DIEMAT

A NAMICS COMPANY

DM2700PF

LOW TEMPERATURE GLASS PREFORMS

1 DESCRIPTION

DM2700PF is a family of **low temperature** glass preforms designed for assembling and **hermetically sealing** small optical and electronic components. Applications include sealing glass optical fibers in a metal package **without fiber metallization**. The preforms adhere 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 no measurable outgassing during or after the sealing process. DM2700PF seals at temperatures as low as 320°C.

2 APPLICATIONS

- Optical fibers in ferrules or tubes
- Ribbon fiber
- Fiber V-groove assemblies
- Fiber couplers/splitters
- Lids and windows
- Lenses in lens holders or package walls

3 KEY FEATURES

- **Hermetic seals** achieved at temperatures **as low as 320 °C**
- ***No fiber metallization*** required – ***replaces solder*** at a lower cost
- ***No flux required*** – can be processed in ***ambient atmosphere***
- ***Creep resistant*** – maintains precise alignment of fibers and lenses
- ***High adhesion*** to many materials including glass, Au, Si, & Al_2O_3
- ***High reliability*** – used in products meeting Telcordia GR-468
- ***No outgassing*** during or after sealing

4 COMPATIBLE MATERIALS

DM2700 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	DM2700PF	Unit	Note / Condition
Density of sealed glass	7.6	g/cc	
Glass Transition temperature (Tg)	215	°C	
Young's modulus	6.33×10^5	kg/cm^2	
Coefficient of Thermal Expansion (CTE)	7.7	ppm/°C	25 to 150°C
Sealing temperature	320 – 375	°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, greenish brown	–	
Dielectric constant	71	–	1 MHz, 25°C
Volume resistivity	$>10^9$	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

DM2700PF 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.

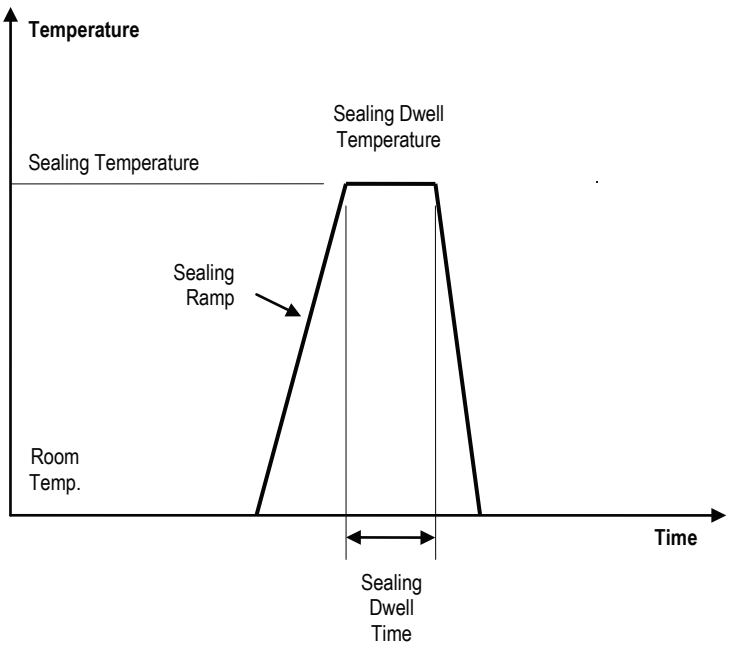
8 SEALING METHODS

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.) An Ameritherm HOTSHOT 1 heater with a part number 018-1482 coil, using a 75 mA current for 15 seconds, is suitable for sealing optical fibers to metal ferrules with many types of DM2700PF preforms.
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 and seal components, place them together with the preform in or adjacent to the joint. For example, to seal an optical fiber, thread the ring-shaped preform over the end of the fiber so that the preform rests on top of the ferrule or tube. Rapidly heating the preform to the sealing temperature will result in a hermetic seal within a few seconds, depending on the sealing temperature. When assembling lids or windows on packages, slight pressure might be applied.

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	320	350	375	°C
Dwell time at peak temp.	30	20	15	Seconds

10 MORE INFORMATION

For more information DM2700PF and other Diemat products, contact:

Diemat, Inc. ▪ 19 Central Street ▪ Byfield, MA 01922 USA
Phone: +1 978-499-0900 Fax: +1 978-499-8484
Email: info@diemat.com www.diemat.com

Revised: 111711