

**PHENOLIC (PF), 55% GLASS AND MINERAL FILLED,
COMPRESSION AND/OR TRANSFER MOLDING
COMPOUND****WSS-M3D182-A****1. SCOPE**

The material defined by this specification is a mineral and glass filled thermosetting compression molding compound based on acid catalyzed phenolic resin.

2. APPLICATION

This specification was released originally for material used for thrust washers used in automatic transmission torque converters.

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).

3.4 MOLDING COMPOUND**3.4.1 Filler Content**

3.4.1.1	Ash Content (ISO 3451/1, Method A, 1 h at 650 +/- 25 °C)	53 - 59%
3.4.1.2	Glass Fiber Content, by weight	20 - 23%

Test Method: Glass content cannot be separated from the total ash content. The raw materials supplier's control plan must be reviewed to ensure that the proper amount of glass is adequately controlled during processing.

3.5 MOLDED TEST SPECIMEN**3.5.1 Preparation of Test Specimens**

Unless otherwise specified all tests shall be carried out on compression molded test specimens.

The following dimensions are required:

- A. 150 min x 10 x 4.0 +/- 0.2 mm
- B. 60 x 60 x 2.0 +/- 0.2 mm
- C. 355 x 100 x 1.0 +/- 0.1 mm (ISO 3795)
- D. 150 x 10 x 4.0 +/- 0.2 mm (ISO 3176, Type 1A)

Date	Action	Revisions
2005 01 05	Revised	Inserted 3.0; Deleted 3.1, 3.2, 3.3, 3.7, 3.8 & 4; Corrected numbering 3.5.10
1998 04 15	Activated	D. Honkanen T. Koch



Test specimen A shall be molded using molding conditions defined by the manufacturer of raw material. Specimens with shorter dimensions shall be cut from the center of the specimen A and/or D. No annealing allowed.

3.5.2	Density (ISO 1183, Method A)	1.78 - 1.83 g/cm ³
3.5.3	Tensile Strength at Max Load, min (ISO 527-1 and ISO 527-2, 150 min x 10 x 4.0 +/- 0.2 mm specimen D, test speed: 5 mm/minute)	40 MPa
3.5.4	Flexural Modulus, min (ISO 178, 80 x 10 x 4.0 +/- 0.2 mm specimen [use center section of specimen A], 2 mm/minute test speed, 64 mm support span)	13 GPa
3.5.5	Flexural Strength, min (ISO 178, 80 x 10 x 4.0 +/- 0.2 mm specimen [use center section of specimen A], 2 mm/ minute test speed, 64 mm support span)	85 MPa
3.5.6	Compressive Strength, min (ISO 604, 10 X 10 X 4.0 +/- 0.2 mm specimen [use center section of specimen A], test speed: 1 mm/minute or 5 mm/ minute)	215 MPa
3.5.7	Shear Modulus at 23 °C, min (ASTM D 5279, forced constant amplitude, fixed frequency of 1 Hz +/- 15%, strain level below 1%. Specimen approximately 60 x 10 x 4.0 +/- 0.2 mm cut from the center of specimen A. Specimen length between clamps 35 - 40 mm. Soak time at each temperature interval - 3 minutes min)	4730 MPa

Additionally, a shear modulus versus temperature curve shall be plotted for -50 to +280 °C temperature range, at 5 °C min intervals. The plotted curve must be within tolerance range granted on the original material approval and it shall constitute the reference standard for materials supplied to this specification and shall be kept on file at the designated material laboratory and be available on request.

3.5.8	Impact Strength, Izod, min (ISO 180/1A, 63.5 x 10 x 4.0 +/- 0.2 mm specimen [use center section of specimen A and/or D], 10 specimens for each test)	
3.5.8.1	At 23 +/- 2 °C	2.0 kJ/m ²
3.5.8.2	At -40 +/- 1 °C	16 kJ/m ²

The test specimen must be conditioned for min of 6 h at the above specified temperature prior to impact test. Low temperature testing shall be done within the cold chamber, if not possible, test may be conducted outside, but within 5 s.