



# DM2995P/J204

LEAD (Pb)-FREE SEALING  
SEALING GLASS PASTE

## PRODUCT DATA SHEET

### I. DESCRIPTION

UNIMEC DM2995P/J204 sealing glass paste is designed to hermetically seal low thermal expansion materials such as silicon, alumina, Kovar, borosilicate and soda lime glasses at temperatures as low as 480°C. UNIMEC DM2995P/J204 is a fine particle-sized lead-free sealing glass paste, which allows for thinner, uniform bondline thickness in certain applications. The paste comprises a lower temperature Pb-free glass powder loaded in a unique organic system which burns out completely during glazing.

UNIMEC DM2995P/J204 paste can be screen-printed, stencil-printed or dispensed. It is glazed to the substrate at 500°C. The glazed surface is mated to the other component under slight pressure and fired at a peak temperature ranging from 480 to 520°C for as little as 2 minutes to achieve a reliable, hermetic seal.

### II. KEY FEATURES

- Very fast processing – as little as one minute as glazed film
- Hermetic seals achieved at temperatures **as low as 480°C**
- Low thermal expansion (**6.4 ppm/°C**)
- High adhesion to most surfaces, including glass, gold, silicon and alumina
- Proprietary, clean burning organic system
- Excellent rheology for screen printing or dispensing
- Twelve month shelf life at room temperature

### III. APPLICATIONS

UNIMEC DM2995P/J204 is designed for low temperature hermetic sealing of ceramic, glass, semiconductor and metal parts. Applications include:

- Wafer bonding for wafer-level packaging (WLP) of MEMS and other devices
- Attaching Kovar and ceramic lids to packages
- Attaching glass and quartz windows to packages
- Attaching lenses or fibers to optical assemblies

#### IV. TYPICAL PROPERTIES

Parameter	Value	Unit	Note / Condition
<b>Paste Properties (before glazing)</b>			
Appearance	Light green	--	
Particle size	3 or less	microns	Average
	TBD	microns	Median
	15	microns	Maximum
Density	3.0	g/cc	
Solids content	80.0 to 84.0	%	
Viscosity	58,000 to 110,000	centipoise	25°C, 10 rpm, Brookfield RVT viscometer
Thixotropic index	3.5	--	10 / 50 rpm, 25 °C
Shelf life	12	months	25 °C. See Storage guidelines
<b>Dispensing / Printing</b>			
Screen mesh size	80 to 230	--	
Line thickness (wet)	5 ± 2	mils	
	125 ± 50	microns	
Aspect ratio, width to thickness	3	--	Minimum
	4.5 or greater	--	Preferred
<b>Interlayer Drying (not needed for single-layer printing)</b>			
Drying temperature	100	°C	
Drying time	10 to 15	minutes	
<b>Organic Burnout</b>			
Temperature ramp rate	≤ 5	°C/minute	Room temp to peak temp. See Figure 1
Peak dwell temperature	250	°C	See Figure 1
Dwell time at peak temperature	30 to 60	minutes	See Figure 1
<b>Glazing</b>			
Temperature ramp rate	30 to 60	°C/minute	Room temp to peak temp. See Figure 1
Peak dwell temperature	500 +/- 5	°C	See Figure 1
Dwell time at peak temperature	1	minute	See Figure 1
Line thickness (after glazing)	2 to 5	mils	
	50 to 125	microns	

## TYPICAL PROPERTIES (continued)

Parameter	Value	Unit	Note / Condition
<b>Sealing</b>			
Temperature ramp rate	50	°C/minute	Minimum
	100 or greater	°C/minute	Preferred
Peak dwell temperature	480 to 520	°C	See Table 1, Figure 2
Dwell time at peak temperature	2 to 10	minutes	See Table 1, Figure 2
Pressure	3 to 6	psi	Applied to paste area
	21 to 41	kPa	
<b>Glass Properties (after sealing)</b>			
Appearance	Green		
Adhesion, shear	3,000	psi	0.25" Si to alumina
	20.7	MPa	6.35 mm Si to alumina
Young's Modulus	80	GPa	
Poisson's ratio	0.26		
Softening temperature	430 to 440	°C	DTA – Differential Thermal Analysis
Glass transition temperature (T <sub>g</sub> )	360	°C	
Coefficient of Thermal Expansion (CTE)	6.4	ppm/°C	25 to 150 °C
Density	5.4	g/cc	
Helium leak rate, MIL-STD-883F, Method 1014	<10 <sup>-9</sup>	atm-cc/sec	With suitable seal design
Dielectric constant	15	--	1 MHz, 25 °C
Volume Resistivity	TBD	Ω-cm	50 °C

## V. STORAGE AND HANDLING

Store UNIMEC DM2995P/J204 in a cool, dry place away from direct sunlight. It does not require cold storage. The paste jar lid must be securely fastened to prevent solvent leakage or evaporation.

If UNIMEC DM2995P/J204 is allowed to stand for a long time, ingredients may settle out. Prior to use, mix completely but gently until the paste is uniform, avoiding entrapping air. You may use a square-tipped metal spatula or stirrer such as the Fisher Scientific model 14-375-20. Jars of UNIMEC DM2995P/J204 should not be excessively mixed nor continuously rolled, as doing so may affect its viscosity.

UNIMEC DM2995P/J204 is supplied ready to use. Thinning is not recommended.

## VI. PROCESSING GUIDELINES

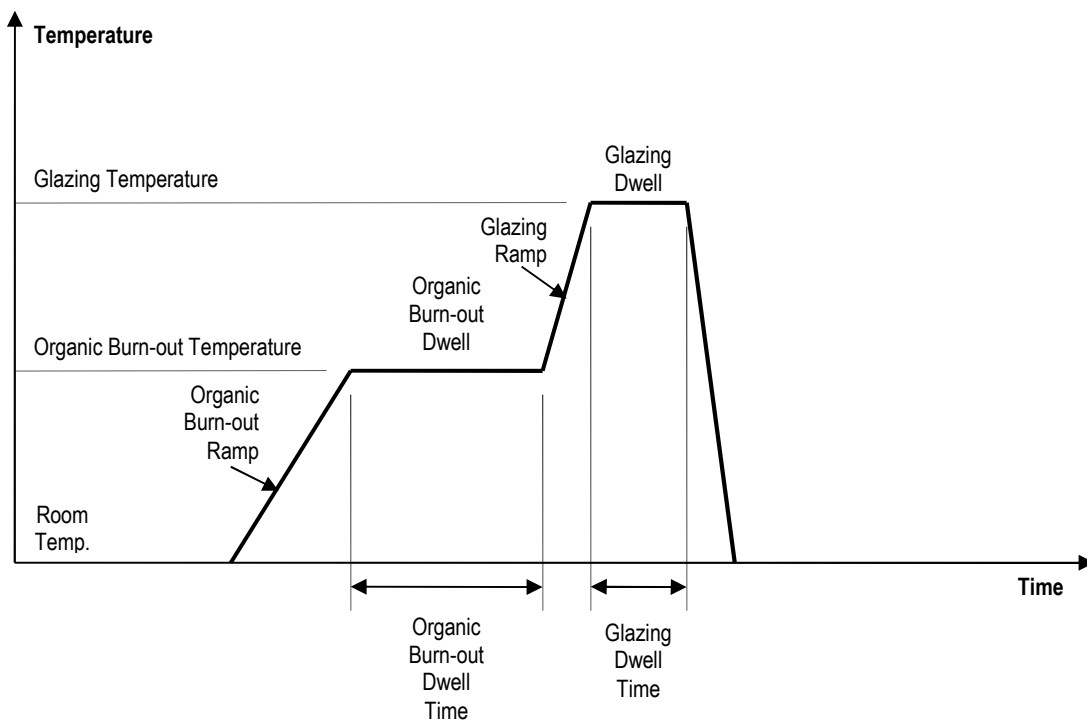
UNIMEC DM2995P/J204 paste can be screen-printed, stencil-printed, or dispensed. It is then dried and glazed to the substrate at 500°C. The glazed component is mated to the other component under slight pressure and fired at a peak temperature ranging from 480 to 520°C for as little as 2 minutes to achieve a reliable, hermetic seal.

Please refer to section IV, Typical Properties, above and the graphs and table below.

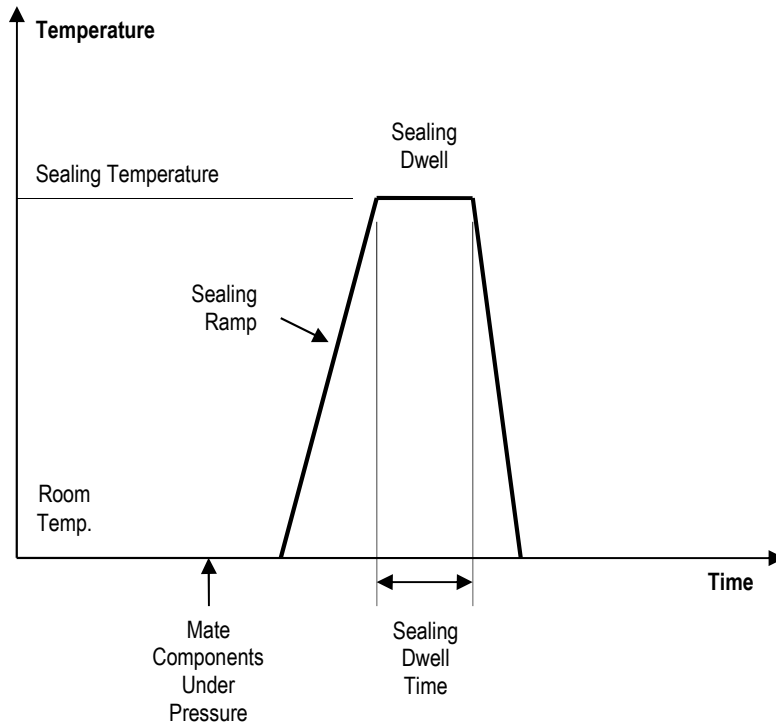
Depending on line width and thickness, paste may be dispensed or printed in one pass. Sometimes, a second layer must be printed over a first layer. In this case, the first layer printed must be dried before printing the second layer. A typical drying profile is 10 minutes at 100°C.

UNIMEC DM2995P/J204 requires an organic burn-out (OBO) step before glazing. The product being glazed may return to room temperature between OBO and glazing, but the preferred process is to transfer directly from OBO to glazing, as shown in Figure 1.

**Figure 1:** Organic Burn-out and Glazing Profile for UNIMEC DM2995P/J204



**Figure 2:** Sealing Profile for UNIMEC DM2995P/J204



**Table 1:** Sealing Time and Temperature Options (select one)

Sealing Parameter	Option A	Option B	Option C	Unit
Peak temperature	480	500	520	°C
Dwell time	10	5	2	minute

Glazing and sealing profiles may vary depending on the size and thermal properties of the components being processed. Clean, dry air atmosphere is preferred. Nitrogen atmosphere may require higher process temperatures or longer process times. Vacuum atmosphere should be avoided. For sealing Si wafer onto glass wafer, Namics recommends low CTE glass wafer such as Corning Pyrex<sup>®</sup> 7740 or SCHOTT AF 32<sup>®</sup> eco.

## VII. CONTACT INFORMATION

For more information on UNIMEC DM2995P/J204 and other Namics products contact:

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