



Md. Moniruzzaman
Assistant Professor
Department of Textile Engineering, KUET

Reasons for Textile Testing

- Checking the quality and suitability of raw material and selection of material.
- Assessment of final product, whether the quality is acceptable or not, (how will be the yarn performance in weaving? etc).
- Monitoring of production i.e. process control.
- Product development and research.
- Investigation of faulty materials (analysis of customer complaint, identification of fault in machine etc.).
- Specification testing: Specifications are formed and the materials are tested to prove whether they fall within the limits allowed in the specification (e.g. specified by a customer).

Objective of Testing:

1. Research: The results of testing in research will help the scientist to decide which route to follow next. What appears to be sound theory is often disproved by experiment and other lines of reasoning must then be pursued.

2. Selection of Raw material: Raw material is a relative term. The raw material of spinner is the fibre. The raw material of the weaver is yarn and that of the finisher is cloth . There may be variation in their quality.

Fibers may be vary in length, Colour, fineness, and strength etc.

The testing of fibers is generally not so important when dealing with MMF because they are supplied to customer's requirements and their properties including length, colour and fineness are determined and controlled during their manufacture.

3. Process Control :

Spinning → Weaving → Dyeing → Finishing.

End breakage should be controlled by controlling weight per lap length, sliver length, roving length or yarn length. Weaving process should be controlled the excessive breakage of warp and weft yarn, EPI, design. Dyeing process should be controlled by M: L, pH, temp, pressure. Finishing process controlled by softness

4. Product Control: The end product of a process should full fill the desired quality.
Spinning process .

- Yarn: Count, Twist.
- Weaving process

5. Process Development: To avoid unnecessary waste of time and money and improve the end product (quality) may change the machine design and setting. May add or discharge some process.

6. Product development: The testing of the product helps in the continual search for new knowledge. To produce new item first should develop a sample as like desired product. It may change as demand customer.

7. Specification test: To re produce a product first should test the specification to the material

TERMS RELATED TO TEXTILE EVALUATION

A) QUALITY:

International Organization for Standardization (ISO) “Ensemble of properties and characteristics of a product or a service which confer on it the capacity to satisfy expressed or implicit requirements” - “suitable for use” or “fitness for use”.

B) TESTING:

A means of determining the capability of an item to meet specified requirements by subjecting the item to a set of physical, chemical, environmental or operating actions, and conditions.

C) INSPECTION:

Activities such as measuring, examining, testing, one or more characteristics of a product or service, and comparing these with specified requirements to determine conformity (end breakage study in R/F, looms, fabric inspection etc).

D) QUALITY CONTROL:

The operational technique and activities used to fulfill requirements of quality $D = f(B, C \dots)$

E) STATISTICAL QUALITY CONTROL (SQC):

The application of statistical technique to the control of quality.

F) QUALITY ASSURANCE (QA) :

All those planned or systematic actions necessary to provide adequate confidence that a product or service will satisfy given requirement for quality. (Control of vendors for supply of raw material, chemicals etc., time management, e.g. idle time of m/c)

Standard Atmosphere: Standard atmosphere is defined as an atmosphere at the prevailing barometric pressure with a relative humidity of 65% and Temperature of 20°C (68°F).

For tropical and Sub tropical countries.

Standard temperature is 27°C /81° F.

Testing Atmosphere: An atmosphere for testing is defined as the atmosphere with a relative humidity of (65% \pm 2%) and Temperature of (20°C \pm 2°C) or (68°F \pm 4°F).

In tropical and sub tropical countries /regions the difficulties of achieving a temp of 20°C are understood and so a higher standard temperature may be used 27°C \pm 2°C (81°F \pm 4°F)

LEVEL I**INSPECTION**

| | | | | The Warehouse Standard | | | |
|-------------|-------------|---------|----|------------------------|----|---------|----|
| ORDER QTY | SAMPLE SIZE | AQL 2.5 | | AQL 4.0 | | AQL 6.5 | |
| | | AC | RE | AC | RE | AC | RE |
| UP-150 | 8 | 0 | 1 | 1 | 2 | 1 | 2 |
| 151-280 | 13 | 0 | 1 | 1 | 2 | 2 | 3 |
| 281-500 | 20 | 1 | 2 | 2 | 3 | 3 | 4 |
| 501-1200 | 32 | 2 | 3 | 3 | 4 | 5 | 6 |
| 1201-3200 | 50 | 3 | 4 | 5 | 6 | 7 | 8 |
| 3201-10000 | 80 | 5 | 6 | 7 | 8 | 10 | 11 |
| 10001-35000 | 125 | 7 | 8 | 10 | 11 | 14 | 15 |

LEVEL II

| | | | | The Warehouse Standard | | | |
|-------------|-------------|-----|----|------------------------|----|-----|----|
| ORDER QTY | SAMPLE SIZE | 2.5 | | 4.0 | | 6.5 | |
| | | AC | RE | AC | RE | AC | RE |
| UP-150 | 20 | 1 | 2 | 2 | 3 | 3 | 4 |
| 151-280 | 32 | 2 | 3 | 3 | 4 | 5 | 6 |
| 281-500 | 50 | 3 | 4 | 5 | 6 | 7 | 8 |
| 501-1200 | 80 | 5 | 6 | 7 | 8 | 10 | 11 |
| 1201-3200 | 125 | 7 | 8 | 10 | 11 | 14 | 15 |
| 3201-10000 | 200 | 10 | 11 | 14 | 15 | 21 | 22 |
| 10001-35000 | 315 | 14 | 15 | 21 | 22 | 21 | 22 |

- AC – Accept Point
- RE – Reject Point
- Critical defects not allowed
- 4 minors equals 1 major

Standardization of Testing:

Requirements of results

- (a) Explicit (how they will perform or how they meet the specification).
- (b) Implicit (variability of results obtained either from time to time, operator by operator or lab to lab).

The lack of reproducibility of results of material may be due to:

a) Variation in the material

It can be solved through,

- ☐ By proper sampling
- ☐ Use of suitable statistical methods to analyze the results

b) Variation due to test methods

Due to operator (care in mounting of specimen, adherence to the test procedures, etc.)

Specimen size

Atmospheric condition

Type of test equipment

Test condition – speed, pressure, etc.

Types of Quality standards

- Company Standard
- Industry Standard
- Government Standard
- Full consensus Standard

Standards allow a company to:

- Attract and assure customers
- Demonstrate market leadership
- Create competitive advantage
- Develop and maintain best practice.

Levels of Quality Standards

Fitness for standard -inspection oriented -no consciousness to customer/mkt

Fitness for use -Must satisfy customer need for use -**Hotel shampoo & body oil**

Fitness for market -Must achieve low cost as well as 1 & 2

Fitness for latent requests -Listening to the voice of the customer



Sources of Quality Standards

To *minimize* these variation standard test methods are followed

- ▶ **Bureau of Indian Standards (BIS) – India**
- ▶ **American Society for Testing of Materials (ASTM) - USA**
- ▶ **British Standards (BS) – Britain**
- ▶ **Deutsches Institut fur Normung (DIN) – Germany Standards Institute**
- ▶ **American Association for textile Chemists and Colorists (AATCC)-USA**
- ▶ **International Organisation for Standardisation(ISO)-Europe and Britain**
- ▶ **Japanese Industrial Standard (JIN)-Japan**
- ▶ **EN (European Standards)
AS (Australian Standards)**

The British Standards are titled as,

BS XYZ:Year Title

Where,

XYZ is the number of the standard

BS EN ISO 9001:2000 Quality management systems Requirements

EN means

- ▶ European Standard, and is created for use throughout the EU countries

BS means

- ▶ British Standard, used mainly, though not only, in the UK

BS EN ISO means

- ▶ British, European and an International Standard. Some are known just as ISO, eg. ISO 9001:2000

OEKO-TEX® | OEKO-TEX® Standard 100 - Certification

The product label "Confidence in textiles – Tested for harmful substances according to OEKO-TEX® Standard 100" is an independent, globally standardized certification system for all types of textiles. Since 1992, it has been providing a guarantee to retailers and consumers that the respective products are free from harmful substances.



It includes:

- ☐ **Illegal substances** such as carcinogenic colourants
- ☐ **Legally regulated substances** such as formaldehyde, plasticizers, heavy metals or pentachlorophenol
- ☐ Substances which according *to current knowledge are* harmful to health, but which are not yet regulated or prohibited *by law* such as pesticides, allergenic dyes or tin-organic compounds
- ☐ Parameters such as colour fastness and a skin-friendly pH-value, which are **precautionary measures to** safeguard consumer health



(GOTS)

The Global Organic Textile Standard (GOTS) is recognised as the world's leading processing standard for textiles made from organic fibres. It defines high-level environmental criteria along the entire organic textiles supply chain and requires compliance with social criteria as well.

Only textile products that contain a minimum of 70% organic fibres can become GOTS certified. All chemical inputs such as dyestuffs and auxiliaries used must meet certain environmental and toxicological criteria. The choice of accessories is limited in accordance with ecological aspects as well. A functional waste water treatment plant is mandatory for any wet-processing unit involved and all processors must comply with minimum social criteria. The key criteria of GOTS, its quality assurance system and the principles of the review and revision procedure are summarised in this section.



REACH is a European Union Regulation concerning the registration, evaluation, authorization and restriction of chemicals. It applies to all chemicals – not only those used in industrial processes but also those found in products which we use in our daily lives, such as cleaning products and paints, or in articles such as clothes, furniture and electrical appliances.



REACH Registration Certificate



Certificate No: [REDACTED]

This document certifies that the non-EU manufacturer

HUNAN YIXIANG TECHNOLOGY CORPORATION Ltd.

Industrial Park of Liuyang, Hunan, China

Has successfully completed the registration of the following substance in accordance with the REACH regulation (EC) No 1907/2006:

[1, 3(or 1, 4)-phenylenebis(1-methylethylidene)]bis[tert-butyl] peroxide
EC: 246-678-3 CAS#25155-25-3

| | |
|----------------------------|--|
| Registration No.: | [REDACTED] |
| Tonnage Band: | 100-1000t/y |
| Type of Registration: | Full Registration |
| REACH Only Representative: | Chemical Inspection and Regulation Service Limited |
| UUID: | ECHA-20625e36-99e6-47b8-8d5c-148db40d8192 |

Date of Issue: 29 May 2013

Issued by: Chemical Inspection & Regulation Service Limited (OR)

Authorized Signature: *Kevin Lee*



Accredited textile testing organization(branch)
in Bangladesh

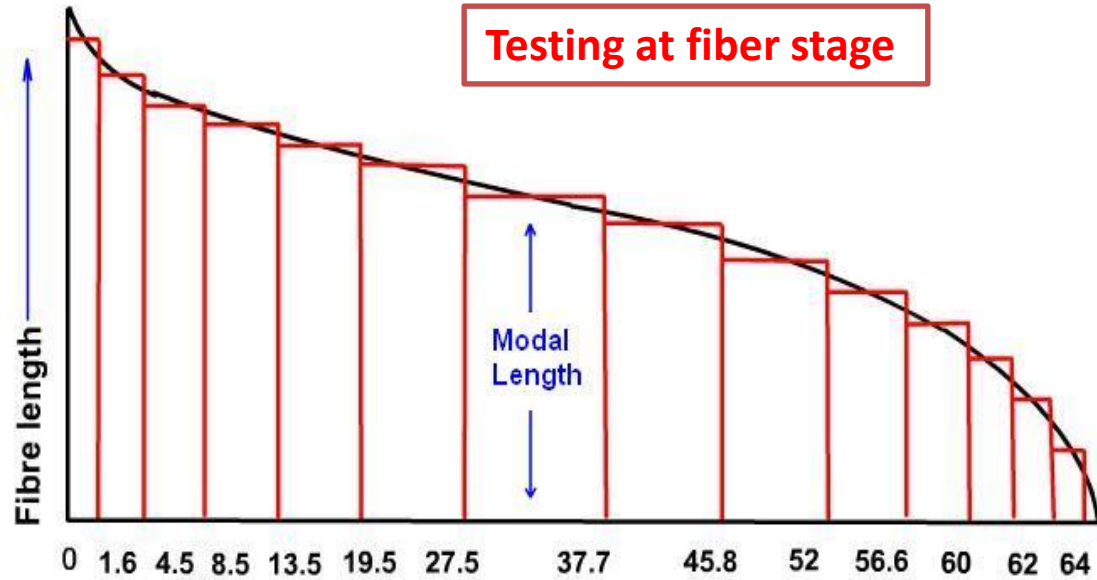


QUALITY CONTROL

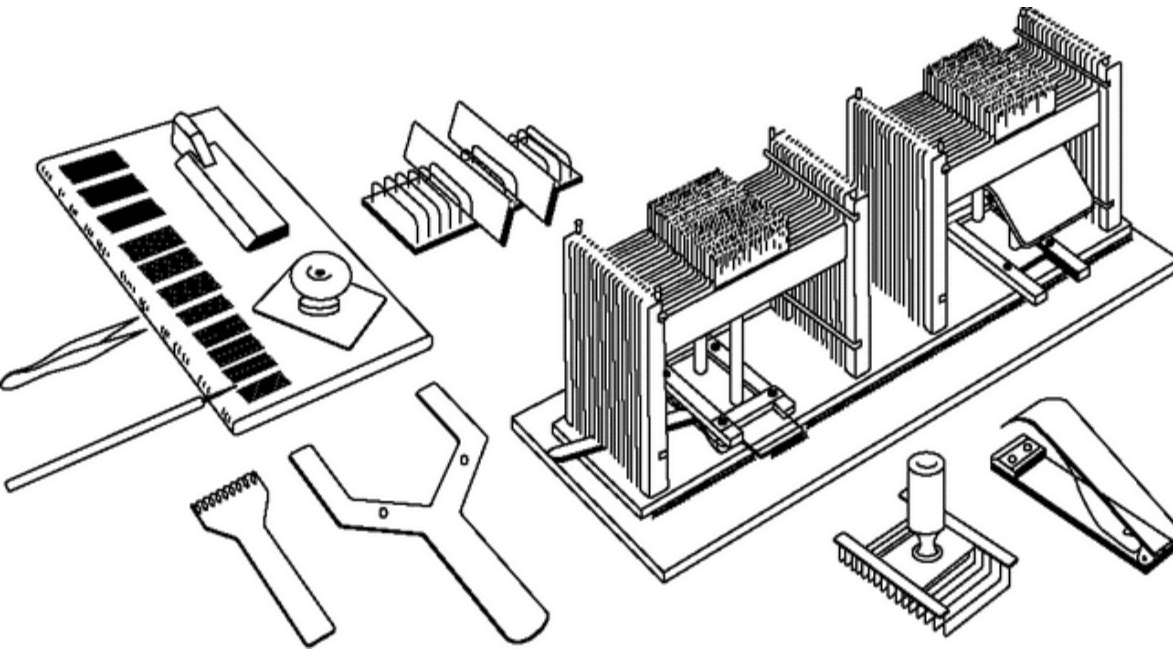
| Harmful substances | Limit values | Test method |
|---|--|---|
| Formaldehyde | not in direct skin contact: 300 mg/kg direct skin contact: 75 mg/kg baby/small children: 20mg/kg | DIN EN ISO 14184/1 Japanese Law 112 |
| PCP | 0.5mg/kg | Extraction with ASE or COH, preparation and detection (GC/MS) based on LMBG Art, 35 B 82.02-8 |
| TeCP | 0.5mg/kg | Extraction with ASE or COH, preparation and detection (GC/MS) based on LMBG Art, 35 B 82.02-8 |
| Cadmium in PVC products including coatings | 100mg/kg | DIN EN 1122 |
| TBT | not in direct skin contact:1.0 mg/kg direct skin contact: 1.0 mg/kg baby/small children: 0.5 mg/kg | Extraction with organic solvent, derivation and detection (GC/MS) based on DIN 38407 |
| For children's Wellington boots: Heavy metals in accordance with SG seal of the PFI | | |
| Antimony | 2.0 mg/kg | Extraction with acidic perspiration solution according to DIN EN ISO 105 E 04, determination using ICP-OES, AAS |
| Arsenic | 0.2 mg/kg | |
| Cadmium | 0.1 mg/kg | |
| Chrome, total | 2.0 mg/kg | |
| Cobalt | 4.0 mg/kg | |
| Copper | 60 mg/kg | |
| Lead | 0.8 mg/kg | |
| Mercury | 0.02 mg/kg | |
| Nickel | 1.0 mg/kg | |
| Lead | 100 mg/kg | DIN EN 1122 |
| Antimony | 100 mg/kg | DIN EN 1122 |

LMBG (German Food and Consumer Goods Law).

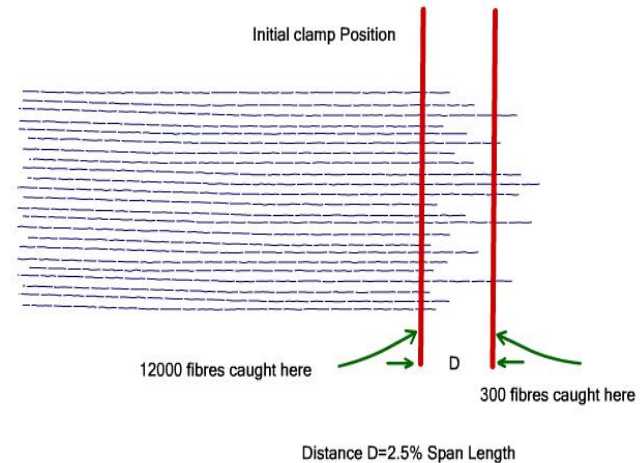
| Harmful substances | Limit values | Test method |
|---|--|--|
| PCB | Not detectable | Extraction with organic solvent, detection with GC/MS based on DIN 38407-2 + 3; EN ISO 6468, DIN 51527 T1, DIN 38414-20, DIN ISO 10382 |
| Azo dye | Not to be used (detectable limit 30 mg/kg) | LMBG § 35 B 82.02-2 general textiles B 82.02-4 / PES fibres B 82.02-3 leather |
| Allergenic and carcinogenic dyes | Not to be used | LMBG Art. 30 recommendation of the BfR - TLC and LC-MS / DIN NMP 512 P - 2003 |
| Vinyl chloride monomers for PVC products including coatings | Not detectable | Gas chromatography and mass spectrometer in accordance with Eco Tex 200 |
| Chrome VI For leather products | Not detectable | DIN 53314 / (pre-standard) DIN CEN/TS 14495 (leather) |



COMB SORTER



Explanation of the term "span length"



Handy Microscope (40x with scale):

- Closer view of yarn or fabric.
- Printing inspection of border line

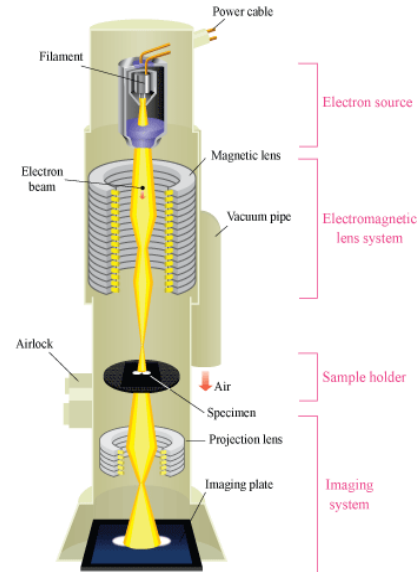


Digital Microscope

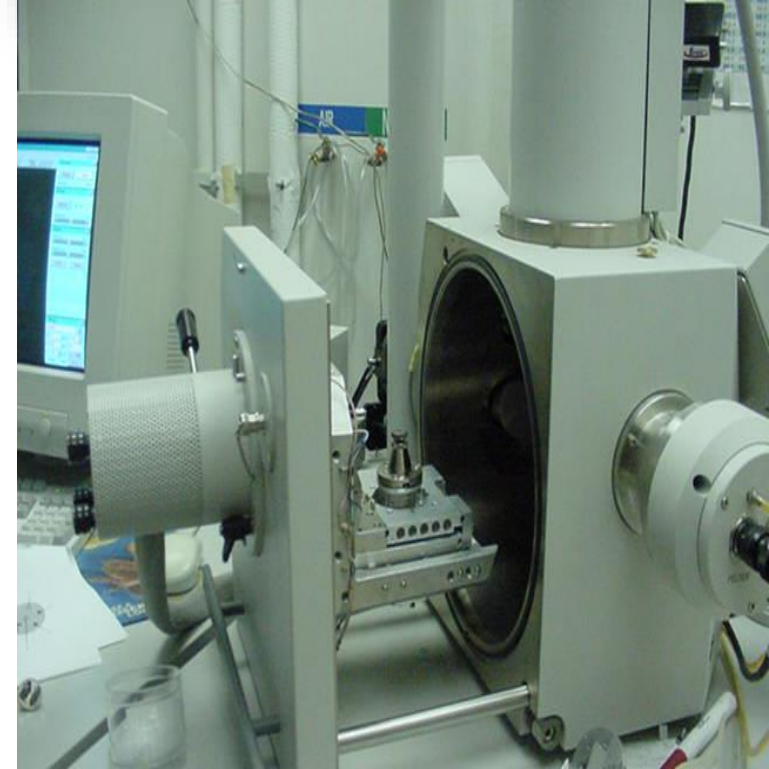
5x,10x,20x,40x & 100x lenses monocular projection microscope with fiber cross section kit, high resolution CCD camera and imaging software with measurement facilities. Scope of use cross section of fiber or yarn, analysis of any fiber, yarn and fabric.



A **scanning electron microscope (SEM)** is a type of electron microscope that produces images of a sample by scanning it with a focused beam of electrons.



Transmission electron microscopy (TEM) is a microscopy technique in which a beam of electrons is transmitted through an ultra-thin specimen, interacting with the specimen as it passes through it. An image is formed from the interaction of the electrons transmitted through the specimen;



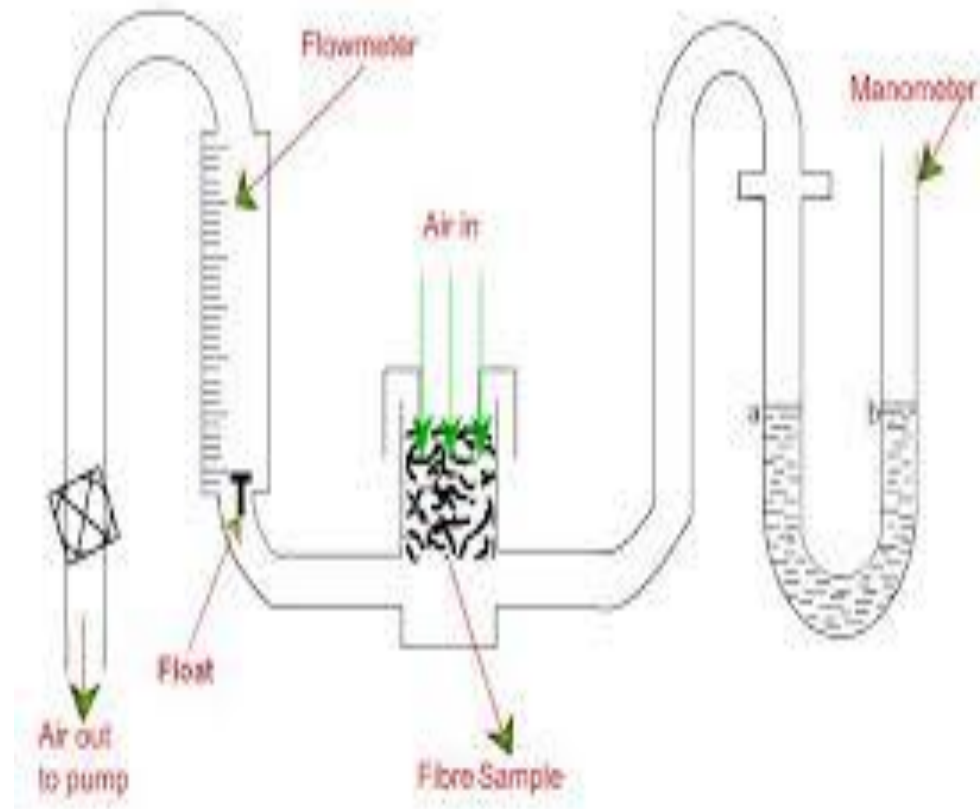


Moisture Analyzer



Fineness Meter

Fibre diameter measurement by airflow



CHEMICAL TEST

- In these types of tests , chemicals are used as a part of the test procedure.
- the specimen is dissolved in the chemical to check its solubility .
- **The test include :**
- Colorfastness
- Fiber identification using the solubility test.



| Solvents | Concentrations | Temperature | Minutes | Fiber |
|--------------------------------|-----------------------|--------------------|----------------|---------------|
| SULPHURIC ACID | 70% | 38°C | 20 | Cotton |
| SULPHURIC ACID | 70% | 38°C | 20 | Flax |
| SODIUM HYPOCHLORITE | 5.25% | 20°C | 20 | Wool |
| SODIUM HYPOCHLORITE | 5.25% | 20°C | 20 | Silk |
| META-CRESOL | 100% | 139°C | 5 | Polyester |
| ACETIC ACID | 100% | 20°C | 5 | Acetate |
| HYDROCHLORIC ACID | 38% | 24°C | 5 | Rayon |
| META-CRESOL | 100% | 139°C | 5 | Nylon |
| DIMETHYL FORMAMIDE | 100% | 90°C | 10 | Lycra/Spandex |



Twist Tester (Auto)

To check the Twist Per Meter of the yarn.

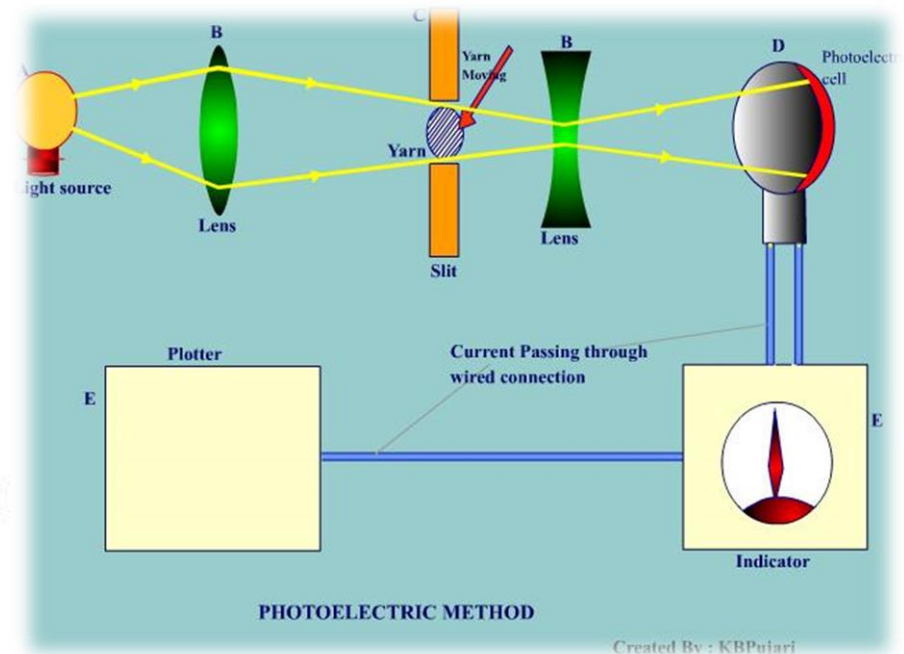
Test length : 250 mm

Counter : Four digit revolution counters.

Overall Dimension of the units : 620mm (L), 80mm (W), 184mm (H).

Weight of Machine : 6.000 Kg.

BS 946:1952



Yarn Evenness Tester

To check the evenness and appearance of the yarn.

Thick places: +50% If the counter is actuated, the mass per unit length (cross section) at the thick place is 150% or more of yarn mean value (> 4 mm length)

(Ranges: +100%, +70%, +50%, +35%)

2. **Thin places:** -50% only 50% of yarn mean value or less.

(Ranges: -60%, -50%, -40%, -30%)

3. **Neps:** +200% The thick place based on 1 mm length, is 300% of the yarn mean value or more. Length shorter than 4 mm (however refers as a reference length of 1 mm)

(Ranges: +400%, +280%, +200%, +140%)

Beeseley Balance

To check Count or Denier of the short samples.

| | | |
|--------------------------------------|----------|-----------------------------------|
| Sizing Template | : | 01 No. |
| Sizing Template Counts System | : | 05 System |
| Overall Dimension of the Unit | : | 545 (L) X 128 (W) X 198(H) |



Wrap Reel (Manual)

To Prepare Lea of Yarn to check Denier, etc.

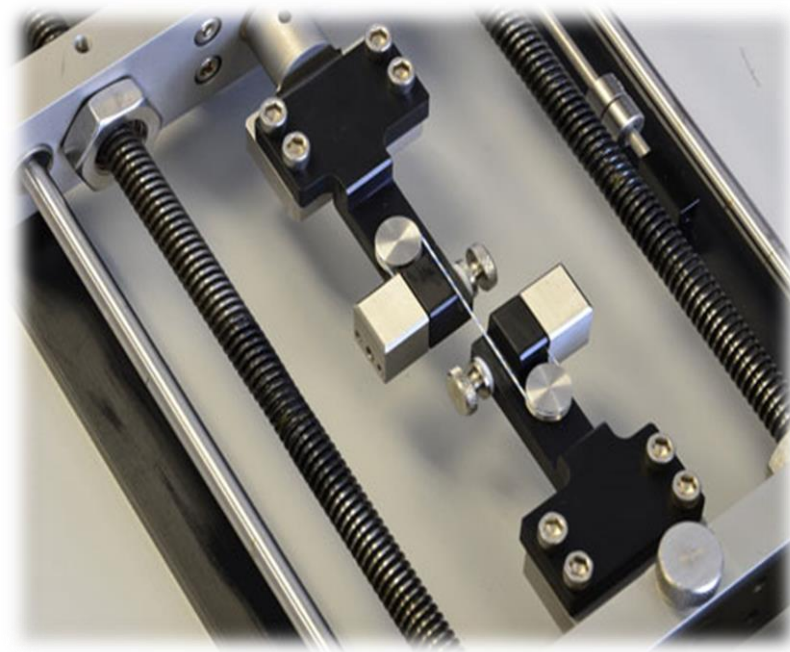
Thread and Yarn Tensile Testing

Testing Machine

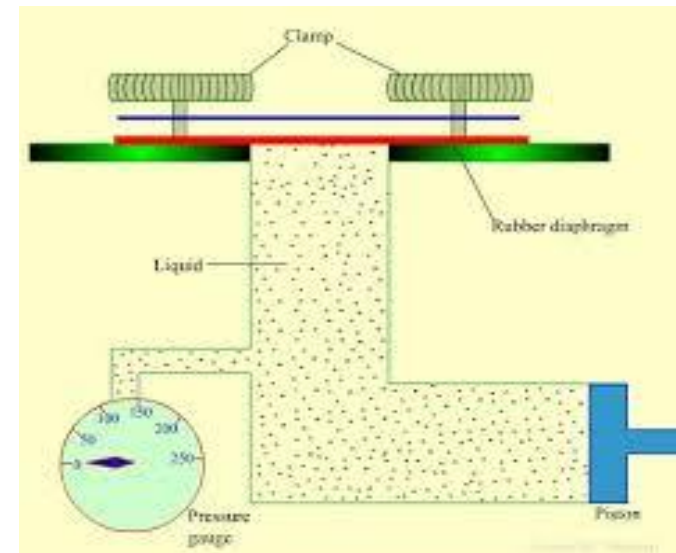
To check the tensile properties of single yarn, lea as well as fabric.



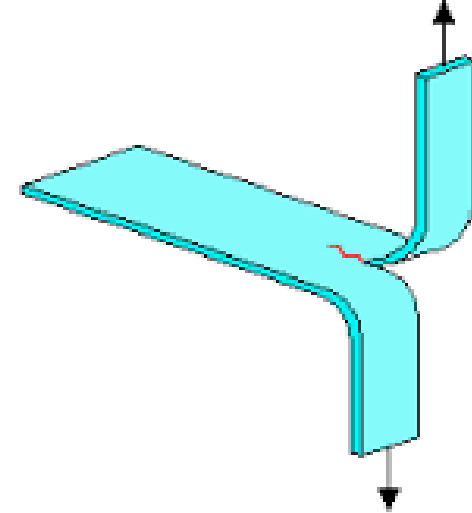
ASTM D2256



Bursting strength tester



As per standards : BS 4153, ASTM D1424, DIN 53862, M & S 29



Tearing Strength Tester

| | | |
|---|---|---|
| Capacity | : | 1600 Gms(By Brass pendulum only) |
| | : | 3200 Gms(By adding Augmenting weights at the back) |
| | : | 6400 Gms (By adding Augmenting weights at the front) |
| Clamping surface of each Clamp | : | 35.5 mm length x 15.5 mm width |
| Distance between clamps | : | 2.5±0.25mm |
| Tearing Distance | : | 43± |
| Slit Size | : | 20 mm |
| Scale reading | : | 0 to 100% of range |
| Calibration check weight | : | At 1600 Gms ,at 3200 Gms. At 6400 Gms. |
| Overall Dimensions of Unit | : | 470(W)x 300(D)x410(H) mm. 18.5” (W)x12” (D)x16”(H) Inch. |
| Net wt of the Unit (With check Wt-1600, 3200&6400 Gms) | : | 29.5Kg.(64.9lbs) |

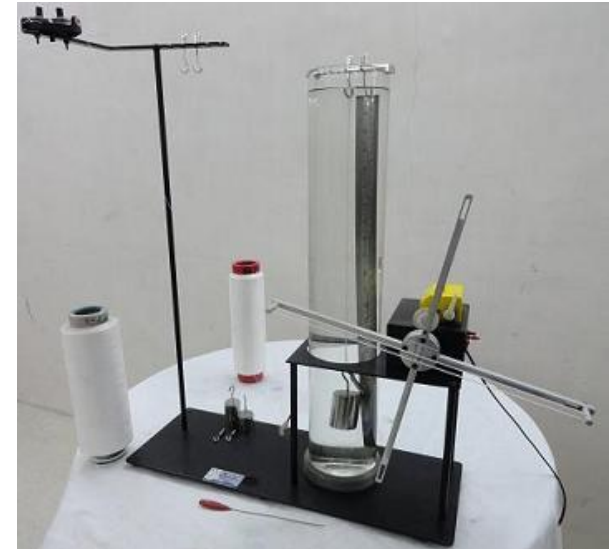
Crimp Tester

Single Yarn Crimp Tester

Over all Dimension of the Unit
:76(L)cmx30(W)cmx8cm(H)
Weight of unit :800gms.



Fabric Extensometer



Crimp Rigidity Tester



Package / Shore Hardness Tester

Standards: DIN53505, ASTM D2240, ISO7619, JISK7215



Measurement Pointer
Displays current reading.

Optional Memory Pointer
Allows you to record peak value during measurement. Must be manually reset by user before measurement.

1. Place the instrument on the material to be tested. The durometer must be level and perpendicular to the specimen.
2. Press the foot of the gauge firmly against the specimen, but not so firmly as to imbed the foot into the surface of the material.
3. Maintain pressure for 2 to 3 seconds. The dial hand gives the reading in durometer points.

GSM Cutter

The unit is recommended for yield testing i.e. the determination of weight per unit area. The sample cutter cuts out rapidly and accurately circular specimen of 100 Cm², which is exactly 1 / 100th of a square meter. The result is grams, multiplied by 100, gives the GSM (Grams per square meter) directly.



| |
|---|
| Grammes per Square Meter = Specimen Weight in Grams x100 |
|---|

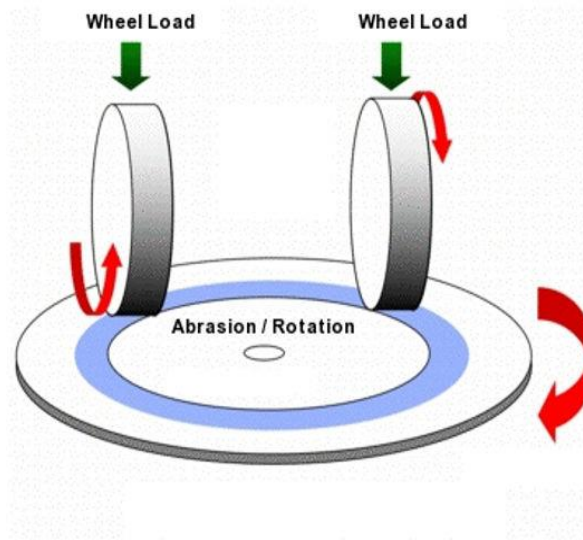


Stiffness Tester

| | | |
|--|---|-----------------------|
| Angle of inclination of intersecting plane to horizontal | : | 41.50 |
| Load on test specimen | : | 10 + 2 gm / cm length |
| Over All Dimensions of the Instrument : | | 271(W)x148(D)x200(H) |
| Net Weight of Instrument | : | 4.500 Kgs. |

Martindale

Abrasion and pilling tester



Martindale Abrasion cum Pilling Tester

| SCOPE | ABRASION | PILLING |
|--|--|--|
| No. Of specimens | 1-4 | 1-4 |
| Exposed area of test specimen | 6.45 cm ² | 6.45 cm ² |
| Working pressure on test specimen | 9 kPa (apparel) 12 kPa (upholstery) | 3 kPa (ASTM D 4970) 9 kPa (BS 5690) 12 kPa (BS 5690) |
| Rotational speed of outer pegs | 47+2.5 r/min. | 47+2.5 r/min. |
| Drive (speed) ratio of Outer pegs: inner pegs | 32.30 | 32.30 |
| Total Stoke of outer and inner pegs | 60.5+0.5 mm | 24.0+0.5 mm |
| Circumferential parallelism of sample holders to abrading tables | +0.05 mm | +0.05 mm |

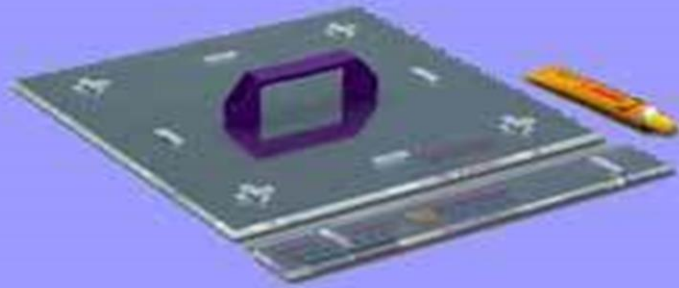
Digital Pilling Tester

SPECIFICATIONS :

| | |
|-------------------------------|-------------------------------|
| Size of Wooden Boxes (Inside) | : 235 x 235 x 235 mm |
| Thickness of Cork Lining | : 3.2 mm (As per standards) |
| Speed of Rotation of Boxes | : 60 r.p.m. |
| Size of Test Specimen | : 12.5 × 12.5 cm ² |
| Net weight | : 35 kg (77 lbs) |

**As per standards: BS 5811, IS: 10971,
IWS 152, M&S P 18**





Shrinkage Template

It consists of a fine calibrated Marking Template which is used to mark the fabric with 14 inches bench marks for accurately determining Change in fabrics/garments.

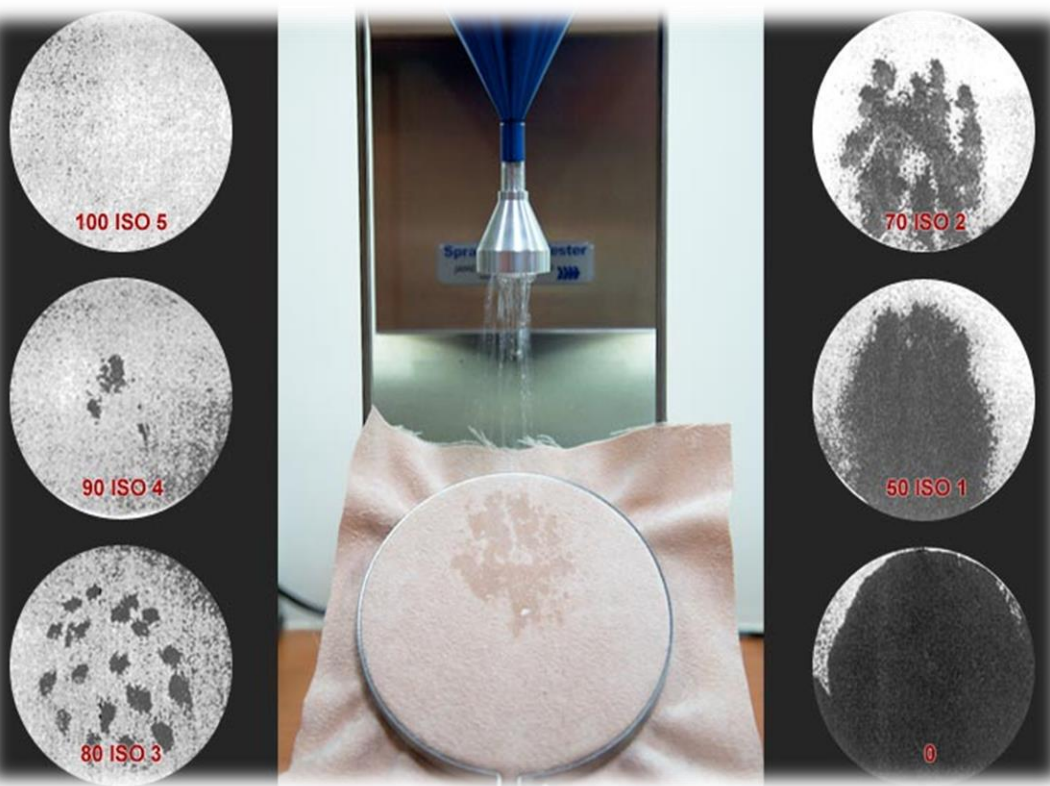
After the fabrics/garment is laundered/dry cleaned/washed Processed, the dimensional change can be read directly and accurately In percent change with the calibrated shrinkage scale/rule.



Fabric thickness Gauge

Specifications

| | |
|-----------------------------|------------------------|
| Range of measurement | :0-10 mm. |
| Least count of dial Gauge: | 0.01 mm. |
| Diameter of anvil : | 60 mm. |
| Diameter of pressure foot : | 10mm, 25mm. |
| Load on the pressure foot: | 78.5 g (100 gm/sq.cm.) |
| Throat depth : | 22mm |
| Net weight of the Unit : | 340 gms |



As per standards : AATCC 22, BS 3702, ISO 4920

Water Repellency Tester

Over all Dimensions of the Unit : 25cmx30cmx55cm(H)
This method is applicable to all fabrics which may or may not have been given a water repellent finish or coating. It is not intended for use in predicting rain penetration resistance of fabrics, since it does not measure penetration of water through the fabric.



Crease Recovery Tester

SPECIFICATIONS:

| | |
|-----------------------------|---|
| Size of the Test Specimen : | 40mm x 15mm. |
| Creasing Load : | 1 Kg. (Stainless Steel) |
| Angle Measurement : | On an Engraved Circular Scale graduated in 1 deg. |
| Scale Measurement : | 0-180 Degrees |
| Material Used : | All Stainless Steel (except base) |
| Size of the Tester : | 9 Kg |

As per standards : : ISO 2313, BS EN: 22313, AATCC 66, ASTM D 1295, IS: 4681

- **Tension Meter:** To Check the online tension during passage of yarn.
- 0.1gm Accuracy, Maximum 300gm.

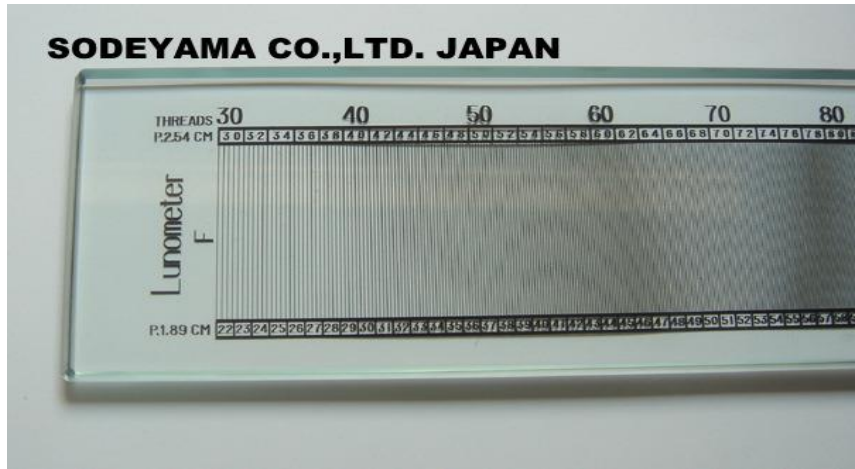


Handy Ends counting Glass (8x).
To determine ends and picks in 1 cm.



Densimeter

To determine E.P.I. and P.P.I. of plain weave fabric.





Yarn Speed & Length Meter

The Length Meter combines the functions of three separate instruments in one, easy-to-use device. It accurately measures the *speed* and *length* of yarns, wires and other filaments using a unique "wrapper" roller.

The Length Meter can also be used as either a *contact* or *non-contact* tachometer to measure rotational speeds of shafts, motors, pulleys, etc. or linear speeds of moving surfaces such as conveyor belts, webs of fabric, etc.



Digital weighing scale

Capacity 210 gms

Accuracy 0.0001gm



- Digital weighing scale
- Capacity 10 gms
- Accuracy 0.001gm



Pocket Weighing Scale

An economical balance to weigh the samples for checking the GSM of the fabrics. To be used with GSM cutter and also weigh the yarn for checking denier.

Capacity 100 gms

Accuracy 0.01gm

Moisture Meter

Moisture content 0-50%, Temperature – 10-60° C.



Sound Level Meter

30~130dB



Lux Meter

0-50000 LUX 0-5000 FC



Stroboscope

50-12,000 Flashes per minute.
Cable free with battery back up facilities.





Fabric Inspection Machine

SPECIFICATIONS :

| | | |
|--------------------|---|---------------------------------|
| Power requirements | : | 230 V AC, 50 Hz, 0.75 KW. |
| Power readout | : | Digital display with meter out. |
| Machine dimensions | : | 90''(w) x 60'' (d) x 80'' (h) |
| View Area | : | 36'' x 72''. |
| Machine weight | : | 260 Kg. |



Softness Tester

Air Permeability Tester

- The Air Permeability Tester is a unique, instrument for determination of the air permeability (or of the pressure drop at a selectable air velocity) and, with some restrictions, of the thickness of fabrics, Nonwoven, felts and films. The main application is paper machine clothing.

