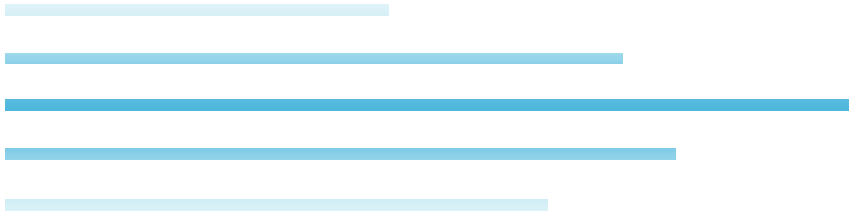


# BISFA

The International Bureau For The Standardization Of Man-Made Fibres



Terminology  
of man-made fibres  
2009 Edition  
(replaces the 2006 edition)

BISFA



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At the beginning of 2007, BISFA decided to revise the 2006 edition recognizing the important change in business scope occurred in the last two decades in the man-made fibres industry towards technical textiles and nonwovens.

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# PREFACE

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In 1968, recognising a need to avoid a confusion of technical terms, BISFA published its first Terminology booklet. This contained those terms and definitions which describe the different forms in which man-made fibres are available, either as primary material or intermediate products. With the objective of avoiding translation difficulties and consequent misunderstanding, the booklet also contained a list in five languages of the principal technical terms used in the various internationally agreed methods booklets.

This booklet was revised in 1977, when new sections were added containing definitions of technical terms used in BISFA methods booklets, an explanation of the SI system of units, and a description of the ISO system for designating yarns in the tex system.

The revision of 1994 introduced the generic names. This edition having sold out was reprinted in 1997. Two elements have been added: definitions for airborne fibrous materials and an overview of ISO definitions to describe the accuracy of a measuring method and the currently used definitions for statistical process control.

In 1999, a complete review of the whole booklet was undertaken, adding or eliminating numerous details. The layout was changed. Terms in different languages are presented in a comprehensive view.

The definitions have been written with due consideration of recognised reference books such as *Textile Terms and Definitions* (The Textile Institute, 10<sup>th</sup> edition 1995), *Dictionary of Man-made Fibres* (H. Koslowski, International business press, 1<sup>st</sup> edition 1998), *Handbuch der Faser* (G. Schnegelsberg, Deutscher Fachverlag 1999), *Textile Dictionary* (several languages, by ITS). Relevant ISO, CEN and ASTM standards were taken into account where appropriate.

The terms and definitions are given in English in alphabetical order. A separate chapter contains the translations of terms into French, German, Italian, Spanish, and, for the first time Czech, Portuguese and Turkish languages. In the case of a disparity between languages the English text is to be used.

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# CHAPTER 1

## Generic names of man-made fibres

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### 1.1 Generic fibre names

#### General introduction

The chapter 1 provides a classification of the various categories of man-made fibres. Each of these categories is designated by a generic name and its definition. Generic names are generally used :

- for customs purposes**
- in defining public sector transactions**
- in technical standards**
- in textile product labelling.**

Through the EU Directive and related national legislation the fibre content of textile articles must be stated at point of sale using the generic names.

BISFA is careful to restrict this classification to those categories of man-made fibres which are produced on an industrial scale or are of commercial significance for special purposes and traded internationally. Fibres which have recently emerged from research or which are still at the stage of development are not included. A generic fibre name can cover different chemical substances. The table of generic names includes non exhaustive examples of chemical formulae representative of the different fibre categories. The producers in BISFA have also adopted a coding system based on generic names as an aid to communication.

BISFA defines generic fibre names only (which are then found in ISO standard 2076 and in EU regulations). BISFA does not define specific substances (polymers, copolymers, etc...).

Generic names are completely distinct from trademarks which are used by individual producers to identify their own products

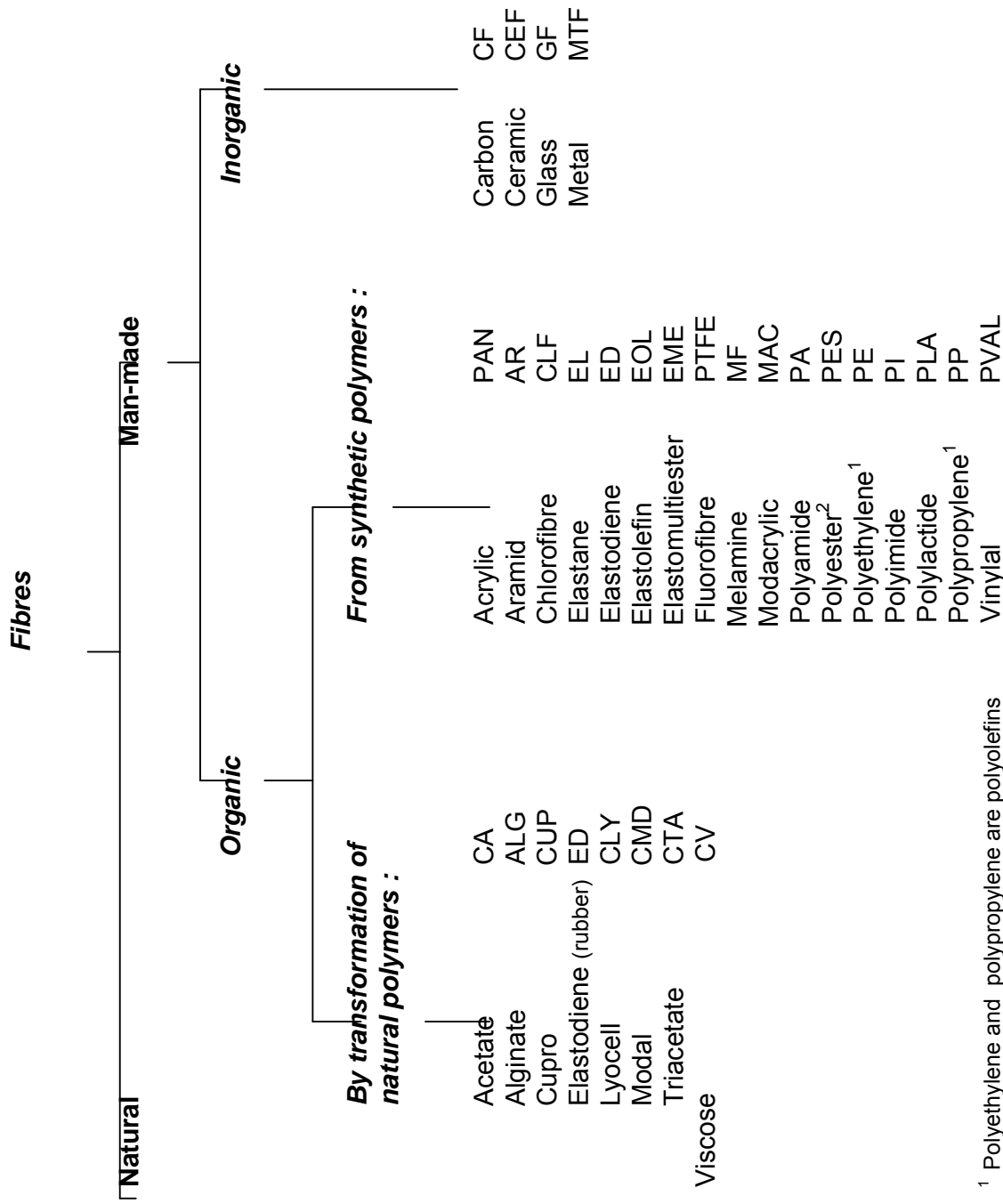
#### Naming mixtures

For naming of fibres containing mixtures of chemically distinct, and not chemically linked polymers or copolymers, the following rules should be applied :

- a) Whereas copolymers may, if necessary, be assigned distinctive generic names, the creation of new generic names for fibres composed of chemically distinct polymers shall be discouraged.
- b) When the proportion of one of the polymers or copolymers reaches 85 % by mass, the fibre takes the generic name corresponding to this component.

- c) When none of the components reaches 85 % by mass, then either a new generic name must be used or the fibre must be identified as a simple mixture e.g. x % poly A, y % poly B. Each such case shall be examined on its merits.

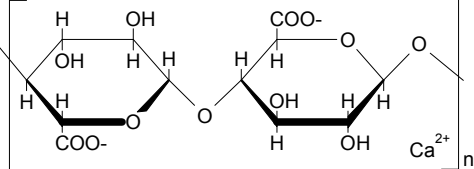
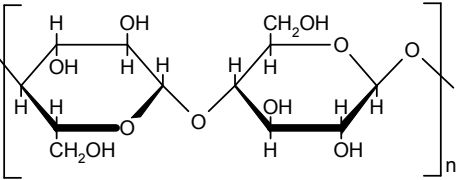
# Generic fibre names with their codes



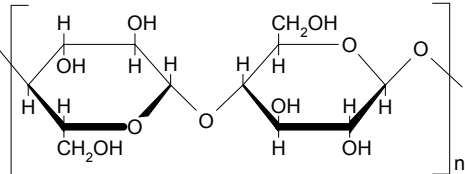
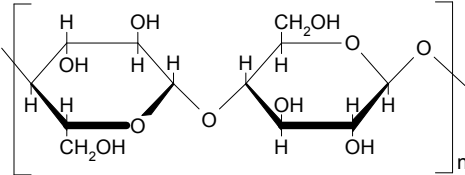
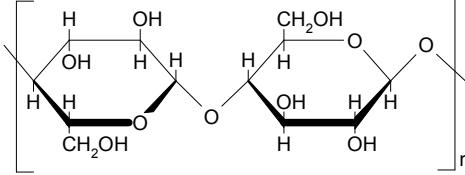
<sup>1</sup> Polyethylene and polypropylene are polyolefins  
<sup>2</sup> The same code is used in the plastic industry for polyether sulfone (ISO 1043)



## 1.2 Generic classification of cellulosic fibres

| Generic name      | Distinguishing attribute   | Examples of chemical formulae  |
|-------------------|--|--|
| <b>acetate</b>    | Cellulose acetate fibre in which less than 92 %, but at least 74 %, of the hydroxyl groups are acetylated. | Secondary cellulose acetate:<br>$\left[ \text{C}_6\text{H}_7\text{O}_2 - (\text{OX})_3 \right]_n$ Where X = H or CH <sub>3</sub> CO and the degree of esterification is at least 2,22 but less than 2,76 |
| <b>triacetate</b> | Cellulose acetate fibre in which at least 92 % of the hydroxyl groups are acetylated.                      | Cellulose triacetate<br>$\left[ \text{C}_6\text{H}_7\text{O}_2 - (\text{OX})_3 \right]_n$ Where X = H or CH <sub>3</sub> CO and the degree of esterification is between 2,76 and 3                       |
| <b>alginate</b>   | Fibre obtained from the metal salts of alginic acid  | Calcium alginate:<br>   |
| <b>cupro</b>      | Cellulose fibre obtained by the cuprammonium process   | Cellulose:<br>   |

## 1.2 Generic classification of cellulosic fibres

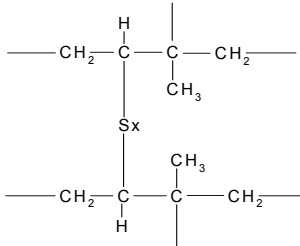
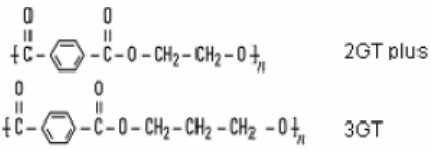

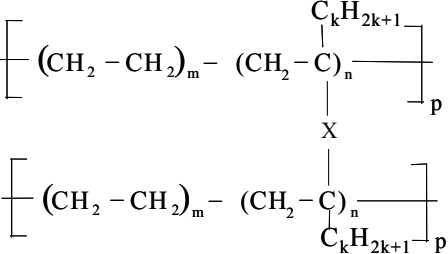
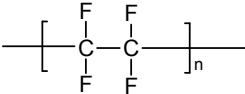
| Generic name   | Distinguishing attribute  | Examples of chemical formulae  |
|----------------|---|--|
| <b>lyocell</b> | <p>Cellulosic fibre obtained by an organic solvent spinning process. It is understood that:</p> <p>1) an “organic solvent” means essentially a mixture of organic chemicals and water, and</p> <p>2) “solvent spinning” means dissolving and spinning without the formation of a derivative.</p>  | <p>Cellulose:</p>    |
| <b>modal</b>   | <p>Cellulose fibre having a high breaking force<sup>1</sup> BF and a high wet modulus B<sub>w</sub>.</p> <p>The breaking force BF<sub>c</sub> in the conditioned state and the wet modulus F<sub>w</sub> required to produce an elongation of 5 % in its wet state are :</p> $BF_c \geq 1.3\sqrt{LD} + 2LD$ $F_w \geq 0,5\sqrt{LD}$ <p>where LD is the mean linear density (mass per unit length) in decitex.<br/>BF<sub>c</sub> and F<sub>w</sub> are expressed in centinewtons.</p> | <p>Cellulose:</p>    |
| <b>viscose</b> | <p>Cellulose fibre obtained by the viscose process</p>  | <p>Cellulose:</p>  |

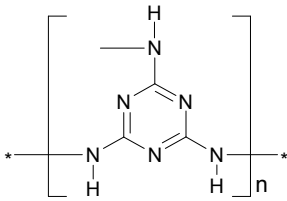
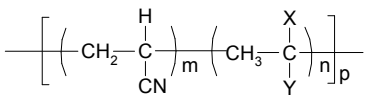
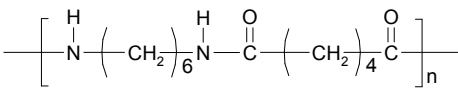
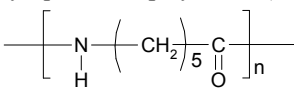
<sup>1</sup> ISO 2076 uses the term "strength"

### 1.3 Generic classification of synthetic fibres

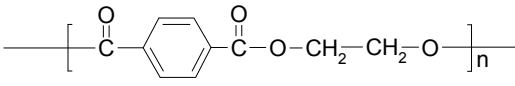
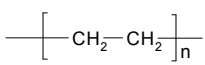
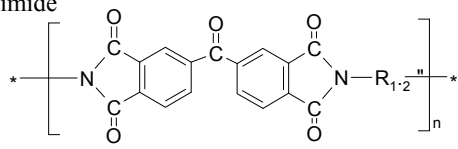
| Generic name       | Distinguishing attribute  | Examples of chemical formulae  |
|--------------------|---|--|
| <b>acrylic</b>     | Fibre composed of linear macromolecules having in the chain at least 85% by mass of acrylonitrile repeating units.  | Polyacrylonitrile:<br>$\left[ \text{CH}_2 - \underset{\text{CN}}{\overset{\text{H}}{\text{C}}} \right]_n$<br>and acrylic copolymers<br>$\left[ \left( \text{CH}_2 - \underset{\text{CN}}{\overset{\text{H}}{\text{C}}} \right)_m \left( \text{CH}_2 - \underset{\text{Y}}{\overset{\text{X}}{\text{C}}} \right)_n \right]_p$   |
| <b>aramid</b>      | Fibre composed of linear macromolecules made up of aromatic groups joined by amide or imide linkages, at least 85% of the amide or imide linkages being joined directly to two aromatic rings and the number of imide linkage, if the latter are present, not exceeding the number of aramide linkages. | Example 1:<br>$\left[ \text{C}(=\text{O}) - \text{C}_6\text{H}_4 - \text{C}(=\text{O}) - \text{NH} - \text{C}_6\text{H}_4 - \text{NH} \right]_n$<br>Example 2:<br>$\left[ \text{O}=\text{C} - \text{C}_6\text{H}_3(\text{C}=\text{O})_2 - \text{N} - \text{C}_6\text{H}_4 - \text{NH} \right]_n$<br><b>Note:</b> in example 1 the aromatic groups may be the same or different |
| <b>chlorofibre</b> | Fibre composed of linear macromolecules having in the chain more than 50% by mass of vinyl chloride or vinylidene chloride units (more than 65% in the case in which the rest of the chains is made up of acrylonitrile, the modacrylic fibres being thus excluded.)                                    | Poly(vinyl chloride):<br>$\left[ \text{CH}_2 - \underset{\text{Cl}}{\overset{\text{H}}{\text{C}}} \right]_n$<br>And<br>Poly(vinylidene chloride):<br>$\left[ \text{CH}_2 - \underset{\text{Cl}}{\overset{\text{Cl}}{\text{C}}} \right]_n$  |
| <b>elastane</b>    | Fibre composed of at least 85% by mass of a segmented polyurethane and which, if stretched to three times its unstretched length, rapidly reverts substantially to the unstretched length when the tension is removed.  | Macromolecules having alternate elastic and rigid segments with repetition of the group<br>$\text{—O—C(=O)—N—H—}$  |

### 1.3 Generic classification of synthetic fibres

| Generic name            | Distinguishing attribute   | Examples of chemical formulae   |
|-------------------------|--|---|
| <b>elastodiene</b>      | Fibre composed of natural or synthetic polyisoprene, or of one or more dienes polymerized with or without one or more vinyl monomers, and which, if stretched to three times its unstretched length, rapidly reverts substantially to the unstretched length when the tension is removed.  | Natural polyisoprene extracted from latex<br><i>Heves brasiliensis</i> , vulcanized<br>   |
| <b>elastomultiester</b> | Fibre formed by interaction of two or more chemically distinct linear macromolecules in two or more distinct phases (of which none exceeds 85% by mass) which contains ester groups as dominant functional unit (at least 85%) and which after suitable treatment when stretched to one and half times its original length and released recovers rapidly and substantially to its initial length | At least 2 ester macromolecules in each filament form an elastomer fibre: e.g.<br><br>Example of physical arrangement:<br><br>Parts A and B consist of different macromolecules with ester groups |
| <b>elastolefin</b>      | Fibre composed of at least 95% (by mass) of macromolecules partially cross-linked, made up from ethylene and at least one other olefin and which, when stretched to one and a half its original length and released, recovers rapidly and substantially to its original length   | Elastolefin<br>   |
| <b>fluorofibre</b>      | Fibre composed of linear macromolecules made from aliphatic fluorocarbon monomers.   | Polytetrafluoroethylene<br>   |

|                           |   |   |
|---------------------------|---|---|
| <b>melamine</b>           | Fibre composed of at least 50 % by mass of cross-linked macromolecules made up of melamine methylol polycondensate.                                       |  <p>Melamine</p>  |
| <b>modacrylic</b>         | Fibre composed of linear macromolecules having in the chain at least 50% and less than 85% by mass of acrylonitrile.                                      | <p>Acrylic copolymers</p>  <p>If X = H and Y = Cl:<br/>Poly(acrylonitrile <i>or</i> vinyl chloride)</p> <p>If X = Y = Cl:<br/>Poly(acrylonitrile <i>or</i> vinylidene chloride)</p> |
| <b>polyamide or nylon</b> | Fibre composed of linear macromolecules having in the chain recurring amide linkages, at least 85% of which are joined to aliphatic cycloaliphatic units. | <p>Polyhexamethylene adipamide (polyamide 66)</p>  <p>Polycaproamide (polyamide 6)</p>           |

### 1.3 Generic classification of synthetic fibres

| Generic name                    | Distinguishing attribute  | Examples of chemical formulae   |
|---------------------------------|---|---|
| <b>polyester</b>                | Fibre composed of linear macromolecules having in the chain at least 85% by mass of an ester of a diol and terephthalic acid. | <p>Poly(ethylene terephthalate)</p>               |
| <b>polyethylene<sup>1</sup></b> | Fibre composed of linear macromolecules of unsubstituted saturated aliphatic hydrocarbons.                                    | <p>Polyethylene</p>                               |
| <b>polyimide</b>                | Fibre of synthetic linear macromolecules having in the chain recurring imide units.   | <p>Polyimide</p>  <p>R1 = Aryl<br/>R2 = Alkyl</p> |

|                                  |   |   |
|----------------------------------|---|---|
| <b>Poly lactide</b>              | Fibre formed of linear macromolecules having in the chain at least 85% (by mass) of lactic acid ester units derived from naturally occurring sugars, and which has a melting temperature of at least 135°C                      | $\left[ \text{O}-\underset{\text{CH}_3}{\overset{\text{H}}{\text{C}}}-\overset{\text{O}}{\parallel}{\text{C}} \right]_n$  |
| <b>polypropylene<sup>1</sup></b> | Fibre composed of linear macromolecules made up of saturated aliphatic hydrocarbon units in which one carbon atom in two carries a methyl side group, generally in an isotactic configuration and without further substitution. | <p>Polypropylene</p> $\left[ \text{CH}_2-\underset{\text{CH}_3}{\overset{\text{H}}{\text{C}}} \right]_n$  |
| <b>vinylal</b>                   | Linear macromolecules of poly (vinyl alcohol) with different levels of acetalization  | <p>Acetalized poly(vinyl alcohol)</p> $\left[ \left( \text{CH}_2-\underset{\text{OH}}{\overset{\text{H}}{\text{C}}} \right)_m \left( \text{CH}_2-\underset{\text{O}-\text{R}-\text{O}}{\overset{\text{H}}{\text{C}}}-\text{CH}_2-\underset{\text{H}}{\overset{\text{H}}{\text{C}}} \right)_n \right]_p$ <p>Where n &gt; 0</p> |

## 1.4 Generic classification of inorganic fibres

| Generic name             | Distinguishing attribute  |
|--------------------------|---|
| <b>Carbon</b>            | Fibre containing at least 90% by mass of carbon obtained by thermal carbonization of organic fibre precursors |
| <b>glass</b>             | Fibre, in textile form, obtained by drawing molten glass.   |
| <b>ceramic</b>           | Fibre, in textile form, obtained from ceramic materials   |
| <b>metal<sup>2</sup></b> | Fibre obtained from metal   |

<sup>1</sup> Forms part of the polyolefins class

<sup>2</sup> Fibres can be coated with metals, in which case they are described as "metallized fibres" and not "metal fibres"

## 1.5 Coding system of man-made fibres and relevant Commercial Allowances

| Alphabetic order of names |                        | Commercial Allowances | Alphabetic order of codes |                   | Commercial Allowances |
|---------------------------|------------------------|-----------------------|---------------------------|-------------------|-----------------------|
| acetate                   | <b>CA</b>              | 9,00                  | <b>ALG</b>                | alginate*         | 20,00                 |
| acrylic                   | <b>PAN</b>             | 2,00                  | <b>AR</b>                 | aramid**          | STD 7,00/HM 3,5       |
| alginate*                 | <b>ALG</b>             | 20,00                 | <b>CA</b>                 | acetate           | 9,00                  |
| aramid **                 | <b>AR</b>              | STD 7,00/HM 3,5       | <b>CF</b>                 | carbon            |                       |
| carbon                    | <b>CF</b>              |                       | <b>CEF</b>                | ceramic           |                       |
| ceramic                   | <b>CEF</b>             |                       | <b>CLF</b>                | chlorofibre*      | 2,00                  |
| chlorofibre*              | <b>CLF</b>             | 2,00                  | <b>CLY</b>                | lyocell           | 13,00                 |
| cupro                     | <b>CUP</b>             | 13,00                 | <b>CMD</b>                | modal             | 13,00                 |
| elastane***               | <b>EL</b>              | 1,30                  | <b>CTA</b>                | triacetate        | 7,00                  |
| elastodiene*              | <b>ED</b>              | 1,00                  | <b>CUP</b>                | cupro             | 13,00                 |
| elastomultiester*         | <b>EME</b>             | 1,50                  | <b>CV</b>                 | viscose           | 13,00                 |
| elastolefin*              | <b>EOL</b>             | 1,50                  | <b>ED</b>                 | elastodiene*      | 1,00                  |
| fluorofibre*              | <b>PTFE</b>            | 0,00                  | <b>EL</b>                 | elastane          | 1,3 0                 |
| glass                     | <b>GF</b>              | 2/3,00                | <b>EME</b>                | elastomultiester* | 1,50                  |
| lyocell                   | <b>CLY</b>             | 13,00                 | <b>EOL</b>                | elastolefin*      | 1,50                  |
| melamine                  | <b>MF</b>              |                       | <b>GF</b>                 | glass             | 2/3,00                |
| metal*                    | <b>MTF</b>             | 2,00                  | <b>MAC</b>                | modacrylic*       | 2,00                  |
| modacrylic*               | <b>MAC</b>             | 2,00                  | <b>MF</b>                 | melamine          |                       |
| modal                     | <b>CMD</b>             | 13,00                 | <b>MTF</b>                | metal*            | 2,00                  |
| polyamide                 | <b>PA</b>              | FY 5,75 SF 6,25       | <b>PA</b>                 | polyamide         | FY 5,75 SF 6,25       |
| polyester                 | <b>PES<sup>1</sup></b> | 1,50                  | <b>PAN</b>                | acrylic           | 2,00                  |
| polyethylene*             | <b>PE</b>              | 1,50                  | <b>PE</b>                 | polyethylene*     | 1,50                  |
| polyimide*                | <b>PI</b>              | 3,50                  | <b>PES<sup>1</sup></b>    | polyester         | 1,50                  |
| polylactide*              | <b>PLA</b>             | 1,50                  | <b>PI</b>                 | polyimide*        | 3,00                  |
| polypropylene             | <b>PP</b>              | 2,00                  | <b>PLA</b>                | polylactide*      | 1,50                  |
| triacetate                | <b>CTA</b>             | 7,00                  | <b>PP</b>                 | polypropylene     | 2,00                  |
| viscose                   | <b>CV</b>              | 13,00                 | <b>PTFE</b>               | fluorofibre*      | 0,00                  |
| vinylal*                  | <b>PVAL</b>            | 5,00                  | <b>PVAL</b>               | vinylal*          | 5,00                  |

\* refers to European Union Directives on Textile Labelling

\*\* European Union Directives on Textile Labelling indicate 8,00

\*\*\* European Union Directives on Textile Labelling indicate 1,50

<sup>1</sup> The same code is used in the plastic industry for polyether sulfone in ISO 1043.

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# **CHAPTER 2**

## **Morphological schemes**

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### **INTRODUCTION**

This chapter gives an overview on terms directly related to "fibres" and sets out in diagrammatic form the relationship between the various forms into which fibres can be transformed, up to and including the twisting stages. The diagrams cover only the main sequences of commonly used operations, and should not be interpreted as implying that all morphological forms listed exist for a particular generic category. Definitions are given for the main cases of elastane containing yarns.

Each term in these diagrams is defined in chapter 3.

### **2.1 BISFA definitions of "fibre" related terms**



### BISFA definitions of "fibre" related terms

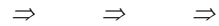
|  |
|--|
| <b>Fibre:</b> a <i>morphological term</i> for substances characterised by their flexibility, fineness and high ratio of length to cross sectional area   |
| <b>Filament:</b> a fibre of <i>very great length, considered as continuous</i>   |
| <b>Yarn:</b> a <i>textile product of substantial length</i> and relatively small cross section, composed of fibres with or without twist. This general term covers all the specific types of yarns, e.g. single yarn, multiplewound yarn, filament yarn, spun yarn |

*Man-made fibre spinning process leads to:*



**Tow:** a *large number of filaments*, assembled without substantial twist usually intended to be cut or stretch-broken for use in staple fibre or top form

**Fibril:** a *subdivision of a fibre* can be attached to the fibre or loose



**Fibre fly:** *airborne* fibres or parts of fibres (light enough to fly), visible as fibres to the human eye

*increasing unit length*

**Flock:** *very short fibres, intentionally produced for other purposes than spinning*



*increasing unit length*



**Staple fibre:** a textile fibre of *limited but spinnable length*.

**Filament**  
a fibre of very great length, considered as *continuous*

↓  
**Textile**

(Textile spinning process leads to)  
**Sliver:** an *indefinitely long assembly of staple fibres*, substantially parallel, without twist, capable of being drafted in preparation for spinning. **Top** = synonym for sliver

↓  
**spinning**

**Roving:** an indefinitely long assembly of staple fibres, *substantially parallel, with slight twist*, capable of being drafted in the later or final stages of preparation for spinning.

↓  
**process**

**Spun yarn:** a yarn made of staple fibres usually *bonded together by twist*.

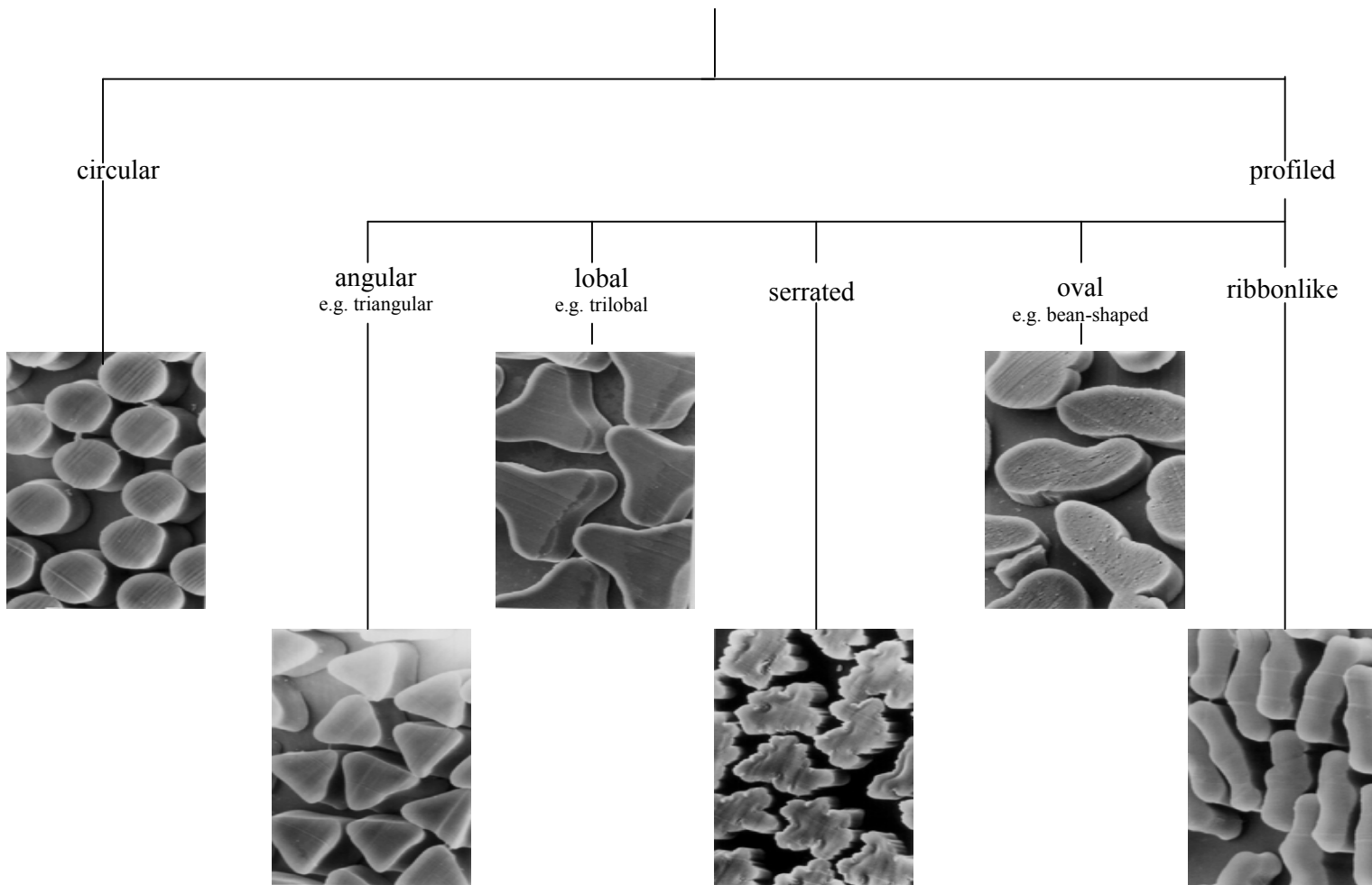
**Filament yarn:** a yarn composed of *one or more filaments*

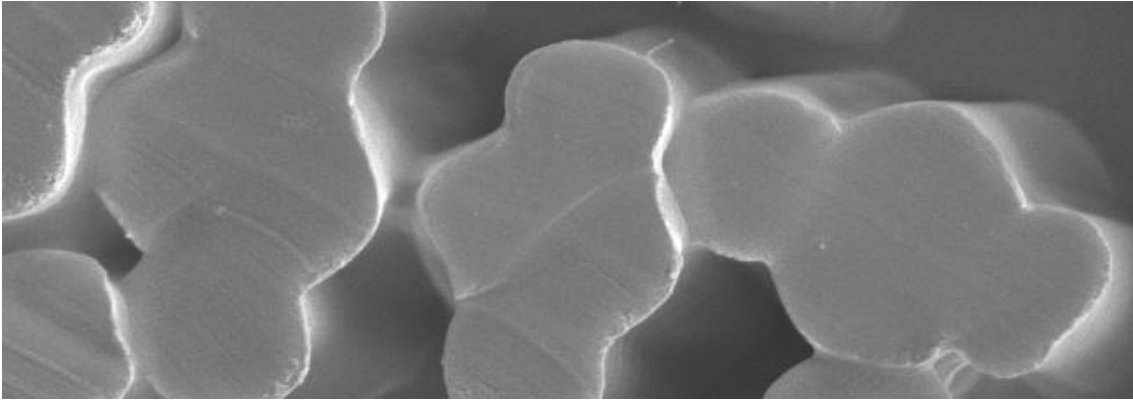
**Monofil:**  
a filament yarn consisting of *a single filament*

|  |
|--|
| <b>Single yarn:</b> a yarn composed of staple fibres (spun yarn), a single filament (monofilament) or several filaments (multifilament), with or without twist |
|--|

## 2.2 Characteristics of man-made fibre cross sections

Cross sectional shape

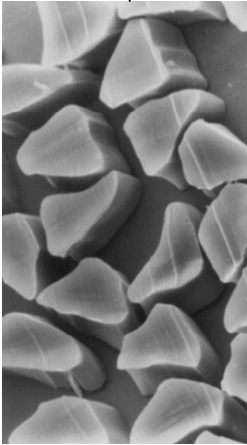




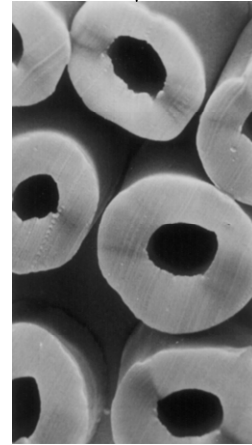
multichannel

Cross sectional area  
Examples:

solid

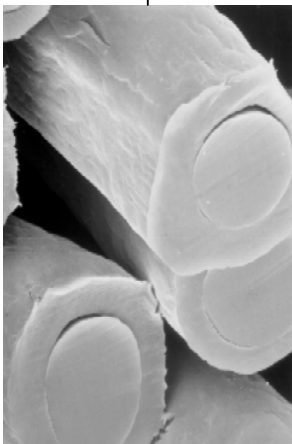


hollow

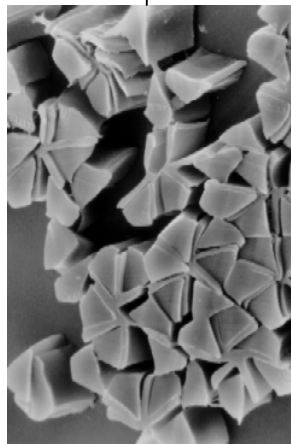


Multi-component fibres  
Examples:

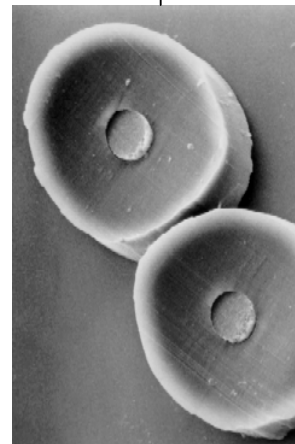
concentric cover-core



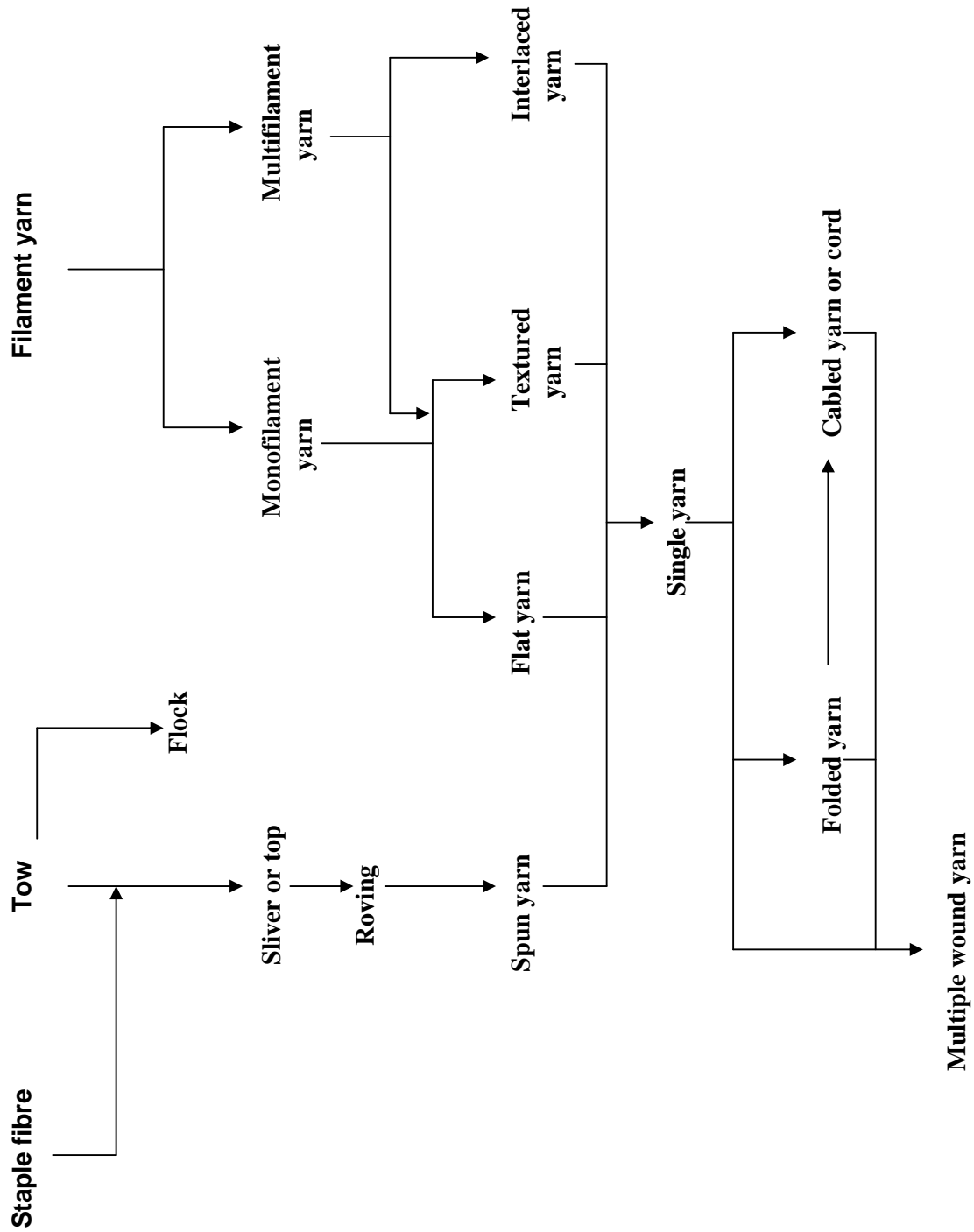
matrix /




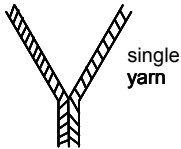
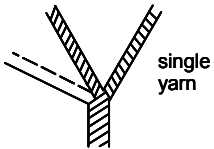
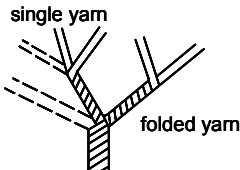
sheath-core

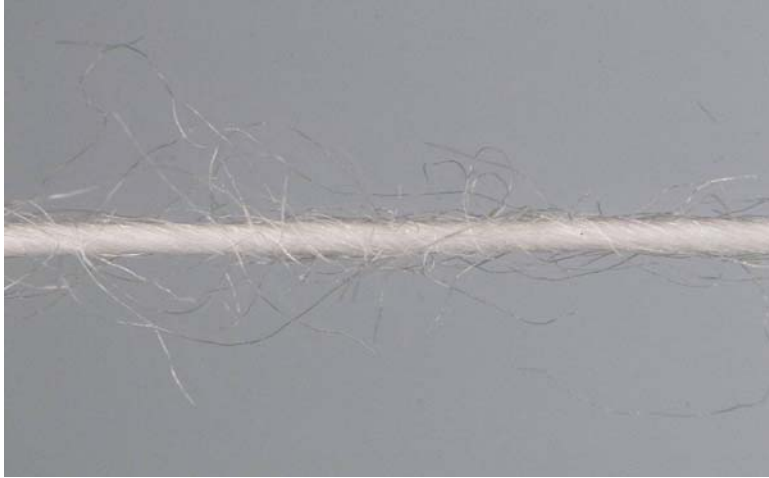


### 2.3 General morphological scheme for man-made fibres

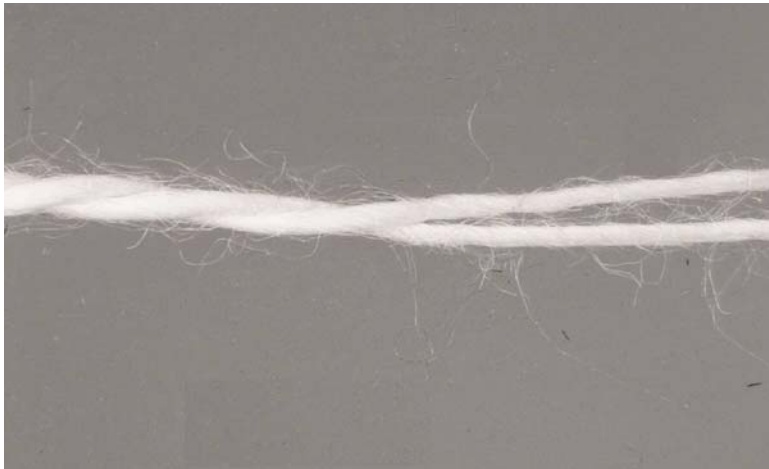


## 2.4 Illustration of yarn constructions

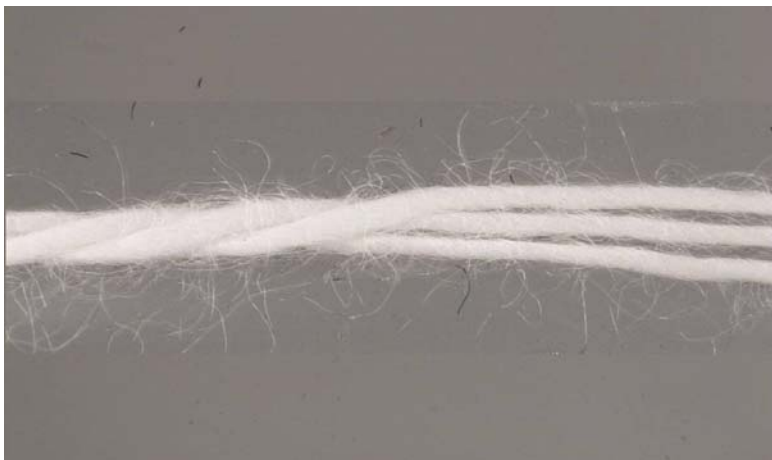
| Definition   | Explanation  |
|--|--|
|  <p data-bbox="537 573 643 600">Single yarn</p>   | <p data-bbox="808 436 980 506">Spun yarn or<br/>Filament yarn</p>  |
|  <p data-bbox="634 730 695 779">single<br/>yarn</p> <p data-bbox="500 848 683 877">Multiple wound yarn</p>  | <p data-bbox="808 720 1208 821">Two or more components<br/>no twisting operation<br/>similar or dissimilar components</p>              |
|  <p data-bbox="634 1016 695 1064">single<br/>yarn</p> <p data-bbox="508 1142 680 1163">Folded (plied yarn)</p>                                       | <p data-bbox="808 1014 1208 1115">Two or more components<br/>one twisting operation<br/>similar or dissimilar components</p>           |
|  <p data-bbox="488 1220 591 1247">single yarn</p> <p data-bbox="618 1331 721 1358">folded yarn</p> <p data-bbox="532 1415 646 1440">Cabled yarn</p> | <p data-bbox="808 1276 1208 1377">Two or more components<br/>more than one twisting operation<br/>similar or dissimilar components</p> |



Single yarn



2 folded (plied) yarn



3 folded (plied) yarn

## 2.5 Morphological scheme for elastane containing yarns

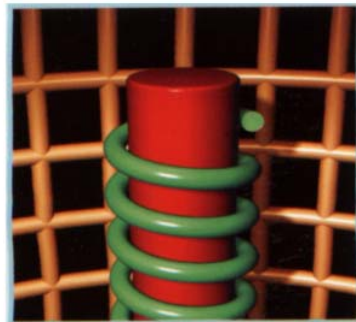
### Elastic covered yarn

General term for elastic yarn with bare elastane core covered by one or more relatively inelastic textile components.

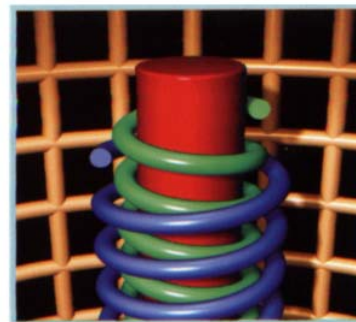
Several processes are in use to combine elastane with other fibres to produce elastic yarns for textile applications. The main yarn constructions of such fibre combinations are :

- **Single or double covered yarn**

Elastic yarn with bare and twistless elastane core and one or more relatively inelastic yarns wrapped around the core with continuous turns in one or opposite directions.



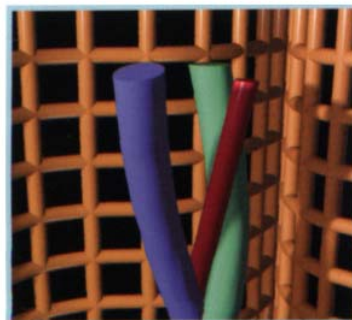
Single-covering



Double-covering

- **Elastic core spun yarns**

Elastic yarn with bare elastane core and relatively inelastic staple fibres from a sliver twisted around the core with continuous turns in one direction.

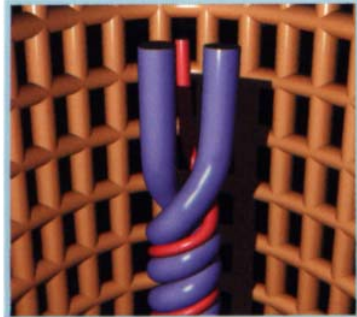


Core-spun



- **Elastic core twisted yarns**

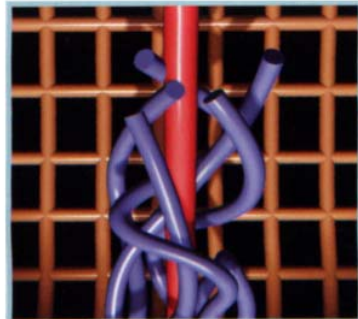
Elastic yarn with bare elastane core and one or more relatively inelastic cover yarns twisted with continuous turns in one direction.



Core-twisting

- **Elastic air covered yarns**

Elastic yarn with bare and twistless elastane core and one or more relatively inelastic cover yarns air-mingled together with the core entwined by the filaments with randomly distributed interlace points.



Air-covering

- **Core textured yarn**

Elastic yarn with bare elastane core covered by one or more relatively inelastic cover yarns continuously textured together with the core entwined by the filaments with false twist turns of randomly changing directions.

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## CHAPTER 3

### Technical terms and definitions

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This chapter lists the technical terms used by BISFA in its various methods booklets together with their definitions. The terms are listed in alphabetical order.

The translation of these terms into languages other than English is set out in Chapter 7.

The definitions of the statistical terms used by BISFA are given in Chapter 4.

Special definitions relevant to tests on steel tyre cord are to be found in the BISFA test methods booklet for steel tyre cord.

#### **Adhesion**

The property denoting the ability of a material to resist delamination or separation into two or more layers.

- **Adhesion, in tyre fabrics**

The force required to separate a textile material or steel cord from rubber or other elastomer by a definite prescribed method.

#### **Adhesion, rubber coverage**

Ratio between the wire surface covered by rubber and total embedded surface after the adhesion pull out test.

#### **Air-covered yarn**

Elastic yarn with bare and twistless elastane (or other elastic) core covered by one or more relatively inelastic cover yarns mingled together by an air stream with the core entwined by the filaments with randomly distributed interlacing points.

#### **Air textured yarn**

Textured filament yarn obtained by overfeeding filament yarn into a turbulent stream of air.

#### **Assembled yarn**

See : Multiple wound yarn

## **Atmosphere**

- **Standard atmosphere :**

Air at local atmospheric pressure with a relative humidity of 65% and a temperature of 20 degree Celsius.

- **Standard atmosphere for testing**

The atmosphere, in which physical testing is carried out, shall be the standard atmosphere maintained with certain limits, to ensure that test results are not significantly influenced by changes in the atmosphere.

Note:

The magnitude of these limits depends on the sorption behaviour of the tested material and is specified in the respective methods booklets.

- **Atmosphere for preconditioning**

The atmosphere used to partially dry the material before further treatment or conditioning. The atmosphere for preconditioning shall be maintained within the following limits :

Humidity :           5 - 25 %  
Temperature :       not exceeding 50 °C

## **BCF (Bulked Continuous Filament)**

Continuous filament fibre containing a degree of crimp or bulk.

## **Beam**

A cylinder usually with flanges on each end on which a defined number of ends are wound substantially parallel with identical length.

- **Back beam**

A beam with a defined number of ends and defined length normally intended for subsequent assembly with other back beams.

- **Warp knitting beam**

A beam with a defined number of ends and length used for subsequent warp knitting operation.

- **Weaver's beam**

A beam carrying the warp which has a defined number of ends of identical length inserted in the loom and used for weaving the fabric.

## **Bicomponent fibre**

See : Multicomponent fibre.

## **Bishrinkage yarn**

Yarn comprising filaments with two different shrinkage properties.

### **Boiling water shrinkage**

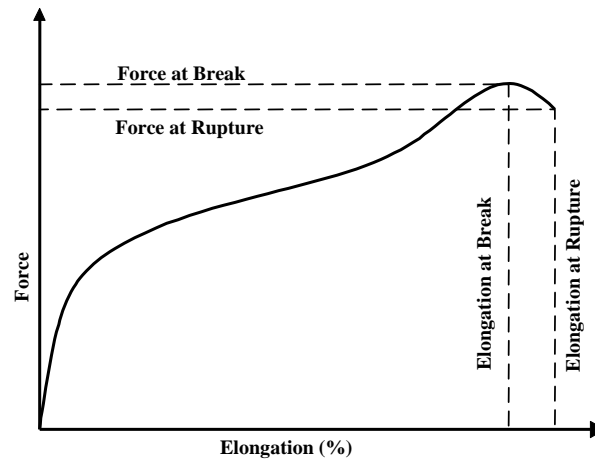
See : Shrinkage.

### **Breaking elongation (deprecated term)**

See : Elongation at break.

### **Breaking force (Synonym: Force at break)**

The maximum force applied to a test specimen carried to rupture during a tensile test (See diagram).



**Figure 3.1 : Force-Elongation-Diagram**

### **Breaking strength (Synonym : Strength at break)**

Term still commonly used, but improperly, for the average of the results of breaking force measurements.

### **Breaking tenacity (Synonym : Tenacity at break)**

The breaking force divided by the linear density of the unstrained material.

**Breaking toughness**

The work required to achieve the breaking force of the test specimen expressed per unit length and linear density of the unstrained material.

**Bulked Continuous Filament**

see BCF

**Cabled yarn**

A yarn with two or more components of which at least one is a folded yarn, combined by one or more twisting operations.

Note : For certain industrial uses the word cord is used for folded or cabled yarns.

**Chord modulus**

See : Modulus

**Clamps**

The parts of a testing device which are used to grip the test specimen by means of suitable jaw faces.

**Coating of steel filament**

- **Mass of coating**

The quantity of covering layer applied to the surface of the filament.

- **Thickness of coating**

The average thickness of the coating layer.

- **Composition of coating**

The quantity of each of the components expressed as a percentage of the total mass of the coating

**Coiling**

The process of laying down a sliver, top or tow into successive layers within which circular spirals are regularly arranged.

**Commercial mass**

See : Mass

**Compact cord**

A cord comprising a number of filaments twisted in the same direction and with the same lay length with a minimum cross-sectional area.

**Conditioned state**

A sample is in the "conditioned state" or "conditioned" for testing purposes when it has been kept in the atmosphere for testing until moisture equilibrium has been reached. Equilibrium shall be considered to have been attained when the mass of the well-opened sample shows no progressive change between successive hourly weighings. In the case of certain fibres, preconditioning is necessary to ensure that moisture equilibrium is reached by absorption.

**Conditioning**

The process of bringing a textile material into moisture equilibrium with the standard atmosphere for testing.

**Consignment**

All the products of one defined type and quality, delivered to one customer against one dispatch note.

**Consignment sample**

A selection of containers representative of the whole consignment.

**Constant rate of extension (CRE) dynamometer**

A tensile testing machine, where one clamp is stationary whilst the other is moving with a constant speed throughout the test, and where the entire testing system is virtually free from deflection.

**Container**

The unit of packaging (e.g. carton, case, bag, bale, pallet, etc.).

**Conventional allowance**

The conventional allowance is an agreed percentage to be added to the oven-dry mass of the material for the calculation of commercial mass and certain other properties.

This allowance is normally fixed for each fibre type and includes the moisture regain which approximately corresponds with equilibrium under the standard atmosphere and for some fibres, an allowance for substances removable during normal processing, e.g. the finish normally applied to impart the required properties to the textile material.

See Mass.

**Cord**

See : Cabled yarn, Steel cord.

**Cord of steel**

See : Steel Cord

**Cord thickness**

A conventional way of expressing an average cord diameter.

**Core (in steel tyre cord)**

A filament, filaments or strand that serves as an extended axis about which other elements can be wound.

**Core-spun yarn**

Yarn with filament (elastane, other elastic or inelastic) core and relatively inelastic staple fibres from a sliver twisted around the core with continuous turns in one direction.

**Core-textured yarn**

Yarn with filament (elastane, other elastic or inelastic) core covered by one or more relatively inelastic cover yarns continuously textured together with the core entwined by the filaments with false twist turns of randomly changing directions.

**Core-twisted yarn**

Yarn with filament (elastane, other elastic or inelastic) core and one or more relatively inelastic cover yarns twisted with continuous turns in one direction.

**Covered yarn (single or double)**

Yarn with filament (elastane, other elastic or inelastic) core covered by one or more relatively inelastic cover yarns continuously wrapped around the core in one or opposite directions.

**Crimp**

The waviness of a fibre, yarn or tow.

Note : This characteristic may be expressed numerically by the combination of the crimp frequency either with the crimp contraction or -in the case of textured yarns- with the crimp elongation.

- **Crimp contraction (also : percentage crimp)**

The contraction of a crimped fibre or a textured yarn owing to the development of crimp, expressed as a percentage of its straightened length.

- **Crimp elongation**

The lengthening of a crimped fibre or of a textured yarn after development of crimp when it is straightened under specified tension expressed as a percentage of its initial length.

- **Crimp frequency**

The number of crimps per unit of length of filament yarn, staple fibre or tow.

Note : Different methods are in common use for expressing crimp frequency, based on half or whole waves and on straightened or unstraightened length.

These bases must therefore be specified in any quantification.

- **Crimp, latent**

Crimp that can be developed by a thermal treatment or by tensioning and subsequent relaxation.

- **Crimp liveliness**

The tendency for a textured yarn to develop its crimp immediately after the reduction of an applied tension.

- **Crimp stability**

The ratio of the crimp of a fibre or textured yarn after a specified treatment to the crimp prior to treatment, expressed as a percentage.

Note : The method for determination of crimp and the treatment must be reported.

### **Cross section**

The shape of a fibre when viewed perpendicular to its axis.

Note : The shape of man-made fibres can be influenced by the spinning process and subsequent processing and treatments, such as texturizing.

### **Delustrant**

A chemical substance added to the polymer in order to reduce the lustre or transparency of a fibre.

### **Dip**

A chemical composition applied to a cord or fabric to improve its adhesion to rubber or elastomers. Direction of lay

See : Twist

### **Durability (Stability)**

The ability of a material to retain its physical or chemical properties after exposure for a specified time under defined conditions such as heat, chemical agents, light or other environmental processes.



## **Dust ; fibre dust**

Non-specific terms. Can cover many types of fibrous and non fibrous species, including contaminants, usually present as mixtures of particulate matter. Recommended specific terms for airborne fibrous material are fibre fly, particulates from fibres, respirable fibre-shaped particulates (RFP).

- **Fibre fly**

Airborne fibres or parts of fibres (light enough to fly), visible as fibres to the human eye.

- **Particulates from fibres**

Airborne particles, not visible as fibres to the naked eye. May or may not be of the polymer material of the fibre or have fibre shape under microscopic view.

- **Fibril**

A subdivision of a fibre. A fibril can be attached to the fibre (fibrillated fibres) or can be loose, independent.

- **Respirable fibre-shaped particulates (RFP)**

Airborne particulates fulfilling the following dimensional conditions: length  $> 5 \mu\text{m}$  and diameter  $< 3 \mu\text{m}$  and length/diameter ratio of  $> 3:1$ .

## **Edge crimped yarn**

A textured filament yarn obtained by drawing heated filament yarn over an edge of small radius of curvature.

## **Elasticity**

That property of a material by virtue of which it tends to recover its original size and shape immediately after removal of a deforming force.

## **Elongation**

The ratio of the extension of a test specimen to its initial length, expressed as a percentage.

- **Elongation at break**

The elongation of a test specimen produced by the breaking force (See Fig. 3.1).

- **Elongation at rupture**

The elongation of a test specimen corresponding to rupture (See Fig. 3.1).

- **Elongation at specified force**

The elongation of a test specimen produced by a specified force.

- **Elongation at specified tenacity**

The elongation of a test specimen produced by a specified tenacity.

- **Elongation between defined forces**

The increase in length of a test specimen which results from subjecting it to two specified forces.

**End**

An individual yarn used in or part of a specific textile assembly such as yarn sheets, warps, yarns on beam.

**Extension**

The increase in length of a test specimen produced by a force, expressed in units of length.

**False twist stretch yarn**

A false twist yarn which has a high crimp elongation or high crimp contraction.

**False twist yarn**

A torsion textured yarn obtained by a continuous process applying high twist, heat setting and untwisting.

**Fibre**

A morphological term for substances characterised by their flexibility, fineness and high ratio of length to cross sectional area.

**Fibre dust**

See: Dust, fibre dust

**Fibre length**

- **Mean length:**

The arithmetic mean of the lengths of staple fibres.

Note : In the case of square cut staple fibres this mean is limited to the "central" section of the frequency distribution.

See Chapter 4: Statistics

- **Nominal length:**

The length quoted on commercial documents.

**Fibril**

See: Dust, Fibre dust

**Filament**

A fibre of very great length, considered as continuous.

See also: Steel Filament.

**Filament yarn**

A yarn composed of one or more filaments.

Note : Filament yarns can have the following morphologies: flat, interlaced, twisted, twistless, textured or combinations of these.

**Finish**

A chemical composition applied to yarns in order to facilitate processing.

**Flame resistance**

The property of a material whereby flaming combustion is slowed, terminated or prevented.

Note : Flame resistance can be an inherent property of the basic material or it may be imparted by specific treatment. The degree of flame resistance exhibited by a material during testing may vary with the test conditions.

**Flare**

The spreading of the filament ends or the strand ends at the cut end of a cord.

**Flock**

Very short fibres, intentionally produced for other purposes than spinning (e.g.: flocking).

**Fly**

See : Dust

**Folded yarn (Synonym: Plied yarn)**

A yarn in which two or more single yarns are combined by a single twisting operation.

**Folding in layers**

The process of placing a sliver, top or tow into successive layers in which each layer is made of regular parallel folds.

**Force**

See : SI units Chapter

- **Force at break**

See: Breaking force

- **Force at rupture**

The final force just before complete rupture of a test specimen (See Fig. 3.1 : Force-Elongation diagram).

- **Force at specified elongation**

The force associated with a specified elongation on the force-elongation curve.

**Gauge length**

The distance between two effective clamping points of a testing device.

**Gear crimped yarn**

Textured filament yarn obtained by passing the yarn between a pair of intermeshed toothed wheels.

**Giant carton**

A container comprising a large number of packages arranged in several layers.

**Gross mass**

See : Mass.

**Heat durability**

The extent to which a material retains its useful properties at ambient air conditions, following its exposure to a specified temperature and environment for a specified time and its return to ambient air conditions.

**Heat resistance**

The extent to which a material retains useful properties as measured during exposure of the material to a specified temperature and environment for a specified time.

**High tenacity yarn**

A yarn with a significantly higher breaking tenacity than others of the same generic category, generally used because of that main characteristic.

Note : Currently the following lower limits are used for high tenacity yarns :

**Table 3.1** : Limits for high tenacity filament yarns

| <b>Generic category of fibre</b> | <b>Lower limit of tenacity (cN/tex)</b> |
|----------------------------------|---|
| Aramid                           | 180                                     |
| Polyamide/Nylon                  | 53                                      |
| Polyester                        | 53                                      |
| Viscose                          | 28                                      |

**Hot air shrinkage, after treatment**

See : Shrinkage.

**Hot air shrinkage, during treatment**

See : Shrinkage.

**Industrial fibre**

Fibres intended for use in products other than non-protective clothing, household, furnishing and floor coverings selected principally but not exclusively for their performance and properties as opposed to their aesthetic or decorative characteristics.

**Initial length**

The length of a test specimen under specified pretension at the beginning of a test.

Note : For a tensile test the initial length is measured between the two effective clamping points.

**Interlaced yarn (Synonym: Intermingled yarn)**

A multifilament yarn in which cohesion is imparted to the filaments usually by passing the yarn through a turbulent air-, gas- or steam-jet without overfeed causing entwining of the filaments and the formation of randomly distributed interlacing points.

**Interlacing distance**

The distance between adjacent interlacing points.

**Interlacing frequency**

The number of interlacing points per unit length.

**Intermingled yarn**

See : Interlaced Yarn.

**Invoice mass**

See : Mass.

**Jaw faces**

The elements of a clamp which grip the test specimen without damaging it and which prevent slippage during the test.

**Knit-deknit yarn**

A textured filament yarn obtained by a process in which the filament yarn is knitted, heat set and subsequently unravelled.

**Laboratory sample**

A portion of the contents of the containers in the consignment sample to be taken to the laboratory for testing.

The laboratory samples must be taken in such a way that collectively they represent the whole consignment.

**Latent crimp**

See : Crimp.

**Lay**

Term in common use in cordage and steel cord industry, similar to twist in the textile industry.

- **Direction of lay:**

The helical disposition of the component, of a filament, strand or cord. Direction of lay is in the "S" or left hand lay ("Z" or right hand lay) when the components of a filament, strand or cord held vertically slope in the same direction as the middle part of the letter S (or Z).

See : Twist.

- **Lang's lay**

Cord in which the direction of lay in the stranding is the same as the direction of lay in cabling the cord.

- **Length of lay**

The axial distance required to make a 360 degree revolution of any element in strand or cord.

- **Ordinary or regular lay**

Cord in which the direction of lay in the stranding is opposite to the direction of lay in cabling the cord.

### **Linear density**

The mass per unit length of an essentially linear structure, for example of a staple fibre, filament yarn, tow or cord.

See Chapter 6 : SI units.

### **Lot**

All the products of one defined type and homogeneous quality delivered to one customer against one dispatch note.

Note : The term lot is sometimes used for the whole consignment and sometimes for a part of a consignment. See : Consignment

### **Lubricant**

A chemical composition such as a fatty or waxy substance applied to a yarn in order to reduce friction in subsequent textile operations, such as knitting.

### **Mass**

See also Chapter 6 : SI units

- **Commercial mass**

The mass obtained by adding to the oven-dry mass of the material the mass corresponding to the conventional allowance and any additions specified in the BISFA methods.

- **Invoice mass**

The mass indicated on the invoice and used as a commercial basis for charging. In BISFA the invoice mass should not normally differ from the commercial mass by more than the tolerance of the invoice mass.

- **Gross mass**

The total mass of a consignment, or of any part of a consignment, including the fibre and the tare.

- **Net mass**

The difference between the gross mass and the corresponding tare, determined at the same time.

- **Oven-dry mass**

The mass obtained by drying the fibre, usually after removal of added products such as finish or oil and of extractable matters.

- **Tare**

The sum of the masses of all the pallets, wrappers and containers, tie bands, and if appropriate all the yarn supports such as bobbins, tubes, relating to a consignment or to any part of a consignment.

- **Tolerance of invoice mass**

The maximum permitted deviation between the value of the commercial mass as determined according to BISFA methods and the invoice mass as indicated on the documents of sale of the consignment, expressed as a percentage of the invoice mass.

### **Matrix fibre**

Multicomponent fibre in which discrete and discontinuous portions of one or more polymers are embedded in a matrix of another polymer.

### **Matrix fibril fibre**

See : Matrix fibre.

### **Mean length**

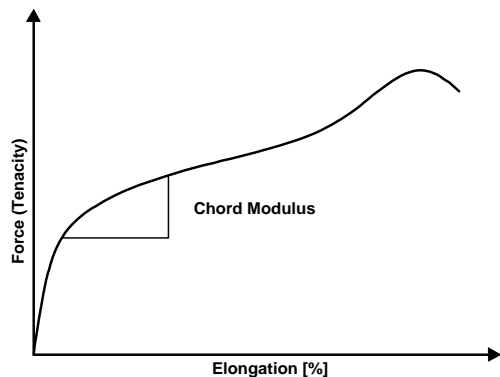
See : Fibre length.

### **Modulus** (see also Fig. 3.1)

The property of a material representative of its resistance to deformation. In tensile testing the modulus is expressed as the ratio of tenacity to strain.

- **Chord modulus**

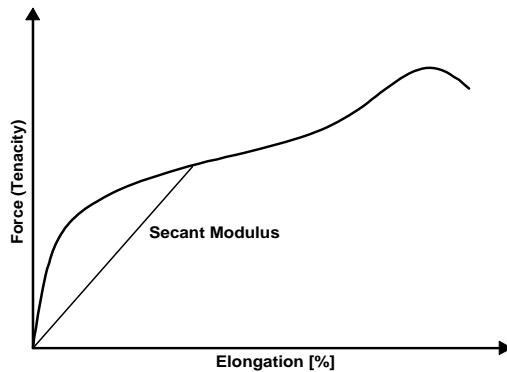
In a tenacity-strain curve, the ratio of the change in tenacity to the change in strain between two specified points on the curve.





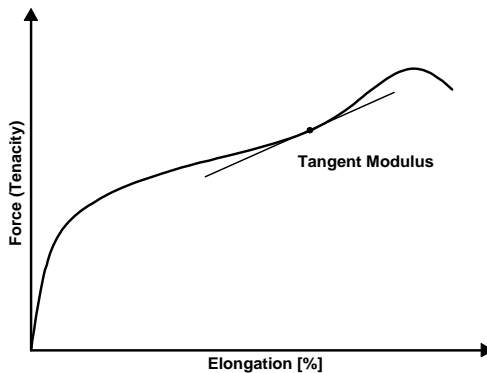
- **Secant modulus**

The secant modulus is a special case of chord modulus : starting at zero.



- **Tangent modulus**

In a tenacity-strain curve, the ratio of the change in tenacity to the change in strain derived from the tangent at any point on the curve.



### **Modulus, wet**

The modulus determined when the material is completely wet.

In the definition of the generic name "modal", the term "wet modulus" is defined as the tenacity required to produce an elongation of 5 % when the specimen is completely immersed in water.

### **Moisture content**

The amount of water contained in a material, expressed as a percentage of its total mass (including moisture and any extractables).

**Moisture regain**

The amount of water contained in the material expressed as a percentage of its oven-dry mass.

**Monofilament yarn (Monofil)**

Filament yarn consisting of a single filament.

**Multicomponent fibre**

Fibre composed of two or more fibre forming polymer components, which are chemically or physically different or both. Components can have arrangements such as side-by-side core-sheath or matrix. Where there are only two components, the fibre is said to be bicomponent.

**Multifilament yarn (Multifil)**

Filament yarn consisting of two or more filaments.

**Multiple wound yarn (Synonym: Assembled yarn)**

A yarn without twist composed of two or more singles, folded or cabled yarns.

**Net mass**

See : Mass

**Nominal length**

See : Fibre length

**Nominal linear density**

The linear density mentioned on the documents of sale (contracts, invoices, etc.).

**Nonwovens**

A manufactured sheet , web or batt of directionally or randomly orientated fibres , bonded by friction , and/or adhesion , excluding paper and products which are woven , knitted , tufted , stitch bonded incorporating binding yarns or filaments , or felted by wet-milling , whether or not additionally needled .

The fibres may be of natural or man-made origin . They may be staple or continuous filaments or be formed in situ .

**Open cord**

A steel cord in which the wires have a periodic loose association which permits "rubber" to penetrate the cross-section.

**Oven dry mass**

See : Mass.

**Package**

A package consists of yarn or cord with its winding support, if used.

Note : Packages may be of various shapes and winding patterns, e.g. bobbins, pirns, cones, cops, hanks, cakes, cheeses, tubes, beams.

**Permanent deformation**

The unrecovered strain of an exercised specimen, measured after a specific recovery period and expressed as percentage of the initial length of the specimen.

**Plied yarn**

See : Folded yarn.

**POY**

Abbreviation for partially oriented yarn, used for filament yarns with a significant degree of residual drawability. Such yarns are designed to be submitted to a further orientation process.

**Preconditioning**

The process of bringing a textile material to approximate equilibrium with the atmosphere for preconditioning.

**Pre-dip**

A chemical composition applied to a cord or fabric to improve the reactivity of the surface.

**Pretension**

The specified tension applied to a test specimen preparatory to making a test.

**Pulp**

Pulp is a generic term for the processed fibrous material manufactured for different end-uses such as fibres, paper, compounds.

**Relative humidity**

The ratio, expressed as a percentage, of the pressure of water vapour actually present in the atmosphere to the saturation pressure at the same temperature and at the same total pressure.

**Residual torsion**

The number of revolutions made by a specific length of steel cord when one end is held in a fixed position and the other allowed to turn freely.

**RFP**

See : Dust

## **Roving**

An indefinitely long assembly of staple fibres, substantially parallel, with slight twist, capable of being drafted in the later or final stages of preparation for spinning.

See : Sliver.

## **Sample**

A representative portion of a lot of material or of a consignment for testing or for record purposes.

## **Shrinkage**

The decrease in length of a test specimen caused by a specified treatment, expressed as a percentage of the length of the untreated test specimen. The lengths are measured before and during or after treatment under specified tensions.

- **Boiling water shrinkage**

The decrease in length of a test specimen caused by a treatment in boiling water for specified time, expressed as a percentage of the length of the untreated test specimen. The lengths are measured before and after treatment under a specified pretension.

- **Hot water shrinkage**

The decrease in length of a test specimen caused by a treatment in hot water under a specified temperature and time, expressed as a percentage of the length of the untreated test specimen. The lengths are measured before and after treatment under a specified pretension. The water temperature to be applied is specified between buyer and seller.

- **Hot air shrinkage, after treatment :**

The decrease in length of a test specimen caused by a treatment in hot air under specified temperature and time, expressed as a percentage of the length of the untreated test specimen. The lengths are measured before and after treatment under a specified pretension.

- **Hot air shrinkage, during treatment :**

The decrease in length of a test specimen caused by a treatment in hot air under specified temperature and time, expressed as a percentage of the length of the untreated test specimen. The lengths are measured before (under a specified pretension) and during treatment (under a specified measuring tension).

## **Single yarn**

A yarn composed of staple fibres (spun yarn), a single filament (monofilament) or several filaments (multifilament yarn), with or without twist.

**Size**

A chemical composition in solution or dispersion applied before weaving normally to warp, but sometimes to weft, to facilitate the weaving operations.

**Sliver**

An indefinitely long assembly of staple fibres, substantially parallel, without twist, capable of being drafted in preparation for spinning.

See : Top, Roving.

**Specimen**

See : Test specimen.

**Spun yarn**

A yarn made of staple fibres usually bonded together by twist.

**Square cut staple fibres**

See : Staple fibre.

**Stabilised false twist yarn**

A yarn, having a low crimp elongation and a low crimp contraction, obtained by false twisting, followed by heat-setting in a state where it is only partly relaxed from the straightened condition.

**Standard atmosphere**

See : Atmospheres

**Staple fibre**

A textile fibre of limited but spinnable length. For man-made fibres the three principal categories are:

- **Square cut staple fibres:**

Staple fibres obtained by cutting into bundles of essentially constant length; they are specified by a single nominal length.

- **Stretch-broken fibres:**

Staple fibres obtained by stretch-breaking a tow in a tow-to top process to a range of lengths up to a defined upper limit.

- **Variable length (or bias cut) staple fibres:**

Staple fibres obtained by cutting in such a way as to deliberately introduce several

lengths. Such fibres are specified by two finite nominal lengths corresponding to the limits of the cut length.

### **Steel cord**

A formed structure composed of two or more steel filaments when used as an end product or combination of strands or filaments and strands.

### **Steel filament**

A steel fibre used as an individual element in a strand or cord.  
See : Filament.

### **Stiffness**

Resistance to bending, characterised by the bending moment required to produce a bent configuration under specified conditions.

### **Straightened length**

The length of a test specimen under a specified tension sufficient to remove crimp.

### **Straightness**

The ability of a steel cord to lie flat between two straight parallel lines which are a prescribed distance apart.

### **Strain**

The ratio of the extension of a test specimen to its initial length.  
See : Elongation.

### **Strand**

A general expression for linear textile assemblies, particularly yarns which are components of ropes and cordage.

Note for steel : A group of filaments twisted together to form a unit product to be processed further. A strand may be considered as a cord if it is the end product for tyre reinforcement or if it may be an element in a more complex structure.

### **Strength at break**

See : Breaking strength.

### **Stress**

The resistance to deformation developed within a material subjected to an external force, expressed as force per cross-sectional area.

Note : Sometimes wrongly used in textile testing for tenacity, which is force per linear density.

**Stretch-broken fibres**

See : Staple fibre.

**Stufferbox crimped yarn**

Textured filament yarn obtained by overfeeding yam and compressing it into a chamber, which may be heated.

**Tabby**

A plain weave fabric. In the context of tyre cord fabric it refers to sections of closely spaced weft yarns in a special section of fabric woven to provide a sample.

**Tabby sample**

The section of a tyre cord fabric between two tabbies.

**Tangent modulus**

See : Modulus.

**Tangled yarn**

Term sometimes used as alternative for interlaced yarn.  
See : Interlaced yarn.

**Tare**

See : Mass

**Tenacity**

Force divided by linear density.

**Tenacity at break**

See : Breaking tenacity

**Tenacity at specified elongation**

The tenacity associated with a specified elongation on the tenacity-elongation curve.

**Tensile stress**

The force per unit cross-sectional area of the unstrained specimen.

**Tension**

A force tending to cause the extension of a body.

Note : An abbreviation for tensioning force. In fibres and yarns the tension applied is usually based on the linear density of the material.

**Tensioning force**

See : Tension

**Test specimen (Synonym : specimen)**

A portion of a laboratory sample or, in certain cases, the entire laboratory sample to be used for a testing procedure.

**Textured filament yarn**

A filament yarn characterised by actual or latent filament crimps, coils or loops, with or without twist liveliness, by which it has, or can develop by after-treatment, bulk and/or stretch properties.

**Titre (deprecated term)**

See : Linear density.

**Tolerance**

The maximum permissible positive or negative deviation between the value of a quantity as determined according to BISFA methods and the value quoted for the consignment. Normally, the tolerance is a percentage of the quoted value.

**Tolerance of commercial mass**

See : Mass

**Top**

Synonym for sliver.

Also a form of package in which sliver can be delivered, e.g.: ball top or bump top.

**Torsion textured yarn**

A textured filament yarn obtained by heat setting of a twisted filament yarn and subsequently untwisting it.

See : False Twist Yarn.

**Toughness at break**

See : Breaking toughness.



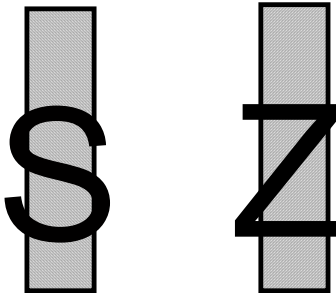
## **Tow**

A large number of filaments, assembled without substantial twist usually intended to be cut or stretch-broken for use in staple fibre or top form.

## **Twist**

The helical disposition of the components of a single, folded or cabled yarn or roving. Twist is in the S (or Z) direction when the spirals of the yarn or roving held vertically slope in the same direction as the middle part of the letter S (or Z).

See : International Standard ISO 2 (1973)



Note : If the S/Z notation cannot be used (for example in numerical fields of databanks) S should be designated as (-) and Z as (+).  
In steel cord the twist is called "direction of lay".

## **Twist factor**

The value obtained when the twist is multiplied by the square root of the linear density of the yarn.

Note 1 :

$$TF = t \cdot \sqrt{\frac{LD}{1000}}$$

where : TF = Twist Factor  
t = Twist in turns per metre  
LD = Linear density in tex

Note 2 : In order to be able to make effective comparison of different fibre generic categories in certain applications, e.g. tyre cords, it is necessary to take into account the density of the fibres.

$$TF_c = t \cdot \sqrt{\frac{LD}{\rho}}$$

where :TF<sub>C</sub> = Twist Factor corrected  
t = Twist in turns per meter  
LD = Linear density in tex  
ρ = Density in kg/m<sup>3</sup>

### **Twist level**

The number of turns per unit length of a twisted yarn.

### **Twist liveliness**

The tendency for a twisted yarn to untwist or for a torsion textured yarn to resume its twisted shape.

### **Type of lay**

See : Lay

### **Tyre cord fabric**

A structure used in tyre manufacture, comprising a sheet of warp cords or yarns bound together by widely spaced weft yarns which are usually of cotton and have a distinctly lower linear density than the warp cords or yarns.

### **Variable length (or bias cut staple fibres)**

Verification factor:

The verification - factor, as numerically defined, can be calculated from the net mass and the oven dry mass plus the conventional allowance.

### **Weight**

Deprecated term still commonly but improperly used for mass.

See : Mass.

### **Wet modulus**

See : Modulus, Wet.

### **Wire**

See : Steel Filament.

### **Work to break**

The total area under the force extension curve up to the breaking force.

**Wrap**

A filament wound helically around a steel cord.

**Yarn**

A textile product of substantial length and relatively small cross section, composed of fibre(s) with or without twist.

This general term covers all the specific types of yarns, e.g. single yarn, multiple wound yarn, filament yarn, spun yarn.

**Yarn length**

The length of yarn wound on a support measured under defined conditions.

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## **CHAPTER 4**

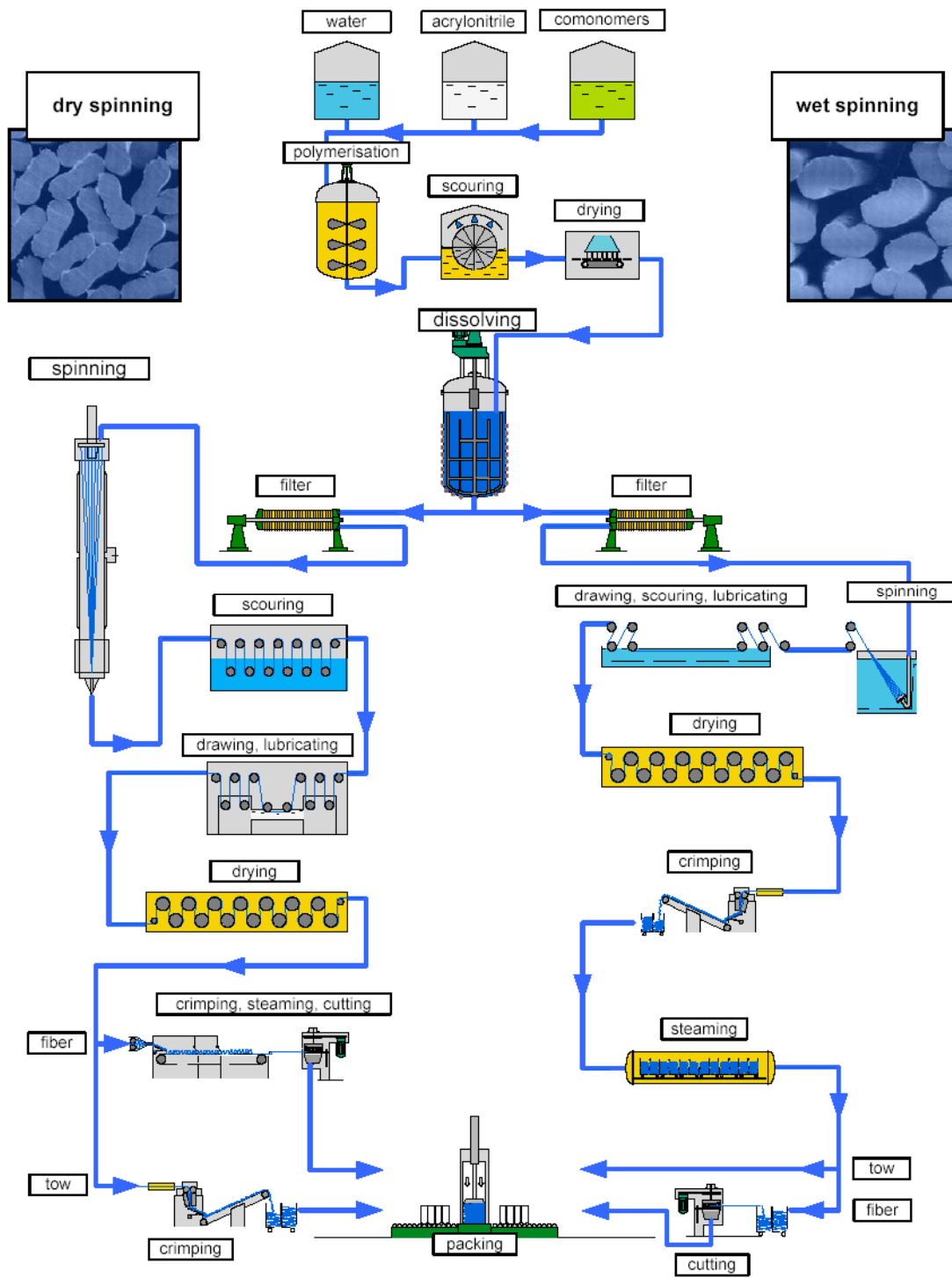
# **Schematic process flow sheets of principal man-made fibres**

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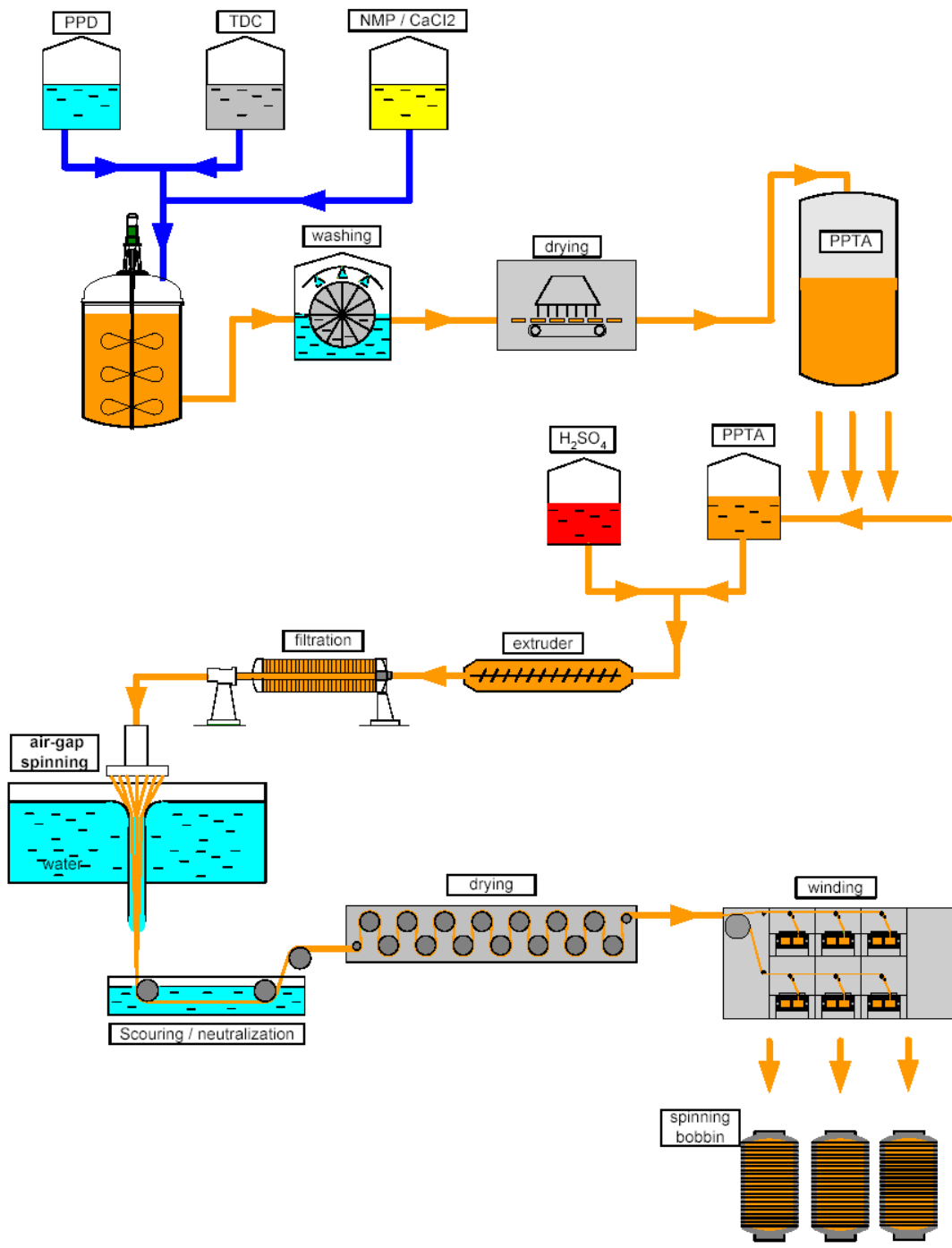
In this chapter only general and schematic process flow sheets of principal man-made fibres are described.

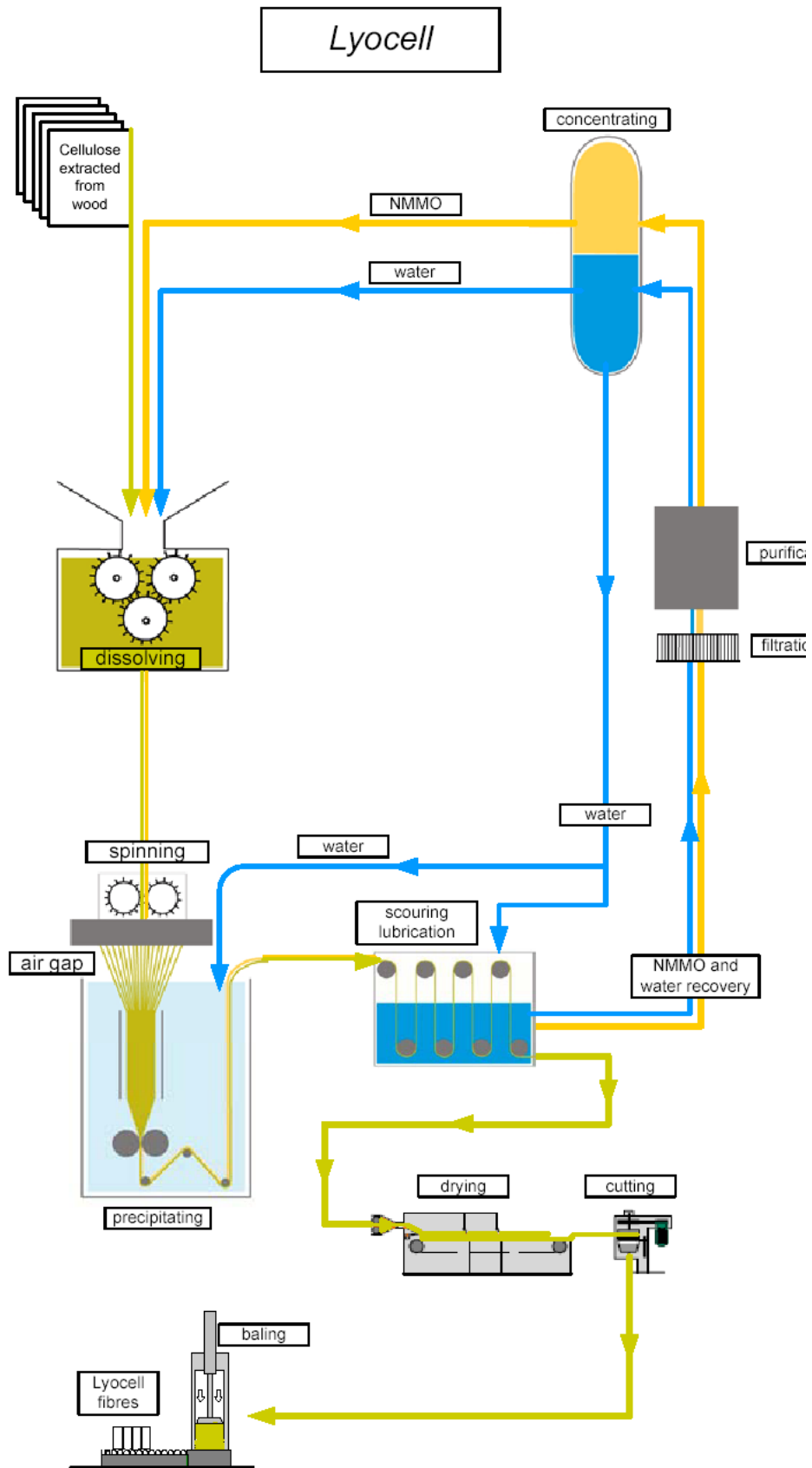
They do not intend to cover all existing technologies.

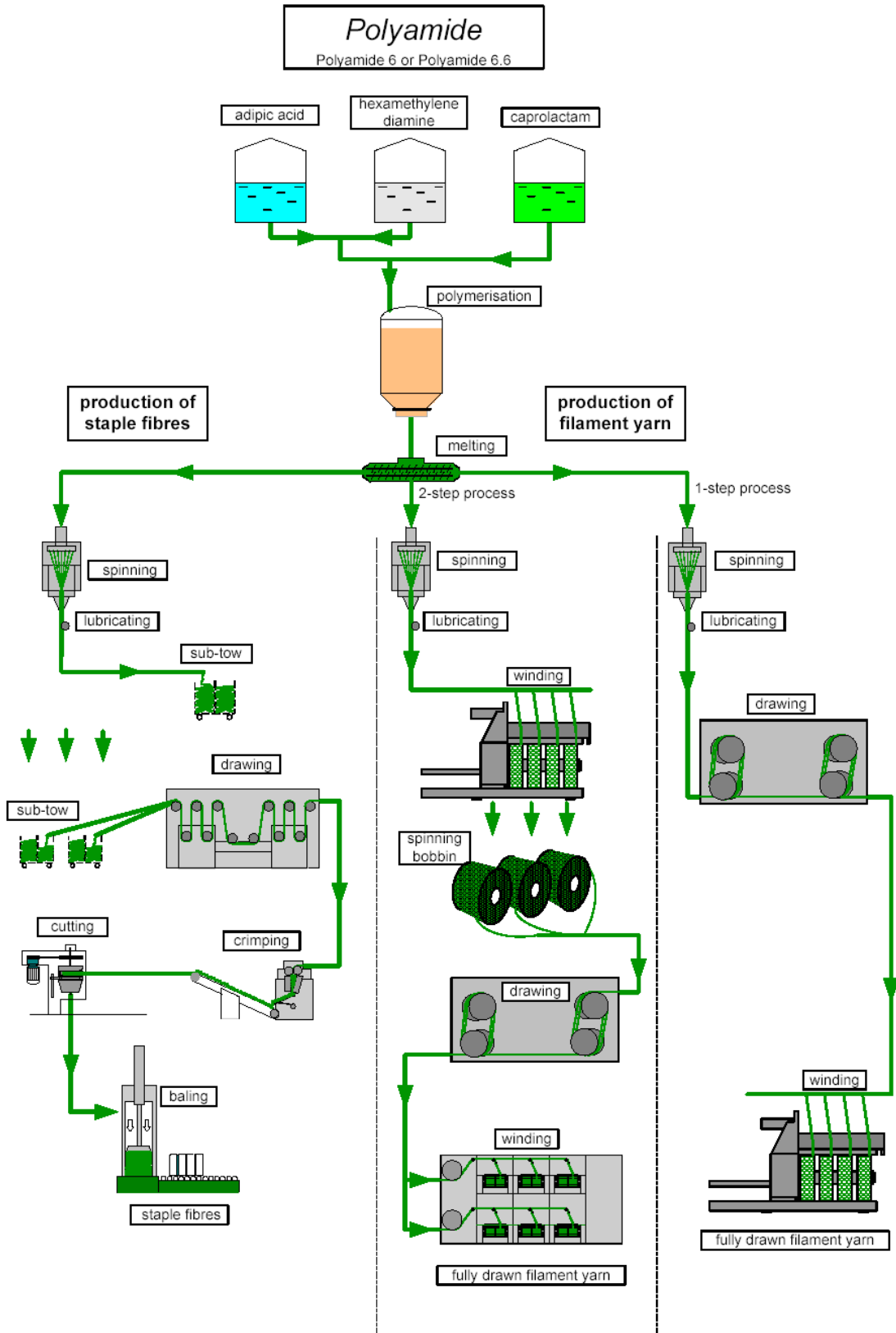
# Acrylic



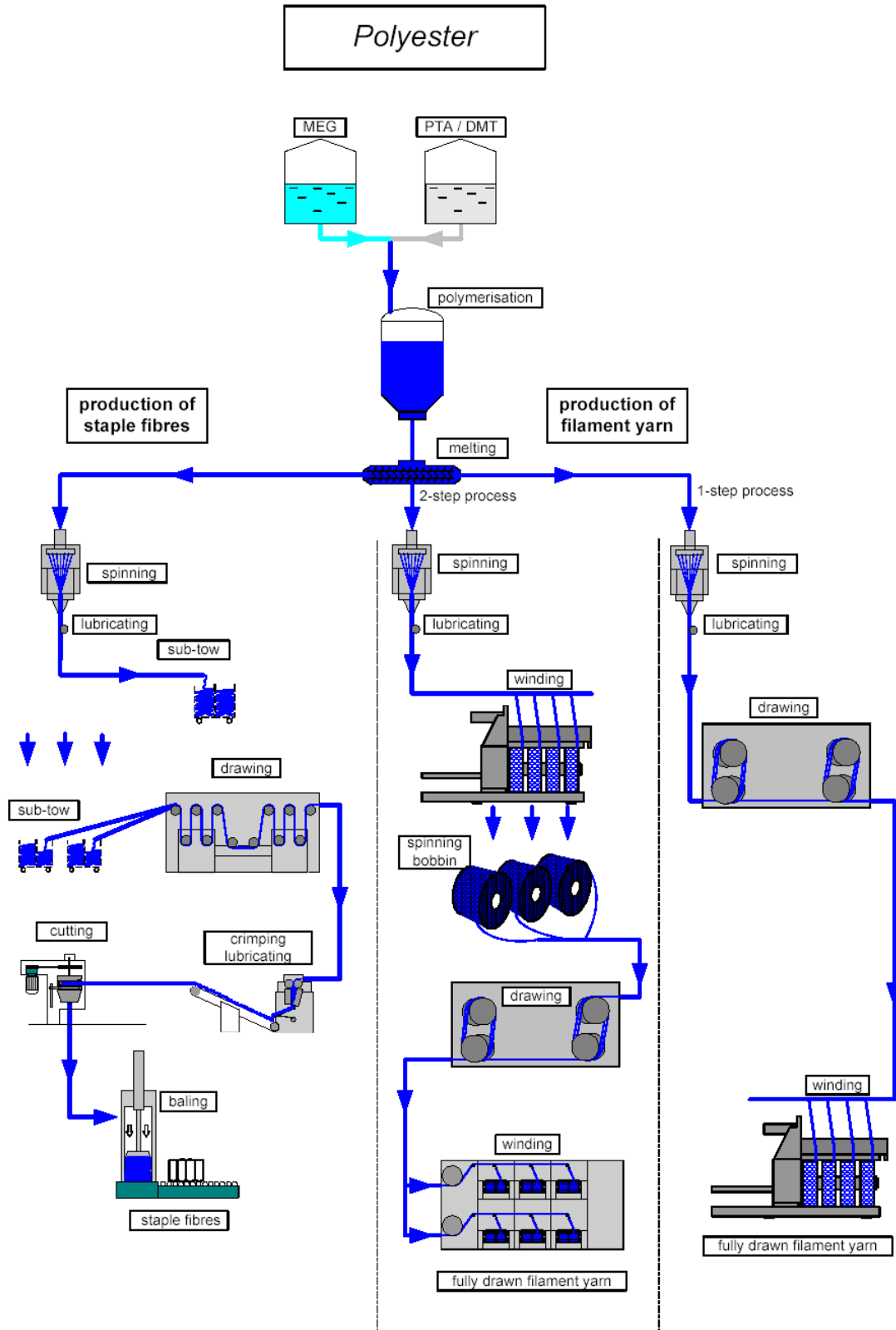
# Aramid

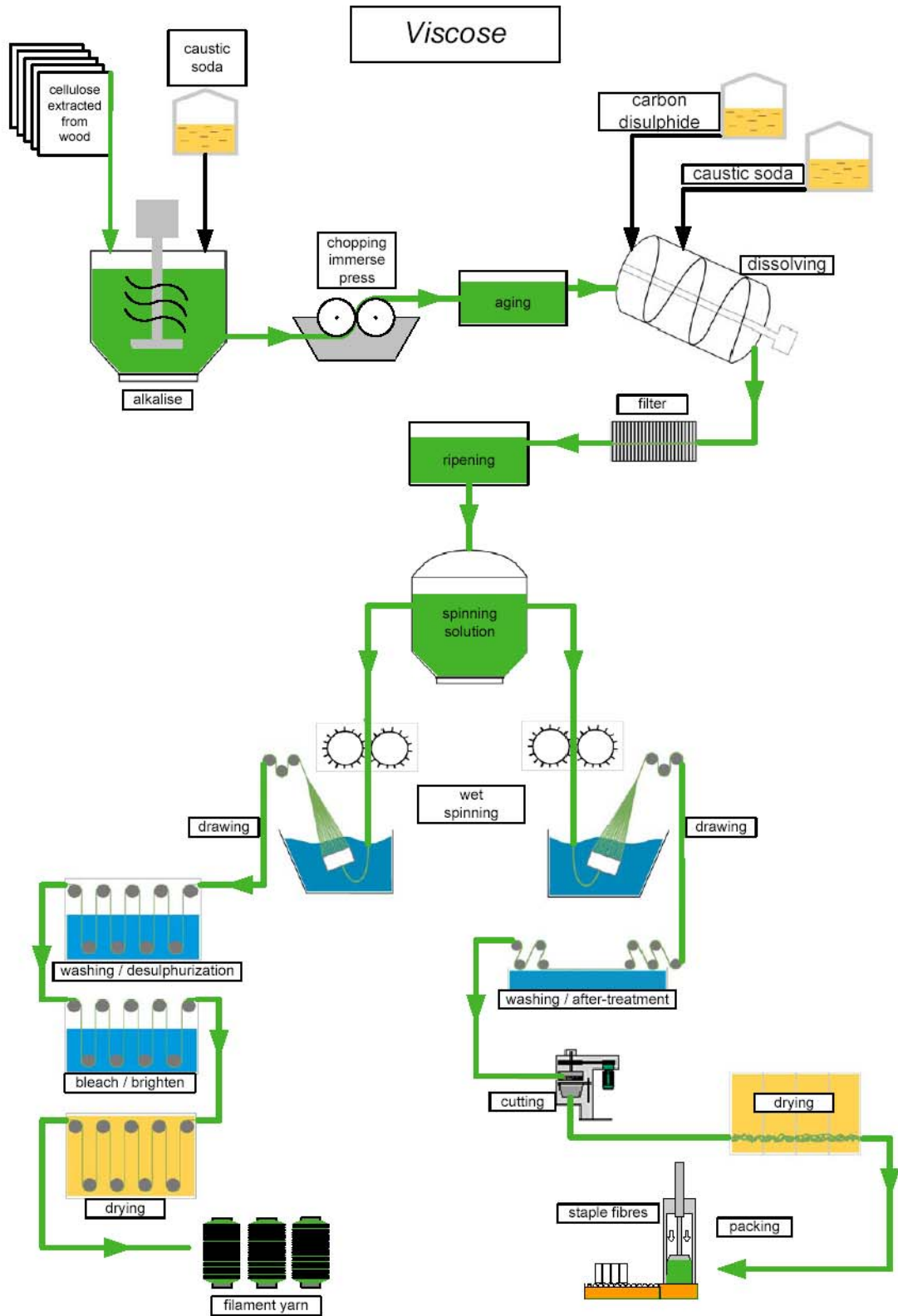












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## **CHAPTER 5**

# **Manufacturing processes of nonwovens and relevant end-uses**

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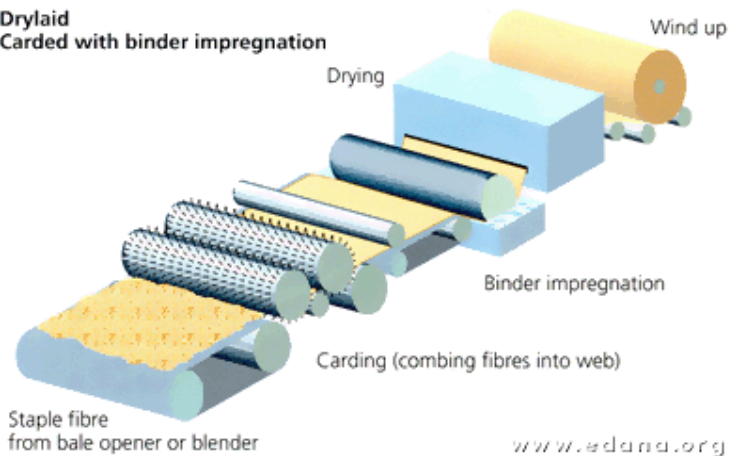
In this chapter , the following schematic process flow sheets of nonwovens manufacturing from principal man-made fibres are described :

- Drylaid
- Spunlaid
- Airlaid
- Wetlaid

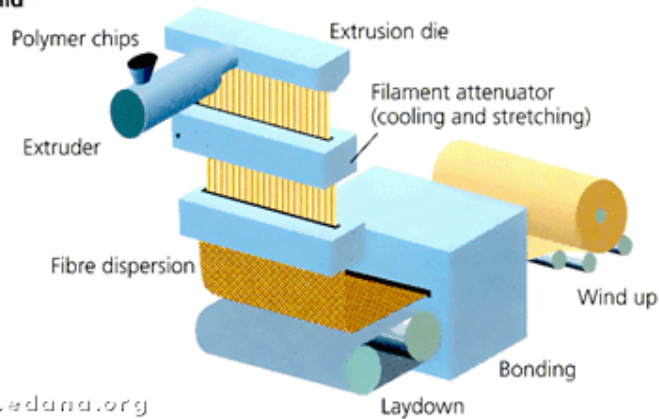
Also typical end uses derived from methods of web formation and bonding processes are shown.

## Drylaid

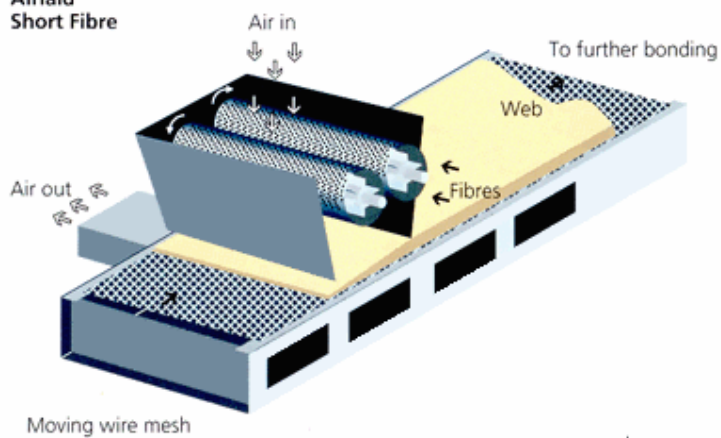
Drylaid  
Carded with binder impregnation

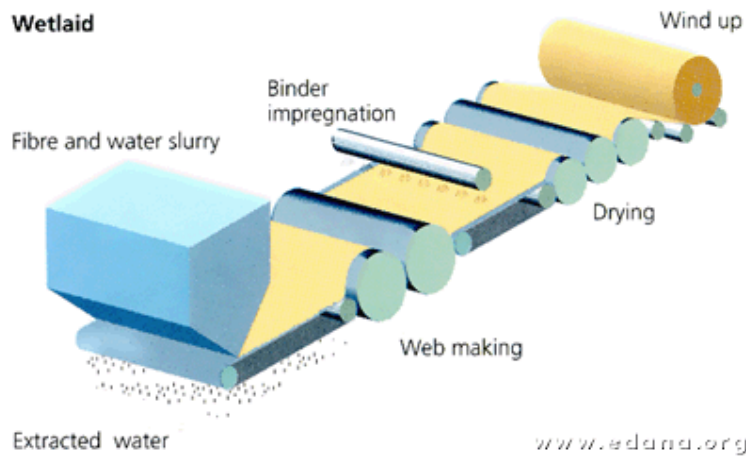


## Spunlaid



## Airlaid Short Fibre

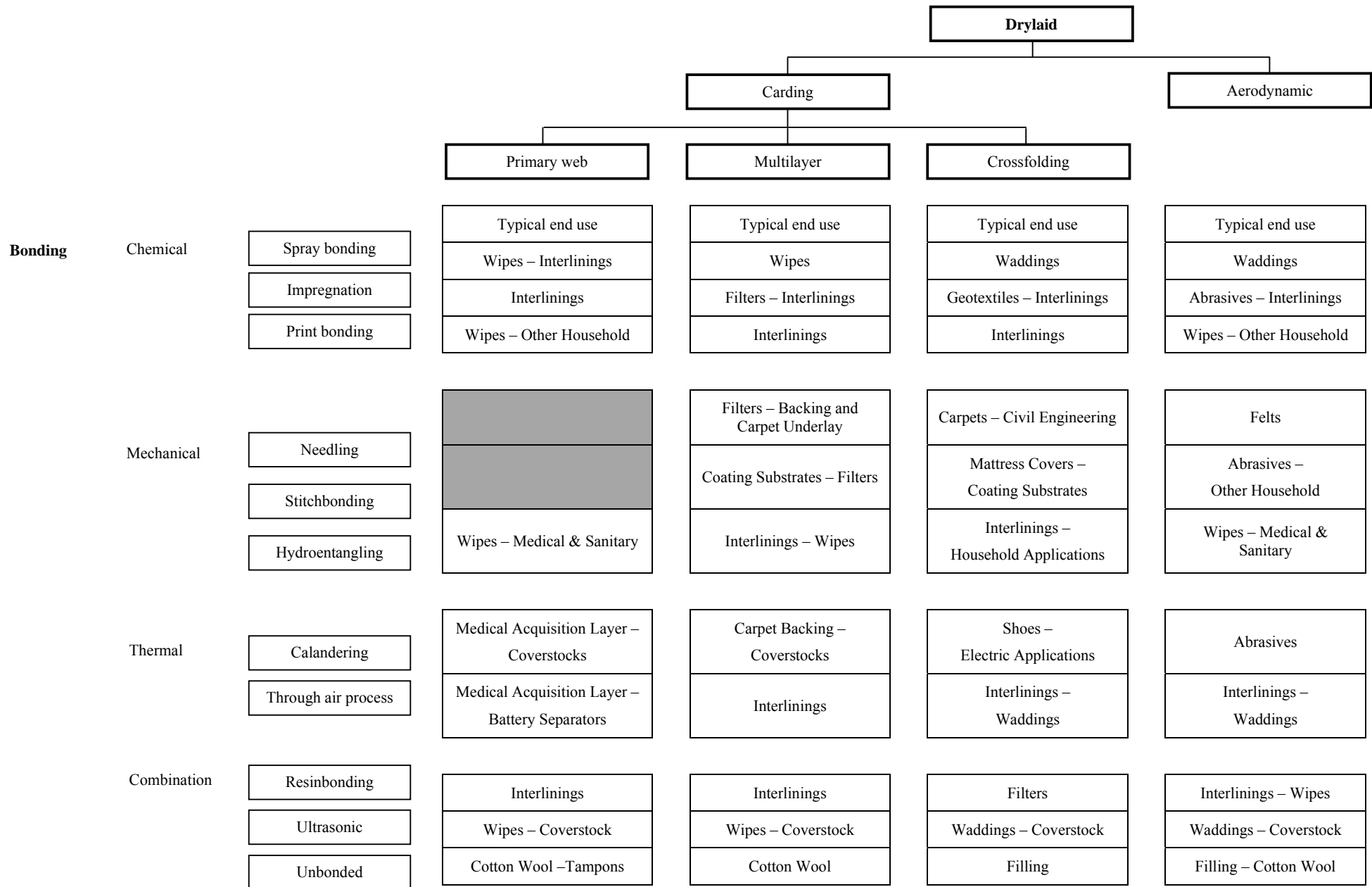




The above schemes are a kind permission from EDANA, Brussels, the international association serving the nonwovens and related industries.

**TYPICAL END USES FROM METHODS OF WEB FORMATION AND BONDING PROCESSES**

|                |             |                     | <b>Spunlaid</b>                        | <b>Meltblown and other polymer based technology</b> | <b>Wetlaid</b>                   | <b>Airlaid</b>    |
|----------------|-------------|---------------------|--|---|----------------------------------|-------------------|
| <b>Bonding</b> | Chemical    | Spray bonding       | Typical end use                        | Typical end use                                     | Typical end use                  | Typical end use   |
|                |             | Impregnation        | Wipes                                  |   | Interlinings                     | Wipes – Waddings  |
|                |             | Print bonding       | Civil Engineering                      | Filters – Interlinings                              | Wipes – Coating Substrates       | Wipes – Abrasives |
|                |             |                     | Table Cloths                           | Interlinings  | Table Cloths                     |                   |
|                | Mechanical  | Needling            | Geotextiles – Carpet Backing           |   |                                  |                   |
|                |             | Stitchbonding       | Furniture Fabrics                      |   |                                  | Abrasives         |
|                |             | Hydroentangling     | Coverstocks                            |   | Wipes                            | Wipes             |
|                | Thermal     | Calandring          | Civil Engineering – Coating Substrates | Filters – Distribution Layers                       | Filters – Tea-bags – Coverstocks |                   |
|                |             | Through air process | Interlinings – Filters                 | Filters – Surgical Masks                            |                                  | Filters           |
|                | Combination | Resinbonding        | Wall Coverings                         |   |                                  | Interlinings      |
|                |             | Ultrasonic          |  |   |                                  | Coverstocks       |
|                |             | Unbonded            |  |   |                                  | Fillings          |



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## **CHAPTER 6**

### **Morphological scheme of industrial yarns and relevant end-uses**

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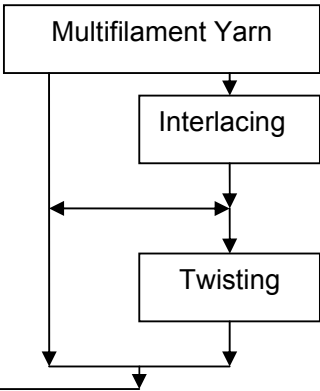
In the following page, the physical yarn transformation and main processing of industrial yarns are described.















Also the main applications and end uses are shown in a concise way.

It is understood that not all the applications are covered in this interesting and expanding high tech sector.



# Morphological Scheme of Industrial Yarns



|   | Processing                                |   | Application                               |  |   |
|---|---|---|---|--|---|
| → | Braiding                                  |    | Nets<br>Mooring<br>Hoses<br>Ropes         |    |    |
| → | Cabling                                   |   | Belts<br>Tires                            |   |   |
| → | Composites                                |  | Sails<br>Concrete<br>reinforcement        |  |  |
| → | Knitting                                  |  | Cut protective<br>gloves<br>Hoses         |  |  |
| → | Pulping                                   |   | Break pads<br>Packings<br>Paper           |  |  |
| → | Weaving<br>broad and<br>narrow<br>fabrics |  | Sail<br>Airbag<br>Ballistic<br>protection |   |  |

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## CHAPTER 7

### Statistical terms and definitions

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#### 7.1 Introduction

This chapter of the booklet covers statistical aspects of tests and test methods. However there is no intention, to give a full and broad build up of statistical knowledge, procedures and tools.

The field of statistics is rapidly expanding and has become much more than mere application of basic formulas. Today statistics is essential when it comes to understand and measure uncertainty and accuracy of test methods. Sophisticated statistical procedures for the determination of the accuracy and comparability of test methods have been developed and laid down in a number of standards.

Chapter 7 of the booklet targets to:

- Give an overview of basic statistical terms and definitions, that serve as basis for any kind of advanced statistical engagement.
- Give an overview of statistical terms, that are defined by ISO for the the estimation of the uncertainty of test methods.
- Give a short cross reference to the conduction of interlab trials.
- Give a definition of statistical Process control parameters.

#### 7.2 Basic Statistics

##### **Individual value**

The result of any one observation (breaking force, linear density, etc.) in a series of tests is called the individual value. The individual value of the  $i^{\text{th}}$  observation in a series of  $n$  observations is denoted by  $x_i$ .

BISFA tests frequently involve the examination of more than one test specimen taken from a laboratory sample or sample. The resultant individual values should first be used to determine the laboratory sample/sample arithmetic mean and it is this mean which should then be used as the individual value in subsequent statistical calculations.

## Normal distribution

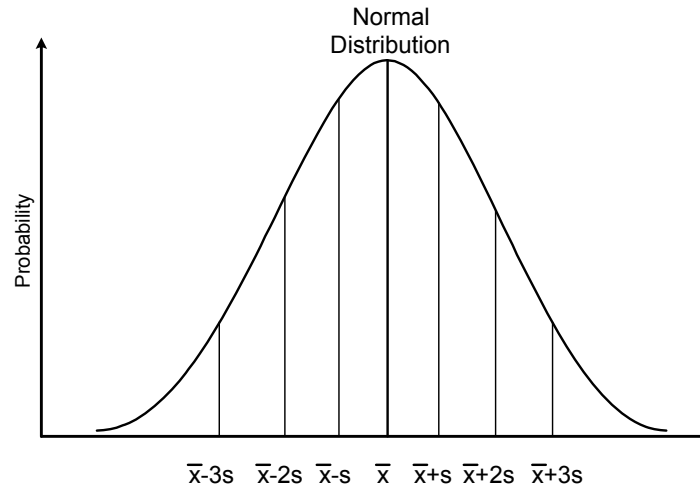
In this booklet it is assumed that individual values follow a normal distribution in which the standard deviation  $s$  is independent from the mean. This distribution

has a bell shape symmetrical around the mean. Characteristics of this distribution are :

$\bar{x} \pm 1s$  contains 68.3 % of data

$\bar{x} \pm 1.96s$  contains 95.0 % of data

$\bar{x} \pm 3s$  contains 99.7 % of data



## Frequency

Frequency is the number of individual values in each class. The number of individual values in the  $j^{\text{th}}$  class is denoted by  $n_j$ ,  $k$  represents the number of classes. It is recalled that :

$$n = \sum_{j=1}^k n_j$$

## Frequency distribution

For a large number of individual values ( $n > 50$ ) it is advantageous to arrange individual values into classes with the same interval; a tabulation or diagram showing the numbers of such values falling into defined class intervals is called a frequency distribution or histogram. It is conventional to include within an interval any observation which falls precisely on its upper boundary.

The central value of a class is defined as the value equidistant between the two class boundaries.

The class containing the greatest number of individual values is called modal class.

### Arithmetic mean

The arithmetic mean of a series of  $n$  individual values  $x_1, x_2, x_3, \dots$ , is the sum of these values divided by their number,  $n$ :

$$\bar{x} = \frac{x_1 + x_2 + \dots + x_n}{n} = \frac{\sum_{i=1}^n x_i}{n}$$

In a frequency table made of  $k$  classes, the arithmetic mean is:

$$\bar{y} = \frac{n_1 y_1 + n_2 y_2 + \dots + n_k y_k}{n} = \left( \frac{\sum_{j=1}^k n_j y_j}{n} \right)$$

$Y_j$  = central value of the  $j^{\text{th}}$  class

$n_j$  = frequency of the  $j^{\text{th}}$  class

### Overall arithmetic mean

It is the arithmetic mean of a set of individual values ignoring any sub-groups (see individual

$$\bar{x} = \frac{\bar{x}_1 + \bar{x}_2 + \dots + \bar{x}_j + \dots + \bar{x}_m}{m} = \frac{\sum_{j=1}^m \bar{x}_j}{m}$$

value) only if the sub-groups contain the same number of individual values.

### Range (R)

The difference between the largest and the smallest values in a set of observations

$$R = x(\text{max}) - x(\text{min})$$

### Average range ( $\bar{R}$ )

The average of a set of  $k$  ranges

$$\bar{R} = \frac{R_1 + R_2 + \dots + R_e + \dots + R_k}{k} = \frac{\sum_{e=1}^k R_e}{k}$$

### Variance and standard deviation

The variance ( $s^2$ ) of a set of  $n$  individual values is the sum of the squares of the differences between each individual value and the arithmetic mean divided by  $(n - 1)$  :

$$s^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n - 1}$$

The standard deviation of a set of individual values is the square root of the variance:

$$s = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n - 1}}$$

These formulae can also be used for mean values when the tests have been done with more than one test specimen from each laboratory sample, but in such cases :

$n$  = the number of samples

$\bar{x}_i$  = the arithmetic mean of the sample

$\bar{x}$  = the overall arithmetic mean of laboratory sample

In the case of a frequency distribution, calculations are made with the following fomulae:

$$s^2 = \frac{\sum_{j=1}^k n_j (y_j - \bar{y})^2}{n - 1}, \quad s = \sqrt{\frac{\sum_{j=1}^k n_j (y_j - \bar{y})^2}{n - 1}}$$

### Universe standard deviation

An estimation of a true standard deviation based on a long series of  $k$  groups of measurements and each group of which consists of  $n$  observations.

$$\sigma_e = \frac{\bar{R}}{d_2} \quad \text{or} \quad \sigma_e = \frac{\bar{s}}{c_2}$$

where :

$$\bar{R} = \frac{\sum_{i=1}^k R_i}{k} \quad \text{and} \quad \bar{s} = \frac{\sum_{i=1}^k s_i}{k}$$

Each group contains the same number of observations  $n$  and has a mean not significantly different from the others.  $d_2$  and  $c_2$  are factors used in connection with sampling by variables and they depend on  $n$ . (see Table 6.1).

Table 7.1 : Factors for estimate  $\sigma_e$

| n  | d <sub>2</sub> | c <sub>2</sub> |
|----|----------------|----------------|
| 2  | 1.1288         | 0.5642         |
| 3  | 1.693          | 0.7236         |
| 4  | 2.059          | 0.7979         |
| 5  | 2.326          | 0.8407         |
| 6  | 2.534          | 0.8686         |
| 7  | 2.704          | 0.8882         |
| 8  | 2.847          | 0.9027         |
| 9  | 2.970          | 0.9139         |
| 10 | 3.078          | 0.9227         |

### Coefficient of variation

The ratio of the standard deviation to the arithmetic mean, expressed as a percentage :

$$V(\%) = \frac{s}{\bar{x}} \cdot 100 \quad \text{or} \quad V(\%) = \frac{s}{y} \cdot 100$$

### Confidence limits

In a consignment for which the individual measured values have practically a normal distribution, it is possible to define, symmetrically around the overall arithmetic mean  $\bar{x}$ , an interval which contains in a given percentage of cases BISFA requires 95 %) the true arithmetic mean of the consignment under test. (This percentage is called confidence level)<sup>1</sup>  
This interval from

$$(\bar{x} - c) \text{ to } (\bar{x} + c)$$

$$(\bar{x} - c) \text{ and } (\bar{x} + c)$$

is called the confidence interval.

are known as the confidence limits.

The half-length,  $c$ , of the confidence interval is thus for a given confidence level, the maximum value of the error made in estimating the true arithmetic mean<sup>2</sup> of the consignment from the overall arithmetic mean. The half-length of the confidence interval is given by the expression :

$$c = t \cdot \frac{s}{\sqrt{n}}$$

<sup>1</sup> Sometimes confidence level is expressed as a figure between 0 and 1, but (see ISO 2602) the expression as a percentage is generally used.

<sup>2</sup> BISFA considers that systematic errors are negligible, as the accuracy requirements on instruments are stringent

in which t is a coefficient, given in the following table as a function of n for the required confidence level of 95 %, s is the standard deviation and n is the number of individual values.

BISFA normally prefers to express the half-length c as a percentage C of the overall arithmetic mean :

$$C(\%) = \frac{c}{\bar{x}} \cdot 100 \quad \text{or} \quad C(\%) = t \frac{V(\%)}{\sqrt{n}}$$

where V is the coefficient of variation.

Table 7.2 : Values  $t_{0,975}$  of Student's t-distribution with degree of freedom equals n+1

| Number of tests<br>n | t-value | Number of tests<br>n | t-value | Number of tests<br>n | t-value |
|----------------------|---------|----------------------|---------|----------------------|---------|
| 4                    | 3.18    | 15                   | 2.14    | 25                   | 2.06    |
| 5                    | 2.78    | 16                   | 2.13    | 26                   | 2.06    |
| 6                    | 2.57    | 17                   | 2.12    | 27                   | 2.06    |
| 7                    | 2.45    | 18                   | 2.11    | 28                   | 2.05    |
| 8                    | 2.36    | 19                   | 2.10    | 29                   | 2.05    |
| 9                    | 2.31    | 20                   | 2.09    | 30                   | 2.04    |
| 10                   | 2.26    | 21                   | 2.09    | 31 to 40             | 2.03    |
| 11                   | 2.23    | 22                   | 2.08    | 41 to 60             | 2.01    |
| 12                   | 2.20    | 23                   | 2.07    | 61 to 120            | 1.99    |
| 13                   | 2.18    | 24                   | 2.07    | 121 to 230           | 1.97    |
| 14                   | 2.16    |                      |         | > 230                | 1.96    |

Note : If a probability other than 95% is desired, those Student's t can be found in statistical books.

Measurements made with single test specimens do not always give values that are normally distributed. Therefore it is necessary to do independent tests on a series of test specimens, all taken from the consignment. For each laboratory sample a number of test specimens is tested and the arithmetic mean of the individual values for that laboratory sample is calculated. The standard deviation of the arithmetic means of each laboratory sample with respect to the overall arithmetic mean is calculated. The confidence limits of the overall arithmetic mean can then be calculated from this standard deviation, using for n the number of laboratory samples that have been tested.

#### Number of tests

For some determinations it may be necessary to increase the number of tests in order to obtain a required confidence interval. If n tests have been made giving a standard deviation s or a coefficient of variation V, the resulting confidence interval may be too large. In order to obtain a required length of confidence interval c\* or C\*, the number of tests must be increased by m additional tests :

$$m = t^2 \frac{s^2}{c} - n \quad \text{or} \quad m = t^2 \frac{V^2}{C^2} - n$$

where t is the value corresponding to n in the above Table 4.2. In such cases calculate the mean and its confidence interval from the result of all (m + n) tests, and verify that the new confidence interval is satisfactory.

### 7.3 Statistical terms used in the estimation of repeatability and reproducibility of test methods

BISFA recommends to apply the ISO 5725 for the conduction of interlab trials. The concept of interlab trials is the basis for the determination of the accuracy of test methods.

#### Accuracy of a measurement

The closeness of agreement between a test result and the accepted reference value.

#### Precision

The closeness of agreement between independent test results obtained under stipulated conditions.

#### Trueness

The closeness of agreement between the average value obtained from a large series of test results and an accepted reference value.

#### Note:

ISO 5725 uses the terms trueness and precision to describe the accuracy of a test method. While trueness compares to an accepted reference value, precision only refers to the closeness of agreement between test results. Any combination of quality of the precision and trueness of a specific test method is possible.

Figure 4.1 illustrates this issue.

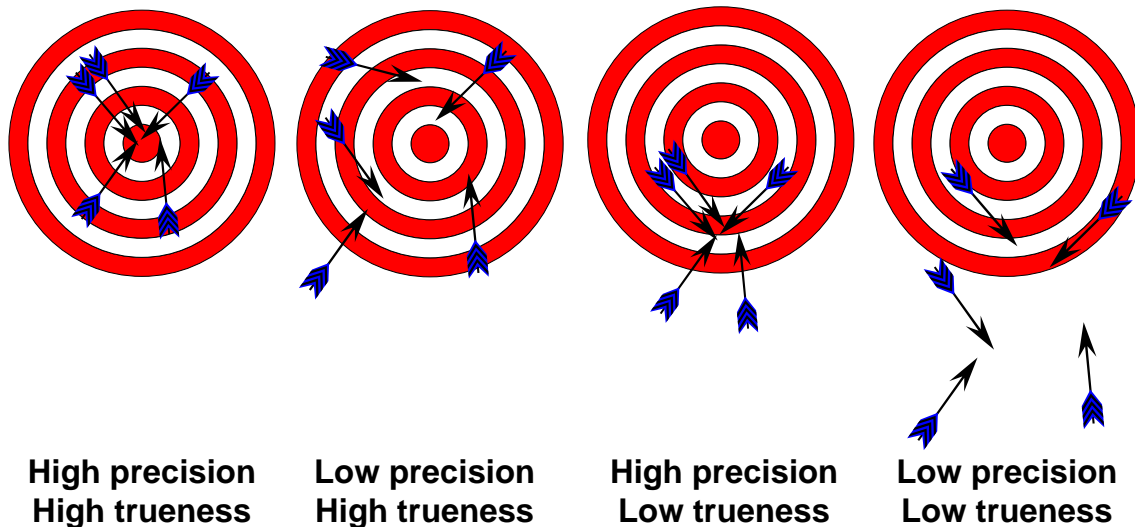


Figure 7.1: Illustration of trueness and precision



### **Uncertainty of measurement**

Parameter, associated with the result of a measurement, that characterizes the dispersion of the values that could reasonably be attributed to the measurand.

### **Bias**

The difference between the expectation of the test results and an accepted reference value.

Note:

Bias is the total systematic error as contrasted to random error. There may be one or more systematic error components contributing to the bias.

### **Accepted reference value**

A value that serves as an agreed-upon reference for comparison, and which is derived as:

1. a theoretical or established value, based on scientific principles
2. an assigned or certified value, based on experimental work of some national or international organisation
3. a consensus or certified value, based on collaborative experimental work under the auspices of a scientific or engineering group
4. when 1), 2) or 3) are not available, the expectation of the (measurable) quantity, ie the mean of a specified population of measurements

Note:

In the case of a sample or consignment of fibre or yarn, then only 4) applies.

### **Component of variance**

Is a portion of a total variance caused a particular source.

In this BISFA – terminology booklet three components of variance are considered. They are expressed as standard deviations.

#### Single Operator component ( $S_e$ )

The variance solely caused by the operator(s).

#### Sample component (The variance, solely caused by the sample)

within laboratories component ( $S_t$ )

The variance caused by instruments, environment (test atmosphere) in the laboratory except the variance due to operators. This component is zero, when there is only operator variability.

#### between laboratories component ( $S_L$ )

The variance caused by different laboratories. This component is zero, when there is only one laboratory.

Note:

Single operator component and sample component are difficult to separate and both contribute to the random error.

### **Repeatability**

Precision under repeatability conditions

**Repeatability conditions**

Conditions where independent test results are obtained with the same method on identical test items by the same operator using the same equipment within short intervals of time.

**Variance**

A measure of dispersion, which is the sum of the squared deviations of observations from their average, divided by one less than the number of observations

**Repeatability limit  $r$** 

The values less than or equal to which the absolute difference between two test results obtained under repeatability conditions is expected to be with a probability of 95%.

**Reproducibility limit  $R$** 

The values less than or equal to which the absolute difference between two test results obtained under reproducibility conditions is expected to be with a probability of 95%.

**Reproducibility**

Precision under reproducibility conditions

**Reproducibility conditions**

Conditions where test results are obtained with the same method on identical test items in different laboratories with different operators using different equipment.

Note:

In the case of textile fibres/yarns, the test is destructive, therefore the items tested are not actually identical, but these must be sampled so as to make them as nearly identical as possible.

**Repeatability standard deviation**

The standard deviation of test results obtained under repeatability conditions

**Reproducibility standard deviation**

The standard deviation of test results obtained under reproducibility conditions

**Error of result**

The test result minus the accepted reference value.

Note: The test result may be the mean of a number of individual observations.

**Random error of result**

A component of the error, which in the course of a number of test results for the same characteristic varies in an unpredictable way.

**Systematic error of result**

A component of the error, which in the course of a number of test results for the same characteristic remains constant or varies in a predictable way.

## 7.4 Interlab trials

Interlab trials are the basic method for the determination of the repeatability and reproducibility of standardised test methods. BISFA recommends to apply the ISO 5725 / 2 for the conduction of interlab trials.

Note:

In the first place the repeatability and reproducibility of a test method will give a measure for its precision only. The bias is considered to be constant during a test carried out under repeatability conditions. However a possible bias of a specific test method may change in value during tests under reproducibility conditions.

Whenever a representative number of laboratories, that can perform a specific test method conduct an interlab trial on the mentioned test method, the bias will convert to a random property, that means to the between laboratory component of variance, expressed and measured by the concept of reproducibility.

The simplified approach, proposed by BISFA, to consider only the three components of variance, as outlined in paragraph 6.3, implies, that there is no intralab bias of a test method.

The BISFA guideline for interlaboratory tests gives some practical explanations for the conduction of such trials. Please note, that this guide also contains some important aspects of outliers, that should be considered, when the evaluation of the trial is done.

## 7.5 Statistical process control parameters

### Process capability ( $6\sigma$ )

The limits of variability in which a process operates under normal conditions. If this variability is within  $6\sigma$ , then the process is under statistical control.

### Accuracy index ( $C_A$ )

Index (expressed in percentage) indicating how close the process centering is to the specified target

$$C_A = \frac{\text{Specified target} - \bar{x}}{0.5 (\text{USL} - \text{LSL})} \cdot 100$$

where  $\bar{x}$  is the overall arithmetic mean.

USL is the upper specification limit

LSL is the lower specification limit.

### Capability index ( $C_p$ )

Index relating the process capability to the specification tolerance

$$C_p = \frac{\text{USL} - \text{LSL}}{6\sigma_e}$$

### Quality index

#### $C_{pk}$

It is the capability index, on a single set of data adjusted for process centering.

$$C_{pk} = \min \left( \frac{\text{USL} - \bar{x}}{3\sigma_e} \right), \left( \frac{\bar{x} - \text{LSL}}{3\sigma_e} \right)$$

Where :  $\sigma_e$  is the estimated standard deviation of the set of data considered.

If both  $C_A$  and  $C_p$  are known, then

$$C_{pk} = C_p \left( 1 - \frac{C_A}{100} \right)$$

#### $P_{pk}$

The performance index measured on different sets of data and adjusted for process centering

$$P_{pk} = \min \left( \frac{\text{USL} - \bar{x}}{3\sigma_s} \right), \left( \frac{\bar{x} - \text{LSL}}{3\sigma_s} \right)$$

where:  $\sigma_s$  is the estimated standard deviation of the data considered.

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# CHAPTER 8

## Designation of yarns in the tex system

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### 8.1 Textile yarns

A standard notation for yarn construction is set out in the international standard ISO 1139, edition 1973. The notation reflects in a condensed form details of the components of a yarn, including values of the linear densities, direction of twist, twist level, number of folds, etc of these components and/or characteristics such as linear density resulting from this construction.

Two methods for the notation of yarns are available. The "single to fold" notation starts from the linear density of the single yarn ; the "fold to single" notation starts from the linear density of the resultant yarn. The symbols used in both systems are identical ; the differences are in the order of presentation, the use of the multiplication sign (x) in the single to fold notation, and of the solidus (/) in the fold to single notation. Distinction between the two methods does not apply to single spun yarn, monofilament and multifilament yarns without twist, nor to multiple wound yarns.

The following symbols are used :

- R** : symbol for resultant linear density, to be put before its numerical value,
- f** : symbol for filaments, to be put before the number of filaments,
- t0** : symbol for zero twist ; other twist values are represented by the number of turns per metre of the twisted yarn, preceded by S or Z to indicate twist direction.  
If the S/Z notation cannot be used, for example in numerical fields of data banks, "S" should be designated as (-) and "Z" as (+), (see international standard ISO 2, edition 1973 and Definition "Twist" in chapter 3).

The notation is best illustrated by examples:

The following are taken in part from ISO 1139, edition 1973

**Table 8.1** : Examples of notations of textile yarns in the tex system

| Type of yarn                     | “Single to fold” notation         | “Fold to single” notation         |
|----------------------------------|-----------------------------------|-----------------------------------|
| <b>Single yarns</b>              |                                   |                                   |
| Spun yarn                        | 40 tex Z660                       |                                   |
| Monofilament yarn without twist  | 17 dtex f1                        |                                   |
| Monofilament yarn with twist     | 17 dtex f1 S800<br>R17.4 dtex     | R17.4 dtex f1<br>S800 ; 17 dtex   |
| Multifilament yarn without twist | 133 dtex f40                      |                                   |
| Multifilament yarn with twist    | 133 dtex f40<br>S1000 ; R136 dtex | R136 dtex f40<br>S1000 ; 133 dtex |

|  |   |  |
|--|---|--|
| <p><b>Multiple wound yarns with</b></p> <p>Similar components</p> <p>Dissimilar components</p> | <p>40 tex S155 x 2</p> <p>(25 tex S420 + 60 tex Z80)</p>  |  |
| <p><b>Folded yarns with</b></p> <p>Similar components</p> <p>Dissimilar components</p>         | <p>34 tex S600 x 2<br/>Z400 ; R69.3 tex</p> <p>(25 tex S420 + 60 tex Z80)<br/>R89.2 tex</p>   | <p>R69.3 tex Z4400/2<br/>S600 ; 34 tex</p> <p>R89.2 tex S360/(S420 +<br/>Z80)<br/>25 tex + 60 tex</p>        |
| <p><b>Cabled yarns with</b></p> <p>Similar components</p> <p>Dissimilar components</p>         | <p>20 tex Z 700 x 2 S 400 x<br/>3 Z 200<br/>R 132 tex</p> <p>(20 tex Z700 x 3 S400 + 34<br/>tex S600) Z200</p>  | <p>R 132 tex Z 200/3 S 400/2<br/>Z 700;<br/>20 tex</p> <p>R96 tex Z200/(S600 +<br/>S400/3 Z700) ; 34 tex</p> |
| <p><b>Covered yarns</b></p> <p>Single covered</p>  | <p>(56 dtex ; C39 dtex) TS800 (17 dtex f1) : R56 dtex</p> <p>Symbol C : linear density of elastane core (stretched)</p> <p>Symbol TS : direction of twist (here S)</p> <p>Symbol R : resultant linear density of the covered yarn</p> |  |



Notes :

- Prefixes and multiples shall be written without space.
- A space shall be used to separate the different characteristics of the yarn construction.
- x or / used to mark multiple yarn components shall be separated with spaces.
- Units shall be written with a space in accordance with ISO 1000.

Addition of the resultant linear density in the "single to fold" notation, and of the single yarn linear density in the "fold to single" notation, is not obligatory; such information is separated from the preceding notation by a semi-colon. If not needed, the direction of twist and the twist level may be omitted; however, the description of twistless yarns may include the symbol for zero twist.

Values of linear density and of twist level used in commercial transactions are usually nominal values and are subject to agreed tolerances. Values of these tolerances which apply to the products of BISFA members can be found in the appropriate **BISFA booklets**.

## 8.2 Steel tyre cord

The nomenclature system describes the construction of steel tyre cord.

The description of the construction follows the sequence of manufacture of the cord i.e., starting with the innermost strand or wire and moving outwards.

### 8.2.1 Format

The full description of the cord is given by the following formula:

$$(N \times F) \times D + (N \times F) \times D + (N \times F) \times D + F \times D$$

Where:

N = number of strands

F = number of filaments

D = nominal diameter of filaments expressed in millimetres

**8.2.1.1** Each part shall be separated by a plus (+) sign.

**8.2.1.2** Brackets may be used to differentiate a part that consists of more than one component, i.e.

$$(1 \times 4) \times 0.20 + (6 \times 4) \times 0.20 + 1 \times 0.15$$

**8.2.1.3** When N or F = 1 they should not be included in order to obtain the simplest formula, i.e.

$$4 \times 0.20 + (6 \times 4) \times 0.20 + 0.15$$

**8.2.1.4** If the diameter is the same for two or more parts in sequence, it needs only be stated at the end of the sequence. The diameter of the spiral wrap shall always be stated separately, i.e.

$$4 + (6 \times 4) \times 0.20 + 0.15$$

**8.2.1.5** When the innermost strand or wire is identical to the adjacent strands or wires the formula may be simplified by stating only the sum of the identical components and brackets need not be used, i.e.

$$7 \times 4 \times 0.20 + 0.15$$

## **8.2.2 Cord lay length and lay direction**

**8.2.2.1** The sequence or order in the designation of the lay length and of the lay direction follows the sequence of manufacturing i.e., starting with the innermost strand and moving outwards.

$$7 \times 4 \times 0.20 + 0.15$$

lay length 10/20/3.5

lay direction S/Z/S

10/S is the lay length and direction of strands

20/Z is the lay length and direction of the cord

3.5/S is the lay length and direction of the spiral wrap

### **8.2.2.2 Direction of lay**

The helical disposition of the components of a strand or cord are designated according to the general rules given below

- strand used as an end product : S
- ordinary or regular lay cord : strand S  
cord Z
- Lang's lay cord : strand and cord S
- spiral wrap : opposite to the direction of the cord lay

### **8.2.2.3 Length of lay**

The nominal length of lay for steel cord constructions shall be based on the ISO R 388 - R 20 Series.

### 8.3. Open cord constructions

Open cord constructions are designated by adding OC behind the cord description.

As an illustration, some examples of designation of steel cord construction are given hereunder.

**Table 8.2** : examples of designation of steel cord construction

| Type of construction      | Lay length (mm) | Lay direction |
|---------------------------|-----------------|---------------|
| 4 x 0.25 OC               | 14              | S             |
| 2 + 7 x 0.22 + 0.15       | 6.3/12.5/5      | SSZ           |
| 3 x 0.20 + 6 x 0.35       | 10/18           | SZ            |
| 3 + 9 + 15 x 0.175 + 0.15 | 5/10/116/3.5    | SSZS          |
| 3 + 9 + 15 x 0.22 + 0.15  | 6.3/12.5/18/3.5 | SSZS          |

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# CHAPTER 9

## Application of SI units to man-made fibres

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### Introduction

The International System of units (SI) was adopted as the system of measuring units by the 11th General Conference of Weights and Measures in 1960. The International Standard ISO 1000 gives full details of the recommended units and the ways in which they should be used.

This chapter does not cover all aspects of the system, it is limited to those which are of particular interest to the fibres and textiles industry.

### 9.1 Base units of the International System (SI)

The International System is founded on the following seven base units

**Table 9.1**

| Quantity                  | Abbreviation or symbol | Base unit | Abbreviation or symbol |
|---------------------------|------------------------|-----------|------------------------|
| Length                    | <i>L</i>               | metre     | m                      |
| Mass                      | <i>m</i>               | kilogram  | kg                     |
| Time                      | <i>t</i>               | second    | s                      |
| Electric current          | <i>I</i>               | ampere    | A                      |
| Thermodynamic temperature | <i>T</i>               | kelvin    | K                      |
| Amount of substance       | <i>n</i>               | mole      | mol                    |
| Luminous intensity        | <i>I</i>               | candela   | cd                     |

## 9.2 Derived units

The units for the measurement of other physical quantities are exclusively derived from these base units. Distinction is made between :

### a) Derived units which are described in terms of base units

These units are expressed algebraically as a function of base units. Their symbols are obtained using signs of multiplication and division, e.g. unit of speed, metre per second (symbol: m/s).

### b) Derived units having names and special symbols which are subdivided into two groups

#### Units of general application

These units are designated not by expression involving the base units, but by the names and special symbols as set out in Table 6.2.

**Table 9.2**

| Quantity                       | Symbol | Unit   |        | Expression as function                              |                                |
|--------------------------------|--------|--------|--------|---|--------------------------------|
|                                |        | Name   | Symbol | SI base unit  | Derived SI unit                |
| Force                          | F      | newton | N      | $\text{kg} \cdot \text{m} \cdot \text{s}^{-2}$      |                                |
| Pressure, stress               | p      | pascal | Pa     | $\text{kg} \cdot \text{m}^{-1} \cdot \text{s}^{-2}$ | $\text{N} \cdot \text{m}^{-2}$ |
| Energy, work, quantity of heat | E      | joule  | J      | $\text{kg} \cdot \text{m}^2 \cdot \text{s}^{-2}$    | $\text{N} \cdot \text{m}$      |
| Power                          | P      | watt   | W      | $\text{kg} \cdot \text{m}^2 \cdot \text{s}^{-3}$    | $\text{J} \cdot \text{s}^{-1}$ |
| Frequency                      | f      | hertz  | Hz     | $\text{s}^{-1}$                                     |                                |

#### Units of specified application

These consist mainly of multiples or sub-multiples of derived SI units and are restricted to special uses ; in particular the unit tex with its multiples and submultiples specifically for the textile industry. See Table 6.3.

**Table 9.3**

| Quantity                           | Name | Symbol | Derived SI unit                  |
|------------------------------------|------|--------|----------------------------------|
| Linear density                     |      |        | kg/m                             |
| Linear density of fibres and yarns | tex  | tex    | 1 tex = 1 mg/m<br>1 tex = 1 g/km |

### 9.3 Multiples and sub-multiples

The names and symbols of the most commonly used decimal multiples and submultiples of the units are formed by the addition of the following prefixes (Table 6.4)

**Table 9.4**

| Multiplication factor of the unit | Prefix | Symbol |
|-----------------------------------|--------|--------|
| $10^9$                            | Giga   | G      |
| $10^6$                            | mega   | M      |
| $10^3$                            | Kilo   | k      |
| $10^2$                            | hecto  | h      |
| 10 (or $10^1$ )                   | deca   | da     |
| $10^{-1}$                         | deci   | d      |
| $10^{-2}$                         | centi  | c      |
| $10^{-3}$                         | milli  | m      |
| $10^{-6}$                         | micro  | $\mu$  |
| $10^{-9}$                         | nano   | n      |

The prefix shall be bound to the name and the symbol of the prefix shall likewise be bound to the symbol of the unit. In certain cases non-decimal multiples and sub-multiples may be used. For example a second of time has as a multiple a minute and a radian has as sub-multiples a degree in minutes and seconds.

## 9.4 Principal SI units in use for textiles

### Mass

The SI System of units replaces the notion of weight by that of mass to describe a quantity of matter.

### Linear Density

The SI unit of linear density is the kilogram per metre (kg/m). In the man-made fibre industry linear density is expressed in dtex (symbol: dtex). A fibre which has a mass of n grams per 10000 metres of length is said to have a linear density of n dtex.

The recommended multiple and sub-multiples of the tex unit for use are given in Table 6.5.

**Table 9.5**

| Name     | Symbol | Definition                     |
|----------|--------|--------------------------------|
| Millitex | mtex   | 1 mtex = 1 mg/km = 1 $\mu$ g/m |
| Decitex  | dtex   | 1 dtex = 1 dg/km = 0.1 mg/m    |
| Tex      | tex    | 1 tex = 1 g/km = 1 mg/m        |
| Kilotex  | ktex   | 1 ktex = 1 kg/km = 1 g/m       |

### Force

The unit of force is the newton (N).

One newton is the force which when applied to a body having a mass of one kilogram imparts thereto an acceleration of one metre per second, per second.

The newton, its multiples and sub-multiples are used in the field of textiles for the expression of force, such as tension, breaking force and force at specified elongation.

### Tenacity

The units used are the centinewton per tex (cN/tex) or the millinewton per tex (mN/tex).

This unit is used to quantify all expressions of force per linear density (e.g. breaking tenacity, tenacity at specified elongation).

### Breaking toughness

The units used are J/g.

### Pressure and stress

The unit of pressure and of stress is the pascal (Pa).

One pascal is the force of one newton which is acting on an area of one square metre.

### **Temperature**

The kelvin is the base unit for thermodynamic temperature and has wide scientific application but for practical purposes the degree Celsius is the unit in everyday use.

The kelvin and the degree Celsius represent the same interval of temperature, but zero on the kelvin scale is at  $-273,15^{\circ}\text{C}$ .



**Table 9.6** : Quantities and units used in BISFA methods

| Quantity                         | SI Units                                   | Symbol            | Former Unit               |        |                                 | Observations                               |
|----------------------------------|--|-------------------|---------------------------|--------|---------------------------------|--|
|                                  |  |                   | Name                      | Symbol | Conversion Factor into SI Units |  |
| <b>Length</b>                    | metre                                      | m                 | yard                      | yd     | 0.914                           | For other units see ISO standard 2947-1997 |
|                                  | kilometre                                  | km                | mile                      | mile   | 1.609                           |  |
|                                  | centimetre                                 | cm                | inch                      | in     | 2.54                            |  |
|                                  | millimetre                                 | mm                | inch                      | in     | 25.4                            |  |
|                                  | micrometre                                 | µm                | one thousandth of an inch | mil    | 25.4                            |  |
| <b>Twist</b>                     | number of turns per metre <sup>(x)</sup>   | tpm               | number of turns per inch  | tpi    | 39.4                            |  |
| <b>Mass</b>                      | kilogram                                   | kg                | pound                     | Lb     | 0.453                           | idem                                       |
|                                  | gram                                       | g                 | ounce                     | oz     | 28.35                           |  |
| Linear density                   | tex  | tex               | denier                    | den    | 0.111                           | idem                                       |
|                                  | decitex                                    | dtex              | denier                    | den    | 1.11                            |  |
|                                  | ktex                                       | ktex              | denier                    | den    | 0.00011                         |  |
| <b>Density</b>                   | kilogram per cubic metre                   | kg/m <sup>3</sup> | ---                       | ---    | ---                             | idem                                       |
| <b>Force</b>                     | newton                                     | N                 | pound force               | lbf    | 4.45                            | idem                                       |
|                                  | centinewton                                | cN                | kilogram force            | kgf    | 9.81                            |  |
|                                  |  |                   | gram force                | gf     | 0.981                           |  |
| <b>Force per linear density</b>  | centinewton per tex<br>millinewton per tex | cN/tex<br>mN/tex  | gram force per denier     | g/den  | 8.83                            | idem                                       |
| <b>Pressure</b>                  | Pascal                                     | Pa                | millimetres of mercury    | mm Hg  | 133.3                           | idem                                       |
| <b>Toughness (specific work)</b> | joule per gram                             | J/g               |                           |        |                                 |  |

<sup>(x)</sup> not an SI unit.

**Note** : To convert from a former unit to an SI unit on the same line, multiply the value expressed in the former unit by the value of this unit given in the column "conversion factor into SI units".

Example : 25 inches = 25 x 25,4 mm = 635,0 mm.

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# CHAPTER 10

## Relative humidity

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### 10.1 Introduction

Following the required limits for the standard atmosphere for testing an appropriate accuracy of the hygrometer used has to be ensured.

BISFA recommends dewpoint measurement for the determination of the humidity of the atmosphere for testing. The dewpoint temperature describes precisely the moisture content of a gas. The optical condensation principle (chilled mirror instrument) has been established as the most fundamental method of determining the moisture content in a gas with excellent accuracy.

Another measurement technique, the psychrometric method, may also be applied. This method yields less precise results, compared to the dew point method.

### 10.2 Dewpoint temperature

The dewpoint temperature is the temperature, at which the liquid and gaseous phases of the water in the atmosphere are in equilibrium (at a given gas pressure), that means, liquid water evaporates at the same rate, at which vapour condenses.

### 10.3 Dewpoint Principle of moisture content determination

Basis for the determination of the relative humidity is an appropriate approximation formula for the saturation vapour pressure as a function of temperature.

An approximated calculation of saturated vapour density can be made from an empirical fit of the vapour density curve. This curve is shown in figure 7.1.

After measuring the dewpoint temperature and the actual temperature the corresponding saturation pressure values can be calculated from the fit. Finally the relative humidity calculates from the formula:

$$Rh [\%] = 100 \cdot \frac{SP(T_D)}{SP(T_A)}$$

$T_D$  : Dewpoint temperature

$T_A$  : Actual temperature

$SP(T_D)$  : Saturation vapour pressure at dewpoint temperature

$SP(T_A)$  : Saturation vapour pressure at actual temperature

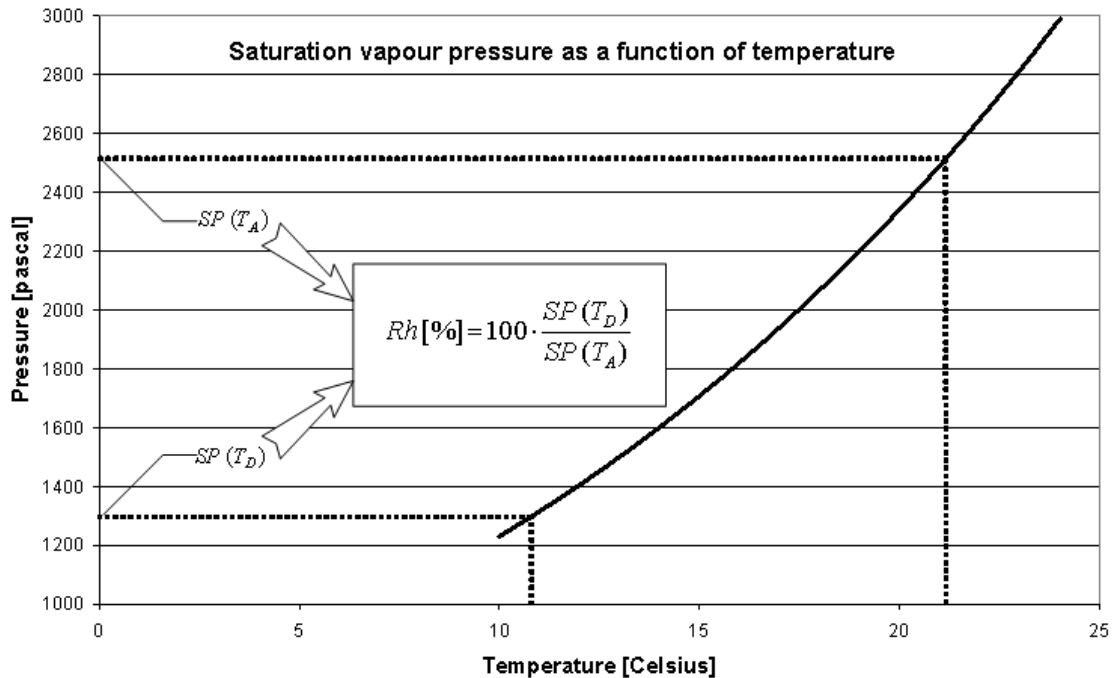


Figure 10.1: Saturation vapour pressure as function of temperature

## 10.4 Accuracy

The accuracy of the temperature measurement shall be  $\pm 0,1$  K or better to be within the demanded limits for the standard atmosphere.

The quality of the calculation of the humidity depends on the accuracy of the empirical fit of the curve in figure 7.1. It is in the responsibility of the supplier of the test equipment to implement an empirical fit of the vapour density curve capable of giving an accuracy as demanded or better.

## 10.5 Calibration of the chilled mirror instrument

The instrument has to be calibrated on a regular basis as recommended by the supplier to keep the demanded accuracy.

## 10.6 Psychrometric method

To be adopted from the test methods booklet viscose filament yarns, 1997 edition – appendix 2, together with annex 1 and annex 2.

## SATURATION VAPOUR PRESSURE OVER WATER

The saturation vapour pressure of the pure phase over plane surface of pure water for temperatures 15 to 25°C was obtained from Wexler's 1976 formulation

$$\ln e_s = \sum_{i=1}^4 g_i \times (T_{68})^{i-2}$$

where:

$$g_1 = -0.63536311 \times 10^4$$

$$g_2 = 0.3404926034 \times 10^2$$

$$g_3 = -0.19509874 \times 10^{-1}$$

$$g_4 = 0.12811805 \times 10^{-4}$$

$$e_s = \text{in Pascal, and}$$

$$T_{68} = 273.15 + t_{68}, \text{ and}$$

$$t_{68} = \text{-degree Celsius (International Practical Temperature Scale of 1968)}$$

### Saturation Vapour Pressure Over Water

| Temp | 0.0     | 0.1     | 0.2     | 0.3     | 0.4     | 0.5     | 0.6     | 0.7     | 0.8     | 0.9     |
|------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| °C   | Pa      | Pa      | Pa      | Pa      | Pa      | Pa      | Pa      | Pa      | Pa      | Pa      |
| 15   | 1705.32 | 1716.33 | 1727.41 | 1738.54 | 1749.75 | 1761.01 | 1772.34 | 1783.73 | 1795.18 | 1806.70 |
| 16   | 1818.29 | 1829.94 | 1841.66 | 1853.44 | 1865.29 | 1877.20 | 1889.18 | 1901.23 | 1913.34 | 1925.53 |
| 17   | 1937.78 | 1950.10 | 1962.48 | 1974.94 | 1987.47 | 2000.06 | 2012.73 | 2025.46 | 2038.27 | 2051.14 |
| 18   | 2064.09 | 2077.11 | 2090.20 | 2103.37 | 2116.61 | 2129.92 | 2143.30 | 2156.75 | 2170.29 | 2183.89 |
| 19   | 2197.57 | 2211.32 | 2225.15 | 2239.06 | 2253.04 | 2267.10 | 2281.23 | 2295.44 | 2309.73 | 2324.10 |
| 20   | 2338.54 | 2353.07 | 2367.67 | 2382.35 | 2397.11 | 2411.95 | 2426.88 | 2441.88 | 2456.94 | 2472.13 |
| 21   | 2487.37 | 2502.70 | 2518.11 | 2533.61 | 2549.18 | 2564.85 | 2580.59 | 2596.42 | 2612.33 | 2628.33 |
| 22   | 2644.42 | 2660.59 | 2676.85 | 2693.19 | 2709.62 | 2726.14 | 2742.75 | 2759.45 | 2776.23 | 2793.10 |
| 23   | 2810.06 | 2827.12 | 2844.26 | 2861.49 | 2878.82 | 2896.23 | 2913.74 | 2931.34 | 2949.04 | 2966.82 |
| 24   | 2984.70 | 3002.68 | 3020.74 | 3038.91 | 3057.17 | 3075.52 | 3093.97 | 3112.52 | 3131.16 | 3149.90 |
| 25   | 3168.74 | 3187.68 | 3206.71 | 3225.85 | 3245.08 | 3264.41 | 3283.85 | 3303.38 | 3323.02 | 3342.76 |

## RELATIVE HUMIDITY - PSYCHROMETRIC

Relative humidities rounded to the nearest 1% RH are tabulated by using Ferrel's formulation for the psychrometer coefficient and standard atmosphere pressure (101325 Pa)

$$H_R = \frac{e}{e_s} \times 100(\%) = \frac{e_w(t_w) - AP(t - t_w)}{e_s} \times 100(\%)$$

where:

$$A = 6.60 \times 10^{-4}(1 + 0.000115 t_w),$$

$$P = 101325 \text{ Pa}$$

$e_w, e_s$  in Pa, and  $t, t_w$  in °C.

**Table 2**

| Air<br>temp.<br>(t)°C | Depression of Wet-Bulb Thermometer (t-t <sub>w</sub> ) °C |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----------------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                       | 3.1   | 3.2 | 3.3 | 3.4 | 3.5 | 3.6 | 3.7 | 3.8 | 3.9 | 4.0 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 4.6 | 4.7 | 4.8 | 4.9 | 5.0 |
| 15                    | 69  | 68  | 67  | 67  | 66  | 65  | 64  | 63  | 62  | 61  | 60  | 59  | 58  | 57  | 57  | 56  | 55  | 54  | 53  | 52  |
| 16                    | 70  | 69  | 68  | 68  | 67  | 66  | 65  | 64  | 63  | 62  | 61  | 60  | 60  | 59  | 58  | 57  | 56  | 55  | 54  | 54  |
| 17                    | 71  | 70  | 69  | 68  | 68  | 67  | 66  | 65  | 64  | 63  | 62  | 62  | 61  | 60  | 59  | 58  | 57  | 56  | 56  | 55  |
| 18                    | 72  | 71  | 70  | 69  | 68  | 68  | 67  | 66  | 65  | 64  | 63  | 63  | 62  | 61  | 60  | 59  | 58  | 58  | 57  | 56  |
| 19                    | 73  | 72  | 71  | 70  | 69  | 68  | 68  | 67  | 66  | 65  | 64  | 64  | 63  | 62  | 61  | 60  | 60  | 59  | 58  | 57  |
| 20                    | 73  | 72  | 72  | 71  | 70  | 69  | 68  | 68  | 67  | 66  | 65  | 64  | 65  | 64  | 63  | 62  | 62  | 61  | 60  | 59  |
| 22                    | 75  | 74  | 73  | 72  | 71  | 71  | 70  | 69  | 68  | 68  | 67  | 66  | 64  | 63  | 62  | 61  | 61  | 60  | 59  | 58  |
| 21                    | 74  | 73  | 72  | 72  | 71  | 70  | 69  | 68  | 68  | 67  | 66  | 65  | 65  | 65  | 64  | 63  | 63  | 62  | 61  | 60  |
| 23                    | 75  | 74  | 74  | 73  | 72  | 71  | 71  | 70  | 69  | 68  | 68  | 67  | 66  | 66  | 65  | 64  | 63  | 63  | 62  | 61  |
| 24                    | 76  | 75  | 74  | 73  | 73  | 72  | 71  | 71  | 70  | 69  | 68  | 68  | 67  | 66  | 66  | 65  | 64  | 64  | 63  | 62  |
| 25                    | 76  | 75  | 75  | 74  | 73  | 73  | 72  | 71  | 70  | 70  | 69  | 68  | 68  | 67  | 66  | 66  | 65  | 64  | 64  | 63  |

## CHAPTER 11

### Translation of technical terms

| English                          | French                              | German                            | Italian                               | Spanish                               | Portuguese                            | Czech                       | Turkish                           |
|----------------------------------|-------------------------------------|-----------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|-----------------------------|-----------------------------------|
| Accuracy of measuring instrument | Précision d'un instrument de mesure | Genauigkeit eines Messinstruments | Precisione di uno strumento di misura | Precisión de un instrumento de medida | Exactidão de um instrumento de medida | Přesnost měřicího zařízení  | Ölçüm cihazının hassasiyeti       |
| <b>Accuracy of measurement</b>   | Précision de la mesure              | Genauigkeit einer Messung         | Accuratezza della misura              | Precisión de la medida                | Exactidão de medida                   | Přesnost měření             | Ölçüm hassasiyeti                 |
| <b>Adhesion</b>                  | Adhésion                            | Haftung                           | Adesione                              | Adhesión                              | Adesão                                | Adheze, přilnavost          | Yapışma                           |
| Adhesion force                   | Force d'adhésion                    | Haftkraft                         | Forza di adesione                     | Fuerza de adhesión                    | Força de adesão                       | Adhezní síla                | Yapışma kuvveti                   |
| Adhesion, rubber coverage        | Adhésion, revêtement de caoutchouc  | Haftung einer Gummi-beschichtung  | Adesione, rivestimento di gomma       | Adhesión, recubrimiento de caucho     | Adesão, cobertura de borracha         | Adheze pryžového povlaku    | Yapışma görünümü                  |
| <b>Air textured yarn</b>         | Fil texturé par air (Taslan)        | Lufttexturiertes Garn             | Filo testurizzato ad aria             | Hilo texturizado por aire             | Fio texturizado por ar                | Vzduchem tvarovaná nit      | Havalı tekstüre iplik             |
| <b>Atmospheres</b>               | Atmosphères                         | Klima                             | Atmosfera                             | Atmósferas                            | Atmosferas                            | Ovzduší                     | Ortam (Klimatik)                  |
| Standard atmosphere              | Atmosphère standard                 | Normalklima                       | Atmosfera normale                     | Atmósfera normal                      | Atmosfera normal                      | Normální ovzduší            | Standard (klimatik) ortam         |
| Atmosphere for testing           | Atmosphère d'essai                  | Prüfklima                         | Atmosfera per l'esame                 | Atmósfera para ensayo                 | Atmosfera de ensaio                   | Ovzduší pro zkoušení        | Test ortamı (Klimatik)            |
| Atmosphere for preconditioning   | Atmosphère de préconditionnement    | Klima für Vorkonditionierung      | Atmosfera di pre-ambientamento        | Atmósfera para preacondicionamiento   | Atmosfera para préacondicionamento    | Ovzduší pro předklimatizaci | On sartlandırma ortamı (Klimatik) |
| <b>Beam</b>                      | Ensouple                            | Baum                              | Subbio                                | Plegador                              | Rôlo de urdime                        | Vál                         | Levent                            |

|   |  |   |  |   |  |   |   |
|---|--|---|--|---|--|---|---|
| Back beam                               | Chaîne de fond                                 | Zettelbaum  | Subbio frazionale  | Plegador posterior                            | Rôlo de urdeira                                | Snovací vál                               | Ara levant                              |
| Weaver's beam                           | Ensemble de tissage                            | Webbaum   | Subbio di tessitura  | Plegador de Tejedor                           | Rolo de tecelagem                              | Osnovní vál                               | Dokuma levendi                          |
| Warp knitting beam                      | Ensemble pour indémaillable (tricotage chaîne) | Teilkettbaum  | Subbio di maglieria in ordito / subbiello per indemagliabile | Plegador para Tejeduría de Punto por Urdimbre | Rôlo de tecelagem de malha por urdime          | Pletařský vál                             | Çözgülü örme (Raşel) levendi            |
| <b>Bicomponent fibre</b>                | Fibre à deux composants                        | Bi-Komponentenfaser   | Fibra bicomponente   | Fibra bicomponente                            | Fibra bicomponente                             | Dvousložkové vlákno                       | Bikomponent (İkili) elyaf               |
| <b>Bishrinkage yarn</b>                 | Fil à retrait différentiel                     | Bi-Schrumpfgarn   | Filo biretraibile  | Hilo de filamentos con contracción distinta   | Fio de filamentos com diferentes encolhimentos | Nit's dvojí sráživostí                    | İki çekmeli iplik                       |
| <b>Breaking elongation</b>              | Allongement de rupture                         | Höchstzugkraft-Dehnung  | Allungamento alla forza massima                              | Alargamiento a la rotura                      | Alongamento à rotura                           | Tažnost při max. tahové síle              | Kopma uzaması (%) (Max. yükte)          |
| <b>Breaking Strength</b>                | Résistance de rupture                          | Zugfestigkeit   | Forza a rottura  | Resistencia a la rotura                       | Resistência à rotura                           | Pevnost při přetrhu                       | Kopma yükü (Max. yük)                   |
| <b>Breaking tenacity</b>                | Ténacité de rupture                            | Reissfestigkeit <u>or</u> Bruchfestigkeit <u>instead of</u> Feinheitsfestigkeit, Feinheitsbezogene Höchstzugkraft | Tenacità alla rottura  | Tenacidad a la rotura                         | Tenacidade à rotura                            | Poměrná pevnost při maximální tahové síle | Kopma dayanımı , Mukavemet (Max. yükte) |
| <b>Breaking toughness</b>               | Energie de rupture                             | Feinheitsbezogene Höchstzugkraft-Arbeit, Bruchzähigkeit   | Lavoro a rottura   | Tenacidad a la rotura                         | Trabalho de rotura                             | Relativní deformační práce                | Birim kopma işi (Max. yükte)            |
| <b>Bulked Continuous Filament (BCF)</b> | Fil continu gonflant (fil tapis BCF)           | Kontinuierlich gekräuselt Filamentgarn  | Filo continuo volumizzato                                    | Filamento Continuo Voluminoso                 | Filamento contínuo voluminoso                  | Objemované nekonečné vlákno               | BCF                                     |
| <b>Cabled yarn</b>                      | Fil câblé                                      | Mehrstufiger Zwirn (Kord)   | Ritorto composto   | Hilo cableado                                 | Fio com cabos                                  | Káblovaná nit                             | Katlı bükülmüş iplik , Kord             |
| <b>Clamps</b>                           | Pinces   | Klemmen   | Morsetti   | Mordazas                                      | Pinças   | Svorky                                    | Kıskaçlar                               |
| <b>Coating (of steel filament)</b>      | Enduction                                      | Beschichtung (Stahlfilament)  | Rivestimento (di filo di acciaio)                            | Recubrimiento de filamento de acero           | Revestimento (de filamento metálico)           | Povlak (ocelového vlákna)                 | Kaplama (çelik filamentin)              |



|   |  |  |   |   |   |   |   |
|---|--|--|---|---|---|---|---|
| <b>Coiling</b>                                      | Looper   | Bandablage, kreisförmig                                | Invasatura a spirale                            | Plegado   | Enrolamento em espiral                            | Navíjení, stáčení   | Spiral serme (Şerit , tops , towda)               |
| <b>Commercial mass</b>                              | Masse commerciale                              | Handelsmasse   | Massa commerciale                               | Masa comercial                                    | Massa comercial                                   | Obchodní hmotnost   | Ticari ağırlık                                    |
| <b>Compact cord</b>                                 | Câble compact                                  | Kompaktcord  | Cord compatto                                   | Cable compacto                                    | Corde compacta                                    | Kompaktní kord  | Kompakt kord                                      |
| <b>Conditioning</b>                                 | Conditionnement                                | Konditionierung  | Ambientamento, condizionamento                  | Acondicionamiento                                 | Condicionamento                                   | Kondicionování, klimatizace                                 | Kondisyonlama , Şartlandırma , Koşullandırma      |
| <b>Conditioned state</b>                            | Etat conditionné                               | Konditionierter Zustand                                | Ambientamento, condizionamento                  | Estado acondicionado                              | Estado de condicionamento                         | Kondicionovaný stav, klimatizovaný stav                     | Kondisyonlanmış (şartlandırılmış) hal             |
| <b>Consignment</b>                                  | Lot  | Lieferung  | Partita   | Lote  | Partida   | Dodávka   | Sevkiyat (Partisi / Lotu)                         |
| Consignment sample                                  | Echantillon du lot                             | Probe aus Lieferung                                    | Campione della partita                          | Muestra escogida                                  | Amostra da partida                                | Vzorek z dodávky  | Sevkiyat / Lot numunesi , örneği                  |
| <b>Constant rate of extension (CRE) dynamometer</b> | Dynamomètre à vitesse d'allongement constant   | Zugprüfgerät mit konstanter Verformungsgeschwindigkeit | Dinamometro a velocità costante di allungamento | Dinamómetro a velocidad constante de alargamiento | Dinamómetro a velocidade constante de alongamento | Dynamometr (trhací stroj) s konstatní rychlostí protahování | Sabit germe hızlı mukavemet cihazı                |
| <b>Container</b>                                    | Conteneur                                      | Verpackungseinheit                                     | Collo   | Caja o recipiente                                 | Recipiente  | Jednotka balení   | Ambalaj birimi , Koli                             |
| <b>Conventional allowance</b>                       | Tolérance conventionnelle (de conditionnement) | Handelszuschlag  | Tasso convenzionale di condizionamento          | Tasa convencional de acondicionamiento            | Taxa convencional de acondicionamento             | Smluvní přírůžka  | Ticari ağırlık eklentisi (Nem , avıvaj ,vb. için) |
| <b>Cord</b>   | Câble  | Kord, mehrstufiger Zwirn                               | Cord  | Cable   | Corde   | Kord  | Kord  |
| Cord of steel                                       | Câble d'acier                                  | Stahlkord  | Fune di acciaio                                 | Cable de acero                                    | Corde de aço                                      | Ocelový kord  | Çelik kord  |
| Cord thickness                                      | Epaisseur du câble                             | Korddicke, <u>oder</u> Korddurchmesser                 | Spessore della fune                             | Espesor del cable                                 | Grossura da corda                                 | Tloušťka kordu  | Kord kalınlığı                                    |
| <b>Core</b>   | Ame  | Kern (-faden)  | Anima   | Núcleo  | Alma, núcleo                                      | Jádro   | Kor , Nüve  |

|                           |                        |                          |   |  |  |   |                                   |
|---------------------------|------------------------|--------------------------|---|--|--|---|-----------------------------------|
| Core (in steel tyre cord) | Ame ou fil d'âme       | Kern (in Stahlkord)      | Anima, nucleo (filato con-, -del filato) in tyre cord d'acciaio | Núcleo (cable de acero para neumático) | Alma do fio, núcleo em tyre cord d'aço | Jádro (v ocelovém kordu pro pneumatiky) | Kor (Çelik lastik kordunda)       |
| Core – spun yarn          | Filé à âme             | Umspinnungsgarn          | Filato con anima  | Hilado - Núcleo                        | fio com alma                           | Jádrová opředená nit                    | Kor ipliği , Nüveli iplik         |
| Core – textured yarn      | Fil texturé à âme      | Texturiertes Umwindegarn | Filato con anima testurizzato                                   | Hilo texturado- Núcleo                 | Fio texturizado com alma               | Jádrová texturovaná nit                 | Kor tekstüre ipliği               |
| Core - twisted yarn       | Fil retordu à âme      | Umwindegarn              | Filato con anima ritorto  | Hilo torcido – Núcleo                  | Fio retorcido com alma                 | Jádrová obeskaná nit                    | Kor bükümlü iplik                 |
| <b>Covered yarn</b>       | Fil guipé              | Ummanteltes Garn         | Filo ricoperto  | Hilo recubierto                        | Fio revestido                          | Opředená, obeskaná nit                  | Kaplanmış iplik                   |
| <b>Crimp</b>              | Frisure                | Kräuselung               | Arricciatura, cretto  | Rizado                                 | Frisado                                | Zkadeření                               | Kıvrıcık                          |
| Crimp contraction         | Contraction de frisure | Kräuselkontraktion       | Contrazione di arricciatura (del cretto)                        | Contracción por rizado                 | Contração de frisado                   | Kontrakce při zkadeření                 | Kıvrıcık kısalması(% Kısalma)     |
| Crimp elongation          | Elongation de frisure  | Kräuseldehnung           | Allungamento di arricciatura (del cretto)                       | Alargamiento por rizado                | Alongamento de frisado                 | Prodloužení zkadeření                   | Kıvrıcık uzaması (% Uzama)        |
| Crimp frequency           | Taux de frisure        | Kräuselbogen-frequenz    | Frequenza di arricciatura (del cretto)                          | Frecuencia de rizado                   | Frequência de frisado                  | Četnost obloučků při zkadeření          | Kıvrıcık sıklığı (Kıv./cm.)       |
| Crimp liveliness          | Nervosité de frisure   | Kräuselneigung           | Nervosità di arricciatura (del cretto)                          | Vivacidad del rizado                   | Vivacidade do frisado                  | Sklon ke kadeření                       | Tekstürize canlılığı              |
| Crimp stability           | Stabilité de frisure   | Kräuselbeständig-keit    | Stabilità di arricciatura (del cretto)                          | Estabilidad del rizado                 | Estabilidade do frisado                | Stálost zkadeření                       | Kıvrıcık kalıcılığı (stabilitesi) |
| Crimp, latent             | Frisure, latente       | Kräuselung, latente      | Arricciatura (cretto), latente                                  | Rizado latente                         | frisado, latente                       | Latentní zkadeření                      | Potansiyel kıvrıcık               |
| <b>Delustrant</b>         | Délustrant             | Mattierungsmittel        | Opacizzante   | Agente deslustrante                    | Deslustrante                           | Matovací prostředek                     | Matlaştırıcı                      |

|  |  |  |                                   |                                      |                                 |                                       |                                   |
|--|--|--|-----------------------------------|--------------------------------------|---------------------------------|---------------------------------------|-----------------------------------|
| <b>Dip</b>                                 | Trempage   | Dip  | Impregnazione                     | Humectar                             | Adesão                          | Úprava namáčením (impregnace)         | Banyo                             |
| <b>Durability</b>                          | Duré d'usage                                       | Beständigkeit  | Durabilità                        | Durabilidad                          | Durabilidade                    | Stabilita                             | Dayanıklılık                      |
| <b>Dust, fibre dust</b>                    | Poussière (de fil, fibres)                         | Faserstaub   | Polvere, polvere di fibra         | Polvo producido por la fibra         | Pó, pó de fibra                 | Vlákenný prach                        | Toz , elyaf tozu                  |
| Fibre fly                                  | Particule de fibre volante                         | Faserflug  | Pulviscolo di fibre               | Fibras flotantes                     | Fibras flutuantes               | Úlet vláken                           | Uçuntu                            |
| Particulates from fibres                   | Particule de fibres                                | Faserpartikel  | Particolato di fibre              | Particularidades de las fibras       | Particulas de fibras            | Částice z vláken                      | Lifsi maddeler                    |
| Fibril                                     | Fibrille   | Fibrille   | Fibrilla                          | Fibrilla                             | Fibrila                         | Fibrila                               | Fibril                            |
| Respirable fibre-shaped particulates (RFP) | Particules fibreuses respirables                   | Lungengängige faserförmige Partikel (LFP)<br><u>instead of</u><br>Atembarer Feinstaub von Fasern | Particolato fibroso respirabile   | Forma de la fibra transfirable       | Particulas de fibra respiráveis | Vlákenné částice, které lze vdechnout | Solunabilir lif şeklinde maddeler |
| <b>Edge crimped yarn</b>                   | Fil texturé sur arête                              | Kantenkräuselgarn  | Filo cretato su spigolo           | Hilo rizado por el borde             | Fio frisado na margem           | Nit zkadeřená tažením přes hranu      | Kenara sürtme tekstüre ipliği     |
| <b>Elasticity</b>                          | Elasticité   | Elastizität  | Elasticità                        | Elasticidad                          | Elasticidade                    | Elasticita, pružnost                  | Elastikiyet                       |
| <b>Elastic yarn</b>                        | Fil élastique                                      | Elastisches Garn   | Filo elasticito                   | Hilado elastico                      | Fio elástico                    | Elastická nit                         | Elastik iplik                     |
| <b>Elongation</b>                          | Allongement (pourcentage)                          | Dehnung (in %)   | Allungamento relativo percentuale | Alargamiento                         | Alongamento                     | Prodloužení                           | Uzama (%)                         |
| Elongation at break                        | Allongement de rupture (pourcentage)               | Höchstzugkraft-Dehnung   | Allungamento a rottura            | Alargamiento a la rotura             | Alongamento de rotura           | Tažnost při max. tahové síle          | Kopma uzaması (%) (Max. yükte)    |
| Elongation at rupture                      | Allongement à la rupture (pourcentage)             | Bruchdehnung   | Allungamento alla rottura         | Alargamiento a la ruptura            | Alongamento à rotura            | Tažnost při přetrhu                   | Kopma anındaki uzama (%)          |
| Elongation at specified force              | Allongement pour une force spécifiée (pourcentage) | Dehnung bei festgelegter Zugkraft  | Allungamento a forza specifica    | Alargamiento a una fuerza específica | Alongamento a força específica  | Tažnost při dané síle                 | Belirli bir yükte uzama (%)       |

|   |   |   |  |  |                                     |   |  |
|---|---|---|--|--|-------------------------------------|---|--|
| Elongation at specified tenacity        | Allongement pour une ténacité spécifiée (pourcentage) | Dehnung bei festgelegter Festigkeit               | Allungamento a tenacità specifica        | Alargamiento a la tenacidad especificada | Alongamento a tenacidade específica | Tažnost při dané poměrné pevnosti         | Belirli bir mukavemette uzama (%)      |
| Elongation between defined forces (EDF) | Allongement (%) entre deux forces définies            | Dehnung zwischen festgelegten Zugkraftgrenzen     | Allungamento percento                    | Alargamiento entre fuerzas definidas     | Percentagem de alongamento          | Prodloužení mezi danými mezními silami    | Belirli iki yük arasında uzama (%)     |
| <b>End</b>                              | Bout (ou filament)                                    | Faden-Ende  | Capo                                     | Cabo                                     | Ponta                               | Osnovní nit                               | Uç ; çözümlü ipliği / teli             |
| <b>Extension</b>                        | Allongement absolu (en unité de longueur)             | Längung   | Allungamento                             | Alargamiento                             | Alongamento                         | Protázení                                 | Uzama (Uzunluk birimi olarak)          |
| <b>False twist stretch yarn</b>         | Fil fausse torsion à élasticité conférée (FT)         | Falschdrallgarn, hochelastisch (HE-Garn)          | Filo elasticizzato a falsa torsione (FT) | Hilo de espuma de falsa torsión          | Fio estirado de falsa torção        | Elastická nit tvarovaná nepravým zákrutem | Yalancı bükümlü streç ipliği           |
| <b>False twist yarn</b>                 | Fil fausse torsion                                    | Falschdrallgarn                                   | Filo a falsa torsione                    | Hilado de falsa torsión                  | Fio de falsa torção                 | Nit tvarovaná nepravým zákrutem           | Yalancı bükümlü tekstüre iplik         |
| <b>Fibre</b>                            | Fibre   | Faser   | Fibra                                    | Fibra                                    | Fibra                               | Vlákno                                    | Elyaf , Lif                            |
| <b>Fibre dust</b>                       | Poussière de fibre                                    | Faserstaub  | Polvere di fibra                         | Polvo de la fibra                        | Pó de fibra                         | Vlákenný prach                            | Elyaf tozu                             |
| <b>Fibre length</b>                     | Longueur de fibre                                     | Faserlänge  | Lunghezza della fibra                    | Longitud de la fibra                     | Comprimento de fibra                | Délka vlákna                              | Elyaf boyu                             |
| <b>Fibril</b>                           | Fibrille  | Fibrille  | Fibrilla                                 | Fibrilla                                 | Fibrila                             | Fibrila                                   | Fibril                                 |
| <b>Filament</b>                         | Filament  | Filament  | Filamento, bava                          | Filamento                                | Filamento                           | Filament, nekonečné vlákno                | Filament , Kesiksiz (sonsuz) lif       |
| <b>Filament yarn</b>                    | Fil continu   | Filamentgarn, Endlosgarn                          | Filo continuo                            | Hilo de filamento                        | Fio de filamento contínuo           | Nit z nekonečných vláken                  | Kontinü / Filament iplik               |
| <b>Finish</b>                           | Ensimage  | Avivage, Schmalze                                 | Ensimaggio                               | Ensimaje                                 | Ensimagem (acabamento)              | Povrchová úprava, aviváž                  | Terbiye maddesi , Yağ , Finiş , Avivaj |
| <b>Flame resistance</b>                 | Anti-feu  | Flammhemmend oder: Flammwidrig<br>Flammfestigkeit | Resistenza alla fiamma                   | Resistencia a la llama                   | Resistente ao fogo                  | Odolnost proti hoření                     | Güç tutuşurluk                         |
| <b>Flare</b>                            | Ouverture à la coupe                                  | Aufspreizen                                       | Apertura                                 | Arder                                    | Abertura                            | Nálevkovitě rozšíření                     | Açılma , Yayılma , Flare               |

|                               |   |                                   |                                  |                                       |                                 |   |                           |
|-------------------------------|---|-----------------------------------|----------------------------------|---------------------------------------|---------------------------------|---|---------------------------|
| <b>Flock</b>                  | Floc  | Flock                             | Flock                            | Flocado                               | Floco                           | Vložka  | Flok                      |
| <b>Folded yarn</b>            | Retors                                      | Einstufiger Zwirn                 | Ritorto semplice                 | Hilo Retorcido                        | Fio retorcido                   | Skaná nit'                                      | Katlı iplik               |
| <b>Folding in layers</b>      | Bambaner                                    | Bandablagen parallel              | Faldare a strati                 | Plegado en capas                      | Dobrar em camadas               | Skládání do vrstev                              | Serme                     |
| <b>Force</b>                  | Force                                       | Kraft, Zugkraft                   | Forza                            | Fuerza                                | Força                           | Síla  | Kuvvet                    |
| Force at break                | Force de rupture                            | Höchstzugkraft                    | Forza (massima) di rottura       | Fuerza a la rotura                    | Força de rotura                 | Maximální síla při tahovém namáhání, tržná síla | Kopma yükü (Max. yük)     |
| Force at rupture              | Force à la rupture                          | Bruchkraft                        | Forza alla rottura               | Fuerza a la ruptura                   | Força à rotura                  | Síla při přetrhu                                | Kopma anındaki yük        |
| Force at specified elongation | Force sous allongement spécifique           | Zugkraft bei festgelegter Dehnung | Forza ad allungamento specifico  | Fuerza a alargamiento específico      | Força a alongamento específico  | Síla při daném prodloužení                      | Belirli bir uzamada yük   |
| <b>Gauge length</b>           | Distance entre pinces                       | Einspannlänge                     | Distanza tra morsetti            | Distancia entre mordazas              | Distância entre pinças (bitola) | Upínací délka                                   | Çene aralığı              |
| <b>Gear crimped yarn</b>      | Fil texturé sur engrenage                   | Zahnrad-kräuselgarn               | Filo cretato con rulli scanalati | Hilado rizado con rodillos acanalados | Fio frisado por rolos           | Nit' tvarovaná ozubenými koly                   | Dişli tekstüre ipliği     |
| <b>Giant carton</b>           | Carton géant                                | Grossverpackung                   | Confezione gigante               | Carton gigante                        | Embalagem gigante               | Velké balení                                    | Maksi kutu                |
| <b>Gross mass</b>             | Masse brute                                 | Bruttomasse                       | Massa lorda                      | Masa bruta                            | Massa bruta                     | Hmotnost s obalem, brutto                       | Brüt ağırlık              |
| <b>Heat durability</b>        | Durabilité à la chaleur                     | Hitzebeständigkeit                | Durabilità al calore             | Durabilidad al calor                  | Durabilidade ao calor           | Tepelná stabilita                               | Isı dayanıklılığı         |
| <b>Heat resistance</b>        | Résistance à la chaleur (Thermo-résistance) | Wärme-beständigkeit               | Resistenza al calore             | Resistencia al calor                  | Resistência ao calor            | Odolnost proti teplu                            | Isı direnci               |
| <b>High tenacity yarn</b>     | Fil haute ténacité                          | Hochfestes Garn                   | Filo ad alta tenacità            | Hilado de alta tenacidad              | Fio de alta tenacidade          | Nit' s vysokou poměrnou pevností                | Yüksek mukavemetli iplik  |
| <b>Industrial fibre</b>       | Fibre à usage industriel                    | Technische Faser                  | Fibra industriale                | Fibra industrial                      | Fibra industrial                | Průmyslové vlákno                               | Endüstriyel (sınai) elyaf |
| <b>Initial length</b>         | Longueur initiale                           | Ausgangslänge                     | Lunghezza iniziale               | Longitud inicial                      | Comprimento inicial             | Počáteční délka                                 | Başlangıç uzunluğu        |
| <b>Interlaced yarn</b>        | Fil entrelacé                               | Verwirbeltes Garn                 | Filo interlacciato               | Hilado entrelazado                    | Fio entrelaçado                 | Proplétaná nit'                                 | Dolamalı (IMG'li) iplik   |

|   |                                       |                             |                                    |   |                              |   |                                |
|---|---------------------------------------|-----------------------------|------------------------------------|---|------------------------------|---|--------------------------------|
| <b>Interlacing distance</b>                 | Distance d'entrelacement              | Verwirbelungsabstand        | Distanza di interlacciamento       | Distancia de entrelazamiento                  | Distância de entrelaçamento  | Vzdálenost mezi propletenými body         | Dolama (IMG) aralığı           |
| <b>Interlacing frequency</b>                | Fréquence d'entrelacement             | Verwirbelungsfrequenz       | Frequenza di interlacciamento      | Frecuencia de entrelazamiento                 | Frequência de entrelaçamento | Počet propletených bodů na jednotku délky | Dolama (IMG) sıklığı           |
| <b>Intermingled yarn (syn : interlaced)</b> | Fil entremêlé                         | Verwirbeltes Garn           | Filo interlacciato                 | Hilado entremezclado (sinónimo.: entrelazado) | Fio entremeado               | Proplétaná nit                            | Dolamalı (IMG'li) iplik        |
| <b>Invoice mass</b>                         | Masse facturée                        | Rechnungsmasse              | Massa da fatturare                 | Masa a facturar                               | Massa de factura             | Fakturovaná hmotnost                      | Fatura ağırlığı                |
| <b>Jaws</b>                                 | Mâchoires                             | Klemmbacken                 | Ganasce                            | Mordazas                                      | Garra (pinças)               | Čelisti                                   | Çeneler                        |
| <b>Knit-deknit yarn</b>                     | Fil texturé par tricotage-détricotage | Strickfixiergarn            | Filo immagliato e demagliato (KdK) | Hilo tricotado-destricotado (KdK)             | Fio tricotado-desmalhado     | Nit tvarovaná postupem pletení-párání     | KDK ipliği                     |
| <b>Laboratory sample</b>                    | Echantillon de laboratoire            | Laborprobe                  | Campione di laboratorio            | Muestra de laboratorio                        | Amostra de laboratório       | Laboratorní vzorek                        | Laboratuar numunesi            |
| <b>Latent crimp</b>                         | Frisure latente                       | Latente Kräuselung          | Arricciatura (cretto) latente      | Rizado latente                                | Frisado latente              | Latentní zkadeření                        | Potansiyel kıvrırcık           |
| <b>Lay</b>                                  | Pas                                   | Verlegung                   | Commettitura                       | Arrollamiento                                 | Enrolamento                  | Vinutí kordů                              | Sarım (Kord için)              |
| Direction of lay                            | Sens du pas                           | Verlegungsrichtung          | Senso di commettitura              | Dirección del arrollamiento                   | Direção do enrolamento       | Směr vinutí                               | Sarım yönü                     |
| Lang's lay                                  | ?                                     | Stahlcord-konstruktion Lang | Commettitura parallela (Lang)      | Arrollamiento de Lang                         | Enrolamento de Lang          | Stejnoseměrné vinutí                      | ?                              |
| Length of lay                               | Longueur du pas développé             | Verlegungslänge             | Passo di commettitura              | Paso del arrollamiento                        | Comprimento do enrolamento   | Délka vinutí, zákrutu                     | Sarım uzunluğu                 |
| Type of lay                                 | Type de pas                           | Stahlcord-konstruktion      | Tipo di commettitura               | Tipo de arrollamiento                         | Tipo de enrolamento          | Typ vinutí                                | Sarım tipi                     |
| <b>Linear density</b>                       | Masse linéique                        | Feinheit                    | Massa per unità di lunghezza       | Densidad lineal                               | Massa por unidade linear     | Délková hmotnost, jemnost                 | Numara (İplik, fitil, elyafta) |

| Lot                                | Lot                                   | Lieferung,<br>Los(grösse)     | Lotto                                 | Lote                               | Lote                             | Partie, (do)dávka   | Parti , Lot   |
|------------------------------------|---------------------------------------|-------------------------------|---------------------------------------|------------------------------------|----------------------------------|---|---|
| <b>Lubricant</b>                   | Lubrifiant                            | Schmiermittel,<br>Gleitmittel | Lubrificante                          | Lubricante                         | Lubrificante                     | Lubrikant, mazadlo  | Yağlayıcı (Finiş ,<br>avivaj) , Lubrikant<br>,Kaydırıcı |
| <b>Mass</b>                        | Masse                                 | Masse                         | Massa                                 | Masa                               | Massa                            | Hmotnost  | Kitle , Kütle   |
| Gross mass                         | Masse brute                           | Bruttomasse                   | Massa lorda                           | Masa bruta                         | Massa bruta                      | Brutto, celková<br>hmotnost                               | Brüt ağırlık  |
| Tare                               | Tare                                  | Tara                          | Tara                                  | Tara                               | Tara                             | Tára  | Dara  |
| Net mass                           | Masse nette                           | Nettomasse                    | Massa netta                           | Masa neta                          | Massa liquida                    | Netto, čistá hmotnost                                     | Net ağırlık   |
| Oven-dry mass                      | Masse sèche                           | Ofentrockenmasse              | Massa anidra                          | Masa anhidra                       | Massa anidra                     | Suchá hmotnost  | Kuru ağırlık  |
| Commercial mass                    | Masse commerciale                     | Handelsmasse                  | Massa commerciale                     | Masa comercial                     | Massa comercial                  | Obchodní hmotnost   | Ticari ağırlık  |
| Invoice mass                       | Masse facturée                        | Rechnungsmasse                | Massa da fatturare                    | Masa a facturar                    | Massa da factura                 | Fakturovaná hmotnost                                      | Fatura ağırlığı   |
| Tolerance of<br>commercial<br>mass | Tolérance sur la<br>masse commerciale | Toleranz der<br>Handelsmasse  | Tolleranza della<br>massa commerciale | Tolerancia de la masa<br>comercial | Tolerância da massa<br>comercial | Odchylka, tolerance<br>obchodní hmotnosti                 | Ticari ağırlık toleransı                                |
| <b>Matrix fibre</b>                | Fibre à matrice                       | Matrixfaser                   | Fibra a matrice                       | Fibra matriz                       | Fibra matriz                     | Matricové vlákno  | Matriks yapılı lif                                      |
| <b>Modulus</b>                     | Module                                | Modul                         | Modulo                                | Módulo                             | Módulo                           | Modul   | Modül   |
| Chord modulus                      | Module sécant                         | Sekantenmodul<br>(Chordmodul) | Modulo della corda                    | Módulo secante                     | Módulo de chord                  | Modul pružnosti<br>(sečna křivky napětí –<br>deformace)   | Tanjant modülü  |
| Tangent modulus                    | Module tangent                        | Tangentenmodul                | Modulo tangente                       | Módulo tangente                    | Módulo tangente                  | Tangentový modul<br>(tečna ke křivce<br>napětí-deformace) | Teğet modülü  |
| Modulus, wet                       | Module au mouillé                     | Nassmodul                     | Modulo a umido                        | Módulo en húmedo                   | Módulo em húmido                 | Modul za mokra  | Islak modül   |
| <b>Moisture content</b>            | Humidité                              | Feuchtigkeitsgehalt           | Contenuto di umidità                  | Contenido de<br>humedad            | Teor de humidade                 | Obsah vlhkosti  | Nem oranı   |

|   |                            |                           |                           |  |                          |                            |  |
|---|----------------------------|---------------------------|---------------------------|--|--------------------------|----------------------------|--|
| <b>Moisture regain</b>                            | Taux de reprise d'humidité | Feuchtigkeitsaufnahme     | Ripresa di umidità        | Recuperación de humedad                                | Retoma de humidade       | Vlhkostní přírůžka         | Nem alma                                     |
| <b>Monofilament yarn (Monofil)</b>                | Fil monofilament           | Monofilamentgarn          | Monofilamento, monobava   | Hilo Monofilamento                                     | Fio de monofilamentos    | Nit' z nekonečného vlákna  | Tek filamentli (Monofilament) iplik          |
| <b>Multicomponent fibre</b>                       | Fibre à multicomposants    | Multikomponenten Faser    | Fibra multicomponente     | Fibra multicomponente                                  | Fibra multicomponente    | Vícesložkové vlákno        | Çok bileşenli (Kompoze) elyaf                |
| <b>Multiconstituent fibre</b>                     | Fibre à multiconstituants  | Multi-konstituenten Faser | Fibra multiconstituente   | Fibra multiconstituyente                               | Fibra multiconstituída   | Multikonstituentní vlákno  | Çok bileşenli (Kompoze) elyaf                |
| <b>Multifilament yarn (Multifil)</b>              | Fil multifilament          | Multifilamentgarn         | Multifilamento, multibava | Hilo multifilamento                                    | Fio multifilamento       | Nit' z nekonečných vláken  | Çok filamentli iplik                         |
| <b>Multiple wound yarn (syn : Assembled yarn)</b> | Fil assemblé               | Gefachtes Garn            | Binato o accoppiato       | Hilo de arrollado múltiple (sinónimo: hilo ensamblado) | Fio junto                | Sdružená nit'              | Bükümsüz (kath) iplik                        |
| <b>Nonwovens</b>                                  | Nontissés                  | Vliesstoff                | Nontessuti                | Non-tejido   | Nao-tecido               | Netkany                    | Dokusuz yusei                                |
| <b>Net mass</b>                                   | Masse nette                | Nettomasse                | Massa netta               | Masa neta  | Massa líquida            | Netto, čistá hmotnost      | Net ağırlık                                  |
| <b>Nominal length</b>                             | Longueur nominale          | Nennlänge                 | Lunghezza nominale        | Longitud nominal                                       | Comprimento nominal      | Jmenovitá délka            | Nominal (İtibari) elyaf boyu                 |
| <b>Nominal linear density</b>                     | Masse linéique nominale    | Nennfeinheit              | Densità lineare nominale  | Densidad lineal nominal                                | Densidade linear nominal | Jmenovitá délková hmotnost | Nominal (İtibari) iplik/fitel/elyaf numarası |
| <b>Nominal titre (Nominal count)</b>              | Titre nominal              | Nenntiter                 | Titolo nominale           | Título nominal   | Titulo nominal           | Jmenovitý titr             | Nominal (İtibari) iplik/fitel/elyaf numarası |
| <b>Open cord</b>                                  | Câble gonflé               | Offener Kord              | Cord aperto               | Cable abierto  | Corde aberta             | Rozvolněný ocelový kord    | Açık kord                                    |
| <b>Oven-dry mass</b>                              | Masse sèche                | Ofentrockenmasse          | Massa anidra              | Masa anhidra   | Massa anidra             | Suchá hmotnost             | Kuru ağırlık                                 |
| <b>Package</b>                                    | Bobine                     | Aufmachungs-einheit       | Confezione                | Unidad de arrollamiento                                | Embalagem                | Cívka s návinem            | Sarılı iplik bobini/masurası/leven di , vb.  |



|                                      |  |                               |                             |                                 |                               |                                       |                                    |
|--------------------------------------|--|-------------------------------|-----------------------------|---------------------------------|-------------------------------|---------------------------------------|------------------------------------|
| <b>Permanent deformation</b>         | Déformation permanente                 | Permanente Deformation        | Deformazione permanente     | Deformación permanente          | Deformação permanente         | Trvalá deformace                      | Kalıcı deformasyon/şekil bozulması |
| <b>Plied yarn</b>                    | Fil retors                             | Einstufiger Zwirn             | Ritorto semplice            | Hilo retorcido                  | Fio retorcido                 | Skaná nit'                            | Bükümlü-Kath iplik                 |
| <b>POY (Partially Oriented Yarn)</b> | Fil continu partiellement orienté      | Teilorientiertes Filamentgarn | Filo parzialmente orientato | Hilo orientado parcialmente     | Fio parcialmente orientado    | Částečně orientovaná nit'             | POY                                |
| <b>Preconditioning</b>               | Précondition-nement                    | Vorklimatisierung             | Pre-ambientamento           | Preacondicionado                | Précondiciona-mento           | Předkondice, předklimatizace          | Ön kondisyonlama/şartlandırma      |
| <b>Pre-dip</b>                       | Pré-trempage                           | Vordip                        | Pre-impregnazione           | Humectación previa              | Pré-impregnação               | Předběžné namáčení                    | Ön banyo                           |
| <b>Pretension</b>                    | Prétension                             | Vorspannkraft                 | Pretensione                 | Pretensión                      | Pré-tensão                    | Předpětí                              | Ön germe                           |
| <b>Pulp</b>                          | Pâte à papier                          | Pulp                          | Pasta (di legno)            | Pulpa                           | Polpa                         | Buničina                              | Selüloz hamuru                     |
| <b>Regular cord</b>                  | Câble ordinaire                        | Regulärer (normaler) Kord     | Cord regolare               | Cable regular                   | Corde regular                 | Pravidelná (stejněměrná) kordová nit' | ?                                  |
| <b>Relative Humidity</b>             | Humidité relative                      | Relative Luftfeuchtigkeit     | Umidità relativa            | Humedad relativa                | Humidade relativa             | Relativní vlhkost                     | Bağlı (İzafi) hava nemliliği       |
| <b>Relaxation ratio</b>              | Taux de relaxation                     | Relaxations-Verhältnis        | Rapporto di rilassamento    | Relación de relajamiento        | Índice de relaxação           | Relaxační poměr                       | Relaksasyon oranı                  |
| <b>Residual torsion</b>              | Torsion résiduelle                     | Resttorsion                   | Torsione residua            | Torsión residual                | Torção residual               | Zbytková torze (zkrut)                | Artık torsiyon / büküm             |
| <b>Roving</b>                        | Mèche de banc (de fibres discontinues) | Vorgarn                       | Stoppino                    | Mecha                           | Mecha de banco ou acabador    | Přást                                 | Fitil                              |
| <b>Sample</b>                        | Echantillon                            | Probe                         | Campione                    | Muestra                         | Amostra                       | Vzorek                                | Numune , Örnek                     |
| <b>Shrinkage</b>                     | Retrait                                | Schrumpf                      | Retrazione (rientro)        | Encogimiento                    | Encolhimento                  | Srážení, sráživost                    | Çekme                              |
| Boiling water shrinkage              | Retrait à l'eau bouillante             | Kochschrumpf                  | Retrazione all' ebollizione | Encogimiento por agua hirviendo | Encolhimento em água fervente | Srážení, sráživost za varu            | Kaynar suda çekme                  |
| Hot water shrinkage                  | Retrait à l'eau chaude                 | Heisswasser-schrumpf          | Retrazione in acqua calda   |                                 | Encolhimento em água quente   |                                       |                                    |

|   |  |   |   |   |  |   |   |
|---|--|---|---|---|--|---|---|
| Hot air shrinkage, after treatment          | Retrait à l'air chaud, après le traitement                         | Heissluftschumpf (nach der Behandlung)      | Retrazione ad aria calda (dopo il trattamento)              | Encogimiento por aire caliente, tratamiento posterior   | Encolhimento a quente (depois de tratamento) | Srážení, sráživost horkým vzduchem (po úpravě)    | Sıcak havada çekme (İşlem sonunda)            |
| Hot air shrinkage, during treatment         | Retrait à l'air chaud, pendant le traitement                       | Heissluftschumpf (während der Behandlung)   | Retrazione (rientro) ad aria calda (durante il trattamento) | Encogimiento por aire caliente durante el tratamiento   | Encolhimento a quente (durante o tratamento) | Srážení, sráživost horkým vzduchem (během úpravy) | Sıcak havada çekme (İşlem sırasında)          |
| <b>Single yarn</b>                          | Fil simple   | Einfachgarn                                 | Filo singolo  | Hilo sencillo   | Fio singelo                                  | Jednoduchá nit                                    | Tek kat iplik                                 |
| <b>Size</b>                                 | Encollage  | Schlichte                                   | Incollaggio   | Encolado  | Encolado                                     | Šlichta   | Haşıl   |
| <b>Sliver</b>                               | Ruban de fibres  | Faserband                                   | Nastro, top   | Cinta   | Mecha  | Pramen  | Şerit   |
| <b>Specimen</b>                             | Eprouvette   | Messprobe                                   | Campione  | Probeta   | Amostra                                      | Zkušební vzorek                                   | Numune , Örnek                                |
| <b>Spun yarn</b>                            | Filé de fibre  | Spinnfasergarn                              | Filato  | Hilado  | Fiado  | Předená nit                                       | Kesik elyaf ipliği , Eğirilmiş iplik          |
| <b>Stabilised false twist yarn</b>          | Fil fausse torsion fixée (FTF)                                     | Falschdrallgarn, niederelastisch (Set-Garn) | Filo a falsa torsione fissato (FTF)                         | Hilo de falsa torsión estabilizada                      | Fio de falsa torção estabilizada             | Stabilizovaná, nepravým zákrutem tvarovaná nit    | Çift firınlı , yalancı bükümlü tekstüre iplik |
| Staple fibre                                | Fibre discontinue  | Spinnfaser                                  | Fibra discontinua   | Fibra discontinua                                       | Fibra em rama                                | Staplové vlákno, stříž                            | Kesik elyaf                                   |
| Length of staple                            | Longueur des fibres  | Stapelfaserlänge                            | Lunghezza di taglio   | Longitud de fibra                                       | Comprimento da rama                          | Délka štáplu                                      | Elyaf boyu , Kesim boyu                       |
| Square cut staple fibres                    | Fibre discontinue à coupe droite                                   | Spinnfaser mit Rechteckschnitt              | Fibre a taglio quadrato                                     | Fibras de corte cuadrado                                | Fibra em rama de corte quadrado              | Stříž se čtvercovým řezem                         | Kesik elyaf , normal kesim                    |
| Variable length (or bias cut) staple fibres | Fibre discontinue à coupe en biais                                 | Spinnfaser mit variabler Stapellänge        | Fibre a taglio variabile (taglio triangolare)               | Fibras cortadas de longitud variable (o corte al sesgo) | Fibra em ramade corte variável               | Stříž s proměnlivým staplem získaná řezáním       | Değişken (variabl) boyda kesilmiş elyaf       |
| Stretch-broken fibres                       | Fibre discontinue obtenue par craquage par étirage (Fibre craquée) | Reisspinnband                               | Fibra discontinua strappata                                 | Fibra craqueada   | Fibra convertida                             | Stříž s proměnlivým staplem získaná trháním       | Germe-koparma elyaf                           |
| <b>Steel cord</b>                           | Câble d'acier  | Stahlkord                                   | Corda (funo) d'acciaio                                      | Cable de acero  | Corda de aço                                 | Ocelový kord                                      | Çelik kord                                    |
| <b>Steel cord wrap</b>                      | Câble d'acier guipage  | Umwindung bei Stahlkord                     | Corda (funo) d'acciaio a filo attorcigliato                 | Arrollamiento de cable de acero                         | Corda de aço de fio enrolado                 | Ovinutí ocelového kordu                           | Çelik kord spirali                            |

|                                |  |                             |   |                                |                                  |   |  |
|--------------------------------|--|-----------------------------|---|--------------------------------|----------------------------------|---|--|
| <b>Steel filament</b>          | Filament métallique (acier)                            | Stahlfilament               | Filo metallico                                | Filamento de acero             | Filamento de aço                 | Ocelové vlákno                              | Çelik filament                                   |
| <b>Stiffness</b>               | Rigidité   | Biegesteifigkeit            | Rigidità-rigidezza                            | Rigidez                        | Rigidez                          | Tuhost                                      | Bükülme sertliği / direnci                       |
| <b>Straightened length</b>     | Longueur défrisée (étirée)                             | Entkräuselte Länge          | Lunghezza del disarricciato                   | Longitud enderezada            | Comprimento desfrisado (alisado) | Délka po vyrovnání zkadeření                | Kıvrırcığı açılmış boy                           |
| <b>Straightness</b>            | Rigidité   | Inflexibilität              | Inflessibilità                                | Escuadría                      | Inflexibilidade (Rigidez)        | Vyrovnnání                                  | Düzgünlük  |
| <b>Strain</b>                  | Allongement relatif                                    | Dehnung, relative           | Allungamento relativo                         | Deformación                    | Alongamento relativo             | Protažení, relativní                        | Uzama oranı                                      |
| <b>Strand</b>                  | Toron  | Litze                       | Trefolo                                       | Cordón                         | Cordão                           | Pramen, provazec                            | İp , Sicim ; Damar (çelik için)                  |
| <b>Strength</b>                | Résistance   | Festigkeit                  | Resistenza                                    | Resistencia                    | Resistência                      | Pevnost                                     | Dayanım  |
| <b>Stress</b>                  | Contrainte   | Spannung                    | Sollecitazione                                | Esfuerzo                       | Esforço                          | Namáhání                                    | Gerilim  |
| Stress decay                   | Chute de contrainte                                    | Spannungsabfall             | Caduta di sollecitazione                      | Deformación debida a la fuerza | Esforço de deterioração          | Pokles napětí                               | Gerilim azalması                                 |
| <b>Stretch-broken fibres</b>   | Fibre discontinue obtenue par craquage (Fibre craquée) | Reisspinnband               | Fibra discontinua strappata                   | Fibra craqueada                | Fibra convertida                 | Stříz s proměnlivým staplem získaná trháním | Germe-koparma elyaf                              |
| <b>Stufferbox crimped yarn</b> | Fil texturé par boîte frisante                         | Stauchkräuselgarn           | Filo arriciato (cretato) con camera di cretto | Hilo rizado con caja de rizado | Fio frisado em caixa frisadora   | Nitř zkadeřená v pěchovací komoře           | (Kıvrırcık kutusunda) Sıkıştırma tekstüre ipliği |
| <b>Tabby</b>                   | Tabby  | Kordgewebeabschnitt (Tabby) | Tabby   | Tabby                          | Tabby                            | Hladká tkanina (taft)                       | Tabby  |
| Tabby sample                   | Echantillon de tabby                                   | Tabbyprobe                  | Campione di tabby                             | Muestra de tabby               | Amostra de tabby                 | Vzorek hladké tkaniny                       | Tabby numunesi                                   |
| <b>Tangled yarn</b>            | Fil enchevêtré   | Verwirbeltes Garn           | Filo interlacciato                            | Hilado entrelazado             | Fio emaranhado                   | Pocuchaná (zapletená) nitř                  | Dolamalı (IMG'li) iplik                          |
| <b>Tare</b>                    | Tare   | Tara                        | Tara  | Tara                           | Tara                             | Tára  | Dara   |

|  |                                    |   |                                    |  |                                      |   |   |
|--|------------------------------------|---|------------------------------------|--|--------------------------------------|---|---|
| <b>Tenacity</b>                          | Ténacité                           | Feinheitsbezogene Zugkraft                          | Tenacità                           | Tenacidad                                | Tencidade                            | Poměrná pevnost                           | Mukavemet                               |
| Tenacity at break                        | Ténacité de rupture                | Feinheits beim Bruch                                | Tenacità a rottura                 | Tenacidad a la rotura                    | Tenacidade à rotura                  | Poměrná pevnost při maximální tahové síle | Kopma dayanımı , Mukavemet (Max. yükte) |
| Tenacity at specified elongation         | Ténacité sous allongement spécifié | Feinheitsbezogene Zugkraft bei festgelegter Dehnung | Tenacità ad allungamento specifico | Tenacidad a un alargamiento especificado | Tenacidade de alongamento específico | Poměrná pevnost při daném prodloužení     | Belirli bir % uzamada mukavemet         |
| <b>Tensile strength</b>                  | Résistance à la traction           | Zugfestigkeit                                       | Resistenza alla trazione           | Resistencia a la tracción                | Resistência à tracção                | Pevnost v tahu                            | Kopma yükü                              |
| <b>Tensile stress</b>                    | Contrainte de traction             | Zugspannung   | Sforzo di trazione                 | Esfuerzo de tracción                     | Esforço de tracção                   | Napětí v tahu                             | Kopma gerilimi (Birim kesit alanına)    |
| <b>Tension</b>                           | Tension                            | Zug(kraft)  | Tensione                           | Tensión                                  | Tensão                               | Napětí                                    | Germe kuvveti                           |
| <b>Tensioning force</b>                  | Force de tension                   | Zugkraft  | Forza di tensionamento             | Fuerza de tensionamiento                 | Força de tensão                      | Napinaci síla                             | Germe kuvveti                           |
| <b>Test specimen (synonym: specimen)</b> | Eprouvette d'essai                 | Messprobe   | Provetta                           | Probeta                                  | Provete                              | Zkušební vzorek                           | Numune , Örnek                          |
| <b>Textile fibre</b>                     | Fibre textile                      | Textilfaser   | Fibra tessile                      | Fibra textil                             | Fibra textil                         | Textilní vlákno                           | Tekstil elyafi / lifi                   |
| <b>Textured filament yarn</b>            | Fil continu texturé                | Texturiertes Filamentgarn                           | Filo continuo testurizzato         | Hilo continuo texturado                  | Fio continuo texturizado             | Tvarovaná nit z nekonečných vláken        | Tekstüre filament iplik                 |
| <b>Titre (count)</b>                     | Titre                              | Titer   | Titolo                             | Título                                   | Titulo                               | Titir                                     | Numara (İplik ,fıtil , elyafta)         |
| <b>Tolerance</b>                         | Tolérance                          | Toleranz  | Tolleranza                         | Tolerancia                               | Tolerância                           | Tolerance, odchylka                       | Tolerans , Limit                        |
| Tolerance of commercial mass             | Tolérance sur la masse commerciale | Toleranz der Handelsmasse                           | Tolleranza della massa commerciale | Tolerancia de la masa comercial          | Tolerância da massa comercial        | Odchylka, tolerance obchodní hmotnosti    | Ticari ağırlık toleransı                |
| <b>Top</b>                               | Ruban                              | Faserband   | Top                                | Peinado                                  | Top (Penteado)                       | Česanec                                   | Şerit , Tops                            |
| <b>Torsion textured yarn</b>             | Fil texturé par torsion            | Torsionstexturiertes Garn                           | Filo testurizzato a torsione       | Hilo texturizado por torsión             | Fio texturizado por torção           | Nit tvarovaná kroucením                   | Yalancı bükümlü tekstüre iplik          |

|                             |   |   |  |                                  |                                 |   |                              |
|-----------------------------|---|---|--|----------------------------------|---------------------------------|---|------------------------------|
| <b>Toughness at break</b>   | Energie de rupture                            | Feinheitsbezogene Höchstzugkraft-Arbeit | Lavoro a rottura                               | Tenacidad a la rotura            | Trabalho de rotura              | Relativní deformační práce                | Birim kopma işi (Max. yükte) |
| <b>Toughness at rupture</b> | Energie à la rupture                          | Feinheitsbezogene Bruchkraft-Arbeit     | Lavoro a rottura specifico                     | Tenacidad a la ruptura           | Trabalho à rotura específica    | Houževnatost při přetržení                | Birim kopma işi (Kopmada)    |
| <b>Tow</b>                  | Câble de filaments (pour fibres discontinues) | Kabel                                   | Cavo di filatura o tow (per fibra discontinua) | Cable (para fibras discontinuas) | Cabo                            | Kabel                                     | Elyaf bandı , Tow            |
| <b>Twist</b>                | Torsion                                       | Drehung                                 | Torsione                                       | Torsi3n                          | Torç3o                          | Zákrut                                    | Büküm                        |
| Twist factor                | Coefficient de torsion                        | Drehungsbeiwert                         | Coefficiente di torsione                       | Coefficiente de torsi3n          | Coefficiente de torç3o          | Zákrutový faktor                          | Büküm katsayısı              |
| Twist level                 | Niveau de torsion                             | Drehungzahl                             | Numero di torsioni                             | Nivel de torsi3n                 | Nível de torç3o                 | Počet zákrutů                             | Büküm sayısı                 |
| Twist liveliness            | Effet torque                                  | Kringelneigung                          | Effetto torque                                 | Vivacidad de la torsi3n          | Efeito torque, efeito de torç3o | Sklon ke tvorbě zákrutů                   | Büküm canlılığı              |
| Tyre cord fabric            | Tissu pour pneumatiques                       | Reifenkordgewebe                        | Tessuto per pneumatici                         | Tejido de cable para neumáticos  | Tecido para pneus               | Tkanina z kordového vlákná pro pneumatiky | Kord bezi                    |
| <b>Weight</b>               | Poids   | Gewicht                                 | Peso   | Peso                             | Peso                            | Hmotnost                                  | Ağırlık                      |
| <b>Wet modulus</b>          | Module au mouillé                             | Nassmodul                               | Modulo ad umido                                | M3dulo en húmedo                 | M3dulo em húmido                | Modul za mokra                            | Islak modül                  |
| <b>Wire</b>                 | Fil tréfilé métallique                        | Draht                                   | Filamento (metallico)                          | Alambre                          | Filamento metálico              | Drát                                      | Tel                          |
| <b>Yarn</b>                 | Fil   | Garn                                    | Filo   | Hilo                             | Fio                             | Nit~                                      | İplik                        |