



***When testing thickness of plastic packaging films, how do you know what specifications to use for the pressure foot and diameter of the measuring foot?***

This is not an easy question.

ASTM recently revised test method F-2251, Standard Test Method for Thickness Measurement of Flexible Packaging Material.

The new method references ASTM D 6998 “Standard Guide for Determination of Thickness of Plastic Film Test Specimens” as the guide for recommending foot diameter and foot pressure.



### Some terms to understand:

- **Pressure foot or upper anvil:** a metal circular upper/moving weight which exerts pressure on the film sample.
- **Lower anvil:** a circular metal base where the film sample is compressed during a test.
- **Parallelism:** the flatness of the pressure foot and lower anvil surfaces when compressed together.
- **Foot pressure:** the amount of force/dead weight of the pressure foot measured in kPa or PSI.

- **Accuracy:** the maximum error allowed in the measurement device- usually 1 micron (0.0393 mils)
- **mils-** a unit of measure for plastic films and other sheet materials- 1 mil = 0.001 inch.

Industries such as paper, tissue paper, corrugated board or textiles have well defined specifications listed in the applicable standard. However, plastic film standards such as ASTM D 6988 and ISO 4593 suggest a range for the diameter and foot pressure based on the stiffness and thickness of the material.

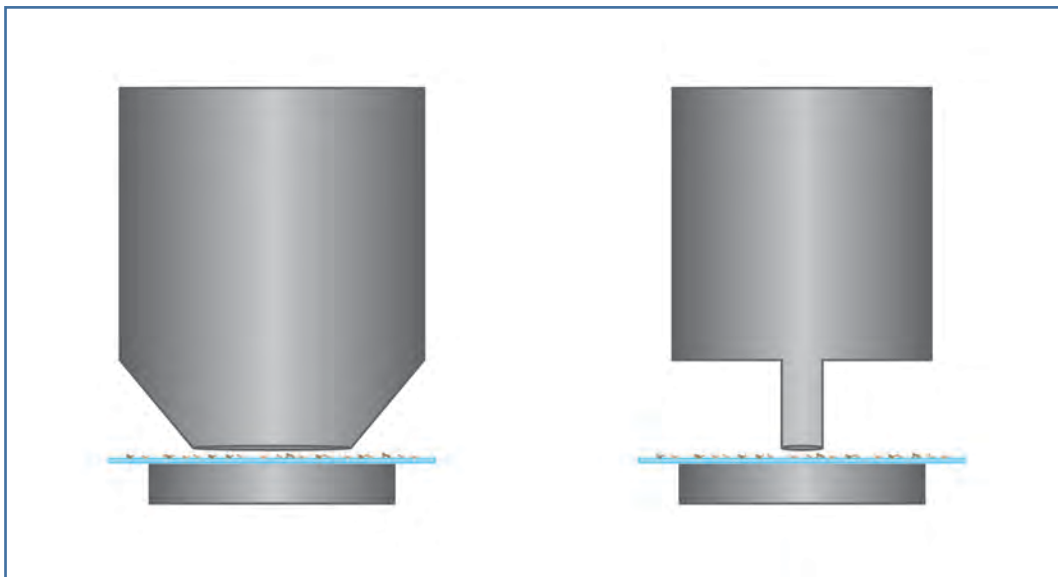
## Questions:

### 1. *Is the material considered a thin or deformable film? What are thin films?*

Thin films are  $\leq 0.025$  mm (0.001 in.). Deformable films are easily compressible and a lower contact foot pressure is recommended.

If the requirement is to test thin films then a maximum pressure of 70 kPa (10 psi) is suggested. If the material is not classified as a thin film then a foot pressure range of 160-185 kPa (23-27 PSI).

A pressure foot with a large area is difficult to calibrate and maintain parallelism between the pressure foot and the anvil. Also a large diameter pressure foot is difficult to keep clean (*as seen in the following illustration*).



Any dust or dirt on the film will be measured during the test. During a measurement, dust can adhere to the upper and lower foot and produce a higher reading. This is a very common problem with thickness measurements.

### 2. *What diameter pressure foot is recommended for plastic films?*

According to ASTM D 6988, the diameter ranges from 3.2- 12.7 mm (0.125-0.5 inch). ISO 4593 recommends a diameter of 2.5 -10mm (0.098- 0.393 inch).

3. ***What is the recommended pressure for plastic films?***

ASTM D 6988 has a range of 5-70 kPa (0.73-10.1 PSI) for thin films and 160-185 kPa (23-27 PSI) for stiffer films.

ISO recommends a pressure range of 0.5-1.0 N (51-102 gram) dead weight.

**Instruments:**



TMI Model **49-56-00-0003** is configured with a 10 mm diameter/12.5 kPa (0.393 inch/1.81 PSI) pressure foot and meets both ASTM D 6988 and ISO 4593.



TMI Model **49-86-00-0006** is configured with a 6.35 mm diameter/31 kPa (0.25-inch diameter/4.5 PSI) pressure foot and meets ASTM D 6988 and ISO 4593.

The above two units feature light weight pressure suitable for testing compressible and non-compressible plastic films.

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