N4000-12

Application Bulletin- Processing

N4000-12 Processing Best Practices

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Scope

This bulletin describes the best practices we recommend for use when processing the N4000-12 substrate materials.

Best Practices

1. Prepreg Storage:
   - Store Prepreg in a temperature and humidity controlled environment (<21ºC [68ºF] and <50% RH)
   - Keep prepreg in bags until needed
   - Reseal opened bags of unused prepreg

2. Dry inner layer details after oxide
   - Bake signal layers at 110ºC (230ºF) for 30 minutes minimum
   - Bake power / ground layers at 110ºC (230ºF)for 60 minutes
   - Use inner layers within 8 hours of drying. Rebake layers if not used within 24 hours.

3. Lamination Cycle:
   - Vacuum: apply vacuum of 1 torr maximum (28.5” Hg) minimum) for 15 minutes before applying heat and pressure
   - Heat rise measured from 83° -139°C (180º-280ºF)
     - ➢ Ideal heat rise is 3.9º - 4.4°C (7º - 8ºF)
     - ➢ A heat rise of 2.3º - 5.6º C (4º- 10ºF) is acceptable.
   - Pressure: KISS pressure cycle (optional)
     - ➢ Initial pressure of 3.5 bar (50psi). Ramp to full pressure when product is between 90°C and 100°C (194º-212ºF) at the rate of 5 bar /min (72 psi. min)
     - ➢ Full pressure of 15 to 22.4 bar (225-325 psi)
   - Cure Cycle
     - ➢ 75 minutes at 193°C (380ºF)
     - ➢ Do not allow product temperature to exceed 201°C (395ºF)
     - ➢ Cool to < 127ºC (260ºF) at a rate <4ºC/min (7ºF/min)

4. Drilling
   - Contact Nelco for drilling parameters. Small hole drill speeds based on 425 sfpm cutting speed
   - Use new drills
   - Limit hit count to 1000 hits
   - Use undercut drills for the smaller holes below 0.48 mm (.0185")
   - Recommend using lubricated entry or backup materials (Mitsubishi LE Sheet or LCOA Slick Back)
   - Recommend peck drilling for boards >2.5 mm (>0.100") in thickness

5. Post Drill Conditioning (Optional stress relief process to minimize crazing)
   - Place panels in stacks of less than 1" height between weighted steel plates.
   - Bake in an oven @ 356ºF (180ºC) for 2 - 4 hours.
   - Cool below 275°F (135°C) at under 8°F/min (4°C/min)

6. Resin smear removal
   - Plasma desmear followed by a mild permanganate desmear is the preferred process.
     Crazing can be minimized by optimizing the exposure times in each of these processes.
   - Plasma process
     - Dry boards at 110°C (220ºF) for 60 minutes before plasma processing. ***(Moisture in the holes can contribute to crazing)***
     - Preheat boards to 71ºC (160ºF) to improve the uniformity of plasma attack.
     - Typical plasma desmear conditions are as follows:
       - Temperature: 80±2ºC
       - Gas mixture: 10% CF_4, 80% O_2, 10% N_2
       - Power: 4000W
       - Time: 25-30 minutes
   - Permanganate process
     - Minimal solvent swell and permanganate etch should be utilized per the following table

	Type	Temp(ºF)	Temp (ºC)	Time
Option 1	Butyl carbitol / hydroxide	173±5	78±2	4-6 min
Note: Cyclic Amine (NMP) solvent swell is not recommended for N4000-12				
	Alkaline permanganate	170±5	77±2	6-8 min
Note: Hydroxyl content should be controlled to 1 N ±.05N (40g/l for NaOH)				