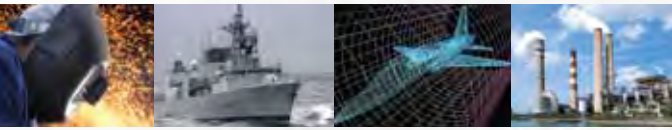
Carolina
Technical Fabrics



product handbook

LEWCO
Specialty Products, Inc.

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Carolina
Technical Fabrics

Carolina Technical Fabics (CTF) is the newest, most modern, fully integrated fine fabric textile plant built in the USA.

Warping

Slashing

Weaving

Finishing

A Tradition of Strength

LEWCO Specialty Products, Inc.

Carolina Technical Fabrics

For more than 25 years, Lewco Specialty Products, Inc. along with the resources of Carolina Technical Fabrics (CTF) have been at the forefront of High Temperature & Reinforcement Technology. Together, both enterprises have developed hundreds of products associated with reinforcements, insulation, filtration, noise abatement, safety, aviation, transportation, automotive, marine, energy, fire protection and many others. Lewco and Carolina Technical Fabrics together have the capabilities to design, manufacture and supply industry with a variety of woven and non woven fiberglass, silica and ceramic fiber textiles.

Carolina Technical Fabrics

Composite Fabrics Add Durability and Strength

"Versatile" is the best word to describe Carolina Technical Fabrics — so much so that it's difficult to define a "typical" end use for them. Our woven fabrics add to the durability and strength of a rich variety of products and applications.

Quality is an Absolute

We strive to be at the leading edge of weaving technology, manufacturing fabrics to meet the exacting requirements of the global marketplace. Lewco and Carolina Technical Composite Fabrics together are ISO 9001-2000 certified to meet the quality standards for its globally applied fabrics. Whether your application is straight forward or complex, our quality standards are not compromised.

Dedicated to Customer Solutions

We never lose sight of our mission: To provide reinforcement solutions to our customers. Often, this means helping them solve specific engineering problems.

If need be, we design a custom solution. Our research and development team has become adept at producing new types of woven fabrics, experimenting with new fibers, and perfecting innovative coatings and finishing techniques. When our customers ask for a solution, we respond quickly because we understand the urgency of their business needs.

CTF PLANT

Carolina Technical Fabrics

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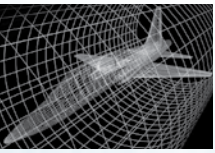
A World of Reinforcement



Aerospace / Military / Ballistic
Aircraft parts, engine blades, interior panels, storage bins found in commercial and military aircraft including helicopters,

Recreation
Diverse applications, from hockey sticks to skis and surboards.

Corrosion & Pipe
Insulation, duct, hoses, machinery parts

Transportation
From lightweight race cars, to truck panels, to heavy duty freight containers

Applications...

Wind Energy
Rotor blades and other key parts

Industrial
Insulation, fireproofing, noise abatement, electrical parts, junction boxes

Marine
Yachts, kayaks, canoes and patrol boats.

Infrastructure
For roads, bridges and pipeline rehabilitation.

Choosing the Right Composite Fabric

Composite fabrics are engineered to provide desired properties, such as strength, resilience, flexibility, light weight, and resistance to weather, heat, fire and corrosion.

To select the right fabric, it is necessary to consider factors that together determine performance characteristics, such as strength, coverage, permeability and drapeability. This handbook provides useful technical information on:

- Yarn Selection
- Fabric Thickness
- Thread Count
- Weave Pattern
- Fabric Weight
- Finishes

Your sales representative can explain the various technical options and help you decide on the optimal solution to your reinforcement challenge.

Understanding the Basics About Fabric

Woven Fabric: Manufactured on a loom, fabric consists of a warp and a weft (also called a fill). Together, the warp and weft determine the type of weave.

Warp: The set of yarns that runs lengthwise and parallel to the selvage, and is interwoven with the fill. The sheet of yarns wound together on a beam for the purpose of weaving or warp knitting.

Weft (Fill): The yarn running at right angles to the warp. Each crosswise length is called a pick. In the weaving process, the filling yarn is carried by the shuttle, rapier, or some other type of yarn carrier.

Weave: The system or pattern of intersecting warp and filling yarns. The three most common are: plain, twill and satin (see Types of Weaves on page 9).

Count: Determined by the number of warp and weft (fill) yarns per inch (10cm) of fabric. Tightness of weave.

Thickness: Fabrics range in thickness and are commonly from .001" to .0125" (.25mm to 2.54mm).

Yarn Size: Weight, thickness and coverage of the fabric, thus determining performance characteristics.

Ply: The number of single yarns twisted together to form a plied yarn, or the number of plied yarns twisted together to form cord.

Finish: In composite and industrial applications, a finish or sizing promotes adhesion between fiber glass and a matrix resin or coating. Sizing compounds are applied to warp yarn to bind the fiber together and stiffen the yarn to provide abrasion resistance.

Fill: See Weft.

Coating: A compound put on a fabric or other textile that protects or seals adding properties needed for specific applications.

More Fabric Terminology

Beaming: The operation of winding yarns onto a beam, usually in preparation for slashing, weaving or warp knitting. Also called warping.

Bursting Strength: The ability of a material to resist rupture by pressure.

Crimp: The amount of extra yarn required to allow for warp and weft (fill) to make a yard (meter) of fabric. Often expressed as a percent.

Filament: Strand in yarn. Yarn that consists of one strand is called monofilament. Most textile filament yarns are multifilament, meaning there are many continuous filaments or strands.

Tear Strength: The force required to begin or continue a tear in a fabric, under specified conditions.

Tensile Strength: The strength exhibited by a fabric subjected to tension, as distinct from torsion, compression or shear.

Scrim: A lightweight, open weave, coarse fabric.

Selvage: The narrow edge of woven fabric that runs parallel to the warp. It is woven more tightly to prevent the fabric from unraveling.

Weight Ratio: The ratio of warp to fill. This number is expressed as a percentage in the product charts.

Types of Weaves

Composite fabrics most commonly use variations on the plain and satin weaves. The type of weave affects the performance of the fabric in many ways, including:

- Stability
- Conformability
- Porosity ('wet-out' characteristics)
- Strength
- Stiffness

Plain: The simplest pattern, with warp (lengthwise) and filling (crosswise) yarns crossing over and under each other. Plain weaves exhibit good stability and little slippage, so the lightest weight fabrics are generally woven in plain weave. Excellent for use in flat panel laminates.

Basket: A variation on plain weave typically found in heavier weight fabrics. Two or more warp yarns and two or more fill yarns are woven together.

Hopsack: Another name for Basket.

Leno: Warp yarns are twisted around one another, locking the filling yarns in place.

Mock Leno: Yarns run in groups both warp and filling, locking each other in place at the interlacings. Provides maximum thickness, good dimensional stability and drapeability. Excellent in tooling applications.

Twill: The warp and filling yarn interlacings are arranged in such a fashion as to form a distinct diagonal line on the fabric surface. Often used in tooling and cosmetic applications.

Unidirectional: A concentration of stronger yarns providing maximum strength in one direction. Typically used in infrastructure applications.

Satin: The warp yarn crosses over four or more filling yarns, under one over four, etc. Very drapeable. Sometimes referred to as HS. Conforms well to contoured surfaces in manufactured parts. Often used to reinforce plastics due to high be-directional strength.

Crowfoot: A satin weave that conforms well with one warp yarn crossing over three and under one filling yarn.

High Modulus Weave: Weave eliminates the interlacing of structural yarns to reduce crimp and shear factors. It is used where high strength and impact resistance are needed. This pliable and conforming weave is ideal for highly contoured planes.

Properties of Fiberglass Fabrics

Fiberglass

Made of plied, spun and texturized continuous glass filaments, it is an all purpose re-inforcement material that will not burn, shrink, stretch or absorb moisture. Flexible and stable with exceptional weathering resistence.

Glass Formulation

Fiber Glass is classed as "E" (Electrical) or "S" (High Strength) depending on the composition.

	E	S
Silicone Dioxide	52-56%	64-66%
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%

E is the most common all-purpose glass.
S is available for special applications.

About Fiber Glass Yarn

Glass yarns consist of a continuous length of multifilaments, which are produced by extruding molten glass though dies containing many orifices. These filaments are gathered together, mechanically attenuated, and solidified as they are wound up onto a high speed winder. At the same time, the yarn is lubricated to assist in subsequent processing.

Glass Manufacture

The manufacture of glass is carried out in a special furnace at about 1550˚C (E glass using finely ground raw materials from carefully selected quarries). The glass leaving the furnace at a very high temperature is used to feed bushings (blocks pierced with hundreds of holes) of platinum alloy.

Forming

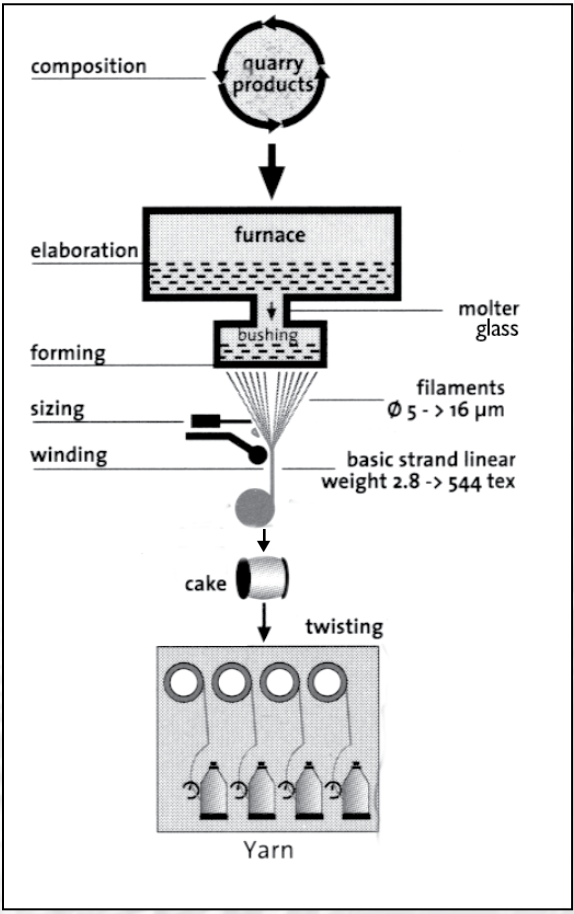
The basic stand is made by forming. Forming is achieved by drawing the molten glass flowing from the holes of the bushing at high speed. This forms to between 50 and several thousand filaments. These filaments are defined by their diameters: from 5 to 24 microns (1 um = 1/1000 mm). Assembled, they make up the basic stand defined by its linear mass expressed in tax (g/km).

Glass Yarn Nomenclature

Two systems are used to identify the wide variety of glass textile yarns available.

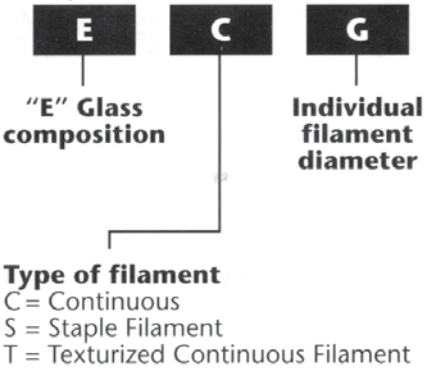
- In the U.S. Glass System (Imperial), yarns are identified by the number of one hundred yards in each pound
- In the Tex System (Metric), the yarns are identifies by the number of grams in each kilometer.

Glass Yarn Manufacture



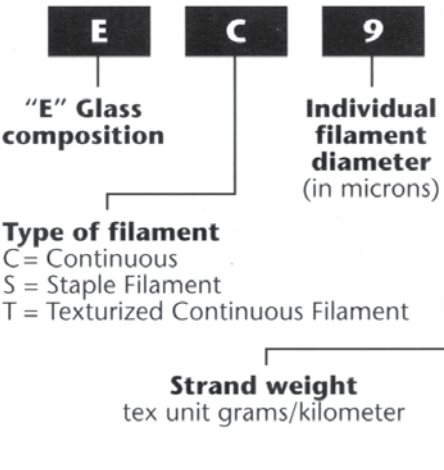
U.S. Glass System

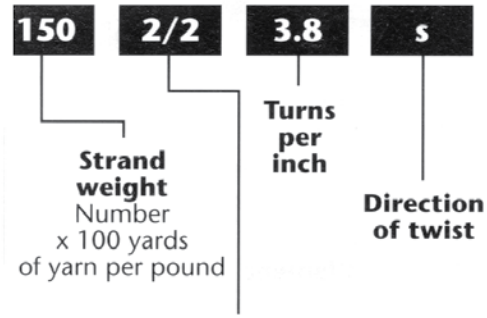
Example: E C G 150 2/2 3.8 s



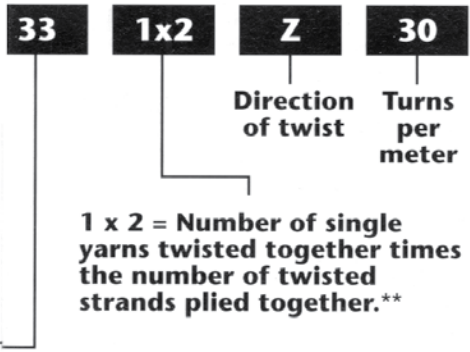
Tex System (Metric)

Example: E C 9 33 1X2 Z 30





Number of single yarns twisted together/number of twisted strands plied together.
1/0 = single yarn
1/2 = two single yarns twisted together
3/4 = three single yarns twisted together, and four of these plied together.*



1 x 2 = Number of single yarns twisted together times the number of twisted strands plied together.**

Finishes for Woven Glass Fabrics

To facilitate weaving, a sizing is applied to the fiber glass yarn. Af
most applications, composite fabrics are used with a matrix resi
or chemical agent to promote bonding.

Carolina Technical Fabrics available finishes:

Code	Description
000	Greige
001	Heat cleaned
012	Heat cleaned and washed
130	Silane. Used with polyester resin systems
132	Silane. Softer hand version of 130
140	Silane. Used with epoxy resin systems
142	Silane. Used with low viscosity polyester, epoxy, melamine and phenolic systems
145	Silane. Used with polyester, epoxy, melamine and phenolic systems
147	Silane. Softer hand version of 145
1111	Silane. Used with epoxy, melamine and phenolic systems.

The finish code is at the end of

CTF™ Composite Fabrics

Finishes, Treatments & Coatings		
No.	Description	
000	Greige or Loom State	
010	Heat Treated or Carmelized	Reduces
011	Oven Heat Cleaned	
012	Washed Fabrics	To remov
130	Silane Monomer Finish	R
132	Modified 130 Silane	A
140	Functional Silane	Yeilds high
142	Modified 140 Silane	
145	Multi-Fnctional Silane	
147	Modified 145 Silane	

fter weaving, this sizing is removed, usually by heat-cleaning. In
n or coating, so the composite fabric is saturated with a finish

	Polymer System								
FINISH or Treatment	Polyester	Phenolics	Epoxy	Vinylester	Melamine	Silicone	PTFE	Acrylics	PVA
000	N	N	N	N	N	E	E	E	E
001	N	N	N	N	N	N	N	N	N
011									
012	N	N	N	N	N	N	N	N	N
130	E	F	E	G	F	N	N	N	N
132	E	G	E	E	G	N	N	N	N
140	G	G	E	G	F	N	N	N	N
142	E	G	E	E	G	N	N	N	N
145	E	G	E	E	G	N	N	N	N
147	E	G	E	E	G	N	N	N	N
1111	E	F	E	F	E	N	N	N	N

E = Excellent
G = Good
F = Fair
N = Not Recommended

Notes and Uses	MSDS
Retains yarn size & weave slash PVA & starches	√
s organic to .1%, helps as weave set, reduces fly and broken filiments	√
Removes all organics, returned to white state	√
ve fly and weave contamination without affecting strength properties	√
etains high wet strength, fast wet-out, improved transparency	√
A softer finish allows greater conformablity to complex shapes	√
flexturalstrenght and retains physical properties in hot water emersion	√
Optimized for use with low viscosity resin systems	√
Universally effective for thermal setting resins	√
For softer hand than with 145	√

Glass Fabric Specifications and Standards

Glass Fabric Specifications and Standards

Some specifications that are applicable to fiber glass fabrics or tapes. Specifications are subject to revision.

AMERICAN STANDARDS

ASTM
(American Society for Testing and Materials)

D-2408-67
Woven glass fabric, cleaned and after finished with amino-silane type finishes, for plastic laminates.

D-2409-67
Woven glass fabric, cleaned and after finished with vinyl silane type finishes, for plastic laminates.

D-2410-67
Woven glass fabric, cleaned and after finished with chrome complexes, for plastic laminates.

D-579
Woven glass fabrics, standard metods of testing and tolerances for.

D-580
Woven glass tapes, standard methods of testing and tolerances for.

D-1668
Woven glass fabric treated with bituminous substances for use in waterproofing.

Federal – U.S.A.
L-P-406B
Plastics, organic: general specifications, test methods.

HH-C-466B
Cloth, glass-coated (for membrane waterproofing and built-up roofing).

Military Specifications – U.S.A.

MIL-C-9084C
Cloth, glass, finished for polyester resin laminates.

MIL-Y-1140E
Yarn, cord, sleeving, cloth and glass tape.

MIL-P-8013C
Plastic materials, polyester resin, glass fiber base, low pressure laminated.

MIL-I-17205B
Insulation cloth and tape, electrical glass fiber, varnished.

MIL-P-17549B
(Ships) Plastic laminates, fibrous glass reinforced marine structural.

MIL-P-18177B
Plastic sheet, laminated thermosetting, glass cloth, epoxy resin.

MIL-C-19663
(Ships) Cloth, glass, woven roving, for plastic laminate.

MIL-C-20079
Fiberglass cloth and tape used as lagging material over thermal insulations.

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

U.S. C. G Sub
Part 164.009
Noncombustible materials for merchant vessels.

CANADIAN STANDARDS

Royal Canadian Air Force (RCAF)

TS-28
Woven glass fabric for epoxy laminates.

Department of National Defense – Canada

JCNAAF-T-14
Tapes; insulating, electrical, pressure sensitive.

TEXT-11-4-2A
Cloth, fibrous glass, insulation cover.

TEXT-11-4-3A
Tape, fibrous glass, insulation cover.

Canadian Government Specification Board

37-GP-63
Cloth; woven glass, for membrane waterproofing systems and built-up roofing.

3-GP-2
Standard textile test methods.

BRITISH STANDARDS

BS-3396
Woven glass fiber fabrics for plastic reinforcement.

DTD 5518
Aircraft material, glass fiber fabric (E Glass).

Glass Yarn Equivalenci

Singles Yarn

TEX	U.S. System	Filamentation Designation	Norminal Yds/Lb.
2.8-1X0	1800-1/0	D	180,000
5.5-1X0	900-1/0	D	90,000
11-1X0	450-1/0	D	45.000
22-1X0	225-1/0	E	22,500
33-1X0	150-1/0	DE	15,000
33-1X0	150-1/0	G	15,000
66-1X0	75-1/0	G	7,500
66-1X0	75-1/0	K	7,500
134-1X0	37-1/0	G	3,700
134-1X0	37-1/0	K	3,700
198-1X0	25-1/0	H	2,500
275-1X0	18-1/0	K	1,800

es

Average Filament Inches	Diameter Micron	Nominal # of Filaments/Strands
0.00021	5	51
0.00021	5	102
0.00021	5	204
0.00029	7	204
0.00025	6	408
0.00036	9	204
0.00036	9	408
0.00051	13	204
0.00036	9	816
0.00051	13	408
0.00043	11	816
0.00051	13	816

FRP Industrial Fabrics

Style Nos.	Weight		Thickness		Thread Count			
					Warp		Weft	
	g/m^2	oz/yd^2	mm	in	/10cm	in	/10cm	in
0122	216	6.4	0.24	.010	80	20	77	19
0123	347	10.2	0.33	0.013	62	16	61	15
0192	623	18.4	0.51	0.020	111	28	54	14
0196	1072	31.6	1.04	0.041	113	29	163	41
0197	664	19.6	0.58	0.023	128	32	113	29
1522	126	3.7	0.13	0.005	96	24	85	22
1523	126	3.7	0.13	0.005	96	24	85	22
1564	413	12.2	0.36	0.014	79	20	70	18
1581	302	8.9	0.29	0.012	224	57	212	54
1584	861	25.4	0.85	0.033	174	44	138	35
1597	1297	38.3	1.28	0.050	120	30	117	30
1800	325	9.6	0.31	0.012	62	16	55	14
2532	240	7.1	0.23	0.009	63	16	55	14
3733	194	5.7	0.20	0.008	71	18	70	18
7500	324	9.6	0.32	0.013	63	16	54	14
7520	294	8.7	0.33	0.013	73	18	70	18
7532	250	7.4	0.25	0.010	63	16	54	14
7533	196	5.8	0.20	0.008	71	18	70	18
7544	623	18.4	0.56	0.022	110	28	54	14
7587	695	20.5	0.83	0.033	157	40	83	21
7725	291	8.6	0.28	0.011	215	54	73	18
7781	294	8.7	0.29	0.011	224	57	212	54

Abbreviations **dtex=** decitex or 1/10 of tex **tex=** gram/1000 meters

Weight Ratio	Yarn				Weave
	Warp		Weft		
warp/fill	Metric	Imp.	Metric	Imp.	
51/49	9	G	9	G	Plain
	134 1X0	37 1/0	134 1X0	37 1/0	
50/50	13	K	13	K	Plain
	275 1X0	18 1/0	275 1X0	18 1/0	
51/49	6	DE	6	DE	2X1
	134 1X2	37 1/2	134 1X4	37 1/4	Hopsack
57/43	9	G	9	G	Fancy
	134 2X2	37 2/2	134 1X2	37 1/2	Double
53/47	9	G	9	G	Fancy
	134 1x2	37 1/2	134 1x2	37 1/2	Double
52/48	9	G	9	G	Plain
	33 1X2	150 1/2	33 1X2	150 1/2	
52/48	9	G	9	G	Plain
	68 1x0	76 1/0	68 1x0	75 1/2	
52/48	9	G	9	G	Plain
	134 1X2	37 1/2	134 1X2	37 1/2	
51/49	9	G	9	G	8End
	33 1X2	150 1/2	33 1X2	150 1/2	Satin
56/44	9	G	9	G	8 End
	134 1X2	37 1/2	134 1X2	37 1/2	Satin
51/49	9	G	9	G	Triple
	134 2X2	37 2/2	134 2X2	37 2/2	Plain
53/47	13	K	13	K	Plain
	275 1X0	18 1/0	275 1X0	18 1/0	
53/47	11	H	11	H	Plain
	198 1X0	25 1/0	198 1X0	25 1/0	
49/51	9	G	9	G	Plain
	134 1X0	37 1/0	134 1X0	37 1/0	
53/47	9	G	9	G	Plain
	134 1X2	37 1/2	134 1X2	37 1/2	
50/50	9	G	9	G	Plain
	66 1X3	75 1/3	66 1X3	75 1/3	
53/47	9	G	9	G	Plain
	66 1X3	75 1/3	66 1X3	75 1/3	
50/50	9	G	9	G	Plain
	66 1X2	75 1/2	66 1X2	75 1/2	
5050	9	G	9	G	2X1
	134 1X2	37 1/2	37 2X2	37 2/2	Hopsack
65/35	9	G	9	G	Mock
	134 1X2	37 1/2	134 1X2	37 1/2	Leno
49/51	6	DE	11	H	Mod.
	66 1X0	75 1/0	198 1X0	25 1/0	Twill
51/49	6	DE	6	DE	8 End
	66 1X0	75 1/0	66 1X0	75 1/0	Satin

den= denier **dsy=** direct size yarn **rov=** roving

Surfboard / Canoe Fabrics

Style Nos.	Weight		Thickness		Thread Count			
					Warp		Weft	
	g/m²	oz/yd²	mm	in	/10cm	in	/10cm	in
0146	184	5.4	0.22	0.009	68	17	66	17
0370	297	8.8	0.28	0.011	54	14	44	11
0372	172	5.1	0.18	0.007	67	17	59	15
0477	124	3.7	0.15	0.006	95	24	85	22
1522	126	3.7	0.13	0.005	96	24	85	22
7533	196	3.7	0.13	0.005	96	24	85	22

Fiber Glass Tapes - General Purpose

Style Nos.	Weight		Thickness		Thread Count			
					Warp		Weft	
	g/m²	oz/yd²	mm	in	/10cm	in	/10cm	in
7521	193	5.7	0.203	0.008	72	18	69	18
7554	297	9.0	0.279	0.011	72	18	69	18

Electrical Fabrics

Style Nos.	Weight		Thickness		Thread Count			
					Warp		Weft	
	g/m²	oz/yd²	mm	in	/10cm	in	/10cm	in
1557	184	5.4	0.14	0.006	224	57	118	30
1610	80	2.3	0.09	0.004	127	32	109	28
1632	127	3.8	0.12	0.005	118	30	126	32
7628	208	6.1	0.20	0.008	173	44	125	32
7642	227	6.7	0.23	0.009	173	44	79	20

Weight Ratio	Yarn				Weave
	Warp		Weft		
warp/fill	Metric	Imp.	Metric	Imp.	
50/50	9	G	9	G	Plain
	66 1X2	75 1/2	66 1X2	75 1/2	
51/49	13 275	K 18	330	1500	Plain
	1X0 dsy	1/0 dsy	rov	rov	
53/47	9 134	G 37	9 134	G 37	Plain
	1X0 dsy	1X0 dsy	1X0 dsy	1X0 dsy	
52/48	9 33	G 150	9 33	G 150	Plain
	1X2 dsy	1/2 dsy	1X2 dsy	1/2 dsy	
52/48	9	G	9	G	Plain
	33 1X2	150 1/2	33 1X2	150 1/2	
50/50	9	G	9	G	Plain
	66 1X2	75 1/2	66 1X2	75 1/2	

Weight Ratio	Yarn				Weave
	Warp		Weft		
warp/fill	Metric	Imp.	Metric	Imp.	
50/50	9 134	G 37	2X 9 66	2X G 75	Plain
	1X0 dsy	1/0 dsy	1X0 dsy	1/0 dsy	
68/32	13 275	K 18	2X 9 66	2X G 75	Plain
	1X0 dsy	1/0 dsy	1X0 dsy	1/0 dsy	

Weight Ratio	Yarn				Weave
	Warp		Weft		
warp/fill	Metric	Imp.	Metric	Imp.	
85/15	9	G	7	E	Crowfoot
	33 1X2	150 1/0	22 1X0	225 1/0	
53/47	9	G	9	G	Plain
	33 1X0	150 1/0	33 1X0	150 1/0	
32/68	9	G	9	G	Plain
	33 1X0	150 1/0	68 1X0	75 1/0	
58/42	9	G	9	G	Plain
	66 1X0	75 1/0	66 1X0	75 1/0	
52/48	9	G	T9	T37	Plain
	68 1X0	75 1/0	134 1X0	1/0	

Industrial Coating Fabrics

Style Nos.	Weight		Thickness		Thread Count	
					Warp	Weft
	g/m²	oz/yd²	mm	in	in	in
2523	390	11.5	0.32	0.013	48	20
3725	385	11.25	0.29	0.012	48	25
3732	425	12.7	0.32	0.013	48	32
3783	530	16.0	0.42	0.016	48	32
3784	875	25.8	0.65	0.027	48	53
7515	272	8	0.23	0.009	29	28
7518	272	8	0.23	0.009	29	28

Texturized Insulation Fabrics

Style Nos.	Weight		Thickness		Thread Count	
					Warp	Weft
	g/m²	oz/yd²	mm	in	in	in
300	300	8.5	0.50	0.20	18	14
2025	600	17.5	0.75	0.030	20	14
2400	800	24.0	1.37	0.055	14	10
2300	900	28.0	1.50	0.060	10	9
3200	1100	32.0	1.62	0.065	10	10
3500	1200	35.0	1.75	0.070	10	11
4000	1350	40.0	1.88	0.075	10	13
6000	2200	60.0	3.125	0.125	10	6
9000	3300	90.0	4.75	0.190	10	20

Weight Ratio warp/fill	Yarn Warp Metric	Yarn Warp Imp.	Yarn Weft Metric	Yarn Weft Imp.	Weave
71/29	9 134 1X0	G 37 1/0	9 134 1X0	G 37 1/0	
66/34	9 134 1/0	G 37 1/0	9 134 1/0	G 37 1/0	Plain
60/40	9 134 1/0	G 37 1/0	9 134 1/0	G 37 1/0	Crowfoot
53/47	9 134 1/0	G 37 1/0	9 134 1/0	G 37 1/0	BHS
56/44	9 134 1/2	G 37 1/2	9 134 1/2	G 37 1/2	BHS
51/49	6 33 1X4	DE 150 1/4	6 33 1X4	DE 150 1/4	Plain
51/49	9 68 1X2	G 75 1/2	9 68 1X2	G 75 1/2	Plain

Weight Ratio warp/fill	Yarn Warp Metric	Yarn Warp Imp.	Yarn Weft Metric	Yarn Weft Imp.	Weave
	9 Texo	G Texo	9 Texo	G Texo	Plain
	9 Texo	G Texo	9 Texo	G Texo	Plain
	9 Texo	G Texo	9 Texo	G Texo	Plain
	9 Texo	G Texo	9 Texo	G Texo	Plain
	9 Texo	G Texo	9 Texo	G Texo	Plain
	9 Texo	G Texo	9 Texo	G Texo	Plain
	9 Texo	G Texo	9 Texo	G Texo	Plain
	9 Texo	G Texo	9 Texo	G Texo	Plain
	9 Texo	G Texo	9 Texo	G Texo	Twill

LEWCO
Specialty Products, Inc.

FIBERGLASS NEEDLED Felts / Blanket

Fiberglass

100% E Glass Fiber to 1200˚F

Lewco Glass Mat is composed of 100% select-grade type "E" glass fibers needled together into mat form. It is **INCOMBUSTIBLE, ASBESTOS FREE,** and contains **NO RESINOUS OR INORGANIC BINDERS**. Lewco Glass Mat can be used on equipment operating at temperatures to 1200˚F and will not deteriorate or shake apart in vibrating applications. Comforms to Mil. Spec. Mil-I-16411, Mil-1-24244, ASTM E-84. Smoke -O, Flame -O NRC-1.36

E Glass Typical Properties

Melting Point	1523˚F
Maximum Temperature	1200˚F
Thickness	1/8", 1/4", 1/2" & 1"
Roll Width	30" and 60"
Roll Length	Various lengths available
Density	6-7#/cu. ft., 9-11#/cu.ft

Thermal Conductivity (K-Factor)
BTU, in./ft2, HR., °F

Temp °F	E-Glass		Silica
	6# density	10#density	10#density
300°F	0.292	0.350	
500°F	0.350	0.480	
700°F	0.445	0.640	
900°F		0.780	0.855
1200°F			1.115
1500°F			1.425
1800°F			1.820

ASTM C - 177

LEWCO
Specialty Products, Inc.

SILICA NEEDLED Felts / Blanket

Silica

98% Silica to 1800°F

Lewco Sil Mat insulation is manufactured using 98% pure textile grade silica fiber needled together into blanket/felt form. Lewco Sil Mat base fiber is made through a hot extrusion process yielding 6-11micron, non-respirable fiber. This fiber is then processed to maximize thermal efficiency. Lewco Sil Mat is INCOMBUSTIBLE, ASBESTOS FREE, NON-RESPIRABLE, and contains no ORGANIC, or RESINOUS BINDERS. Typical applications include engine exhaust system insulation, hot industrial equipment insulation, and many others. Maximum temperature - 1800°F

Silica Typical Properties

Melting Point	3000°F
Continuous Temperature	1800°F
Shrinkage	<7% @ continuous @ 1800°F
Thickness	1/4", 1/2" & 1"
Roll Width	36"
Roll Length	1/4"x 100 ft., 1/2" x 50 ft., 1" x 25 ft.
Density	1/4" - 8#, 1/2" -9#, 1"-10#

TESTING

FLAME SPREAD INDEX = 0
SMOKE DEVELOPED INDEX = 0

ASTM-E84-95 Standard Test Method for SURFACE BURNING CHARACTERISTICS OF BUILDING MATERIALS (ANSI 2.5, NFPA 255, UBC 8-1, UL 723)

Combustibility
USCG Subpoint:
164.109 & 164.009

Corrosiveness
NRC 1.36, Mil. 1.24244

Coated Fabrics
Heat and Chemically Resistant

LEWCO
Specialty Products, Inc.

Lewco Specailty Products, Inc. has been at the fore front of coating fiberglass fabrics for high temperature, chemically resistence for over 25 years. We have developed coatings and compounds for some of the toughest applications in industry with temperatures to 3000˚F and uses in chemically hostile environments. Coatings include PTFE, Silicane, Neoprene, Hypalon, Acrylic, Vermiculite and other compounds.

Chemical Compatibility Data

®Teflon, Kevlar and Nomex are trademarks of E.I. DuPont.

			Resistance to:						
Product	**Temp.**	**Weathering**	**Oil**	**Fuel**	**Water**	**Ozone**	**Acid, Dilute**	**Acid Conc.**	**Solvents**
PTRE/Teflon@	550°F	V.G.	V.G.	V.G.	V.G.	V.G.	V.G.	V.G.	V.G.
Silicone	500°F	V.G.	Fair	Fair	V.G.	V.G.	Good	Fair	Poor
Neoprene	250°F	Good	Good	Fair	Good	Good	Good	Good	Good
Hypalon	275°F	V.G.	Good	Fair	Good	V.G.	V.G.	V.G.	Good
Natural Rubber	240°F	Poor	Poor	Poor	Good	Poor	Fair	Fair	Poor

Sewing Threads and Cordage
Heat and Chemically Resistant

Lewco stocks a variety of high temperature, chemical resistant Threads and Drawcords. Nomex®, Kevlar®, Fiberglass, Quartz and Stainless Steel Threads and Drawcords are available from stock. Please contact Lewco for more information.

Sewing Threads	Styles	Thickness	Brk. Strn.	Temp	Yield
TEFLON® Coated Fiberglass - Specially coated for excellent chemical and UV resistance. "L" suffix denotes an E-Z Sew finish has been added.	TCFT 18 TCFT 18L TCFT 21 TCFT 21L	.017" .017" .021" .021"	19 lbs. 19 lbs. 27 lbs. 27 lbs.	750°F 750°F 750°F 750°F	2500 yds./lb. 2500 yds./lb. 1875 yds./lb. 1612 yds./lb.
Starch Coated Fiberglass - Specially coated to meet NRC requirements.	B8	.020"	31.3 lbs.	750°F	1875 yds./lb
Natural Kevlar®	T-90	.016"	16 lbs	380°F	4704 yds./lb
Nomex®	T-70	.014"	4.5 lbs	480°F	6340 yds./lb
Quartz®	Q-18	.017"	24 lbs	2000°F	1950 yds./lb
Polyester / Stainless Steel	PSS	.0145"	8 lbs	1000°F	6500 yds./lb
Polyester / Inconel	PINC	.0145"	8 lbs	2000°F	6100 yds./lb

Drawcords	Styles	Thickness	Weight	Temp	Put Up
Teflon® Coated Fiberglass - Braided Fiberglass rope with a Teflon® coating for chemical resistance.	TCFR 125	.125"	36.9g/10 ft.	550°F	650 ft./spl.
Braided Stainless Steel - Continuous stainless steel wire braided into rope form.	SSD 125	.125"	72.5g/10 ft.	1500°F	500 ft./spl.

Technical Information

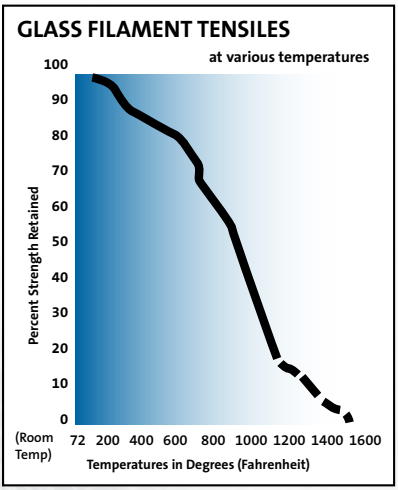


Table 2 – Description of Continuous Filament Glass Fibers

Filament Designation		Nominal Yarn Number (strand count)			
US Units (letter)	SI Units (microns)	100 yds/lb	Bare Glass (yds/lb)	SI Units TEX (g/1000m)	Approximate Number of Filaments
D	5	1,800	180,000	2.75	51
C	4.5	1,200	120,000	4.1	102
d	5	900	90,000	5.5	102
D	5	450	45,000	11	204
D	5	225	22.500	22	1,064
E	7	225	22,500	22	408
BC	4	150	15,000	33	204
DE	6	150	15,000	33	408
G	9	150	15,000	33	204
E	7	110	11,000	45	408
H	11	110	11,000	45	204
DE	6	100	10,000	50	612
C	4.5	75	7,500	66	1,632
DE	6	75	7,500	66	816
G	9	75	7,500	66	408
K	13	75	7,500	66	204
H	11	55	5,500	90	408
DE	6	50	5,000	99	1,224
DE	6	37	3,700	134	1,632
G	9	37	3,700	134	816
K	13	37	3,700	134	408
H	11	25	2,500	198	816
G	9	19	1,900	257	1,632
K	13	18	1,800	275	816
H	11	18	1,800	275	1,224

Note that the strand count indicates a basic strand* of yarn.

Conversion Charts
Units: metric and U.S. Systems
Standard measurement units

Mass• oz : ounce, lb : pound
1 oz = 28.35 g • 1 g = 0.035 oz
1lb = 0.454 kg • 1 kg = 2.205 lb
Force • N : Newton, daN : decaNewton
1 N = 0.102 kgf ≈ 0.1 kgf • 1 daN = 1.02 kgf ≈ 1 kgf
1 kgf = 9.81 N ≈ 10 N or 1 daN • 1 kgf = 2.2046 lbf •
IN = 0.225 lbf : pound force • 1 lbf = 4.4482 N = 0.4536 kgf
Strength • Pa : Pascal, MPa : (megaPascal) = 1 N/mm2
1 MPa = 10 bars = 0.1 hbar ≈ 10 kgf/cm2 or 0.1 kgf/mm2
1 bar = 0.1 MPa = 105 Pa ≈ 1 daN/cm2 ≈ 1 kgf/cm2
1 hbar = 10 MPa = 107 Pa ≈ 1 kgf/mm2
100 p.s.i. (lbf/in2) = 0.69 MPa • 1MPa = 145 p.s.i.
1 p.s.i. (lbf/in2) = 6 894.76 Pa ≈ 0.0703 kgf/cm2
Length • yd : yard, ft : foot, in : inch
UK Mile : 1 mile = 1.609 km • 1 km = 0.62 mile
Nautical Mile : 1 mile = 1.852 km
1 yd = 0.9144 m • 1 m = 1.09 yd
1 ft (1/3 yd) = 0.3048 m • 1 m = 3.281 ft
1 in (1/12 ft) = 2.54 cm • 1 cm = 0.39 in
Surface
1 square inch = 6.45 cm2 • 1 cm2 = 0.15 sq.in
1 square yard = 0.83 m2 • 1 m2 = 1.19 sq.yd
1 square foot = 0.093 m2 • 1 m2 = 10.76 sq.ft
1 square mile = 2.59 km2 • 1 km2 = 0.39 sq.mile
1 acre = 0.40 ha • 1 ha = 2.47 acre
Volume
1 cubic inch = 16.39 cm3 • 1 cm3 = 0.06 cub.in
1 cubic yard = 0.76 m3 • 1 m3 = 1.31 cub.yd
1 cubic foot = 28.31 dm3 • 1 dm3 = 0.035 cub.ft
Density
1 lb/in3 = 27.68 g/cm3 • 1 g/cm3 = 0.036 lb/in3
1 lb/ft3 = 0.016 g/cm3 • 1 g/cm3 = 62 lb/ft3
Capacity
(US) Gallon : 1 gal = 3.78 l • 1 l = 0.26 gal
(UK) Gallon : 1 gal = 4.54 l • 1 l = 0.21 gal
Consumption
(US) 10 miles/gal = 23.5 l/100 km • 10 l/100 km = 23.8 miles/gal
(UK) 10 miles/gal = 28.21 l/100 km • 10 l/100 km = 29.5 miles/ga

Conversion Charts
Units: metric and U.S. Systems
Standard measurement units

Velocity
1 km/h = 0.2778 m/s - 1 mph = 1.609 km/h = 0.4470 m/s
Energy = Heat • J : Joule, cal : calorie, th : thermal unit
Power • W : Watt = 1 J/s
1 Wh = 3 600 J = 0.860 kcal • 1 kcal = 4 185.5 J = 1.1626 Wh
1 kJ = 0.2389 kcal • 1 cal = 4.185 J • 1 J = 0.2389 cal 1 th = 1 000 kcal
tep : ton (metric) equivalent fuel oil
tec : tonne (metric) equivalent coal
1 tep = 10 000 th = 11 626 kWh = 11.6 MWh ≈ 1.5 tec ≈ 1 100 Nm3 natural gas
Specific heat : kJ/kg.K : kilojoule per kilogramme x Kelvin
Thermal conductivity l : 1 W/m.K or W/m.°C = 0.860 kcal/m.h.°C
1 kcal/m.h.°C = 1.1626 W/m.K
Coefficient of thermal transmission : 1 W/m2.K or W/m2.°C = 0.860 kcal/m2.°C
Coefficient of thermal loss : 1 W/m3.K or W/m3.°C = 0.860 kcal/m3.h°C
Temperature • K : Kelvin , °C : degree Celsius, °F : degree Farenheit
Interval of temperature : 1° kelvin = 1° Celsius TK = q °C + 273.15
0 °c = 32 °F • 100 °C = 212 °F
°F = 1.8 °C + 32 = 9/5 °C + 32 rough calculation °F = (°C x 2) - 10% + 32
°C = 5/9x(°F-32) = 0.55x(°F-32) rough calculation °C = (°F-32) x 1/2 + 1/20 + 1/200 + 1/2 000 +...

Surface densities of mats and fabrics	
Mats	Fabrics
1 oz.sq.ft ≈ 300 g/m²	1 oz.sq.ft ≈ 34 g/m²
1.5 oz.sq.ft ≈ 450 g/m²	3 oz.sq.ft ≈ 100 g/m²
2 oz.sq.ft ≈ 600 g/m²	24 oz.sq.ft ≈ 800 g/m²
	1 g/m2 ≈ 0.00328 oz.sq.ft
	≈ 0.0295 oz.sq.yd

NOTE: In as much as Carolina Technical Fabrics has no control over installation design, installation workmanship, accessory materials, or conditions of application, Carolina Technical Fabrics does not warrant, with respect to the installation or use of the product or of any final product into which the product may be incorporated by the purchaser and/or user, the performance or results of any such installation or use.

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