INTERNATIONAL STANDARD

ISO 4167

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Polyolefin agricultural twines

Ficelles agricoles en polyoléfines

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

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 4167 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 248, *Textiles and textile products*, in collaboration with Technical Committee ISO/TC 38, *Textiles*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 4167:1979), of which it constitutes a technical revision.

Polyolefin agricultural twines

1 Scope

This International Standard specifies the principal properties of polyolefin agricultural twines, the test methods which permit their verification, and the form of delivery for the twines.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
agricultural twine
simple yarn intended to be used in agriculture, notably for binding the bundles on automatic pick-up balers or on similar machines

3.2
batch
definite quantity of twine produced under conditions which are presumed uniform

3.3
laboratory sample
total selection of samples from a batch intended for testing in the laboratory

3.4
polyolefin
principally polypropylene (PP) and high density polyethylene (PE)

3.5
specimen
quantity of twine on which a test conforming to the requirements of this International Standard is carried out

4 Designation

A twine shall be designated by

— the words “agricultural twine”,

— the number of this International Standard, i.e. ISO 4167,

— the material from which the agricultural twine is made, and

— the nominal runnage in metres (m) per kilogram (kg) of the agricultural twine.

EXAMPLE Designation example:

A polypropylene (PP) agricultural twine having a nominal runnage of 350 m/kg is designated as follows:

agricultural twine ISO 4167 - PP - 350

5 Raw materials

The raw material used for the manufacture of twine shall consist of polyolefin. Adequate stabilization against degradation by sunlight shall be incorporated.

Any ultraviolet (UV) inhibitor system as well as colour pigment may be used.

Used colour pigment and stabilizers should not be toxic.

NOTE 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 and grass.

6 Manufacture

Each spool of twine shall be capable of working with continuity throughout its length. The twine shall have a Z twist in accordance with ISO 2.

Twine should always be removed from the centre of a spool in an anti-clockwise direction.

7 Technical properties

The methods used for measuring the technical properties of the agricultural twine shall be as given in Table 1.

Table 2 shows indicative characteristics of some twines only; others shall be calculated in accordance with the formulae in this clause and in 9.1.5.

In order to assure a minimum quality level, the following formulae are given for determining the technical characteristics of the agricultural twines.

For the minimum twine breaking force requirement, the following formula shall be used:

$$F_{\text{twine}} = \frac{31\,450}{n} + 8$$

where

F_{twine} is the minimum twine breaking force, in decanewtons rounded to the nearest integer;

n is the specified nominal runnage of the twine, in metres per kilogram, in accordance with the procedure given in 9.1.

For the minimum average knot breaking force requirement, the following formula shall be used:

$$F_{\text{knot}} = 0{,}55\ F_{\text{twine}}$$

where F_{knot} is the minimum average knot breaking force, in decanewtons rounded to the nearest integer.

For the nominal runnage tolerance requirement, a tolerance of $\pm$ 8 % rounded to the nearest integer shall be allowed.

Table 1 — Technical properties of polyolefin agricultural twines

Relevant property		Values of properties Example: Agricultural twine ISO 4167 - PP - 350	Method of test
Linear density	tex	2 857 $^{+249}_{-211}$	See 9.1.
Runnage	m/kg	350 ± 28	See 9.1.
Minimum twine breaking force	daN [1)]	98	See 9.2.
Minimum average knot breaking force	daN [1)]	54	See 9.3.

1) 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.

Table 2 — Indicative characteristics of some twines

Designation/ end use	Linear density, ρ_l		Runnage of the twine		Minimum twine breaking force	Minimum average knot breaking force
	nominal	tolerance	nominal, n	tolerance	F_{twine}	F_{knot}
	tex	tex	m/kg	m/kg	daN	daN
Round bales	1 176	$^{+103}_{-87}$	850	± 68	45	25
Round bales	1 724	$^{+149}_{-127}$	580	± 46	62	34
Conventional bales	2 326	$^{+199}_{-171}$	430	± 34	81	44
Conventional bales	2 857	$^{+249}_{-211}$	350	± 28	98	54
Conventional bales	3 448	$^{+297}_{-253}$	290	± 23	116	64
Big bales	6 667	$^{+579}_{-494}$	150	± 12	218	120
Big bales	7 692	$^{+641}_{-549}$	130	± 10	250	137

8 Sampling

8.1 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 a batch for testing using the following sampling formula:

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

where

S is the number of spools sampled, rounded to the nearest integer;

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

8.2 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.

9 Test method

9.1 Determination of linear density and runnage

9.1.1 Principle

Specimens of specified length are weighed under specific conditions and then the linear density and the runnage (or length in metres per kilogram) are calculated.

9.1.2 Apparatus

9.1.2.1 **Balance**, accurate to 0,5 g.

9.1.2.2 **Wrap-reel** of known perimeter.

9.1.3 Specimens

9.1.3.1 Selection

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

— Directly from the centre of each spool, in an anti-clockwise direction, draw the first 10 m of twine and discard it.

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

Each specimen of 30 m constitutes a test piece.

9.1.3.2 Conditioning

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

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

9.1.4 Procedure

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

9.1.5 Expression of results

9.1.5.1 Calculation of linear density

For each specimen, calculate the linear density, ρ_l, in tex rounded to the nearest integer, using the following formula:

$$\rho_l = \frac{1\,000\ m_1}{30}$$

where

m_1 is the mass of the specimen in grams.