International Standard

ISO 21898

Packaging — Flexible intermediate bulk containers (FIBCs) for non-dangerous goods

Emballages — Grands récipients pour vrac souples (GRVS) pour matières non dangereuses

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 122, *Packaging*, Subcommittee SC 3, *Performance requirements and tests for means of packaging, packages and unit loads (as required by ISO/TC 122)*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 261, *Packaging,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 21898:2004), which has been technically revised.

The main changes are as follows:

— in 5.2.1, a new note on non-standard filling material has been added;

— a new subclause 4.4 on the use of and requirement for recycled materials has been added;

— a new subclause 4.5 on electrostatic protective FIBC has been added;

— in Clause 7, the label has been modified;

— Annex A has been revised;

— Annex C has been revised;

— a new Annex F, Optional methods for UV resistance test, has been added;

— IEC 61340-4-4 has been incorporated in the document through a series of cross-references.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Packaging — Flexible intermediate bulk containers (FIBCs) for non-dangerous goods

1 Scope

This document specifies materials, construction and design requirements, type test and marking requirements for flexible intermediate bulk containers (FIBCs) intended to contain non-dangerous solid materials in powder, granular or paste form, and designed to be lifted from above by integral or detachable devices.

This document also provides guidance on the selection and safe usage of FIBCs.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 4892-3, *Plastics — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps*

ISO 12048, *Packaging — Complete, filled transport packages — Compression and stacking tests using a compression tester*

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

IEC 61340-4-4, *Electrostatics — Part 4-4: Standard test methods for specific applications — Electrostatic classification of flexible intermediate bulk containers (FIBC)*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1 General

3.1.1
flexible intermediate bulk container
FIBC
intermediate bulk container having the body made of flexible material such as woven plastic fabric or plastics film, designed to be in contact with the contents, either directly or through an inner liner, and collapsible when empty

3.1.2
heavy-duty reusable flexible intermediate bulk container
FIBC designed and intended to be used for a multitude of fillings and discharges, and both factory and field repairable in such a way that the tensile strength across a repair is at least as great as that of the original

3.1.3
standard-duty reusable flexible intermediate bulk container
FIBC designed and intended to be used for a limited number of fillings and discharges

Note 1 to entry: An FIBC of this category cannot be reused if damaged, i.e. it is not repairable.

Note 2 to entry: The replacement of a removable inner liner is not considered a repair.

3.1.4
single-trip flexible intermediate bulk container
FIBC designed and intended to be used for one filling only

Note 1 to entry: An FIBC of this category cannot be reused. Neither replacement of an inner liner nor repair of the FIBC is relevant to this category.

3.1.5
FIBC type
FIBCs of like design, manufactured using like materials and methods of construction (giving at least equal performance) to the same nominal cross-sectional dimensions

Note 1 to entry: Within a type, the circumference may be increased by up to 10 % by comparison with samples passing a type test, provided the same geometry is maintained. Where the type has a base discharge spout, smaller diameter discharge spouts of like design may be used.

Note 2 to entry: The presence or absence of an inner liner does not constitute a change of type.

3.1.6
safe working load
SWL
maximum load which the FIBC may carry in service, as certified

3.1.7
safety factor
SF
integer quotient between the final test load in the cyclic top lift test and the SWL value rounded down

Note 1 to entry: Safety factors can be illustrated as follows (see also B.3.3):

	Example 1	Example 2
Designated SWL	500 kg	500 kg
Final load, cyclic test	2 400 kg	2 600 kg
Quotient	4,8	5,2
Integer quotient, rounded down	4	5

Note 2 to entry: The results in Example 1 indicate a single-trip FIBC which does not meet the requirements of this document, whilst those in Example 2 indicate a single-trip FIBC which meets the requirements.

3.1.8
lifting device
integral and/or fixed lifting devices which form part of the FIBC and are tested with it

Note 1 to entry: Detachable lifting devices are regarded as lifting tools.

3.2 FIBC parts

3.2.1
walls
tube of one or more layers, seamless or made out of one or more panels joined together

3.2.2
base
part of the FIBC which is connected to or integral with the walls and forms the base of the standing FIBC

3.2.3
plain base
base without an opening

3.2.4
full open base
extensions to the wall(s), forming the base of the FIBC after closing

3.2.5
top
part of the FIBC, excluding handling devices, forming the upper end of the FIBC after closing

3.2.6
body
walls and base of the FIBC

3.2.7
inner liner
integral or removable container which fits into the FIBC

3.3 Operating devices

3.3.1
filling spout
tube-shaped part at the top for filling the FIBC

3.3.2
filling slit
slit-shaped opening at the top for filling the FIBC

3.3.3
discharging spout
tube-shaped part at the base for discharging the FIBC

3.4 Handling devices

3.4.1
lifting devices
webbings, loops, ropes, eyes, frames or other devices formed from a continuation of the walls of the FIBC, which are integral or detachable, and are used to support or lift the FIBC

3.4.2
four-point lifting
four lifting devices used simultaneously to lift the FIBC

3.4.3
two-point lifting
two lifting devices used simultaneously to lift the FIBC

3.4.4
one-point lifting
one lifting device, or one or more lifting devices brought to one point for lifting

3.5
coated and laminated materials
materials having a surface coating or comprising two or more layers laminated together to protect the contents of the filled FIBC or to protect the environment against the effects of leakage of the contents

3.6 Special treatments

3.6.1
stabilization
modification of the FIBC materials to give better resistance against weathering and ageing

EXAMPLE The addition of an ultraviolet (UV) absorber and/or an antioxidant.

3.6.2
electrostatic protective treatment
treatment for modifying the electrostatic behaviour of the FIBC

3.6.3
insect-repellent treatment
treatment for increasing the ability of the FIBC to protect itself and/or its contents against insect attack

3.6.4
flame-retardant treatment
treatment to impart flame resistance to the FIBC

4 Materials, construction and design

4.1 Materials

All categories of FIBC shall be manufactured from flexible materials covered by a written specification. The FIBC manufacturer shall have an authorized statement of conformity for each separate batch of materials.

The materials can have a surface coating or consist of two or more layers laminated together to protect the contents of the filled FIBC or to protect the environment from the effects of leakage of the contents.

The properties of the materials can be modified by additives to improve the resistance of the materials against, for example, degradation by heat and sunlight, and to reduce the effect of static electricity.

NOTE IEC 61340-4-4 specifies a test method for the electrostatic classification of FIBCs.

All load-bearing materials of the FIBC shall be tested in accordance with the test method specified in Annex A and shall retain at least 50 % of their initial values of the force at rupture and elongation at rupture.

Other light sources than the one specified in Annex A can be used. Details of these other light sources are given in Annex F.

In case of dispute, the light source specified in Annex A shall be used.

Materials should be chosen and joined together in such a way that recovery is promoted.

4.2 Construction

All stitched seams and joints shall be locked off and/or back sewn, or provided with a minimum 20 mm tail. All stitched seam-ends shall be secured. The surfaces to be joined by welding, gluing or heat-sealing shall be clean.

NOTE Annex E shows some design examples of FIBCs illustrated in Figures E.1 to E.13.

4.3 Design filling height

The designed filling height of the FIBC should be 2,0 times maximum of the shortest horizontal dimension of the FIBC.

NOTE 1 For FIBCs with a circular cross-section, the shortest horizontal dimension is normally the diameter of the FIBC base, even if the base has square dimensions. For FIBCs with a rectangular base, the shortest horizontal dimension is normally the shortest side.

NOTE 2 Detailed guidance on the selection and use of FIBCs is given in Annex D.

4.4 Recycled materials

Recycled mono-materials (RM), consisting of 95 % or more of the same polymer, can be used for all components of the FIBC.

As long as the following point is observed, there is no percentage restriction on the use of recycled materials.

— FIBCs from recycled material shall fulfil the same test criteria as FIBCs made of virgin material.

— If the application allows the use of liners from recycled materials, it shall fulfil the same test criteria as liners made of virgin material.

4.5 Electrostatic protective FIBC

Electrostatic discharges from FIBC can ignite explosive atmospheres formed by combustible dusts, gases or solvent vapours. To minimize the risk of explosion, FIBC intended for use in hazardous explosive atmospheres shall meet the requirements specified in IEC 61340-4-4.

NOTE 1 Detailed guidance on the selection and use of FIBCs is given in Annex D.

NOTE 2 Annex E shows some design examples of FIBCs illustrated in Figures E.1 to E.13.

5 Performance

5.1 Type-testing

All FIBC types shall be subjected to the following tests:

a) cyclic top lift;

b) compression/stacking test.

At least three specimens of each FIBC type shall be submitted for testing leading to certification. The specimens shall be tested as follows.

— Specimen 1: cyclic top lift test using the FIBC having the shortest vertical dimension.

— Specimen 2: cyclic top lift test using the FIBC having the greatest vertical dimension.

— Specimen 3: compression test using the FIBC having the greatest vertical dimension.

To conform with this document, the three specimens shall all withstand the tests.

When the FIBC type has only one fixed vertical dimension, only Specimens 1 and 3 need to be submitted and tested to withstand the tests.

One tested sample shall be durably identified and retained for reference in any later complaint or arbitration.

Tests shall be carried out at a testing facility with suitable calibration and operation.

5.2 Preparation of FIBC for test

5.2.1 Filling

For both the top lift and compression/stacking test, the FIBC shall be filled to the level specified in accordance with 4.3 by the manufacturer/supplier with a tolerance of between 0 % to +5 % of that height. The FIBC shall be filled with either:

a) a material, for example plastics granules, having the following mechanical properties:

- bulk density, 400 kg/m^3 to 900 kg/m^3,
- mesh size 3 mm to 12 mm,
- angle of repose 30° to 35°, or

b) the actual contents to be carried, when these are known, and where their use will not itself be a hazard.

NOTE 1 When option b) is chosen, the FIBC type is certified in relation to that specific product only.

NOTE 2 The transport of coarse sharp-edged materials in FIBCs is a non-standard use (see Clause 1). Such materials may only be transported in FIBCs that are marked with a special label. The special label is issued when the FIBCs have been tested with the intended filling material.

5.2.2 Conditioning

The filled FIBC shall be conditioned before testing at ambient temperature and relative humidity. However, in the event of dispute, testing shall be carried out after conditioning under standard conditions of (23 ± 2) °C and (50 ± 5) % relative humidity.

5.3 Test requirements

5.3.1 Cyclic top lift test(s)

Cyclic top lift test(s) shall be carried out in accordance with Annex B and the following criteria shall apply:

a) there shall be no breakage of any lifting devices to the extent that any of the lifting devices ceases to support its load;

b) when tested with an inner liner, there shall be no protrusion of the latter beyond the outer surface of the FIBC, except through the closure(s), where this is a design feature;

c) there shall be no loss of contents;

d) no deterioration of the body which renders the FIBC unsafe for transport or storage.

A slight discharge during the test (e.g. from closures or stitch holes) should not be considered to be a failure of the FIBC, provided that no further leakage occurs after the FIBC has been raised clear of the ground.

5.3.2 Compression/stacking test

The compression/stacking test shall be carried out in accordance with Annex C and the following criteria shall apply:

a) there shall be no loss of contents;

b) no deterioration of the body which renders the FIBC unsafe for transport or storage.

A slight discharge during the test (e.g. from closures or stitch holes) should not be considered to be a failure of the FIBC, provided that no further leakage occurs after the FIBC has been raised clear of the ground.

6 Statement of conformity

The statement of conformity to this document shall contain the data shown for the marking specified in Clause 7 a) to i) and Clause 7 k) to m).

And if available, together with;

a) the name(s) and address(es) of the conformity assessment body, together with the reference(s) and date(s) of the relevant test report(s), and

b) the material used as contents in the cyclic top lift and compression/stacking tests.

A document for an FIBC type should be valid for a period of three years from the date of issue.

An FIBC documented and marked as a single-trip FIBC in conformity with this document shall not be reused.

An FIBC documented and marked as a reusable (heavy- or standard-duty) FIBC in conformity with this document shall be reused only with the same type of contents as in the first use.

Reuse of FIBCs with contents differing from those of the first use is not in accordance with this document.

7 Marking

All FIBCs shall be durably marked by means of a permanently attached and easily visible and readable label, or durably printed on the body so that it is easily visible and read after the FIBC has been filled. The following data shall be included:

a) name and address of the manufacturer;

b) manufacturer's reference, which shall be unique to any one FIBC type;

c) safe working load (SWL) in kilograms (see Figure 1 as example);

d) safety factor (SF), i.e. 5:1, 6:1 or 8:1 as appropriate (see Figure 1 as example);

e) maximum number of the FIBCs permitted to be stacked on the bottom FIBC (see Figure 1 as example);

f) test number (which shall be unique to any one type);

g) test date: the month and year in which the type test was issued;

h) name of the approved laboratory;

i) a reference to this document, i.e. ISO 21898:2024;

j) class of FIBC, i.e. "heavy-duty reusable", "standard-duty reusable" or "single-trip";

k) date of manufacture of the FIBC, i.e. month and year;

l) handling recommendations/pictograms;

m) details of any special treatments including stabilization, electrostatic protective treatment, insect-repellent treatment and flame-retardant treatment as defined in 3.6 or coated and laminated materials described in 4.1;

n) where the FIBC is certified in relation to a specific product, the description of that product shall be added;

o) name and address of the supplier, if required;

The layout of the label shall be as in Figure 1. Additions of calendars or lists of safe working loads and safety factors to be ticked to are not permitted.

The label description should be contained in Figure 1.

<table>
<tr><td colspan="2">MANUFACTURER’S NAME & ADDRESS:</td></tr>
<tr><td colspan="2">MANUFACTURER’S REFERENCE:</td></tr>
<tr><td colspan="2"><EXAMPLE>

SWL= 1 000 kg
SF= 5 : 1

MAX
PERMITTED
STACKING
1 + 4 BAGS

 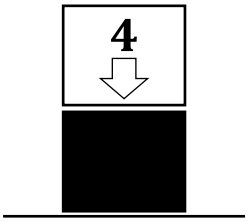 </td></tr>
<tr><td rowspan="8">MATERIAL DETAILS IF ANY SPECIAL TREATMENT, COAT, OR LAMINATE</td><td>TEST No:</td></tr>
<tr><td>TEST Date:</td></tr>
<tr><td>APPROVED LABORATORY:</td></tr>
<tr><td>TEST STANDARD: ISO 21898:20xx</td></tr>
<tr><td>FIBC CLASS:</td></tr>
<tr><td>DATE OF MANUFACTURE OF FIBC:</td></tr>
<tr><td></td></tr>
<tr><td></td></tr>
<tr><td colspan="2">Handling recommendations/Pictograms:</td></tr>
<tr><td colspan="2">Supplier’s name and address (if required):</td></tr>
</table>

Figure 1 — Example of an FIBC label