



Technical Reference Handbook

JPS
COMPOSITE MATERIALS
A Handy & Harman Company



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Company

JPS Composite Materials is the world's leading manufacturer of high strength fiberglass, Astroquartz®, aramid, carbon, and specialty reinforcement fabrics.

Our materials are used extensively in composite reinforcing, insulating, and safety applications. JPS fabrics are used in consumer and industrial electronics, aerospace interior and exterior structures, advanced commercial and military radomes, in marine and surf applications, sporting goods, and other advanced composites, and as ballistic protection.

Our materials are readily adaptable to unlimited applications!

Direct customer access to customer service:

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Locations

Anderson, South Carolina

Corporate Headquarters

Aerospace Composite, Astroquartz®, Aramid, and
Specialty Fabrics

Statesville, North Carolina

Electrical Laminate E-glass Fabrics,
Lightweight Advanced and
Aerospace Composite Fabrics,
Carbon 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. 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 variables associated with producing industrial reinforcement fabrics (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 only. The data contained herein is subject to change at the Seller's discretion 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 must be considered. These are broken down into five basic variables: Yarn Weight, Yarn Thickness, Yarn Count, Weave Pattern, and Fabric Finish.

Yarn weight and yarn count determine the majority of the physical properties of the fabric. Yarn count is defined as the number of warp yarn ends (lengthwise) and filling yarn picks (widthwise) used per inch.

The weave pattern determines the stiffness or drapability of the fabric. The pattern will also have an influence on overall thickness. For composite applications there are six basic patterns: Plain, Basket, Leno, Four Harness Satin (Crowfoot), Eight Harness Satin, and Twill.

The fabric finish is the surface chemistry applied to the fabric post weaving. Finishes are generally applied to promote adhesion between the fabric and any resin coatings. They may also serve to add stiffness, prevent moisture uptake, and wear damage caused by handling.

Glass Yarn

Yarn determines the majority of the end fabric properties, including the fabric weight, thickness, and strength.

The yarn properties are determined by the chemical composition, the number of input filaments per yarn strand, the number of yarn strands twisted or plied together, and the overall denier (weight) of the final input yarn.

Glass Formulations

Glass fibers are made from different formulations: "E" is the most common all-purpose glass. Other types include "S", "T", and "L", among others. Astroquartz® products are the purest form of silica commercially available.

COMPOSITION OF TYPICAL GLASSES

(%) by weight

Ingredient	"E" Glass	"S", "T" Glass	"Astroquartz ® II & III"
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	-

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Filament/Yarn Nomenclature

An exact system for identifying fiberglass textile yarns is required because of the wide variety of available types. The nomenclature consists of two basic parts. The alphabetical portion describes the composition and construction. The numerical describes the weight and number of yarns twisted and plied together.

As an example:

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)	

The above describes the basic strand by composition, type and diameter. The numbers identify strand weight and construction. The above description would be for ECG 150 1/2 yarn, or more simply G-150 1/2, used in style 1581 fabric. The S-glass version for style 6581 fabric would be SCG 150 1/2, where "S" denotes S-glass. The non-twisted equivalent for 7781 would be ECDE 75 1/0.

The strand count is the first series of numbers following the letters. It indicates approximate yardage per pound, in hundreds. The number of yards in one pound of single yarn strand can be found by multiplying the strand count by 100.

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The second series of numbers designates the number of plies in continuous filament yarns. The first digit in the second digit series 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 in the second series, 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 in a yarn, multiply the two numbers (0 multiplied as 1). A typical nomenclature for a continuous yarn:

ECG 150-1/2 Where:

E = E-glass

C = Continuous filament

G = Average filament diameter (see table, page 6)

150 = 15,000 Yd/Lb (Nominal) of basic "singles" strand

1/2 = One continuous filament yarn strand consisting of two strands plied together (1X2)

The approximate yards per pound of fabricated yarn can be found by dividing the strand count, multiplied by 100, by the number of strands.

Therefore, ECG 150 1/2 contains:

$$\frac{150 \times 100}{1 \times 2} = 7500 \text{ yds/lb for fabricated yarn}$$

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

DESCRIPTION OF CONTINUOUS FILAMENT GLASS FIBERS

Filament Name	Filament Diameter mils	Diameter microns	Strand Count (x100=yd/lb)	Tex	Number of Filaments
B	0.15	3.8	150	33	1224
C	0.15	3.8	150	33	816
D	0.23	5.0	1800	2.75	51
			900	5.5	102
			450	11	204
			225	22	408
DE	0.25	6.0	150	33	408
			75	66	816
			50	99	1224
			37	134	1632
E	0.29	7.0	225	22	204
G	0.36	9.0	150	33	204
			75	66	408
			37	134	816
H	0.43	10	25	198	816
K	0.51	13	75	66	204
			37	134	408
			25	198	608
			18	275	816

DESIGN CONSIDERATIONS FOR GLASS FABRIC SELECTION

There are five basic design variables to consider when choosing fabric for industrial use: thickness, aerial weight, yarn size, construction, finish.

Thickness

Glass fabrics are available in thicknesses ranging from ~0.001" to ~0.060".

Weight

Fabric weights are typically measured in ounces per square yard (osy) or grams per square meter (gsm). Glass fabrics are available from about 0.50 osy up to about 52 osy (17 gsm to 1773 gsm.)

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Construction

Construction refers to the fabric pattern, which is both the number of warp yarns per inch (machine direction, ends) and fill yarns per inch (cross-machine direction, picks), and the pattern of interlacing used (plain, twill, satin, etc).

Yarn Size (denier or weight)

Fabric weight and thickness are determined by the input yarn size (denier or weight).

Finish

The finish is the chemical composition of the surface of final fabric. Organic coatings are applied (or removed) to make the fabric more suitable for future resin coating and end use performance requirements.

FABRIC CREATION

Yarn Preparation: Twisting/Plying

This process serves to control the yarn strength, diameter, weight, and flexibility.

Filaments are twisted and or plied based on the end fabric specification requirements.

Most glass fabrics are woven from singles yarns (1/0). Some notable exceptions including styles 108, 120, and 1581.

Warping

Warping is the laying of the machine direction fibers in parallel order. This creates the warp, or machine direction, lof the fabric.

A specified number of yarns per inch are drawn from a

creel and wound on a warp beam. Several “section” beams are then combined to provide the designated number of yarns per inch required in the fabric specification.

Slashing/Combining

The section beams from warping are combined during the slashing process to create a warp beam (aka: loom beam). This entire system of parallel threads is wound onto one large beam to become the “warp”, or machine direction, of the fabric.

An additional yarn binder is applied to the warp yarns during the slashing process. The additional binder helps to improve fabric surface quality by providing extra protection to the warp yarns during the weaving process.

Entering

The entering operation draws the warp yarns into to the loom, setting up the weave pattern, yarn spacing and thread counts. The warp yarns are threaded through the harnesses and reed. The entire warp beam-harness-reed unit is then transferred to the loom to begin weaving.

Weaving

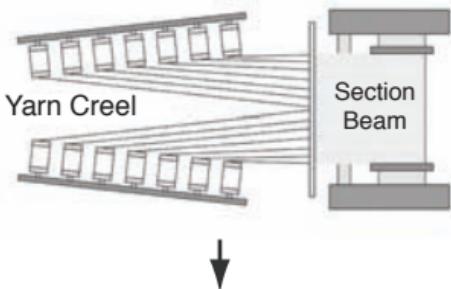
Weaving is the interlacing of filling (cross machine) yarns through warp (machine direction) yarns in a predetermined pattern, including yarn counts, yarn spacings, over/under sequences and predetermined intersecting angles.

Cleaning and Finishing

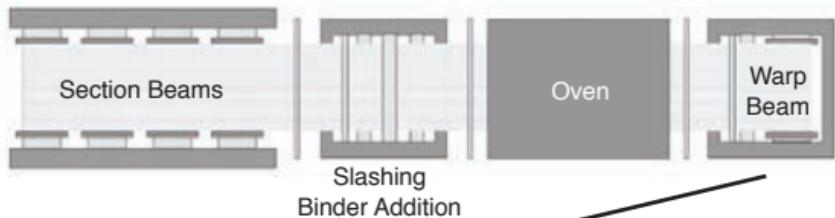
Dependent on the end fabric use, specialty chemical finishes may be applied to the fabric surface. The loom state (greige) fabric surface must first be cleaned. This is accomplished via either heat exposure or chemical washing. Most glass fabrics are ‘heat cleaned’, most polymer based and specialty fabrics are chemically scoured. The specialty finish is applied post cleaning.

Manufacturing Process Overview

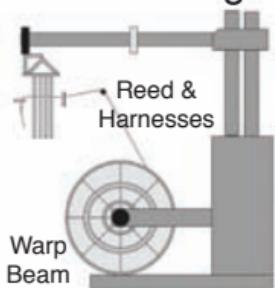
1. Yarn Prep and Warping



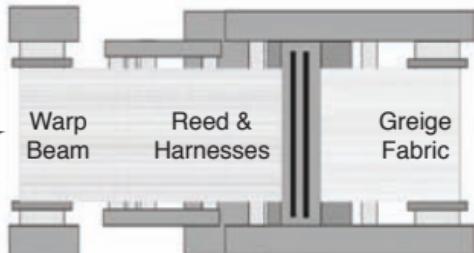
2. Slashing/Combining



3. Entering



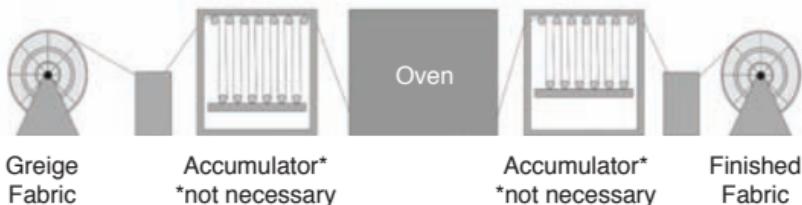
4. Weaving



5. Heat Cleaning/Chemical Scouring



6. Finishing



Finishes most commonly act as coupling agents to improve resin wet-out and bonding. Finishes may also be applied to improve water and wear resistance, high temperature performance..

JPS offers a wide range of existing finishes. We do develop specialty and exclusive finishes based on customer input. For more information please contact us.

Weave Patterns

The matching of yarn, weave pattern and finish for a particular application is an exacting science. Because glass, carbon, aramid and specialty fabrics are highly engineered, the right combination of fabric weight, thickness and construction is essential in selecting the proper fabric. Selecting the right reinforcement fabric for any requirement can be simplified by calling us. Our specialized experience can aid in selecting a reinforcement fabric suited to your requirements.

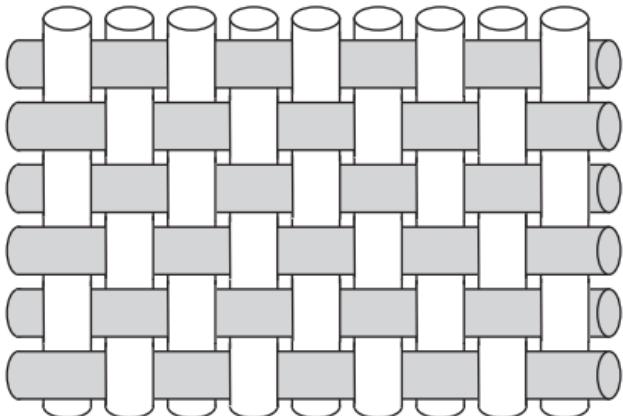
All standard of fabric weaves presented here can be produced with fiberglass, aramid, Astroquartz ®, polymer, specialty and carbon yarns.

The six most common fabric patterns are presented here. Other fabric patterns are available on request; as well as through development.

Plain Weave fabrics tend to be the most stable pattern, followed by Leno, Basket Weave, 4H Satin, 8H Satin fabrics.

In terms of drape or conformability, 8H Satin is the most conformable, followed by the 4H Satin, Basket Weave, Plain Weave and Leno fabrics.

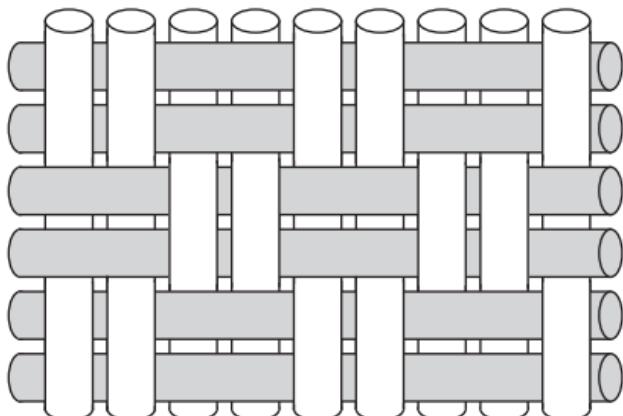
Plain Weave



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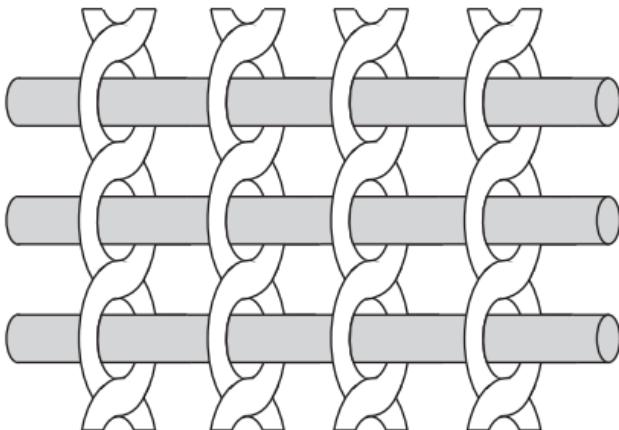
The plain weave consists of yarns interlaced in an alternating pattern, one over and one under every other yarn. The plain weave provides good fabric stability. It is the primary fabric used in the electronics and coating industries.

Basket Weave



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

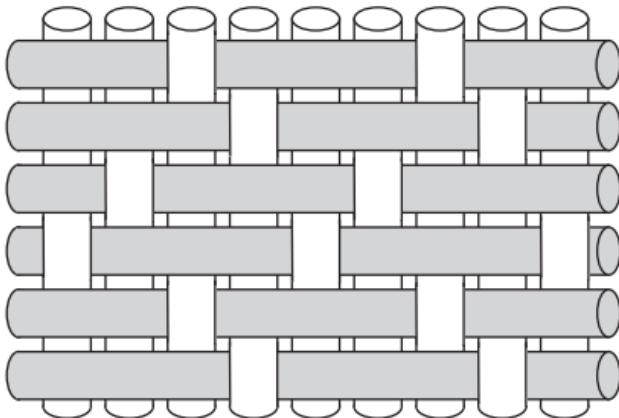
Leno



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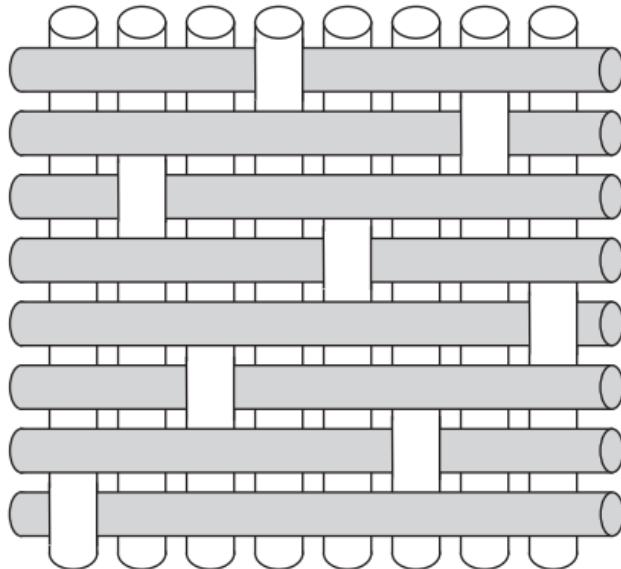
The leno weave is used where relatively low aerial weights are desired but specific thicknesses must be maintained. The leno weave pattern locks the yarns in place by crossing two or more warp threads over each other and interlacing with one or more fill threads. Leno weave patterns are common in EIFS applications and to set bond line thicknesses for adhesives and tapes.

Four-Harness Satin (Crowfoot)



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

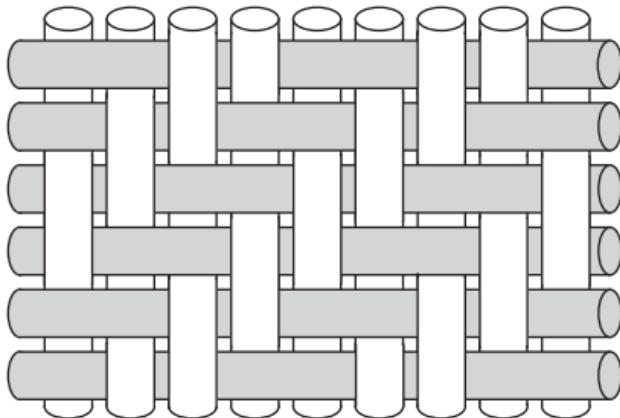
Eight-Harness Satin



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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.

2x2 Twill



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 two consecutive picks, permitting more yarns per unit area.

Specifications and Standards

JPS fabrics are designed to meet the requirements of a wide range of applications. Listed below is a partial offering of the standards and specifications we manufacture towards. For adherence to a specific standard or specification not listed please contact customer service or technical support.

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AMS-3824 - Glass Cloth, Finished for Resin Laminates

AMS-3846 - Quartz Cloth, Finished for Resin Laminates

AMS-3902 - Para-Aramid Cloth for Structural Composites

AMS-C-9084 - Glass Cloth, Finished for Resin Laminates

ASTM-D-579 - Greige Woven Glass Fabrics

ASTM-D-1668 - Standard Specification for Glass Fabrics

ASTM-D-4029 - Standard Specification for Finished Glass Fabrics

BMS 9-3 - Boeing requirements for E-Glass Fabrics

BMS 9-8 - Boeing requirements for carbon Fabrics

BMS 9-17 - Boeing requirements for Intermediate Modulus Carbon Fabrics

IPC-4412 - Standard Specification for Glass Fabrics for Use in Printed Circuit Boards

MIL-DTL-62474 - Aramid-Reinforced-Plastic Composites

MIL-PRF-64154 - Glass-Reinforced-Phenolic Composites

MIL-R-7575 - Glass-Reinforced-Polyester Composites

MIL-R-9300 - Glass-Reinforced-Epoxy Composites

MIL-Y-1140 - Greige Woven Glass Fabrics

FIBERGLASS PRODUCTS

Physical Properties of E-glass Fiber

Approximate Chemistry*

SiO ₂	52-56%
CaO.....	16-25%
Al ₂ O ₃	12-16%
B ₂ O ₃	5-10%
MgO.....	0-5%
NaO ₂	0-1%
KO ₂	0-1%
Other Elements.....	0-2%

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Physical Properties*

Density.....	2.54-2.60 g/cc
Refractive Index.....	1.547 to 1.562
Mohs Hardness.....	6.5

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 (-30°C to 250°C).....	5.4 $\mu\text{m}/\text{m}\cdot^\circ\text{C}$
Specific Heat Capacity.....	0.80-1.03 kJ/kg-K
Thermal Conductivity.....	1.0-1.3 W/m-K
Softening Point.....	$\leq 845^\circ\text{C}$

Electrical Properties*

Dk @ 1 MHz.....	6.6
Dk @ 10 GHz.....	6.1
Df @ 1 MHz.....	0.003
Df @ 10 GHz.....	0.004
Volume Resistivity.....	$4.02 \cdot 10^{15} \Omega\text{-cm}$
Surface Resistivity.....	$4.20 \cdot 10^{16} \Omega\text{-cm}$
Dielectric Strength.....	103kV/cm

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

Physical Properties of S-Glass

Approximate Chemistry*

SiO ₂	64-66%
Al ₂ O ₃	24-26%
MgO.....	9-11%
Other Elements.....	0-1.2%

Physical Properties*

Density.....	2.46-2.49 g/cc
Refractive Index.....	1.520 to 1.525
Mohs Hardness.....	6.5

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Mechanical Properties*

UTS (room temp).....	4.6-4.8 GPa
Breaking Strain.....	5.4-5.8%
Young's Modulus.....	85-90 GPa
Shear Modulus.....	33-37 GPa
Poisson's Ratio.....	0.230

Thermal Properties*

CTE (-30°C to 250°C).....	2.9 $\mu\text{m}/\text{m}\cdot^\circ\text{C}$
Specific Heat Capacity.....	0.74-0.82 kJ/kg-K
Thermal Conductivity.....	1.1-1.4 W/m-K
Softening Point.....	$\leq 1055^\circ\text{C}$

Electrical Properties*

Dk @ 1 MHz.....	5.3
Dk @ 10 GHz.....	5.2
Df @ 1 MHz.....	0.002
Df @ 10 GHz.....	0.007
Volume Resistivity.....	$0.905 \cdot 10^{13} \Omega\text{-cm}$
Surface Resistivity.....	$0.886 \cdot 10^{13} \Omega\text{-cm}$
Dielectric Strength.....	130kV/cm

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

Fiberglass Fabric Applications

Fiberglass fabrics are used in a wide range of industrial applications, some of which are outlined below.

Aerospace Applications

Fiberglass is used for interior cabin structures including seats, luggage bins, bulkheads, lavatories, wall panels, and in honeycomb structures. Other applications include gasketing, as galvanic barriers between carbon and metal, for structural parts, and in support of radomes. JPS is BMS, AMS, SAE and MIL spec approved for your needs.

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Electrical Applications

Fiberglass fabrics can be found in printed circuit boards, antennas, high voltage generators, transformers, switches, cables and many other electrical applications.

Structural Applications

Fiberglass fabrics are used as reinforcements in highly engineered composite materials in many of the world's leading aircraft, automobiles, buildings, and roadways,

Recreational Applications

JPS fiberglass is found in many recreational composites, including in high performance racecars and motorcycles, bicycles, bats, racquets, hockey sticks, and in high end surf and snow boards.

Thermal Insulation

The U.S. Navy, commercial shipyards, the automotive, and aerospace industries all use fiberglass almost exclusively for pipe lagging, thermal pad cover, thermal protection, and insulation applications.

General Industrial Applications

Fiberglass fabrics can be found in window shades, vapor barriers, movie screens, packaging tapes, awnings, protective clothing, gaskets, conveyor belts, food cooking applications, and countless other products that improve our lives daily.

Fiberglass Fabric Finishes

Fiberglass fabrics are available with a variety of finishes and treatments. The most common finishes are listed here, for specific applications, or to develop a custom finish for your application please contact customer service or your technical support representative.

Finish Name	Functionality:			Notes
	Primary	Secondary		
Greige	Uncoated	Phenolic	Loom state fabric with yarn binders	
Caramelized (210)	Uncoated	PTFE	Loom state fabric, partially volatized	
F3	Polyester	Epoxy	Volan, green tint	
F12	Silicone		Neutral pH	
F16	Polyester	Epoxy	Volan, green tint	
112	Uncoated	Phenolic	Fully heat cleaned BMS 9-3 Listed	
CS-309	Polyimide	Epoxy, BT	Silane Finish	
CS-310	Epoxy		Silane Finish BMS 9-3 Listed	
CS-550	PE, Epoxy	Phenolic	Volan, green tint	
CS-616	Melamine		Silane finish, tan	
CS-718	Epoxy		Silane Finish	
CS-724	Epoxy		Silane Finish BMS 9-3 Listed	
CS-745	Epoxy	BT, Cynate Ester, PI	Silane Finish	
CS-767	Epoxy, Polyimide, Cynate Ester	BMI, Phenolic, SBR	Silane Finish BMS 9-3 Listed	

Fiberglass Fabric Finishes (cont.)

Finish Name	Functionality:		Notes
	Primary	Secondary	
S-910	Polyester		High clarity for surf
S-912	Polyester	Epoxy	High clarity for surf
A-1100	Phenolic	Epoxy	Silane finish BMS 9-3 Listed
A-1100S	Phenolic	Epoxy	Recommend for hand layup, BMS 9-3 Listed
Z-6040	Epoxy	Phenolic	Common base silane
9464	Uncoated	Epoxy	Antimony-free Hull Board
9465	Uncoated	Epoxy	Higher flame retardant Hull Board
9466	Uncoated	Epoxy	Standard Hull Board
9827	Epoxy	Polyimide	Silane finish
9837	Vinyl Ester	Polyester	Vinyl silane finish
Great White Polyester			Highest clarity for surf
Volan	Polyester	Epoxy	Volan finish, green tint, BMS 9-3 Listed

Fiberglass Fabrics

Style	Weave	Count	Warp Yarn	Fill Yarn	Weight (oz/y)	Thickness (mils)	Strength (lbf/in) Warp Fill				
Common		Warp	Fill		(gsm)	(mm)					
101	Plain	75	75	ECD 1800 1/0	ECD 1800 1/0	0.48	16	1.0	0.02	40	40
104 X	Plain	60	52	ECD 900 1/0	ECD 1800 1/0	0.55	19	1.1	0.03	60	50
106 X	Plain	56	56	ECD 900 1/0	ECD 900 1/0	0.72	24	1.3	0.03	45	40
108 X	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 X	Plain	60	58	ECD 450 1/2	ECD 450 1/2	3.09	105	4.0	0.10	170	140
117	Plain	54	39	ECD 450 1/2	ECD 450 1/2	2.40	81	3.7	0.09	160	100
119	Plain	54	50	ECD 450 1/2	ECD 450 1/2	2.71	92	3.6	0.09	150	150
120 X	4H Satin	60	58	ECD 450 1/2	ECD 450 1/2	3.16	107	3.9	0.10	150	150
128	Plain	44	32	ECE 225 1/3	ECE 225 1/3	6.00	204	7.0	0.18	200	200
138	4H Satin	65	60	ECE 225 1/2	ECE 225 1/2	6.53	221	6.9	0.18	270	260
139	4H Satin	64	60	ECE 225 1/2	ECE 225 1/2	6.50	220	6.5	0.17	250	200
162 X	Plain	28	16	ECE 225 2/5	ECE 225 2/5	12.01	407	13.8	0.35	650	420
220 X	4H Satin	60	58	ECE 225 1/0	ECE 225 1/0	3.14	106	3.7	0.09	150	150

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 Fabrics

Style Common	Weave	Count	Warp Yarn	Warp Yarn	Fill Yarn	Fill	Weight (oz/y)	Thickness (mils)	Strength (lbf/in) Warp	Fill
332	X	4H Satin	48	32	ECG 37 1/0	ECG 37 1/0	13.00	441	14.2	0.36
333		4H Satin	48	32	ECDE 37 1/0	ECDE 37 1/0	13.00	441	14.0	0.36
403		4H Satin	54	50	ECG 75 1/0	ECG 150 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	X	8H Satin	73	72	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
1014	X	Knit	18	20	ECDE 150 1/0	ECDE 150 1/0	6.60	223	10.5	0.26
1025		Knit	18	20	ECDE 225 1/0	ECDE 225 1/0	4.90	167	8.4	0.21
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	0.73	25	1.3	0.03
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	5.6	0.14
1064		Plain	18	21	ECG 75 1/2	ECG 150 1/2	4.60	156	5.8	0.15
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

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Fiberglass Fabrics

Style Common	Weave	Count	Warp Yarn	Fill Yarn	Weight (oz/y)	Thickness (mils) (mm)	Strength (lbf/in) Warp Fill				
1070 X	Plain	60	35	ECD 450 1/0	ECD 900 1/0	1.02	35	1.9	0.05	126	33
1071	Plain	60	30	ECD 900 1/0	ECD 900 1/0	0.60	20	1.2	0.03	60	30
1076	Plain	60	25	ECD 450 1/0	ECD 900 1/0	0.96	33	1.8	0.05	120	20
1078	Plain	54	54	ECD 450 1/0	ECD 450 1/0	1.41	48	1.7	0.04	100	100
1080 X	Plain	60	47	ECD 450 1/0	ECD 450 1/0	1.41	48	2.2	0.06	120	90
1081	Plain	70	60	ECD 450 1/0	ECD 450 1/0	1.72	59	2.4	0.06	80	20
1086	Plain	60	60	ECD 450 1/0	ECD 450 1/0	1.65	56	2.2	0.06	120	120
1125	Plain	40	39	ECD 450 1/2	ECG 150 1/0	2.60	88	3.5	0.09	100	150
1131 X	Plain	120	52	ECD 450 1/0	ECG 150 1/0	3.65	124	4.8	0.12	190	260
1141	Plain	32	21	ECDE 75 1/0	ECDE 75 1/0	4.20	142	7.0	0.18	250	120
1142 X	Plain	31	21	ECG 37 1/0	ECG 37 1/0	8.39	284	10.3	0.26	400	310
1161 X	Plain	100	42	ECD 450 1/0	ECDE 100 1/0	3.86	131	5.0	0.13	150	340
1162 X	Plain	100	36	ECD 450 1/0	ECG 75 1/0	4.33	137	5.6	0.14	100	180
1165 X	Plain	60	52	ECD 450 1/2	ECG 150 1/0	3.66	124	4.1	0.10	150	260
1167 X	Plain	60	55	ECD 450 1/2	ECG 150 1/0	3.79	129	4.2	0.11	160	260

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Fiberglass Fabrics

Style	Weave	Count	Warp Yarn	Fill Yarn	Fill	Weight (oz/y) (gsm)	Thickness (mils) (mm)	Strength (lb/in) Warp Fill				
1188	X	4H Satin	47	30	ECH 25 1/0	ECG 150 1/0	12.02	408	11.8	0.30	750	130
1280	X	Plain	60	60	ECD 450 1/0	ECD 450 1/0	1.65	56	2.2	0.06	120	120
1297	X	Plain	50	20	ECD 450 1/0	ECD 900 1/0	0.79	27	2.0	0.05	110	30
1299	X	Plain	50	20	ECD 450 1/0	ECD 450 1/0	0.92	31	2.0	0.05	100	40
1521	X	Plain	30	16	ECG 150 1/2	ECG 75 1/0	3.60	122	5.5	0.14	150	150
1522	X	Plain	24	22	ECG 150 1/2	ECG 150 1/2	3.63	123	4.7	0.12	170	140
1523	X	Plain	28	20	ECG 150 3/2	ECG 150 3/2	11.55	392	13.2	0.34	510	390
1526		Plain	35	32	ECG 150 1/2	ECG 150 1/2	5.30	180	6.2	0.16	250	240
1527		Plain	17	17	ECG 150 3/3	ECG 150 3/3	11.98	406	14.0	0.36	480	480
1528	X	Plain	42	32	ECG 150 1/2	ECG 150 1/2	6.03	204	7.0	0.18	280	200
1530		Plain	20	18	ECG 150 3/3	ECG 150 3/3	13.20	448	15.0	0.38	500	470
1543		4H Satin	49	30	ECG 75 1/2	ECE 225 1/0	8.52	289	8.2	0.21	680	70
1557		4H Satin	57	30	ECG 150 1/2	ECE 225 1/0	5.25	178	5.3	0.13	370	110
1562	X	Leno	30	16	ECG 150 1/0	ECG 150 1/0	1.88	64	4.9	0.12	100	70
1564	X	Plain	20	18	ECG 37 1/2	ECG 37 1/2	12.42	421	15.1	0.38	520	500

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Fiberglass Fabrics

Style Common	Weave	Count Warp	Fill	Warp Yarn	Fill Yarn	Weight (osy)	Thickness (mils)	Strength (lbf/in) Warp	Strength (lbf/in) Fill
1568	Leno	16	8	ECH 25 1/0	ECG 37 1/3	7.97	270	16.5	0.42
1581	X 8H Satin	57	54	ECG 150 1/2	ECG 150 1/2	8.78	298	8.2	0.21
1582	8H Satin	60	56	ECG 150 1/3	ECG 150 1/3	13.52	462	12.6	0.32
1583	8H Satin	54	48	ECG 75 1/2	ECG 75 1/2	16.55	561	16.1	0.41
1584	X 8H Satin	44	35	ECG 150 4/2	ECG 150 4/2	26.34	893	22.9	0.58
1597	Plain	30	30	ECG 37 1/4	ECG 37 1/4	38.46	1308	38.3	0.97
1608	Plain	30	26	ECG 150 1/0	ECG 150 1/0	2.22	75	3.5	0.09
1609	X Plain	32	10	ECG 150 1/0	ECD 450 1/0	1.48	50	2.8	0.07
1610	X Plain	32	28	ECG 150 1/0	ECG 150 1/0	2.36	80	4.0	0.10
1611	Plain	32	28	ECG 150 1/0	ECDE 150 1/0	2.42	82	4.0	0.10
1614	X Leno	30	14	ECG 150 1/0	ECG 75 1/0	2.35	80	5.7	0.14
1617	Plain	30	14	ECG 150 1/0	ECG 75 1/0	2.31	78	6.8	0.17
1620	X Plain	20	20	ECG 150 1/0	ECG 150 1/0	1.60	50	3.2	0.08
1628	X Plain	40	28	ECDE 150 1/0	ECDE 150 1/0	2.71	92	4.3	0.11
1632	Plain	30	32	ECG 150 1/0	ECG 150 1/0	3.75	127	4.9	0.12

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Fiberglass Fabrics

Style	Weave	Count	Warp	Yarn	Warp	Yarn	Fill	Weight	Thickness	Strength (lb/in)
Common			Warp	Fill			Yarn	(oz/y)	(mils)	Warp Fill
1633	Plain	40	20	ECG 150 1/0	ECG 75 1/0	3.20	108	4.1	0.11	120 120
1634	Plain	41	24	ECDE 150 1/0	ECDE 150 1/2	3.11	105	3.7	0.10	120 120
1636	Plain	40	24	ECDE 150 1/0	ECDE 150 1/0	2.59	88	4.4	0.11	210 130
1647	Plain	51	30	ECG 150 1/0	ECE 110 1/0	3.55	121	4.1	0.11	120 120
1649	Plain	51	38	ECG 150 1/0	ECE 110 1/0	4.01	136	4.7	0.12	120 200
1651	Plain	51	27	ECG 150 1/0	ECG 37 1/0	4.31	146	5.3	0.14	120 130
1652 X	Plain	52	52	ECG 150 1/0	ECG 150 1/0	4.13	140	4.4	0.11	230 100
1657	Plain	51	32	ECDE 150 1/0	ECDE 150 1/0	2.82	96	3.8	0.10	150 100
1658 X	Plain	20	10	ECG 150 1/0	ECG 75 1/0	1.62	55	3.7	0.09	100 20
1659 X	Leno	20	10	ECG 150 1/0	ECG 75 1/0	1.66	56	4.5	0.11	80 160
1669	Plain	60	12	ECG 150 1/0	ECD 450 1/0	2.50	85	3.2	0.08	310 160
1674 X	Plain	40	32	ECG 150 1/0	ECG 150 1/0	2.87	97	4.2	0.11	210 200
1675 X	Plain	40	32	ECDE 150 1/0	ECDE 150 1/0	2.89	98	4.4	0.11	220 160
1676 X	Plain	56	48	ECDE 150 1/0	ECDE 150 1/0	4.00	136	4.8	0.12	70 60
1677 X	Plain	41	40	ECDE 150 1/0	ECDE 150 1/0	3.15	105	3.7	0.09	180 160

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Fiberglass Fabrics

Style Common	Weave	Count	Warp Yarn	Fill Yarn	Weight (oz)	Thickness (mils)	Strength (lbf/in)
					(gsm)	(mm)	Warp Fill
1678	Plain	40	40	ECG 150 1/0	ECG 150 1/0	3.20	108
1680	8H Satin	72	70	ECDE 150 1/0	ECDE 150 1/0	5.73	194
1681	Plain	56	36	ECDE 150 1/0	ECDE 150 1/0	3.65	123
1688	X	Plain	32	20	ECG 150 1/0	ECG 75 1/0	2.90
1692	Plain	40	22	ECG 150 1/0	ECG 75 1/0	3.19	108
1694	Plain	40	24	ECG 150 1/0	ECG 75 1/0	3.54	120
1695	X	Plain	40	24	ECDE 150 1/0	ECDE 75 1/0	3.59
1800	Plain	16	14	ECK 18 1/0	ECK 18 1/0	9.39	318
1884	8H Satin	44	35	ECK 18 1/0	ECK 18 1/0	25.40	861
1908	Mod Twill	32	15	ETDE 11.6 Tex	ETDE 11.6 Tex	24.0	812
1938	8H Satin	45	36	ECK 18 1/0	ECG 37 1/2	26.8	909
2025	X	Plain	20	14	ETDE 11.6 Tex	ETDE 11.6 Tex	17.05
2112	X	Plain	40	39	ECE 225 1/0	ECE 225 1/0	2.10
2113	X	Plain	60	56	ECE 225 1/0	ECD 450 1/0	2.35
2114	Plain	56	48	ECE 225 1/0	ECE 225 1/0	2.69	91

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Fiberglass Fabrics

Style Common	Weave	Count Warp	Fill	Warp Yarn	Fill Yarn	Weight (osy) (gsm)	Thickness (mils) (mm)	Strength (lbf/in) Warp Fill
2116 X	Plain	60	58	ECE 225 1/0	ECE 225 1/0	3.12	106	3.4 0.09 200 180
2117	Plain	66	55	ECE 225 1/0	ECE 225 1/0	3.18	108	3.7 0.09 200 150
2119	Plain	54	50	ECE 225 1/0	ECE 225 1/0	2.66	90	3.4 0.09 140 110
2125	Plain	41	38	ECE 225 1/0	ECE 225 1/0	2.60	88	3.5 0.09 120 120
2313	Plain	60	64	ECE 225 1/0	ECD 450 1/0	4.32	146	5.9 0.15 180 280
2316	Plain	61	61	ECE 225 1/0	ECE 225 1/0	3.13	106	3.8 0.10 230 230
2319	Plain	60	49	ECE 225 1/0	ECE 225 1/0	2.72	92	3.4 0.09 200 180
3070	Plain	70	70	ECDE 300 1/0	ECDE 300 1/0	2.83	96	3.0 0.08 190 160
3313	Plain	61	62	ECDE 300 1/0	ECDE 300 1/0	2.45	83	3.0 0.08 190 160
3582	8H Satin	60	56	ECG 50 1/0	ECG 50 1/0	13.76	467	13.8 0.35 700 600
3733	Plain	18	18	ECG 37 1/0	ECG 37 1/0	5.59	190	7.1 0.18 370 320
3784 X	8H Satin	45	36	ECG 37 1/2	ECG 37 1/2	25.79	874	24.2 0.61 1180 930
3788 X	12H Satin	42	36	ECG 37 1/4	ECG 37 1/4	52.30	1773	48.7 1.24 1900 1600
3884	8H Satin	46	36	ECDE 37 1/2	ECDE 37 1/2	26.50	899	26.7 0.68 1000 930
4180 X	4H Satin	80	100	SCD 450 1/0	SCD 450 1/0	2.52	85	2.7 0.07 180 200

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Fiberglass Fabrics

Style	Weave	Count	Warp Yarn	Fill Yarn	Weight (oz/y)	Thickness (mils)	Strength (lbf/in) Warp Fill
Common					(gsm)	(mm)	
4522	Plain	24	22	SCG 150 1/2	SCG 150 1/2	3.66	124 5.1 0.13 190 150
4526	Basket 2x2	36	34	SCG 75 1/0	SCG 75 1/0	5.60	190 6.0 0.15 350 350
4527	Plain	24	22	SCG 75 1/0	SCG 75 1/0	3.58	121 5.6 0.14 340 310
4533	Plain	18	18	SCG 75 1/2	SCG 75 1/2	5.59	190 8.1 0.21 340 310
4579	Plain	30	16	SCG 150 1/2	SCG 75 1/0	3.59	122 5.4 0.14 300 300
4985	Plain	18	22	SCG 75 1/2	SCG 150 1/2	4.70	159 6.2 0.16 300 110
6080	Plain	60	47	SCD 450 1/0	SCD 450 1/0	1.44	4.9 2.0 0.05 150 110
6220	4H Satin	60	58	SCE 225 1/0	SCE 225 1/0	3.08	104 4.0 0.10 250 200
6580	X 8H Satin	72	72	SCG 150 1/0	SCG 150 1/0	5.60	190 5.6 0.14 350 300
6581	8H Satin	56	54	SCG 150 1/2	SCG 150 1/2	8.75	297 10.4 0.26 250 250
6771	8H Satin	46	45	SCG 75 1/0	SCG 75 1/0	7.06	239 8.0 0.20 500 500
6781	X 8H Satin	57	54	SCG 75 1/0	SCG 75 1/0	8.94	303 9.6 0.24 560 450
16781	X 8H Satin	58	55	SCG 75 1/0	SCG 75 1/0	9.00	305 9.6 0.24 550 500
16791	Conform	58	55	SCG 75 1/0	SCG 75 1/0	9.00	305 9.6 0.24 550 500
26781	X 8H Satin	56	53	SCG 75 1/0	SCG 75 1/0	8.50	288 9.0 0.23 450 400

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Fiberglass Fabrics

Style	Weave	Count	Warp	Yarn	Warp	Yarn	Fill	Yarn	Weight	Thickness	Strength (lbf/in)	
	Common	Warp	Fill		(osy)	(gsm)		(mils)	(mm)	Warp	Fill	
7500	X	Plain	16	14	ECG 37 1/2	9.41	319	11.9	0.30	420	400	
7510	X	Plain	18	21	ECG 75 1/2	4.50	152	7.0	0.18	120	70	
7520		Plain	18	18	ECG 75 1/3	8.39	284	10.1	0.26	330	310	
7523		Plain	28	20	ECG 75 1/3	ECG 75 1/3	11.55	392	13.2	0.34	680	500
7531	X	Plain	23	14	ECG 75 1/2	ECG 75 1/2	5.50	186	9.0	0.23	160	110
7532	X	Plain	16	14	ECG 75 1/3	ECG 75 1/3	7.20	244	9.4	0.24	340	300
7533	X	Plain	18	18	ECG 75 1/2	ECG 75 1/2	5.61	191	7.3	0.19	250	230
7544	X 2 End Plain	28	14	ECG 37 1/2	ECG 37 1/4	18.00	612	19.1	0.49	700	700	
7581	X	8H Satin	57	54	ECG 75 1/0	ECG 75 1/0	9.00	305	8.9	0.23	570	500
7587	X	Mock Leno	40	21	ECG 37 1/2	ECG 37 1/2	20.50	695	30.0	0.76	750	450
7597		Double Satin	30	30	ECG 37 1/4	ECG 37 1/4	37.90	1289	40.3	1.02	1000	1100
7618		Plain	43	18	ECG 75 1/0	ECG 75 1/0	4.95	168	6.5	0.17	330	120
7624		Plain	44	24	ECG 75 1/0	ECG 75 1/0	5.53	187	7.0	0.18	350	250
7627		Plain	44	24	ECG 75 1/0	ECG 75 1/0	5.58	189	6.2	0.16	320	170
7628	X	Plain	44	31	ECG 75 1/0	ECG 75 1/0	6.10	207	7.1	0.18	350	270

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Fiberglass Fabrics

Style	Weave	Count	Warp Yarn	Fill Yarn	Weight (oz/y)	Thickness (mils)	Strength (lbf/in) Warp Fill
Common	Warp	Fill			(gsm)	(mm)	
76281	4H Satin	44	32	ECG 75 1/0	6.10	207	7.0 0.18 350 270
7629	Plain	44	34	ECG 75 1/0	6.26	212	7.1 0.18 350 270
7637 X	Plain	44	23	ECG 75 1/0	ECG 37 1/0	7.09	240 9.5 0.24 320 420
7642	Plain	44	20	ECG 75 1/0	ETG 37 1/0 Tex	6.86	233 10.9 0.28 350 180
7645 X	8H Satin	46	42	ECG 75 1/2	ECG 75 1/2	14.31	485 13.4 0.34 600 500
17645 X	8H Satin	46	42	SCG 75 1/2	SCG 75 1/2	13.90	471 13.0 0.33 700 600
7781 X	8H Satin	57	54	ECDE 75 1/0	ECDE 75 1/0	8.87	301 8.6 0.22 500 400
17781 X	8H Satin	58	55	ECDE 75 1/0	ECDE 75 1/0	9.00	305 8.7 0.23 580 500
7791 X	Conform	58	58	ECDE 75 1/0	ECDE 75 1/0	8.95	303 8.7 0.23 500 440
16550 X	Plain	24	22	SCG 150 1/2	SCG 150 1/2	3.66	124 5.6 0.14 250 230
21522 X	Plain	24	22	ECG 150 1/2	ECG 150 1/2	3.65	124 5.5 0.14 300 280
27533 X	Plain	18	17	ECG 75 1/2	ECG 75 1/2	5.55	188 8.2 0.21 300 280
85392 X	Plain	44	30	SCG 75 1/0	T-5043	6.00	203 8.5 0.22 300 75

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Fiberglass Fabric Weight Index

Style	Weight (oz/yd ²) (g/m ²)													
101	0.49	17	108	1.42	48	1617	2.31	78	2114	2.69	91	220	3.14	106
104	0.57	19	6080	1.44	49	3132	2.32	78	119	2.71	92	1677	3.15	107
1071	0.60	20	1609	1.48	50	1614	2.35	80	1628	2.71	92	2117	3.18	108
993	0.71	24	3080	1.57	53	2113	2.35	80	1657	2.82	95	1692	3.19	108
1037	0.73	25	1620	1.60	54	1610	2.36	80	3070	2.83	96	1633	3.20	108
1297	0.79	27	1658	1.62	55	113	2.39	81	3313	2.83	96	1678	3.20	108
106	0.81	27	1280	1.65	56	1611	2.42	82	1674	2.87	97	1694	3.54	120
1035	0.88	30	1086	1.65	56	2313	2.45	83	1675	2.89	98	1647	3.55	122
1067	0.91	31	1659	1.66	56	117	2.46	83	1688	2.90	98	4527	3.58	121
1299	0.92	31	1081	1.72	59	1669	2.50	85	6220	3.08	104	1695	3.59	122
1076	0.96	33	1629	1.78	60	4180	2.52	85	116	3.09	105	4579	3.59	122
1070	1.02	35	1562	1.88	64	1636	2.59	88	3116	3.10	105	1521	3.60	122
1065	1.08	37	112	2.10	71	1125	2.60	88	1634	3.11	105	1522	3.63	123
1078	1.41	48	2112	2.10	71	2125	2.60	88	2116	3.12	106	1131	3.65	124
1080	1.41	48	1608	2.22	75	2119	2.66	90	120	3.14	106	1681	3.65	124

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Fiberglass Fabric Weight Index

Style	Weight (oz/yd ²) (g/m ²)	Style (oz/yd ²) (g/m ²)	Weight (oz/yd ²) (g/m ²)	Style (oz/yd ²) (g/m ²)	Weight (oz/yd ²) (g/m ²)	Style	Weight (oz/yd ²) (g/m ²)	Style	Weight (oz/yd ²) (g/m ²)					
21522	3.65	124	4985	4.70	159	880	5.70	193	7532	7.20	244	16791	9.00	306
1165	3.66	124	1025	4.90	167	1680	5.73	194	1142	8.39	284	17781	9.00	306
4522	3.66	124	7618	4.95	168	128	6.00	203	7520	8.39	284	1800	9.39	318
16550	3.66	124	1044	5.10	173	85392	6.00	203	403	8.40	285	7500	9.41	319
1632	3.75	127	1557	5.25	178	1528	6.03	204	7537	8.50	288	1523	11.55	392
1167	3.79	129	1526	5.30	180	7628	6.10	207	1543	8.52	289	7523	11.55	392
2316	3.86	131	1047	5.44	184	76281	6.10	207	520	8.70	295	1527	11.98	406
1161	3.86	131	7531	5.50	186	7629	6.26	212	6581	8.75	297	162	12.00	407
1649	4.01	136	7624	5.53	187	7667	6.27	213	1581	8.78	298	3764	12.02	408
1676	4.12	140	7627	5.58	189	139	6.50	220	7781	8.87	301	1188	12.02	408
1652	4.13	140	3733	5.59	190	138	6.53	221	6781	8.94	303	1564	12.42	421
1141	4.20	142	4533	5.59	190	1014	6.60	223	7698	8.95	303	332	13.00	441
1651	4.31	145	4526	5.60	190	7642	6.86	233	7791	8.95	303	333	13.00	441
7510	4.50	152	6580	5.60	190	6771	7.06	239	7581	8.99	305	1530	13.20	448
1064	4.60	156	7533	5.61	191	7637	7.09	240	16781	9.00	306	1582	13.52	462

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

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)
3582	13.76	467	3788	52.30	1773				
17645	13.90	470							
7645	14.31	485							
3783	16.15	546							
2025	17.05	578							
7544	17.99	612							
7587	20.50	695							
1908	24.00	811							
1884	25.40	861							
3784	25.79	874							
1584	26.34	893							
3884	26.50	899							
1938	26.80	909							
7597	37.90	1289							
1597	38.46	1308							

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

Style	Thickness (mils) (mm)								
101	0.78 0.02	108	2.2 0.06	1669	3.2 0.08	1677	3.7 0.09	1678	4.3 0.11
104	1.0 0.03	1080	2.2 0.06	2114	3.3 0.08	2117	3.7 0.09	1636	4.4 0.11
1035	1.1 0.03	1086	2.2 0.06	113	3.4 0.09	1657	3.8 0.10	1652	4.4 0.11
993	1.1 0.03	1280	2.2 0.06	2116	3.4 0.09	2316	3.8 0.10	1675	4.4 0.11
1071	1.2 0.03	3080	2.3 0.06	2119	3.4 0.09	116	3.9 0.10	1659	4.5 0.11
106	1.3 0.03	1081	2.4 0.06	112	3.5 0.09	120	3.9 0.10	2875	4.5 0.11
1037	1.3 0.03	4180	2.7 0.07	1125	3.5 0.09	1610	4.0 0.10	1522	4.7 0.12
1067	1.4 0.04	1609	2.8 0.07	1608	3.5 0.09	1611	4.0 0.10	1649	4.7 0.12
1078	1.7 0.04	2113	2.8 0.07	2125	3.5 0.09	6220	4.0 0.10	1681	4.7 0.12
1076	1.8 0.05	2313	2.8 0.07	119	3.6 0.09	1165	4.1 0.10	1688	4.7 0.12
1070	1.9 0.05	3132	2.8 0.07	3116	3.6 0.09	1633	4.1 0.10	1131	4.8 0.12
1297	2.0 0.05	3313	2.9 0.07	117	3.7 0.09	1647	4.1 0.10	1562	4.9 0.12
1299	2.0 0.05	2112	3.0 0.08	220	3.7 0.09	1167	4.2 0.11	1629	4.9 0.12
6080	2.0 0.05	3070	3.0 0.08	1634	3.7 0.09	1674	4.2 0.11	1632	4.9 0.12
1065	2.1 0.06	1620	3.2 0.08	1658	3.7 0.09	1628	4.3 0.11	1676	4.9 0.12

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

Style	Thickness (mils) (mm)	Thickness (mils) (mm)								
1161	5.0 0.13	16550	5.6 0.14	1528	7.0 0.18	1025	8.4 0.21	6781	9.6 0.24	
4522	5.1 0.13	1614	5.7 0.14	7510	7.0 0.18	7537	8.5 0.22	16781	9.6 0.24	
1692	5.2 0.13	1064	5.8 0.15	7624	7.0 0.18	85392	8.5 0.22	16791	9.6 0.24	
1.694	5.2 0.13	880	6.0 0.15	7667	7.0 0.18	7781	8.6 0.22	7520	10.1 0.26	
1557	5.3 0.13	4526	6.0 0.15	76281	7.0 0.18	7791	8.7 0.22	1142	10.3 0.26	
1651	5.3 0.13	1526	6.2 0.16	3733	7.1 0.18	17781	8.7 0.22	6581	10.4 0.26	
1695	5.4 0.14	4985	6.2 0.16	7628	7.1 0.18	403	8.9 0.23	1014	10.5 0.27	
4579	5.4 0.14	7627	6.2 0.16	7629	7.1 0.19	7581	8.9 0.23	7642	10.9 0.28	
1521	5.5 0.14	139	6.5 0.17	7533	7.3 0.19	7531	9.0 0.23	1800	11.2 0.28	
21522	5.5 0.14	7618	6.5 0.17	3780	7.8 0.20	7698	9.0 0.23	1188	11.8 0.30	
1044	5.6 0.14	3731	6.7 0.17	3743	7.9 0.20	26781	9.0 0.23	7500	11.9 0.30	
1047	5.6 0.14	1617	6.8 0.18	6771	8.0 0.20	520	9.1 0.23	1582	12.6 0.32	
1680	5.6 0.14	138	6.9 0.18	4533	8.1 0.21	7532	9.4 0.24	17645	13.0 0.33	
4527	5.6 0.14	128	7.0 0.18	1543	8.2 0.21	7637	9.5 0.24	1523	13.2 0.34	
6580	5.6 0.14	1141	7.0 0.18	1581	8.2 0.21	7637	9.5 0.24	7523	13.2 0.34	

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

Style	Thickness (mils) (mm)								
1530	15.0	0.38	3788	48.7	1.24				
1564	15.1	0.38							
3783	15.7	0.40							
1583	16.1	0.41							
7544	19.1	0.49							
1584	22.9	0.58							
3784	24.2	0.61							
1884	26.0	0.66							
2025	26.2	0.67							
1938	26.6	0.68							
3884	26.7	0.68							
7587	30.0	0.76							
1597	38.3	0.97							
1908	40.0	1.01							
7597	40.3	1.02							

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.

ASTROQUARTZ ® PRODUCTS

Astroquartz ® is a registered trademark of JPS Industries

JPS has been weaving the 99.99% pure silica fabric since 1964. Astroquartz ® is used in many of the world's most advanced composite applications. This includes usage in the manned and unmanned space programs, as stealth supporting materials, as radomes for superior signal integrity, and internet connectivity on commercial airliners.

Astroquartz ® is the leader when it comes to low dielectric, high strength, and high thermal reliability composite reinforcements.

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Astroquartz II ® & Astroquartz III ® Properties

Astroquartz ®, Astroquartz II ® and Astroquartz III ® are composed of identical raw materials. Astroquartz ® has been discontinued in favor of Astroquartz II ® and Astroquartz III ®. Improved manufacturing and handling technologies have allowed Astroquartz II ® and Astroquartz III ® to become more robust and cost effective. All represent unparalleled quality, purity, and performance. JPS and Astroquartz ® 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/cm³

Silica Content (exclusive of yarn binder).....99.99%

Fiber Diameter - Astroquartz II ®.....9µm

Fiber Diameter - Astroquartz III ®.....14µm

Physical Properties of Fused Quartz

Mechanical Properties

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

Electrical Properties

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 Properties

Linear Expansion Coefficient.....	0.54 x 10 ⁻⁶
Specific Heat @ 20°C (J/gK).....	7.5 x 10 ²
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

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Optical Properties

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

Astroquartz® Applications and Design Considerations

Astroquartz® fabrics offer better solutions when high strength, low dielectric loss and high heat resistance is required.

The aerospace industry relies on Astroquartz® fiber products made from pure fused silica (99.99% SiO₂) to produce an outstanding, reproducible reinforcement material.

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

Astroquartz ® Applications and Design Considerations (cont.)

Thickness

Quartz and composite fabrics are available in thicknesses ranging from 0.003" to 0.027" (0.13-0.69 mm).

Weight

The weight for Astroquartz ® fabrics range from 2.0 to 19.5 ounces per square inch (128 to 660 gsm).

Construction

Construction is the number of warp and fill yarns per inch (machine and cross-machine direction) and the fabric pattern. This helps determine the thickness, weight, drapability, and overall performance of the fabric.

Yarn Size

39 Yarn size is a major factor in determining the weight and thickness of the fabric. The yarn size, twist and ply counts will also play a large role in determining the overall strength of the woven fabric. For specific applications, one yarn may be selected over another to the advantage of the performance characteristics.

Finish

The Astroquartz ® fabrics can be coated with a coupling agent, called the finish, to assist resin wet out and to improve the strength of the fiber to resin interface. This has the effect of improving the mechanical, thermal and electrical performance characteristics of the final part. Please contact JPS technical or customer service for assistance in choosing the correct fabric finish for your application.

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 JPS.

Finish Name	Functionality:		Notes
	Primary	Secondary	
S-928	Epoxy		Epoxy functional silane
1059 HT/ 2059 HT/ 3059 HT	Polyimide	Thermo-plastic matrices	Formulated for high temperature and moisture resistance
9779	Epoxy	Bismaleimide Cynate Ester	Amino-silane
9827/ 2827/ 3827	Epoxy	Polyimide, Bismaleimide	Recommended for electronic and aerospace applications
9836/ 2836/ 3836	Epoxy	Bismaleimide	Scoured fabric to remove most organic binder components
9837/ 2837/ 3837	Polyester	Vinyl Ester Epoxy, Cynate Ester	Recommended for resins cured by vinyl addition

Astroquartz II ® Chopped Fiber

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

Astroquartz II ® chopped fibers are widely used in reinforced plastics, molding compounds and ceramic composites. The chopped fibers add thermal resistance and improved ablation to the final part.

Type 556 Chopped Fiber

Fiber Lengths*
from 1/8" to 1"

Astroquartz II ® chopped fiber with an aminosilane binder. Compatible with epoxy, phenolic and some polyimide resins.

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

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Standard Packaging

1 lb packages packed loosely in clear polyethylene bags.

Order Requirements and Lead Times

Please contact JPS to confirm availability and lead time.

Dependent on available inventory the minimum order requirement is approximately 60 lbs. Please allow 8-12 weeks for processing.

Astroquartz® II & III Fabrics

Style Common	Weave	Count	Warp Yarn	Warp Yarn	Fill Yarn	Fill	Weight (osy)	Thickness (mils)	Strength (lbf/in) Warp Fill		
503 X	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 1/0	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 X	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 X	Plain	40	31	QCK 125 1/0	QCK 125 1/0	3.38	114	5.0	0.13	115	100
4581 X	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.)

Handling

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.

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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

* Test Method - ASTM D-234

** 0.3%-0.6% LOI

** Test Method - ASTM D-578 • +0-1

† ±10% †† Tensile, min. avg., uncoated roving

Astroquartz ® Roving (cont.)

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

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; capable of extended exposure to 2000°F. Fiber composition is 99.99% SiO₂ (silica) exclusive of binder.

Astroquartz II ® sewing threads are supplied coated with PTFE.

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With 9855 Teflon Coating (20±4%)

Type	Approx. Diameter (in)	Breaking Strength*		Approx. Yield**	
		Typical (lb)	Minimal	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	-	900

* Test Method - ASTM D-578

** ±10%

Standard Packaging

Astroquartz II ® sewing thread are typically available in 0.5 kg spools. Please contact JPS for price and delivery lead times.

Astroquartz ® Yarn

Astroquartz ® 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.

Astroquartz ® yarn has more than five times the yarn yield of high silica leached yarn. This results in higher tensile strength and abrasion resistance. With Astroquartz ® high production efficiencies are possible in the production of high temperature flexible insulation.

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

Property Data

Type	Approx. Diameter (in)	Approx. Breaking ε (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

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Astroquartz ® yarns are available with an amino-silane 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

* Astroquartz II ® filaments are 9 µm in diameter, similar to an ECG filament
* Each filament is 9 µm in diameter, equivalent to an ECK filament.

Physical Properties of Para-Aramid

Para-Aramid - Kevlar ®*, Twaron ®**

Physical Properties

Density.....	1.44 g/cc
Equilibrium Moisture Level, Kevlar 29.....	4.5%
Equilibrium Moisture Level, Kevlar 49.....	3.5%

Mechanical Properties

UTS (room temp).....	2.9-3.0 GPa
Elongation at Break.....	2.4-3.6%
Young's Modulus.....	71-112 GPa
Shear Modulus.....	26-41 GPa
Poisson's Ratio.....	0.36

Thermal Properties

Shrinkage in Water at 212°F (100°C).....	<0.1%
Shrinkage in Dry Air at 351°F (177°C).....	<0.1%
Specific Heat Capacity at 77°F (25°C).....	1.420 kJ/kg-K
Specific Heat Capacity at 212°F (100°C).....	2.01 kJ/kg-K
Specific Heat Capacity at 356°F (180°C).....	2.52 kJ/kg-K
Thermal Conductivity.....	0.04 W/m-K
Decomposition Temperature in Air.....	800-900°C
Recommended Max Temperature Range for Long Term Use in air.....	149-177°C
Heat of Combustion.....	35x10^6 J/kg

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

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

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

Physical Properties of UHMWPE

Ultra High Molecular Weight Polyethylene -

Dyneema ®*, Spectra ®**

Physical Properties

Density..... 0.97 g/cc

Mechanical Properties

UTS (Spectra 900).....	25-30 GPa
UTS (Spectra 1000).....	35-43 GPa
Elongation at Break (Spectra 900).....	3.6-3.9%
Elongation at Break (Spectra 1000).....	2.9-3.5%
Young's Modulus (Spectra 900).....	850-920 GPa
Young's Modulus (Spectra 1000).....	1170-1580 GPa

Thermal Properties

Melting Range.....	144-152°C
Decomposition Temperature in Air.....	>300°C
Advised Lowest Temperature.....	No Limit
Advised Long Duration Temperature Limit.....	70°C
Advised Short Duration Temperature Limit	
Non-Constrained Fiber.....	130°C
Constrained Fiber.....	145°C

Tensile Strength Relative to 23°C

at -60°C.....	110%
at 23°C.....	100%
at 60°C.....	80%
at 100°C.....	55%

* Dynnema ® is a registered trademark of Royal DSM N.V.

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

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

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.

Aerospace and Recreational Composites

JPS high performance fabrics are used in a variety of composite applications. Aramids and other high performance fabrics are designed to maximize strength, weight savings, durability, and cost. Applications include aerospace, kayaks, recreational sporting goods, and safety equipment, among others.

Advanced Fabrics 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 textile 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 and Decitex

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.

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

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 JPS.

Finish Name	Description
CS-811	Loom state fabric
CS-800	Scoured aramid fabrics
CS-802	Scoured UHMWPE fabrics
CS-892	Water repellent finish for Spectra and Dyneema fabrics
CS-898	Traditional water repellent finish for Kevlar fabrics
CS-899	Traditional water repellent finish for Twaron fabrics
CS-6000	Engineered aramid water repellent treatment for improved performance
LCS	Laminated Composite Substrate
ML	Micro-Laminate
WRT	Water Repellent Treated

Aramid Fabrics

Style #	Weave	Count	Warp Yarn	Fill Yarn	Weight (osy)	Thickness (mils)	Strength (lb/in)	Warp Fill
JPS	AMS Common	Warp Fill	Warp Yarn	Yarn	(gsm)	(mm)		
290	Leno	9.6	5	Kevlar 29 1500d	4.0	136	12.8	0.33
296	Leno	12	12	Kevlar 29 3000d	9.8	333	28.0	0.71
297	Leno	14	14	Kevlar 29 6000d	Kevlar 29 6000d	12.4	420	33.5
312	Plain	36	36	Kevlar KM2+ 400d	Kevlar KM2+ 400d	3.5	122	7.0
313	Rip Stop	36	36	Kevlar KM2+ 400d	Kevlar KM2+ 400d	3.1	105	6.0
314	Plain	31	31	Kevlar KM2+ 400d	Kevlar KM2+ 400d	3.1	105	6.0
323	335	4H Satin	17	17	Kevlar 49 1420d	Kevlar 49 1420d	6.2	210
324	2x2 Twill	24	24	Kevlar 49 1140d	Kevlar 49 1140d	7.3	248	13.4
5324	2x2 Twill	24	24	Twaron 2200 1270dt	Twaron 2200 1270dt	7.2	244	13.3
328	328	Plain	17	17	Kevlar 49 1420d	Kevlar 49 1420d	6.5	220
5328	328	Plain	17	17	Twaron 2200 1580dt	Twaron 2200 1580dt	6.4	215
343	143	4H Satin	100	20	Kevlar 49 380d	Kevlar 49 195d	5.5	187
345	124	4H Satin	34	34	Kevlar 49 195d	Kevlar 49 195d	1.7	58
348	181	8H Satin	50	50	Kevlar 49 380d	Kevlar 49 380d	5.1	173
5348	181	8H Satin	50	50	Twaron 1055 405dt	Twaron 1055 405dt	4.9	166

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.

Aramid Fabrics

Style #	Weave	Count	Warp Yarn	Fill Yarn	Weight (oz/y)	Thickness (mils)	Strength (lbf/in) Warp Fill
JPS	AMS Common	Warp Fill	Warp Yarn	Kevlar 49 195d	2.0	68	4.0 0.10 230 230
349	4H Satin	41	40	Kevlar 49 195d	2.0	68	4.0 0.10 230 230
350	120 X Plain	34	34	Kevlar 49 195d	1.8	61	3.9 0.10 200 200
351	220 X Plain	22	22	Kevlar 49 380d	2.2	75	4.8 0.12 300 300
5351	220 Plain	22	22	Twaron 1055 405dt	2.2	75	4.6 0.12 300 300
352	281 X Plain	17	17	Kevlar 49 1140d	5.2	176	9.8 0.25 750 700
5352	281 Plain	17	17	Twaron 2200 1270dt	5.2	176	10.7 0.27 800 800
353	285 X 4H Satin	17	17	Kevlar 49 1140d	5.2	176	9.3 0.24 660 650
5353	285 X 4H Satin	17	17	Twaron 2200 1270dt	5.2	176	9.7 0.25 750 750
354	500 Plain	13	13	Kevlar 49 1420d	4.9	166	9.8 0.25 650 650
5354	500 Plain	13	13	Twaron 2200 1580dt	4.9	166	10.0 0.25 550 550
357	540 Plain	11	17	Kevlar 49 1420d	5.2	176	10.0 0.25 410 700
372	4x4 Twill	72	72	Kevlar 49 195d	3.8	129	7.0 0.18 520 550
383	900 5H Satin	16	16	Kevlar 49 2160d	9.1	309	13.0 0.33 920 970
5383	900 5H Satin	16	16	Twaron 2200 2420dt	9.1	309	13.0 0.33 920 970
384	1050 Basket 4x4	28	28	Kevlar 49 1420d	10.7	363	19.0 0.48 1360 1300

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Aramid Fabrics

Style #	Weave	Count	Warp Yarn	Warp Yarn	Fill Yarn	Weight (oz/yd ²)	Thickness (mils)	Strength (lb/in)
JPS	AMS Common	Warp Fill				(gsm)	(mm)	Warp Fill
5384	1050	1050	28	28	Twaron 2200 1580dt	10.7	363	19.0
386	1350	1350	27	22	Kevlar 49 2160d	13.9	471	26.4
5386	1350	1350	27	22	Twaron 2200 2420dt	13.9	471	26.4
388	1033	1033	40	40	Kevlar 49 1420d	15.5	526	27.6
5388	1033	Basket 8x8	40	40	Twaron 2200 1580dt	15.5	526	26.9
710	Plain	24	24	Kevlar 29 1500d	Kevlar 29 1500d	9.7	324	19.4
712	Plain	12	12	Kevlar 29 3000d	Kevlar 29 3000d	9.1	309	16.5
5712	Plain	12	12	Twaron 1000 3360dt	Twaron 1000 3360dt	9.1	309	16.5
713	Plain	31	31	Kevlar 29 1000d	Kevlar 29 1000d	8.2	278	16.8
5713	Plain	31	31	Twaron 2040 1100dt	Twaron 2040 1100dt	8.2	278	16.3
715	Plain	28	28	Kevler KM2+ 400d	Kevler KM2+ 400d	2.9	99	5.3
716	Plain	31	31	Kevler KM2+ 400d	Kevler KM2+ 400d	3.2	109	5.7
717	Plain	34	34	Kevler KM2+ 400d	Kevler KM2+ 400d	3.6	122	6.3
718	2x2 Twill	34	34	Kevler KM2+ 400d	Kevler KM2+ 400d	3.6	122	5.6
719	2x2 Twill	38	38	Kevler KM2+ 400d	Kevler KM2+ 400d	4.0	136	6.2

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Aramid Fabrics

Style #	Weave	Count	Warp	Yarn	Fill	Weight	Thickness	Strength (lbf/in)			
JPS	AMS Common	Warp	Fill	Yarn		(oz/y)	(gsm)	(mils) (mm)	Warp Fill		
5719	X	Plain	19.5	19.5	Twaron 2040 930dt	4.3	146	7.5	0.19	600	600
720	X	Plain	20	20	Kevlar 129 1420d	7.6	259	13.8	0.35	1000	1000
722	X	Plain	22	22	Kevlar 129 1420d	8.5	289	15.8	0.40	600	900
724		Plain	24	24	Kevlar KM2+ 1000d	6.2	210	11.4	0.29	760	780
5724		Plain	24	24	Twaron 2040 1100dt	6.2	210	11.0	0.28	760	780
725		Plain	27	27	Kevler KM2+ 500d	3.5	119	6.3	0.16	580	600
5726		Plain	26	26	Twaron 2040 930dt	5.8	200	10.1	0.26	900	900
728		Plain	17	17	Kevlar K29 1500d	6.6	224	12.7	0.32	900	900
727		Plain	26	26	Kevlar 129 1000d	6.7	227	12.3	0.31	910	980
5728		Plain	17	17	Twaron 2040 1680dt	6.9	234	12.1	0.31	780	800
729		Plain	17	17	Kevlar 129 1420d	6.6	224	12.8	0.33	900	900
730		Plain	22	22	Kevlar 29 1000d	5.6	190	11.6	0.29	800	800
5731		Plain	31	31	Twaron 2040 1100dt	8.1	275	16.1	0.41	760	770
735	Basket 2x2	35	35	Kevlar 29 1500d	Kevlar 29 1500d	14.1	478	25.4	0.65	1700	1800
736	Basket 2x2	36	36	Kevlar 129 1420d	Kevlar 129 1420d	14.1	478	26.3	0.67	1950	2000

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.

Aramid Fabrics

Style #	Weave	Count	Warp Yarn	Fill Yarn	Weight (oz/yd ²)	Thickness (mils)	Strength (lb/in)
JPS	AMS Common	Warp Fill	Warp Yarn	Fill Yarn	(gsm)	(mm)	Warp Fill
739	Plain	39	36	Kevlar 29 1500d	Kevlar 29 1500d	15.2	517
740	Plain	40	40	Kevlar 29 200d	Kevlar 29 200d	2.1	71
741	Plain	11	11	Kevlar 29 3000d	Kevlar 29 3000d	8.5	288
5741	Plain	11	11	Twaron 1000 3360dt	Twaron 1000 3360dt	8.5	288
742	Plain	31	31	Kevlar KM2+ 600d	Kevlar KM2+ 600d	4.9	167
743	Twill 4x4	40	40	Kevlar 29 3000d	Kevlar 29 3000d	16.5	559
744	2x2 Twill	31	31	Kevlar KM2+ 600d	Kevlar KM2+ 600d	4.9	167
745	X Plain	17	17	Kevlar 29 3000d	Kevlar 29 3000d	13.3	451
5745	Plain	17	17	Twaron 1000 3000dt	Twaron 1000 3000dt	13.4	454
746	4H Satin	31	31	Kevlar KM2+ 600d	Kevlar KM2+ 600d	4.8	163
747	Plain	10	10	Kevlar 29 3000d	Kevlar 29 3000d	6.5	220
748	Basket 8x8	48	48	Kevlar 29 1500d	Kevlar 29 1500d	18.8	637
749	Plain	24	24	Kevlar KM2+ 600d	Kevlar KM2+ 600d	3.8	129
750	2x2 Twill	24	24	Kevlar KM2+ 600d	Kevlar KM2+ 600d	3.8	129
754	X Basket 2x2	21	21	Kevlar 29 3000d	Kevlar 29 3000d	16.5	559

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Aramid Fabrics

Style #	Weave	Count	Warp Yarn	Fill Yarn	Weight (osy) (gsm)	Thickness (mils) (mm)	Strength (lb/in) Warp Fill
JPS	AMS Common	Warp Fill					
5754	Basket 2x2	21	21	Twaron 1000 3360dt	549	30.0	0.76
755	X Basket 4x4	21	21	Kevlar 29 3000d	554	27.9	0.71
5755	Basket 4x4	21	21	Twaron 1000 3360dt	549	30.0	0.76
759	Basket 4x4	24	24	Kevlar 29 3000d	610	30.0	0.76
760	Basket 2x2	30	30	Kevlar 29 1420d	400	21.1	0.54
764	Plain	31	31	Kevlar KM2+ 850d	6.8	231	13.9
5704	Plain	31	31	Twaron 2040 930dt	6.8	231	13.8
766	Plain	34	34	Kevlar KM2+ 600d	5.4	184	9.8
767	X Plain	28	28	Kevlar KM2+ 600d	4.4	150	7.8
768	X Plain	28	28	Kevlar KM2+ 500d	3.6	122	6.5
5768	X Plain	28	28	Twaron 2040 550dt	3.6	122	6.5
770	Plain	31	31	Kevlar KM2+ 600d	4.8	163	8.6
772	Plain	24	24	Kevlar KM2 1000d	6.2	210	11.0
5772	Plain	28	28	Twaron 2040 550dt	3.6	122	6.6
5761	Plain	26	26	Twaron 2040 1100dt	6.7	227	11.0

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Aramid Fabrics

Style # JPS	Weave AMS Common	Count Warp Fill	Warp Yarn	Fill Yarn	Weight (osy) (gsm)	Thickness (mils) (mm)	Strength (lbf/in) Warp Fill					
5774	Plain	27	27	Twaron 2040 500d	Twaron 2040 500d	3.6	122	6.5	0.17	580	610	
775	Plain	31	31	Kevlar KM2+ 850d	Kevlar KM2+ 850d	6.8	231	11.8	0.30	880	950	
777	X	Plain	32	32	Kevlar KM2+ 400d	Kevlar KM2+ 400d	3.2	108	6.2	0.16	450	450
779	Plain	70	70	Kevlar 159 200d	Kevlar 159 200d	3.7	122	7.6	0.19	350	350	
785	Plain	20	20	Kevlar KM2+ 850d	Kevlar KM2+ 850d	4.4	150	7.6	0.19	700	700	
787	X	Plain	23	23	Kevlar KM2+ 850d	Kevlar KM2+ 850d	5.1	173	8.7	0.22	800	800
790	X	Plain	22	22	Kevlar KM2+ 850d	Kevlar KM2+ 850d	4.3	146	7.5	0.19	600	600
794	X	Twill 2x2	26	26	Kevlar KM2+ 840d	Kevlar KM2+ 840d	5.7	194	9.6	0.24	850	950
796	Plain	26	26	Kevlar KM2+ 850d	Kevlar KM2+ 850d	5.8	200	10.2	0.26	850	950	
797	X	Basket 2x2	34	34	Kevlar KM2+ 600d	Kevlar KM2+ 600d	5.3	180	8.9	0.23	750	850
798	X	Plain	28	28	Kevlar KM2+ 400d	Kevlar KM2+ 400d	2.9	98	5.6	0.14	800	600
4033	X	Plain	23	23	Kevlar KM2+ 600d	Kevlar KM2+ 600d	3.5	119	6.9	0.18	600	600
4039	X	Plain	29	29	Kevlar KM2+ 600d	Kevlar KM2+ 600d	4.5	153	8.4	0.21	700	700
5930	X	Plain	27	27	Twaron 2040 930dt	Twaron 2040 930dt	5.8	197	10.5	0.27	850	950
5931	Plain	31	31	Twaron 2040 930dt	Twaron 2040 930dt	7.0	237	12.0	0.31	900	950	

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Aramid Fabric Weight Index

Style	Weight (oz/yd ²) (g/m ²)	Style Weight (oz/yd ²) (g/m ²)					
345	1.7	58	717	3.6	122	767	4.4
350	1.8	61	718	3.6	122	785	4.4
349	2.0	68	768	3.6	122	4039	4.5
740	2.1	71	5768	3.6	122	746	4.8
351	2.2	75	5772	3.6	122	770	4.8
5351	2.2	75	5774	3.6	122	354	4.9
715	2.9	99	372	3.7	126	5348	4.9
798	2.9	99	779	3.7	126	5354	4.9
314	3.1	105	749	3.8	129	742	4.9
716	3.2	109	750	3.8	129	744	4.9
777	3.2	109	290	4.0	136	348	5.1
725	3.5	119	719	4.0	136	787	5.1
4033	3.5	119	790	4.3	146	352	5.2
312	3.6	122	5719	4.3	146	353	5.2
313	3.6	122	795	4.4	150	357	5.2

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Aramid 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)
741	8.5	289	5745	13.4	456				
722	8.5	289	5386	13.6	462				
5741	8.5	289	386	13.9	473				
383	9.1	309	735	14.1	479				
5383	9.1	309	736	14.1	479				
712	9.1	309	739	15.2	517				
5712	9.1	309	5388	15.3	520				
5383	9.4	320	388	15.5	527				
710	9.7	330	5755	16.2	551				
296	9.8	333	755	16.3	554				
384	10.7	364	743	16.5	561				
5384	10.7	364	754	16.5	561				
760	11.8	401	5754	16.5	561				
297	12.4	422	759	18.0	612				
745	13.3	452	748	18.8	639				

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.

Aramid Fabric Thickness Index

Style	Thickness (mils) (mm)								
345	3.0 0.08	768	6.5 0.17	795	7.9 0.20	357	10.0 0.25	5931	12.0 0.31
350	3.9 0.10	5768	6.5 0.17	5348	8.0 0.20	5354	10.0 0.25	5728	12.1 0.31
349	4.0 0.10	5774	6.5 0.17	742	8.4 0.21	796	10.2 0.26	727	12.3 0.31
5351	4.6 0.12	5772	6.6 0.17	4039	8.4 0.21	5726	10.2 0.26	728	12.7 0.32
351	4.8 0.12	749	6.8 0.18	746	8.5 0.21	5930	10.2 0.26	290	12.8 0.33
740	5.2 0.13	750	6.8 0.18	348	8.7 0.22	5352	10.7 0.27	328	12.8 0.33
715	5.3 0.13	4033	6.9 0.18	787	8.7 0.22	343	11.0 0.28	729	12.8 0.33
798	5.6 0.14	312	7.0 0.18	797	8.9 0.23	5724	11.0 0.28	5704	12.9 0.33
716	5.7 0.14	3113	7.0 0.18	353	9.3 0.24	5761	11.0 0.28	383	13.0 0.33
717	5.7 0.14	372	7.2 0.18	770	9.4 0.24	796	11.4 0.29	5383	13.0 0.33
314	6.0 0.15	790	7.5 0.19	794	9.6 0.24	730	11.6 0.29	5354	13.3 0.34
719	6.2 0.16	5719	7.5 0.19	5353	9.7 0.25	775	11.8 0.30	354	13.4 0.34
777	6.2 0.16	785	7.6 0.19	352	9.8 0.25	323	12.0 0.31	720	13.8 0.35
713	6.3 0.16	779	7.6 0.19	354	9.8 0.25	747	12.0 0.31	764	13.9 0.35
725	6.3 0.16	767	7.8 0.20	766	9.8 0.25	5328	12.0 0.31	383	14.8 0.38

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.

Aramid Fabric Thickness Index

Style	Thickness (mils)	Thickness (mm)								
5741	15.0	0.38	745	25.3	0.65					
722	15.8	0.40	735	25.4	0.65					
741	16.1	0.41	736	26.3	0.67					
5731	16.1	0.41	386	26.4	0.67					
5713	16.3	0.41	5388	26.9	0.68					
712	16.5	0.42	388	27.6	0.70					
5712	16.5	0.42	755	27.9	0.71					
713	16.8	0.43	296	28.0	0.71					
384	19.0	0.48	743	29.0	0.74					
5384	19.0	0.48	754	29.0	0.74					
710	19.4	0.49	5754	29.0	0.74					
760	21.1	0.54	759	30.0	0.76					
5745	24.2	0.61	5755	30.0	0.76					
5386	25.0	0.64	748	32.1	0.82					
739	25.3	0.65	297	33.5	0.85					

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.

Engineered Aramid Fabrics

These unique fabrics are engineered using the synergy from a combination of specialty yarns and weave types to produce a structure with advanced ballistic performance.

Style	Weave	Warp Count	Warp Fill	Fill Yarn	Weight (oz/y)	Thickness (mils)	Strength (lb/in)	Warp	Fill
					(gsm)	(mm)			
420	Proprietary	28	28	Proprietary	4.0	136	7.6	0.19	700
421	Proprietary	28	28	Proprietary	4.0	136	7.4	0.19	770
422	Proprietary	28	28	Proprietary	4.0	136	7.4	0.19	620
423	Proprietary	28	28	Proprietary	4.0	136	7.7	0.19	630

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.

Dyneema Fabrics

Style	Weave	Count Warp	Count Fill	Warp Yarn	Fill Yarn	Weight (oz/yd ²) (g/m ²)	Thickness (mils) (mm)	Strength (lb) Warp	Strength (lb) Fill
821	Plain	32	32	DSM SK 75	DSM SK 75	3.43	116	9.9	0.25
822	2x2 Twill	32	32	DSM SK 75	DSM SK 75	3.36	114	9.8	0.25
823	2x2 Basket	32	32	DSM SK 75	DSM SK 75	3.45	117	10.5	0.27
824	4H Satin	32	32	DSM SK 75	DSM SK 75	3.37	114	9.3	0.24

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	15.5	0.39
903	Plain	21	21	Spectra 900 1200d	Spectra 900 1200d	6.6	224	18.0	0.46
904	Plain	34	34	Spectra 900 650d	Spectra 900 650d	6.3	214	17.1	0.44
912	Basket 4x4	32	32	Spectra 900 1200d	Spectra 900 1200d	11.1	378	24.0	0.61
945	Plain	45	45	Spectra 1000 215d	Spectra 1000 215d	2.6	88	6.3	0.16
951	Plain	17	17	Spectra 1000 1000d	Spectra 1000 1000d	3.3	112	8.1	0.20
955	Plain	56	56	Spectra 1000 215d	Spectra 1000 215d	2.9	90	9.5	0.24
956	Plain	34	34	Spectra 1000 215d	Spectra 1000 215d	1.9	67	5.0	0.13
960	Plain	32	32	Spectra 1000 375d	Spectra 1000 375d	3.2	108	8.0	0.20
961	Plain*	32	32	Spectra 1000 375d	Spectra 1000 375d	3.2	108	8.0	0.20
984	Plain	32	32	Spectra 1000 650d	Spectra 1000 650d	5.5	187	14.0	0.36
985	8H Satin	32	32	Spectra 1000 650d	Spectra 1000 650d	5.5	187	12.2	0.36

*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

Carbon Fabrics

JPS Composite Materials now offers a full line of carbon fabrics, available with a wide variety of yarn types and weights. We have invested in the production of carbon fabrics using the latest new weaving technologies. With the addition of our new carbon fabrics division JPS offers the most complete lineup of composite reinforcement fabrics in the industry.

We offer a variety of PAN based carbon fabrics utilizing 3k, 4k, 6k, and 12k carbon fibers. Our carbon fabrics are manufactured in a dedicated, FOD controlled, state-of-the-art facility located on our Statesville, NC campus.

JPS carbon fabric can be used for a wide variety of applications, including and primary and secondary aerospace structures, for high performance and recreational composites, as well as in ducting, tooling, and cosmetic applications.

We invite you to consider using carbon fabrics from JPS for your application. See first hand why we are considered the leader when it comes to high performance, precision engineered composite reinforcement materials.

For more information about our carbon fabrics, or to tailor a fabric to suit your application, please contact us at:

**1-800-431-1110
1-800-288-0577
(864) 260-6581 Fax**

For further information, write to
JPS Composite Materials
PO Box 2627, Anderson, SC, 29622
dhudgens@jpscsm.com

Carbon Fabrics

Style	Weave	Tow Size	Warp Count	Warp Yarn	Fill Yarn	Weight (osy)	Weight (gsm)
604	8H Satin	3k	24	23	3k Carbon	3k Carbon	11.05
605	5H Satin	3k	18	18	3k Carbon	3k Carbon	8.46
608	8H Satin	3k	24	24	3k Carbon	3k Carbon	11.29
611	Plain	3k	12.5	12.5	3k Carbon	3k Carbon	5.88
612	Plain	3k	12	12	3k Carbon	3k Carbon	5.64
620	2x2 Twill	3k	12	12	3k Carbon	3k Carbon	5.64
622	2x2 Twill *	3k	12	12	Hexcel AS4C	Hexcel AS4C	5.70
623	2x2 Twill	3k	18	18	3k Carbon	3k Carbon	8.46
632	2x2 Twill	3k	12	12.5	Hexcel AS4C	Hexcel AS4C	5.82
635	2x2 Twill	12k	10.5	10.5	Hyosong 12k	Hyosong 12k	19.95
636	2x2 Twill	12k	11	11	12k Carbon	12k Carbon	20.69
660	2x2 Twill	6k	12	12	6k Carbon	6k Carbon	11.29
							382

* Contains Tracer Yarn

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.

Technical References - English

Fiber	Density (lb/in ³)	Tensile Strength (ksi)	Tensile Modulus (msi)	Strain to Failure (%)	Specific Tensile Strength (10 ⁶ in)	Modulus (10 ⁸ in)	Specific Tensile Modulus (10 ⁻⁶ /°F)	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
Astroquartz ®	0.080	870	10.0	-	-	-	0.54		3092
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 ® KM2+ 400d	0.052	520	13.6	3.8	10.00	2.61	-1.22		842
Kevlar ® KM2+ 500d	0.052	525	10.8	3.8	10.10	2.08	-1.22		842
Kevlar ® KM2+ 600d	0.052	525	13.6	3.8	10.10	2.61	-1.22		842
Kevlar ® KM2+ 850d	0.052	512	11.8	3.8	9.85	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

Technical References - Metric

Fiber	Density (g/cm ³)	Tensile Strength (GPa)	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	2.6	72	4.0	13.42	2.82	1.60	730
S-2® Glass	2.48	4.8	85	5.5	18.86	3.55	0.48	850
Astroquartz®	2.20	6.0	72	-	-	-	0.54	1700
Kevlar® 49, 1420d	1.44	2.9	109	2.5	20.71	7.72	-2.70	450
Kevlar® 29 1500d	1.44	2.9	75	3.3	29.71	5.32	-2.20	450
Kevlar® KM2+ 400d	1.44	3.3	94	3.8	23.39	6.64	-2.20	450
Kevlar® KM2+ 500d	1.44	3.4	75	3.8	24.27	5.27	-2.20	450
Kevlar® KM2+ 600d	1.44	3.4	94	3.8	24.60	7.52	-2.20	450
Kevlar® KM2+ 850d	1.44	3.4	81	3.8	24.27	5.76	-2.20	450
Spectra® 900 650d	0.97	2.4	79	3.6	25.23	8.26	-	150
Spectra® 1000 375d	0.97	2.8	103	3.1	29.72	10.80	-	150
Spectra® 2000 195d	0.97	3.2	113	2.9	33.71	11.89	-	150
Twaron® 1000	1.44	3.5	65	3.7	24.76	4.59	-2.20	450
Twaron® 2000	1.44	3.3	90	3.3	23.39	6.35	-2.20	450
Twaron® 2200	1.45	3.5	103	2.1	24.59	7.23	-2.40	450

Selected Conversions and Formulae

US to SI

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

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

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

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

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

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

$$1 \text{ psi} = 6894.76 \text{ Pa}$$

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

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

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

$$1 \text{ lb/ft}^2 = 4.88 \text{ kg/m}^2$$

$$1 \text{ lb/ft}^3 = 16.02 \text{ kg/m}^3$$

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

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

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

SI to US

$$1 \text{ g/m}^2 = 0.0295 \text{ oz/yd}^2$$

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

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

$$1 \text{ kgf} = 9.81 \text{ N}$$

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

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

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

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

$$1 \text{ Tex} = 496,052 \text{ yds/lbs}$$

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

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

$$1 \text{ kg/m}^2 = 0.205 \text{ lb/ft}^2$$

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

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

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

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 1.7513	= N/cm
Thickness	in	x 25.400	= mm
Mullen Burst	lb/in ²	x 0.007	= MPa
Air Permeability	cfm	x 0.508	= cm/cm ²
Area	yd ²	x 0.8361	= m ²

Notes

JPS Composite Materials
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