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# International Standard



# 2113

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INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

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## Textile glass — Woven fabrics — Basis for specification

*Verre textile — Tissus — Base de spécification*

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Price based on 5 pages

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 2113 was developed by Technical Committee ISO/TC 61, *Plastics*, and was circulated to the member bodies in January 1979.

It has been approved by the member bodies of the following countries :

Australia	Hungary	South Africa, Rep. of
Austria	India	Spain
Belgium	Israel	Sweden
Brazil	Italy	Switzerland
Canada	Japan	Turkey
China	Korea, Rep. of	United Kingdom
Czechoslovakia	Libyan Arab Jamahiriya	USA
Finland	Netherlands	USSR
France	Poland	
Germany, F.R.	Romania	

No member body expressed disapproval of the document.

This second edition cancels and replaces the first edition (i.e. ISO 2113-1972).

# Textile glass — Woven fabrics — Basis for specification

## 1 Scope and field of application

This International Standard provides a basis for a specification applicable to glass fabrics woven from yarns (including folded yarns, multiple wound yarns and rovings) and used as reinforcements for plastics intended for mechanical and/or electrical applications.

This International Standard does not cover all requirements for some specialized applications. If such other requirements are necessary, they are given, or will be given, in other International Standards.

ISO 4605, *Textile glass — Woven fabrics — Determination of mass per unit area.*

ISO 4606, *Textile glass — Woven fabrics — Determination of tensile breaking force and breaking elongation by the strip method.*

ISO 5025, *Textile glass — Woven fabrics — Determination of width and length.*

ISO 6355, *Textile glass — Vocabulary.*

## 2 References

ISO 139, *Textiles — Standard atmospheres for conditioning and testing.*

ISO 291, *Plastics — Standard atmospheres for conditioning and testing.*

ISO 1886, *Textile glass — Method of sampling applicable to batches.*<sup>1)</sup>

ISO 1887, *Textile glass products — Determination of percentage of combustible matter.*

ISO 2078, *Textile glass yarns — Designation.*

ISO 2797, *Textile glass — Rovings — Basis for specification.*

ISO 3572, *Textiles — Weaves — Definitions of general terms and basic weaves.*

ISO 3598, *Textile glass yarns — Basis for a specification.*

ISO 4602, *Textile glass — Woven fabrics — Determination of number of yarns per unit length of warp and weft.*

ISO 4603, *Textile glass — Woven fabrics — Determination of thickness.*

ISO 4604, *Textile glass — Woven fabrics — Determination of conventional flexural stiffness — Fixed-angle flexometer method.*

## 3 Definitions

For the purpose of this International Standard, the following definitions apply.<sup>2)</sup>

**3.1 fabric, woven** (textile glass) : A textile glass fabric made by interlacing at least two sets of threads (single, folded, cabled yarns, rovings) perpendicular to each other, or at some other specified angle, such interlacing being formed during weaving on a loom or weaving machine.

**3.2 warp** : Yarns (single, folded, cabled yarns, rovings) lying in the lengthwise direction of the fabric.

**3.3 weft** : Yarns (single, folded, cabled yarns, rovings) running from selvedge to selvedge generally at right angles to the warp.

**3.4 weave** : Method of interlacing warp and weft.

**3.5 weave repeat** : The smallest number of warp and weft threads on which a weave interlacing can be represented.

**3.6 construction** : Type, weave repeat and number of yarns (single, folded, cabled yarns, rovings) per unit length in the warp and the weft directions.

1) At present at the stage of draft. (Revision of ISO 1886-1975.)

2) For definitions of other terms, see ISO 3572 and ISO 6355.

## 4 Types — Technological description of woven glass fabrics

The complete description of a woven glass fabric requires definition of the following points :

- a) the designation of the yarns in the warp direction;
- b) the designation of the yarns in the weft (fill) direction;
- c) the construction of the fabric :
  - 1) type of weave,
  - 2) weave repeat,
  - 3) number of yarns per 10 mm width of warp and weft (fill);
- d) the type of treatment.

As the full description is unwieldy, woven glass fabric manufacturers normally give a code number to their fabrics to simplify ordering and stocking. The full description of the woven fabric shall, however, be given in the manufacturer's catalogue against its code number.

Thus this technological description is not meant for use in the designation of glass fabrics, but is intended to be used as an aid in the preparation of standardized descriptions in glass fabric catalogues and to ensure the consistency of glass fabric identification.

NOTE — For the designation of textile glass yarns, see ISO 2078.

## 5 Characteristics

### 5.1 General

The woven glass fabrics shall be of uniform structure. Depending on their type or end-use, the supplier shall specify some or all of the characteristics listed under 5.2.

### 5.2 Characteristics to be specified

For relevant test methods, see clause 7.

#### 5.2.1 Construction characteristics

**5.2.1.1** The type of weaving yarns (single, folded, cabled yarns, rovings) shall be in accordance with ISO 2797 and/or ISO 3598.

**5.2.1.2** The construction of the glass fabric shall be specified by :

- a) the type of yarns used in the warp and weft directions;
- b) the linear density, in tex, of the warp and weft yarns;

c) the weave : the following main weaves are used (see the figure) :

- 1) plain,
- 2) twill,
- 3) crowfoot (4 shaft broken twill),
- 4) 5 harness satin,
- 5) 8 harness satin (etc.),
- 6) mock leno,
- 7) basket (matt),
- 8) leno;

d) the number of yarns in warp and weft, given for a 10 mm width but measured over 100 mm. The number of yarns shall lie within  $\pm 5\%$  of the nominal value.

**5.2.1.3** The nominal thickness shall be indicated in millimetres. The measured thickness shall lie within  $\pm 15\%$  of the nominal thickness.

**5.2.1.4** The width and length shall be subject to agreement between the supplier and the purchaser. The width shall be indicated in centimetres and the length in metres. The measured values shall lie within  $\pm 3\%$  of the nominal values for both width and length.

**5.2.1.5** A roll of material shall be assumed to be in one piece, unless otherwise stated.

#### 5.2.2 Physical characteristics

##### 5.2.2.1 Surface density

The surface density of glass fabric as received shall be indicated in grams per square metre. The measured value shall lie within  $\pm 10\%$  of the nominal value.

##### 5.2.2.2 Resin compatibility

Woven glass fabrics are initially produced with yarns either having a plastic size that is compatible with the resin to be reinforced, or with textile size. To improve compatibility with the resin, fabrics with textile size shall be desized or, if necessary, desized and finished.

#### 5.2.3 Mechanical characteristics

##### 5.2.3.1 Drape.

##### 5.2.3.2 Slipping resistance.

##### 5.2.3.3 Tensile strength, by the strip test method.

##### 5.2.3.4 Stiffness.

**5.2.4 Treatment characteristics**

**5.2.4.1 Type of treatment :**

- a) textile size;
- b) plastic size;
- c) desized;
- d) coupling finish;
- e) any other treatment.

**5.2.4.2 Amount of size and finish.**

**5.2.4.3 Uniformity of size and finish.**

**5.2.5 Defects — Definitions**

**5.2.5.1 Warp defects**

- 1) ends out : A gap caused by a missing warp yarn.
- 2) misreed (wrong denting) : A place in the fabric where one or more ends (warp yarns) are not properly placed in the reeds.
- 3) tight end : A single end woven under excessive tension.
- 4) slack end (warp yarn) : An end woven under insufficient tension.
- 5) slack selvage : Self-descriptive.
- 6) tight selvage : Self-descriptive.

**5.2.5.2 Weft defects**

- 1) broken pick : A pick missing from a portion of width.
- 2) weft with differing tex numbers : Self-descriptive.
- 3) heavy mark : A band or bar running in the weft direction across the full width of the fabric or a portion of it, containing picks of larger linear density than normally used in the fabric or containing more than the normal number of picks.
- 4) light mark : Opposite of heavy mark.
- 5) jerked-in (or lashed-in weft or trailer) : An extra thread dragged into the shot with the regular pick and extending only a part of the way across the fabric.
- 6) loopedge : An improperly woven selvage of excessive thickness or a selvage containing irregular weft loops extending beyond the outer edge of the selvage.
- 7) slack picks : One or more weft yarns woven under insufficient tension.

8) tight picks : One or more picks woven under abnormally high tension, producing a fabric condition appearing as a wavy ruffled surface.

**5.2.5.3 Defects of either warp or weft**

- 1) coarse end or pick; fine end or pick : Warp or weft yarns larger or smaller in linear density than normally used in the fabric.
- 2) centre loops : A place in the fabric where a short length of either warp or weft yarns has spontaneously doubled back on itself.
- 3) float : A place in the fabric where a warp or weft yarn extends unbound over or under the ends with which it should be interlaced.

**5.2.5.4 Finish defects**

uneven finish : Self-descriptive.

**5.2.5.5 Other defects**

- 1) dirt : Self-descriptive.
- 2) folds : Self-descriptive.
- 3) grease : Self-descriptive.
- 4) holes : Self-descriptive.
- 5) faulty splices : Self-descriptive.
- 6) clumps of short fibres (slubs) or short pieces of yarns caught in the weave : Self-descriptive.
- 7) baggy cloth : A cloth that does not lie flat, due to sections of tight or loose yarns either in warp or weft.
- 8) smash : A relatively large hole in the cloth characterized by many broken warp ends and floating picks.
- 9) curled selvage : Self-descriptive.
- 10) cut-selvage : Self-descriptive.
- 11) width exceeding tolerance : Self-descriptive.

**6 Sampling**

**6.1 Selection of samples**

Each delivery of a given type of fabric shall be sampled according to ISO 1886. The whole length of the sample roll shall be examined for defects and all other tests shall be applied to sections taken from the length of the fabric. The sections shall be taken at least 5 m from the roll ends and at least 50 mm from the edges of the fabric.

The number of test specimens taken shall be as specified for each test method.

## 6.2 Conditioning of samples

Specimens shall be kept for at least 6 h in one of the atmospheres specified in ISO 291 and ISO 139 (generally  $23 \pm 2$  °C,  $50 \pm 5$  % relative humidity), unless a different conditioning atmosphere is specified.

## 7 Test methods

### 7.1 Surface density

The method specified in ISO 4605 shall be used to determine the ratio of the mass of a test specimen of specified dimensions to its surface area. This mass shall include that of the textile glass yarns and that of the size and/or finish.

The result shall be expressed in grams per square metre.

### 7.2 Thickness

The method specified in ISO 4603 shall be used to measure the thickness, i.e. the perpendicular distance between the surfaces of the fabric measured at a specified pressure.

The result shall be expressed in millimetres, to the nearest 0,01 mm.

### 7.3 Width and length

The method specified in ISO 5025 shall be used to measure

- a) width, i.e. the distance measured perpendicularly to the warp yarns between the outside edges of the outermost warp yarns.

NOTE — The overall width, i.e. including the fringes, may also be measured, subject to agreement between the supplier and the purchaser.

The result shall be expressed in centimetres, to the nearest 0,1 cm.

- b) length, measured after unwinding the fabric.

The result shall be expressed in metres, generally to the nearest 0,1 m.

### 7.4 Number of yarns per unit length of warp and weft

The method specified in ISO 4602 shall be used to determine the number of yarns per unit length of warp and weft.

The results shall be expressed to one decimal place.

### 7.5 Tensile strength and elongation at break

The strip method specified in ISO 4606 shall be used to determine the tensile strength and elongation at break in the warp and weft directions.

The results shall be expressed in newtons to the nearest 1 % for forces, and as a percentage to two decimal places for elongations.

### 7.6 Stiffness

The fixed-angle flexometer method, specified in ISO 4604, shall be used to determine the stiffness in the warp and weft directions.

The results shall be expressed in millinewtons.

### 7.7 Amount of size and finish

The method specified in ISO 1887 shall be used to determine the amount of size and finish.

The results shall be expressed as a percentage by mass of the dried fabric, to the nearest 0,01 %.

### 7.8 Other tests

Methods of test for the following characteristics will form the subjects of future International Standards :

- uniformity of size and finish;
- slipping resistance of yarns in a fabric;

## 8 Packaging, packing and ordering

### 8.1 Packaging and packing

Packaging and packing recommendations shall be given here.

### 8.2 Ordering data

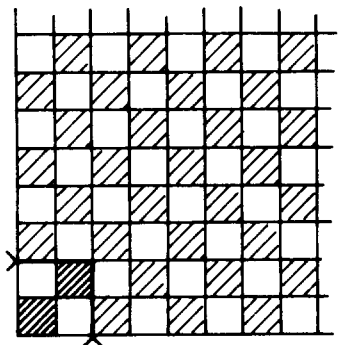
- a) title, number and date of this International Standard;
- b) quantity desired;
- c) type of fabric required;
- d) width required;
- e) roll length.

The manufacturer shall supply, at the purchaser's request, a certificate of conformity with this International Standard.

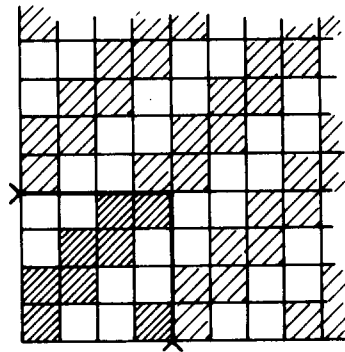
## 9 Storage

The care required to ensure stability of the quality of glass fabric during storage shall be precisely described in the specification, including the following information :

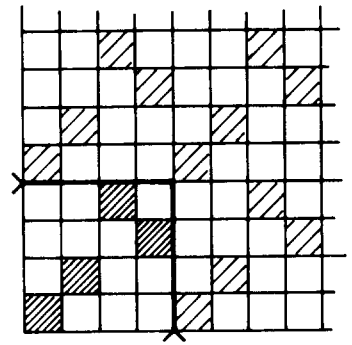
- conditioning (temperature, humidity, sunlight exposure);
- packing;
- arrangement (stacking) of rolls.



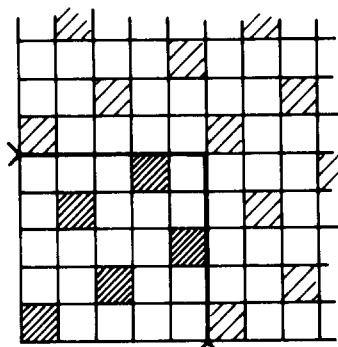
1) Plain



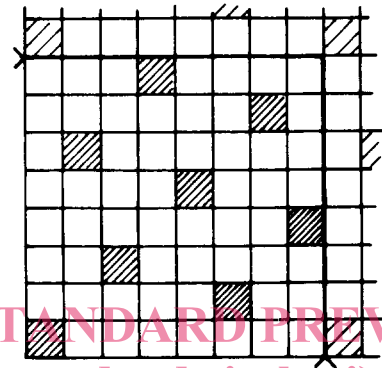
2) Twill 2/2 (example of twill)



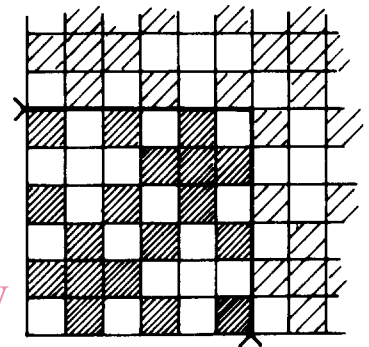
3) Crowfoot (4 shaft broken twill)



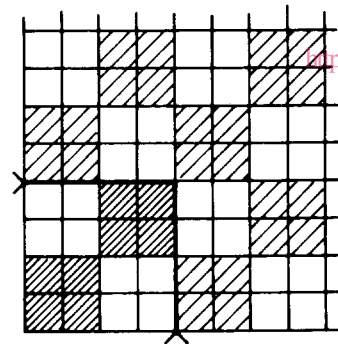
4) 5 harness satin



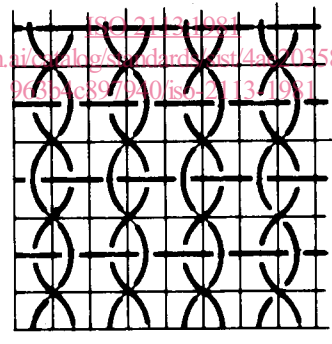
5) 8 harness satin



6) Mock leno



7) Basket (matt) 2 x 2  
(example of basket)



8) Leno

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Figure — Examples of types of weave

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