



# CTD-101G

## Cryogenic, Alumina Filled, Anhydride Cured Epoxy

CTD-101G is a specially formulated, radiation resistant resin system with alpha phase filler whose content can be varied between 50 - 75% by weight. The system is supplied as a three part system with the filler pre-mixed into the resin and the hardener. Once mixed, the epoxy can be used for resin transfer molding, magnet potting, filament winding or vacuum transfer processes.

### Special features of CTD-101G:

- Filler Content can be varied for customized Thermal / Mechanical Properties.
- Cure Options: With minimal loss of performance
  - 5 hrs at 110 °C + 16 hrs at 120 °C ( post cure)
  - 5 hrs at 110 °C + 2.0 hrs at 160 °C ( post cure)
  - 1.5 hrs at 135 °C
- Lower viscosity and longer pot life than most commercially available potting resins.
- High resistance to radiation induced damage.
- Excellent performance at temperatures from 4K to 400K.
- Low toxicity and good handling characteristics.

### Physical Properties

|                  |                      |         |
|------------------|----------------------|---------|
| Temperature      | 60 °C                | 110 °C  |
| Viscosity (cP)   | 23,000               | 2,000   |
| Pot Life         | 8 hrs                | 1.5 hrs |
| Specific Gravity | 67% filler by weight | 2.2     |



**Thermal / Mechanical Properties:** (at 76 K, calculated with ROM)

CTE (\*) =  $10 - 30 \text{ e}^{-6} / ^\circ\text{C}$     Thermal Conductivity (\*) =  $< 10 \text{ W/mK}$

(\*) can be varied with filler content.

## Performance of CTD-101G

### Dimensional Stability with Radiation Exposure: 67% filler by weight

| Product  | Dose (MRAD) | Irradiation Temperature [K] | Change in Diameter [%] | Change in Length [%] | Change in Mass [%] |
|----------|-------------|-----------------------------|------------------------|----------------------|--------------------|
| CTD-101G | 0           | 4                           | 0                      | 0                    | 0                  |
|          | 2900        | 4                           | -0.10                  | -1.08                | -0.26              |
|          | 16400       | 4                           | -0.12                  | -0.98                | -2.27              |
|          | 0           | 330                         | 0                      | 0                    | 0                  |
|          | 970         | 330                         | 0.24                   | -0.20                | -0.26              |
|          | 9700        | 330                         | -0.83                  | -0.95                | -0.78              |

### Performance with Cryogenic Irradiation: 67% filler by weight

| Product  | Property [Torsion]   | Test Temp | Dose (MRAD) | Irradiation Temperature | Value |
|----------|----------------------|-----------|-------------|-------------------------|-------|
| CTD-101G | Shear Strength [MPa] | 76K       | 0           | 4                       | 168   |
|          |                      | 76K       | 2900        | 4                       | 147   |
|          |                      | 76K       | 16400       | 4                       | 25    |
|          | Modulus [GPa]        | 76K       | 0           | 4                       | 8.1   |
|          |                      | 76K       | 2900        | 4                       | 7.9   |
|          |                      | 76K       | 16400       | 4                       | 4.6   |
|          | Strain [radians]     | 76K       | 0           | 4                       | .028  |
|          |                      | 76K       | 2900        | 4                       | .024  |
|          |                      | 76K       | 16400       | 4                       | .006  |



**Performance with Elevated Temperature Irradiation: 67% filler by weight**

| Product  | Property [Torsion]   | Test Temp | Dose (MRAD) | Irradiation Temperature [C] | Value |
|----------|----------------------|-----------|-------------|-----------------------------|-------|
| CTD-101G | Shear Strength [MPa] | 76K       | 0           | 60                          | 168   |
|          |                      | 76K       | 970         | 60                          | 131   |
|          |                      | 76K       | 9700        | 60                          | 50    |
|          | Modulus [GPa]        | 76K       | 0           | 60                          | 8.2   |
|          |                      | 76K       | 970         | 60                          | 7.6   |
|          |                      | 76K       | 9700        | 60                          | 7.6   |
|          | Strain [radians]     | 76K       | 0           | 60                          | 0.028 |
|          |                      | 76K       | 970         | 60                          | 0.022 |
|          |                      | 76K       | 9700        | 60                          | 0.019 |