

1 DESCRIPTION

DM2995PF is a new lead-free (Pb-free) glass preform material designed for assembling and hermetically sealing small optical and electronic components. The components being sealed do not require metallization. The glass adheres well to a wide variety of metals, glasses, ceramics, and semiconductor materials. The preforms are pressed from a proprietary glass powder into a wide variety of shapes and sizes and then sintered. The sintering process provides green strength for the assembly operation and removes all organic residue. There is essentially no outgassing during or after the sealing process.

2 APPLICATIONS

- Lenses in lens holders or package walls
- Lids and windows
- Fiber V-groove assemblies
- Sensor wires

3 KEY FEATURES

- **Hermetic seals** achieved at temperatures as low as 480 °C
- **No lead (Pb) or Pb-containing compounds**
- **No metallization** required – *replaces solder* at a lower cost
- **No flux required** – can be processed in **ambient atmosphere**
- **Low thermal expansion (6.4 ppm/°C)**
- **High adhesion** to many materials including glass, Au, Si, & Al₂O₃
- **No measurable outgassing** during or after sealing

4 COMPATIBLE MATERIALS

DM2995 preforms are compatible with a wide range of materials used in packaging semiconductors and optoelectronics, including:

Metals	Glasses	Semiconductors	Ceramics
Aluminum	Borosilicate	Silicon	Alumina
Copper	Pyrex	Gallium Arsenide	Aluminum Nitride
Gold	Quartz	Indium Phosphide	Boron Nitride
Invar	Silica	Silicon Carbide	Sapphire
Kovar	Soda lime		
Nickel			
Stainless steel			
Tungsten			

5 TYPICAL PROPERTIES

Parameter	DM2995PF	Unit	Note / Condition
Density of sealed glass	5.4	g/cc	
Glass Transition temperature (T _g)	362	°C	
Young's modulus	8.16 x 10 ⁵	kg/cm ²	
Coefficient of Thermal Expansion (CTE)	6.4	ppm/°C	25 to 150°C
Sealing temperature	480 – 520	°C	At preform
Temperature ramp rate	>50	°C/minute	At preform
Helium leak rate	<10 ⁻⁸	atm-cc/sec	Based on MIL-STD-883, METHOD 1014 *
Color after firing	Opaque, green	–	
Dielectric constant	15	–	1 MHz, 25°C
Volume resistivity	TBD	Ω-cm	50°C

* Open-face leak test based on MIL-STD-883, Method 1014, using a He probe spray and a Veeco MS-170 helium leak detector.

6 PACKAGING AND STORAGE

The preforms are packaged in small vials or boxes depending on their size. They may be stored in standard ambient conditions of room temperature and relative humidity between 40 and 60%.

7 PREFORM SIZES

DM2995PF preforms are available in a wide variety of sizes and shapes, including circular, oblong, and rectangular. Please refer to our preform selection guide, which is available at www.diemat.com. Application-specific designs can be tooled for a modest charge.

Because of its higher T_g and melting point, DM2995PF preforms are not recommended for sealing small-diameter glass fibers; DM2700PF preforms are recommended for these applications.

8 SEALING METHODS

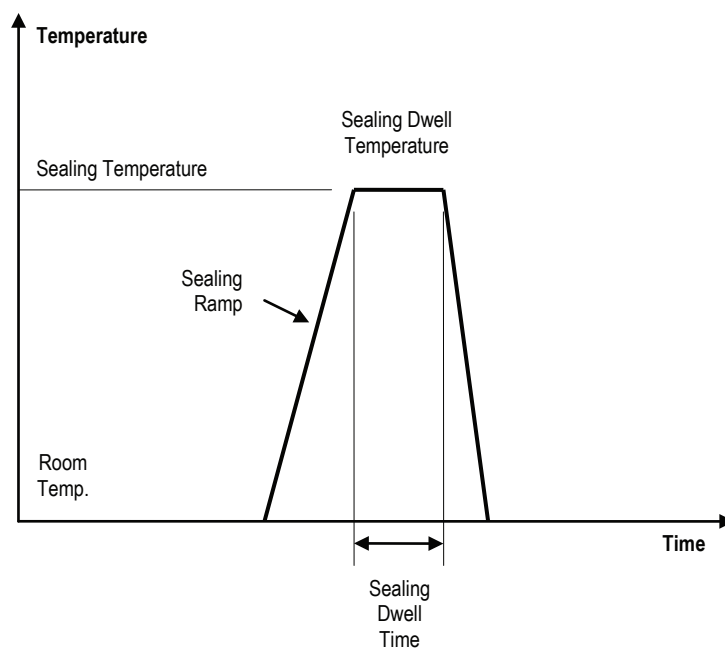
1. **RF induction heating** the metal component. This method is the most common and has the advantage of rapid, localized heating of a ferrule or tube, providing it is metal. (Glass and ceramic do not absorb RF energy.)
2. **Resistance heating** the component through electrodes. This provides localized heating, but parts must be electrically conductive.
3. **Hot air, torch, or microflame.** These provide localized heating, and the component does not need to be electrically conductive. Note that air currents could cause the preform to move before melting.
4. **Resistance-heated iron or jacket.** This method is not as localized.
5. **Laser.** Defocusing or scanning would assure heating both preform and part.

6. **Hot plate.** This method is not as localized.
7. **Radiant heating,** for example via a wire filament. This can provide relatively localized heating of arbitrary shapes, as the filament can be formed to match the geometry of the components to be assembled.
8. **Oven.** The whole assembly must be heated.

9 SEALING AND ASSEMBLY

To assemble components, place them together with the preform in or adjacent to the joint. Rapidly heating the preform to the sealing temperature will result in a hermetic seal within minutes, depending on the sealing temperature. When assembling lids or windows on packages, slight pressure may be necessary.

Sealing temperature profiles will vary depending on the materials and dimensions of parts being joined. The following table shows profiles that can be used as starting points in developing a sealing profile for a specific application. Use any one of the options, or an intermediate temperature/time combination.



Sealing Parameter	Option A	Option B	Option C	Unit
Temperature ramp rate	50 (minimum)			°C/minute
Peak temperature	480	500	520	°C
Dwell time at peak temp.	3	2	1	Minutes

10 MORE INFORMATION

For more information DM2995PF and other Namics products, contact:

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