Flammability and Durability Solution with Polyester Compounds

<FR PET/GF SKYTRA 5220F >

Feb. 2020

Engineering Plastics Business Team

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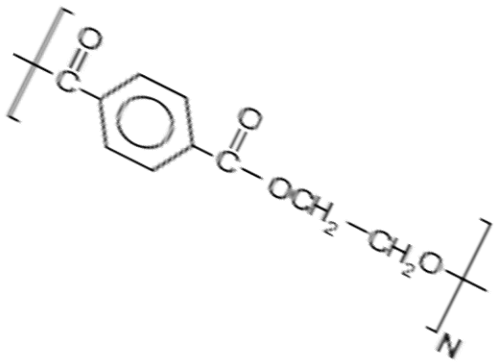
Introduction

Introduction

SKYTRA 5220F (FR PET/GF) is a 30% glass reinforced, flame retardant modified polyethylene terephthalate resin approved by UL as UL94(V-0), UL746C(f1) and UL746B(RTI).
It is a prime solution in many demanding applications where critical tolerances, long term thermal properties, strong chemical resistances and dielectric properties are key requirements

Characteristics

- High heat resistance & Long-term heat stability
- Excellent UL flammability and relative temperature index rating
- Excellent electrical properties
- Good UV resistance and weatherability
- Good processability
- Good chemical resistance
- Good surface appearance



Applications

Applications

SKYTRA 5220F (FR PET/GF) offers excellent properties that are high strength, stiffness, excellent dimensional stability, outstanding chemical and heat resistance, and good electrical properties. It is a prime solution for many encapsulation and electrical and electronic applications. Especially where the high temperature index and UV resistance are required.

Applications

- Motor insulators
- Printer fuser unit
- Coil bobbins, Relay Socket
- Photovoltaic junction box housings
- Curling iron, Hair dryers
- Pot coil base
- Oven handles, small appliance handles
- Luggage racks

Material requirements : Motor Insulator

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DD Motor

Linear Motor

☐ Requirements

- UL 94 (Flammability Ratings)
  - * V-0 @ 0.7mm
- UL 746B RTI (Relative Temperature Index)
  - * Elec > 140℃ / Imp > 140℃ / Str > 140℃
- UL 746C (f1) Class
  - * UV exposure & Water immersion
- UL 1446 EIS (Electrical Insulation System)
  - * OBJS2's requirements or available of OBJY2 (STTA : UL's Short-Term Thermal Aging)
- Hole strength
- Dimensional stability
- Insulation resistance
- Insulation pressure resistance
- Chemical resistance

Material requirements : Printer Fuser Unit

☐ Requirements

- UL 94 (Flammability Ratings)
  - * 5VA @ 1.5mm
- UL 746B RTI (Relative Temperature Index)
  - * Elec > 150℃ / Imp > 140℃ / Str > 140℃
- Dimensional stability (Mold Shrinkage)
  - * MD(Flow) < 0.2mm
  - * TD(Cross-Flow) < 1.0mm
- HDT (Heat distortion temperature)
  - * 220 ℃ @ 1.82 Mpa
- Surface roughness
- Lowest warpage

Material requirements : Bobbin & Relay

Coil bobbin

Relay Socket

☐ Requirements

- UL 94 (Flammability Ratings)
  - * V-0 @ 0.35mm
- UL 746A
  - Under the condition a V-0
  - * HWI (Hot Wire Ignition) : Assigned PLC 4
  - * HAI (High-Current Arc Ignition) : Assigned PLC 3
  - GWIT(Glow Wire Ignitability Temperature) on some parts
    Under the condition a 0.75mm @ 775 ℃
  - GWFI(Glow-Wire Flammability) on some parts
    Under the condition a 0.75mm @ 960 ℃
- UL 746B RTI (Relative Temperature Index)
  - * Elec > 150℃ / Imp > 140℃ / Str > 140℃

- Some Customer ask for VDE(Germany) approved products certification is better

Material requirements ; Juntion box housing

Junction box housing

☐ Requirements

- UL 94 (Flammability Ratings)

  * 5VA @ 1.5mm

- UL 746A

  - IPT (Inclined Plane Tracking) : 1500V

  - Under the condition a V-0

    * HWI (Hot Wire Ignition) : Assigned PLC 3

    * HAI (High-Current Arc Ignition) : Assigned PLC 4

  - GWIT(Glow Wire Ignitability Temperature)

    * Inner : 650V, Outer : 750V

  - Ball Pressure

    * Inner : 90V, Outer : 125V

- UL 746B RTI (Relative Temperature Index)

  * Elec > 130℃ / Imp > 130℃ / Str > 130℃

- UL 746C (f1) Class

  * UV exposure & Water immersion

- UL3730 (Standard for Photovoltaic Junction)
- UL6703 (Standard for Connectors for Use in Photovoltaic Systems)
- IEC 62790 (Junction boxes for photovoltaic modules - Safety requirements and tests)
- IEC 62852(Connectors for DC - application in photovoltaic systems - Safety requirements and tests)

Comparison of Properties

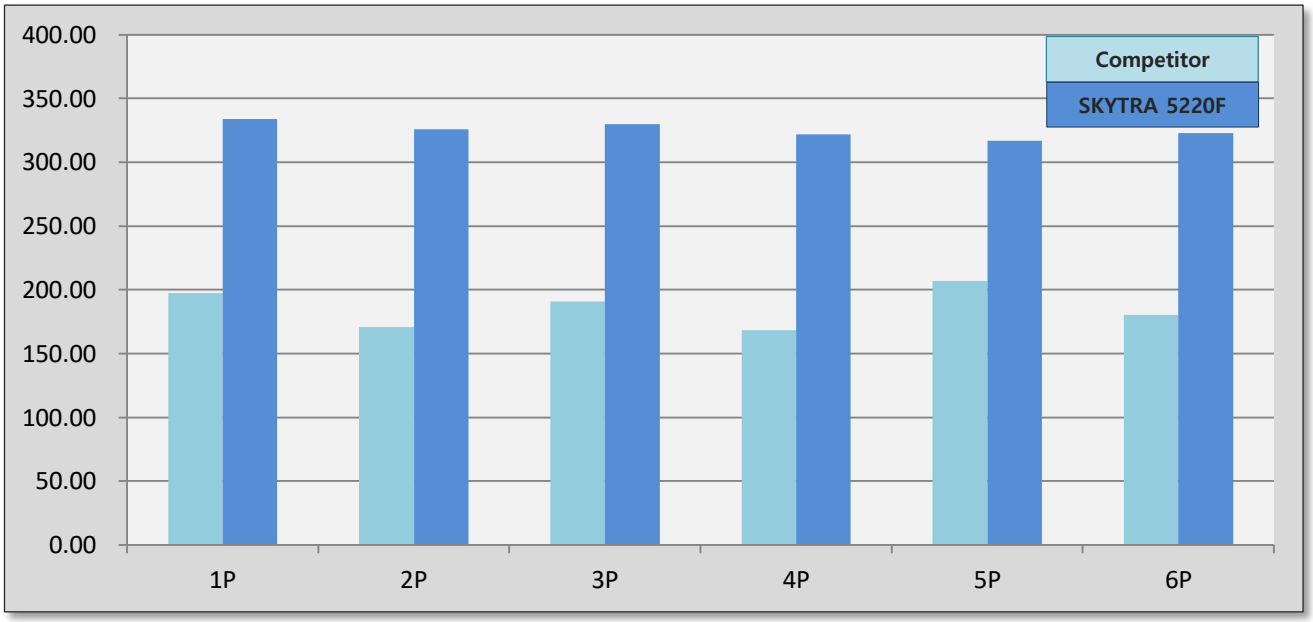
Mechanical Properties			SK	Dupont	KANEKA	Samyang
			SKYTRA 5220F	RYNITE FR530	HYPERITE 8300SE	TRIPET LV2550GN30
Tensile Strength @ Yield (5mm/min)	ASTM D638	kgf/cm²	1,400	1,350	1,500	1,370
Elongation @ Break (5mm/min)	ASTM D638	%	2.50	2.47	2.50	3.00
Tensile Modulus (5mm/min)	ASTM D638	kgf/cm²	109,000	91,800	X	X
Flexural Strength (1.27mm/min)	ASTM D790	kgf/cm²	1,900	1,650	2,050	1,750
Flexural Modulus (1.27mm/min)	ASTM D790	kgf/cm²	95,000	84,650	95,000	88,250
Izod Impact Strength Notched 3.2 mm @ 23℃(73℉) Notched 6.4 mm @ 23℃(73℉)	ASTM D256	J/m	90 70	82 60	78 -	59 -
Thermal Properties						
HDT @ 1.82 MPa	ASTM D648	℃	225	225	220	220
Flammability @ 0.35 mm @ 1.5 mm	UL94	-	V-0 V-0, 5VA	V-0 V-0, 5VA	X V-0, 5VA	X V-0, 5VA
Ball Pressure	IEC 60695-10-2	℃	245	245	X	X
Physical Properties						
Specific Gravity	ASTM D792	g/cm³	1.63	1.68	1.70	1.63
Mold Shrinkage MD (Flow) TD (Cross-Flow)	ASTM D955	%	0.15 0.80	0.20 0.80	0.20 0.90	0.2~0.4 -
Electrical Properties						
Comparative Tracking Index(CTI)	UL 746A	V(volt)	250	250	X	X
Relative Tem. Index(RTI) @ 3.0mm	UL 746A	℃	155	155	150	150
Glow-wire Ignition (GWIT) @ 3.0mm	UL 746A	℃	975	975	X	X

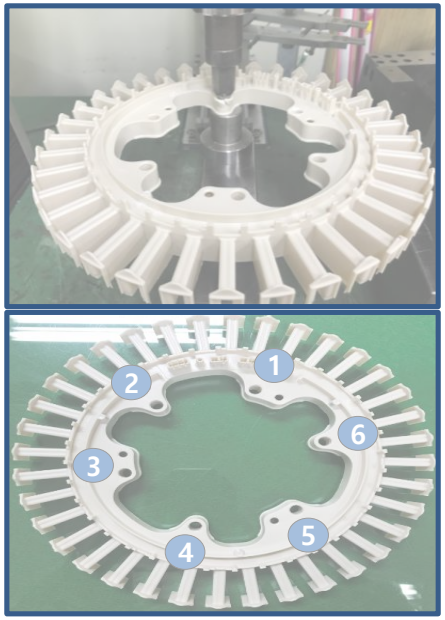
• KANEKA & Samyang's materials can be used in Printer Fuser Unit only

Certification with SKYTRA FR PET GF

Introduction - comparison with competitive material

Hole strength “ Motor Insulator “





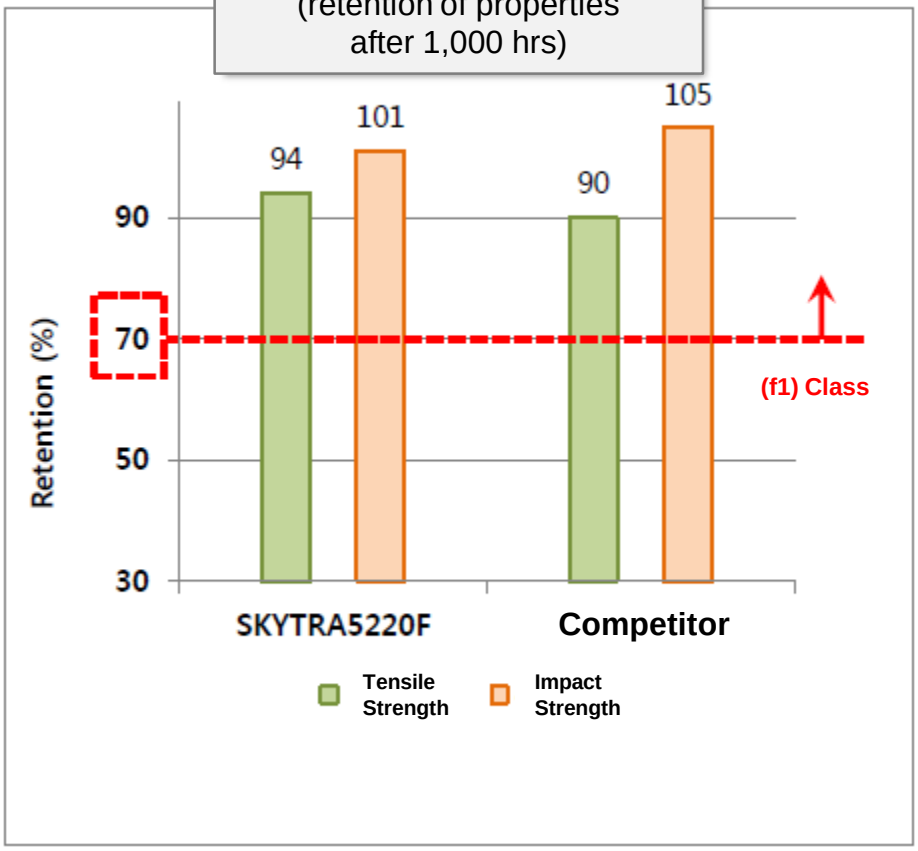
- SKYTRA 5220F (FR PET GF30%) has
  - a higher hole strength than the competitor’s

- SK Chemicals Reference
  - E85300.OBJY2/8 - New EIS, DD Motor, 155(F) class STTA Evaluation (1000 hr, 50 day)

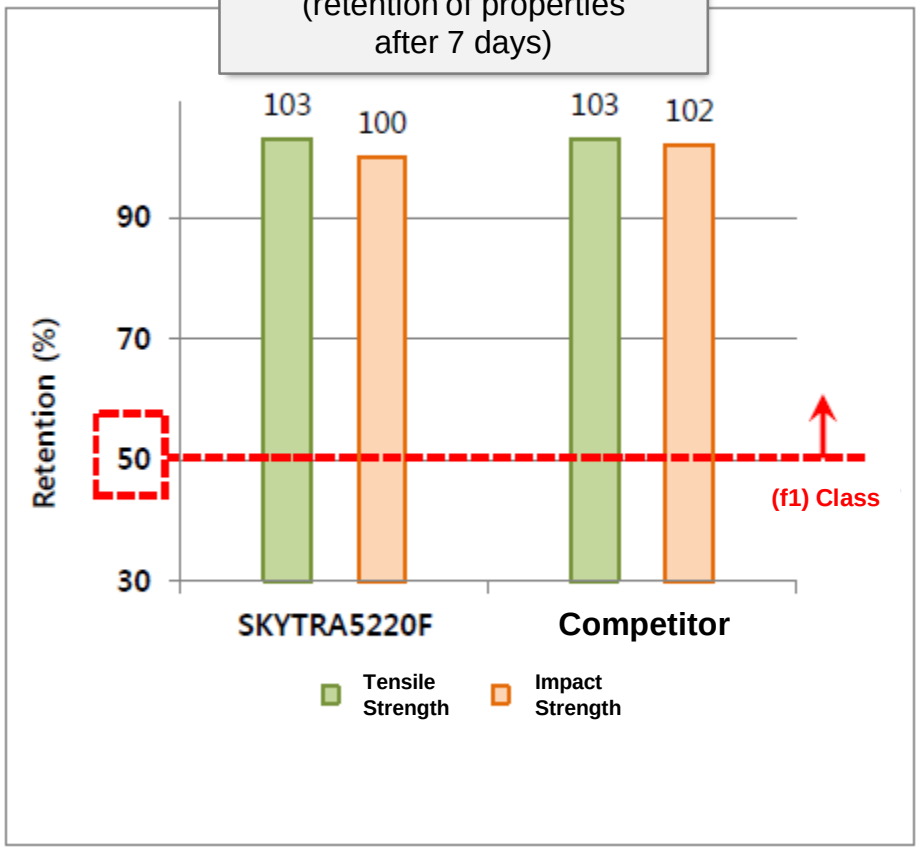
Introduction - comparison with competitive material

Comparison with competitive materialUL746C is an evaluation of polymer materials properties for outdoor uses, such as ultraviolet (UV) light exposure and/or water immersion. “ Motor Insulator & Photovoltaic junction box housings “

UV exposure
(retention of properties after 1,000 hrs)



Water immersion
(retention of properties after 7 days)



• SK Chemicals Reference: File E215991

Thermal Properties (f1)

SKYTRA

Component - Plastics E215991

Guide Information

SK CHEMICALS CO LTD

98-36 Dongtansandan 7-gil Dongtan-myeon, Hwaseong-si Gyeonggi-do 18487 KR

SKYTRA 5220F(#)(f1)

Polyethylene Terephthalate (PET), furnished as pellets

Color	Min. Thk (mm)	Flame Class	HWI	HAI	RTI Elec	RTI Imp	RTI Str
NC, BK	0.7	V-0	0	0	155	155	155
	1.5	V-0	0	0	155	155	155
	3.0	V-0	0	0	155	155	155

Comparative Tracking Index (CTI): 2

Dielectric Strength (kV/mm): 35.04

High-Voltage Arc Tracking Rate (HVTR): 4

Dimensional Stability (%): 0

Inclined Plane Tracking (IPT) kV: -

Volume Resistivity (10^X ohm-cm): 14

Surface Resistivity (10^X ohm-cm):

High Volt, Low Current Arc Resis (D495): 7

(#) - May be replaced by one or two numbers and/or letters.

(f1) - Suitable for outdoor use with respect to exposure to Ultraviolet Light, Water Exposure and Immersion in accordance with UL 746C.

ANSI/UL 94 small-scale test data does not pertain to building materials, furnishings and related contents. ANSI/UL 94 small-scale test data is intended solely for determining the flammability of plastic materials used in the components and parts of end-product devices and appliances, where the acceptability of the combination is determined by UL.

Report Date: 2013-12-06

Last Revised: 2020-01-30

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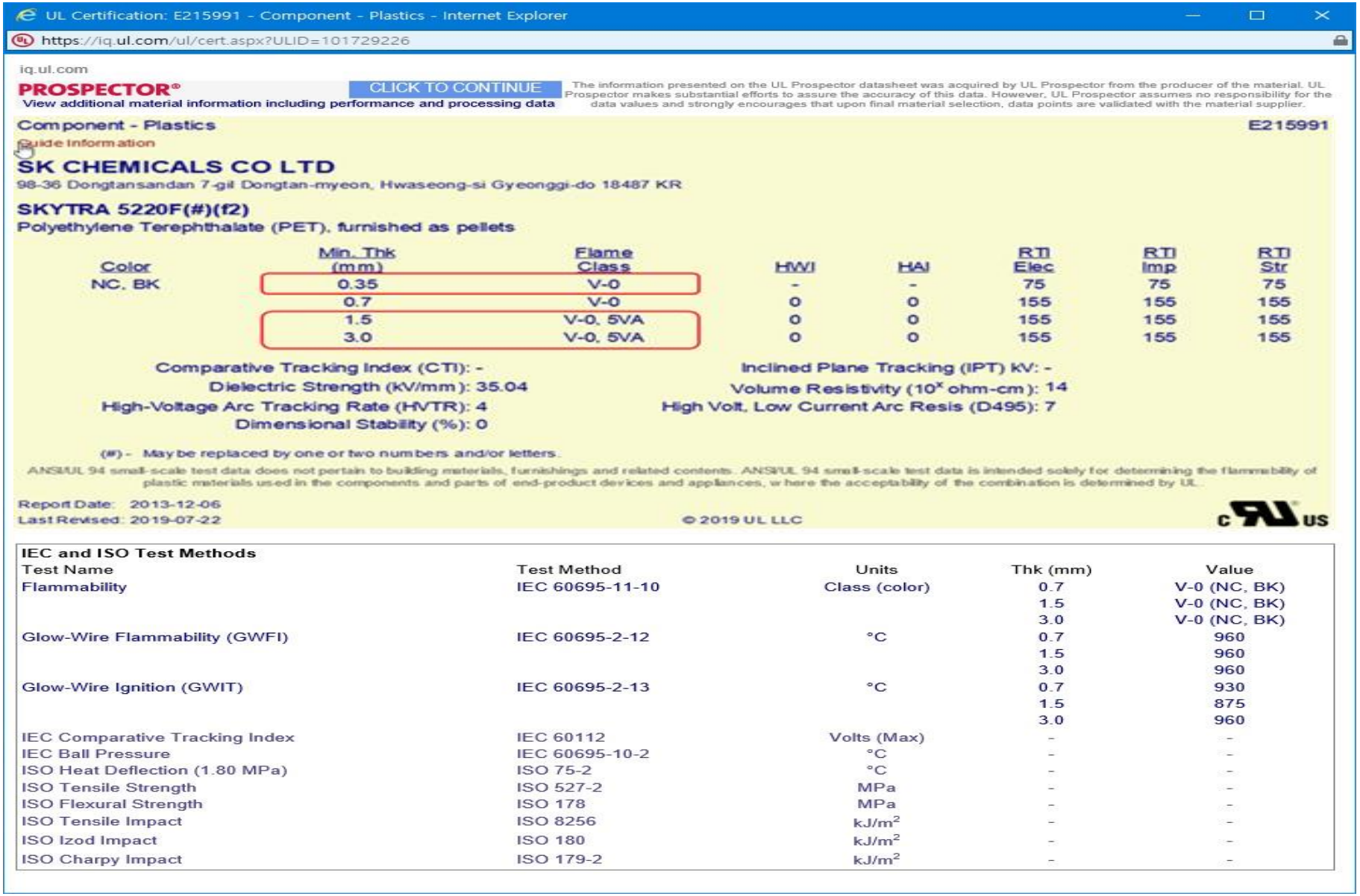
IEC and ISO Test Methods

Test Name	Test Method	Units	Thk (mm)	Value
Flammability	IEC 60695-11-10	Class (color)	0.7	V-0 (NC, BK)
			1.5	V-0 (NC, BK)
			3.0	V-0 (NC, BK)
Glow-Wire Flammability (GWFI)	IEC 60695-2-12	°C	0.7	960
			1.5	960
			3.0	960
Glow-Wire Ignition (GWIT)	IEC 60695-2-13	°C	0.7	930
			1.5	875
			3.0	960
IEC Comparative Tracking Index	IEC 60112	Volts (Max)	-	-
IEC Ball Pressure	IEC 60695-10-2	°C	-	240
ISO Heat Deflection (1.80 MPa)	ISO 75-2	°C	-	-
ISO Tensile Strength	ISO 527-2	MPa	-	-
ISO Flexural Strength	ISO 178	MPa	-	-
ISO Tensile Impact	ISO 8256	kJ/m^2	-	-
ISO Izod Impact	ISO 180	kJ/m^2	-	-
ISO Charpy Impact	ISO 179-2	kJ/m^2	-	-

Thermal Properties (f2)

SKYTRA



UL Certification: E215991 - Component - Plastics - Internet Explorer

https://iq.ul.com/ul/cert.aspx?ULID=101729226

iq.ul.com

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View additional material information including performance and processing data

The information presented on the UL Prospector datasheet was acquired by UL Prospector from the producer of the material. UL Prospector makes substantial efforts to assure the accuracy of this data. However, UL Prospector assumes no responsibility for the data values and strongly encourages that upon final material selection, data points are validated with the material supplier.

Component - Plastics E215991

Guide Information

SK CHEMICALS CO LTD

98-36 Dongtansandan 7-gil Dongtan-myeon, Hwaseong-si Gyeonggi-do 18487 KR

SKYTRA 5220F(#)(f2)

Polyethylene Terephthalate (PET), furnished as pellets

Color	Min. Thk (mm)	Flame Class	HWI	HAI	RTI Elec	RTI Imp	RTI Str
NC, BK	0.35	V-0	-	-	75	75	75
	0.7	V-0	0	0	155	155	155
	1.5	V-0, 5VA	0	0	155	155	155
	3.0	V-0, 5VA	0	0	155	155	155

Comparative Tracking Index (CTI): -

Dielectric Strength (kV/mm): 35.04

High-Voltage Arc Tracking Rate (HVTR): 4

Dimensional Stability (%): 0

Inclined Plane Tracking (IPT) kV: -

Volume Resistivity (10^x ohm-cm): 14

High Volt, Low Current Arc Resis (D495): 7

(#) - May be replaced by one or two numbers and/or letters.

ANSI/UL 94 small-scale test data does not pertain to building materials, furnishings and related contents. ANSI/UL 94 small-scale test data is intended solely for determining the flammability of plastic materials used in the components and parts of end-product devices and appliances, where the acceptability of the combination is determined by UL.

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Test Name	Test Method	Units	Thk (mm)	Value
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			1.5	V-0 (NC, BK)
			3.0	V-0 (NC, BK)
Glow-Wire Flammability (GWFI)	IEC 60695-2-12	°C	0.7	960
			1.5	960
			3.0	960
Glow-Wire Ignition (GWIT)	IEC 60695-2-13	°C	0.7	930
			1.5	875
			3.0	960
IEC Comparative Tracking Index	IEC 60112	Volts (Max)	-	-
IEC Ball Pressure	IEC 60695-10-2	°C	-	-
ISO Heat Deflection (1.80 MPa)	ISO 75-2	°C	-	-
ISO Tensile Strength	ISO 527-2	MPa	-	-
ISO Flexural Strength	ISO 178	MPa	-	-
ISO Tensile Impact	ISO 8256	kJ/m^2	-	-
ISO Izod Impact	ISO 180	kJ/m^2	-	-
ISO Charpy Impact	ISO 179-2	kJ/m^2	-	-

Processing Guidelines

Processing Guidelines

	Units	Condition	Remarks
Mold Temperature	℃	120	▷ For oil heater - Temperature range : 100 ~ 140 ℃
Melt Temperature **Nozzle** **Front** **Middle** **Rear**	 ℃ ℃ ℃ ℃	 265 ~ 275 270 ~ 280 265 ~ 275 255 ~ 265	▷ Hot Runner : 260 ~ 330 ℃
Screw Speed	rpm	50 ~ 150	
Back Pressure	bar	3 ~ 20	
Injection Pressure	Bar	50 ~ 500	
Drying Temperature & Time	℃, h	120℃, 5 ~ 6 120℃, Overnight	▷ Dehumidified dryer, dew point of dry air : -30 ℃, -40 ℃ is better for good drying
Moisture Content, Max.	%	< 0.03% (300ppm)	

*** Effects of Moisture (insufficient drying)**

- Degradation of Base Resin & any additives
- Adverse effect of the color of the final product
- Difficult control of the processing parameters such as melt pressure, rheology, and power consumption
- Bubble and silver streaks

*** It is better to reduce injection speed just at the gate (It would be helpful to decrease gate blush issue.)**

We care for the future

Healthcare, Earthcare

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