



# IPC-TM-650 TEST METHODS MANUAL

**1.0 Scope** This method is designed to determine the resin content of a prepreg without removing the resin from the reinforcement. The basis weight of the fabric must be known. This method is applicable to both organic and inorganic reinforcements.

**Note:** For referee testing of prepregs with inorganic reinforcement, Method 2.3.16 shall be used.

## 2.0 Applicable Documents

**IPC-EG-140** Specification for Finished Fabric Woven from "E" Glass for Printed Boards

**IPC-SG-141** Specification for Finished Fabric Woven from "S" Glass

**IPC-A-142** Specification for Finished Fabric Woven from Aramid for Printed Boards

**IPC-QF-143** Specification for Finished Fabric Woven from Quartz (Pure Fused Silica) for Printed Boards

## IPC-TM-650

Method 2.1.6.1, Weight of Fabric Reinforcements

Method 2.3.17, Resin Flow Percent of Prepreg

Method 2.3.19, Volatile Content of Prepreg Materials

## 3.0 Test Specimens

**3.1 Size** Specimens shall be 101.6 mm x 101.6 mm [4.0 in x 4.0 in]. If the reinforcement is a continuous fiber woven fabric, the sides shall be cut on a bias to the orientation of the fabric.

**3.2 Quality and Sampling** Unless otherwise specified, three specimens shall be taken equally spaced across the width (web) of a roll or from different locations in a predetermined quantity of paneled prepreg, such as an inspection lot. If specimens are to be used for Resin Flow Percent (TM 2.3.17), then four specimens shall be used, cut from adjacent points in a roll or cut panels (see 6.4).

## 4.0 Apparatus or Material

**4.1** Analytical balance, capable of weighing to the nearest milligram (0.001 gram).

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**4.2** Static shield (a thin piece of metal, e.g., 7 oz./sq. ft. copper foil 5 in x 5 in (127 mm x 127 mm) or larger). This is not needed if the balance pan is larger than the specimen.

**4.3** Sample cutting apparatus—die cut press, or equivalent, capable of cutting specimens to the specified size.

**4.4** Desiccator capable of maintaining an atmosphere less than 30% R.H. at 23°C [73°F].

**Note:** Do not use vacuum or other means which would be capable of removing solvent or resin fractions.

## 5.0 Procedure

**5.1 Preconditioning** Unless the prepreg is tested within 10 minutes of production the specimen shall be desiccated for a minimum of 4 hours. For referee testing, the specimens shall be desiccated.

**5.2 Test Conditions** The test shall be performed at standard laboratory conditions. For materials which absorb moisture rapidly, care should be taken to insure that moisture content is not significant by measurement immediately after removal from desiccation.

## 5.3 Measurement

**5.3.1** Place the static shield on the balance pan.

**5.3.2** Zero the balance.

**5.3.3** If applicable, remove the specimens from the desiccator. Place the specimens together on the balance, insuring that they sit entirely on the balance pan, or the static shield if needed (see 6.4).

**5.3.4** Determine and record the weight of the specimens to the nearest 0.1g. For prepregs of nominal 0.15 mm [0.006 in] thickness and less, weigh to the nearest 0.001g.

## 5.4 Calculations

**5.4.1** Determine the basis weight of the fabric using one of the methods of Appendix A.

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**5.4.2** Calculate the Resin Content (RC) of the material from the treated weight (TW) and the basis weight (BW) of the fabric for 41,290 mm<sup>2</sup> [64 in<sup>2</sup>]. The basis weight may be determined by any suitable method in Appendix A.

$$RC = \left(1 - \frac{BW}{TW}\right) \times 100$$

where:

RC = Resin Content in %

BW = weight of the fabric as determined in accordance with Appendix A

TW = treated weight from 5.3.4.

## 5.5 Report

**5.5.1** Report the Resin Content to the nearest .1%.

**5.5.2** Report the method used to determine the basis weight of the reinforcement.

**5.5.3** Report any anomalies in the test or any variations from the specified procedures or tolerances

## 6.0 Notes

**6.1** The solvent or volatile content of the prepreg (excluding moisture) is considered part of the treated weight using this method. If it is desired to exclude solvent content, the specimen should be vacuumed for an appropriate time and temperature.

**6.2** The accuracy of this method for determination of resin content is dependent primarily upon the accuracy of the basis weight and the consistency of the reinforcement.

**6.3.** The effect of static charges may present a serious problem in weighing material which has been stored if the sample is larger than the sample pan.

**6.4** If it is desired to check variation across the web the individual specimens may be weighed separately or 4 specimens may be cut down the web at each location to be tested.

**6.5 Desiccator Conditions** The Test Methods Task Group determined that a great majority of test laboratories are unable to consistently hold the Relative Humidity in a desiccator to less than 20%. Based on data from participating company lab management, the lowest practically feasible RH for use with the affected IPC Test Methods is 30% maximum.

## Appendix A

**Determination of Basis Weight of Reinforcement** All the following methods consider any finishes applied to the fabric as part of the fabric. In most cases, the level of organic material is negligible; however, special considerations have to be made for material such as greige goods, which have substantial amount of organic (5% or more), and for organic fabrics which may have significant moisture content.

Methods shown are based on four specimens, with a total area of 41,290 mm<sup>2</sup> [64.0 in<sup>2</sup>].

**Method 1** Determine the Basis Weight from the actual length, width and weight of the roll.

$$BW = 806.4 \frac{WR}{L \times W}$$

BW = Basis Wt in g

WR = Roll weight in lb.

L = Roll length in yds.

W = Roll width in in.

**Method 2** Determine the Basis Weight from median statistical or typical fabric weight in oz/yd<sup>2</sup>

BW = 1.40 W

BW = Basis wt in g

W = Weight of 1 yd<sup>2</sup> in oz.

**Method 3** Determine the Basis Weight from the actual fabric weight at the beginning of the roll, using Method 2.1.6.1.

**Method 4** Determine the Basis Weight from the reported weight supplied by the manufacturer.

BW = 1.40W

BW = Basis Wt in g

W = Weight of 1 yd<sup>2</sup> in oz

**Method 5** Determine the Basis Weight by consulting the unit weight tables in the applicable documents; see 2.0.