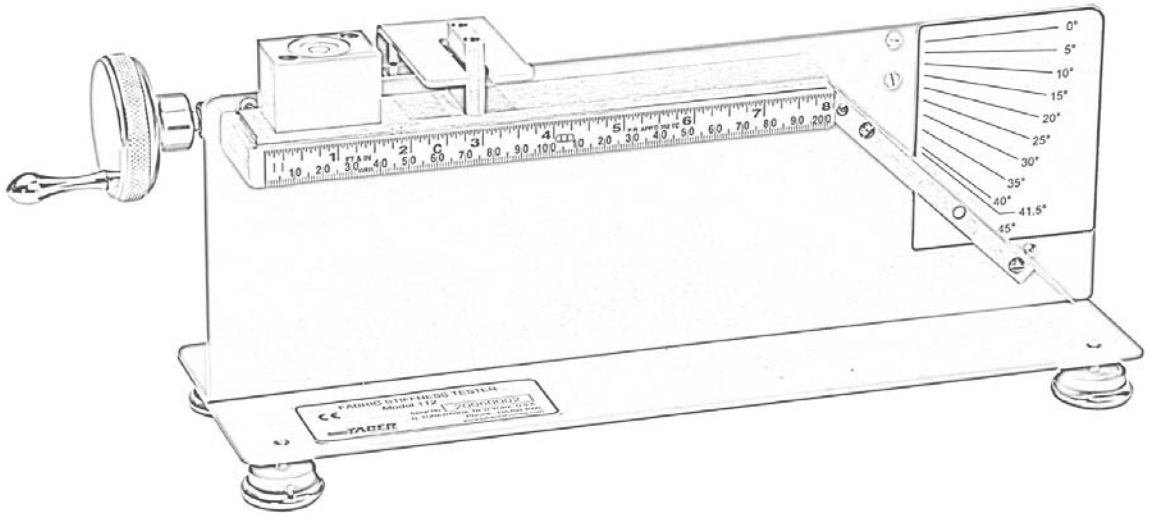
Taber® Fabric Stiffness Tester

Model 112



** Image shows optional hand crank*

Operating Instructions

TABER® INDUSTRIES

ISO 9001:2000 CERTIFIED

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We use extreme care in selection, checking, and packing to eliminate the possibility of error. If a shipping error is discovered:

1. Carefully examine the packing materials and ensure nothing was inadvertently overlooked when the shipment was unpacked.

2. Notify the company you purchased the product from and immediately report the shortage. The materials are packed at the factory, and should be complete if the box has not been opened.

3. Claims should be filed within 30 days from shipment.

CLAIMS FOR DAMAGES

Claims for loss or damage in transit should be made promptly and directly to the transportation company.

ICONS

This instruction manual contains several notes and warnings that should be observed carefully by the user. The following icons denote these notes and warnings:

Indicates a ***NOTE*** that warrants careful attention. These notes may detail a step in the procedure or point out a unique feature of the instrument. Please read and follow all notes carefully.

Indicates a ***WARNING*** that warrants careful attention. These warnings inform the user of any dangers that may cause injury to the operator and/or damage to the instrument. It is imperative that you please read and follow all warnings carefully.

CONTENTS

Contents of the shipping container should include the following:

- *Fabric Stiffness Tester – Model 112*
- *Specimen Slide Assembly*
- *Operating Instructions*

INTRODUCTION

Fabric Stiffness Tester Model 112 provides a quick and accurate method of determining stiffness properties such as flexural rigidity and drape characteristics of fabric and other flexible materials. Ideal for testing most textile fabrics and non-woven materials, this tester may also be useful in evaluating similar characteristics of leather, paper, plastic films, and other flexible sheet materials. Textiles may be untreated or treated, including those that are heavily sized, coated, resin-treated or otherwise treated.

In general, this instrument is more suitable for testing woven fabrics than knit fabrics and is not suitable for very limp fabrics or those that show a marked tendency to curl or twist at a cut edge.

PRODUCT DESCRIPTION

Simple to use, the Fabric Stiffness Tester Model 112 is a rugged instrument based on a design described in internationally recognized test standards, including:

ASTM D1388
ASTM D5732
BS 3356
DIN 53362
ISO 9073-7
JIS L-1096

Employing the principle of cantilever bending, a rectangular specimen is supported on a smooth low-friction horizontal platform with a 41.5° or 45° slope at one end. A weighted slide is placed on the specimen. The operator manually advances the slide across the platform at a constant rate of speed. As the leading edge of the specimen projects from the platform, it bends under its own mass. Once the material flexes enough to touch the bend angle indicator, the test is stopped. The length of the overhang is measured and flexural rigidity and bending modulus can be calculated.

PRODUCT FEATURES

The features of the Model 112 Fabric Stiffness Tester include:

- Adjustable bend angle indicator for inclined angles of either 41.5° (0.724 rad) or 45° (0.785 rad) below the plane of the platform surface.
- Easy-to-read bend angle reference scale with 5° graduations.
- Adjustable leveling feet.
- Overhang unit scale calibrated in both metric and English units.
- Specimen slide assembly with integrated leveling bubble.
- OPTIONAL: Precision hand crank speed control advances a screw-driven slide, offering an economical solution for controlling the rate of sliding (see Figure 2) [reference part number 980112-1].

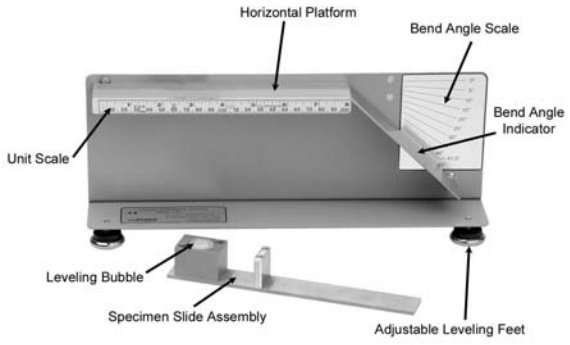

Figure 1

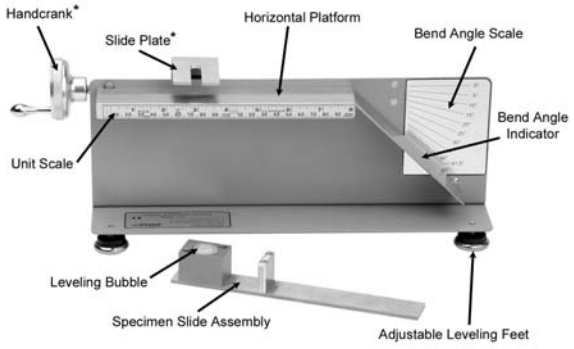

Figure 2

** Optional Feature*

INSTRUMENT SET-UP

Remove contents from the shipping container and verify that you have all the components.

General Set-Up

1. Set the instrument on a flat, rigid surface.
2. Place the specimen slide assembly on the top of the horizontal platform. If your instrument includes the hand crank, ensure the specimen slide assembly is aligned within the slide plate (see Figure 3).

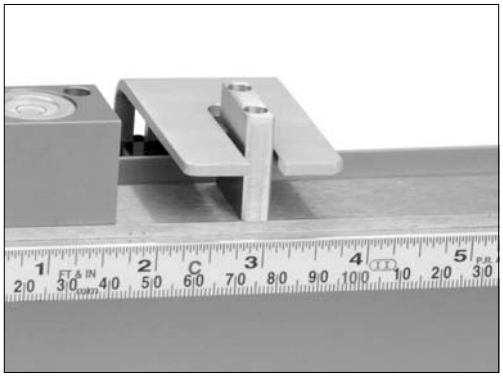

Figure 3

3. Using the leveling bubble on the specimen slide assembly as a guide, adjust the leveling feet such that the platform is horizontal. If the bubble is centered, no adjustment is necessary (see Figure 4).

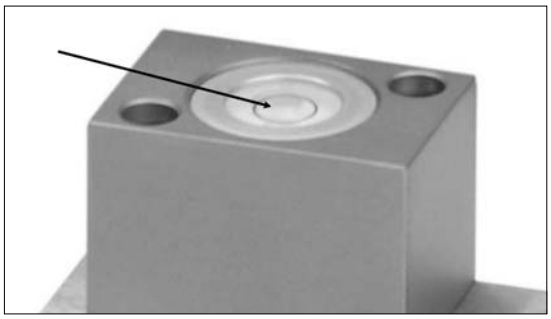

Figure 4

NOTE: To achieve repeatable results, the instrument must be level.

SPECIMEN PREPARATION

As you start your testing, use of these guidelines should assist you in developing a test procedure that will yield reproducible test results, accurate within the variations of quality inherent in the material itself.

- The suggested number of test specimens from each laboratory sampling unit is a minimum of 3 machine direction (lengthwise) and 3 cross-machine direction (widthwise).
- Using a sharp die (or other appropriate device) cut each specimen 25 x 200 mm ±1 (1 x 8 inch ±0.04).
- All specimens should be labeled to maintain specimen identity. DO NOT affix a label with adhesive or tape.
- Prior to testing, specimens should be conditioned for at least 24 hours in a standard laboratory atmosphere.

NOTE: Avoid samples taken close to the edge. Ensure all specimens are free of folds, creases, and wrinkles.

NOTE: Consider the long dimension of the specimen as the direction of the test. Cut the specimens to be used for the measurement of machine direction with the longer dimension parallel to the machine direction. For testing cross-machine direction, cut the specimens with the longer dimension parallel to the cross-machine direction. Be certain to cut straight with respect to thread orientation.

WARNING: A material's inherent grain or weave may affect the stiffness of the product. It is recommended these be tested in both the machine and transverse directions.

TESTING PROCEDURES

The procedure outlined below is based on ASTM D1388[1]:

1. Remove the specimen slide assembly.
2. Determine the appropriate angle for your test and position the bend angle indicator accordingly. The angle can be changed by removing and repositioning the two fastening screws (see Figure 5).

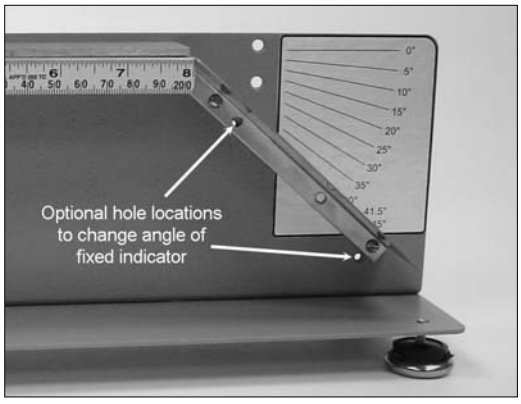

Figure 5

[1] ASTM D1388, *Standard Test Method for Stiffness of Fabrics*

3. For instruments equipped with the hand crank speed control feature, depress the button to disengage the slide plate from the screw. Manually return the slide plate to its original start position.

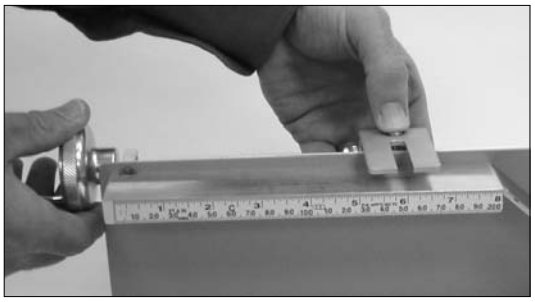

Figure 6

4. Place a specimen on the horizontal platform with the side to be evaluated facing up and length parallel to the platform edge. Align the right edge of the specimen with the edge of the horizontal platform (8 inch marking).
5. Place the specimen slide assembly on the specimen, taking care not to change the position of the specimen. If using the optional hand crank feature, the specimen slide assembly must be positioned within the slide plate (see Figure 3).
6. To commence testing, push the slide forward in a smooth manner at approximately 120 mm per minute (4.75 inch per minute) ±5%. For instruments with the optional hand crank speed control, turn the crank at approximately 95 ±5 rpm. This will move the specimen, allowing for it to project from the platform toward the slope.

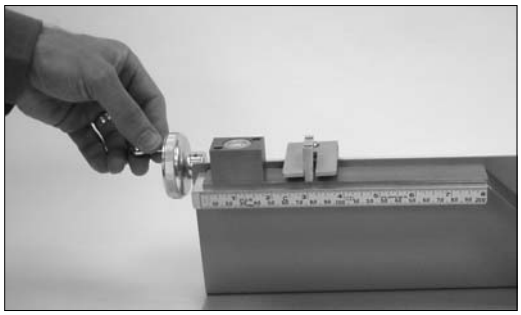

Figure 7

Continue until the leading edge of the specimen contacts the indicator angle. If the specimen has a tendency to twist, take the reference point at the center of the leading edge.

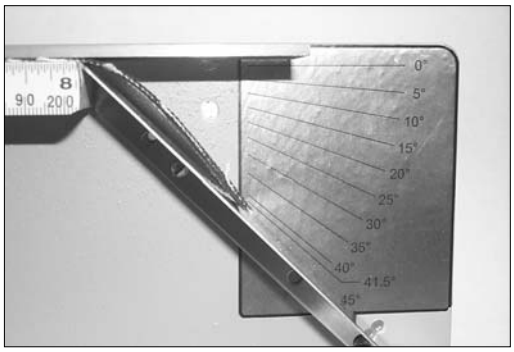

Figure 8

7. Determine the overhang length by taking the unit scale reading where the left edge of the specimen slide assembly is positioned. Record to the nearest 1 mm (1/32 inch).
8. For each specimen, test the face and back of both ends of each specimen for a total of four (4) readings per specimen.

CALCULATION OF RESULTS

For comparable and reproducible tests, it is recommended that all testing be performed under conditions covered by an established test procedure.

NOTE: Bending length reflects the stiffness of a fabric when bent in one plane under the force of gravity.

NOTE: In some cases, it may be of interest to differentiate between the sides of the fabric. For these instances, average the readings separately.

NOTE: The stiffer the material, the longer it takes to bend. Thus, a higher number represents a stiffer material.

Length of Overhang, Individual Specimens – For each test specimen, average the four readings to the nearest 1 mm. The values for machine (length) and cross-machine (width) direction should be calculated separately.

Bending Length – Using the mean length of overhang results (O), calculate the bending length to the nearest 1 mm. The value for machine (length) and cross-machine (width) should be calculated separately.

$$c = O / 2$$

Where c = bending length, mm
O = length of overhang, mm

Fexural Rigidity – Flexural rigidity is the work per unit width required to bend a fabric to unit radius of curvature and is typically a measure of stiffness associated with hand. Using the appropriate values, calculate the flexural rigidity (G) in µjoule/m separately in the warp and weft directions by the following formula:

$$G = 1.421 \times 10^{-5} \times W \times c^3$$

Where G = flexural rigidity, µjoule/m
W = fabric mass per unit area, g/m^2
c = bending length, mm

NOTE: The formula stated in historic versions of ASTM D1388 described force rather than work. The above formula was adopted in 2008 such that the definition is consistent with the corrected calculations for flexural rigidity.

Bending Modulus – This value is independent of the strip tested and may be defined as the intrinsic stiffness of the fabric. For its calculation, the thickness of the specimen must be calculated at a pressure of 1 lb/in^2. A fabric thickness tester must be used for this purpose. The bending modulus (in kg/cm^2) is then given by the following formula:

$$\text{Bending Modulus} = \frac{12G \times 10^{-6}}{g_2^3}$$

Where g_2 = cloth thickness in cm
G = flexural rigidity

INFLUENCES ON RESULTS

For comparable and reproducible tests, it is recommended that all testing be performed under conditions covered by an established test procedure.

The following factors could potentially impact your test results:

- Storage Conditions (i.e. length of time of storage and how stored)
- Specimen Conditioning
- Material influences (i.e. type and thickness of specimen surface treatment)

According to a study conducted by ASTM International, no evidence has been found showing that bending length is dependent on the width. The tendency for specimens to curl or twist will affect the result because of the rigidity provided at the edge. Consequently, the wider the strip the less important is the edge effect.

DATA SHEET

The following section provides a brief guideline on developing a data sheet and information that should be included.

Tested By: Print the name of the test technician.

Signature: For authenticity, have the test technician sign here.

Date: Indicate the date the test was performed.

Product: Indicate or describe the product or type of material being tested.

Notes: Add any special test procedures or other general notes.

Sample No.: For traceability, it is recommended that all test specimens be issued a sample number and that the sample number be recorded here.

Test No.: It is recommended that all tests on a particular specimen be issued a sequential test number and that test number be recorded here.

Overhang Length: Enter the overhang length with the corresponding specimen orientation.

Final Measurement: Record the stiffness property here (e.g. bending length; flexural rigidity).

Data Sheet#: Indicate the sequential data sheet number here, for your records.

MAINTENANCE

The Fabric Stiffness Tester Model 112 is a precision instrument and if used and maintained properly should give you many years of trouble-free service. As with any precision test instrument, basic common sense care will ensure a long life from your Fabric Stiffness Tester.

General Care

- To prevent the nuts from being dislodged from the instrument, do not overtighten the fixed plate indicator fasteners.
- Avoid sliding the moveable slide across the horizontal platform with no specimen in place.
- If necessary, the bearing assembly of the screw-driven slide on instruments equipped with the hand crank speed option may be lubricated with a silicone type spray lubricant.

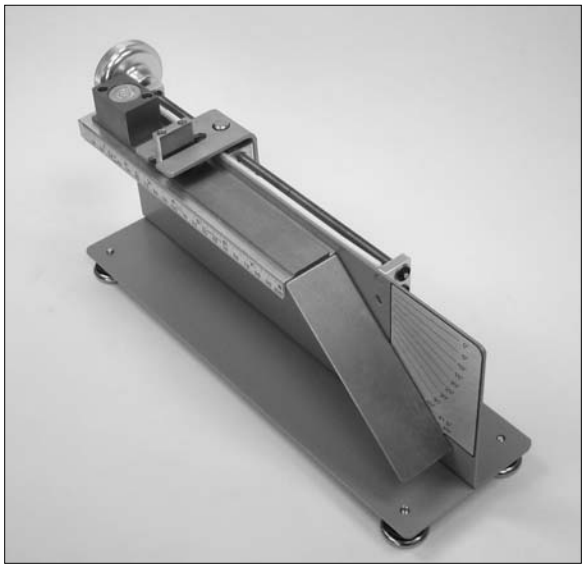

Figure 9

CALIBRATION / FACTORY SERVICE

Should your Fabric Stiffness Tester require calibration, repair, or adjustment, carefully pack the instrument in a rugged container with adequate cushioning material. After obtaining a return authorization number from the factory, the unit should be shipped, transportation charges prepaid, to Taber Industries.

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