

Therefore:

$$\frac{150 \times 100}{2 \times 2} = 3750 \text{ yds/lb for fabricated yarn}$$

The results of this computation must always be considered approximate because yards per pound are reduced slightly in the twisting and plying operations.

DESCRIPTION OF CONTINUOUS FILAMENT GLASS FIBERS

<u>Filament Designation</u>	<u>Strand Count</u>	<u>Nominal Filament (x100=yd/lb)</u>	<u>Number of Filaments</u>
B	150	0.00015	1224
C	150	0.00015	816
D	1800	0.00023	51
	900	0.00023	102
	450	0.00023	204
	225	0.00023	408
DE	150	0.00025	408
	75	0.00025	816
	50	0.00025	1632
	37	0.00025	1632
E	225	0.00029	204
G	150	0.00036	204
	75	0.00036	408
	37	0.00036	816
H	25	0.00043	816
K	75	0.00051	204
	37	0.00051	408
	25	0.00051	608
	18	0.00051	816

DESIGN CONSIDERATIONS FOR GLASS FABRIC SELECTION

There are five basic design variables to consider when choosing fabric for industrial use:

Thickness

Glass fabrics are available in thicknesses ranging from 0.0010" to 0.060".

Weight

The weight range begins at less than 1 ounce per square yard to over 50 ounces per square yard.

7

Construction

This is determined by the number of warp yarns (machine direction) and fill yarns (cross-machine direction) per inch of the fabric.

Yarn Size

Yarn size determines the weight and thickness of the fabric. For specific applications, one yarn may be selected over another to the advantage of the fabric's performance characteristics.

Finish

Most industrial applications require that fabric be used with another material. For compatibility with other materials, a finish or after treatment is often applied to the fabric. See the finish sections for descriptions of various treatments.

YARN CONSTRUCTION

Twisting/Plying

This process serves to control the yarn strength, diameter, weight, and flexibility. The filaments are twisted to a predetermined specification, and the twisted threads are then combined or plied, to balance and avoid any stresses in the yarn that can cause processing difficulties. Many glass fabrics are woven from single yarns as received from the yarn producers. The filament diameter and the number of filaments in the base strand will also affect the yarn strength, diameter and flexibility.

Warping

The warping operation in producing woven fabric is accomplished by laying the fibers in parallel order. A specified number of threads per inch are drawn from a creel and wound on a warp beam. Several warp beams are then combined to provide the designated number of threads per inch required in the fabric specification. This entire system of parallel threads is wound on one loom beam to become the "warp" or lengthwise system of threads in the fabric.

Slashing

Slashing is employed when non twisted yarn is used. Warp sizing is applied to the yarns to facilitate handling and to provide protection during the weaving process. This operation involves (1) sizing single-fiberglass warp yarns with a specially compounded chemical formulation, (2) drying the yarns, and (3) winding the desired number of ends on the loom beam.

Entering

The entering operation arranges yarn for weaving in the warp direction. In this process, the warp yarns are threaded from the loom beam through the needle eyes on the proper harnesses to achieve the desired pattern or design in the fabric. The warp yarn is then drawn through a reed that is the final coating of the warp thread count. The reed is also to place the filling yarns in their proper position.

Weaving

Weaving consists of interlacing a series of fiberglass filling yarns with a series of warp yarns at right angles. The filling yarns are inserted by an air jet, rapier or shuttle that traverses the yarns from one side of the warp to the other, interlacing the two systems of threads, "warp" and "filling", in a prearranged weave plan.

Weaves

The matching of yarn, weave and finish for a particular requirement is an exacting science. Because fiberglass fabrics are highly engineered, the right combination of fabric weight, thickness and construction is essential in selecting the proper fabric for a particular application.

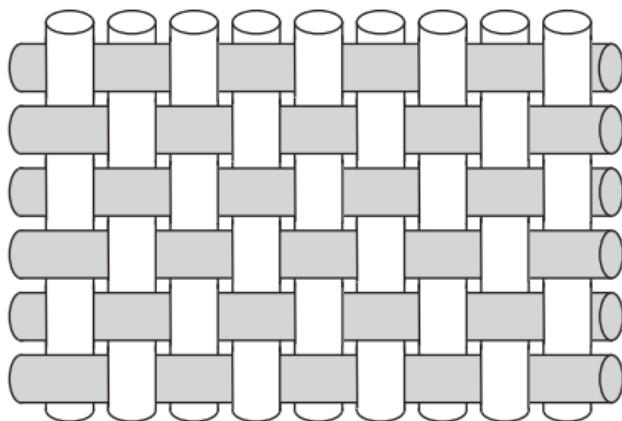
Selecting the right reinforcement fabric for any requirement can simplified by calling our technicians, design engineers and technical representatives. Their specialized experience can aid in selecting a reinforcement fabric suited to your requirements.

The weaving of reinforcement fabrics is a highly complex function that combines the latest in modern machine technology with the art of weaving, which is as old as

civilization. All standard fabric weaves can be produced with fiberglass, aramid, Astroquartz ®, polymer and carbon yarns.

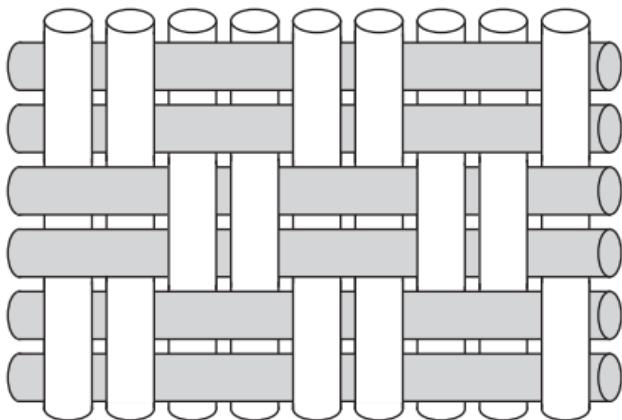
9

Plain Weave



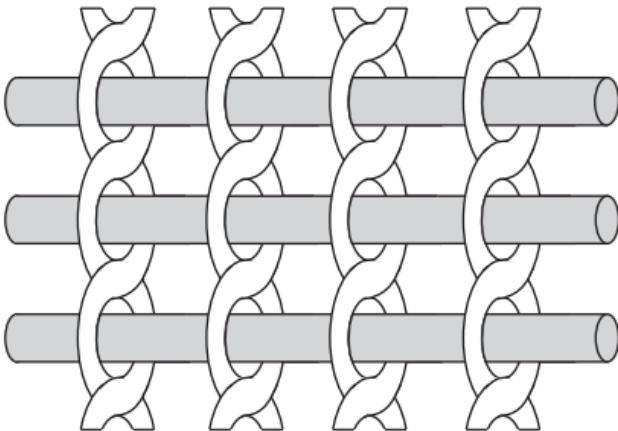
The plain weave consists of yarns interlaced in an alternating fashion, one over and one under every other yarn. The plain weave provides good fabric stability. It is the primary fabric used in the electronics and coating industries.

Basket Weave



The basket weave is similar to the plain weave, except that two or more filling yarns are alternately interlaced over and under each other. The basket weave is more pliable, flatter, and stronger than the plain weave, but is not as stable.

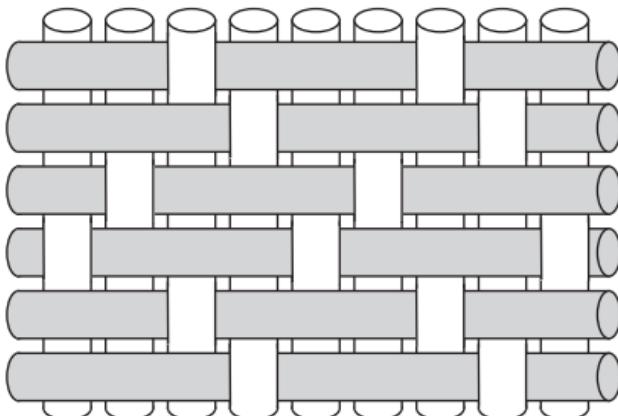
Leno



10

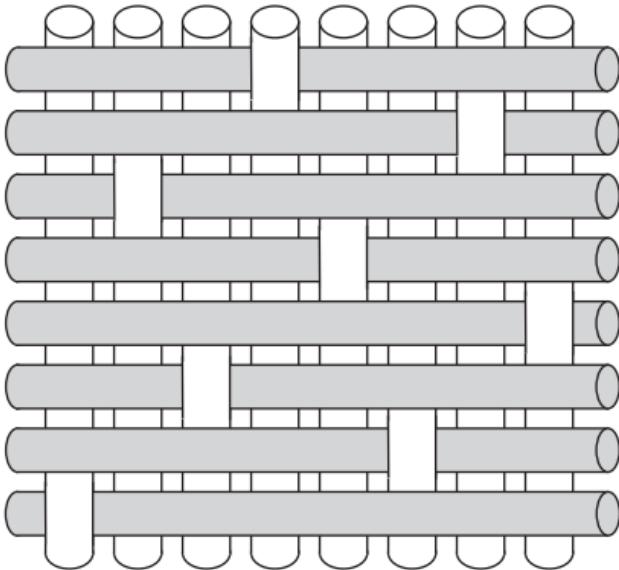
The leno weave is used where relatively low numbers of yarns are involved. The leno weave locks the yarns in place by crossing two or more warp threads over each other and interlacing with one or more fill threads. Light weight membrane Applications use the leno weave.

Four-Harness Satin (Crowfoot)



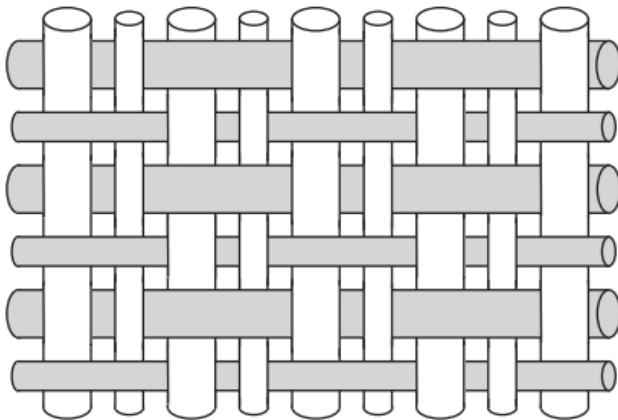
The four-harness satin weave is more pliable than the plain weave and is easier to conform to curved surfaces typical in reinforced plastics. In this weave pattern there is a three by one interlacing, where a fill yarn floats over three warp and under one.

Eight-Harness Satin

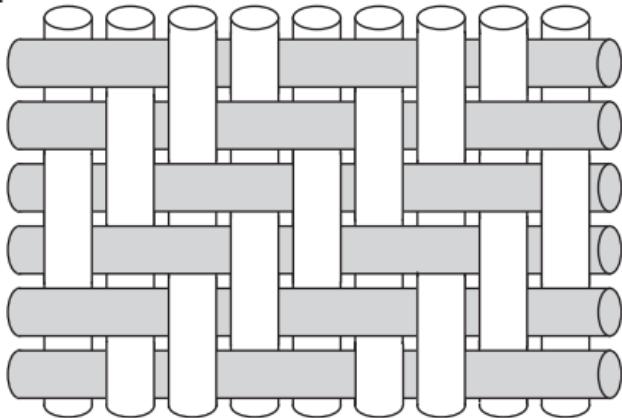


The eight-harness satin is similar to the four-harness satin except than one filling yarn floats over seven warp yarns and under one. This is a very pliable weave and is used for forming curved surfaces. It is generally produced in the 6 oz/sqyd to 18 oz/sqyd weight range.

High Modulus Weave



The high modulus weave is used where high impact resistance and high strength are required. The weave eliminates the interlacing of structural yarns, thereby reducing crimp and shear factors. This special weave is the most pliable and conforms most readily to highly contoured planes.

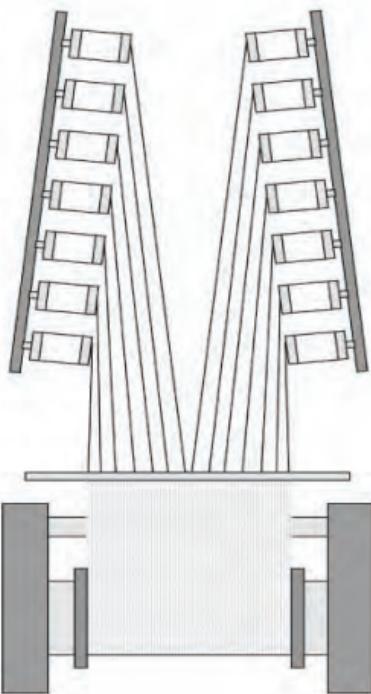


The twill is used where tightly woven fabric with high density is required. The twill weave is characterized by a diagonal rib or twill line. The warp yarn floats over at least two consecutive picks, permitting more yarns per unit area.

The Manufacturing Process: Yarn to Fabric

1. Warping

Input yarn is transferred from the bobbin creel to section beams. The section beams constitute the machine direction or thread sheet segment of yarn in the loom. Several section beams are produced and consolidated into a “set”, which provides the input for slashing.



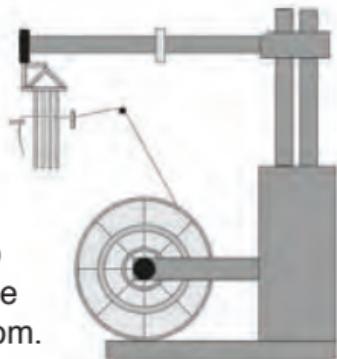
2. Slashing

Slashing combines the warp ends of the set's multiple section beams in a single warp or loom beam for weaving. Sizing is applied to the individual warp ends to minimize filament damage during handling and weaving.



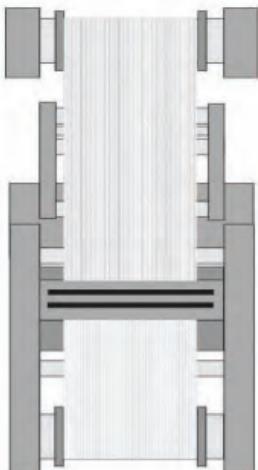
3. Entering

In the entering state the warp beam is setup for installation on the loom. A warp can contain over 4,500 individual ends, depending on the design of the style. Each warp end is drawn through a drop wire, heddles and a reed by hand or by machine. The drop wire, heddles and reed work to mechanically arrange and control the warp yarn during weaving on the loom.



4. Weaving

The warp beam is installed on the loom, then either rapier technology for heavy fabrics or air jet technology for lighter weight fabrics is used to interlace the filling yarns at 90° angles to the warp ends. Once woven the fabric, called "greige fabric", is then wound onto a roll ready for heat cleaning for glass or scouring for organic fabrics.



5. Heat Cleaning

Glass fabrics are processed through a caramelizer or coronizer to oxidize the organic binders and sizings from prior steps. The fabric then wound onto a porous steel drum, called a mandrel, and placed in a large batch oven and exposed to high heat. The heat flows around the exterior of the fabric, as well as through the mandrels to ensure complete exposure. The heat removes

all organics, leaving pure clean glass fabric. Organic, polymer based, fabrics are not heat cleaned.

6. Finishing

Coupling agents are applied to the fabric during finishing. The coupling, or finishing, agents act to provide optimum adhesion between the reinforcement fabric and the polymer matrix. Ballistic fabrics may undergo scouring and water repellent treatment in the finishing stage.



Specifications and Standards

JPSCM fabrics are designed to meet the requirements of a wide range of end users, including commercial and governmental specifications for composite reinforcement fabrics. This standards and specifications. Listed below are a partial offering of the standards and specifications we manufacture towards. For adherence to a specific standard or specification not listed, please inquire not listed please contact customer service or technical support.

AMS-3824 - Covers basic forms of finished fiberglass fabrics used alone or components in other materials.

AMS-3846 - Covers quartz fabrics in woven form finished for resin laminates.

AMS-3902 - Covers cloth woven from high modulus, continuous multifilament aramid yarn.

AMSC-9084 - Covers the requirements for woven, cleaned, and finished glass fabrics for use in resin laminates and sandwich materials.

ASTM-D-579 - Standard specifications for greige woven glass fabrics and their testing.

ASTM-D-1668 - Covers open mesh woven glass fabrics used for membrane waterproofing and built up roofing.

ASTM-D-3659 - Covers flame spread in self extinguishing EIFS finishes.

ASTM-D-4029 - Standard specifications for woven E-glass fabrics for reinforcement use.

ASTM-E-2098 - Covers Alkali resistance of finished fabrics used in Exterior Insulation Facing Systems (EIFS) for building products.

BMS 9-3 - Covers Boeing Commercial Airplane Company's requirements for woven, cleaned, and finished E-glass fiber fabrics for use in aircraft structures and repair.

IPC-4412 - Covers woven and finished glass fabrics for use in printed circuit boards.

MIL-C-20079 - Covers glass and tape used as lagging material over thermal insulation and for hull insulation board.

MIL-C-22787 - Covers vinyl coated base glass fabrics.

MIL-DTL-44050 - Covers cloth woven with high modulus, continuous, multifilament yarn.

MIL-DTL-46593 - Projectile specifications for armor testing.

MIL-DTL-62474 - Covers aramid fabric reinforced plastic laminate for use in composite armor systems.

MIL-I-24244 - Covers thermal insulation with special corrosion and chloride requirements.

MIL-PRF-64154 - Covers phenolic laminates made with glass fabric for use in composite armor systems.

MIL-R-7575 - Polyester resin low pressure laminates made with glass fabric reinforcement.

MIL-R-9300 - Covers epoxy resin low pressure laminates made with glass fabric reinforcement.

MIL-S-662 - V-50 ballistic test for armor.

MIL-Y-1140 - Covers basic forms of untreated glass yarns and fabrics used alone or as components of other materials.

NRC 1.36 - Covers the requirements of the Nuclear Regulatory Certification of GlasTex fabrics.

USCG Subpart 164-009 - Covers non-combustible material for use in merchant vessels.

FIBERGLASS PRODUCTS

Physical Properties of E-glass Fiber

16

Approximate Chemistry*

SiO ₂	52-60%
CaO.....	16-25%
Al ₂ O ₃	12-16%
BaO.....	8-13%
MgO.....	0-6%
NaO ₂	0-1%
KO ₂	0-1%

Physical Properties*

Density.....	2.54-2.60 g/cc
Refractive Index.....	1.558 to 1.562

Mechanical Properties*

UTS (room temp).....	3.4-3.5 GPa
Breaking Strain.....	4.5-5.0%
Young's Modulus.....	65-75 GPa
Shear Modulus.....	28-32 GPa
Poisson's Ratio.....	0.200

Thermal Properties*

CTE (20°C).....	4.0-5.0 $\mu\text{m}/\text{m}\cdot^\circ\text{C}$
CTE (30°C to 250°C).....	4.5-5.5 $\mu\text{m}/\text{m}\cdot^\circ\text{C}$
Specific Heat Capacity.....	0.78-0.82 J/g- $^\circ\text{C}$
Thermal Conductivity.....	1.28-1.32 W/m-K
Softening Point.....	$\leq 845^\circ\text{C}$

Electrical Properties*

Dk @ 1 MHz.....	6.3-6.6
Df @ 1 MHz.....	0.0023-0.0027
Electrical Resistivity.....	3.5-4.0e+12 $\Omega\text{-cm}$
Dielectric Strength.....	10.3 kV/mm

*All values approximate. Actual values may vary, for further info contact JPSCM.

Physical Properties of S-2 ®* Glass

* S-2 ® is a registered trademark of AGY Corporation

Approximate Chemistry*

SiO ₂	64-66%
Al ₂ O ₃	24-26%
MgO.....	9-11%

Physical Properties*

Density.....	2.44-2.48 g/cc
Refractive Index.....	1.548 to 1.553
Mohs Hardness.....	6.5

Mechanical Properties*

UTS (room temp).....	4.8-4.9 GPa
Breaking Strain.....	5.5-6.0%
Young's Modulus.....	85-90 GPa
Shear Modulus.....	33-37 GPa
Poisson's Ratio.....	0.230

Thermal Properties*

CTE (20°C).....	1.5-1.7 µm/m-°C
Specific Heat Capacity.....	0.72-0.75 J/g-°C
Thermal Conductivity.....	1.44-1.46 W/m-K
Softening Point.....	≤ 1055°C

Electrical Properties*

Dk @ 1 MHz.....	5.0-5.4
Df @ 1 MHz.....	0.0018-0.0022
Electrical Resistivity.....	8.5-9.1e+10Ω-cm

Corrosion Resistance*† (%weight loss, greige fiber)

10% H SO	5.7
Conc. HCl.....	1.4
10% NHO	7.3
H O (Distilled).....	1.0
10% NaOH or 10% KOH.....	66.0

*All values approximate. Actual values may vary, for further info contact JPSCM

† 1 week immersion @ 205°F

Physical Properties of Insulbatte ®, Tempmat ®

Insulbatte ® and Tempmat ® are registered trademarks of JPS Industries

Insulbatte ® and Tempmat ® are mechanically bonded, noncorrosive, noncombustible, nonalkaline, chemically stable fabrics mat blankets. The 100% E-glass mats are manufactured in web form through a needling process to form thicknesses of 1/4", 1/2", and 1". E-glass fibers are accurately chopped to provide maximum density, high insulation, and strong physical properties at temperatures up to 1200°F.

18

Insulbatte ® and Tempmat ® are commonly used in complex applications in oil refineries, steam and gas turbine operations, exhaust systems and commercial marine applications as well as applications for the U.S. Navy and U.S. Coast Guard. In addition, the mats are used as insulators in automotive applications and to replace rigid block nuclear power plants.

Insulbatte ® and Tempmat ® meet the requirements of MIL-I-16411 Type II, NRC 1.36, MIL-I-24244, USCG 164-009, and all pertinent automotive specifications.

Insulbatte ® / Tempmat® Bonded Glass Fiber Mat

Style

	1006	1050	1031	1032	1033	1034
Thickness (in)	1/4	1/2	1	1	1	3/4
Weight (oz/sqft)	4	6	15	15	17	14
Width (in)	60	60	60	60	60	60
Roll Length (ft)	150	75	45	45	45	45
Area (sqft/roll)	750	375	225	225	225	225
Approx. Roll Weight (lb)	180	140	221	221	221	221

Note: Width and roll length can be made-to-order. All values above are nominal values. S/1036 1" is double needled.

Physical Properties

Service Temperature.....	Up to 1200°F
Fire Resistance.....	Incombustible
Density (Approximate).....	9 lb/cft
Loss in Weight at 1200°F.....	Up to 2%
Moisture Absorption.....	Negligible

19

Thermal Conductivity

"K" Value at 9.1 lb/cft

At 300°F.....	0.40 K
At 500°F.....	0.50 K
At 700°F.....	0.65 K

K = (btu/sqft/hr/ $^{\circ}$ F/in)

R-values available upon request

Fiberglass Fabric Applications

Fiberglass fabrics are used in a wide range of industrial applications. The high strength, dimensional stability, design flexibility, and electrical properties are some of the characteristics that ensure optimal performance and economy with this highly engineered material.

Coated and Lamination Fabrics

Fiberglass fabrics provide high strength, dimensional stability, fire resistance, and low cost making them ideal for use as reinforcements in foils, plastic films, and other protective coatings. Fiberglass fabrics can be found in window shades, vapor barriers, movie screens, packaging tapes, awnings, protective clothing, gaskets, conveyor belts and countless other products that improve our lives daily.

Construction

Fiberglass fabrics can found in everything from industrial strength tapes to wall-board and bridge construction.

Fiberglass scrims are used to reinforce paper and films used for insulation facings, to provide dimensional stability to asphalt roofing and roadway materials. In architectural applications fiberglass fabrics provide strength and sustainability to the exterior facades of commercial buildings, and reinforcement for commercial roofing systems.

Fiberglass reinforced material are often used to cover out recreational facilities, among other structures.

Electrical

Fiberglass fabrics offer outstanding performance to the electrical industry. Fiberglass fabrics are used in electrical laminates, antennas and printed circuit boards because they offer high strength, dimensional stability, temperature resistance and excellent electrical properties for low cost. Fiberglass fabrics may be coated with epoxies, silicones, rubber, PTFE, polyimides, neoprene and many other polymers. Fiberglass fabrics can be found in printed circuit boards, antennas, high voltage generators, transformers, switches, cables and many other electrical applications.

Structural Applications

Due to their high strength, dimensional stability and low cost, fiberglass fabrics are often used in the aerospace, automotive industries for structural applications. Fiberglass fabrics are used as reinforcements in highly engineered composite materials in many of the worlds leading aircraft, automobiles, buildings, bridges, roadways and sporting goods, among countless other applications.

Thermal Insulation

Strength retention at high temperatures, corrosion and fire resistance and ease of handling make fiberglass fabrics an important material for thermal insulation. The U.S. Navy and commercial shipyards use fiberglass almost exclusively for pipe lagging and for thermal pad cover applications.

Fiberglass Fabric Finishes

Fiberglass fabrics are available with a variety of finishes and treatments.

Greige

Loom state fabric that includes organic binders and size applied to the yarn prior to weaving.

Carmelized

Partially heat cleaned fabric in which the organic binders and size are only partially volatilized.

Finished	Fully heat cleaned fabric treated with a coupling agent that provide the a chemical bond between the fiberglass surface and various matrix resins.
APS Technology	Treatment process that spreads and flattens both the warp and fill yarns. Provides uniform fiber distribution, thinner fabrics with flatter knuckles, smoother surface and improved mechanical properties.
Weave Set	Also called tie coats, finishes added to greige fabrics to improve weave stability and adhesion of various coatings to the fabric.

The following pages offer recommended finishes based on end use market application, including Electrical Laminates, Aerospace and Advanced Composites, Boat and Tooling, Surf, EIFS and Construction, Filtration, Insulation and Glastex, as well as other special finishes and processes for customer directed end use applications.

Finishes for Electrical Laminates

A partial list of the available finishes is presented, for additional finishes or to develop an application specific finish, please contact JPSCM.

Finish Code	Matrix Resin	Performance Features
CS-309	Polyimide	Designed for polyimide resins.
CS-616	Melamine	Silane finish applied to partially heat cleaned fabrics. Fabric has a light tan cast.
CS-718	Epoxy	Proprietary silane finish that provides good moisture resistance.

Finishes for Electrical Laminates (cont.)

A partial list of the available finishes is presented, for additional finishes or to develop an application specific finish, please contact JPSCM.

Finish Code	Matrix Resin	Performance Features
CS-745	Polyimide, Epoxy BT, Cynate Ester	Multifunctional finish designed for lead free and CAF resistant applications.
Z-6040	Epoxy	Offers good resistance to blistering and measling in solder dip or etching solutions.
9827	Epoxy, Polyimide Bismaleimide	Blended silane finish for a broad spectrum of high performance resin systems.
9837	Vinyl, Polyester Vinyl Ester, Epoxy Bismaleimide	Silane finish with vinyl functionality for resins cured via vinyl addition.

22

Finishes for Aerospace, Conform & Advanced Composites

A partial list of the available finishes is presented, for additional finishes or to develop an application specific finish, please contact JPSCM.

Finish Code	Matrix Resin	Performance Features
CS-310	Epoxy	Recommended for advanced composite and aerospace applications
CS-550	Polyester, Epoxy, Phenolic	Volan/Silane finish for structural applications.

Finishes for EIFS

Flexmesh™ Name	Performance Features
Standardflex™	High impact strength for high maintenance areas.
Duraflex™	Good "hand" for flat wall work.
Ultraflex™	Excellent for detail and high end work.

Finishes for Aerospace, Conform & Advanced Composites (cont.)

Finish Code	Matrix Resin	Performance Features
S-550	Epoxy, Phenolic, Melamine	Good conformability and hand. Fabric has a light green cast
CS-616	Melamine	Silane finish applied to partially heat cleaned fabrics. Fabric has a light tan cast.
CS-724	Epoxy	Specifically developed finish for structural composites.
CS-767	Polyimide, BT Epoxy	Multifunctional capacity for use with all major resin systems.
933 HTS	Polyimide, Epoxy Phenolic, BT	Excellent high temperature and moisture resistance.
S-977	Epoxy, Polyester Phenolic, Melamine	Specifically developed finish for structural composites.
1059 HT	Polyimides	Designed for high temperature (700°F) polyimide systems.
1069 HT	Polyimide, BT, Cynate Ester,	Recommended for low Dk, high Tg resin systems.
A-1100	Phenolic, Epoxy	Reactive amino silane.
Z-6040	Epoxy	Good wet strength retention and electrical properties.

Finishes for Boat & Tooling / Surf

A partial list of the available finishes is presented, for additional finishes or to develop an application specific finish, please contact JPSCM.

Finish Code	Matrix Resin	Performance Features
S-910	Polyester	Laminates have good clarity & high wet strength retention.
S-912	Polyester Epoxy	Recomended for marine and surf applications.
F3	Polyester	Traditional Volan-A type-finish.
F16	Epoxy Polyester	Recomended for advanced composite, marine and aerospace applications.
Great White	Polyester	High mechanical properties, long term wet strength retention, clarity, drapability, and fast wet out.
Volan	Polyester, Epoxy	Methacrylate Chromium complex finish. Laminates have a green cast.

24

Finishes for EIFS

A partial list of the available finishes is presented, for additional finishes or to develop an application specific finish, please contact JPSCM.

JPSCM EIFS finishes are designed to provide superior performance and enhanced workability in residential and commercial EIFS construction applications. Our Flexmesh™ finishes feature both superior impact strength for maintenance areas and excellent hand for ease of application in intricate detail areas. All Flexmesh™ finishes are self-extinguishing and alkali resistant, certified to ASTM standards D-3659 and E-2098.

Finishes for Filtration Fabrics

A partial list of the available finishes is presented, for additional finishes or to develop an application specific finish, please contact JPSCM.

Finish Code	Performance Features
1200 Acid-Flex™	Excellent acid resistance and high flexibility at elevated temperature. The finish is hydrophobic, oleo phobic, and is dust and dirt repellent.
1300 Acid-Bond™	Designed for lamination to PTFE films Excellent acid resistance and high flexibility at elevated temperature.
1400 Ultra-Flex™	Excellent chemical and heat resistance. Ideal for finishing filtration bags in baghouse applications.
1625	Excellent acid resistance and high flexibility at elevated temperture. Laminatable with PTFE membranes.
9892	Tritemp finish - special formula blend of silicone, fluorocarbon & graphite for maximum high temperature lubricity of glass fabrics.
9963	Teflon B finish - A fluorocarbon finish with excellent chemical resistance and high temperature lubricity. The finish has a soft hand and meets the challenges of many dust collection and air pollution control problems.
PTFE	A fluorocarbon finish with excellent chemical resistance and high temperature lubricity. The finish has a soft hand and meets the challenges of many dust collection and air pollution control problems.

Finishes for Insulation & GlasTex Fabrics

A partial list of the available finishes is presented, for additional finishes or to develop an application specific finish, please contact JPSCM.

Finish Name	Performance Features
9383	Treatment to enhance hand and weave setting characteristics.
9480	Aluminum foil is laminated to GlasTex fabrics with a fire-retardant thermoplastic adhesive. This vapor barrier laminate is specified for shipboard usage as flange fuel spray shields.
9752	Weave set finish for fabric stability and reduction of fiber irritation.
9845	A low smoke treatment over 9383 finish that provides good weave stability.
9957	Dyed red to Federal Color #31158 to indicate a nonasbestos bearing product.
9987	A treatment over 9383 finish that provides oil and water repellency.
9995	GlasTex fabrics are impregnated with a water-activated adhesive for application as a rewettable lagging material. After drying, normal sizing and painting is recommended for permanency.

Other Finishes & Special Procedures

A partial list of the available finishes is presented, for additional finishes or to develop an application specific finish, please contact JPSCM.

Finish Name	Performance Features
P-44	Thermomechanical cleaning process. Fabrics possess superior tensile strengths and are white in color.
111	Similar to 210 heat cleaning but is distinguished by lower levels of remaining organic binder.
112	Fully heat cleaned fabric.
210	Carmelized fabric in which organic binders are partially volatilized.
9583 Scour	Continuous chemical treatment for size reduction.
Greige	Loom state fabric, no additional fabric finish processing.
NPH	Neutral pH finish for silicone laminates.

Electrical Fiberglass Fabrics

Style	Weave	Count	Count	Warp Yarn	Warp Yarn	Fill Yarn	Weight (oz/yd ²) (g/m ²)	Thickness (mils) (mm)	Strength (lbf/in) Warp Fill		
101	Plain	75	75	ECD 1800 1/0	ECD 1800 1/0	0.48	16	1.0	0.02	40	40
104	Plain	60	52	ECD 900 1/0	ECD 1800 1/0	0.55	19	1.1	0.03	40	15
106	Plain	56	56	ECD 900 1/0	ECD 900 1/0	0.72	24	1.3	0.03	45	40
108	Plain	60	47	ECD 900 1/2	ECD 900 1/2	1.40	48	2.4	0.06	70	40
112	Plain	40	39	ECD 450 1/2	ECD 450 1/2	2.08	71	3.6	0.09	100	90
113	Plain	60	64	ECD 450 1/2	ECD 900 1/2	2.39	81	3.4	0.09	120	70
116	Plain	60	58	ECD 450 1/2	ECD 450 1/2	3.09	105	4.0	0.10	125	120
117	Plain	54	39	ECD 450 1/2	ECD 450 1/2	2.40	81	2.6	0.07	100	90
119	Plain	54	50	ECD 450 1/2	ECD 450 1/2	2.71	92	3.6	0.09		
1035	Plain	66	68	ECD 900 1/0	ECD 900 1/0	0.88	30	1.1	0.03		
1037	Plain	70	73	ECC 1200 1/0	ECC 1200 1/0	0.68	23	1.1	0.03	45	40
1044	Plain	44	44	ECDE 100 1/0	ECDE 100 1/0	5.10	171	5.6	0.14		
1047	Plain	47	47	ECDE 100 1/0	ECDE 100 1/0	5.44	184	5.8	0.15	110	130
1065	Plain	56	56	ECD 450 1/0	ECD 900 1/0	1.08	37	2.1	0.05		
1067	Plain	70	70	ECD 900 1/0	ECD 900 1/0	0.91	31	1.4	0.04		
1067 APS	Plain	70	70	ECD 900 1/0	ECD 900 1/0	0.88	30	1.3	0.03		
1070	Plain	60	35	ECD 450 1/0	ECD 900 1/0	1.01	34	1.8	0.05	70	20

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. For additional information, please contact a Technical Service Representative, (864) 224-3506.

Electrical Fiberglass Fabrics (cont)

Style	Weave	Count	Warp	Yarn	Fill	Weight (oz/yd ²)	Thickness (mils)	Strength (lbf/in)	Warp	Fill
			Warp	Fill						
1078	Plain	54	54	ECD 450 1/0	ECD 450 1/0	1.41	48	1.7	0.04	
1080	Plain	60	47	ECD 450 1/0	ECD 450 1/0	1.38	47	2.1	0.05	120 90
1081	Plain	70	60	ECD 450 1/0	ECD 450 1/0	1.72	59	2.4	0.06	80 20
1125	Plain	40	39	ECD 450 1/2	ECG 150 1/0	2.65	90	3.6	0.09	120 80
1131	Plain	120	52	ECD 450 1/0	ECG 150 1/0	3.65	124	5.0	0.13	140 150
1141	Plain	32	21	ECDE 75 1/0	ECDE 75 1/0	4.20	142	7.0	0.18	250 125
1142	Plain	31	21	ECG 37 1/0	ECG 37 1/0	8.37	285	11.1	0.28	400 290
1161	Plain	100	42	ECD 450 1/0	ECDE 100 1/0	3.87	131	4.8	0.12	125 180
1165	Plain	60	52	ECD 450 1/2	ECG 150 1/0	3.57	123	4.0	0.10	125 160
1167	Plain	60	55	ECD 450 1/2	ECG 150 1/0	3.82	129	4.4	0.11	170 250
1180	Plain	60	50	ECD 450 1/0	ECD 450 1/0	1.44	49	2.3	0.06	
1280/1086	Plain	60	60	ECD 450 1/0	ECD 450 1/0	1.55	53	2.2	0.06	120 100
1280 APS	Plain	60	60	ECD 450 1/0	ECD 450 1/0	1.54	53	2.1	0.05	100 100
1316	Plain	61	61	ECD 225 1/0	ECD 225 1/0	3.18	108	4.0	0.10	
1500	Plain	50	20	ECD 450 1/0	ECD 450 1/0	0.92	31	2.2	0.06	100 40
1501	Plain	49	42	ECE 110 1/0	ECE 110 1/0	4.84	164	5.9	0.15	260 250
1502	Plain	52	50	ECE 125 1/0	ECE 150 1/0	4.78	148	5.9	0.15	

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. For additional information, please contact a Technical Service Representative, (864) 224-3506.

Electrical Fiberglass Fabrics (cont.)

Style	Weave	Count	Count	Warp	Yarn	Fill	Yarn	Weight (oz/yd ²)	(g/m ²)	Thickness (mm)	Strength (lbf/in)	Warp	Fill
1503	Plain	64	46	ECDE	150 1/0	ECD	150 1/0	4.36	148	5.3	0.14		
1504	Plain	60	50	ECDE	150 1/0	ECDE	150 1/0	4.36	148	4.9	0.13		
1634	Plain	51	30	ECG	150 1/0	ECG	150 1/0	3.11	105	3.7	0.10		
1647	Plain	51	30	ECG	150 1/0	ECE	110 1/0	3.55	121	4.1	0.11		
1649	Plain	51	38	ECG	150 1/0	ECE	110 1/0	4.01	136	4.7	0.12		
1651	Plain	51	27	ECG	150 1/0	ECG	67 1/0	4.31	146	5.3	0.14		
1652	Plain	52	52	ECG	150 1/0	ECG	150 1/0	4.09	138	4.5	0.11	220	210
1657	Plain	51	32	ECG	150 1/0	ECG	150 1/0	2.82	96	3.8	0.10		
1674	Plain	40	32	ECDE	150 1/0	ECDE	150 1/0	2.84	97	4.0	0.10		
1676	Plain	56	48	ECDE	150 1/0	ECDE	150 1/0	4.06	138	4.6	0.14	250	190
1677	Plain	44	38	ECG	150 1/0	ECG	150 1/0	3.15	105	3.7	0.09		
1678	Plain	40	40	ECG	150 1/0	ECG	150 1/0	3.20	108	4.3	0.11	200	200
2112	Plain	40	39	ECE	225 1/0	ECE	225 1/0	2.04	69	3.2	0.08	90	80
2113	Plain	60	56	ECE	225 1/0	ECD	450 1/0	2.30	78	3.1	0.08	195	75
2114	Plain	56	48	ECE	225 1/0	ECE	225 1/0	2.69	91	3.3	0.08	190	160
2116	Plain	60	58	ECE	225 1/0	ECE	225 1/0	3.06	104	3.7	0.09	125	120
2117	Plain	66	55	ECE	225 1/0	ECE	225 1/0	3.18	108	3.7	0.09		

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. For additional information, please contact a Technical Service Representative, (864) 224-3506.

Electrical Fiberglass Fabrics (cont)

Style	Weave	Count	Warp	Warp Yarn	Fill Yarn	Fill (oz/yd ²) (g/m ²)	Weight (mils)	Thickness (mm)	Strength (lbf/in)	Warp Fill	
2119	Plain	54	50	ECE 225 1/0	ECE 225 1/0	2.66	90	3.4	0.09	140	110
2125	Plain	40	39	ECE 225 1/0	ECE 150 1/0	2.54	88	3.6	0.09	120	120
2157	Plain	60	35	ECE 225 1/0	ECG 75 1/0	4.36	148	5.1	0.13	130	200
2165	Plain	60	52	ECE 225 1/0	ECE 150 1/0	3.55	122	4.0	0.10	75	75
2166	Plain	60	38	ECE 225 1/0	ECG 75 1/0	4.60	155	5.5	0.14	185	300
2313	Plain	60	64	ECE 225 1/0	ECD 450 1/0	2.40	81	3.3	0.08	140	140
2316	Plain	61	61	ECE 225 1/0	ECE 225 1/0	3.13	106	3.8	0.10		
2319	Plain	60	49	ECE 225 1/0	ECE 225 1/0	2.72	92	3.4	0.09		
2875	Plain	40	28	ECE 150 1/0	ECE 150 1/0	2.70	91	4.5	0.11	175	100
3070	Plain	70	70	ECDE 300 1/0	ECDE 300 1/0	2.43	82	3.2	0.08	180	160
3080	Plain	51	30	ECDE 300 1/0	ECDE 300 1/0	1.57	53	2.3	0.06		
3116	Plain	58	58	ECD 450 1/2	ECD 225 1/0	3.10	105	3.5	0.09	150	140
3132	Plain	60	60	ECD 450 1/0	ECE 225 1/0	2.32	79	2.8	0.07		
3313	Plain	60	62	ECDE 300 1/0	ECDE 300 1/0	2.48	82	3.3	0.08	160	140
3323	Plain	60	46	ECDE 300 1/0	ECE 225 1/0	2.4	81	3.4	0.09		
6060	Plain	60	60	ECDE 600 1/0	ECDE 600 1/0	1.15	39	1.9	0.05	75	75
7196	Plain	44	33	ECG 67 1/0	ECG 67 1/0	6.72	230	7.9	0.2		

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. For additional information, please contact a Technical Service Representative, (864) 224-3506.

Electrical Fiberglass Fabrics (cont)

Style	Weave	Count Warp	Count Fill	Warp Yarn	Fill Yarn	Weight (oz/yd ²) (g/m ²)	Thickness (mils) (mm)	Strength (lbf/in) Warp	Fill
7255	Plain	37	37	ECG 75 1/0	ECG 75 1/0	6.00	203	7.0	0.18
7618	Plain	43	18	ECG 75 1/0	ECG 75 1/0	4.95	168	6.5	0.17
7624	Plain	44	24	ECG 75 1/0	ECG 75 1/0	5.44	184	6.4	0.16
7626	Plain	34	32	ECG 75 1/0	ECG 75 1/0	5.40	183	6.0	0.15
7627	Plain	44	30	ECG 75 1/0	ECG 75 1/0	5.87	199	6.5	0.17
7628	Plain	44	31	ECG 75 1/0	ECG 75 1/0	6.00	203	6.8	0.17
7629	Plain	44	34	ECG 75 1/0	ECG 75 1/0	6.19	210	7.1	0.18
7630	Plain	31	30	ECG 75 1/0	ECG 75 1/0	4.84	164	6.0	0.15
7635	Plain	44	29	ECG 75 1/0	ECG 50 1/0	6.85	232	7.9	0.20
7637	Plain	44	22	ECG 75 1/0	ECG 37 1/0	6.73	228	8.7	0.22
7640	Plain	44	34	ECG 75 1/0	ECG 50 1/0	7.60	258	9.8	0.25
7642	Plain	44	20	ECG 75 1/0	ECG 37 1/0 text	6.72	228	10.0	0.25
7650	Plain	30	23	ECG 75 1/0	ECG 50 1/0	6.12	208	7.5	0.19
7652	Plain	32	32	ECG 50 1/0	ECG 50 1/0	7.60	258	8.7	0.22
7660	Plain	30	30	ECG 75 1/0	ECG 75 1/0	4.73	160	5.9	0.15
7667	Plain	44	31	ECG 67 1/0	ECG 67 1/0	6.54	222	7.2	0.19
76290	Plain	44	31	ECG 75 1/0	ECG 67 1/0	6.27	213	7.0	0.18

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. For additional information, please contact a Technical Service Representative, (864) 224-3506.

Aerospace, Conform, and Advanced Composite Fabrics

Style	Weave	Count	Warp Yarn	Fill Yarn	Fill	Weight (oz/yd ²) (g/m ²)	Thickness (mils) (mm)	Strength (lbf/in) Warp	Fill
120	4H Satin	60	58	ECD 450 1/2	ECD 450 1/2	3.16	107	3.5	0.09
138	4H Satin	65	60	ECE 225 1/2	ECE 225 1/2	6.66	226	6.6	0.17
139	4H Satin	64	60	ECD 225 1/2	ECD 225 1/2	6.50	220	6.5	0.165
162	Plain	28	16	ECE 225 2/5	ECE 225 2/5	12.01	407	13.8	0.35
220	4H Satin	60	58	ECE 225 1/0	ECE 225 1/0	3.22	109	3.5	0.09
232	Plain	48	30	ECG 37 1/0	ECG 75 1/2	12.60	427	14.6	0.37
403	4H Satin	54	50	ECG 75 1/0	ECG 75 1/2	8.40	285	8.9	0.23
520	Plain	18	17	ECG 75 1/3	ECG 75 1/3	8.70	295	9.1	0.23
880	4H Satin	50	71	ECDE 150 1/0	ECDE 150 1/0	5.70	193	6.0	0.15
993	Plain	38	67	ECD 900 1/0	ECD 900 1/0	0.71	24	1.2	0.03
1071	Plain	60	30	ECD 900 1/0	ECD 900 1/0	0.60	20	1.2	0.03
1076	Plain	60	25	ECD 450 1/0	ECD 900 1/0	1.60	54	2.9	0.07
1188	4H Satin	47	30	ECH 25 1/0	ECG 150 1/0	12.63	428	11.8	0.30
1297	Plain	50	20	ECD 450 1/0	ECD 900 1/0	0.82	28	2.3	0.06
1299	Plain	50	20	ECD 450 1/0	ECD 450 1/0	0.92	31	2.2	0.06
1507	Leno	20	10	ECG 75 1/3	ECG 37 1/3	9.80	332	25.0	0.64
1526	Plain	35	32	ECG 150 1/2	ECG 150 1/2	5.33	181	5.9	0.15

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. For additional information, please contact a Technical Service Representative, (864) 224-3506.

Aerospace, Conform, and Advanced Composite Fabrics (cont.)

Style	Weave	Count	Count	Warp	Yarn	Fill	Yarn	Weight (oz/yd ²)	(g/m ²)	Thickness (mils)	(mm)	Strength Warp	Fill
1527	Plain	17	17	ECG 150 3/3	ECG 150 3/3	12.03	417	15.0	0.38	430	430		
1530	Plain	20	18	ECG 150 3/3	ECG 150 3/3	13.14	201	14.4	0.37	500	450		
1543	4H Satin	49	30	ECG 75 1/2	ECE 225 1/0	8.60	292	8.0	0.20	500	60		
1557	4H Satin	57	30	ECG 150 1/2	ECE 225 1/0	5.26	178	5.5	0.14	350	60		
1576	12H Satin	120	24	ECG 150 1/2	ECG 150 1/0	10.60	359	11.1	0.28	400	80		
1581	8H Satin	57	54	ECG 150 1/2	ECG 150 1/2	8.90	302	8.0	0.22	350	330		
1582	8H Satin	60	56	ECG 150 1/3	ECG 150 1/3	14.06	477	13.4	0.34	525	500		
1583	8H Satin	54	48	ECG 75 1/2	ECG 75 1/2	16.10	546	16.0	0.41	650	590		
1584	8H Satin	44	35	ECG 150 4/2	ECG 150 4/2	26.40	895	25.5	0.65	950	800		
1597	Plain	30	30	ECG 37 1/4	ECG 37 1/4	38.50	1305	44.0	1.12	900	900		
1608	Plain	30	26	ECG 150 1/0	ECG 150 1/0	2.22	75	3.5	0.09	160	130		
1609	Plain	32	10	ECG 150 1/0	ECD 450 1/0	1.48	50	2.6	0.07	120	15		
1610	Plain	32	28	ECG 150 1/0	ECDE 150 1/0	2.30	78	3.5	0.09	115	100		
1611	Plain	32	28	ECG 150 1/0	ECG 150 1/0	2.42	82	4.0	0.10	160	150		
1617	Plain	30	14	ECG 150 1/0	ECG 75 1/0	2.31	78	6.8	0.17	105	50		
1620	Plain	20	20	ECG 150 1/0	ECG 150 1/0	1.60	54	3.5	0.09	70	70		
1628	Plain	40	28	ECDE 150 1/0	ECDE 150 1/0	2.69	91	3.4	0.09	70	70		

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. For additional information, please contact a Technical Service Representative, (664) 224-3506.

Aerospace, Conform, and Advanced Composite Fabrics (cont.)

Style	Weave	Count Warp	Count Fill	Warp Yarn	Fill Yarn	Weight (oz/yd ²) (g/m ²)	Thickness (mils) (mm)	Strength (lbf/in) Warp	Fill			
1632	Plain	30	32	ECG 150 1/0	ECG 75 1/0	3.75	127	4.7	0.12	150	360	
1636	Plain	40	24	ECDE 150 1/0	ECDE 150 1/0	2.60	88	4.0	0.09	190	130	
1658	Plain	20	10	ECG 150 1/0	ECG 150 1/0	1.60	54	4.0	0.10	70	70	
1669	Plain	60	12	ECG 150 1/0	ECD 450 1/0	2.50	85	3.7	0.09	300	20	
1680	8H Satin	72	70	ECDE 150 1/0	ECDE 150 1/0	5.70	193	6.1	0.15	320	600	
1884	8H Satin	44	35	ECK 18 1/0	ECK 18 1/0	25.40	861	26.0	0.66	950	800	
1938	8H Satin	45	36	ECK 18 1/0	ECG 37 1/2	26.76	907	27.0	0.69	880	580	
3582	8H Satin	60	56	ECG 50 1/0	ECG 50 1/0	13.70	465	14.4	0.37	900	850	
3743	4H Satin	49	30	ECG 37 1/0	ECE 225 1/0	8.45	287	8.5	0.22	600	60	
3783	8H Satin	54	48	ECG 37 1/0	ECG 37 1/0	16.40	556	16.0	0.41	550	490	
3784	8H Satin	45	36	ECG 37 1/2	ECG 37 1/2	26.42	896	25.9	0.66	915	830	
3788	12H Satin	42	36	ECG 37 1/2	ECG 37 1/4	52.30	1774	46.7	1.19	1500	1300	
3884	8H Satin	46	36	ECDE 37 1/2	ECDE 37 1/2	26.55	901	27.5	0.70	875	740	
4180	8H Satin	80	100	SCD 450 1/0	SCD 450 1/0	2.41	82	3.0	0.08	75	100	
4526	2x2 Basket	36	34	SCG 75 1/0	493 SCG 75 1/0	493	5.60	190	6.0	0.15	200	180
6580	8H Satin	72	72	SCG 150 1/2	SCG 150 1/2	5.70	193	6.1	0.15	300	250	
6581	8H Satin	56	54	SCG 150 1/2	SCG 150 1/2	8.75	297	10.4	0.26	400	325	

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. For additional information, please contact a Technical Service Representative, (864) 224-3506.

Aerospace, Conform, and Advanced Composite Fabrics (cont.)

Style	Weave	Count	Count	Warp	Yarn	Fill	Yarn	Weight (oz/yd ²)	(g/m ²)	Thickness (mils)	(mm)	Strength (lbf/in)	Warp	Fill
6781	8H Satin	57	54	SCG 75 1/0	SCG 75 1/0	8.90	301	9.0	0.23	400	325			
6781 (HT)	8H Satin	57	57	SCG 75 1/0	933	SCG 75 1/0	933	9.00	305	9.7	0.25	530	530	
7581	8H Satin	57	54	ECG 75 1/0	ECG 75 1/0	8.95	303	9.0	0.23	300	280			
7597	Double Satin	30	30	ECG 37 1/4	ECG 37 1/4	38.60	1309	40.6	1.03	900	800			
7698	Conform	44	32	ECG 75 1/0	ECG 75 1/0	6.10	206	6.5	0.17	375	250			
7645	8H Satin	46	42	ECG 75 1/2	ECG 75 1/2	14.43	489	13.5	0.34	560	490			
7715	Modified Plain	80	18	ECG 75 1/0	ECG 150 1/0	7.30	248	7.7	0.20	450	80			
7725	2/2 Twill	54	18	ECG 75 1/0	ECG 25 1/0	8.80	298	9.3	0.24	300	300			
7781	8H Satin	57	54	ECDE 75 1/0	ECDE 75 1/0	8.81	299	8.6	0.22	570	450			
7791F	Conform	58	55	ECDE 75 1/0	ECDE 75 1/0	8.95	303	9.0	0.23	350	300			
8000	Plain	81	8	ECG 75 1/2	Dacron R-14	13.09	444	11.8	0.30	950	10			
8800	4H Leno 17(8)	8	ECG 150 1/0-ECG 37 1/3	ECG 37 1/3	8.25	280	16.4	0.42	290	310				
16781	8H Satin	58	55	SCG 75 1/0	SCG 75 1/0	9.00	305	9.5	0.24	500	350			
16791	Conform	58	55	SCG 75 1/0	SCG 75 1/0	9.00	305	9.0	0.23	125	125			
17645	Satin	46	42	SCG 75 1/2	SCG 75 1/2	13.90	471	13.0	0.33	700	600			
26781	Satin	56	53	SCG 75 1/0	SCG 75 1/0	8.50	288	9.0	0.23	425	350			
85392	Plain	44	30	SCG 75 1/0	T-5043	6.00	203	8.5	0.21	300	75			

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. For additional information, please contact a Technical Service Representative, (864) 224-3506.

Fiberglass Reinforced Plastics (FRP) - Boat & Tooling Fabrics

Style	Weave	Count	Count	Warp	Yarn	Fill	Yarn	Weight (oz/yd ²)	(g/m ²)	Thickness (mils)	(mm)	Strength Warp	Fill
1064	Plain	18	21	ECG 75 1/2	ECG 150 1/2	4.68	159	6.3	0.16	220	150		
1500	Leno	20	10	ECG 75 1/3	ECG 37 1/3	10.30	349	25.0	0.64	300	310		
1522	Plain	24	22	ECG 150 1/2	ECG 150 1/2	3.67	124	4.8	0.12	130	120		
1528	Plain	42	32	ECG 150 1/2	ECG 150 1/2	5.97	201	6.5	0.17	250	200		
1562	Leno	30	16	ECG 150 1/0	ECG 150 1/0	1.82	62	4.5	0.11	75	50		
1564	Plain	20	18	ECG 37 1/2	ECG 37 1/2	12.50	424	14.0	0.36	400	350		
1579	Plain	30	16	ECG 150 1/2	ECG 75 1/0	3.68	125	4.5	0.11	120	160		
1614	Leno	30	14	ECG 150 1/0	ECG 75 1/0	2.33	79	5.0	0.13	75	85		
1659	Leno	20	10	ECG 150 1/0	ECG 75 1/0	1.60	54	4.2	0.11	65	70		
1800	Plain	16	14	ECK 18 1/0	ECK 18 1/0	9.80	332	12.0	0.30	330	300		
2025	Plain	20	14	ECDE 37 1/3 Text	ECDE 37 1/3 Text	17.17	582	26.1	0.66	300	225		
2523	Plain	28	20	ECH 25 1/0	ECH 25 1/0	11.65	395	13.0	0.33	400	350		
2532	Plain	16	14	ECH 25 1/0	ECH 25 1/0	7.25	246	10.0	0.25	300	280		
3731	Plain	17	15	ECG 37 1/0	ECG 37 1/0	5.21	177	5.5	0.14	250	200		
3733	Plain	18	18	ECG 37 1/0	ECG 37 1/0	5.80	197	8.0	0.20	200	175		
3764	Plain	20	18	ECG 37 1/0	ECG 37 1/0	12.00	407	15.5	0.39	250	200		
4522	Plain	24	22	SCG 150 1/2	SCG 150 1/2	3.64	123	5.1	0.13	140	125		

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. For additional information, please contact a Technical Service Representative, (864) 224-3506.

Fiberglass Reinforced Plastics (FRP) - Boat & Tooling Fabrics (cont.)

Style	Weave	Count	Count	Warp	Yarn	Fill	Weight	Thickness	Strength (lbf/in)				
	Warp	Fill		Yarn		Yarn	(oz/yd ²) (g/m ²)	(mils) (mm)	Warp Fill				
4527	Plain	24	22	SCG 75 1/0	993	SCG 75 1/0	993	3.70	125	4.0	0.10	140	130
4533	Plain	18	18	SCG 75 1/2		SCG 75 1/2	5.92	201	7.4	0.19	270	300	
4700	Plain	14	13	ECG 37 1/0		ECDE 75 1/2	4.40	149	4.7	0.14	160	150	
4797	Leno	28	14	ECG 75 1/0		ECG 75 1/2	4.63	157	7.4	0.19	170	170	
4985	Plain	18	22	SCG 75 1/2		SCG 150 1/2	4.70	159	6.2	0.16	320	170	
6543	4H Satin	48	30	SCG 75 1/2		ECE 225 1/0	8.50	288	9.1	0.23	600	60	
6557	4H Satin	57	30	SCG 150 1/2		ECE 225 1/0	5.40	183	5.8	0.15	350	60	
7500	Plain	16	14	ECG 37 1/2		ECG 37 1/2	9.60	325	11.0	0.28	300	250	
7510	Plain	18	21	ECG 75 1/2		ECG 150 1/2	4.50	152	7.0	0.18	125	75	
7520	Plain	18	18	ECG 75 1/3		ECG 75 1/3	8.68	294	12.0	0.30	330	330	
7531	Plain	23	14	ECG 75 1/2		ECG 75 1/2	5.50	186	9.0	0.23	160	110	
7532	Plain	16	14	ECG 75 1/3		ECG 75 1/3	7.23	245	10.0	0.25	250	200	
7533	Plain	18	18	ECG 75 1/2		ECG 75 1/2	5.85	198	8.0	0.20	220	220	
7537	Mod. Crow.	56	25	ECG 75 1/0		ECG 37 1/0	8.50	288	8.5	0.22	225	175	
7544	2 End Plain	28	14	ECG 37 1/2		ECG 37 1/4	18.20	617	20.0	0.51	500	500	
7580	Plain	24	14	ECG 75 1/2		ECG 37 1/0	6.20	210	7.8	0.20	310	280	
7587	Mock Leno	40	20	ECG 37 1/2		ECG 37 1/2	20.50	695	30.0	0.76	750	450	

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. For additional information, please contact a Technical Service Representative, (864) 224-3506.

Filtration Fabrics

Style	Weave	Count Warp	Count Fill	Warp Yarn	Fill Yarn	Weight (oz/yd ²) (g/m ²)	Permeability (in)	Strength (lbf/in) Warp Fill
417	Crowfoot	54	52	ECDE 75 1/0	ECDE 75 1/0	8.30	281	8-18 375 325
419	3x1 Twill	53	54	ECDE 75 1/0	ECDE 75 1/0	8.40	284	35-55 350 325
601	3x1 Twill	54	30	ECDE 150 1/2	ECDE 150 1/4 Text	9.25	313	60-90 320 120
602	3x1 Twill	53	30	ECDE 150 1/2	ECDE 75 1/2 Text	9.50	322	75-110 325 100
647	Mod Twill	47	30	ECDE 37 1/0 + DE 75 1/0x3	Text	15.30	518	25-50 350 325
	TOP BEAM			ECDE 37 1/0 Text				
651	3x1 Twill	44	24	ECDE 37 1/0	ECDE 75 1/0 + ECDE 75 1/2 Text	13.00	440	60-90 575 350
3602	3x1 Twill	54	30	ECDE 75 1/0	ECDE 150 1/0 + ECDE 50 1/0 Text	8.90	301	65-95 350 225
3626	3x1 Twill	48	24	ECDE 37 1/0	ECDE 75 1/3 Text	13.40	454	45-80 550 200
3635	Mod Twill	44	22	ECDE 37 1/0	ECDE 75 1/4 Text	14.50	491	50-80 500 250
3636	3x1 Twill	44	22	ECDE 37 1/0	ECDE 75 1/4 Text	14.50	491	45-80 550 250
7574	Special	48	40	ECDE 75 1/2	ECDE 75 1/0x2 Text	16.50	559	80-120
7576	Special	48	40	ECDE 75 1/2	ECDE 75 1/0x4 Text	21.50	728	40-80 500 500

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. For additional information, please contact a Technical Service Representative, (864) 224-3506.

Filtration Finished Fabrics

Filtration Finished Fabrics									
Style	Finish	Loss on Ignition	Permeability (in)	Mullen Burst	Weight (oz/yd ²) (g/m ²)	MIT Flex (After Acid)			Strength (lbf/in) Warp Fill
647	Teflon B	10.0 min.	25-55	600	15.8-17.8	535-603	-	-	300 250
651	Tritemp	1.7 min.	35-65	600	13.50	457	-	-	450 200
651	Teflon B	10.0 min.	30-60	600	14.00	474	-	-	650 300
651	Ultra-Flex	7.0 min.	35-60	600	12.9-14.4	437-487	200k+	16k+	500 250
651	Acid-Flex	5.0 min.	25-65	500	14.00	474	100k+	10k+	400 200
651	1625-Acid Resist	5.0 min.	35-60	600	12.9-14.2	437-480	-	-	650 300
3602	Tritemp	1.7 min.	40-60	500	9.00	305	-	-	250 175
3602	Teflon B	10.0 min.	30-60	500	10.00	339	-	-	325 200
3602	Ultra-Flex	7.0 min.	25-60	500	9.50	322	200k+	20k+	250 175
3602	Acid-Flex	7.0 min.	25-60	500	9.50	322	100k+	15k+	250 175
3602	1625-Acid Resist	5.0 min	35-60	500	8.9-10.0	302-33.9	-	-	350 250
7576	Tritemp	1.7 min.	25-55	800	21.00	711	-	-	350 300
7576	Teflon B	10.0 min.	25-60	500	22.40	758	-	-	650 450
7576	Ultra-Flex	7.0 min.	20-50	800	22.00	745	100k+	18k+	500 350
7576	Acid-Flex	5.0 min.	15-50	800	21.80	738	80k+	9k+	550 500
7576	1625 Acid Resist	10 min.	30-90	800	21.5-25.7	728-871	-	-	600 500

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. For additional information, please contact a Technical Service Representative, (864) 224-3506.

Insulation Coating Fabrics

Style	Weave	Count Warp	Count Fill	Warp Yarn	Fill Yarn	Weight (oz/yd ²) (g/m ²)	Thickness (mils) (mm)	Strength (lbf/in) Warp	Fill
332	4H Satin	48	32	ECG 37 1/0	ECG 37 1/0	12.60	427	13.5	0.34
333	4H Satin	49	32	ECDE 37 1/0	ECDE 37 1/0	12.78	433	13.8	0.35
1523	Plain	28	20	ECG 150 3/2	ECG 150 3/2	11.50	390	13.0	0.33
1629	Plain	13	9	ECG 75 1/0	ECG 75 1/0	1.78	60	4.9	0.13
1633	Plain	40	20	ECG 150 1/0	ECG 75 1/0	3.20	108	4.1	0.11
1636	Plain	40	24	ECDE 150 1/0	ECDE 150 1/0	2.61	88	3.7	0.09
1658	Plain	20	10	ECG 150 1/0	ECG 75 1/0	1.60	54	4.0	0.10
1692	Plain	40	20	ECG 150 1/0	ECG 75 1/0	3.39	115	4.6	0.12
1694	Plain	40	24	ECG 150 1/0	ECG 75 1/0	3.54	120	4.9	0.13
1695	Plain	40	24	ECDE 150 1/0	ECDE 75 1/0	3.59	122	5.4	0.14
1908	Mod Twill	32	15	ECDE 37 3x	ECDE 11.6 Text	24.0	812	40.0	1.02
3713	Plain	13	12	ECG 37 1/3	ECG 37 1/3	11.70	396	14.5	0.37
76281	Satin	44	32	ECG 75 1/0	ECG 75 1/0	6.00	203	7.0	0.18

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. For additional information, please contact a Technical Service Representative. (864) 224-3506.

Insulation GlasTex Fabrics

Style	Weave	Finish	Count Warp	Count Fill	Weight (oz/yd ²)	Thickness (mils)	Strength (lbf/in) Warp	Strength (lbf/in) Fill
1908*	Mod Twill	9383	32	16	24.00	812	40.0	1.02
1916	Plain	Greige	20	13	17.00	575	24.0	0.61
2023	Plain	9383	20	9	26.00	880	40.0	1.02
2025	Plain	9383	20	14	17.70	599	26.0	0.66
2025	Plain	9957	20	14	17.70	599	23.0	0.58
2025	Plain	9987	20	14	17.70	599	25.0	0.64
2025	Plain	9480	20	14	17.70	599	40.0	1.02
2035*	Mod Twill	9383	20	14	33.00	1117	56.0	1.42
2035*	Mod Twill	9752	20	14	33.00	1117	58.0	1.47
84215	Plain	9383	18	14	8.50	288	16.5	0.42
84215	Plain	9957	18	14	8.50	288	14.0	0.36
84215	Plain	9995	18	14	14.50	491	26.0	0.66
84217	Mod Plain	9383	18	14	8.50	288	16.0	0.41
84217	Mod Plain	9957	18	14	8.50	288	14.0	0.36
84217	Mod Plain	9995	18	14	14.50	491	35.0	0.89
84220	Twill	Greige	18	16	23.00	779	33.0	0.84
84224	G Ffill	9383	18	15	7.90	267	15.5	0.39
84225	G Ffill	9383	18	15	8.00	271	13.5	0.34
84226	G Ffill	9383	18	15	8.00	271	13.4	0.34

* Not covered by MIL-C-20079

The physical properties listed are for greige (untreated) fabrics. Actual values may vary.

EIFS Mesh Fabrics

Alkali Resistant Finished Fabrics

Style	Width (in)	Length (in)	Weight (oz/yd ²) (g/m ²)	Thickness (mils) (mm)	Rolls/Carton	Cartons/Pallet	Strength (lbf/in)
					16/4/2	9/9/12	Warp
						Fill	Fill
1350	9.5/38/48/72	50 (all)	4.30	145.6	14.0	0.36	140
1351	38/48	50	5.50	186.2		4	170
1352	38/48	25	11.50	389.3	29.0	0.74	
1353	38/48	50	4.80	162.5	22.0	0.56	
1358	38/48	25	14.00	473.9	31.0	0.79	240
1362	38/48	25	20.50	693.9	55.0	1.40	
					2	9/6	550

Greige or Unfinished Fabrics

Style	Weave	Count Warp	Count Fill	Warp	Fill	Weight (oz/yd ²) (g/m ²)	Thickness (mils) (mm)
1350	Leno	12	6	3700 yd/lb	1800 yd/lb	3.90	132.0
1351	Leno	12	6	3700 yd/lb	1200 yd/lb	4.50	152.3
1352	Leno	16	6	1800 yd/lb	650 yd/lb	9.20	311.4
1353	Leno	6	3	1800 yd/lb	900 yd/lb	4.00	135.4
1358	Leno	16	3	1800 yd/lb	225 yd/lb	13.00	440.1
1362	Leno	12	3	450 yd/lb	225 yd/lb	19.00	643.2

The physical properties listed are approximate guides only. Actual values may vary. For additional information, please contact a Technical Service Representative, (864) 224-3506.

Fiberglass Fabric Weight Index

Style	Weight (oz/yd ²) (g/m ²)	Style	Weight (oz/yd ²) (g/m ²)	Style	Weight (oz/yd ²) (g/m ²)	Style	Weight (oz/yd ²) (g/m ²)	Style	Weight (oz/yd ²) (g/m ²)					
101	0.48	16	1180	1.44	49	1617	2.31	78	2875	2.70	92	220	3.22	109
104	0.55	19	1609	1.48	50	1614	2.33	79	119	2.71	92	1692	3.39	115
1071	0.60	20	1280 APS	1.54	53	113	2.39	81	2319	2.72	92	1634	3.50	118
1037	0.68	23	1280	1.55	53	139	2.39	81	3070	2.74	93	1694	3.54	122
993	0.71	24	3080	1.57	53	117	2.40	81	1674	2.82	97	1647	3.55	122
106	0.72	24	1620	1.58	54	2313	2.40	81	1675	2.84	97	2165	3.55	122
1297	0.82	27	1076	1.60	54	3313	2.40	81	2116	3.06	104	1165	3.57	122
1035	0.88	30	1658	1.60	54	4180	2.41	82	116	3.09	105	1695	3.59	122
1067 APS	0.88	30	1659	1.60	54	1611	2.42	82	3116	3.10	105	4522	3.64	123
1067	0.91	31	1081	1.72	59	1669	2.50	85	1634	3.11	105	1131	3.65	124
1299	0.92	31	1629	1.78	60	2154	2.54	88	2316	3.13	106	1522	3.67	124
1070	1.01	34	1562	1.82	62	1636	2.60	88	1677	3.15	106	1579	3.68	125
1065	1.08	37	2112	2.04	69	1636	2.61	88	120	3.16	111	4527	3.70	125
6060	1.15	39	112	2.08	71	1125	2.65	90	1316	3.18	107	1632	3.75	127
1080	1.38	47	1608	2.22	75	2119	2.66	90	2117	3.18	108	1167	3.82	129
108	1.40	48	1610	2.30	78	1628	2.69	91	1633	3.20	108	1161	3.87	131
1078	1.41	48	2113	2.30	78	2114	2.69	91	1678	3.20	108	1165	4.00	136

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. For additional information, please contact a Technical Service Representative, (864) 224-3506.

Fiberglass Fabric Weight Index (cont.)

Style	Weight (oz/yd ²) (g/m ²)	Style	Weight (oz/yd ²) (g/m ²)	Style	Weight (oz/yd ²) (g/m ²)	Style	Weight (oz/yd ²) (g/m ²)	Style	Weight (oz/yd ²) (g/m ²)	
1649	4.01	136	1353	4.80	163	1680	5.70	193	139	6.50
1676	4.06	138	1500	4.83	164	6580	5.70	193	1528	6.50
1652	4.09	138	7630	4.84	164	3733	5.80	197	7667	6.54
1141	4.20	142	1501	4.86	165	7533	5.85	198	138	6.66
1350	4.30	146	7618	4.95	168	1538	5.87	199	7642	6.72
1651	4.31	146	1047	5.10	171	7627	5.87	199	7637	6.73
1503	4.36	148	3731	5.21	177	4533	5.92	201	7642	6.84
1504	4.36	148	1557	5.26	178	1528	5.94	201	7635	6.85
2157	4.36	148	1526	5.33	181	7255	6.00	203	7637	7.08
4700	4.40	149	6557	5.40	183	7628	6.00	203	7635	7.09
7510	4.50	152	7626	5.40	183	76281	6.00	203	7532	7.23
2166	4.60	155	1047	5.44	184	85392	6.00	203	7715	7.30
4797	4.63	157	1351	5.50	186	7698	6.10	206	7640	7.60
1064	4.68	159	7531	5.50	186	7650	6.12	208	7652	7.60
7660	4.73	160	7624	5.50	186	7629	6.19	210	8800	8.25
1502	4.78	162	4526	5.60	190	7580	6.20	210	417	8.30
4985	4.85	159	880	5.70	193	76290	6.27	213	1142	8.37

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. For additional information, please contact a Technical Service Representative, (864) 224-3506.

Fiberglass Fabric Weight Index (cont.)

Style	Weight (oz/yd ²) (g/m ²)	Style Weight (oz/yd ²) (g/m ²)				
7791	8.95	303	3764	12.00	407	1358
6781(HT)	9.00	305	1527	12.03	417	7645
16781	9.00	305	6045	12.25	415	3635
16791	9.00	305	1564	12.50	424	3636
601	9.25	313	232	12.60	427	634
602	9.50	322	332	12.60	427	1527
7500	9.60	325	1163	12.63	428	647
334	9.70	328	333	12.78	433	1583
1800	9.80	332	653	12.86	435	3783
1507	9.80	332	651	13.00	441	2025
1500*	10.30	349	8000	13.09	444	7544
1576	10.60	359	1530	13.14	445	1362
1352	11.50	390	1530	13.20	448	7587
1523	11.50	390	1582	13.20	448	7576
2523	11.65	395	3626	13.40	454	1908
3713	11.70	396	3582	13.70	465	1884
162	12.01	407	17645	13.90	471	1584

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. For additional information, please contact a Technical Service Representative, (864) 224-3506.

* 1500 Leno

Fiberglass Fabric Thickness Index

Style	Thickness (mils) (mm)	Style	Thickness (mils) (mm)	Style	Thickness (mils) (mm)	Style	Thickness (mils) (mm)	Style	Thickness (mils) (mm)
101	1.0 0.02	1180	2.3 0.06	2119	3.4 0.09	1677	3.7 0.09	1659	4.2 0.11
104	1.1 0.03	1297	2.3 0.06	2319	3.4 0.09	2116	3.7 0.09	1678	4.3 0.11
1035	1.1 0.03	3080	2.3 0.06	3070	3.4 0.09	2117	3.7 0.09	1167	4.4 0.11
1037	1.1 0.03	108	2.4 0.06	3323	3.4 0.09	1674	3.8 0.10	1562	4.5 0.11
993	1.2 0.03	1081	2.4 0.06	120	3.5 0.09	2316	3.8 0.10	1579	4.5 0.11
1071	1.2 0.03	117	2.6 0.07	220	3.5 0.09	116	4.0 0.10	1652	4.5 0.11
106	1.3 0.03	1609	2.6 0.07	1608	3.5 0.09	1165	4.0 0.10	2875	4.5 0.11
1067 APS	1.3 0.03	3132	2.8 0.07	1610	3.5 0.09	1316	4.0 0.10	1692	4.6 0.12
1067	1.4 0.04	1076	2.9 0.07	1620	3.5 0.09	1611	4.0 0.10	1632	4.7 0.12
1078	1.7 0.04	4180	3.0 0.08	3116	3.5 0.09	1636	4.0 0.10	4700	4.7 0.12
1070	1.8 0.05	2113	3.1 0.08	112	3.6 0.09	1658	4.0 0.10	1161	4.8 0.12
6060	1.9 0.05	2112	3.2 0.08	1125	3.6 0.09	1675	4.0 0.10	1522	4.8 0.12
1065	2.1 0.05	2114	3.2 0.08	119	3.6 0.09	2165	4.0 0.10	1634	4.8 0.12
1280 APS	2.1 0.05	3113	3.2 0.08	2125	3.6 0.09	4527	4.0 0.10	1676	4.8 0.12
1080	2.1 0.05	3313	3.3 0.08	1634	3.7 0.09	1633	4.1 0.11	1504	4.9 0.13
1280	2.2 0.06	113	3.4 0.09	1636	3.7 0.09	1647	4.1 0.11	1629	4.9 0.13
1299	2.3 0.06	1628	3.4 0.09	1669	3.7 0.09	1649	4.1 0.11	1694	4.9 0.13

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. For additional information, please contact a Technical Service Representative, (864) 224-3506.

Fiberglass Fabric Thickness Index (cont.)

Style	Thickness (mils) (mm)													
1131	5.0	0.13	7660	5.9	0.15	7628	6.8	0.17	1581	8.0	0.20	7725	9.3	0.24
1614	5.0	0.13	880	6.0	0.15	1141	7.0	0.18	3733	8.0	0.20	16781	9.5	0.24
2157	5.1	0.13	4526	6.0	0.15	7255	7.0	0.18	7652	8.3	0.21	7637	9.6	0.24
4522	5.1	0.13	7626	6.0	0.15	7510	7.0	0.18	3743	8.5	0.22	6781 (HT)	9.7	0.25
1503	5.3	0.13	7630	6.0	0.15	76281	7.0	0.18	7537	8.5	0.22	7640	9.8	0.25
1651	5.3	0.14	1680	6.1	0.15	76290	7.0	0.18	85392	8.5	0.22	334	10.0	0.25
1695	5.4	0.14	6580	6.1	0.15	1538	7.0	0.18	7781	8.6	0.22	2532	10.0	0.25
1557	5.5	0.14	4985	6.2	0.16	7629	7.1	0.18	7637	8.8	0.22	7532	10.0	0.25
2166	5.5	0.14	1064	6.3	0.16	7669	7.2	0.19	403	8.9	0.23	7642	10.0	0.25
3731	5.5	0.14	7624	6.4	0.16	4533	7.4	0.19	6781	9.0	0.23	6581	10.4	0.26
1501	5.5	0.14	139	6.5	0.17	4797	7.4	0.19	7531	9.0	0.23	7500	11.0	0.28
1044	5.6	0.14	1528	6.5	0.17	7650	7.5	0.19	7581	9.0	0.23	7642	11.0	0.28
1047	5.8	0.15	7618	6.5	0.17	7715	7.7	0.20	16791	9.0	0.23	1142	11.1	0.28
6557	5.8	0.15	7627	6.5	0.17	7580	7.8	0.20	26781	9.0	0.23	1576	11.1	0.28
1500	5.9	0.15	7698	6.5	0.17	7196	7.9	0.20	7791F	9.0	0.23	1188	11.8	0.30
1502	5.9	0.15	138	6.6	0.17	7635	7.9	0.20	520	9.1	0.23	8000	11.8	0.30
1526	5.9	0.15	1617	6.8	0.17	1543	8.0	0.20	6543	9.1	0.23	7520	12.0	0.30

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. For additional information, please contact a Technical Service Representative, (864) 224-3566.

Fiberglass Fabric Thickness Index (cont.)

Style	Thickness (mils) (mm)								
1523	13.0	0.33	3783	16.0	0.41	1597	44.0	1.12	
2523	13.0	0.33	8800	16.4	0.42	3788	48.7	1.24	
17645	13.0	0.33	7544	20.0	0.51	1362	55.0	1.40	
1582	13.4	0.34	1353	22.0	0.56				
332	13.5	0.34	1500*	25.0	0.56				
7645	13.5	0.34	1507	25.0	0.65				
162	13.8	0.35	1584	25.5	0.65				
333	13.8	0.35	3784	25.9	0.66				
1350	14.0	0.36	1884	26.0	0.66				
1564	14.0	0.36	2025	26.1	0.66				
1530	14.4	0.37	1938	27.0	0.69				
3582	14.4	0.37	7587	27.2	0.69				
232	14.6	0.37	3884	27.5	0.70				
3713	14.5	0.37	1352	29.0	0.74				
1527	15.0	0.38	1358	31.0	0.79				
3764	16.0	0.41	1908	40.0	1.02				
1583	16.0	0.41	7597	40.6	1.03				

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. For additional information, please contact a Technical Service Representative, (864) 224-3506.

*1500 Leno

ASTROQUARTZ® PRODUCTS*

Astroquartz® is a registered trademark of JPS Industries

Astroquartz® II & Astroquartz® III Properties

Astroquartz II® and original Astroquartz are composed of identical raw materials. Through improved manufacturing and handling technologies Astroquartz II represents a stronger, cleaner product with unparalleled quality, standards, and specifications. Such innovation gives new flexibility to your design opportunities.

Properties of Astroquartz® Fibers

Tensile Strength - Virgin Single Filament.....	6.0 GPa (870 ksi)
Tensile Strength - Impregnated Strand on 20 End Roving (ASTM D-2343).....	3.6 GPa (530 ksi)
Young's Modulus.....	72 GPa (10 msi)
Poisson's Ratio.....	0.16
Density.....	2.2 g/cm ³
Silica Content (exclusive of yarn binder).....	99.99%
Fiber Diameter - Astroquartz® II.....	.9µm
Fiber Diameter - Astroquartz® III.....	14µm

Physical Properties of Fused Quartz

Mechanical

Density.....	2.2 g/cm ³ or 0.79 lb/m ³
Hardness (Mohs Scale).....	7

Electrical

Dielectric Constant (Dk) - 1 MHz.....	3.70
Dielectric Constant (Dk) - 10 GHz.....	3.74
Dissipation Factor (Df) - 1 MHz.....	0.0001
Dissipation Factor (Df) - 10 GHz.....	0.0002

Thermal

Linear Expansion Coefficient.....	0.54 x 10 ⁻⁶
Specific Heat @ 20°C (J/gK).....	7.5 x 10 ⁻³
Thermal Conductivity (W/mK).....	1.38
Strain Point (Log ₁₀ n = 14.6).....	1070°C (1958°F)
Annealing Point (Log ₁₀ n = 13).....	1220°C (2084°F)
Softening Point (Log ₁₀ n = 7.6).....	1700°C (3092°F)

Note: n = Viscosity in Poise

Physical Properties of Fused Quartz (cont.)

Optical

Refractive Index @ 15°C.....	1.4585
Dispersion.....	67
Field of Transparency (μm).....	0.2 to 4.0

Astroquartz ® Applications

Astroquartz ® fabrics offer better solutions to high heat, high strength problems.

The aerospace industry relies on Astroquartz fiber products made from pure fused silica (99.99% SiO₂). An outstanding reinforcement for high temperature and ablative space and missile applications. Astroquartz products are recommended when low dielectric loss properties are required, such as microwave transmission in radome and antenna applications.

51

Other applications include insulation for the space shuttle, cable tray insulation for nuclear power plants, and laminated fabric for circuit boards.

Conform formable Astroquartz fabrics are recommended for use in preforms for resin transfer molding (RTM), press molding, and tooling applications.

Design Considerations for Astroquartz ® Fabric Selection

There are five basic design variables to consider when choosing Astroquartz ® fabrics:

Thickness

Quartz and composite fabrics are available in thicknesses ranging from 0.003" to 0.027".

Weight

The weight for Astroquartz fabrics range from two to twelve ounces per square inch.

Design Considerations for Astroquartz® Fabric Selection (cont.)

Construction

This is determined by the number of warp yarns/denier (in the machine direction) and filling yarns/denier (in the cross-machine direction) per inch of the fabric.

Yarn Size

Yarn size determines the weight and thickness of the fabric. For specific applications, one yarn may be selected over another to take advantage of the fabric's performance characteristics.

Finish

Most industrial applications require that Astroquartz fabric be used along with another material. For compatibility a finish or after treatment is often applied to the fabric.

Astroquartz® II & III Fabric Finishes

A partial list of the available finishes is presented, for additional finishes or to develop an application specific finish, please contact JPSCM.

52

Finish Code	Matrix Resin	Performance Features
S-928	Epoxy	Epoxy functional silane.
933 HTS	Polyimide, Epoxy, Bismaleimide	Excellent high temperature and moisture resistance.
S-977	Epoxy, Melamine, Phenolic, PE	Applied to scoured fabric for superior bonding strength.
1059 HT/ 2059 HT/ 3059 HT	Polyimides, Thermoplastic Matrices	Recommended for high temperature (700°F) systems.
9779	Epoxy, Bismaleimide	High performance amino-silane yarn binder, applied to yarn for woven fabric.

Astroquartz® II & III Fabric Finishes (cont.)

Finish Code	Matrix Resin	Performance Features
9827/	Epoxy, Polyimide,	Applied to scoured fabrics.
2827/	Bismaleimide	Recommended for electronic
3827		and aerospace applications.
9836/	Epoxy,	9779 finished fabric is washed
2836/	Bismaleimide	to remove nonfunctional
3836		organic binder components.
9837/	Polyester,	Applied to scoured fabrics.
2837/	Vinyl Ester	Recommended for resins
3837		cured by vinyl addition.

Astroquartz® II Chopped Fiber

Astroquartz® II chopped fiber is made by cutting continuous filaments of high purity, extremely fine pure quartz fibers to a predetermined length. Fiber composition is 99.99% SiO₂ (silica) exclusive of binder.

Because of their high strength plus excellent ablative, electrical, and high temperature characteristics, Astroquartz II chopped fibers are used widely in reinforced plastics, molding compounds, and as a ceramic reinforcement.

Type 556 Chopped Fiber

Fiber Lengths* from 1/8" to 1" Standard Binder Astroquartz II chopped fiber with 9779 binder compatible with epoxy, phenolic and some polyimide resins.

* Due to the nature of the cutting process, cut lengths may vary slightly.

Standard Packaging

1 lb packages packed loosely in clear polyethylene bags.

Astroquartz® II & III Fabrics

Style	Weave	Count	Warp	Yarn	Fill	Yarn	Weight (oz/yd ²)	Thickness (mils)	Strength (lbf/in)	Warp	Fill
			Warp	Fill							
503	Plain	50	40	QCG 300 1/2	QCG 300 1/2	3.58	128	5.0	0.13	155	140
507	Plain	27	25	QCG 300 1/2	QCG 300 1/2	2.10	71	4.0	0.10	80	60
525	Plain	50	50	QCG 300 1/0	QCG 300 1/0	2.00	68	3.0	0.08	65	65
527	Plain	42	32	QCG 300 2/2	QCG 300 2/2	6.10	206	8.0	0.20	270	250
531	8H Satin	68	65	QCG 300 1/2	QCG 300 1/2	5.20	176	7.0	0.18	225	200
533	2x2 Basket	36	36	QCG 300 2/2	QCG 300 2/2	5.30	179	7.0	0.18	250	250
557	Crowfoot	57	31	QCG 300 2/2	QCG 300 2/2	5.00	169	6.0	0.15	410	55
570	5H Satin	38	24	QCG 300 2/8	QCG 300 2/8	19.5	659	27.0	0.69	825	650
572	Plain	17	16	QCG 300 2/8	QCG 300 2/8	9.90	335	17.0	0.43	590	480
581	8H Satin	57	54	QCG 300 2/2	QCG 300 2/2	8.60	291	10.0	0.25	400	375
591	Conform	57	54	QCG 300 2/2	QCG 300 2/2	8.45	286	12.0	0.30	420	350
593	5H Satin	49	46	QCG 300 2/2	QCG 300 2/2	7.50	254	9.0	0.23	270	270
594	Leno	20	10	QCG 300 2/2	QCG 300 2/2	2.40	81	8.0	0.20	90	55
4503	Plain	40	31	QCK 125 1/0	QCK 125 1/0	3.38	114	5.0	0.13	115	100
4581	8H Satin	47	44	QCK 125 2/0	QCK 125 2/0	8.45	286	10.0	0.25	370	330

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. For additional information, please contact a Technical Service Representative, (864) 224-3506. Note: AQ II fabrics are woven with 9779 resin compatible binder. AQ III are available only as finished fabrics.

Astroquartz ® Mat Style No. 550

Specifications

Length.....	1000 mm (39.37 in)
Width.....	500 mm (19.69 in)
Area.....	0.5 m ² per sheet (5.38 ft ²)
Thickness.....	5 mm (0.2 in)
Weight.....	78 g/m ³ (2.3 oz/yd ³)
Density.....	0.016 g/cm (1 lb/ft - approx.)

Binder

Astroquartz s/550 mat is impregnated with a polyvinyl alcohol binder in the manufacturing operation. This provides a stable mat which can be handled, cut, or fabricated to exact dimensions and can be installed with ease. The binder can be removed by heating to 900°F for 1 hour, or at 500°F for 24 hours. Binder content on the Astroquartz mat is between 4% and 5% by weight. Cut sheets of approximately 500 mm x 500 mm (20 in x 20 in) are also available with an area of approximately 2.8 ft² per sheet.

55

Astroquartz ® II Roving

Astroquartz ® II roving is made from continuous filaments of pure fused silica nine microns in diameter. Fiber composition is 99.99% SiO² (silica) exclusive of binder. Standard 20 end roving equivalent to 20 ends of 150 1/0 contains 4800 nine micron diameter filaments. The fiber density is 2.2 g/cm³.

Astroquartz II roving has a fiber tensile strength of 0.5 MSI*.

Property Data**

Type	End Count•	Binder	Yds/Lb◆	Strength†
552	20	9779/9989	750	65 lbs
552	12	9779/9989	1250	40 lbs
552	8	9779/9989	1875	25 lbs
552	6	9779/9989	2500	20 lbs

Astroquartz ® II roving is available with an end count less than 20, please consult your JPS for details. Other finishes are also available.

* Test Method - ASTM D-2343

** Test Method - ASTM D-578

• +0-1

◆ ±10%

† Tensile, min. avg., determined on uncoated roving

Astroquartz ® Roving (cont.)

Standard Packaging

Inside Diameter.....	3 in
Length.....	11 in
Traverse.....	10 in
Waywind.....	3 in
Wind Direction.....	Forward
Type Build.....	Straight
Maximum OD.....	7 OD

Approximate Net Weight

9779 Binder.....	2.2 lbs
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Astroquartz ® II Sewing Thread

Astroquartz ® II sewing thread is made from high purity extremely fine continuous filaments of pure fused silica that is capable of extended exposure to 2000°F. Fiber composition is 99.99% SiO₂ (silica) exclusive of binder. Unless otherwise specified, Astroquartz II sewing threads are supplied coated with Teflon.

Because of its high strength and flexibility, high purity and high temperature resistance, Astroquartz II sewing thread is widely used in sewing or wrapping insulation blankets, shrouds, blast curtains and separators.

The strength, smoothness and flexibility of Astroquartz II sewing threads are far superior to any quartz threads previously offered.

With 9855 Teflon Coating (20±4%)

Type	Diameter (in)	Breaking Strength*		Approx. Yield**	
		Typical (lb)	Minimal (lb)	Uncoated	Coated
Q-12	0.014	15	12	3660	2925
Q-18	0.017	24	19	2440	1950
Q-24	0.022	30	25	1830	1460
Q-27	0.024	30	25	-	1030

* Test Method - ASTM D-578

** ±10%

Astroquartz ® II Yarn

Astroquartz ® II yarn is made from extremely fine continuous filaments of 99.99% pure fused silica, exclusive of binder, capable of extended heat exposure to 2000°F.

With more than five times the yarn yield of high silica leached yarn, Astroquartz II yarn has a higher tensile strength and abrasion resistance. As a result, high production efficiencies are now possible in the production of high temperature flexible insulation.

Astroquartz II yarn is widely used in the form of braided insulation in thermocouple wire, coaxial cables, space separators, hoop wire, and heating elements

Property Data

Type	Approx. Diameter (in)	Approx. Breaking Strain (lb)*	Approx. Yield (yd/lb)
300 2/0	0.008	3	15000
300 2/2	0.012	6	7500
300 2/4	0.018	10	3750
300 2/8	0.020	24	1875

*Test Method - ASTM D-578

57

Astroquartz II yarns are available with the 9779 binder system, compatible with phenolic, epoxy, and some polyimide resins. Heavier or lighter count yarns can also be manufactured. Please consult JPS for price and delivery.

Standard Packaging

Yarns are available on standard milk bottle packages for plied yarns and double flanged packages for twisted single yarn. Net yarn weights range from a minimum of 1 lb/pkg to a maximum of 2.5 lb/pkg.

Fiber Characteristics*

Astroquartz II

Number of Filaments

300 1/0 - 120 filaments

300 2/0 - 240 filaments

300 2/2 - 480 filaments

Astroquartz III

125 1/0 - 120 filaments

125 2/0 - 240 filaments

* Each filament is 9 μm in diameter, equivalent to a fiberglass "G" filament.

Astroquartz® II

350°F Epoxy Laminates

Style 581-9779/CE-900 Epoxy Prepreg*

Property	Results**
Tensile Strength, Room Temperature.....	715 MPa
Tensile Strength, 1/2 Hour @ 350°F.....	635 MPa
Young's Modulus, Room Temperature.....	28 GPa
Young's Modulus, 1/2 Hour @ 350°F.....	25 GPa
Flexural Strength, Room Temperature.....	682 MPa
Flexural Strength, 1/2 Hour @ 350°F.....	523 MPa
Taylor's Modulus, Room Temperature.....	24 GPa
Taylor's Modulus, 1/2 Hour @ 350°F.....	21 GPa
Compressive Strength, Room Temperature.....	499 MPa
Compressive Strength, 1/2 Hour @ 350°F.....	344 MPa
Compressive Modulus, Room Temperature.....	26 GPa
Compressive Modulus, 1/2 Hour @ 350°F.....	23 GPa

* Cytec Corporation

** Average of 3 runs, 32 wt% resin content, 1.77 g/cm specific gravity

Astroquartz® II

Toughened Epoxy Laminates

Style 581/R7376 Prepreg*

Property	Results**
Flexural Strength, Room Temperature.....	889 MPa
Flexural Strength, 180°F.....	770 MPa
Taylor's Modulus, Room Temperature.....	28 GPa
Taylor's Modulus, 180°F.....	27 GPa
Compressive Strength, Room Temperature.....	608 MPa
Compressive Strength, 180°F.....	534 MPa
Compressive Modulus, Room Temperature.....	29 GPa
Compressive Modulus, 180°F.....	26 GPa
Short Beam Shear Strength, Room Temperature.....	91 MPa
Short Beam Shear Strength, 180°F.....	81 MPa

* Cytec Corporation

** 32 wt% resin content, 0.009 in. ply thickness

Astroquartz® II Polyimide Laminates

Style 581-9779/F-178 Polyimide Prepreg*

Property	Results**
Tensile Strength, Room Temperature.....	726 MPa
Young's Modulus, Room Temperature.....	27 GPa
Flexural Strength, Room Temperature.....	701 MPa
Flexural Strength, 1/2 Hour @ 350°F.....	471 MPa
Taylor's Modulus, Room Temperature.....	22 GPa
Taylor's Modulus, 1/2 Hour @ 350°F.....	18 GPa
Compressive Strength, Room Temperature.....	462 MPa
Compressive Strength, 1/2 Hour @ 350°F.....	266 MPa
Compressive Modulus, Room Temperature.....	26 GPa
Compressive Modulus, 1/2 Hour @ 350°F.....	19 GPa

* Hexcel Corporation

** 36.2 wt% resin content

Astroquartz® II Lightweight

8-Harness Satin Fabric

Style 531-9827/EPON 828 Prepreg*

Nadic Methyl Anhydride Wet Layup

Property	Results**
Tensile Strength, Room Temperature.....	64 MPa
Flexural Strength, Room Temperature.....	818 MPa
Taylor's Modulus, Room Temperature.....	25 GPa
Compressive Strength, Room Temperature.....	580 MPa

* Shell Chemical Company

** 20 Plies, 34.2 wt% resin content, 0.0062" ply thickness

Astroquartz® II Roving

Impregnated Strand Test, ASTM D-2343*

Property	Results
Astroquartz II-9779.....	3.7 GPa
"S-2" Fiberglass-463.....	3.6 GPa
"S" Fiberglass-901.....	3.8 GPa
"E" Fiberglass-456.....	1.9 GPa
"E" Fiberglass-462.....	1.9 GPa

* Owens Corning Fiberglass Corporation Pub No. 5-ASP 10139-A

Astroquartz® II Unidirectional Fabric

Style 557-9779/EPON 828*/Eporal/BF3 Wet Layup

Property	Results**
Tensile Strength, Room Temperature.....	1.1 GPa
Tensile Strength, 2 Hour Boil.....	1.0 GPa
Flexural Strength, Room Temperature.....	1.1 GPa
Flexural Strength, 2 Hour Boil.....	1.1 GPa
Taylor's Modulus, Room Temperature.....	35 GPa
Taylor's Modulus, 2 Hour Boil.....	35 GPa
Compressive Strength, Room Temperature.....	657 MPa
Compressive Strength, 2 Hour Boil.....	604 MPa

* Shell Chemical Company

** 33.6 wt% resin content, 12 Plies, 0.066" Thickness

Astroquartz® II Dielectric Properties

Typical Dielectric Properties of Astroquartz II

Quartz/Polyimide Compared to E-glass/Polyimide, 9.4 GHz

Temperature	% Resin	Dielectric Constant, Dk		Loss Tangent, Df	
		AQ II	E-glass	AQ II	E-glass
Room	35	3.30	3.87	0.005	0.009
600°F	35	3.25	4.20	0.003	0.009

Quartz/Silicone Compared to E-glass/Silicone, 9.4 GHz

Temperature	% Resin	Dk		Df	
		AQ II	E-glass	AQ II	E-glass
Room	-	3.21	4.35	0.003	0.006
500°F	-	3.21	4.31	0.003	0.006

Quartz/Polybutadiene versus E-glass/Polybutadiene, 35GHz*

Temperature	% Resin	Dk		Df	
		AQ II	E-glass	AQ II	E-glass
Room	-	3.10	4.20	0.003	0.010

* Fibercote Industries, AQ II s/581-910, E-glass s/7781-550

Dielectric Properties of Various Glasses, 9.4GHz

Temp.	AQ II	Dk		Df		
		E-glass	S-glass	AQ II	E-glass	S-glass
Room	3.78	6.13	5.21	0.0001	0.004	0.007

Astroquartz® III Plain Weave Fabric

Style 4503-9836/EPON 828 Prepreg*

Nadic Methyl Anhydride Wet Layup

Property	Results**
Tensile Strength, Room Temperature.....	674 MPa
Tensile Strength, 2 Hour Boil.....	651 MPa
Flexural Strength, Room Temperature.....	653 MPa
Flexural Strength, 2 Hour Boil.....	619 MPa
Taylor's Modulus, Room Temperature.....	21 GPa
Taylor's Modulus, 2 Hour Boil.....	21 GPa
Compressive Strength, Room Temperature.....	455 MPa
Compressive Strength, 2 Hour Boil.....	443 MPa
Specific Gravity.....	1.78 g/cm ³

* Shell Chemical Company

** 12 Plies, 40.7 wt% resin content, 0.121" laminate thickness

Astroquartz® III

8-Harness Satin Fabric

Style 4581-9836/EPON 828 Laminate*

Nadic Methyl Anhydride Wet Layup

Property	Results**
Tensile Strength, Room Temperature.....	707 MPa
Tensile Strength, 2 Hour Boil.....	667 MPa
Flexural Strength, Room Temperature.....	819 MPa
Flexural Strength, 2 Hour Boil.....	793 MPa
Taylor's Modulus, Room Temperature.....	23 GPa
Taylor's Modulus, 2 Hour Boil.....	24 GPa
Compressive Strength, Room Temperature.....	558 MPa
Compressive Strength, 2 Hour Boil.....	546 MPa
Specific Gravity.....	1.82 g/cm ³

* Shell Chemical Company

** 12 Plies, 35.1 wt% resin content, 0.123" laminate thickness

ADVANCED MATERIALS PRODUCTS

Physical Properties of Aramid Fibers

Aramids - Kevlar ®*, Twaron ®**

High Strength

Aramid fibers are 43% lighter than E-glass fibers, with a density of 1.44 g/cc compared to 2.55 g/cc. Aramids are twice as strong as E-glass, ten times as strong as Aluminum and approach the strength of carbon fiber on a specific tensile strength basis.

Dimensional Stability

Aramids display excellent dimensional stability, with a slightly negative coefficient of thermal expansion (-2.4 $\mu\text{m}/^\circ\text{C}$).

Chemical Resistance

Aramids show minimal to no embrittlement and strength loss at temperatures as low as -320°F. Aramids do not melt or combust, but will carbonize at approximately 800°F.

* Kevlar ® is a registered trademark of the E.I. DuPont du Nemours

** Twaron ® is a registered trademark of Teijin Twaron USA, Inc.

Physical Properties of Selected

Advanced Performance Fibers

Ultra High Molecular Weight Polyethylene - Spectra ®

High Strength

UHMWPE has a density of 0.97 g/cc making it one of the lightest high performance fibers, with a high strength to weight ratio. This fiber can be up to fifteen times as strong as steel.

Chemical Resistance

UHMWPE has excellent resistance to water, acetic acid, hydrochloric acid, nitric acid, ammonium hydroxide, kerosene, toluene, trichloromethane and microorganisms. This fiber is slightly affected by strong base.

Thermal Stability

The melting point of UHMWPE is 150°C. The tenacity and modulus decrease at higher temperatures but increase in sub-zero temperatures. They show essentially no embrittlement at temperatures as low as -150°C.

* Spectra ® is a registered trademark of Honeywell International Corp.

Advanced Materials Applications

Ballistics and Protection Products

JPS manufactures high performance fabrics for use in ballistic resistant applications. High performance fabrics are used extensively in bullet, fragment, and stab resistant body armor for militaries, federal agencies, police, and correctional departments. They are also used in the manufacture of helmets for both military and civilian agencies.

Marine, Tooling, and Recreational Products

JPS high performance fabrics, exhibiting the properties of high strength and durability, are used in a variety of applications ranging from boating to skiing. Applications are driven by strength, weight durability, clarity, and cost. Applications include kayaks, boats, hydroplanes, safety equipment, and other sporting goods.

Advanced Materials Fiber Nomenclature

High performance fibers are typically designated by denier, tex, or decitex (dtex). Each is described below.

Denier

The denier system is used internationally to measure the size of silk and synthetic filaments and yarns. Denier number indicates the weight in grams of 9,000 meters of filament or filament yarn. For example, if 9,000 meters weighs 100 grams, it is a 100-denier yarn. The smaller the denier number, the finer the yarn.

$$\text{Denier} = \text{dtex} \times 0.9$$

Tex

The tex system is also applicable to the measurement of filament yarns. It is based on the weight in grams of one kilometer (3,300 feet) of yarn. Decitex (dtex) is defined as ten times tex.

$$\text{Tex} = \text{dtex}/10$$

For example, 840 denier yarn may also be designated as 933 dtex or 93.3 Tex.

Finishes for Advanced Materials

A partial list of the available finishes is presented, for additional finishes or to develop an application specific finish, please contact JPSCM.

Finish Code	Performance Features
CS-811	Loom state fabric
CS-800	Scour finish for Aramid fabrics
CS-802	Scour finish for Spectra ® and Dyneema ® fabrics
CS-892	Water repellent finish for Spectra ® and Dyneema ®* fabrics
CS-897	Water repellent finish for Aramid fabrics
CS-898	Proprietary finish for Kevlar ® fabrics
CS-899	Proprietary finish for Twaron ® fabrics
LCS	Laminated Composite Substrate
ML	Micro-Laminate
WRT	Water Repellent Treated

ADVANCED MATERIALS FABRIC CONSTRUCTION: Kevlar® 49 Fabrics

Style	Weave	Count Warp	Count Fill	Warp Yarn	Fill Yarn	Weight (oz/yd ²) (g/m ²)	Thickness (mils) (mm)	Strength (lbf/in) Warp	Fill
328	Plain	17	17	Kevlar 49 1420d	Kevlar 49 1420d	6.4	217	12.0	0.30
345	Crowfoot	34	34	Kevlar 49 195d	Kevlar 49 195d	1.7	58	3.0	0.08
348	8H Satin	50	50	Kevlar 49 380d	Kevlar 49 380d	4.9	166	8.0	0.20
350	Plain	34	34	Kevlar 49 195d	Kevlar 49 195d	1.7	58	3.0	0.08
351	Plain	22	22	Kevlar 49 380d	Kevlar 49 380d	2.2	75	4.0	0.10
352	Plain	17	17	Kevlar 49 1140d	Kevlar 49 1140d	5.0	173	10.0	0.25
353	Crowfoot	17	17	Kevlar 49 1140d	Kevlar 49 1140d	5.0	173	9.0	0.23
354	Plain	13	13	Kevlar 49 1420d	Kevlar 49 1420d	4.8	163	10.0	0.25
384	Basket 4x4	28	28	Kevlar 49 1420d	Kevlar 49 1420d	10.7	363	19.0	0.48
386	Basket 4x4	27	27	Kevlar 49 2160d	Kevlar 49 2160d	13.6	461	25.0	0.64
388	Basket 8x8	40	40	Kevlar 49 1420d	Kevlar 49 1420d	15.0	508	25.0	0.66

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. JPSCM strongly recommends designers and users perform testing for application and package specific conditions. For additional information, please contact a Technical Service Representative, (864) 224-3506.

Twaron ® Fabrics

Style	Weave	Count	Count	Warp	Yarn	Fill	Yarn	Weight (oz/yd ²)	Thickness (mils)	Strength (lbf/in)	Warp	Fill
5328	Plain	17	17	Twaron 2200 1580dt	Twaron 2200 1580dt	6.4	215	12.0	0.30	700	750	
5348	8H Satin	50	50	Twaron 1055 405dt	Twaron 1055 405dt	4.9	166	8.0	0.20	660	650	
5351	Plain	22	22	Twaron 1055, 405dt	Twaron 1055, 405dt	2.2	75	4.0	0.10	290	300	
5352	Plain	17	17	Twaron 2200 1270dt	Twaron 2200 1270dt	5.0	170	10.0	0.25	620	640	
5353	4H Satin	17	17	Twaron 2200 1270dt	Twaron 2200 1270dt	5.0	170	9.0	0.23	620	635	
5354	Plain	13	13	Twaron 2200 1540dt	Twaron 2200 1540dt	4.8	163	10.0	0.25	560	600	
5384	Basket 4x4	28	28	Twaron 2200 1580dt	Twaron 2200 1580dt	10.7	363	19.0	0.48	1360	1300	
5386	Basket 4x4	27	27	Twaron 2200 2420dt	Twaron 2200 2420dt	13.6	461	25.0	0.64	1820	1470	
5388	Basket 8x8	40	40	Twaron 2200 1580dt	Twaron 2200 1580dt	15.0	508	25.0	0.66	1830	1790	
5704	Plain	31	31	Twaron 2040 930dt	Twaron 2040 930dt	6.5	198	12.0	0.30	900	950	
5712	Plain	12	12	Twaron 1000 3360dt	Twaron 1000 3360dt	9.1	309	16.5	0.42	1200	1200	
5713	Plain	31	31	Twaron 2040 1100dt	Twaron 2040 1100dt	8.4	280	15.0	0.40	950	1100	
5719	Plain	19.5	19.5	Twaron 2040 780dt	Twaron 2040 780dt	4.3	146	7.5	0.19	600	600	
5724	Plain	24	24	Twaron 2040 1100dt	Twaron 2040 1100dt	6.5	220	11.0	0.28	760	775	
5726	Plain	26	26	Twaron 2040 930dt	Twaron 2040 930dt	6.0	203	10.0	0.25	760	770	
5731	Plain	31	31	Twaron 2040 1100dt	Twaron 2040 1100dt	6.1	275	15.0	0.37	900	900	
5741	Plain	11	11	Twaron 1000 3360dt	Twaron 1000 3360dt	8.5	286	15.0	0.38	1100	1150	

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. JPSCM strongly recommends designers and users perform testing for application and package specific conditions. For additional information, please contact a Technical Service Representative, (864) 224-3506

Twaron® Fabrics

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. JPSCM strongly recommends designers and users perform testing for application and package specific conditions. For additional information, please contact a Technical Service Representative. (864) 224-3506

Kevlar® 29, 129, LT, KM2, KM2+, X300, and Comfort XLT Fabrics

Style	Weave	Count	Count	Warp	Yarn	Fill	Yarn	Weight (oz/yd ²)	Weight (g/m ²)	Thickness (mils)	Thickness (mm)	Strength (lbf/in)	Warp	Fill
290	Plain Leno	9.6	5	Kevlar 29	1500d	Kevlar 29	1500d	4.0	136	12.8	0.36	70	900	
296	Plain Leno	12	12	Kevlar 29	3000d	Kevlar 29	3000d	9.8	333	28.0	0.71	900	1420	
297	Plain Leno	14	14	Kevlar 29	3000d	Kevlar 29	3000d	12.0	408	32.0	0.81	1000	1650	
310	Plain	35.5	35.5	Kevlar LT	400d	Kevlar LT	400d	3.5	122	7.0	0.18	530	530	
311	Rip Stop	35.5	35.5	Kevlar LT	400d	Kevlar LT	400d	3.5	122	7.0	0.18	575	530	
431	Plain	31	31	Kevlar LT	400d	Kevlar LT	400d	3.1	105	6.0	0.15	575	575	
702	Plain	21.6	21.6	Kevlar 129	1000d	Kevlar 129	1000d	5.6	190	10.1	0.25	650	700	
704	Plain	31	31	Kevlar 129	840d	Kevlar 129	840d	6.5	220	12.0	0.30	900	950	
705	Plain	31	31	Kevlar KM2	850d	Kevlar KM2	850d	6.8	231	12.0	0.30	880	950	
706	Plain	34	34	Kevlar KM2	600d	Kevlar KM2	600d	5.3	180	9.0	0.23	775	880	
707	Plain	31	31	Kevlar KM2	600d	Kevlar KM2	600d	4.7	160	8.4	0.21	675	750	
710	Plain	24	24	Kevlar 29	1500d	Kevlar 29	1500d	9.4	333	17.1	0.43	1100	1200	
712	Plain	12	12	Kevlar 29	3000d	Kevlar 29	3000d	9.1	309	16.5	0.42	1200	1200	
713	Plain	31	31	Kevlar 29	1000d	Kevlar 29	1000d	8.3	281	15.0	0.38	900	930	
720	Plain	20	20	Kevlar 129	1420d	Kevlar 129	1420d	7.6	258	14.1	0.36	980	990	
722	Plain	22	22	Kevlar 129	1420d	Kevlar 129	1420d	8.2	278	15.8	0.40	970	960	
724	Plain	24	24	Kevlar 129	1000d	Kevlar 129	1000d	6.5	220	11.0	0.28	760	775	

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. JPSCM strongly recommends designers and users perform testing for application and package specific conditions. For additional information, please contact a Technical Service Representative, (864) 224-3506

Kevlar® 29, 129, LT, KM2, KM2+, X300, and Comfort XLT Fabrics (cont.)

Style	Weave	Count	Warp	Yarn	Fill	Yarn	Weight (oz/yd ²)	Thickness (mil)	Strength (lbf/in)	Warp	Fill
726	Plain	26	26	Kevlar 129 840d	Kevlar 129 840d	5.8	203	10.0	0.25	760	1060
727	Plain	26	26	Kevlar 129 1000d	Kevlar 129 1000d	7.2	220	12.0	0.30	910	1060
728	Plain	17	17	Kevlar 29 1500d	Kevlar 29 1500d	6.9	234	12.1	0.31	780	810
729	Plain	17	17	Kevlar 129 1420d	Kevlar 129 1420d	6.6	224	12.1	0.31	900	890
730	Plain	22	22	Kevlar 29 1000d	Kevlar 29 1000d	6.1	207	10.1	0.25	650	725
731	Plain	31	31	Kevlar 129 1000d	Kevlar 129 1000d	8.1	275	15.0	0.37	900	900
732	Plain	32	32	Kevlar 29 400d	Kevlar 29 400d	3.5	119	6.0	0.15	450	430
735	Basket 2x2	35	35	Kevlar 29 1500d	Kevlar 29 1500d	14.2	483	23.0	0.58	1800	1800
736	Basket 2x2	36	36	Kevlar 129 1420d	Kevlar 129 1420d	13.7	475	23.0	0.58	1950	2000
737	Plain	28	28	Kevlar KM2 600d	Kevlar KM2 600d	4.4	150	6.0	0.15	550	575
739	Plain	39	36	Kevlar 29 1500d	Kevlar 29 1500d	15.2	517	25.3	0.64	2000	1800
740	Plain	40	40	Kevlar 29 200d	Kevlar 29 200d	2.1	71	5.0	0.13	340	330
741	Plain	11	11	Kevlar 29 3000d	Kevlar 29 3000d	8.4	286	15.0	0.38	1100	1150
741ML	Plain	22	22	Kevlar 29 3000d	Kevlar 29 3000d	18.8	639	29.0	0.74	1700	1800
743	Twill 4x4	40	40	Kevlar 29 3000d	Kevlar 29 3000d	16.5	576	29.0	0.74	3200	3200
745	Plain	17	17	Kevlar 29 3000d	Kevlar 29 3000d	13.2	448	24.1	0.61	1600	1800
745 WRT	Plain	17	17	Kevlar 29 3000d	Kevlar 29 3000d	13.2	448	24.1	0.61	1400	1500

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. JPSCM strongly recommends designers and users perform testing for application and package specific conditions. For additional information, please contact a Technical Service Representative, (864) 224-3506

Kevlar® 29, 129, 159, LT, KM2, KM2+, X300, and Comfort XLT Fabrics (cont.)

Style	Weave	Count	Count	Warp	Yarn	Fill	Yarn	Weight (oz/yd ²)	(g/m ²)	Thickness (mils)	(mm)	Strength (lbf/in)	Warp	Fill
745 LCS	Plain	17	17	Kevlar 29 3000d	Kevlar 29 3000d	15.5	524	25.0	0.64	1600	1800			
747	Plain	10	10	Kevlar 29 3000d	Kevlar 29 3000d	6.5	220	12.0	0.30	910	1060			
748	Basket 8x8	48	48	Kevlar 29 1500d	Kevlar 29 1500d	6.9	234	12.1	0.31	780	810			
751	Plain	29	29	Kevlar KM2 600d	Kevlar KM2 600d	4.5	153	6.2	0.16	600	650			
753	Basket 2x2	34	34	Kevlar KM2 600d	Kevlar KM2 600d	5.3	180	8.9	0.23	770	880			
754	Basket 2x2	21	21	Kevlar 29 3000d	Kevlar 29 3000d	16.5	576	29.0	0.74	2000	2000			
755	Basket 4x4	21	21	Kevlar 29 3000d	Kevlar 29 3000d	16.2	549	30.0	0.76	2000	2000			
756	Plain	28	28	Kevlar KM2 400d	Kevlar KM2 400d	2.9	95	5.0	0.13	450	430			
759	Basket 4x4	24	24	Kevlar 29 3000d	Kevlar 29 3000d	14.7	496	23.0	0.58	1800	1800			
760	Basket 2x2	30	30	Kevlar 29 1420d	Kevlar 29 1420d	11.6	295	20.0	0.51	1200	1300			
768	Plain	28	28	Kevlar KM2+ 500d	Kevlar KM2+ 500d	4.6	156	7.5	0.19	500	500			
779	Plain	70	70	Kevlar 159 200d	Kevlar 159 200d	3.9	132	7.0	0.18	350	500			
780	Plain	20	20	Kevlar KM2 850d	Kevlar KM2 850d	5.1	173	8.5	0.22	700	700			
782	Plain	22	22	Kevlar KM2 850d	Kevlar KM2 850d	4.3	146	7.5	0.19	600	600			
4000	Plain	18	18	Kevlar X300 800d	Kevlar X300 800d	3.6	122	7.0	0.18	720	750			
4015	Plain	22	22	Kevlar X300 800d	Kevlar X300 800d	4.1	139	8.2	0.21	650	600			
4015 ML	Plain	44	44	Kevlar X300 800d	Kevlar X300 800d	9.0	306	16.6	0.42	1100	1100			

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. JPSCM strongly recommends designers and users testing for application and package specific conditions. For additional information, please contact a Technical Service Representative, (864) 224-3506

Kevlar® 29, 129, 159, LT, KM2, KM2+, X300, and Comfort XLT Fabrics (cont.)

Style	Weave	Count Warp	Count Fill	Warp Yarn	Fill Yarn	Weight (oz/yd ²) (g/m ²)	Thickness (mils) (mm)	Strength (lbf/in) Warp	Fill
4023	Plain	23	23	Kevlar XLT 600d	Kevlar XLT 600d	3.5	119	6.9	0.18
4029	Plain	29	29	Kevlar XLT 600d	Kevlar XLT 600d	4.6	156	8.8	0.22

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. JPSCM strongly recommends designers and users perform testing for application and package specific conditions. For additional information, please contact a Technical Service Representative, (864) 224-3506.

Spectra® Fabrics

Style	Weave	Count Warp	Count Fill	Warp Yarn	Fill Yarn	Weight (oz/yd ²) (g/m ²)	Thickness (mils) (mm)	Strength (lbf/in) Warp	Fill		
902	Plain	17	17	Spectra 900 1200d	Spectra 900 1200d	5.5	187	18	0.46	900	850
903	Plain	21	21	Spectra 900 1200d	Spectra 900 1200d	7.9	237	20	0.51	1100	1100
904	Plain	34	34	Spectra 900 650d	Spectra 900 650d	6.0	203	17	0.43	950	900
912	Basket 4x4	32	32	Spectra 900 1200d	Spectra 900 1200d	11.7	399	27	0.69	1500	1600
945	Plain	45	45	Spectra 1000 215d	Spectra 1000 215d	2.6	88	6	0.15	500	475
951	Plain	17	17	Spectra 1000 1000d	Spectra 1000 1000d	2.9	108	11	0.28	600	550
955	Plain	56	56	Spectra 1000 215d	Spectra 1000 215d	3.3	112	7	0.18	700	550
956	Plain	34	34	Spectra 1000 215d	Spectra 1000 215d	1.9	64	5	0.13	400	360
960	Plain	32	32	Spectra 1000 375d	Spectra 1000 375d	3.3	112	7	0.18	600	550
961	Plain*	32	32	Spectra 1000 375d	Spectra 1000 375d	3.3	112	7	0.18	600	550
984	Plain	32	32	Spectra 1000 650d	Spectra 1000 650d	5.5	186	14	0.36	1050	1000

*Kevlar Tracer

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. JPSCM strongly recommends designers and users perform testing for application and package specific conditions. For additional information, please contact a Technical Service Representative. (864) 224-3506

S-2 Glass® Rovings and Aramid Hybrid Fabrics

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. JPSCM strongly recommends designers and users perform testing for application and package specific conditions. For additional information, please contact a Technical Service Representative, (864) 224-3506

Technical References - English

Fiber	Density (lb/in ³)	Tensile Strength (ksi)	Tensile Modulus (msi)	Strain to Failure (%)	Specific Tensile Strength (10 ⁶ in)	Tensile Modulus (10 ⁸ in)	Specific Tensile Modulus (10 ⁸ in)	Coefficient of Thermal Expansion (10 ⁻⁶ /°F)	Decomposition Temperature (°F)
E-glass	0.095	500	10.5	4.0	5.28	1.11	3.00	1346	
S-2 Glass	0.090	665	12.5	5.5	7.42	1.40	0.90	1562	
Kevlar ® 49, 1420d	0.052	424	15.8	2.5	8.15	3.04	-1.50	842	
Kevlar ® 29 1500d	0.052	424	10.9	3.4	8.15	2.10	-1.22	842	
Kevlar ® 129 840d	0.052	479	13.6	3.3	9.21	2.61	-1.22	842	
Kevlar ® KM2 850d	0.052	497	10.8	3.5	9.55	2.08	-1.22	842	
Kevlar ® LT 400d	0.052	497	13.6	3.4	9.55	2.61	-1.22	842	
Kevlar ® KM2 600d	0.052	497	11.8	3.6	9.55	2.27	-1.22	842	
Spectra ® 900 650d	0.035	348	11.4	3.6	9.93	3.25	-	302	
Spectra ® 1000 375d	0.035	410	14.9	3.1	11.70	4.25	-	302	
Spectra ® 2000 195d	0.035	465	16.4	2.9	13.27	4.68	-	302	
Twaron ® 1000	0.052	507	9.4	3.7	9.74	1.81	-1.22	842	
Twaron ® 2000	0.052	479	12.9	3.3	9.21	2.50	-1.22	842	
Twaron ® HM	0.052	507	14.7	2.1	9.69	2.85	-1.33	842	

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. JPSCM strongly recommends designers and users perform testing for application and package specific conditions. For additional information, please contact a Technical Service Representative, (864) 224-3506

Technical References - Metric

Fiber	Density (g/cm ³)	Tensile Strength (MPa)	Tensile Modulus (GPa)	Strain to Failure (%)	Specific Tensile Strength (10 ⁶ cm)	Specific Tensile Modulus (10 ⁸ cm)	Coefficient of Thermal Expansion (10 ⁻⁶ /°C)	Decomposition Temperature (°C)
E-glass	2.50	2600	72	4.0	13.42	2.82	1.60	730
S-2 ® Glass	2.48	4800	85	5.5	18.86	3.55	0.48	850
Kevlar ® 49, 1420d	1.44	2926	109	2.5	20.71	7.72	-2.70	450
Kevlar ® 29 1500d	1.44	2926	75	3.3	29.71	5.32	-2.20	450
Kevlar ® 129 840d	1.44	3305	94	3.3	23.39	6.64	-2.20	450
Kevlar ® KM2 850d	1.44	3429	75	3.5	24.27	5.27	-2.20	450
Kevlar ® LT 400d	1.44	3429	94	3.4	24.60	7.52	-2.20	450
Kevlar ® KM2 600d	1.44	3429	81	3.6	24.27	5.76	-2.20	450
Spectra ® 900 650d	0.97	2401	79	3.6	25.23	8.26	-	150
Spectra ® 1000 375d	0.97	2829	103	3.1	29.72	10.80	-	150
Spectra ® 2000 195d	0.97	3209	113	2.9	33.71	11.89	-	150
Twaron ® 1000	1.44	3498	65	3.7	24.76	4.59	-2.20	450
Twaron ® 2000	1.44	3305	90	3.3	23.39	6.35	-2.20	450
Twaron ® HM	1.45	3498	103	2.1	24.59	7.23	-2.40	450

The physical properties listed are for greige (untreated) fabrics. Actual values may vary. JPSCM strongly recommends designers and users perform testing for application and package specific conditions. For additional information, please contact a Technical Service Representative, (864) 224-3506

Selected Conversions and Formulae

US to SI

$$1 \text{ oz/yd}^2 = 33.91 \text{ g/m}^2$$

$$1 \text{ oz} = 28.35 \text{ g}$$

$$1 \text{ lb} = 16 \text{ oz}$$

$$1 \text{ lb} = 0.454 \text{ kg}$$

$$1 \text{ N} = 0.102 \text{ kgf}$$

$$1 \text{ psi} = 6.89 \times 10^{-3} \text{ MPa}$$

$$1 \text{ denier} = 0.111 \text{ Tex}$$

$${}^\circ\text{F} = ({}^\circ\text{C} + 32) * (9/5)$$

$$1 \text{ in} = 25.4 \text{ mm} = 2.54 \text{ cm}$$

$$1 \text{ lb/ft}^2 = 4.89 \text{ kg/m}^2$$

$$1 \text{ lb/ft}^3 = 16.05 \text{ kg/m}^3$$

$$1 \text{ yd} = 0.91 \text{ m}$$

$$1 \text{ ft} = 0.3048 \text{ m}$$

$$1 \text{ w.m}^{-1}. \text{k}^{-1} = 0.86 \text{ kcal.m}^{-1}. \text{h}^{-1}. \text{k}^{-1} = 6.9 \text{ btu.in}/(\text{ft.hr.}{}^\circ\text{F})$$

SI to US

$$1 \text{ g/m}^2 = 0.295 \text{ oz/yd}^2$$

$$1 \text{ g} = 0.035 \text{ oz}$$

$$1 \text{ kg} = 2.205 \text{ lb}$$

$$1 \text{ kgf} = 4.45 \text{ N}$$

$$1 \text{ ksi} = 6.89 \text{ MPa}$$

$$1 \text{ MPa} = 1 \text{ N/mm}^2$$

$$1 \text{ GPa} = 1000 \text{ MPa}$$

$$1 \text{ Tex} = 9 \text{ denier}$$

$$1 \text{ Tex} = 496.24 \text{ yd/lb}$$

$${}^\circ\text{C} = ({}^\circ\text{F} - 32) * (5/9)$$

$$1 \text{ cm} = 0.39 \text{ in}$$

$$1 \text{ kg/m}^2 = 0.204 \text{ lb/ft}^2$$

$$1 \text{ kg/m}^3 = 0.062 \text{ lb/ft}^3$$

$$1 \text{ m} = 1.09 \text{ yd}$$

$$1 \text{ m} = 3.281 \text{ ft}$$

Metric Conversion Chart

Fabric	US	Factor	Metric
Length	yd	x 0.914	= m
Width	in	x 2.540	= cm
Weight	oz/yd ²	x 33.906	= g/m ²
Breaking Strength	lb/in	x 8.756	= N/cm
Thickness	in	x 25.400	= mm
Mullen Burst	lb/in ²	x 0.007	= MPa
Porosity	cfm	x 0.508	= cm/cm ²
Area	yd ²	x 0.8361	= m ²



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