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Woven polypropylene sacks for bulk packaging of foodstuffs

Sacs tissés en polypropylène pour l'emballage en vrac de denrées alimentaires

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Foreword

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ISO 23560 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 11, *Products*.

Introduction

With the removal of trade barriers between nations, there is a need for an International Standard for the packaging, transportation and storage of foodstuffs such as cereals. Polypropylene (PP) sacks made from woven fabric are an ideal choice for the packaging of foodstuffs. Such sacks are produced from food-grade polypropylene and ensure the mechanical strength needed for storage and transportation.

This International Standard describes the construction of the sacks, their dimensions and test methods suitable for ensuring the long-term storage and transportation of foodstuffs in the sacks.

Woven polypropylene sacks for bulk packaging of foodstuffs

1 Scope

This International Standard specifies the general characteristics, requirements and methods of test for woven polypropylene (PP) sacks. It is applicable to woven PP sacks, having a capacity of 50 kg or 25 kg, intended for the transport and storage of foodstuffs, such as cereals, sugar and pulses.

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

ISO 4892-3:2006, *Plastics — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps*

ISO 4915, *Textiles — Stitch types — Classification and terminology*

ISO 6591-2, *Packaging — Sacks — Description and method of measurement — Part 2: Empty sacks made from thermoplastic flexible film*

ISO 13934-1, *Textiles — Tensile properties of fabrics — Part 1: Determination of maximum force and elongation at maximum force using the strip method*

ISO 13935-1, *Textiles — Seam tensile properties of fabrics and made-up textile articles — Part 1: Determination of maximum force to seam rupture using the strip method*

3 Terms and definitions

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

3.1
woven PP sack
container made of woven polypropylene (PP) fabric, closed at one end, in certain cases combined with other flexible materials used, for instance, for the liner to provide the properties required for filling, storage and distribution of the packaged commodity

4 Manufacture

4.1 Raw materials

A suitable grade of PP conforming to food contact requirements shall be utilized in the manufacture of the PP tape/fabric used in the sacks.

4.2 Fabric

The fabric used in the manufacture of woven PP sacks shall be woven as a tube on a circular loom from PP tapes having a width of (2,5 ± 1) mm. The tapes shall be woven sufficiently tightly so that the packaged foodstuff does not leak out of the sack. The construction of the weave shall be sufficiently rough to ensure that filled sacks do not slip from a stack of sacks.

The required construction parameters of sacks are given in Table 1.

Table 1 — Required construction parameters of fabric and sacks

Parameter		Requirement		Test method
		Type 1	Type 2	
Capacity (kg)		50	25	—
Dimensions (cm)	Inside length	100^{+2}_{0}	65^{+2}_{0}	ISO 6591-2
	Inside width	57^{0}_{-1}	48^{0}_{-1}	
Mass of sack (g)		135^{+9}_{-4}	67^{+4}_{-3}	See Annex A
Average breaking strength of fabric (N)	Lengthwise	⩾ 918	⩾ 816	See Annex B
	Widthwise	⩾ 918	⩾ 816	
Elongation at break of fabric (%)	Lengthwise	(20 ± 5)	(20 ± 5)	See Annex B
	Widthwise	(20 ± 5)	(20 ± 5)	
Average breaking strength of bottom seam (N)		⩾ 377	⩾ 337	See Annex B

NOTE 1 The dimensions specified provide the optimum free space of at least 20 % of the length above the surface of the contents.

NOTE 2 The masses given for the sacks are based on typical ones for fabric weighing 106 g/m^2 for type 1 sacks and 96 g/m^2 for type 2 sacks.

NOTE 3 The average breaking strength of the fabric and the average breaking strength of the bottom seam are calculated with respect to a specimen width of 50 mm.

Woven PP sacks of the dimensions specified in Table 1 are suitable for the packaging of foodstuffs such as wheat, rice, pulses, millet and other, similar, grains. Other sack dimensions are allowed by agreement between the purchaser and seller. The mass of such sacks shall be calculated by the method given in Annex A.

5 Sack

5.1 The sack may be flat or gusseted.

5.2 The bottom seam shall be stitched with two rows of chain stitches in accordance with ISO 4915. The two rows of stitches shall be separated from each other by at least 4 mm and the outer stitch shall be at least 7 mm from the outer edge of the sack. The stitching shall be done through a single or double fold, so that the stitches pass through a minimum of four layers of the fabric, made in such a way that the seam width is at least 25 mm. The number of stitches per unit length shall be (14 ± 2) stitches/dm. These requirements shall be verified by visual inspection.

5.3 The material used for stitching shall be polypropylene tape or any other thread suitable for the purpose. The stitching shall be uniform with no loose thread or knots. These requirements shall be verified by visual inspection.

5.4 The closure of the filled sack shall be designed to prevent leakage of the contents during transport and handling.

6 Liner

If required by the buyer, the unlaminated sacks shall be provided with a loose liner made of a suitable polyolefin film conforming to the requirements for food contact. The width of the liner shall be 10 % more than the width of the sack. The bottom seam of the liner shall be at least 25 mm from its bottom edge. The liner shall be free from pinholes, patches, tears, blisters and other visible defects.

7 Requirements

7.1 Conditioning and test conditions

The atmospheres for conditioning and testing shall be as specified in ISO 291.

7.2 Construction parameters

The sacks shall conform to the requirements specified in Table 1, within the limits specified in 10.2.

7.3 UV resistance

Sacks made of UV-stabilized fabric shall retain at least 50 % of their original breaking strength when tested (see Annex B) after exposure to UV radiation and weathering for 144 h in accordance with the procedure given in ISO 4892-3:2006, Table 4, method A, cycle No. 1.

7.4 Mass of the bale

The mass of a bale of sacks (excluding packing material) shall be within $\pm$ 3 % of the mass calculated by multiplying the number of sacks by the mass specified in Table 1 for one sack.

7.5 Drop testing

When tested in accordance with Annex C, sacks shall meet the requirements specified in that annex.

8 Food compatibility

When used for foodstuffs, as will normally be the case, the sacks shall meet the legal requirements for food contact of the country where they are to be used.

9 Marking and packaging

9.1 Marking on sacks

The identification mark of the manufacturer, along with any information required by the buyer, shall be printed on the sacks, using ink or another suitable method that will ensure legibility during use.

9.2 Packaging

The sacks shall be packed to form a circular bale, using a layer of woven PP fabric for wrapping, and suitably secured. Each bale shall contain 500 sacks or a multiple thereof.

9.3 Marking on bales

The bales shall be marked with the following information:

a) the name of the manufacturer;

b) the type of sack and the sack size;

c) the gross mass of the bale;

d) the net mass of the bale;

e) the month and year of manufacture;

f) any other information required by the buyer.

10 Sampling and criteria for conformity

10.1 Sampling

10.1.1 All the sacks of the same construction in a consignment shall be grouped together to constitute a lot.

10.1.2 The conformity of the lot to the requirements of this International Standard shall be determined on the basis of tests carried out on samples randomly selected from the lot.

10.1.3 The requirements for sampling for the various tests are specified in Table 2.

Table 2 — Sample size and criteria for conformity

Number of sacks in lot	Number of bales to be sampled	Sample size for visual inspection and measurement of dimensions and mass	Sample size for measurement of breaking strength and elongation at break of fabric, breaking strength after exposure to UV radiation and breaking strength of seam
Up to 12 500	3	13	8
12 501 to 25 000	5	20	8
25 001 to 50 000	8	32	13
50 001 and above	12	50	20

10.2 Criteria for conformity

The lot shall be considered as conforming to the requirements of this International Standard if the following conditions are satisfied:

a) the number of sacks found defective in the case of visual inspection and measurement of dimensions shall be no more than 10 % of the sample size specified in Table 2;

b) none of the sacks shall have a mass which is more than 3 % below the lower limit specified in Table 1;

c) none of the bales of 500 sacks shall have a mass which is more than 3 % below the calculated mass of the bale;

d) the average breaking strength of the fabric in both the lengthwise and widthwise directions shall not be less than the values specified in Table 1, and none of the individual values shall be more than 10 % below the value specified in Table 1;

e) ten percent of the sacks tested may have a bottom seam strength down to 323 N (33 kgf) in the case of 50 kg sacks and 294 N (30 kgf) in the case of 25 kg sacks, provided the average seam strength of all the sacks tested is $\geqslant$ 377 N (38 kgf) in the case of 50 kg sacks and $\geqslant$ 337 N (34 kgf) in the case of 25 kg sacks;

f) no sack shall exhibit an elongation outside the range specified in Table 1;

g) none of the sacks tested after exposure to UV radiation and weathering shall have a breaking strength less than 50 % of the original breaking strength.

Annex A
(normative)

Method of calculation of the mass of a sack

A.1 The total mass of a sack is made up of a) the mass of the fabric and b) the mass of the seam stitching tape or thread.

A.2 Calculate the mass of the sack using the relevant equations given below.

a) Mass of tubular fabric (single-fold stitching):

$$m_f = (L + 40) \times 2W \times \rho_A \times 10^{-6}$$

Mass of tubular fabric (double-fold stitching):

$$m_f = (L + 65) \times 2W \times \rho_A \times 10^{-6}$$

b) Mass of stitching tape or thread:

$$m_{st} = L_1 \times T \times 10^{-6}$$

where

m_f is the mass of the fabric, in g;

L is the length of the sack, in mm;

W is the width of the sack, in mm;

ρ_A is the mass per unit area of the fabric, in g/m^2;

m_{st} is the mass of the stitching tape or thread, in g;

L_1 is the approximate length of the stitching tape or thread, in mm;

T is the linear density of the stitching tape or thread, in tex.

Annex B
(normative)

Breaking strength of fabric and bottom seam

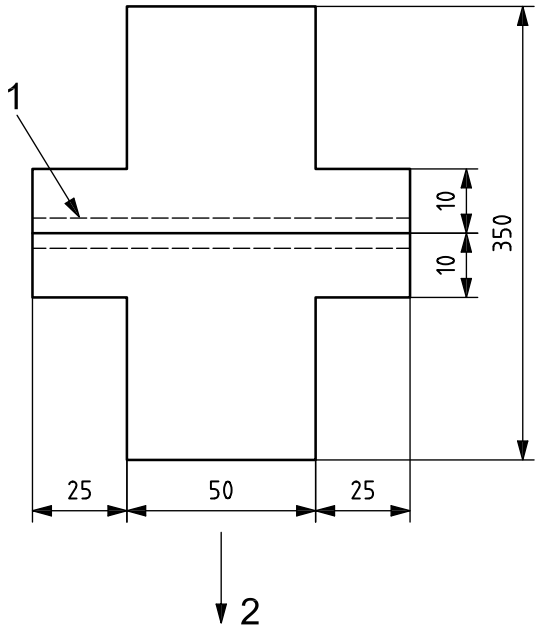
B.1 Breaking strength and elongation at break of fabric

The breaking strength and elongation at break of the fabric shall be determined in accordance with ISO 13934-1, using a suitable tensile-testing machine and test specimens of width 50 mm and having a gauge length of 200 mm, taken from the centre of one side of the sack in both the lengthwise and widthwise directions.

B.2 Breaking strength of bottom seam

The breaking strength of the bottom seam shall be determined in accordance with ISO 13935-1, using a suitable tensile-testing machine and the test specimen shown in Figure B.1.

Dimensions in millimetres



Key

1 seam
2 direction of application of force

Figure B.1 — Test specimen for measurement of breaking strength of bottom seam

NOTE The same tensile-testing machine can be used as in Clause B.1.

Annex C
(normative)

Drop testing

C.1 Filling sacks for testing

Sacks shall be filled with the foodstuff with which they are intended to be used or, if this is not possible, with a similar material to give the same degree of filling. The bulk density and mass of this similar material, if used, shall be within ± 2 % of the values for the foodstuff with which the sack is intended to be used.

C.2 Drop testing

C.2.1 General

Drop testing shall be carried out on three sacks and shall comprise the following sequence:

1) butt dropping;

2) flat dropping.

C.2.2 Butt dropping

The sack shall be dropped from a height of 1,20 m on to the bottom of the sack.

C.2.3 Flat dropping

The sack shall be dropped from a height of 1,60 m, twice on to one flat face and twice on to the other flat face.

C.2.4 Criterion for passing the drop test

After each drop there shall be no rupture or loss of contents. A slight discharge, e.g. from closures or stitch holes, upon impact shall not be considered a failure of the sack provided that no further leakage occurs after the sack has been raised clear of the ground.

Bibliography

[1] EN 277, *Sacks for the transport of food aid — Sacks made of woven polypropylene fabric*

[2] EN 1086, *Sacks for the transport of food aid — Recommendations on the selection of type of sack and the liner in relation to the product to be packed*

[3] ISO 2206, *Packaging — Complete, filled transport packages — Identification of parts when testing*

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[5] ISO 3676, *Packaging — Unit load sizes — Dimensions*

[6] ISO 4892-1, *Plastics — Methods of exposure to laboratory light sources — Part 1: General guidance*

[7] ISO 7023, *Packaging — Sacks — Method of sampling empty sacks for testing*

[8] ISO 7965-2, *Sacks — Drop test — Part 2: Sacks made from thermoplastic flexible film*

[9] ISO 17557, *Plastics — Film and sheeting — Cast polypropylene (PP) films*

[10] ISO 21898, *Packaging — Flexible intermediate bulk containers (FIBCs) for non-dangerous goods*

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