FACTS:
YARN PROCESSING
2011
PLIED YARNS

Culimeta Textilglas-Technologie GmbH & Co. KG

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TECHNICAL DATA SHEET
E-, S-2- AND ECR-GLASS

Composition of different fibres

Oxide	E-glass (%)	S-2 Glass® (%)	ECR-glass
SiO_2	52 - 56	64 - 66	54 - 62
AL_2O_3	12 - 16	24 - 25	9 - 15
B_2O_3	5 - 10	-	-
CaO	16 - 25	0 - 0.2	17 - 25
MgO	0 - 5	9.5 - 10	0 - 4
$Na_2O + K_2O$	0 - 2	0 - 0.2	2 - 5
TiO_2	0 - 1.5	-	-
Fe_2O_3	0 - 0.8	0 - 0.1	0 - 0,8
F_2	0 - 1	-	-

E-GLASS – TECHNICAL DATA

Physical properties

Properties	Unit	E-glass
Density	g/cm³	2.60
Hardness (Vickers 50 g – 15 s)	-	5.60
Sound velocity	m/s	5680

Mechanical properties

Properties	Unit	E-glass
Virgin filament	MPa	3400
	ksi	493
Impregnated strand tensile test	MPa	2400
(calculated on fiber cross section)		
	ksi	348
Tensile modulus	Gpa	73
	msi	10.5
Tenacity (sized yarn)	cN/Tex	Min. 50
Elongation at break for sized yarns	%	2.2 – 2.5
according to binder system		
Elastic recovery	%	100

Electrical properties

Properties	Unit	E-glass
Dielectric constant at 1 MHz	-	6.4
Dielectric constant at 1 GHz	-	6.13
Loss angle at 1 MHz	-	0.0018 to 0.0039
Loss angle at 1 GHz	-	0.0039
Volume resistivity	Ohm.cm	10^{14} to 10^{15}
Surface resistivity	Ohm.cm	10^{13} to 10^{14}
Electrical regidity	kV/mm	8 - 12

Thermal properties

Properties	Unit	E-glass
Softening point (Littleton)	°C	840
Strain point (Littleton)	°C	617
Linear coefficient		
of thermal expansion	m/m/°C	5.3 $1_{0\text{-}6}$
Specific heat	J/g. °K	0.764 at 20°C
		0.958 at 200°C
Coefficient of thermal conductivity	W/m. °K	1.0

Thermal resistance of E-glass virgin filament

Temperature °C	Residual strength (%) E-glass
-200	100
200	98
300	82
400	65
500	46
600	144

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6. Nouvelle Tissafil S.a.r.l., La Grand-Croix (France)
7. Moulinage d`Auberives, Auberives-en-Royans (France)
8. SIA „Culimeta Baltics“, Valmiera (Lativa)

The production

Our twisting mills in Germany, France and Latvia are able to produce plied yarns with up to 10 strands. As per customers‘ request, twisting of other yarns such as Aramid, PES, steel or hybrid yarns is also possible. Brand-new computerized machines can guarantee the highest quality level.

The following two processes are available:

Direct cabling method

This process is capable of making 2-ply yarns. Twisting up to 520 tpm/13 tpi is possible. The yarn is presented on BBC bobbins (see page 15)

Ring twisting method

This process is capable of making up to 10-ply yarns. Twisting up to 340 tpm/8.5 tpi is possible. The 100% balanced yarn is presented on bobbins H5, H8 or H9. Tie on tail can be offered according to customers‘ needs.

NOMENCLATURE

Example: EC-9 136 X 3 S135 C1 H8 (According to ISO 2078)

- E - Type of glass
- C - Kind of filament (continuous)
- 9 - Filament diameter (µm)
- 136 - TEX Single yarn (g/1000 m)
- X 3 - Number of yarns
- S - Direction of turns (S/Z)
- 135 - Turns per meter (TPM)
- C1 - Size/Binder (textile/silane)
- H8 - Type of bobbin

Example: ECG 37 1/3 3.4 S C1 H8 (According to ASTM D587)

- E - Type of glass
- C - Kind of filament (continuous)
- G - Filament diameter US Unit
- 37 - Linear density in 100 yards/pounds
- 1/3 - 1st digit: number of identical single yarns twisted together
  - 2nd digit: number of plied yarns twisted together
- 3.4 - Final twist in turns/inch
- S - Final twist direction
- C1 - Size/Binder
- H8 - Type of bobbin

YARN CONSTRUCTIONS

EU-Unit (TEX)	TPM	US-Unit (yd/lb)	TPI	Bobbin
EC-4 33 X 2 X 2	S150	BC 150 2/2	3.8S	H8
EC-4 33 X 2 X 3	S135	BC 150 2/3	3.4S	H8
EC-4 33 X 4 X 3	S150	BC 150 4/3	3.8S	H8
EC-5 2,8 X 2	S180	ECD 1800 1/2	4.5S	7636
EC-5 5,5 X 2	S180	ECD 900 1/2	4.5S	7636/H3
EC-5 11 X 2	S180	ECD 450 1/2	4.5S	7636/H3
EC-6 34 X 2	S150	ECDE 150 1/2	3.8S	H5/BBC
EC-6 34 X 3	S150	ECDE 150 1/3	3.8S	H5
EC-6 68 X 2	S150	ECDE 75 1/2	3.8S	H8/H5/BBC
EC-6 68 X 3	S150	ECDE 75 1/3	3.8S	H8/H5
EC-6 68 X 4	S150	ECDE 75 1/4	3.8S	H8/H5
EC-6 68 X 2 X 2	S120	ECDE 75 2/2	3.0S	H8/H5
EC-6 68 X 2 X 3	S120	ECDE 75 2/3	3.0S	H8/H5
EC-6 134 X 2	S120/135	ECDE 37 1/2	3.0S/3.4	H8/H5/BBC
EC-6 134 X 3	S135	ECDE 37 1/3	3.4S	H8/H5
EC-6 134 X 4	S120/135	ECDE 37 1/4	3.0S/3.4S	H8/H5
EC-6 134 X 5	S120/135	ECDE 37 1/5	3.0S/3.4S	H8/H5
EC-7 22 X 2	S150	ECE 225 1/2	3.8S	H5/BBC
EC-7 22 X 3	S150	ECE 225 1/3	3.8S	H5
EC-9 34 X 2	S150	ECG 150 1/2	3.8S	H5/BBC
SC-9 33 X 2	S150	SCG 150 1/2	3.8S	H5/BBC
EC-9 34 X 3	S150	ECG 150 1/3	3.8S	H8/H5
EC-9 68 X 2	S150	ECG 75 1/2	3.8S	H8/H5/BBC
EC-9 68 X 2 +V4A	S150	ECG 75 1/2 + Steel	3.8S	BBC
SC-9 66 X 2	S150	SCG 75 1/2	3.8S	H5/BBC
EC-9 68 X 3	S150/S260/S300	ECG 75 1/3	3.8S/6.5S/7.5S	H8/H5
EC-9 68 X 4	S150	ECG 75 1/4	3.8S	H8/H5
EC-9 68 X 5	S150	ECG 75 1/5	3.8S	H8
EC-9 110 X 2	S120	ECG 45 1/2	3.0S	H8
EC-9 110 X 3	S120	ECG 45 1/3	3.0S	H8
EC-9 136 X 2	S135	ECG 37 1/2	3.4S	H8/H5/BBC
EC-9 136 X 3	S135/S260	ECG 37 1/3	3.4S/6.5S	H8/H5
EC-9 136 X 4	S135	ECG 37 1/4	3.4S	H8/H5
EC-9 136 X 5	S135	ECG 37 1/5	3.4S	H8/H5
EC-11 51 X 2	S150	ECH 100 1/2	3.8S	H5/BBC
EC-11 51 X 3	S150	ECH 100 1/3	3.8S	H8/H5
EC-13 136 X 2	S135	ECK 37 1/2	3.4S	H8
EC-13 136 X 3	S135	ECK 37 1/3	3.4S	H8
EC-13 136 X 4	S135	ECK 37 1/4	3.4S	H8
EC-13 136 X 5	S135	ECK 37 1/5	3.4S	H8

STANDARD BOBBIN DESIGN FOR TWISTED GLASS YARNS

EU-Unit (TEX)	TPM	US-Unit	TPI	Bobbin
EC-13 272 X 4	S100	ECK	18 1/4	2.5S H8
EC-13 272 X 5	S100	ECK	18 1/5	2.5S H8
EC-13 408 X 2	S100	ECK	12 1/2	2.5S H8
EC-13 408 X 3	S100	ECK	12 1/3	2.5S H8
EC-13 408 X 4	S100	ECK	12 1/4	2.5S H8
EC-13 408 X 5	S100	ECK	12 1/5	2.5S H8
EC-13 544 X 2	S100	ECK	9 1/2	2.5S H8
EC-13 544 X 3	S100	ECK	9 1/3	2.5S H8
EC-13 544 X 4	S100	ECK	9 1/4	2.5S H8
EC-13 544 X 5	S100	ECK	9 1/5	2.5S H8

Binder system:

AGY®	PPG®	Saint Gobain-Vetrotex®
620, 620 -1, 622	610, 611, 690	5312
636	207	T6, T8, T30, T32
602	1383	TD24, TD37
		T10, T18
Valmiera Glasfaser AG®		„C“ = Czech Republic
2/4		„M“ = Mexico
3/4		
302P		

Packaging:

	BBC	7636	H5	H8/46
Bobbins/pallet	72	216	92	46
Dim. (m) L, W. H.:	1,00 X 1,20 X 1,30	1,15 x 1,15 x 0,92	1,00 X 1,20 X 0,93	1,00 X 1,20 X 1,00
Max. weight (kg):	720 kg	500 kg	450 kg	350 kg

Available tpm/tpi:

1. Direct cabling process (BBC) — up to 520 tpm/13 tpi in „S“ and „Z“ Direction
2. Ring twisting process (H9/H8/H5) — up to 340 tpm/8.5 tpi in „S“ and „Z“ Direction

Quality Control:

TEX:	Tensile strength (N)	TPM/TPI
ISO 1889	ISO 3341	ISO 1890

Other constructions available upon request

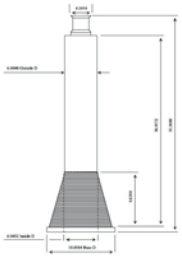
H9, H8, H5, 28

	H9	H8	H5	28	bottle bobbin
Height (mm)	446	446	395	330	
Winding height (mm)	380	377	350	282	
Bottom diameter (mm)	203	190	150	152	
Inside diameter (mm)	83,0	83,0	60,3	60,4	
Max. bobbin weight (kg)	9,0	7,6	4,9	4,9	

BBC, (Bicone)

	BBC	Bicone
Height (mm)	230	69 mm inside diameter card board sleeve, wall thickness 5 mm
Winding height (mm)	200	
Bottom diameter (mm)	–	
Inside diameter (mm)	69,0	
Max. bobbin weight (kg)	10	
		Max. outside diameter 250 mm

7636

	SI (cm)	Bobbin
Type	Plastic Tube	
Inside Diameter	6,05	
Length	35,56	
Traverse	30,94	
Base Outside Diameter	10,06	
Type Build	Double Taper	
Bare bobbin nom. weight	229,3 g	
Max. Full Package Dia.	11,43	

CONVERSION:
US - UNITS - EUROPEAN UNITS

			Number of filaments (approx.)							
			50	100	200	400	600	800	1200	1600
µm	5	tex	2,8	5,5	11					
US	D	h.y.p.p.	1800	900	450					
µm	6	tex				34		68		136
US	DE	h.y.p.p.				150		75		37
µm	7	tex			22					
US	E	h.y.p.p.			225					
µm	9	tex			34	68	110	136	204	272
US	G	h.y.p.p.			150	75	45	37	25	18
µm	11	tex			51	102		204	340	
US	H	h.y.p.p.			100	50		25	15	
µm	13	tex				136		272	408	544
US	K	h.y.p.p.				37		18	12	9

tex: g/1000 m
h.y.p.p.: hundred yards per pound
yard (yd): 0,9144 m
inch (in): 25,4 mm
pound: 0,4536 kg

TEX = 4691/h.y.p.p.

Standard Twists Plied Yarns

TPM number of twists per meter
TPI number of twists per inch (TPM/40)

T/m	Tpi
80	2.0
100	**2.5**
120	3.0
135	**3.4**
150	3.8
260	**6.6**

PRODUCT IDENTIFICATION WITH "PICCS"

Culimeta has invented a new system for marking all plied yarns products. The new way of labelling is named Culimeta PICCS. This stands for Product Identification Colour Code System and guarantees that every article has got a unique tab. As the name already indicates, the system is based on different colours which symbolise different characteristics of the product.

Culimeta PICCS
Product Identification Colour Code System

Culimeta PICCS avoids the mix-up of articles!