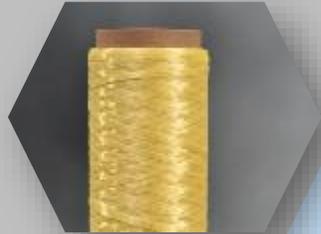


# CTMI PRODUCT SELECTOR GUIDE

DEFENSE



WEAVING

PREPREG



INDUSTRY

AERONAUTICS

PREFORMS

KNITTING





## INTRODUCTION TO CTMI

AN HISTORICAL COMPANY



The creation dates back to 1886. For more than 90 years, the company was indeed a silk manufactory that supplied the silk market of Lyon.

At the turn of the 1980s, society faced with the decline of silk has turned gradually to technical textiles. This is how CTMI has progressively woven fiberglass and successively aramid, carbon, quartz.

Over the years, we have conquered the aerospace, defense and space markets as well as many applications in the industry.

Today, CTMI carries all this legacy and textile tradition firmly rooted in our territory, and still wants to continue to bring innovation and disruptive technologies to the composites market.

**Let's build together the Textiles and Composite Materials of tomorrow that will help push the boundaries of today's technology**

**QUALITY, SAFETY AND ENVIRONMENT: the three fundamental pillars of a responsible company**

CTMI always have been driven by Innovation and have proven history for confidentiality. The company has long and strong relationship with European producer for Quartz, Carbon, Glass Fibers: we are preferred partner for their R&D. CTMI holds patents on 3D weaving construction.

CTMI focuses through its charts to protect employees & environment.

**CTMI is ISO 9001 version 2015 & EN9100.**



# FIELDS OF APPLICATIONS



## AEROSPACE MARKET

CTMI holds qualified preregs for aerospace:

CTMI supply Major OEM & Tier 1/2. We are flying on A350 & A330neo.



## DEFENSE MARKET

This is our historical market and we became over the years a qualified supplier for various customers: naval ships, military jet plane, missiles, etc.



## INDUSTRIAL MARKET

CTMI delivers its products to various industrial markets from technical fabrics to preregs.

We deliver our products for example into: Food Industry (cooking mould); Water castle; TGV High speed train (pentograph); Composite tooling; Painting industry.

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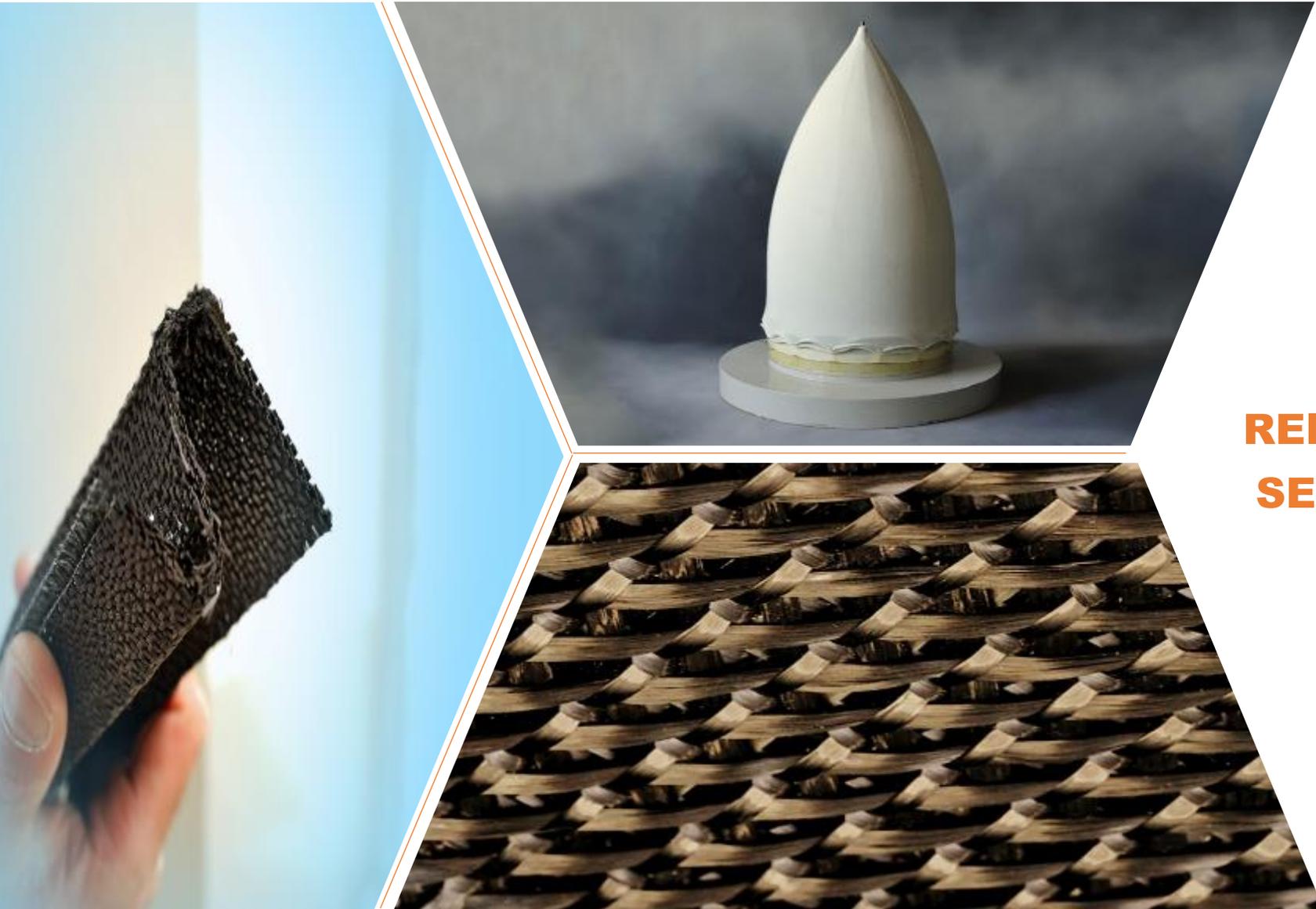
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**DRY  
REINFORCEMENTS  
SELECTOR GUIDE**

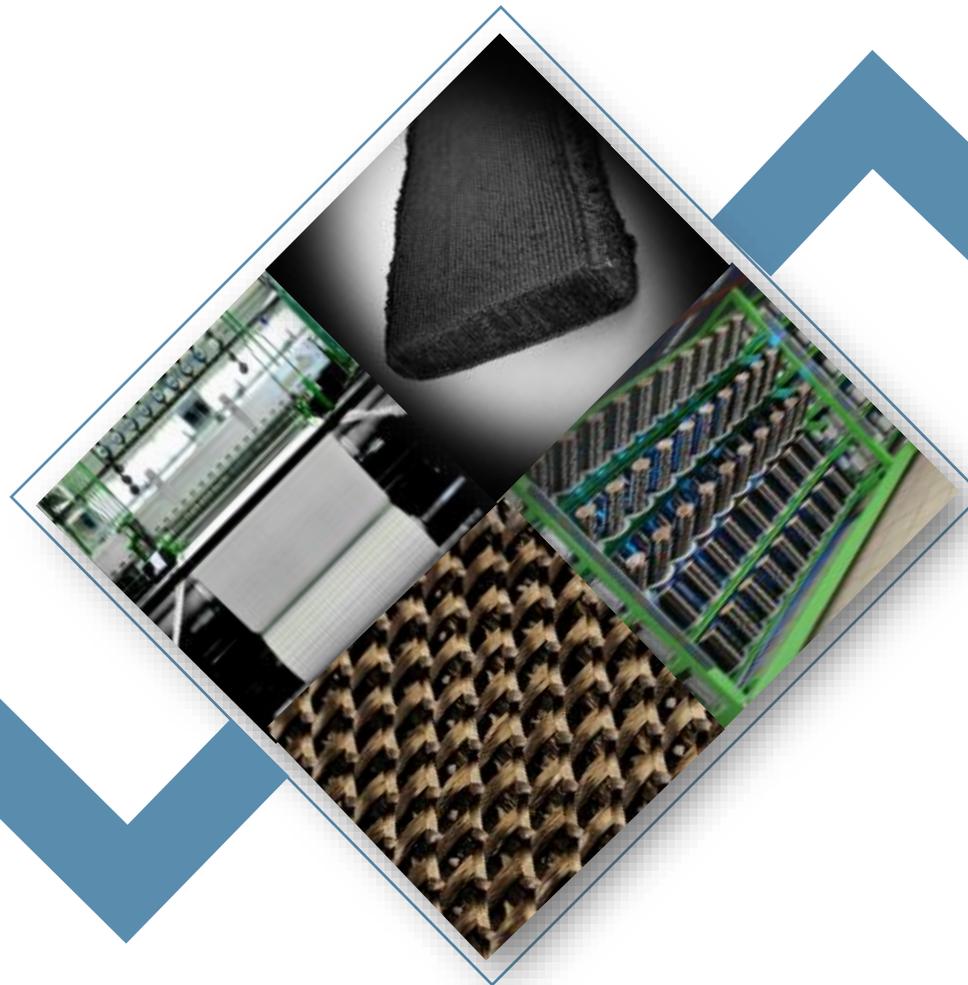
## 2D FABRICS

FROM SAMPLING TO MEDIUM SIZE RUN

WIDTH: UP TO 220 CM

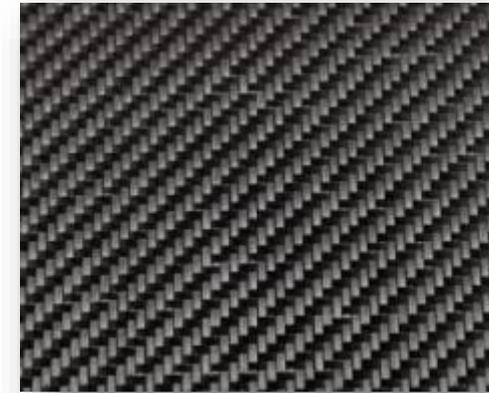
WHITE ROOM FOR QUARTZ WEAVING

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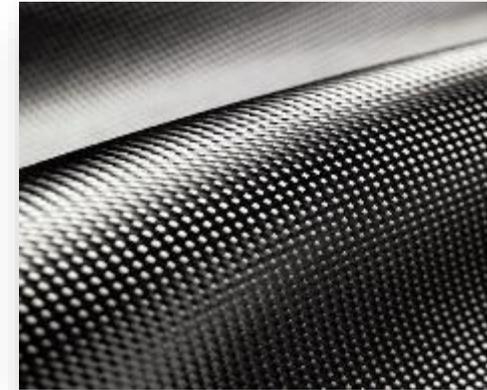
## HIGH STRENGTH CARBON FABRICS

STYLE	WEIGHT	FIBER COUNT		REINFORCEMENT YARN		WEAVE
		WARP (yarns/cm)	WEFT (picks/cm)	WARP	WEFT	
5811	100 g/m <sup>2</sup>	7,4	7,4	1 k	1 k	Plain
	170 g/m <sup>2</sup>	6,5	4	3 k	3 k	Plain
5468	200 g/m <sup>2</sup>	5	5	3 k	3 k	Plain
5626	200 g/m <sup>2</sup>	5	5	3 k	3 k	Twill 2 x 2
5488	250 g/m <sup>2</sup>	7,5	7,5	3 k	3 k	Twill 2 x 2
5469	280 g/m <sup>2</sup>	7	7	3 k	3 k	4 H satin
5783	290 g/m <sup>2</sup>	7,25	7,25	3 k	3 k	5 H satin
5802	300 g/m <sup>2</sup>	3,75	3,75	6 k	6 k	Twill 2 x 2
5926	600 g/m <sup>2</sup>	7,5	7,5	6 k	6 k	Twill 2 x 2
5807	600 g/m <sup>2</sup>	3,75	3,75	12 k	12 k	Twill 2 x 2



## INTERMEDIATE MODULUS CARBON FABRICS AND UNIDIRECTIONAL

STYLE	WEIGHT	FIBRE COUNT		REINFORCEMENT YARN		WEAVE
		WARP (yarns/cm)	WEFT (picks/cm)	WARP	WEFT	
<b>INTERMEDIATE MODULUS FABRICS</b>						
	200 g/m <sup>2</sup>	4.5	4.5	IM 6K	IM 6K	Twill 2x2
	280 g/m <sup>2</sup>	6.5	6.5	IM 6K	IM 6K	Satin 5
<b>UNIDIRECTIONAL FABRICS - HIGH STRENGTH FIBERS</b>						
5531	169 g/m <sup>2</sup>	8	4	3K	EC5 22	UD PW
	175 g/m <sup>2</sup>	8.4	6.9	3K	EC5 11	UD PW
	185 g/m <sup>2</sup>	8.4	4	3K	1K HS	UD PW
	300 g/m <sup>2</sup>	3.7	3	12K	EC5 11	UD PW
	530 g/m <sup>2</sup>	6.2	4.4	12K	EC9 68	UD PW



# QUARTZ FABRICS

STYLE	WEIGHT	FIBER COUNT		REINFORCEMENT YARN		WEAVE
		WARP <i>(yarns/cm)</i>	WEFT <i>(picks/cm)</i>	WARP	WEFT	
6019	60 g/m <sup>2</sup>	18	18	17 tex	17 tex	Plain
5603	100 g/m <sup>2</sup>	15	15	33 tex	33 tex	Twill 2 x 2
6049	118 g/m <sup>2</sup>	19,2	15,6	34 tex	34 tex	Plain
5465	140 g/m <sup>2</sup>	10	10	66 tex	66 tex	Plain
5903	180 g/m <sup>2</sup>	11	11	80 tex	80 tex	4 H satin
5863	270 g/m <sup>2</sup>	17	16	80 tex	80 tex	5 H satin
5937	270 g/m <sup>2</sup>	8	8	80 x 2 tex	80 x 2 tex	Twill 2 x 2
5935	285 g/m <sup>2</sup>	22	20,5	66 tex	66 tex	8 H satin



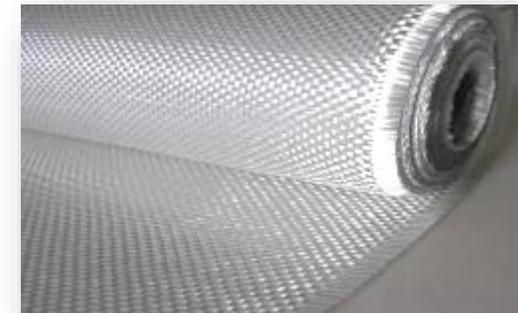
## E GLASS FABRICS (SILIONNE)

STYLE	WEIGHT	FIBER COUNT		REINFORCEMENT YARN		WEAVE
		WARP (yarns/cm)	WEFT (picks/cm)	WARP	WEFT	
5445	60 gr/m <sup>2</sup>	8,5	8,5	34 tex	34 tex	Plain
5145	100 gr/m <sup>2</sup>	23	22	22 tex	22 tex	Plain
	106 gr/m <sup>2</sup>	24	23	22 tex	22 tex	Plain
5071	150 gr/m <sup>2</sup>	11	11	34 x 2 tex	34 x 2 tex	Plain
	160 gr/m <sup>2</sup>	11.8	10.7	68 tex	68 tex	Plain
	162 gr/m <sup>2</sup>	11.8	11.5	EC9 68	68 tex	Twill 2 x 2
5492	190 gr/m <sup>2</sup>	15	12,5	68 tex	68 tex	4 H satin
5945	190 gr/m <sup>2</sup>	14	14	68 tex	68 tex	Twill 2 x 2
6044	200 gr/m <sup>2</sup>	17	11.8	68 tex	68 tex	Plain
5912	290 gr/m <sup>2</sup>	7,25	7,25	68 x 3 tex	68 x 3 tex	Twill 2 x 2
5512	300 gr/m <sup>2</sup>	22	22	68 tex	68 tex	8 H satin
5641	435 gr/m <sup>2</sup>	16	16	68 x 2 tex	68 x 2 tex	4 H satin
	600 gr/m <sup>2</sup>	22	22	136 x 3 tex	136 x 4tex	Twill 2 x 2



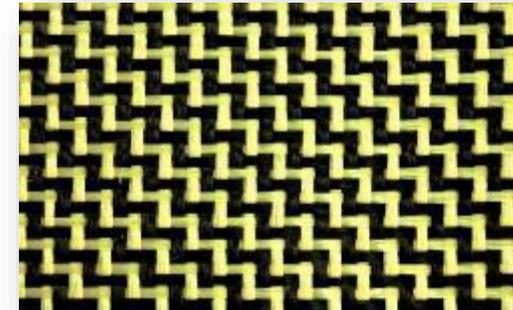
## SPECIALTY FABRICS

STYLE	WEIGHT	FIBER COUNT		REINFORCEMENT YARN		WEAVE
		WARP (yarns/cm)	WEFT (picks/cm)	WARP	WEFT	
<b>VERRANNE</b>						
5669/120	100 g/m <sup>2</sup>	2,6	2,6	200 tex	200 tex	Plain
6034/120	200 g/m <sup>2</sup>	6	4	200 tex	200 tex	Plain
5373/120	500 g/m <sup>2</sup>	4	3	660 tex	660 tex	Plain
<b>E GLASS ROVING FABRICS</b>						
6033 B /130	270 g/m <sup>2</sup>	5	4	300 tex	300 tex	Plain
500 T /125	500 g/m <sup>2</sup>	2,2	2	1200 tex	1200 tex	Plain
800 T /125	800 g/m <sup>2</sup>	1,6	1,6	2400 tex	2400 tex	Plain
<b>S2 GLASS FABRICS</b>						
6000/120	500 g/m <sup>2</sup>	2,1	2,2	1200 tex	1200 tex	Plain
<b>TEXTURED GLASS</b>						
5416	56 g/m <sup>2</sup>	4	4	70 tex	70 tex	Plain



## ARAMID & CARBON/ARAMID FABRICS

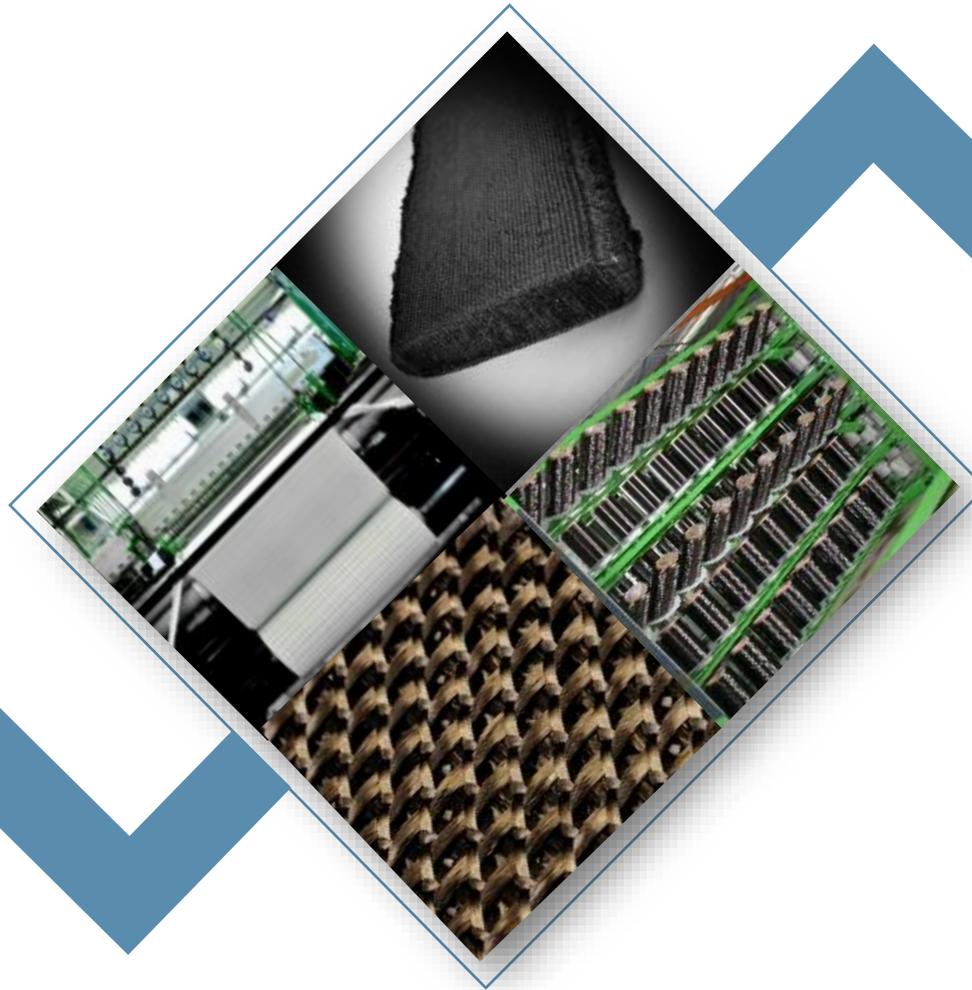
STYLE	WEIGHT	FIBER COUNT		REINFORCEMENT YARN		WEAVE
		WARP (yarns/cm)	WEFT (picks/cm)	WARP	WEFT	
<b>ARAMID</b>						
5927	175 g/m <sup>2</sup>	5.5	5	168 tex	168 tex	Twill
5487	180 g/m <sup>2</sup>	7	7	127 tex	127 tex	4 H Satin
5886	320 g/m <sup>2</sup>	9	9	168 tex	168 tex	5 H Satin
<b>CARBON/ARAMID</b>						
5456	192 g/m <sup>2</sup>	6.5	6.5	3K + 121 tex	3K + 121 tex	Twill 2x2
5488	240 g/m <sup>2</sup>	7	7	3K + 121 tex	3K + 121 tex	Twill 2x2



# 3D FABRICS (CARBON, GLASS)

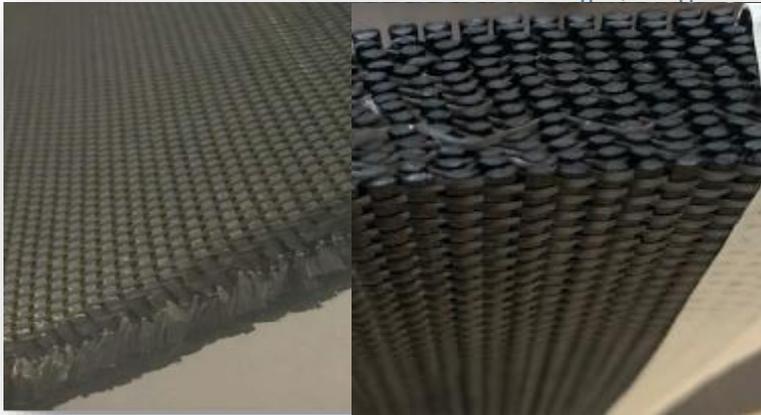
ORTHO AND NON ORTHOGONAL WEAVING - PATENTED PRODUCTS

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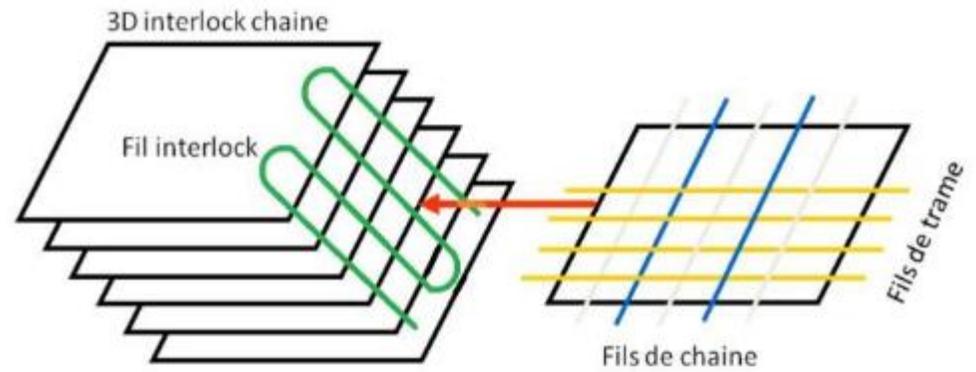


## 3D WOVEN FABRICS

- 3D weaving reduces the number of steps required to create a complex composite part.
- It offers the possibility of joining fabric layers during weaving.



between  
fabrics pr

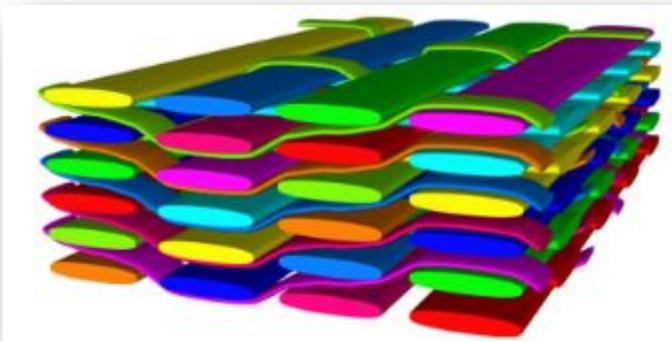


**3D**

**2D**

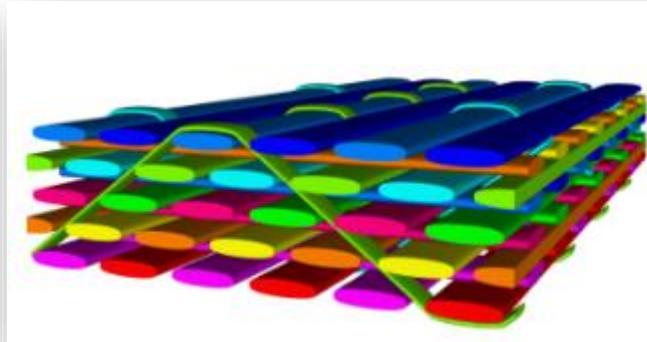
## 3D FABRICS

**LAYER TO LAYER ANGLE INTERLOCK**  
**COT 3D and COT DEF**



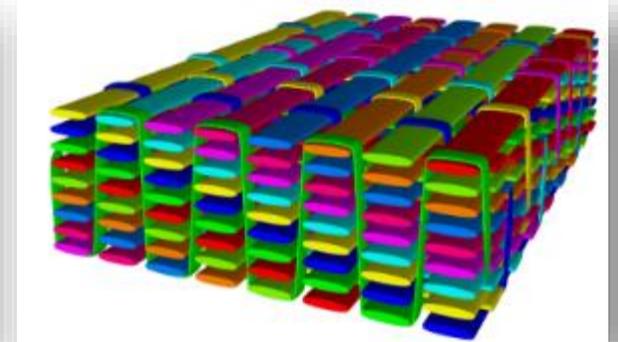
COT 3D

**ANGLE INTERLOCK THROUGH THE THICKNESS**  
**3X**



3X with filling warp layers – 5 layers

**ORTHOGONAL 3D FABRICS**  
**3D orthogonal**



3D orthogonal – 9 layers

CTMI Weave style	PROPERTIES	COMMENTS		DEFORMABILITY
3D orthogonal	RIGID, GOOD MECHANICAL PROPERTIES	Z yarn woven through the thickness at 90°	stacks of 0° and 90° UD = no weaving of each individual ply	- ↓ +
3X	SHEAR STRENGTH		with or without filling warp UD	
COT 3D	TENACITY	max width: 1,47m (thickness: 6mm)	4 warp yarns per layer unit	
COT DEF	DEFORMABILITY, SHAPE RETENTION		6 warp yarns per layer unit	

## COMPLEMENTARY PROCESSES

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**HEAT SETTING:** Thermal process to clean fabrics or remove sizing

**POWDERING:** binders available for low and high  $T_g$

**PREFORMING:** ideal for RTM processing complex shapes

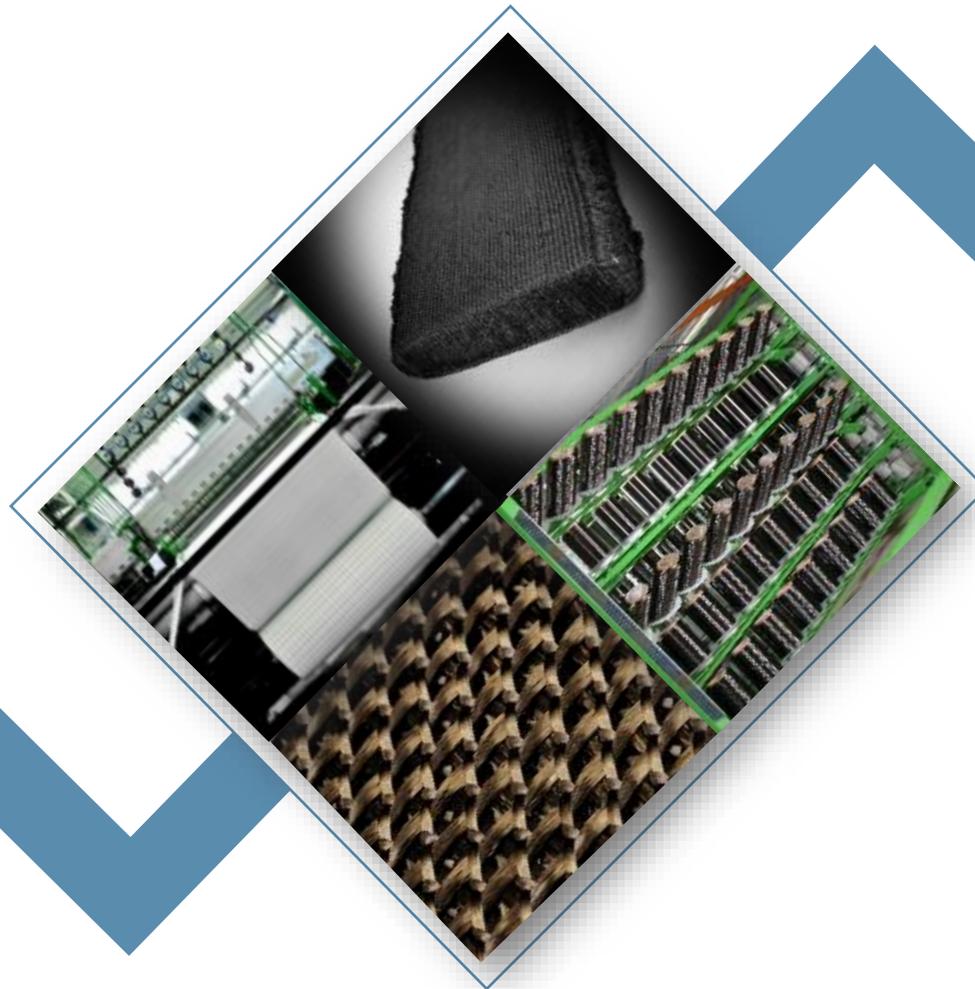
**SEWING:** different sizes of machines



# KNITTED FABRICS

TWO TECHNOLOGIES FOR THE MOST CHALLENGING LAY-UPS

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## KNITTED FABRICS FOR COMPLEX SHAPES

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### WEFT KNITTED FABRICS

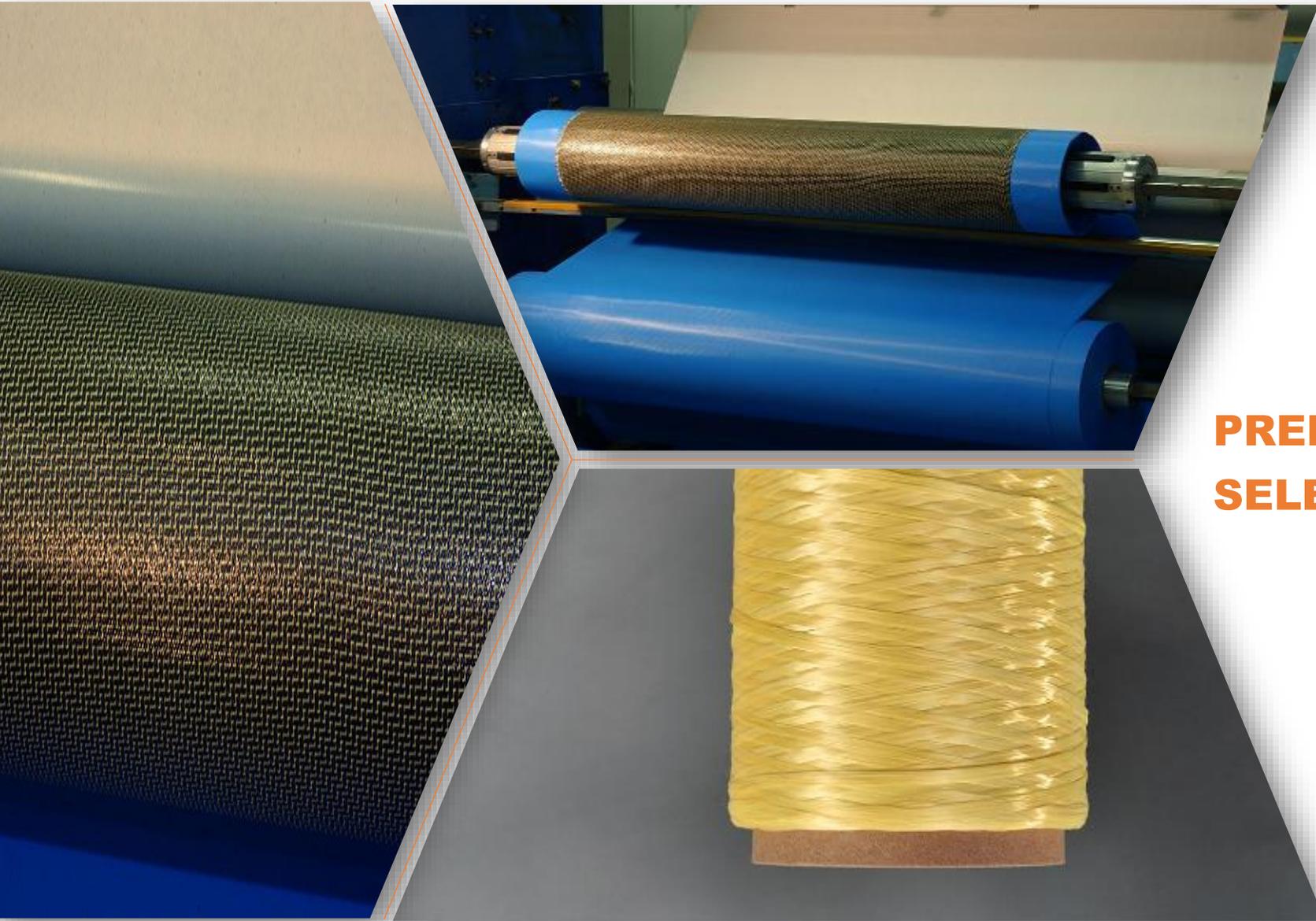
From single unit to medium production run



### WARP KNITTED FABRICS

From small to large production run.  
Width up to 320 cm





## **PREPREG MATRIX SELECTOR GUIDE**

## AEROSTRUCTURES SYSTEMS

FORMULATION		DRY TG	TYPICAL CURE CYCLE	POST CURING NEEDED	OUTLIFE		INITIAL TACK	CURED DENSITY	COMMENTS
		(DSC)			AMBIANT (weeks)	-18°C (months)			
		NEAT FORMULATION							
LILAS	Epoxy	100°C	120°C / 120min	no	4	12	low	1,55	FAR25 amdt.72§853(a) app. F A4: Accelerated version B: Tacky version
1808NA	Epoxy	120°C	120°C / 75min	no	4	12	moderate	1,18	For UD tape
1721	Epoxy	180°C	35-180°C / 30-120mi	no	2	9	low	0,86	with microsperes



## RADOME ANTENNA SYSTEMS

FORMULATION		DRY TG	TYPICAL CURE CYCLE	POST CURING NEEDED	OUTLIFE		INITIAL TACK	FABRIC	UD Tape	CURED DENSITY	COMMENTS
		(DSC)			AMBIANT (weeks)	-18°C (months)					
		NEAT FORMULATION									
1808S	Epoxy	125°C	120°C/90min		4	12	moderate	X		1,18	$\epsilon' = 3,22 / Tg. \delta = 0,015$ X band - quartz
1721	Epoxy	180°C	135-180°C / 30-120min		2	9	low	X		0,86	
1730-21	Epoxy TGMDA	255°C	180°C / 180min	X	3	6	low	X		0,86	
1731NS	Epoxy TGMDA	300°C	180°C / 180min	X	3	6	moderate		X	1,27	
1950	Cyanate-ester	290°C	180°C / 180min	X	4	12	moderate	X		1,26	N: UD tape version
1951	Cyanate-ester	310°C	180°C / 180min	X	4	12	high	X	X	1,24	1951-21: with microsphere version
1954	Cyanate-ester	290°C	135°C / 6h	X	4	12	high	X		1,1	PEG1 : high tack PEG 3: moderate tack



## INDUSTRIAL – MID & HIGH TEMPERATURE SYSTEMS

FORMULATION		DRY TG	TYPICAL CURE CYCLE	POST CURING NEEDED	OUTLIFE		INITIAL TACK	FABRIC	CURED DENSITY	COMMENTS
		(DSC)			AMBIANT (weeks)	-18°C (months)				
		NEAT FORMULATION								
1115	Epoxy	100°C	120°C / 90min		4	12	low	X	1,56	A4: accelerated version
1120	Epoxy	100°C	120°C / 120min		4	12	low	X	1,62	B: moderate tack version
1808S	Epoxy	125°C	120°C / 90min		4	12	moderate	X	1,18	PEG2: low tack version NS: UD version 1821: with microsphere
1846	Epoxy	155°C	120°C / 90min	X	4	12	moderate	X	1,18	
1721SM	epoxy	188°C	135-180°C / 30-120min		2	9	moderate	X	1,25	without microsphere
1713BS	epoxy	210°C	140-180°C / 40-120min		3	6	moderate	X	1,24	1713E: high tack version 1713N: UD version

## SPORT & LEASURE SYSTEM

FORMULATION		DRY TG	TYPICAL CURE CYCLE	OUTLIFE		INITIAL TACK	FABRIC	UD TAPE	CURED DENSITY
		(DSC)		AMBIANT (weeks)	-18°C (months)				
		NEAT FORMULATION							
1808NS A4	Epoxy	120°C	120°C / 30min 150°C / 10min	4	12	moderate	X	X	1,18



## COSMETIC SYSTEM

FORMULATION		DRY TG	TYPICAL CURE CYCLE	POST CURING NEEDED	OUTLIFE		INITIAL TACK	FABRIC	UD TAPE	CURED DENSITY
		(DSC)			AMBIANT (WEEKS)	-18°C				
		NEAT FORMULATION				(MONTHS)				
1814	Epoxy	110°C	140°C / 120min	no	4	12	low	X	no	1,26



## ULTRA-HIGH TEMPERATURE SYSTEMS

FORMULATION		DRY TG	TYPICAL CURE CYCLE	POST CURING NEEDED	OUTLIFE		INITIAL TACK	FABRIC	UD TAPE	ADHESIVE TO FOAM AND NIDA	CURED DENSITY	COMMENTS
		(DSC)			AMBIANT (weeks)	-18°C (months)						
		NEAT FORMULATION										
1730	Epoxy TGMDA	300°C	180°C / 180min	X	3	6	moderate	X		-	1,27	1730-21: with microsphere
1731NS	Epoxy TGMDA	300°C	180°C / 180min	X	3	6	moderate		X	-	1,27	
1950	Cyanate-ester	290°C	180°C / 180min	X	4	12	moderate	X		X	1,26	1950-N: UD version
1951	Cyanate-ester	310°C	180°C / 180min	X	4	12	high	X	X	X	1,24	1950-21: with microsphere
1952	Cyanate-ester	295°C	180°C / 180min	X	12	24	moderate	X	X	X	1,24	1,24
1954 PEG1	Cyanate-ester	290°C	135°C / 6h	X	4	12	high	X		X	1,1	1954 PEG1: high tack 1954 PEG3: moderate tack



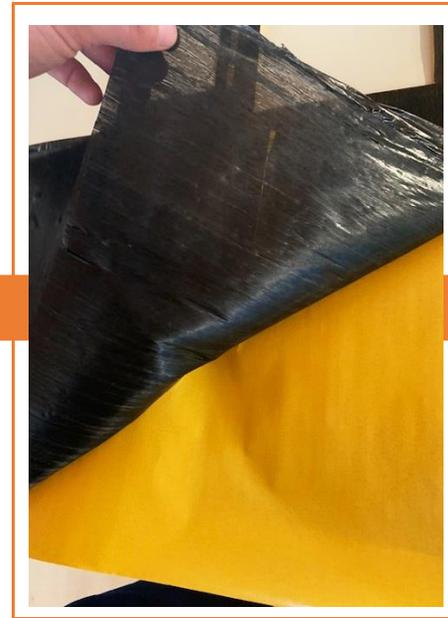
## TOOLING SYSTEMS

FORMULATION		DRY TG	WET TG	TYPICAL CURE CYCLE	OUTLIFE		INITIAL TACK	CURED DENSITY	COMMENTS
		(DSC)	(VANHOGRAPHE)		AMBIANT (WEEKS)	-18°C			
		NEAT FORMULATION	LAMINATE			(MONTHS)			
1770T	Epoxy	175°C		50°C / 48h	2	6	high	1,19	Tack life : 15 days
1771A	Epoxy	205°C		50°C / 48h	2	6	high	1,19	Aeronautical grade



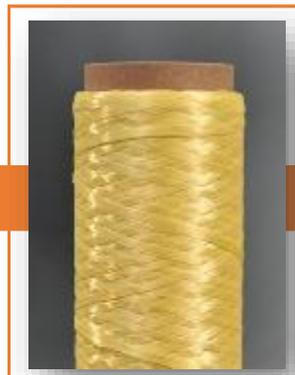
## ULTRA LOW WEIGHT UD TAPE

ULTRA THIN UD TAPES (FROM 17 TO 40 GSM)	
VARIETY OF FORMULATIONS :	Hotmelt epoxy systems
	Water-based thermoplastic systems
VARIETY OF FIBERS :	Aramid
	Carbon
	Vectran ®
	Dyneema ®
SLITTING FOR ATL/AFP AS AN OPTION	



## TOWPREG SYSTEMS (Filament winding)

FORMULATION		DRY TG	WET TG	TYPICAL CURE CYCLE	OUTLIFE		INITIAL TACK	CURED DENSITY	COMMENTS
		(DSC)	(VANHOGRAPHE)		AMBIANT (WEEKS)	-18°C			
		NEAT FORMULATION	LAMINATE			(MONTHS)			
F1260M	Epoxy	45°C		60°C / 120min	24h	3	high	1,2	Low temperature cure epoxy towpreg
1213	Epoxy	140°C	128°C	120°C / 120min	4	12	high	1,2	Standard epoxy towpreg
1211	Epoxy	170°C		160°C / 120min			high	1,23	Epoxy Tg 170°C
1217B to E	Epoxy	140°C	135°C	150°C / 120min	4	12	high	1,2	Epoxy conductive electrically
1713E mod3	Epoxy	200°C		135-180°C / 40-120min	3	6	moderate	-	Epoxy Tg 180°C
1950F	Cyanate-ester	290°C		180°C / 180min	4	12	high	1,26	Post curing is necessary



## TOWPREG SYSTEMS (Automated Fiber Placement)

FORMULATION		DRY TG	WET TG	TYPICAL CURE CYCLE	OUTLIFE		INITIAL TACK	CURED DENSITY	COMMENTS
		(DSC)	(VANHOGRAPHE)		AMBIANT (WEEKS)	-18°C			
		NEAT FORMULATION	LAMINATE			(MONTHS)			
1218	Epoxy	102°C	-	120C / 120min	4	12	low	1,19	¼" towpreg with backing film



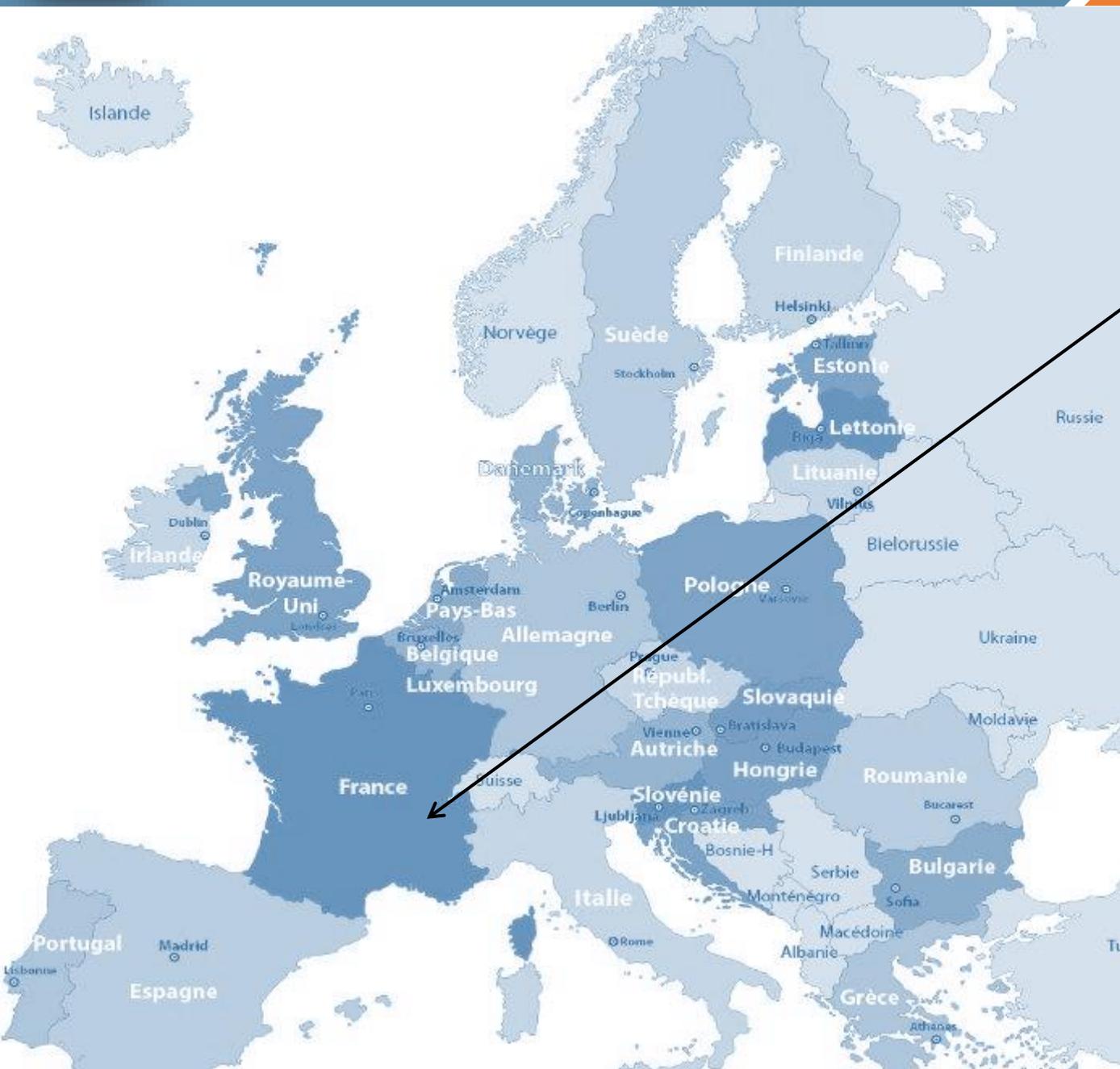
## SMC SYSTEMS (Prepreg “paillettes”)

FORMULATION		DRY TG	WET TG	TYPICAL CURE CYCLE	OUTLIFE		INITIAL TACK	CURED DENSITY	COMMENTS
		(DSC)	(VANHOGRAPHE)		AMBIANT (WEEKS)	-18°C			
		NEAT FORMULATION	LAMINATE			(MONTHS)			
1814 B	Epoxy	-	-	140°C / 120min	4	12	low	1,26	carbon flakes





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**LA SONE**

PARIS	565 KM
GENEVE	145 KM
LYON	120KM
GRENOBLE	55 KM



**COMPOSITE TEXTILE MATERIALS INNOVATION**

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