International Standard 4167

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

Polyolefin agricultural twines

Ficelles agricoles en polyoléfine

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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 4167 was developed by Technical Committee ISO/TC 38, *Textiles*, and was circulated to the member bodies in April 1978.

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

Belgium
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The member bodies of the following countries expressed disapproval of the document on technical grounds :

Australia
Italy
USA

Printed in Switzerland

Polyolefin agricultural twines

1 Scope and field of application

This International Standard establishes the principal properties of polyolefin[1] agricultural twines, prescribes methods of test permitting their verification and specifies the form of commercial presentation for the twines.

NOTE — This International Standard deals only with Z-twist twine since development work was concerned with this product only. It will eventually be extended to cover untwisted and S-twist twine when the appropriate work has been carried out.

2 References

ISO 2, *Textiles — Designation of the direction of twist in yarns and related products.*

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

ISO 2076, *Man-made fibres — Generic names.*

ISO 3534, *Statistics — Vocabulary and symbols.*

3 Definition

agricultural twine : A simple yarn intended to be used in agriculture, notably for binding the bundles on automatic pick-up balers or on similar machines.

4 Designation

A twine conforming to this International Standard is designated by the term "agricultural twine", followed by the name of the material used, its code number and the number of this International Standard.

Example of designation : a polypropylene agricultural twine having a runnage of 330 m/kg is designated as follows :

"Polypropylene agricultural twine No. 330/ISO 4167."

5 Raw material

The raw material used for the manufacture of twine shall consist of high-quality polyolefin.

Adequate stabilization against degradation by sunlight shall be incorporated. Any ultra-violet (U.V.) inhibitor system may be used, such as pigmentation by carbon black, iron(III) oxide or other suitable colouring medium or special U.V. inhibitors consisting of, for example, selected nickel salts.

Attention is drawn to the fact that in some areas of the world a more stringent level of stabilization may be necessary than in others.

The colour of the twine shall be distinguishable from straw or grass.

6 Manufacture

Each spool of twine shall be capable of working with continuity throughout its length.

The twine shall have a Z twist (twist direction as defined in ISO 2).

1) The term "polyolefin" implies principally polypropylene and high-density polyethylene.

7 Technical properties

The technical properties of the twines and the methods to be used for measuring them are indicated in the table.

When the indicated values are neither maxima nor minima, the permitted tolerances are indicated in the table.

8 Sampling

8.1 Vocabulary

For the purposes of this International Standard the following terms, defined in ISO 3534, are used :

8.1.1 batch : A definite quantity of twine produced under conditions which are presumed uniform.

8.1.2 laboratory sample : The total selection of samples from a batch intended for testing in the laboratory.

8.1.3 specimen : A quantity of twine on which a test conforming to the requirements of this International Standard is carried out.

8.2 Number of spools in a laboratory sample

Each 50 t or part thereof in a consignment of twine of the same code number shall represent for testing a batch to which the following sampling formula applies :

$$S = 0{,}25\sqrt{N}$$

where

S is the number of spools sampled (when S as calculated is not a whole number, the value obtained shall be rounded off to give a whole number);

N is the number of spools in a batch of 50 t or less.

8.3 Selection of sample

For each batch, the laboratory sample shall be made up as follows :

Select at random the required number of spools, each one taken from the different bales of the batch.

Table — Technical properties of polyolefin agricultural twines

Relevant property		Designation of the twine* (code number) No. 330 Values for property	Method of test
Linear density	tex	3 030 $^{+\ 259}_{-\ 221}$	See 9.2
Runnage	m/kg	330 ± 26	
Minimum twine breaking force	daN**	98	See 9.3
Minimum average knot breaking force	daN**	57	See 9.4

* The recommended runnage of twine is 330 m/kg, but any country which, for internal reasons, would have to include other twines in its national standard must record in its standard that these twines are not included in the International Standard. In order to make sure that these twines have the same quality level as that of the present standard twine, their specifications shall be calculated, as far as the minimum twine breaking force requirement is concerned, by means of the formula

$$R = \frac{32\,340}{n}$$

where

R is the minimum twine breaking force, in decanewtons;

n is the specified runnage of twine, in metres per kilogram;

and, as far as the minimum average knot breaking force requirement is concerned, by means of the formula

$$R' = 0{,}58\,R$$

where R' is the minimum average knot breaking force, in decanewtons.

** The SI unit of force is the newton. A force of 1 decanewton (daN) corresponds to that exerted by a mass of 1,02 kg.

9 Methods of test

9.1 Conditioning

The tests shall be carried out in ambient atmosphere, provided that the twine has been kept in conditions which do not damage its original properties.

In cases of dispute, the specimens shall be conditioned for 24 h in the standard temperate atmosphere for testing specified in ISO 139 [temperature 20 ± 2 °C, relative humidity (65 ± 2)%], before continuing with the tests.

NOTE — The standard tropical atmosphere for testing specified in ISO 139 is 27 ± 2 °C (65 ± 2)% relative humidity.

9.2 Determination of linear density and runnage

9.2.1 Principle

Weighing, under given conditions, specimens of specified length, then calculating of the linear density and the runnage (or length, in metres, per kilogram).

9.2.2 Apparatus

9.2.2.1 Balance, accurate to 0,5 g.

9.2.2.2 Wrap-reel, of known perimeter.

9.2.3 Specimens

Select 30 m of twine from each spool, proceeding in the following manner :

— draw directly from the centre of each spool, in an anti-clockwise direction, the first 10 m of twine and discard them;

— then draw 30 m of twine and wind as adjacent turns (without overlapping) on the wrap-reel, excercising just sufficient tension on the twine to maintain straightness.

Each length of 30 m thus obtained constitutes a specimen.

9.2.4 Procedure

Weigh each specimen to the nearest 0,5 g (let m_1 be the mass obtained, in grams).

9.2.5 Expression of results

9.2.5.1 Calculation of linear density

For each specimen, calculate the linear density **Tt**, in tex, using the formula

$$\mathbf{Tt} = \frac{1\,000\ m_1}{30}$$

where m_1 is the mass, in grams, of the specimen.

9.2.5.2 Calculation of runnage

Calculate the runnage, l, in metres per kilogram of twine, using the formula

$$l = \frac{10^6}{\mathbf{Tt}}$$

where **Tt** is the linear density, in tex.

9.2.5.3 Check test

If any specimen is outside the tolerance, a check test shall be carried out on another spool.

If the result of the check test is found to be within the limits of the permitted tolerances (see the table in clause 7), it is the result of the check test which is adopted for the value of the linear density.

9.3 Determination of twine breaking force

9.3.1 Principle

Measurement of the force (expressed in decanewtons) necessary to break, under prescribed conditions, a specimen of specified length.

9.3.2 Apparatus

Tensile testing machine, having a constant rate of traverse, with a mobile grip. This testing machine should comprise :

9.3.2.1 Two devices for gripping and guiding the ends of the test piece (for example : bollards), in order to achieve an indirect pull on the test piece.

9.3.2.2 A device for maintaining the rate of traverse constant.

9.3.2.3 A device for indicating or continuously recording the force applied.

9.3.3 Specimens

After determining the runnage, draw directly from the centre of each spool in an anti-clockwise direction, and without cutting the twine, ten specimens spaced 5 m from each other and of sufficient length so that once they are mounted in the testing machine, the free length of the specimen between the gripping devices (9.3.2.1) is a minimum of 250 mm.

Each specimen shall be identified by reference to the spool from which it has been drawn.

9.3.4 Procedure

9.3.4.1 Before mounting the test piece between the grips (9.3.2.1), check that the axes of the latter are a minimum of 250 mm apart.

9.3.4.2 Check that the speed of movement of the moving grip of the machine is constant and numerically equal, in millimetres per minute, within ± 10 %, to the length, in millimetres, of the specimen between the grips.

9.3.4.3 Mount the specimen in the machine so that it coincides with the axis of pull, taking care to avoid loss of twist other than that inevitably lost in drawing out the twine from the spool.

9.3.4.4 Start the machine and apply the force continuously until the specimen breaks. If a specimen breaks in the grips, or as a result of damage caused by them, remove it and start the test again with a new specimen.

9.3.5 Expression of results

For the twine breaking force test, take into consideration only the results obtained when the break occurs clear of the grips of the testing machine.

If any one of the ten specimens from a sample spool fails to reach the minimum twine breaking force specified in the table in clause 7 or that applicable to the size of the twine being tested, reject the result and sample another spool of twine in its place.

This retest procedure is applicable to all sample spools representing a batch.

Should any test result from the retest sample spool or spools fail to reach the minimum twine breaking force requirement, the batch represented by the sample spools shall be deemed not to comply with this International Standard.

9.4 Determination of knot breaking force

9.4.1 Principle

Measurement of the force (expressed in decanewtons) necessary to break, under prescribed conditions, a specimen containing a thumb knot tied as shown in the figure.

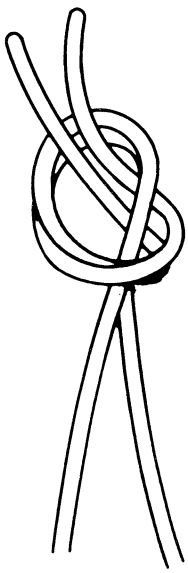
9.4.2 Apparatus

See 9.3.2.

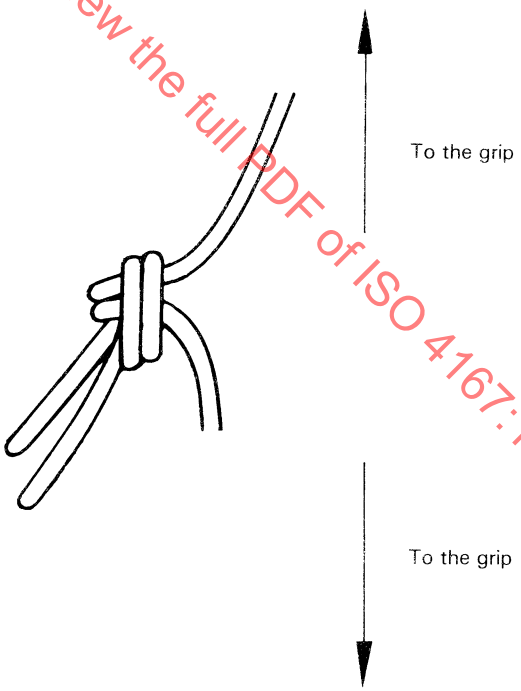
9.4.3 Specimens

After determining the twine breaking force, draw directly from the centre of each spool, in an anti-clockwise direction, ten specimens spaced 5 m from each other and of sufficient length so that once they contain a thumb knot and are mounted in the testing machine, the free length of the specimen between the gripping devices is a minimum of 250 mm.

Each specimen shall be identified by reference to the spool from which it has been drawn.



a) Knot loosely tied



The ends diverge at 180° to the grips, as shown. The twine is loaded to rupture in this manner.

b) Knot drawn tight

Figure — Tying of thumb knot