



## POLYESTER RESIN, GLASS FIBER REINFORCED - INJECTION MOLDING COMPOUND

ESB-M3D127-A

### 1. SCOPE

The material defined by this specification is a glass fiber reinforced polyester resin injection molding compound with good mechanical and thermal resistance properties, excellent moldability and first surface paintability.

### 2. APPLICATION

This specification was released originally for material used to manufacture grille opening panels.

### 3. REQUIREMENTS

#### 3.0 STANDARD REQUIREMENTS FOR PRODUCTION MATERIALS

Material suppliers and part producers must conform to the Company's Standard Requirements For Production Materials (WSS-M99P1111-A).

##### 3.1.1 Process Potential and Capability

Short-term process potential study must be conducted using 25 subgroups from one lot, and submitted to the Product Materials Engineering Office prior to production start-up.

Long-term process capability study must be conducted using a sample made up of one subgroup from each of 25 production lots, and submitted to the Product Materials Engineering Office.

##### 3.1.2 Standard Deviation Estimate

Using the existing sample size, estimate the process standard deviation (the estimate is known as "sigma hat"), found by dividing the average of the subgroup ranges (for periods with the ranges in control) by a constant d2 varying by sample size, as shown in the partial table below:

|    |      |      |      |      |      |
|----|------|------|------|------|------|
| n  | 6    | 7    | 8    | 9    | 10   |
| d2 | 2.53 | 2.70 | 2.85 | 2.97 | 3.08 |

| Date       | Action   | Revisions                                         |
|------------|----------|---------------------------------------------------|
| 2004 10 26 | Revised  | Inserted 3.0; Deleted 3.1, 3.2, 3.3, 3.6, 3.7 & 4 |
| 1986 12 09 |          | Revised & Retyped CA01-RD161116                   |
| 1978 09 11 | Released | AJ1-6000-41                                       |





### 3.4 MOLDED TEST SPECIMENS

#### 3.4.1 Preparation of Test Specimens

##### 3.4.1.1 Preparation of Test Specimens for Short-term Process Potential Study

All test specimens shall be prepared from injection molded plaques with a thickness of 2.54 +/- 0.25 mm. Prepared specimens must show no evidence of fiber tear or loose fiber strands protruding from the specimens.

In each of the following tests (para 3.4.10, 3.4.11, 3.4.12 and 3.4.13) a minimum of 6 specimens are to be evaluated. Three of the specimens are to be oriented in any one direction with the other three perpendicular to the first set. The numerical average of the 6 specimens shall meet the minimum average

##### 3.4.1.2 Preparation of Test Specimens for Long-term Process Capability Study

All test specimens shall be prepared from injection molded production parts or from injection molded plaques formed in the mold with the production part. When tests are required on molded production parts, the location from which test specimens are to be taken will be shown on the engineering drawing. When no location for testing is specified, test specimens shall be taken from random locations on the part where the dimensions, shape and size permit fabrication of test specimens for evaluation by the specified method. A minimum of 6 specimens are to be evaluated in each subgroup to meet the requirements of 3.4.10 (Tensile Strength).

|       |       |                                                     |
|-------|-------|-----------------------------------------------------|
| 3.4.2 | Color | Natural or as specified on the engineering drawing. |
|-------|-------|-----------------------------------------------------|

|       |                                                |     |
|-------|------------------------------------------------|-----|
| 3.4.3 | Glass Fiber Content, by weight,<br>Average min | 20% |
|-------|------------------------------------------------|-----|

Test Method: Weigh each of three 645 mm<sup>2</sup> test specimens randomly selected from different locations (at least 150 mm apart) on the test plaque or part. Place the specimens in tared crucibles and ignite in a muffle furnace maintained at 425 +/- 5 °C for 30 min. Increase temperature to 650 +/- 28 °C for 60 min. Cool slowly to 23 +/- 2 °C and weigh the residues. Boil the glass fibers and filler residue in a 5% by volume hydrochloric acid solution for 15 min.

If the hydrochloric acid solution does not completely dissolve the filler residue, alternate reagents should be used until all fillers are removed. Rinse the glass fibers several times with distilled water before drying in an oven for 2 h at 120 +/- 2 °C. After cooling, weigh the crucibles and calculate the percent fiberglass as follows:

$$\text{Wt. \% Glass Fbr.} = \frac{\text{wt. of washed glass fibers residue}}{\text{original wt. of specimen}} \times 100$$

Note: Those suppliers who determine percent glass fiber content by volume must convert this value to percent by weight.