

# INTERNATIONAL STANDARD

**ISO**  
**9958-1**

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## **Draughting media for technical drawings — Draughting film with polyester base —**

### **Part 1: Requirements and marking**

*Supports de traçage pour dessins techniques — Films à dessin à base  
de polyester —*

*Partie 1: Caractéristiques et marquage*



Reference number  
ISO 9958-1:1992(E)

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 9958-1 was prepared by Technical Committee ISO/TC 10, *Technical drawings, product definition and related documentation*, Sub-Committee SC 9, *Media and equipment for drawing and related documentation*.

ISO 9958 consists of the following parts, under the general title *Draughting media for technical drawings* --- *Draughting film with polyester base*:

- *Part 1: Requirements and marking*
- *Part 2: Determination of properties*

Annexes A and B of this part of ISO 9958 are for information only.

# Draughting media for technical drawings — Draughting film with polyester base —

## Part 1: Requirements and marking

### 1 Scope

This part of ISO 9958 specifies the requirements for draughting film with a biaxially oriented polyethylene terephthalate base (commonly known as a polyester base) used as a medium for drawn and written information which it is possible to duplicate, revise and store.

In addition, this part of ISO 9958 specifies the contents of the label to be affixed on the outside of the draughting film package, and gives an example of the product information which may be prepared by the manufacturer or retailer of the draughting film.

### 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 9958. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 9958 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 4593:—<sup>1)</sup>, *Plastics — Film and sheeting — Determination of thickness by mechanical scanning*

ISO 9177-1:1989, *Mechanical pencils — Part 1: Classification, dimensions, performance requirements and testing*.

ISO 9177-2:1989, *Mechanical pencils — Part 2: Black leads — Classification and dimensions*.

ISO 9958-2:1992, *Draughting media for technical drawings — Draughting film with polyester base — Part 2: Determination of properties*.

### 3 Definitions

For the purposes of this part of ISO 9958, the following definitions apply.

**3.1 draughting film:** A film for drawn and written information with either chemically or mechanically produced drawing surfaces on one or both sides.

**3.2 total thickness of the draughting film:** The thickness of the draughting film, measured in accordance with ISO 4593.

**3.3 base film; raw film:** Biaxially oriented film made of polyethylene terephthalate (a polymer of polyester type) without any coating(s).

**3.4 base film thickness:** The thickness of the base film, measured in accordance with ISO 4593.

**3.5 drawing layer:** A coating on the base film, mainly composed of binder substances containing pigments or fillers and bonded to the base film. The bonding may be produced by an adhesion layer.

**3.6 adhesion:** The state in which two surfaces are held together by chemical and/or physical forces.

**3.7 adhesion layer:** A layer on the surface of the base film that ensures adhesion between the base film and the drawing layer or anti-curling layer.

1) To be published. (Revision of ISO 4593:1979)

**3.8 anti-curling layer:** On a draughting film having one drawing surface (i.e. a single-sided draughting film), a coating bonded to the base film on the surface opposite the drawing surface which compensates the curling that may be caused by the drawing layer. The bonding may be produced by an adhesion layer.

**3.9 coating<sup>2)</sup>:** The process of covering a surface with one or more layers of coating slip or other materials in a fluid form.

**3.10 top layer:** The last layer coated on a basic material in order to obtain the required surface characteristics.

**3.11 visual density:** ISO standard diffuse visual transmission density used as a measure of the amount of light, in the visual region, absorbed by the material (method specified in ISO 5-2<sup>[1]</sup>).

**3.12 machine direction<sup>2)</sup>:** Feeding direction when manufacturing the draughting film.

**3.13 cross direction<sup>2)</sup>:** Direction perpendicular to the machine direction.

**4 Structure**

Various types of draughting film are shown in figure 1.

**5 Requirements**

**5.1 General**

Draughting film shall be free from defects which might affect its appearance or fitness for use.

**5.2 Thickness**

The base film thickness, rounded to the nearest 5 µm, shall be specified in the designation of the draughting film. This thickness shall be recorded in the designation box on the draughting film label (see 7.1).

The product information (see 7.2 and annex A) shall include the base film thickness, with tolerance, and the total thickness of the draughting film, with tolerance.

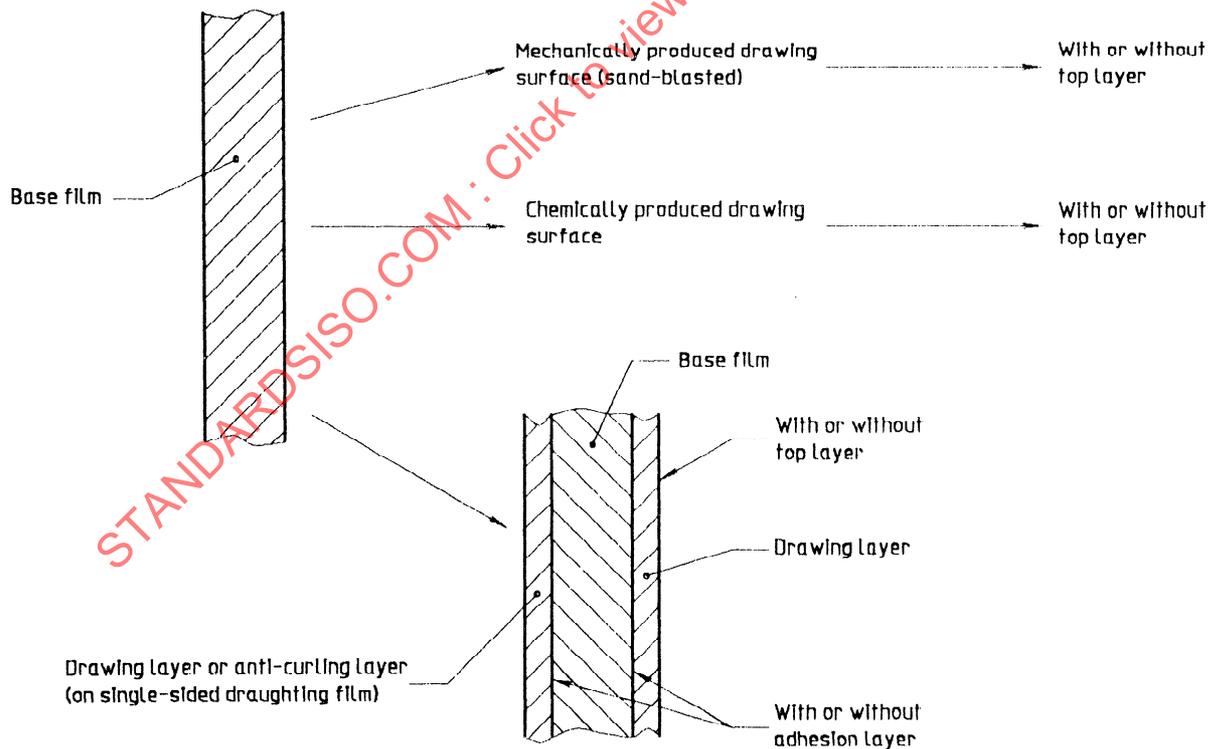


Figure 1 -- Various types of draughting film

2) See also ISO 4046<sup>[3]</sup>.

### 5.3 Dimensional stability, permanent dimensional change and stability of form

NOTE 1 The sizes of and tolerances for pre-cut draughting film sheets are given in ISO 216<sup>[2]</sup>.

#### 5.3.1 Dimensional stability

Changes in the dimensional properties of film depend not only on the film composition and method of manufacture but also on its thermal and moisture history.

##### 5.3.1.1 Thermal coefficient of expansion

The draughting film, tested in accordance with ISO 9958-2, shall have a thermal coefficient of expansion of no more than 30 ppm<sup>3)</sup> for each degree of change in temperature in the range 20 °C to 50 °C at  $(50 \pm 5)$  % relative humidity.

The thermal coefficient of expansion of the draughting film shall be reported in the product information (see 7.2 and annex A).

##### 5.3.1.2 Hygroscopic coefficient of expansion

The draughting film, tested in accordance with ISO 9958-2, shall have a hygroscopic coefficient of expansion of no more than 20 ppm<sup>3)</sup> for each per

cent change in relative humidity in the range 40 % to 80 % at  $23 \text{ °C} \pm 2 \text{ °C}$ .

The hygroscopic coefficient of expansion of the draughting film shall be reported in the product information (see 7.2 and annex A).

#### 5.3.2 Permanent dimensional change

The permanent dimensional change of the draughting film, tested in accordance with ISO 9958-2, shall not be more than 400 ppm<sup>3)</sup>.

The permanent dimensional change of the draughting film shall be reported in the product information (see 7.2 and annex A).

#### 5.3.3 Stability of form

##### 5.3.3.1 Curling

Pre-cut sheets of draughting film, tested in accordance with ISO 9958-2, shall not curl more than 5 mm (see figure 2).

##### 5.3.3.2 Bulging

Draughting film, tested in accordance with ISO 9958-2, shall not have round or elliptical bulges visible to the naked eye or transverse bulges longer than  $1/4$  of the width of the draughting film (see figure 3).

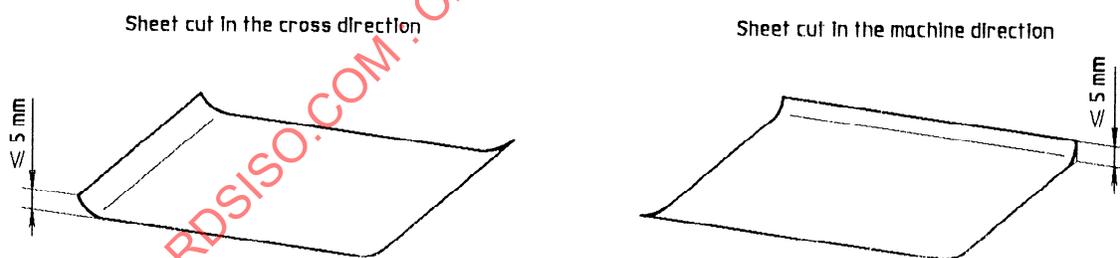


Figure 2 — Curling

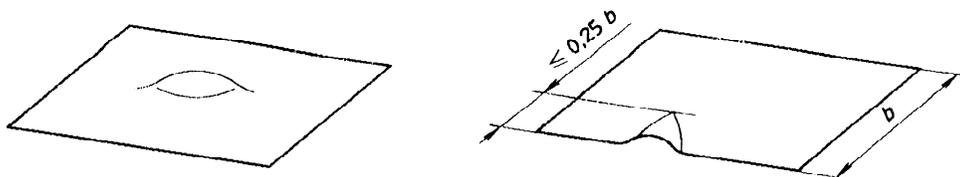


Figure 3 — Bulging

3) ppm = parts per million.

## 5.4 Adhesion

### 5.4.1 General

The draughting film shall not show any detachment of the drawing layer or anti-curling layer after testing in accordance with ISO 9958-2.

### 5.4.2 Adhesion after immersion in water

If draughting film tested as described in ISO 9958-2 fulfils the requirements of 5.4.1, this shall be noted on the draughting film label and in the product information (see 7.2 and annex A).

### 5.4.3 Adhesion after immersion in ammonia solution

If draughting film tested as described in ISO 9958-2 fulfils the requirements of 5.4.1, this shall be noted on the draughting film label and in the product information (see 7.2 and annex A).

## 5.5 Marking from metal objects

The surfaces of some polyester draughting films are made and manufactured in such a way that they can be used for draughting using metal pens. Therefore, in order to avoid metal marks from templates, which might appear in copies, it is recommended that templates with metal-free frames or templates recommended by the manufacturer be used.

If the draughting film is suitable for metal-pen draughting, this shall be noted on the draughting film label and in the product information (see 7.2 and annex A).

## 5.6 Fold marks

Draughting film treated as described in ISO 9958-2 shall not have fold marks visible to the naked eye on

- copies from a plain-paper copying machine, or
- copies from a diazo copying machine.

## 5.7 Surface resistance

If the draughting film is antistatically treated, this may be reported on the draughting film label, and in the product information (see 7.2 and annex A).

The surface resistance of the draughting film shall be determined in accordance with ISO 9958-2 if required.

Unused antistatically treated draughting film shall have a surface resistance of  $10^{12} \Omega$  or less when delivered to the user.

## 5.8 Visual density

### 5.8.1 General

The visual density is a measure of the light absorption of the specimen, expressed in logarithmic units:

$$D = 10 \log \frac{\phi_o}{\phi}$$

where

$\phi_o$  is the incident flux;

$\phi$  is the flux transmitted through the specimen.

In general, clear films have densities less than 0,1 and matted films have densities less than 0,2.

The visual density of the draughting film, determined in accordance with ISO 9958-2, may be reported in the product information (see 7.2 and annex A).

### 5.8.2 Visual density after heat ageing

The visual density shall not increase by more than 0,05 when the film is heat aged in accordance with ISO 9958-2.

## 5.9 Draughting quality

Draughting film complying with 5.9.1 and 5.9.2 may be reported as suitable for ceramic and polymer leads, respectively, on the draughting film label (see 7.1) and in the product information (see 7.2 and annex A).

Draughting film complying with 5.9.3 and 5.9.4 may be reported as suitable for drawing inks on the draughting film label (see 7.1) and in the product information (see 7.2 and annex A).

### 5.9.1 Draughting quality with mechanical pencils

At present there is no test method available but, generally speaking, the draughting film surface shall be such that ceramic leads (type C) and polymer leads (type P), of various hardnesses complying with ISO 9177-2, for mechanical pencils of push-type F, complying with ISO 9177-1, can be used to draw continuous lines.

### 5.9.2 Redraughting quality with mechanical pencils

Ceramic or polymer lead lines shall not be interrupted when drawn on draughting film where up to four corrections have been made in accordance with ISO 9958-2.

### 5.9.3 Draughting quality with tubular technical pens

The mean line width, determined in accordance with ISO 9958-2, shall be  $\pm 10\%$  of the nominal line width (i.e. the tolerance is approximately  $\pm 0,04$  mm).

### 5.9.4 Redraughting quality with tubular technical pens

The line width of ink lines in corrected areas, determined in accordance with ISO 9958-2, shall differ by no more than 10 % from the mean line width in uncorrected areas.

## 6 General recommendations

### 6.1 Ageing

At present there is no standardized test method for ageing draughting film, but it is recommended that the requirements specified in this part of ISO 9958, except those for surface resistance (5.7) and visual density (5.8), should still be met after 20 years' storage of the draughting film under the conditions specified in 6.2.

However, when a standardized test method for ageing is established, this subclause will be reviewed.

### 6.2 Storage and filing

General advice and specifications on storage and filing can be found in national regulations and directives, or in the manufacturer's or the retailer's directives.

Draughting film shall be stored flat, hanging or rolled. If rolled, the diameter of the roll shall be as specified in table 1.

Table 1 — Roll diameter

Base film thickness $T$ $\mu\text{m}$	Roll diameter $D$ mm
$T \leq 100$	75
$T > 100$	100

The temperature shall be between  $+15\text{ }^{\circ}\text{C}$  and  $+25\text{ }^{\circ}\text{C}$  with a maximum daily variation of  $2\text{ }^{\circ}\text{C}$ . The relative humidity shall be between 40 % and 60 % with a maximum daily variation of 5 %.

## 7 Identification

### 7.1 Draughting film label

On the outside of the draughting film packaging, the retailer shall affix a label comprising at least the information shown in figure 4.

For draughting film in rolls, the batch number shall figure on the bobbin (or tube) on which the draughting film is wound. The batch number shall always be clearly legible.

Pre-cut sheets of draughting film with or without printing may be marked with the batch number or some other identification in agreement with the customer or user. The batch number shall, however, always be logged by the draughting film retailer so that the manufacturing history of each piece of draughting film can be checked at a later date.

### 7.2 Product information

If required, the retailer or manufacturer may prepare product information (PI) for inclusion in the draughting film packaging. The product information may be presented in the form of a data sheet or any other appropriate data medium.

An example of the contents of the product information is given in annex A.

1		Drafting film complying with ISO 9958-1																							
2	Designation :	AAA 70	Year of manufacture :																						
3	Product information No. :	BBB PI 638-4	<table border="1"> <tr> <td></td> <td></td> <td>AS</td> <td>WR</td> <td>AR</td> <td>I</td> <td>P</td> <td>C</td> <td>MP</td> <td>T</td> <td>Pl0</td> </tr> <tr> <td></td> <td>X</td> <td>X</td> <td>X</td> <td></td> <td>X</td> <td>X</td> <td></td> <td>X</td> <td></td> <td>X</td> </tr> </table>			AS	WR	AR	I	P	C	MP	T	Pl0		X	X	X		X	X		X		X
		AS	WR	AR	I	P	C	MP	T	Pl0															
	X	X	X		X	X		X		X															
4	Batch No. :	724-4	5																						
			Dimensions :																						
			0,62m x 20m																						

Figure 4 — Example of a completed label

Key to figure 4

1 Drafting film complying with ISO 9958-1

ISO 9958-1 is the International Standard specifying requirements for drafting film.

2 Designation

This box shall contain the name of the film given by the drafting film retailer and the base film thickness (see 5.2). In this example, retailer BBB has designated the film AAA 70, where AAA is the name of the film and 70 is the base film thickness.

3 Product information number

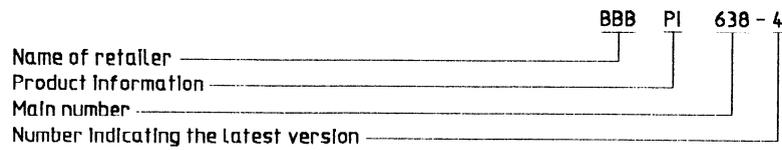
This refers to the product information with recommendations on the use of the drafting film.

	Matt on one side		Matt on both sides		Antistatic
	Water-resistant		Ammonia-resistant		Suitable for India Inks
	Suitable for polymer leads		Suitable for ceramic leads		Suitable for metal leads and pens
	Suitable for typewriting		Suitable for numerically controlled drafting machines (plotters)		

The product information number may comprise:

- the name of the retailer responsible for the drafting film;
- the letters PI (product information);
- a main number, specified by the manufacturer;
- a number indicating the latest version.

Example of a product information number:



#### 4 Batch number

The draughting film manufacturer's batch number, which may be used to obtain all the information about each batch of draughting film. The batch number shall be logged by the retailer

- for two years for samples;
- for three years for records.

#### 5 Dimensions

The dimensions of the draughting film. In this example it is a roll with a width of 0,62 m and a length of 20 m. The number of pre-cut sheets may be stated in this box.

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