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Reinforcement fibres — Woven fabrics — Basis for a specification

Renforts — Tissus — Base de spécification

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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 2113 was prepared by Technical Committee ISO/TC 61, *Plastics,* Subcommittee SC 13, *Composites and reinforcement fibres.*

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Introduction

A basis for a specification is intended to give guidance on the establishment of technical specifications for products of a given type. It should enumerate as completely as possible the points that should be considered at the time of drafting the specifications.

The basis for a specification, therefore, does not in itself constitute a specification, but rather a model plan for the elaboration of specifications applying to a particular product, or to a family of products whose characteristics are closely related. These specifications may be established by a producer, supplier or user, or by a standardization organization.

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Reinforcement fibres — Woven fabrics — Basis for a specification

1 Scope

This International Standard provides a basis for a specification applicable to fabrics woven from yarns (including single yarns, multiple-wound yarns, plied yarns, cabled yarns and rovings) made from textile glass, carbon or aramid and generally used for plastics reinforcements.

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.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard 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 139:1973, *Textiles — Standard atmospheres for conditioning and testing.*

ISO 291:—[1], *Plastics — Standard atmospheres for conditioning and testing.*

ISO 1886:1990, *Reinforcement fibres — Sampling plans applicable to received batches.*

ISO 1887:1995, *Textile glass — Determination of combustible-matter content.*

ISO 2078:1993, *Textile glass — Yarns — Designation.*

ISO 2797:1986, *Textile glass — Rovings — Basis for a specification.*

ISO 3572:1976, *Textiles — Weaves — Definitions of general terms and basic weaves.*

ISO 3598:1986, *Textile glass — Yarns — Basis for a specification.*

ISO 4602:—[2], *Reinforcements — Woven fabrics — Determination of number of yarns per unit length of warp and weft.*

ISO 4603:1993, *Textile glass — Woven fabrics — Determination of thickness.*

ISO 4604:1978, *Textile glass — Woven fabrics — Determination of conventional flexural stiffness — Fixed angle flexometer method.*

ISO 4605:1978, *Textile glass — Woven fabrics — Determination of mass per unit area.*

ISO 4606:1995, *Textile glass — Woven fabric — Determination of tensile breaking force and elongation at break by the strip method.*

ISO 5025:1978, *Textile glass — Woven fabric — Determination of width and length.*

ISO 10548:1994, *Carbon fibre — Determination of size content.*

1) To be published. (Revision of ISO 291:1977)

2) To be published. (Revision of ISO 4602:1978)

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 woven fabric: A reinforcement-fibre fabric made by interlacing at least two sets of threads perpendicularly to each other, or at some other specified angle, such interlacing being carried out by during weaving on a loom or weaving machine.

3.2 warp: Yarns lying in the lengthwise direction of the fabric (0° direction).

3.3 weft: Yarns running from selvedge to selvedge, generally at right angles to the warp (90° direction).

3.4 type of weave: Designation of the method of interlacing warp and weft to give a regular, repeating pattern of weaving, e.g. plain, satin, twill, etc.

3.5 construction: The number of yarns per centimetre length in the warp and weft directions.

3.6 tracer yarn: A yarn of different colour and/or different composition from the reinforcement yarns, which is included in the fabric for product identification or to aid fabric alignment during moulding.

4 Types — Technical description of woven reinforcement fabrics

The technical description of a woven reinforcement 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 direction;

c) the construction of the fabric:

   1) type of weave,

   2) weave ratio,

   3) number of yarns per centimetre in warp and weft;

d) the type of treatment and/or size content, if applicable;

e) the mass per unit area.

As the full description is unwieldy, woven reinforcement 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.

Though this technical description is not necessary for the designation of fabrics, it may be used as a guide to the establishment of descriptions in the reinforcement fabric catalogues, so ensuring a strong basis for identification of fabrics.

For the designation of textile yarns, see ISO 2078.

NOTE 1 The designation of carbon fibres will be covered in a future International Standard, ISO 13002, *Carbon fibres — Designation.*

5 Sampling and number of test specimens

Each delivery of a given type of fabric shall be sampled in accordance with ISO 1886.

For the verification of visual properties, each roll selected as part of the sample shall be examined along its whole length except where otherwise specified.

For the physical properties, take, from each roll selected, a laboratory sample, after removal of at least the outside layer of the roll. The specification may stipulate that more than one laboratory sample has to be taken from each roll.

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

6 Conditioning

The specification shall supply the information required for the proper conditioning of the elementary units (rolls of fabric). In the absence of specific instructions for the fabric under consideration, it shall include a reference to ISO 139 or ISO 291.

When required, specific conditioning instructions for the laboratory samples or test specimens shall be as given in each test method.

7 Characteristics and test methods

7.1 General

Woven reinforcement fabrics shall be of uniform structure. Depending on the type and end use, the supplier shall specify some or all of the characteristics listed in 7.2.

For each parameter specified, reference shall be made to the product specification for the specified value(s) and the allowable tolerances on such value(s).

The yarn used shall be in accordance with ISO 2797 and/or ISO 3598.

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

7.2 Characteristics to be specified

7.2.1 Construction characteristics

The construction of the reinforcement fabric shall be specified by

a) the type of yarn used in the warp and weft directions;

b) the linear density, in tex, of the warp and weft yarns;

c) the type of weave: the main types of weave are illustrated in figure 1;

d) the number of yarns in the warp and the weft per centimetre width, determined in accordance with ISO 4602, expressing the results to one decimal place.

7.2.2 Physical characteristics of fabric

7.2.2.1 Mass per unit area

The mass per unit area of the fabric as received shall be determined in accordance with ISO 4605 and indicated in grams per square metre. The measured value shall lie within ± 5 % of the specified value, unless stated otherwise in the product specification (see 7.1).

7.2.2.2 Width and length

The width and length shall be subject to agreement between the interested parties. The width shall be indicated in centimetres and the length in metres.

The method specified in ISO 5025 shall be used to measure

a) the width;

b) the length, measured during manufacture or by unrolling the fabric.

NOTE 2 The overall width, i.e. including the fringes, may also be measured, subject to agreement between the interested parties.

7.2.2.3 Thickness

The thickness shall be determined in accordance with ISO 4603 and expressed in millimetres. The measured thickness shall lie within ± 15 % of the specified thickness value, unless stated otherwise in the product specification (see 7.1).

7.2.3 Surface treatment

Fabrics may be produced with different types of surface treatment depending on the type of yarn and the resin compatibility required. The following properties shall be specified to ensure the resin compatibility:

7.2.3.1 Type of surface treatment of fibre

a) textile size;

b) plastic size;

c) cleaned and finished;

d) oxidized;

e) Corona-treated;

f) any other treatment.

7.2.3.2 Amount of size and/or finish

The amount of size and finish on the fabric shall be determined in accordance with

ISO 1887 for glass-fibre fabrics;

ISO 10548 for carbon-fibre fabrics.

For fabrics manufactured from other reinforcement yarns or mixed fibres, the specification shall provide suitable instructions. The results shall be expressed as a percentage by mass of the dried fabric, to the nearest ± 0,1 %.

7.2.4 Tracer yarn

If the fabric contains a tracer yarn, the following shall be identified:

a) the type;

b) the linear density;

c) the warp spacing;

d) the weft spacing.

7.2.5 Mechanical characteristics

7.2.5.1 Tensile strength and elongation at break

The tensile strength and elongation at break of the reinforcement fabric shall be determined in accord-

ance with ISO 4606 in both the warp and the weft directions. The results shall be expressed in newtons to the nearest 1 % for the tensile strength and as a percentage to two decimal places for the elongation.

7.2.5.2 Stiffness

The stiffness of the reinforcement fabric shall be determined in accordance with the fixed-angle flexometer method specified in ISO 4604 The stiffness shall be determined in both the warp and the weft directions. The results shall be expressed in millinewton metres.

7.3 Defects

Any or all of the following defects may be excluded by agreement between the interested parties.

7.3.1 Warp defects

a) Ends out: a gap caused by a missing warp yarn.

b) Misreed (wrong denting): a place in the fabric where one or more ends are not properly placed in the reeds.

c) Tight end: a single end woven under excessive tension.

d) Slack end: an end woven under insufficient tension.

e) Slack selvedge.

f) Tight selvedge.

g) Fuzzy ends/fuzz balls.

h) Streaks: short lengths of yarn of different colour.

7.3.2 Weft defects

a) Broken pick: a pick missing across part of the width.

b) Weft with differing tex values.

c) Heavy mark: a band or bar running in the weft direction across the full width of the fabric or part of it and containing picks of larger linear density than normally used in the fabric or containing more than the normal number of picks.

d) Light mark: opposite of heavy mark.

e) 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.

f) Loopedge: an improperly woven selvedge of excessive thickness or a selvedge containing irregular weft loops extending beyond the outer edge of the selvedge.

g) Slack picks: one or more yarns woven under insufficient tension.

h) Tight picks: one or more picks woven under abnormally high tension, producing a fabric condition appearing as a wavy ruffled surface.

i) Burst filling: the yarn is texturized (usually a fault in air-jet looms, mainly due to excessive air pressure).

7.3.3 Defects of either warp or weft

a) Coarse end or pick; fine end or pick: warp or weft yarns of larger or smaller linear density than that normally used in the fabric.

b) Centre loops: a place in the fabric where a short length of either warp or weft yarns has spontaneously doubled back on itself.

c) 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.

7.3.4 Surface-treatment defects

Uneven treatment.

7.3.5 Other defects

a) Dirt.

b) Folds.

c) Grease.

d) Holes.

e) Faulty splices.

f) Clumps of short fibres (slubs) or short pieces of yarn caught in the weave.

g) Baggy cloth: a cloth that does not lie flat, due to sections of tight or loose yarns either in the warp or in the weft.

h) Smash: a relatively large hole in the cloth, characterized by many broken warp ends and floating picks.

i) Curled selvedge.

j) Cut selvedge.

k) Width exceeding tolerance.

l) Binder flashes: an effect caused by poor or uneven heat-cleaning.

8 Packaging, packing and ordering

8.1 Packaging and packing

Packaging and packing recommendations shall be given in the specification.

8.2 Information for ordering

a) title, number and date of the applicable specification (based in this International Standard);

b) quantity of fabric;

c) type of fabric;

d) width;

e) roll length.

If required by the purchaser, the manufacturer shall supply a certificate of conformity with the product specification, written on the basis of this International Standard.

9 Storage

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

— conditioning (temperature, humidity, exposure to sunlight);

— packing;

— arrangement (stacking) of rolls.