

DuPont 99XB

LEAD-FREE SERIES - HEATED GLASS COMPOSITIONS

Technical Data Sheet

Product Description

DuPont 99XB Series is provided for use in production of electrically heated backlights by the "direct" (unplated) method. The pastes can be blended with each other to obtain a wide range of electrical resistance.

Product Benefits

- Dark fired color
- High green strength
- Cadmium-free and lead-free*
- Low sensitivity to firing temperature
- Supplied ready to print

*Cadmium and lead "free" as used herein means that cadmium and lead are not intentional ingredients in and are not intentionally added to the referenced product. Trace amounts however may be present.

Processing

Blending

In order to obtain a specific resistance value, the pastes can be blended with each other. A table showing sheet Resistivity vs. silver content (%) and Density vs. silver content (%) is attached. The data in this table can be used to determine blend recipes for specific heated window designs.

Printing Parameters

Screen mesh size: 150 - 250 per inch
Emulsion thickness: 15 - 25 μm
Emulsion type: terpene resistant
Enamel compatibility: Air Dried and some UV

Drying

Allow printed paste to dry to desired green strength at 125°C.

Firing

Average Glass Surface

Temp : 600 - 670°C over enamel
: 600 - 700°C over glass.

Furnace atmosphere: Solvent and sulphite free

Soldering

Burnish: Steel Wool or Fiberglass
Flux: Type R - rosin
Connector: Cu Clip or Braid pref. pretinned

Test Procedure

Typical fired properties listed on table 1, are based on laboratory tests, using the following conditions:

Printing : 156 mesh polyester screen, 20 μm emulsion

Firing : 12 minute cycle, 5 zone belt furnace, peak temp. of 640°C

Adhesion Test: Soldered copper clip, 70Pb/27Sn/3Ag, reflow with flame

Substrate: 2"x4" soda lime silicate glass, 4 mm thick.

Storage and Shelf Life

Containers should be stored, tightly sealed, in a clean, stable environment at room temperature (<25°C). Shelf life of material in unopened containers is six months from date of shipment. Some settling of solids may occur and compositions should be thoroughly mixed prior to use.

Composition Properties

Test	Properties		
Pastes	9903B	9912B	9915B
Silver Content (%)	78.7	69.4	58.2
Solids (%)	83.2	75.4	63.6
Density (g/cc)	3.8	3.0	2.2
Viscosity (Pa.S) [Brookfield #7 @ 20 rpm]	40 - 50	25 - 35	25 - 35
Thinner	DuPont 9450		
Typical Fired Properties			
Resistivity Typical (Ω /ft)	1.0 - 1.4	2.9 - 5.9	4.0 - 8.0
Typical (m Ω /sq)	2.5 - 3.5	6.3 - 11.3	10.0 - 20.0
Rel. Range (\pm %)	15	29	33
SR($\mu\Omega$ -cm)	3.2	9.0	14.0
Fired thickness (μ m)			
Range	10 - 14	8 - 12	8 - 12
Typical	12	10	10
Line Width (μ m)	350 - 800		
Color	Light-brown		
Air side color	Dark brown		
Tin side color			
Solder metallurgy	60Pb/27Sn/3Ag/10Bi		
20 - 350°C/5 sec	70Pb/27Sn/3Ag		
320 - 400°C/5 sec			
Adhesion (kg force)	50	45	40
Typical for clip			

Table 1 shows anticipated typical physical properties for DuPont 99XXB based on specific controlled experiments in our labs and are not intended to represent the product specifications, details of which are available upon request.



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99XXB Pb Free Blend Densities and Rs



	Gardco WG-SS-83.2 Cup Wt. (g)	Gardco WG-SS-8.32 Cup Wt. (g)	Paste Density (g/cc)	Ag (%)	Nominal Rs (Ω /ft)	Nominal Rs (m Ω /sq)	Nominal SR ($\mu\Omega$ -cm)
9903B	316.2	31.6	3.80	78.7	1.2	3.0	3.2
90:10	309.5	31.0	3.72	77.8	1.4	3.4	3.5
80:20	302.8	30.3	3.64	76.8	1.5	3.8	3.9
70:30	296.2	29.6	3.56	75.9	1.7	4.3	4.4
60:40	289.5	29.0	3.48	75.0	1.9	4.8	4.8
50:50	282.9	28.3	3.40	74.1	2.2	5.4	5.4
40:60	276.2	27.6	3.32	73.1	2.4	6.1	6.0
30:70	269.6	27.0	3.24	72.2	2.7	6.8	6.6
20:80	262.9	26.3	3.16	71.3	3.1	7.7	7.3
10:90	256.3	25.6	3.08	70.3	3.5	8.7	8.1
9912B	249.6	25.0	3.00	69.4	3.9	9.8	9.0
90:10	242.9	24.3	2.92	68.3	4.1	10.3	9.4
80:20	236.3	23.6	2.84	67.1	4.3	10.8	9.8
70:30	229.6	23.0	2.76	66.0	4.6	11.4	10.3
60:40	223.0	22.3	2.68	64.9	4.8	12.0	10.7
50:50	216.3	21.6	2.60	63.8	5.1	12.7	11.2
40:60	209.7	21.0	2.52	62.6	5.3	13.4	11.7
30:70	203.0	20.3	2.44	61.5	5.6	14.1	12.3
20:80	196.4	19.6	2.36	60.4	5.9	14.9	12.8
10:90	189.7	19.0	2.28	59.2	6.3	15.7	13.4
9915B	183.0	18.3	2.20	58.1	6.6	16.5	14.0

	Gardco WG-SS-83.2 Cup Wt. (g)	Gardco WG-SS-8.32 Cup Wt. (g)	Paste Density (g/cc)	Ag (%)	Nominal Rs (Ω /ft)	Nominal Rs (m Ω /sq)	Nominal SR ($\mu\Omega$ -cm)
9903B	316.2	31.6	3.80	78.7	1.2	3.0	3.2
90:10	302.8	30.3	3.64	76.6	1.4	3.6	3.7
80:20	289.5	29.0	3.48	74.6	1.7	4.2	4.3
70:30	276.2	27.6	3.32	72.5	2.0	5.0	5.0
60:40	262.9	26.3	3.16	70.5	2.4	5.9	5.8
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10:90	196.4	19.6	2.36	60.2	5.6	13.9	12.1
9915B	183.0	18.3	2.20	58.1	6.6	16.5	14.0



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Safety and Handling

For Safety and Handling information pertaining to this product, read the Material Safety Data Sheet (MSDS).

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