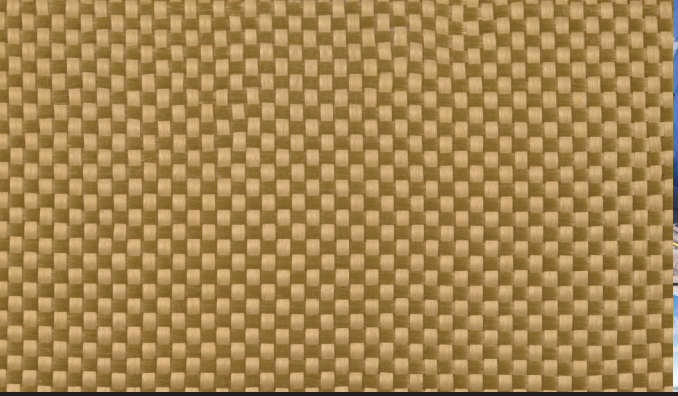


JPS COMPOSITE MATERIALS
A STEEL PARTNERS COMPANY

JPS Composite Materials
2200 South Murray Avenue
P.O. Box 2627 I Anderson, SC, 29622 I (800) 431-1110 Toll Free

ISO 9001 and AS9100 Registered
www.jpscm.com

jpscm.com

JPS COMPOSITE MATERIALS
A STEEL PARTNERS COMPANY

Technical Reference Handbook

www.jpscm.com

Revision: 2025

Table of Contents

Company

JPS Composite Materials is the world's leading manufacturer of high strength fiberglass, Astroquartz®, aramid, 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 commerical and military radomes, in marine and surf applications, sporting goods, and other advanced composites. Our materials are readily adaptable to unlimited applications!

JPS Composite Materials is an ISO 9001:2015 and AS9100:0 certified company.

Direct customer access to customer service:
1-800-431-1110

For further information,
JPS Composite Materials
PO Box 2627, Anderson, SC, 29622
www.jpscm.com

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

MISSION

Develop, manufacture and support high quality products that solve problems and add value to our customers

Adapt to evolving customer needs and market fluctuations to remain a viable, relevant partner

Create a positive company culture through developing leaders and hiring and retaining talent who embrace our Core Values.

Embrace a continuous improvement mindset and commit to get better every day.

JPS COMPOSITE MATERIALS
A STEEL PARTNERS COMPANY

VISION

To become the most trusted North American Composite Manufacturer in the Aerospace and Industrial Markets

JPS COMPOSITE MATERIALS
A STEEL PARTNERS COMPANY

PURPOSE

Deliver our customers a technically superior product on time, and as ordered.

Meet or exceed our commitments to our stakeholders, delivering a fair return on investment.

Create sustainable career opportunities for our people, continuing a rich legacy of impacting our communities.

JPS
COMPOSITE MATERIALS
A STEEL PARTNERS COMPANY

VALUES

TEAMWORK — We drive to the best outcomes together and push each other to become the best individually, so we can be the best collectively.

RESPECT — We value and respect all members of the JPS family and work to include all viewpoints and embrace the power that diversity and inclusion gives all of us.

INTEGRITY — We do what we say we're going to do. We manage our work responsibilities with a high morale code of conduct, and display honest, productive candor with others.

COMMITMENT — We show up. We work hard. We don't quit. We offer solutions instead of complaints. JPS is OUR company and we are committed to see it, and each other, succeed.

ACCOUNTABILITY — We set a common expectation for ourselves and our people and live the Vision, Mission, Purpose and Core Values. We learn from mistakes and embrace opportunities each day.

JPS
COMPOSITE MATERIALS
A STEEL PARTNERS COMPANY

JPS Composite Materials Quality Policy

JPS Composite Materials recognizes that our greatest assets are our people and our customers. Our Quality Policy highlights values that are elemental to our success and includes:

Being driven by integrity, honesty, and a high moral code of conduct, we will maintain our position as the premier supplier for our customers in a global market.

Delivering our customers a technically superior substrate on time and as ordered, accomplished by a teamwork approach that recognizes we achieve more collectively than as individuals.

Establishing partnerships with our suppliers and customers through respect, and development of innovative products designed to meet everchanging market demands.

An unwavering commitment to our people to provide an environment which guarantees Safety and demands accountability.

A commitment to meet or exceed expectations we hold for ourselves and all interested parties.

Our Mission, Vision, Purpose and Core Values will continue to drive JPS forward in the pursuit of excellence for our people, our business, and our partners.

For Future Generations

JPS is committed to doing our part to ensure that our world continues to provide sustainable resources for generations to come.

While we feel that our footprint should be small, we strive for our impact to be great.

Through the EcoVadis Platform sustainability performance system JPS is demonstrating that we put our values to work not only within the walls of our facilities, but also throughout our local and global communities.

Through our parent company

JPS Composite Materials offers programs such as **Steel Grow** to further develop our associates.

Steel Sports takes our internal values to the community through the Foundations of Positive Coaching. This program provides coaches with the necessary tools to develop the next generation and is a shining example of our commitment to make the world a better place, one child at a time.

Parameters for Fabric Selection

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.

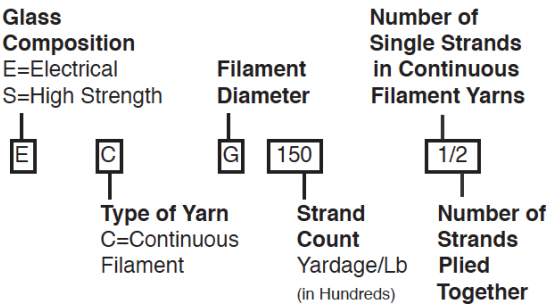
COMPOSITION OF TYPICAL GLASSES

(%) 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	-

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:



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.

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 14)
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	Filament Diameter microns	Strand Count (x100=yd/lb)	Tex	Number of Filaments
C	0.18	4.5	150	33	816
D	0.20	5.0	1800	2.75	51
			900	5.5	102
			450	11	204
			225	22	408
DE	0.24	6.0	150	33	408
			75	66	816
			50	99	1224
			37	134	1632
E	0.28	7.0	225	22	204
G	0.35	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).

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, of the fabric.

A specified number of yarns per inch are drawn from a creel and wound on a beam. Several “section” beams are then combined to provide the designated number of yarns per inch required in the fabric specifications.

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.

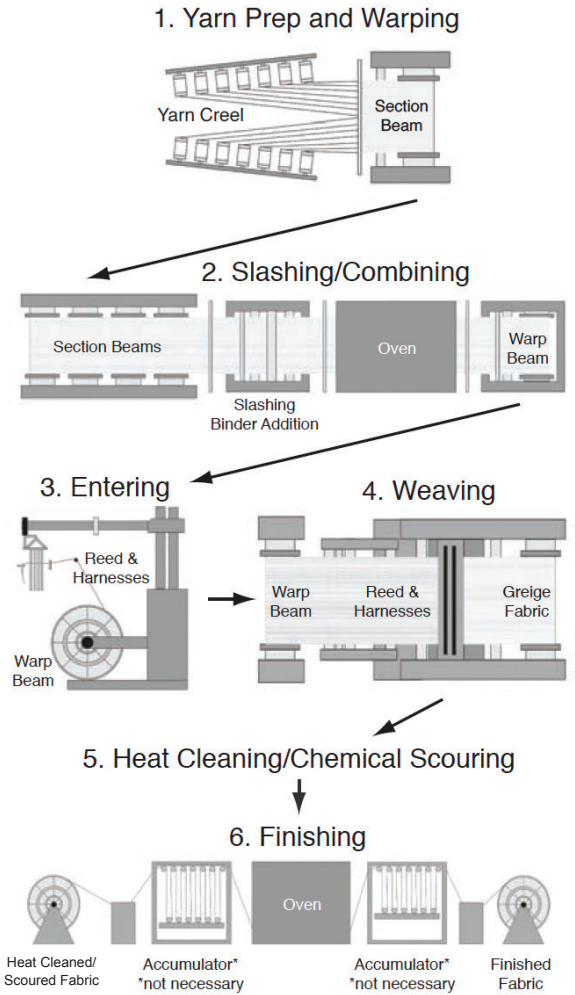
An additional yarn binder may be applied to the warp yarns during the slashing process. The additional binder helpsto improve fabric surface quality by providing extra protection to the warp yarns during the weaving process.

Entering
The entering operation draws the warp yarns into the loom hardware, 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



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, and high temperature performance.

JPS offers a wide range of existing finishes. We also 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, 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.

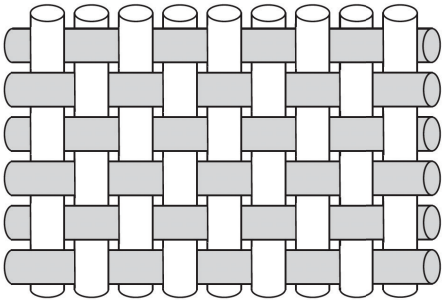
All standard fabric weaves presented here can be produced with fiberglass, aramid, Astroquartz ®, polymer and specialty yarns.

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.

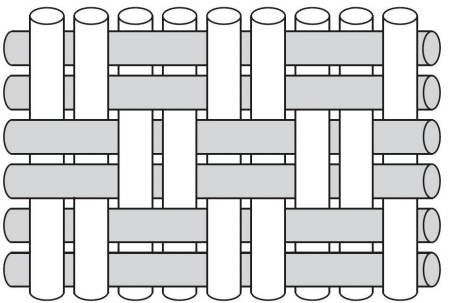
In terms of drape or conformability, 8H Satin is the most conformable, followed by the 4H Satin, Basket Weave, Plain Weave and Leno fabrics.

Plain Weave



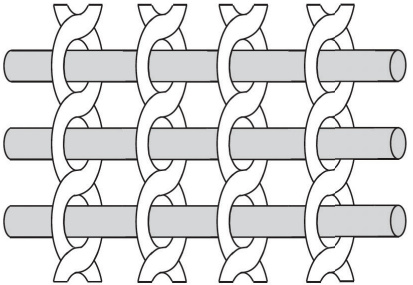
The plain weave consists of yarns interlaced in an alternating pattern, one over and one under every other yarn. The plain weave provides good fabric stability. It is the primary fabric used in the electronics and coating industries.

Basket Weave



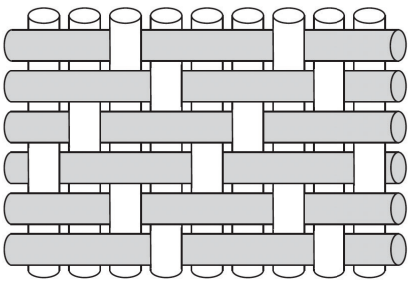
The basket weave is similar to the plain weave, except that two or more filling yarns are alternately interlaced over and under one another. The basket weave is more pliable, flatter, and stronger than the plain weave, but is not as stable as a plain weave.

Leno



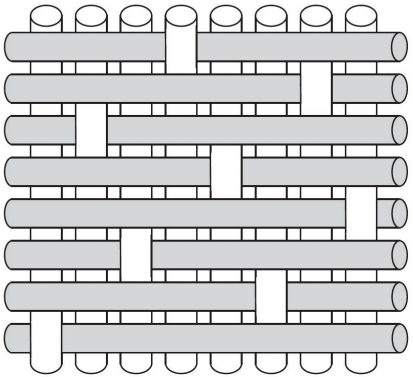
The leno weave is used where relatively low aerial weights are desired but specific thicknesses must be maintained. The leno weave pattern locks the yarns in place by crossing two or more warp threads over each other and interlacing with one or more fill threads. Leno weave patterns are common in EIFS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

Four-Harness Satin (Crowfoot)



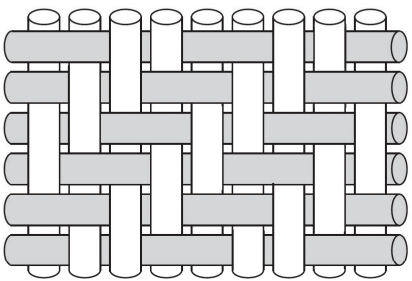
The four-harness satin relies on a three by one interlacing pattern. The fill yarn floats over three warp yarns and under one. The four-harness satin weave is more pliable than the plain weave and is easier to confirm to curved surfaces typical in reinfores plastics.

Eight-Harness Satin



The eight-harness satin is similar to the four-harness satin except that 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.

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

IPC-4413 - 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

Physical Properties of E-glass Fiber

Approximate Chemistry*

SiO_2	52-56%
CaO	16-25%
Al_2O_3	12-16%
B_2O_3	5-10%
MgO	0-5%
Na2O	0-1%
K2O	0-1%
Other Elements	0-2%

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 (-30ºC to 250ºC)	5.4 µm/m-ºC
Specific Heat Capacity	0.80-1.03 kJ/kg-K
Thermal Conductivity	1.0-1.3 W/m-K
Softening Point	≤ 845ºC

Electrical Properties*

Dk @ 1 MHz	6.6
Dk @ 10 GHz	6.1
Df @ 1 MHz	0.003
Df @ 10 GHz	0.004
Volume Resistivity	$4.02_{10}{}^{15}$ Ω-cm
Surface Resistivity	$4.20_{10}{}^{16}$ Ω-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_2O_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

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 (-30ºC to 250ºC)	1.6 µm/m-ºC
Specific Heat Capacity	0.74-0.82 kJ/kg-K
Thermal Conductivity	1.1-1.4 W/m-K
Softening Point	≤ 1055ºC

Electrical Properties*

Dk @ 1 MHz	5.3
Dk @ 10 GHz	5.2
Df @ 1 MHz	0.002
Df @ 10 GHz	0.007
Volume Resistivity	$0.905_{10}{}^{13}$ Ω-cm
Surface Resistivity	$0.886_{10}{}^{13}$ Ω-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.

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 too.

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: Primary	Secondary	Notes
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, Cyanate Ester, PI	Silane Finish
CS-767	Epoxy, Cyanate Ester	BMI, Phenolic, SBR	Silane Finish **BMS 9-3 Listed**

Fiberglass Fabric Finishes (cont.)

Finish Name	Functionality: Primary	Secondary	Notes
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	Count Fill	Yarn Warp	Yarn Fill	Weight (osy)	Weight (gsm)	Thickness (mils)	Thickness (mm)	Strength (lb/in) Warp	Strength (lb/in) Fill
101	Plain	75	75	ECD 1800 1/0	ECD 1800 1/0	0.47	15.9	0.7	0.02	35	30
104	Plain	60	52	ECD 900 1/0	ECD 1800 1/0	0.55	18.6	1.4	0.04	40	15
106	Plain	56	56	ECD 900 1/0	ECD 900 1/0	0.73	25.0	1.5	0.04	45	40
108	Plain	60	47	ECD 900 1/2	ECD 900 1/2	1.40	47.5	2.1	0.05	70	40
112	Plain	40	39	ECD 450 1/2	ECD 450 1/2	2.08	70.5	3.4	0.08	100	70
116	Plain	60	58	ECD 450 1/2	ECD 450 1/2	3.09	105.0	3.5	0.09	150	130
117	Plain	54	39	ECD 450 1/2	ECD 450 1/2	2.40	81.4	3.7	0.09	125	100
120	4H Satin	60	58	ECD 450 1/2	ECD 450 1/2	3.12	106.0	3.6	0.09	150	140
128	Plain	43	32	ECE 225 1/3	ECE 225 1/3	5.87	199.0	6.0	0.15	250	200
138	4H Satin	65	60	ECE 225 1/2	ECE 225 1/2	6.53	221.4	6.6	0.17	270	260
162	Plain	28	16	ECE 225 2/5	ECE 225 2/5	11.96	405.5	13.0	0.33	650	400
220	4H Satin	60	58	ECE 225 1/0	ECE 225 1/0	3.08	104.4	3.4	0.09	150	150
332	4H Satin	48	32	ECG 37 1/0	ECG 37 1/0	12.36	419.1	12.7	0.32	526	370
880	8H Satin	73	72	ECDE 150 1/0	ECDE 150 1/0	5.70	193.0	5.5	0.14	300	230
1014	Knit	18	20	ECDE 150 1/0	ECDE 150 1/0	6.60	223.0	10.5	0.26	20	10
1025	Knit	18	20	ECDE 225 1/0	ECDE 225 1/0	4.90	167.0	8.4	0.21	20	10
1035	Plain	65	68	ECD 900 1/0	ECD 900 1/0	0.87	29.0	1.2	0.03	45	45
1037	Plain	70	73	ECC 1200 1/0	ECC 1200 1/0	0.70	24.0	1.0	0.03	40	40
1039	2X2 Twill	30	29	ECG 75 1/0	ECG 75 1/0	4.85	164.0	6.6	0.17	400	300

Fiberglass Fabrics

		Count		Yarn		Weight		Thickness		Strength (lb/in)	
Style	Weave	Warp	Fill	Warp	Fill	(osy)	(gsm)	(mils)	(mm)	Warp	Fill
1067	Plain	70	70	ECD 900 1/0	ECD 900 1/0	0.91	31.0	1.0	0.03	19	18
1071	Plain	60	30	ECD 900 1/0	ECD 900 1/0	0.58	19.7	1.2	0.03	55	16
1076	Plain	60	25	ECD 450 1/0	ECD 900 1/0	0.98	33.2	1.4	0.03	100	20
1078	Plain	54	54	ECD 450 1/0	ECD 450 1/0	1.40	47.0	2.0	0.05	70	80
1080	Plain	60	47	ECD 450 1/0	ECD 450 1/0	1.40	47.5	1.9	0.05	98	65
1125	Plain	40	39	ECD 450 1/2	ECG 150 1/0	2.60	88.2	3.4	0.09	100	150
1131	Plain	120	52	ECD 450 1/0	ECG 150 1/0	3.66	124.1	4.6	0.12	130	150
1142	Plain	31	21	ECG 37 1/0	ECG 37 1/0	8.33	282.4	9.8	0.25	400	250
1161	Plain	100	42	ECD 450 1/0	ECDE 100 1/0	3.83	130.0	4.4	0.11	110	250
1162	Plain	100	36	ECD 450 1/0	ECG 75 1/0	4.30	145.8	5.3	0.13	100	180
1165	Plain	60	52	ECD 450 1/2	ECG 150 1/0	3.53	119.7	3.8	0.10	125	190
1167	Plain	60	55	ECD 450 1/2	ECG 150 1/0	3.76	127.5	4.0	0.10	110	200
1188	4H Satin	46	30	ECH 25 1/0	ECG 150 1/0	12.36	419.1	12.0	0.30	500	35
1280	Plain	60	60	ECD 450 1/0	ECD 450 1/0	1.58	53.6	1.9	0.05	88	79
1297	Plain	50	20	ECD 450 1/0	ECD 900 1/0	0.77	26.1	1.7	0.04	83	12
1299	Plain	50	20	ECD 450 1/0	ECD 450 1/0	0.90	30.5	2.0	0.05	80	30
1521	Plain	30	16	ECG 150 1/2	ECG 75 1/0	3.49	118.0	4.4	0.11	200	148
1522	Plain	24	22	ECG 150 1/2	ECG 150 1/2	3.57	121.0	5.0	0.13	147	143

Fiberglass Fabrics

		Count		Yarn		Weight		Thickness		Strength (lb/in)	
Style	Weave	Warp	Fill	Warp	Fill	(osy)	(gsm)	(mils)	(mm)	Warp	Fill
1523	Plain	28	20	ECG 150 3/2	ECG 150 3/2	11.26	381.8	12.0	0.30	510	370
1526	Plain	35	32	ECG 150 1/2	ECG 150 1/2	5.30	180.0	6.2	0.16	300	250
1526	Plain	35	32	ECG 150 1/2	ECG 150 1/2	5.30	180.0	6.2	0.16	300	250
1527	Plain	17	17	ECG 150 3/3	ECG 150 3/3	11.80	400.0	14.0	0.35	400	425
1528	Plain	43	32	ECG 150 1/2	ECG 150 1/2	6.03	204.0	6.7	0.17	280	200
1530	Plain	20	18	ECG 150 3/3	ECG 150 3/3	13.20	448.0	14.4	0.37	500	470
1538	Plain	44	32	ECDE 150 1/2	ECDE 150 1/2	6.00	203.4	7.0	0.18	300	200
1543	4H Satin	49	30	ECG 75 1/2	ECE 225 1/0	8.52	289.0	7.9	0.20	700	80
1557	4H Satin	58	30	ECG 150 1/2	ECE 225 1/0	5.13	174.0	4.6	0.12	300	85
1562	Leno	30	16	ECG 150 1/0	ECG 150 1/0	1.86	63.1	4.7	0.12	75	37
1564	Plain	20	18	ECG 37 1/2	ECG 37 1/2	12.07	409.2	13.0	0.33	520	500
1568	Leno	16	8	ECH 25 1/0	ECG 37 1/3	7.97	270.0	16.5	0.42	237	374
1581	8H Satin	57	54	ECG 150 1/2	ECG 150 1/2	8.66	294.0	7.8	0.20	400	342
1582	8H Satin	60	56	ECG 150 1/3	ECG 150 1/3	13.26	449.6	12.0	0.30	600	530
1583	8H Satin	54	48	ECG 75 1/2	ECG 75 1/2	16.10	546.0	17.0	0.43	700	600
1584	8H Satin	44	35	ECG 150 4/2	ECG 150 4/2	25.13	852.0	24.0	0. 61	950	800
1597	Triple Plain	30	30	ECG 37 1/4	ECG 37 1/4	36.69	1244.0	36.9	0.94	900	900
1609	Plain	32	10	ECG 150 1/0	ECG 450 1/0	1.39	47.1	2.5	0.06	130	10

Fiberglass Fabrics

		Count		Yarn		Weight		Thickness		Strength (lb/in)	
Style	Weave	Warp	Fill	Warp	Fill	(osy)	(gsm)	(mils)	(mm)	Warp	Fill
1610	Plain	32	28	ECG 150 1/0	ECG 150 1/0	2.30	78.0	3.6	0.09	90	70
1614	Leno	30	14	ECG 150 1/0	ECG 75 1/0	2.33	79.0	5.5	0.14	75	85
1617	Leno	30	14	ECG 150 1/0	ECDE 75 1/0	2.31	78.0	5.5	0.14	50	25
1620	Plain	20	20	ECG 150 1/0	ECG 150 1/0	1.57	53.2	2.7	0.07	70	60
1628	Plain	40	28	ECDE 150 1/0	ECDE 150 1/0	2.60	88.2	3.5	0.09	170	100
1632	Plain	30	32	ECG 150 1/0	ECG 75 1/0	3.73	126.5	4.5	0.11	140	200
1633	Plain	40	20	ECG 150 1/0	ECG 75 1/0	3.07	104.1	4.2	0.11	150	120
1634	Plain	40	24	ECDE 150 1/0	ECDE 150 1/2	3.49	118.3	5	0.13	150	150
1636	Plain	40	24	ECDE 150 1/0	ECDE 150 1/0	2.55	86.5	4.4	0.11	175	70
1652	Plain	52	52	ECG 150 1/0	ECG 150 1/0	4.14	140.4	4.2	0.11	180	120
1658	Plain	20	10	ECG 150 1/0	ECG 75 1/0	1.57	53.2	3.5	0.09	60	70
1659	Leno	20	10	ECG 150 1/0	ECG 75 1/0	1.57	53.2	4.3	0.11	40	60
1669	Plain	60	12	ECG 150 1/0	ECD 450 1/0	2.50	85.0	2.8	0.07	300	15
1674	Plain	40	32	ECG 150 1/0	ECG 150 1/0	2.85	97.0	3.7	0.09	140	100
1675	Plain	40	32	ECDE 150 1/0	ECDE 150 1/0	2.84	96.3	3.8	0.10	180	140
1676	Plain	55	48	ECDE 150 1/0	ECDE 150 1/0	4.00	136.0	4.5	0.11	200	160
1677	Plain	40	40	ECDE 150 1/0	ECDE 150 1/0	3.12	105.8	4.0	0.10	190	160
1680	8H Satin	72	70	ECDE 150 1/0	ECDE 150 1/0	5.57	189.0	5.3	0.13	355	314

Fiberglass Fabrics

		Count		Yarn		Weight		Thickness		Strength (lb/in)	
Style	Weave	Warp	Fill	Warp	Fill	(osy)	(gsm)	(mils)	(mm)	Warp	Fill
1681	Plain	56	36	ECDE 150 1/0	ECDE 150 1/0	3.57	121.0	4.2	0.11	220	180
1688	Plain	31	20	ECG 150 1/0	ECG 75 1/0	2.88	97.6	4.7	0.12	100	120
1692	Plain	40	22	ECG 150 1/0	ECG 75 1/0	3.19	108.2	5.2	0.13	140	160
1694	Plain	40	24	ECG 150 1/0	ECG 75 1/0	3.51	119.0	4.9	0.12	170	200
1695	Plain	40	24	ECDE 150 1/0	ECDE 75 1/0	3.44	117.0	4.9	0.12	150	200
1800	Plain	16	14	ECH 18 1/0	ECH 18 1/0	9.39	318.4	11.2	0.28	460	410
2025	Plain	20	14	ETDE 11.6 TEX	ETDE 11.6 TEX	18.0	610.3	3.0	0.08	420	320
2112	Plain	40	39	ECE 225 1/0	ECE 225 1/0	2.07	70.2	2.9	0.07	109	112
2113	Plain	60	56	ECE 225 1/0	ECD 450 1/0	2.32	78.7	2.5	0.06	168	65
2114	Plain	56	48	ECE 225 1/0	ECE 225 1/0	2.74	93.0	3.4	0.08	175	135
2116	Plain	60	58	ECE 225 1/0	ECE 225 1/0	3.07	104.1	3.4	0.09	130	130
2117	Plain	66	55	ECE 225 1/0	ECE 225 1/0	3.18	108.0	3.7	0.09	200	150
2157	Plain	60	35	ECE 225 1/0	ECG 75 1/0	4.27	144.8	5.8	0.15	165	275
2165	Plain	60	52	ECE 225 1/0	ECG 150 1/0	3.65	123.8	4.0	0.10	170	190
2313	Plain	60	64	ECE 225 1/0	ECD 450 1/0	2.46	83.4	2.8	0.07	140	60
2523	Plain	28	20	ECH 25 1/0	ECH 25 1/0	11.01	373.3	12.2	0.31	493	394
2532	Plain	16	14	ECG 25 1/0	ECG 25 1/0	6.79	230.2	8.6	0.22	417	316
3070	Plain	70	70	ECDE 300 1/0	ECDE 300 1/0	2.79	94.6	2.9	0.07	133	110

Fiberglass Fabrics

		Count		Yarn		Weight		Thickness		Strength (lb/in)	
Style	Weave	Warp	Fill	Warp	Fill	(osy)	(gsm)	(mils)	(mm)	Warp	Fill
3118	Plain	60	59	ECD 450 1/2	ECE 225 1/0	3.11	105.4	3.7	0.09	150	100
3313	Plain	61	62	ECDE 300 1/0	ECDE 300 1/0	2.43	82.4	2.8	0.07	124	101
3582	8H Satin	59	55	ECG 50 1/0	ECG 50 1/0	13.60	462.0	12.5	0.32	712	674
3733	Plain	17	17	ECG 37 1/0	ECG 37 1/0	5.48	186.0	6.4	0.16	354	291
3743	4H Satin	48	30	ECG 37 1/0	ECE 225 1/0	7.89	268.0	7.3	0.19	600	60
3783	8H Satin	53	48	ECG 37 1/0	ECG 37 1/0	15.76	534.4	16.0	0.41	900	873
3784	8H Satin	45	36	ECG 37 1/2	ECG 37 1/2	25.53	866.0	23.1	0.59	1000	875
3788	12H Satin	42	36	ECG 37 1/4	ECG 37 1/4	49.74	1686.5	45.2	1.15	1523	1265
3884	8H Satin	46	36	ECDE 37 1/2	ECDE 37 1/2	26.43	896.1	25.7	0.65	1000	800
4180	4H Crowfoot	80	100	SCD 450 1/0	SCD 450 1/0	2.19	74.3	2.4	0.06	129	133
4527	Plain	24	22	SCG 75 1/0	SCG 75 1/0	3.58	121.4	5.2	0.13	300	250
6060	Plain	60	60	ECDE 600 1/0	ECDE 600 1/0	1.11	38.0	1.5	0.04	60	40
6080	Plain	60	47	SCD 450 1/0	SCD 450 1/0	1.27	43.1	1.9	0.05	100	70
6580	8H Satin	72	69	SCG 150 1/0	SCG 150 1/0	5.67	192.2	6.1	0.15	300	250
6781	8H Satin	57	54	SCG 75 1/0	SCG 75 1/0	8.64	293.0	8.8	0.22	420	400
7500	Plain	16	14	ECG 37 1/2	ECG 37 1/2	9.14	310.0	11.0	0.28	420	320
7510	Plain	18	21	ECG 75 1/2	ECG 150 1/2	4.50	153.0	5.8	0.15	200	100
7523	Plain	28	20	ECG 75 1/3	ECG 75 1/3	10.85	368.0	13.0	0.33	680	500
7531	Plain	23	14	ECG 75 1/2	ECG 75 1/2	5.50	186.5	7.3	0.19	250	150

Fiberglass Fabrics

		Count		Yarn		Weight		Thickness		Strength (lb/in)	
Style	Weave	Warp	Fill	Warp	Fill	(osy)	(gsm)	(mils)	(mm)	Warp	Fill
7532	Plain	16	13	ECG 75 1/3	ECG 75 1/3	6.89	234.0	8.9	0.23	350	300
7533	Plain	17	17	ECG 75 1/2	ECG 75 1/2	5.46	185.1	6.8	0.17	170	160
7544	2 End Plain	28	14	ECG 37 1/2	ECG 37 1/4	17.63	598.0	18.6	0.47	700	700
7581	8H Satin	57	54	ECG 75 1/0	ECG 75 1/0	8.95	303.5	8.3	0.21	500	400
7587	Mock Leno	40	20	ECG 37 1/2	ECG 37 1/2	19.81	672.0	24.0	0.61	900	560
7618	Plain	43	18	ECG 75 1/0	ECG 75 1/0	4.94	167.5	6.2	0.16	300	120
7624	Plain	44	24	ECG 75 1/0	ECG 75 1/0	5.49	186.1	7.0	0.18	395	174
7626	Plain	34	32	ECG 75 1/0	ECG 75 1/0	5.17	175.3	5.8	0.15	225	200
7628	Plain	44	31	ECG 75 1/0	ECG 75 1/0	6.00	203.0	7.0	0.18	300	200
7629	Plain	44	33	ECG 75 1/0	ECG 75 1/0	6.20	210.2	6.8	0.17	250	215
7635	Plain	44	29	ECG 75 1/0	ECG 50 1/0	6.90	234.0	8.5	0.22	300	400
7637	Plain	43	22	ECG 75 1/0	ECG 37 1/0	7.02	238.0	9.5	0.24	282	203
7642	Plain	44	20	ECG 75 1/0	ECG 37 1/0 TEX	6.69	227.0	9.7	0.25	350	250
7645	8H Satin	47	42	ECG 75 1/2	ECG 75 1/2	14.54	493.0	12.8	0.33	650	550
7715	Modified Plain	80	18	ECG 75 1/0	ECG 150 1/0	7.13	242.0	7.7	0.19	650	40
7725	2X2 Twill	54	18	ECG 75 1/0	ECH 25 1/0	8.55	290.0	9.0	0.23	575	475
7781	8H Satin	57	54	ECDE 75 1/0	ECDE 75 1/0	8.5	288.0	8.6	0.22	500	400
7791	Conform	58	58	ECDE 75 1/0	ECDE 75 1/0	9.0	305.2	10.0	0.25	500	440

Fiberglass Fabrics

		Count		Yarn		Weight		Thickness		Strength (lb/in)	
Style	Weave	Warp	Fill	Warp	Fill	(osy)	(gsm)	(mils)	(mm)	Warp	Fill
16550	Plain	24	22	S2CG 150 1/2	S2CG 150 1/2	3.63	123.0	5.1	0.13	125	120
16781	8H Satin	57	55	SCG 75 1/0	SCG 75 1/0	9.08	308.0	9.1	0.23	481	410
17645	8H Satin	47	42	SCG 75 1/2	SCG 75 1/2	14.54	493.0	13.4	0.34	650	550
17781	8H Satin	57	55	ECDE 75 1/0	ECDE 75 1/0	8.74	296.3	8.5	0.22	500	380
20095	Plain	33	33	ECD 900 1/0	ECD 900 1/0	0.43	15.0	1.1	0.03	25	20
21522	Plain	24	22	ECG 150 1/2	ECG 150 1/2	3.65	124.0	4.6	0.12	147	158
24527	Plain	25	22	SCG 75 1/0	SCG 75 1/0	3.47	118.0	4.9	0.12	338	292
24629	Plain	24	22	SCG 75 1/0	ECG 75 1/0	3.6	122.1	4.5	0.11	240	220
26781	8H Satin	57	55	SCG 75 1/0	SCG 75 1/0	8.71	295.3	9.0	0.23	450	400
27533	Plain	17	17	ECG 75 1/2	ECG 75 1/2	5.60	190.0	8.0	0.20	400	400
76281	4H Satin	44	31	ECG 75 1/0	ECG 75 1/0	6.03	204.4	6.4	0.16	400	300
85392	Plain	44	31	SCG 75 1/0	STG 150 1/2 Tex	5.93	201.0	7.3	0.19	350	200

Fiberglass Fabrics Weight Index

	Weight			Weight			Weight			Weight			Weight	
Style	(osy)	(gsm)	Style	(osy)	(gsm)	Style	(osy)	(gsm)	Style	(osy)	(gsm)	Style	(osy)	(gsm)
20095	0.43	15.0	1609	1.39	47.1	2113	2.32	78.7	1633	3.07	104.1	1165	3.53	119.7
101	0.47	15.9	108	1.40	47.5	1614	2.33	79.0	2116	3.07	104.1	1522	3.57	121.0
104	0.55	18.6	1078	1.40	47.0	117	2.40	81.4	220	3.08	104.4	1681	3.57	121.0
1071	0.58	19.7	1080	1.40	47.5	3313	2.43	82.4	116	3.09	105.0	4527	3.58	121.4
1037	0.70	24.0	1620	1.57	53.2	2313	2.46	83.4	3118	3.11	105.4	24629	3.6	122.1
106	0.73	25.0	1658	1.57	53.2	1669	2.50	85.0	120	3.12	106.0	16550	3.63	123.0
1297	0.77	26.1	1659	1.57	53.2	1636	2.55	86.5	1677	3.12	105.8	2165	3.65	123.8
1035	0.87	29.0	1280	1.58	53.6	1125	2.60	88.2	2117	3.18	108.0	21522	3.65	124.0
1299	0.90	30.5	1562	1.86	63.1	1628	2.60	88.2	1692	3.19	108.2	1131	3.66	124.1
1067	0.91	37.0	2112	2.07	70.2	2114	2.74	93.0	1695	3.44	117.0	1632	3.73	126.5
1076	0.98	33.2	112	2.08	70.5	3070	2.79	94.6	24527	3.47	118.0	1167	3.76	127.5
1070	1.03	35.0	4180	2.19	74.3	1675	2.84	96.3	1521	3.49	118.0	1161	3.83	130.0
6060	1.11	38.0	1610	2.30	78.0	1674	2.85	97.0	1634	3.49	118.3	1676	4.00	136.0
6080	1.27	43.1	1617	2.31	78.0	1688	2.88	97.6	1694	3.51	119.0	1652	4.14	140.4

Fiberglass Fabrics Weight Index

Style	Weight (osy)	Weight (gsm)	Style	Weight (osy)	Weight (gsm)	Style	Weight (osy)	Weight (gsm)	Style	Weight (osy)	Weight (gsm)	Style	Weight (osy)	Weight (gsm)
2157	4.27	144.8	27533	5.60	190.0	7532	6.89	234.0	7581	8.95	303.5	1582	13.26	449.6
1162	4.30	145.8	6580	5.67	192.2	7635	6.90	234.0	7791	9.0	305.2	3582	13.60	462.0
7510	4.50	153.0	880	5.70	193.0	7637	7.02	238.0	16781	9.08	308.0	7645	14.54	493.0
1039	4.85	164.0	128	5.87	199.0	7715	7.13	242.0	7500	9.14	310.0	17645	14.54	493.0
1025	4.90	167.0	85392	5.93	201.0	3743	7.89	268.0	1800	9.39	318.4	3783	15.76	534.4
7618	4.94	167.5	1538	6.00	203.4	1568	7.97	270.0	7523	10.85	368.0	1583	16.10	546.0
1557	5.13	174.0	7628	6.00	203.0	1142	8.33	282.4	2523	11.01	373.3	7544	17.63	598.0
7626	5.17	175.3	1528	6.03	204.0	7781	8.5	288.0	1523	11.26	381.8	2025	18.0	610.3
1526	5.30	180.0	76281	6.03	204.4	1543	8.52	289.0	1527	11.80	400.0	7587	19.81	672.0
7533	5.46	185.1	7629	6.20	210.2	7725	8.55	290.0	162	11.96	405.5	1584	25.13	852.0
3733	5.48	186.0	138	6.53	221.4	6781	8.64	293.0	1564	12.07	409.2	3784	25.53	866.0
7624	5.49	186.1	1014	6.60	223.0	1581	8.66	294.0	332	12.36	419.1	3884	26.43	896.1
7531	5.50	186.5	7642	6.69	227.0	26781	8.71	295.3	1188	12.36	419.1	1597	36.69	1244.0
1680	5.57	189.0	2532	6.79	230.2	17781	8.74	296.3	1530	13.20	448.0	3788	49.74	1686.5

Fiberglass Fabrics Thickness Index

Style	Weight (osy)	Weight (gsm)	Style	Weight (osy)	Weight (gsm)	Style	Weight (osy)	Weight (gsm)	Style	Weight (osy)	Weight (gsm)	Style	Weight (osy)	Weight (gsm)
101	0.7	0.02	6080	1.9	0.05	112	3.4	0.08	1165	3.8	0.10	24629	4.5	0.11
1037	1.0	0.03	1078	2.0	0.05	220	3.4	0.09	1675	3.8	0.10	1131	4.6	0.12
1067	1.0	0.03	1299	2.0	0.05	1125	3.4	0.09	1167	4.0	0.10	1557	4.6	0.12
20095	1.1	0.03	108	2.1	0.05	2114	3.4	0.08	1677	4.0	0.10	21522	4.6	0.12
1035	1.2	0.03	4180	2.4	0.06	2116	3.4	0.09	2165	4.0	0.10	1562	4.7	0.12
1071	1.2	0.03	1609	2.5	0.06	116	3.5	0.09	1633	4.2	0.11	1688	4.7	0.12
104	1.4	0.04	2113	2.5	0.06	1628	3.5	0.09	1652	4.2	0.11	1694	4.9	0.12
1076	1.4	0.03	1620	2.7	0.07	1658	3.5	0.09	1681	4.2	0.11	1695	4.9	0.12
106	1.5	0.04	1669	2.8	0.07	120	3.6	0.09	1659	4.3	0.11	24527	4.9	0.12
6060	1.5	0.04	2313	2.8	0.07	1610	3.6	0.09	1161	4.4	0.11	1522	5.0	0.13
1070	1.6	0.04	3313	2.8	0.07	117	3.7	0.09	1521	4.4	0.11	1634	5	0.13
1297	1.7	0.04	2112	2.9	0.07	1674	3.7	0.09	1636	4.4	0.11	16550	5.1	0.13
1080	1.9	0.05	3070	2.9	0.07	2117	3.7	0.09	1632	4.5	0.11	1692	5.2	0.13
1280	1.9	0.05	2025	3.0	0.08	3118	3.7	0.09	1676	4.5	0.11	4527	5.2	0.13

Fiberglass Fabrics Thickness Index

Style	Weight (osy)	(gsm)	Style	Weight (osy)	(gsm)	Style	Weight (osy)	(gsm)	Style	Weight (osy)	(gsm)	Style	Weight (osy)	(gsm)
1162	5.3	0.13	138	6.6	0.17	27533	8.0	0.20	1142	9.8	0.25	7523	13.0	0.33
1680	5.3	0.13	1039	6.6	0.17	7581	8.3	0.21	7791	10.0	0.25	17645	13.4	0.34
880	5.5	0.14	1528	6.7	0.17	1025	8.4	0.21	1014	10.5	0.26	1527	14.0	0.35
1614	5.5	0.14	7533	6.8	0.17	7635	8.5	0.22	7500	11.0	0.28	1530	14.4	0.37
1617	5.5	0.14	7629	6.8	0.17	17781	8.5	0.22	1800	11.2	0.28	3783	16.0	0.41
2157	5.8	0.15	1538	7.0	0.18	2532	8.6	0.22	1188	12.0	0.30	1568	16.5	0.42
7510	5.8	0.15	7624	7.0	0.18	7781	8.6	0.22	1523	12.0	0.30	1583	17.0	0.43
7626	5.8	0.15	7628	7.0	0.18	6781	8.8	0.22	1582	12.0	0.30	7544	18.6	0.47
128	6.0	0.15	3743	7.3	0.19	7532	8.9	0.23	2523	12.2	0.31	3784	23.1	0.59
6580	6.1	0.15	7531	7.3	0.19	7725	9.0	0.23	3582	12.5	0.32	1584	24.0	0. 61
1526	6.2	0.16	85392	7.3	0.19	26781	9.0	0.23	332	12.7	0.32	7587	24.0	0.61
7618	6.2	0.16	7715	7.7	0.19	16781	9.1	0.23	7645	12.8	0.33	3884	25.7	0.65
3733	6.4	0.16	1581	7.8	0.20	7637	9.5	0.24	162	13.0	0.33	1597	36.9	0.94
76281	6.4	0.16	1543	7.9	0.20	7642	9.7	0.25	1564	13.0	0.33	3788	45.2	1.15

ASTROQUARTZ ® PRODUCTS

Astroquartz ® is a registered trademark of JPS Composite Materials

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.

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/cm
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 @ 20ºC (J/gK) ..... 7.5 x 10^2
Thermal Conductivity (W/mK)..... 1.38
Strain Point (Log n = 14.6) 1070ºC (1958ºF)
Annealing Point (Log n = 13)..... 1220ºC (2084ºF)
Softening Point (Log n = 7.6)..... 1700ºC (3092ºF)
Note: n = Viscosity in Poise

Optical Properties

Refractive Index @ 15ºC 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% SiO_2) 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 yard (68 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
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: Primary	Secondary	Notes
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 Cyanate Ester	Amino-silane
9827 2827 3827	Epoxy	Polyimide, Bismaleimide	Recommended for electronic and aerospace applications
9836 2836 3836	Epoxy	Bismaleimide	Scoured fabric to to remove most organic binder components
9837 2837 3837	Polyester	Vinyl Ester Epoxy, Cyanate 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% SiO_2(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.

Standard Packaging

1 lb packages loosely in clear polyethylene bags.

Order Requirements and Lead Times

Please contact JPS to confirm availability and lead time.

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

Astroquartz® Fabrics

Style # JPS	Weave	Count Warp	Count Fill	Yarn	Yarn	Fill	Weight (osy)	Weight (gsm)	Thickness (mils)	Thickness (mm)	Strength (lb/in) Warp	Strength (lb/in) Fill
503	Plain	50	40	QCG 300 1/2	QCG 300 1/2		3.35	114	4.5	0.11	165	140
507	Plain	27	25	QCG 300 1/2	QCG 300 1/2		2.10	71	3.8	0.10	80	60
523	Plain	50	38	QCG 300 1/2	QCG 300 1/0		2.78	94	3.7	0.09	220	100
525	Plain	50	50	QCG 300 1/0	QCG 300 1/0		1.94	66	2.7	0.07	112	96
527	Plain	42	32	QCG 300 2/2	QCG 300 2/2		5.76	195	8.0	0.20	270	250
557	Crowfoot	56	31	QCG 300 2/2	QCG 300 1/0		5.0	170	5.9	0.15	410	55
570	5H Satin	38	24	QCG 300 2/8	QCG 300 2/8		19.5	661	25.0	0.64	825	650
581	8H Satin	57	54	QCG 300 2/2	QCG 300 2/2		8.40	285	9.9	0.25	400	375
593	5H Satin	49	46	QCG 300 2/2	QCG 300 2/2		7.46	253	9.5	0.24	400	400
4503	Plain	38	32	125 1/0 QS13	125 1/0 QS13		3.32	113	4.5	0.11	115	100
4581	8H Satin	47	44	125 2/0 QS13	125 2/0 QS13		8.67	294	9.5	0.24	370	330

Astroquartz ® Mat Style No. 550

Specifications

Length.....1000 mm (39.37 in)
Width .....500 mm (19.69 in)
Area ..... 0.5 m per sheet (5.38 ft)
Thickness .....5 mm (0.2 in)
Weight .....78 g/m (2.3 oz/yd)
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 900ºF for 1 hour, or at 500ºF 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 ft per sheet.

Astroquartz® II Roving

Astroquartz II® roving is made from continuous filaments of pure fused silica nine microns in diameter. Fiber composition is 99.99% SiO_2 (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/cm^3. 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 ** Test Method - ASTM D-578 • +0-1
••0.3%-0.6% LOI † ±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 ..... Ratio
Wind Direction ..... Forward
Type Build..... Straight
Maximum OD.....7 in

Approximate Net Weight

9779 Binder .....2.2 lbs

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 2000ºF. Fiber composition is 99.99% SiO_2(silica) exclusive of binder. Astroquartz II® sewing threads are supplied coated with PTFE.

With 9855 Teflon Coating (20±4%)

Type	Approx. Diameter	Breaking Strength*			Approx. Yield**
	(in)	Typical (lb)	Minimum	Uncoated	Coated
Q-12	0.014	15	12	3660	2925
Q-18	0.017	24	19	2440	1950
Q-24	0.022	3	25	1830	1460
Q-27	0.024	30	25	-	900

* Test Method - ASTM D-578

** ±10%

Standard Packaging

Astroquartz II ® sewing thread is 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 2000ºF.

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 (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

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®*	Astroquartz III®**
Number of Filaments	
300 1/0 - 120 filaments	125 1/0 - 120 filaments
300 2/0 - 240 filaments	125 2/0 - 240 filaments
300 2/2 - 480 filaments	

* Astroquartz II® filaments are 9 µm in diameter, similar to an ECG filament
** Each filament is 14 µm in diameter, equivalent to an ECK filament.

Physical Properties of Para-Aramids

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

* 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 - Dyneem®*, 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 144-152ºC
Decomposition Temperature in Air.....>300ºC
Advised Lowest Temperature .....No Limit
Advised Long Duration Temperature Limit 70ºC
Advised Short Duration Temperature Limit
Non-Constrained Fiber 130ºC
Constrained Fiber.....145ºC
Tensile Strength Relative to 23ºC
at -60ºC 110%
at 23ºC.....100%
at 60ºC.....80%
at 100ºC.....55%

* Dyneema® 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

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.
Denier = dtex X 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.

Tex = 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 Greige
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 # JPS	AMS	Weave	Count Warp	Count Fill	Warp Yarn	Fill Yarn	Weight (osy)	Weight (gsm)	Thickness (mils)	Thickness (mm)	Strength (lb/in) Warp	Strength (lb/in) Fill
310		Plain	36	36	Kevlar LT (400d)	Kevlar LT (400d)	3.6	122.0	7.00	0.18	600	600
311		Rip stop	35	35	Kevlar LT (400d)	Kevlar LT (400d)	3.6	122.1	6.60	0.17	500	500
312		Plain	36	36	Kevlar KM2+ (400d)	Kevlar KM2+ (400d)	3.5	118.6	6.60	0.17	650	650
328	328	Plain	17	17	Kevlar 49 (1420d)	Kevlar 49 (1420d)	6.0	203.4	13.00	0.33	800	800
348	181	8H Satin	50	50	Kevlar 49 (380d)	Kevlar 49 (380d)	5.0	170.5	8.50	0.22	600	600
350	120	Plain	34	34	Kevlar 49 (195d)	Kevlar 49 (195d)	1.8	61.0	3.90	0.10	200	200
351	220	Plain	22	22	Kevlar 49 (380d)	Kevlar 49 (380d)	2.2	74.6	4.10	0.10	300	300
5351	220	Plain	22	22	Twaron 1055 (405dt)	Twaron 1055 (405dt)	2.2	75.0	4.60	0.12	300	300
352	281	Plain	17	17	Kevlar 49 (1140d)	Kevlar 49 (1140d)	5.1	172.0	9.30	0.24	600	600
353	285	4H Satin	17	17	Kevlar 49 (1140d)	Kevlar 49 (1140d)	5.2	176.3	9.10	0.23	600	600
5353	285	4H Satin	17	17	Twaron 2200 (1270dt)	Twaron 2200 (1270dt)	5.1	173.0	8.80	0.22	725	725
372		4X4 Twill	72	72	Kevlar 49 (195d)	Kevlar 49 (195d)	3.8	129.0	7.00	0.18	450	550
431		Plain	31	31	Kevlar LT (400d)	Kevlar LT (400d)	3.1	105.1	5.90	0.15	500	500
705		Plain	31	31	Kevlar KM2 (850d)	Kevlar KM2 (850d)	6.8	231.0	13.60	0.35	750	775
710		Plain	24	24	Kevlar 29 (1500d)	Kevlar 29 (1500d)	9.4	318.0	18.40	0.47	1100	1200
711		Plain	29	29	Kevlar A-200 (600d)	Kevlar 29 A-200 (600d)	4.5	153.0	8.50	0.22	600	600
712		Plain	11	11	Kevlar 29 (3000d)	Kevlar 29 (3000d)	8.5	288.0	16.60	0.42	1200	1200
713		Plain	31	31	Kevlar 29 (1000d)	Kevlar 29 (1000d)	8.0	271.2	16.40	0.42	780	1000
5713		Plain	31	31	Twaron 2000 (1100dt)	Twaron 2000 (1100dt)	8.1	274.9	16.30	0.41	900	900

Aramid Fabrics

Style # JPS	AMS	Weave	Count Warp	Count Fill	Warp Yarn	Fill Yarn	Weight (osy)	Weight (gsm)	Thickness (mils)	Thickness (mm)	Strength (lb/in) Warp	Strength (lb/in) Fill
5719		Plain	20	20	Twaron 2040 (930dt)	Twaron 2040 (930dt)	4.3	143.1	7.50	0.19	600	600
720		Plain	20	20	Kevlar 129 (1420d)	Kevlar 129 (1420d)	7.3	247.5	14.20	0.36	1000	1000
722		Plain	22	22	Kevlar 129 (1420d)	Kevlar 129 (1420d)	8.2	278.0	15.80	0.40	600	900
724		Plain	24	24	Kevlar 129 (1000d)	Kevlar 129 (1000d)	6.0	203.4	11.00	0.28	760	780
726		Plain	26	26	Kevlar 129 (840d)	Kevlar 129 (840d)	5.7	193.0	10.00	0.25	700	750
727		Plain	26	26	Kevlar 129 (1000d)	Kevlar 129 (1000d)	6.8	231.0	12.30	0.31	910	980
728		Plain	17	17	Kevlar 29 (1500d)	Kevlar 29 (1500d)	6.6	223.0	1.70	0.04	900	900
729		Plain	17	17	Kevlar 129 (1420d)	Kevlar 129 (1420d)	6.5	220.0	12.00	0.30	900	900
731		Plain	30	30	Kevlar 129 (1000d)	Kevlar 129 (1000d)	8.1	274.0	15.00	0.38	850	950
5731		Plain	30	31	Twaron 2040 (1100dt)	Twaron 2040 (1100dt)	8.1	275.0	16.10	0.41	850	850
735		Basket 2X2	35	35	Kevlar 29 (1500d)	Kevlar 29 (1500d)	13.5	458.0	23.00	0.58	1700	1800
740		Plain	40	40	Kevlar 29 (200d)	Kevlar 29 (200d)	2.1	71.2	5.00	0.13	300	300
741		Plain	11	11	Kevlar 29 (3000d)	Kevlar 29 (3000d)	8.4	285.0	16.00	0.40	135	130
5741		Plain	11	11	Twaron 1000 (3360dt)	Twaron 1000 (3360dt)	8.6	291.6	15.50	0.39	1100	1150
745		Plain	17	17	Kevlar 29 (3000d)	Kevlar 29 (3000d)	13.0	440.8	24.60	0.62	1400	1150
5745		Plain	17	17	Twaron 1000 (3360dt)	Twaron 1000 (3360dt)	13.0	440.1	24.00	0.61	1700	1800
747		Plain	10	10	Kevlar 29 (3000d)	Kevlar 29 (3000d)	7.6	257.0	14.50	0.37	900	900
754		Basket 2X2	21	21	Kevlar 29 (3000d)	Kevlar 29 (3000d)	14.8	502.0	30.00	0.76	2000	2000
755		Basket 4X4	21	21	Kevlar 29 (3000d)	Kevlar 29 (3000d)	15.3	517.0	29.00	0.74	2000	2000
756		Plain	28	28	Kevlar KM2 (400d)	Kevlar KM2 (400d)	2.9	97.6	5.50	0.14	400	400

Aramid Fabrics

Style # JPS	AMS	Weave	Count Warp	Count Fill	Warp Yarn	Fill Yarn	Weight (osy)	Weight (gsm)	Thickness (mils)	Thickness (mm)	Strength (lb/in) Warp	Strength (lb/in) Fill
758		Plain	16	16	Kevlar 129 (2820d)	Kevlar 129 (2802d)	11.6	394.0	21.00	0.53	1400	1400
760		Basket 2X2	30	30	Kevlar 129 (1420d)	Kevlar 129 (1420d)	11.6	393.0	21.10	0.54	850	600
5704		Plain	31	31	Twaron 2040 (930dt)	Twaron 2040 (930dt)	6.7	227.2	12.40	0.31	800	900
767		Plain	28	28	Kevlar KM2+ (600d)	Kevlar KM2+ (600d)	4.3	145.1	7.80	0.20	700	700
768		Plain	28	28	Kevlar KM2+ (500d)	Kevlar KM2+ (500d)	3.6	121.4	6.30	0.16	500	550
5768		Plain	27	27	Twaron 2040 (550dt)	Twaron 2040 (550dt)	3.6	122.0	6.40	0.16	500	500
5772		Plain	28	28	Twaron 2642 (550dt)	Twaron 2642 (550dt)	3.6	122.0	6.60	0.17	700	750
5761		Plain	26	26	Twaron 2040 (1100dt)	Twaron 2040 (1100dt)	6.5	220.4	11.70	0.29	760	780
775		Plain	30	30	Kevlar KM2+ (850d)	Kevlar KM2+ (850d)	6.7	229.0	13.20	0.34	600	800
778		Plain	58	58	Kevlar 159 (300d)	Kevlar 159 (300d)	4.9	166.5	10.20	0.26	TBD	TBD
779		Plain	70	70	Kevlar 159 (200d)	Kevlar 159 (200d)	3.0	101.7	8.20	0.18	350	350
785		Plain	20	20	Kevlar KM2+ (850d)	Kevlar KM2+ (850d)	4.4	148.0	8.40	0.21	680	700
787		Plain	23	23	Kevlar KM2+ (850d)	Kevlar KM2+ (850d)	5.0	170.5	9.50	0.24	800	700
5930		Plain	27	27	Twaron 2040 (930dt)	Twaron 2040 (930dt)	5.8	197.0	10.50	0.25	800	850

Aramid Fabric Weight Index

JPS Style #	Weight (osy)	Weight (gsm)
350	1.8	61.0
740	2.1	71.2
351	2.2	74.6
5351	2.2	75.0
756	2.9	97.6
779	3.0	101.7
431	3.1	105.1
312	3.5	118.6
768	3.6	121.4
310	3.6	122.0
311	3.6	122.1
5768	3.6	122.0
5772	3.6	122.0
372	3.8	129.0
767	4.3	145.1
5719	4.3	143.1
785	4.4	148.0
711	4.5	153.0
778	4.9	166.5
348	5.0	170.5
787	5.0	170.5
352	5.1	172.0
5353	5.1	173.0
353	5.2	176.3

JPS Style #	Weight (osy)	Weight (gsm)
726	5.7	193.0
5930	5.8	197.0
328	6.0	203.4
724	6.0	203.4
729	6.5	220.0
5761	6.5	220.4
728	6.6	223.0
5704	6.7	227.2
775	6.7	229.0
705	6.8	231.0
727	6.8	231.0
720	7.3	247.5
747	7.6	257.0
713	8.0	271.2
731	8.1	274.0
5731	8.1	275.0
5713	8.1	274.9
722	8.2	278.0
741	8.4	285.0
712	8.5	288.0
5741	8.6	291.6
710	9.4	318.0
760	11.6	393.0
758	11.6	394.0

JPS Style #	Weight (osy)	Weight (gsm)
5745	13.0	440.1
745	13.0	440.8
735	13.5	458.0
754	14.8	502.0
755	15.3	517.0

Aramid Fabric Thickness Index

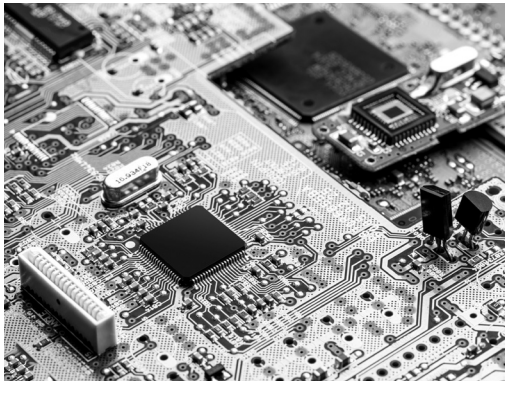
JPS Style #	Weight (osy)	Weight (gsm)
728	1.70	0.04
350	3.90	0.10
351	4.10	0.10
5351	4.60	0.12
740	5.00	0.13
756	5.50	0.14
431	5.90	0.15
768	6.30	0.16
5768	6.40	0.16
311	6.60	0.17
312	6.60	0.17
5772	6.60	0.17
310	7.00	0.18
372	7.00	0.18
5719	7.50	0.19
767	7.80	0.20
779	8.20	0.18
785	8.40	0.21
348	8.50	0.22
711	8.50	0.22
5353	8.80	0.22
353	9.10	0.23
352	9.30	0.24
787	9.50	0.24

JPS Style #	Weight (osy)	Weight (gsm)
726	10.00	0.25
778	10.20	0.26
5930	10.50	0.27
724	11.00	0.28
5761	11.70	0.29
729	12.00	0.30
727	12.30	0.31
5704	12.40	0.31
328	13.00	0.33
775	13.20	0.34
705	13.60	0.35
720	14.20	0.36
747	14.50	0.37
731	15.00	0.38
5741	15.50	0.39
722	15.80	0.40
741	16.00	0.40
5731	16.10	0.41
5713	16.30	0.41
713	16.40	0.42
712	16.60	0.42
710	18.40	0.47
758	21.00	0.53
760	21.10	0.54

JPS Style #	Weight (osy)	Weight (gsm)
735	23.00	0.58
5745	24.20	0.61
745	24.60	0.62
755	29.00	0.74
754	30.00	0.76

Dyneema Fabrics

Style	Weave	Count		yarn		weight		thickness		Strength (lb)	
		Warp	Fill	Warp	Fill	(osy)	(gsm)	(mils)	(mm)	Warp	Fill
821	Plain	32	32	DSM SK 75	DSM SK 75	3.40	115.3	8.9	0.23	34	34



Spectra Fabrics

Style	Weave	Count		yarn		weight		thickness		Strength (lb)	
		Warp	Fill	Warp	Fill	(osy)	(gsm)	(mils)	(mm)	Warp	Fill
903	Plain	21	21	Spectra 900 (1200d)	Spectra 900 (1200d)	7.00	237.3	18.5	0.47	1100	1100
904	Plain	34	34	Spectra 900 (650d)	Spectra 900 (650d)	6.30	214.0	17.0	0.43	950	900
951	Plain	17	17	Spectra 1000 (650d)	Spectra 1000 (650d)	2.90	98.3	9.3	0.24	700	650
955	Plain	54	56	Spectra 1000 (215d)	Spectra 1000 (215d)	3.30	112.0	7.8	0.20	600	550
960	Plain	32	32	Spectra 1000 (375d)	Spectra 1000 (375d)	3.18	107.8	8.0	0.20	600	550
961	Plain	32	32	Spectra 1000 (375d)	Spectra 1000 (375d)	3.20	108.5	8.0	0.20	600	550
985	8H Satin	32	32	Spectra 1000 (650)	Spectra 1000 (650d)	5.50	186.0	13.0	0.33	1050	1000
956	Plain	34	34	Spectra 1000 (215d)	Spectra 1000 (215d)	1.90	67.0	5.0	0.13	400	360
960	Plain	32	32	Spectra 1000 (375d)	Spectra 1000 (375d)	3.18	107.8	8.0	0.20	600	550
961	Plain	32	32	Spectra 1000 (375d)	Spectra 1000 (375d)	3.20	108.5	8.0	0.20	600	550
984	Plain	32	32	Spectra 1000 (650d)	Spectra 1000 (650d)	5.50	187.0	14.0	0.36	1050	1000
985	8H Satin	32	32	Spectra 1000 (650)	Spectra 1000 (650d)	5.50	186.0	13.0	0.33	1050	1000

Technical References - English

Fiber	Density (lb/in^3)	Tensile Strength (ksi)	Tensile Modulus (msi)	Strain to Failure (%)	Specific Tensile Strength (10^6in)	Specific Tensile Modulus (10^8in)	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 (10^6cm)	Specific Tensile Modulus (10^8cm)	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	SI to US
1 oz/yd^2 = 33.91 g/m^2	1 g/m^2 = 0.0295 oz/yd^2
1 oz = 28.35 g 1 lb = 16 oz	1 g = 0.035 oz
1 lb = 0.454 kg	1 kg = 2.205 lb
1 N = 0.102 kgf 1 lbf = 4.45 N	1 kgf = 9.81 N
1 psi = 6894.76 Pa	1 ksi = 6.89 MPa 1 MPa = 1 N/mm^2 1GPa = 1000 MPa
1 denier = 0.111 Tex	1 Tex = 9 denier 1 Tex = 496,052 yds/lbs
°F = (°C)*(9/5)+32	°C = (°F-32)*(5/9)
1 in = 25.4 mm = 2.54 cm	1 cm = 0.39 in
1 lb/ft^2 = 4.88 kg/m^2 1 lb/ft^3 = 16.02 kg/m^3	1 kg/m^2 = 0.205 lb/ft^2 1 kg/m^3 = 0.062 lb/ft^3
1 yd = 0.91 m	1 m = 1.09 yd
1 ft = 0.3048 m	1 m = 3.281 ft

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

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

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For further information,
JPS Composite Materials
PO Box 2627, Anderson, SC, 29622
(800) 431-1110
www.jpscm.com

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JPS Composite Materials
2200 South Murray Avenue
P.O. Box 2627 I Anderson, SC, 29622 I (800) 431-1110 Toll Free

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