INTERNATIONAL STANDARD

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Reinforcements — Woven fabrics — Determination of number of yarns per unit length of warp and weft

Renforts — Tissus — Détermination du compte de fils de chaîne et de duites par unité de longueur

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Foreword

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The main task of technical committees is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 4602 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 13, *Composites and reinforcement fibres*.

This third edition cancels and replaces the second edition (ISO 4602:1997), which has been revised principally to include an alternative method (method A) in addition to the original method (now method B). For details, see Clause 2.

Reinforcements — Woven fabrics — Determination of number of yarns per unit length of warp and weft

1 Scope

This International Standard specifies two methods of determining the number of yarns per unit length of warp and weft of woven textile-reinforcement fabrics made of glass, carbon, aramid or any other (textile-diameter) reinforcement fibre.

2 Principle

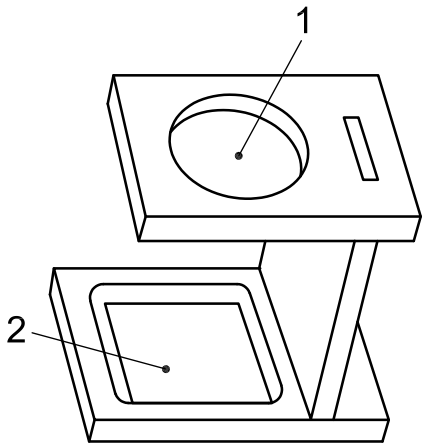
The numbers of yarns in the warp and in the weft are counted over a given distance using a suitable yarn-counting device. Two methods, A and B, are specified. In method A, a given number of yarns is counted and the distance between the first and the last measured. In method B, the distance over which the yarns are to be counted is fixed and the yarns lying within this distance counted. The method used is normally chosen by agreement between the interested parties or specified by the materials specification.

3 Apparatus

3.1 Rule, graduated in millimetres.

3.2 Yarn-counting device: any suitable magnifying device ranging from a counting glass (see Figure 1) to a traversing microscope.

3.3 Suitable needle, if required, for separating the yarns.



Key

1 lens (several magnifications available, usually from ×7 to ×10)

2 window (several sizes available, usually from 10 mm to 30 mm)

Figure 1 — Example of a counting glass

4 Test area

Measurements shall be made on areas free from creases or deformation.

5 Procedure

5.1 Method A — Measurement of a fixed number of yarns

5.1.1 Determine the number of yarns to be counted so that the distance covering the yarns will be between 10 mm and 200 mm.

The number should preferably be 50 or more. If, however, the distance covering 50 yarns is more than 200 mm, the number may be decreased, down to a minimum of 20.

5.1.2 Lay the fabric smoothly and without tension on a horizontal surface.

5.1.3 Do not make measurements closer than 50 mm to the edges or selvedges of the fabric.

5.1.4 Place the graduated rule (3.1) or yarn-counting device (3.2) on the fabric so that the zero (or any other suitable reference point) is coincident with the right-hand edge of a warp yarn.

Count the number of yarns determined in 5.1.1. If necessary, use the needle (3.3) to separate the yarns which have been counted from the yarns which have still to be counted.

Measure the exact distance from the initial reference point to the right-hand edge of the last yarn to be counted. The measurement resolution of this distance shall be 0,5 mm or better.

5.1.5 Consider this as one measurement. Move the graduated rule or yarn-counting device to another position chosen so that none of the yarns in the previous measurement is included and, still counting in the same direction, repeat the above procedure at least three times to give a total of at least four measurements.

For narrow fabric that is not wide enough for four measurements to be made in accordance with the requirements concerning the edges of the fabric (see 5.1.3) and the non-inclusion of yarns which have already been counted (see first paragraph in this subclause), the number of measurements may, by agreement between the interested parties, be reduced to three or two.

5.1.6 Repeat the same procedure for the weft yarns.

5.2 Method B — Measurement over a fixed distance

5.2.1 Determine the distance over which the measurements are to be made, taking care that the distance chosen will enable at least 20 yarns to be counted and that the distance is not less than 10 mm and not more than 200 mm.

5.2.2 Lay the fabric smoothly and without tension on a horizontal surface.

5.2.3 Do not make measurements closer than 50 mm to the edges or selvedges of the fabric.

5.2.4 Place the graduated rule (3.1) or yarn-counting device (3.2) on the fabric so that the zero (or any other suitable reference point) is coincident with the right-hand edge of a warp yarn.

Count, to the nearest tenth of a yarn, the number of yarns or part yarns lying within the distance determined in 5.2.1. If necessary, use the needle (3.3) to separate the yarns which have been counted from the yarns which have still to be counted.

5.2.5 Consider this as one measurement. Move the graduated rule or yarn-counting device to another position chosen so that none of the yarns in the previous measurement is included and, still counting in the same direction, repeat the above procedure at least three times to give a total of at least four measurements.

For narrow fabric that is not wide enough for four measurements to be made in accordance with the requirements concerning the edges of the fabric (see 5.2.3) and the non-inclusion of yarns which have already been counted (see first paragraph in this subclause), the number of measurements may, by agreement between the interested parties, be reduced to three or two.

5.2.6 Repeat the same procedure for the weft yarns.

6 Expression of results

6.1 Calculate, for each of the measurements made, the number of warp or weft yarns, N, in a given distance, l (10 mm or 25 mm), using the equation

$$N = \frac{n \times l}{a}$$

where

n is the number of yarns counted;

a is the distance, in millimetres, over which the yarns were counted.

The distance l (10 mm or 25 mm) is referred to as the “unit length”.

6.2 Calculate the average number of warp yarns and the average number of weft yarns per unit length as the arithmetic mean of the measurements made.

6.3 Report the average number of warp and weft yarns per unit length to three significant figures.

7 Precision

The precision of this method is not known because interlaboratory data are not available. When interlaboratory data are obtained, a precision statement will be added at the following revision of this International Standard.

8 Test report

The test report shall include the following particulars:

a) a reference to this International Standard (i.e. ISO 4602:2010) and the method used (method A or method B);

b) all details necessary for complete identification of the fabric measured;

c) the size of the window of the counting glass used (if applicable);

d) the number of yarns counted in making each measurement (method A) or the distance over which the yarns were counted (method B);

e) the individual values and the average values of the number of warp yarns per unit length and the number of weft yarns per unit length;

f) details of any operations not specified in this International Standard, as well as details of any incidents which might have affected the results;

g) the date of the test.

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