



JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS Z 1651 : 2008

(JFC/JSA)

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

ICS 55.180.10

Reference number : JIS Z 1651 : 2008 (E)

PROTECTED BY COPYRIGHT

Date of Establishment: 1976-12-01

Date of Revision: 2008-03-20

Date of Public Notice in Official Gazette: 2008-03-21

Investigated by: Japanese Industrial Standards Committee
Standards Board

Technical Committee on Logistics and Distribution
of Goods

JIS Z 1651 : 2008, First English edition published in 2008-10

Translated and published by: Japanese Standards Association
4-1-24, Akasaka, Minato-ku, Tokyo, 107-8440 JAPAN

In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

© JSA 2008

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

Printed in Japan

PROTECTED BY COPYRIGHT

Contents

	Page
Introduction.....	1
1 Scope.....	1
2 Normative references	1
3 Terms and definitions	2
4 Classification and symbol.....	6
5 Material, construction and design	6
5.1 Material	6
5.2 Construction	7
5.3 Design filling height	8
5.4 Shape and dimension	8
5.5 FIBC volume and maximum filling mass	8
6 Product test	8
6.1 Test conditions	8
6.2 Type test	9
6.3 Preparation of FIBC.....	9
6.4 Performance	10
7 Marking.....	11
8 Instruction manual.....	13
Annex A (normative) Weatherability test	14
Annex B (normative) Cyclic top lift test	16
Annex C (normative) Compression test and stacking test	24
Annex D (informative) Guidance on selection and use of FIBCs	25
Annex E (informative) Design of FIBC	30
Annex JA (normative) Tensile strength test	36
Annex JB (normative) Tearing strength test.....	37
Annex JC (normative) Tensile strength test of slinging parts (sling belt and sling rope)	38
Annex JD (normative) Thermal resistance test	39
Annex JE (normative) Low temperature resistance test	40
Annex JF (normative) Crumpling resistance test.....	41
Annex JG (normative) Dimension measurement.....	42

Annex JH (normative)	Drop impact test	43
Annex JI (informative)	Comparison table between JIS and corresponding International Standard	44

Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Flexible Container's Industrial Association (JFC)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently **JIS Z 1651** : 2002 is replaced with this Standard.

This **JIS** document is protected by the Copyright Law.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

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

Introduction

This Japanese Industrial Standard has been prepared based on the first edition of **ISO 21898** published in 2004 with some modifications of the technical contents.

The portions given sidelines or dotted underlines are the matters in which the contents of the corresponding International Standard have been modified. A list of modifications with the explanations is given in Annex JI.

1 Scope

This Standard specifies materials, construction, design requirements, product test and marking for the flexible intermediate bulk containers (hereafter referred to as “FIBC”) to be used for the conveyance of non-dangerous goods in powdery and granular forms.

This is applicable to containers designed to be lifted from above by integral or detachable devices.

NOTE : The International Standard corresponding to this Standard is as follows.

ISO 21898:2004 *Packaging—Flexible intermediate bulk containers (FIBCs) for non-dangerous goods* (MOD)

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21**.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. For the standards with the indication of year, the edition of the indicated year shall be applied and not any revisions made thereafter (including amendments). For those with no indication of year, the most recent editions (including amendments) shall be applied.

JIS B 7512 *Steel tape measures*

JIS B 7514 *Steel straightedges*

JIS B 7522 *Textile tape measures*

JIS B 7753 *Light-exposure and light-and-water-exposure apparatus (Open-flame carbon-arc type)*

JIS L 1096:1999 *Testing methods for woven fabrics*

NOTE : Corresponding International Standard: ISO 13934-1 *Textiles—Tensile properties of fabrics—Part 1: Determination of maximum force and elongation at maximum force using the strip method* (MOD)

JIS L 2703 *Vinylon ropes*

JIS L 2704 *Nylon ropes*

JIS L 2705 *Polyethylene ropes*

JIS L 2706 *Polypropylene ropes*

JIS L 2707 *Polyester ropes*

JIS Z 0212 *Packaged freights and containers—Method of compression test*

NOTE : Corresponding International Standard: ISO 12048 *Packaging—Complete, filled transport packages—Compression and stacking tests using a compression tester* (MOD)

ASTM G 154-98 *Standard practice for operating fluorescent light apparatus for UV exposure of nonmetallic materials*

3 Terms and definitions

For the purposes of this Standard, the following definitions shall apply.

3.1 General

3.1.1 flexible intermediate bulk container

intermediate bulk container having the body made of flexible material such as woven fabric, plastics film or paper, slinging parts for lifting and openings for filling and discharging goods

NOTE : It is 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 type I

FIBC designed and intended to be used for a multitude of fillings and discharges, and 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 heavy-duty reusable flexible intermediate bulk container type J (Class 1, Class 2)

FIBC designed and intended to be used for a multitude of fillings and discharges, and repairable in such a way that the tensile strength across a repair is at least as great as that of the original, but excellent in also weatherability and waterproofness according to the difference in material design and designed in such a way that those performances (see 5.1.2) are maintained when repaired

3.1.4 standard-duty reusable flexible intermediate bulk container

FIBC designed and intended to be used several times as a limited number or for one year as a limited period of fillings and discharges

In addition, a FIBC of this category can not be reused or repaired if damaged, provide that the replacement of a removable inner liner and components such as a belt is not considered a repair.

3.1.5 single-trip flexible intermediate bulk container

FIBC designed and intended to be used for one time only

3.1.6 FIBC type

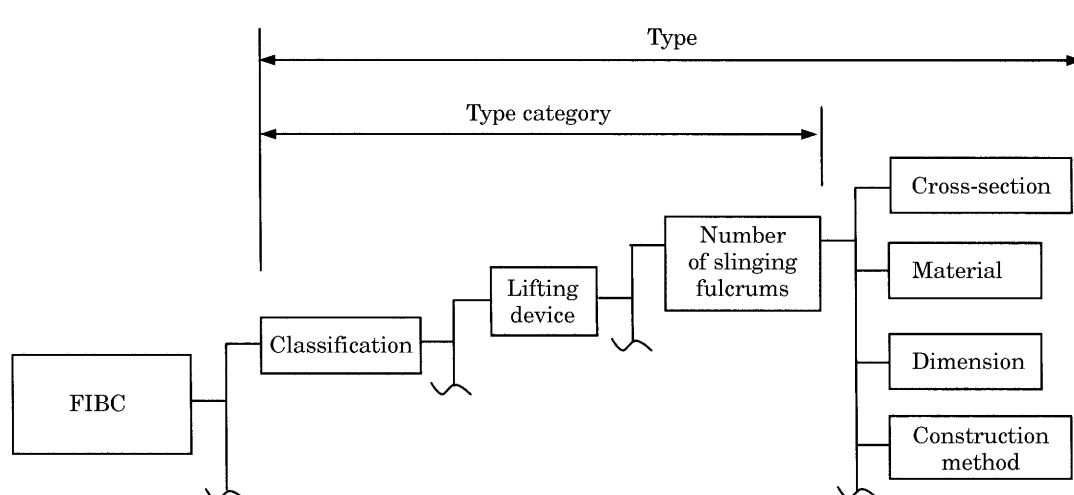
FIBC of similar design, materials and construction methods (giving at least equal performance) manufactured with the same nominal cross-section

In addition, within a type, the circumference may be increased by up to 10 %, provided that the same geometry is maintained. Where the type has a base discharge spout, smaller diameter discharge spouts of the same design may be used. The presence or absence of an inner liner does not effect the change of type.

3.1.7 FIBC type category

category in which classification, lifting device (see 3.4.1) and slinging fulcrum (see 3.4.2) among types are the same, and the same performance is obtained

The concept shall be as shown in figure 1.



NOTE : When the material and the construction method have significant effects on FIBC performance, they also shall be taken into consideration as the type category.

Figure 1 Type and type category

3.1.8 safe working load (SWL)

maximum load (N) which FIBC in service (filling, storage, transportation, etc.) may carry safely

3.1.9 maximum filling mass

maximum (kg) mass which FIBC in service (filling, storage, transportation, etc.) may carry safely

3.1.10 FIBC volume

volume (L) which can fill FIBC

3.1.11 number of stacks

number of stacks designed up to which FIBC of the same maximum filling mass can be stacked on the top of another FIBC

3.1.12 safety factor (SF)

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

The calculation method of safety factor shall be as given in table 1.

Table 1 Calculation method of safety factor

	Example 1	Example 2
Maximum filling mass kg	500	500
Safe working load (SWL) N	4 900	4 900
Final load in cyclic test N	23 520	25 480
Final load/ safe working load	4.8	5.2
Safety factor (SF)	4	5

The result in example 1 indicate that the single-trip FIBC does not meet the requirements (see table 4) of this Standard, however, that in example 2 meets the requirements.

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 FIBC connected to or integral with walls that forms the base of FIBC

3.2.3 top

upper part of FIBC forming the top of FIBC after closing the filling spout (see **3.3.1**) excluding handling devices

3.2.4 inner liner

integral or removable container which fits into FIBC

3.3 Filling and discharging device

3.3.1 filling spout

slit or tube-shaped part for filling at the top of FIBC

3.3.2 discharging spout

tube-shaped part for discharging at the lower part of FIBC

3.3.3 closing parts

ropes, belts, tapes, etc. used to close the filling spout and the discharging spout

3.4 Handling device

3.4.1 lifting device

belts, ropes, loops, fittings or others of integral or detachable (parts for lifting) formed from a continuation of walls of FIBC, which are used to support or lift FIBC and mainly composed of two slinging parts and ropes, etc. (see figure E.12)

3.4.2 slinging parts

parts which connect ropes, belts, etc. and are attached to the walls and the base by components or parts which become the fulcrum for lifting FIBC (slinging fulcrum)

3.4.3 four-point lifting

four lifting devices used simultaneously to lift FIBC (see figure E.8)

3.4.4 three-point lifting

three lifting devices used simultaneously to lift FIBC (see figure E.9)

3.4.5 two-point lifting

two lifting devices used simultaneously to lift FIBC (see figure E.10)

3.4.6 one-point lifting

one lifting device, or one or more lifting devices brought to one point for lifting (see figure E.11)

3.5 coated and laminated materials

surface coating materials or two or more layers laminated together to protect the contents filled in FIBC or to protect the environment against the leakage of the content

3.6 Special treatments

3.6.1 stabilization

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

For example, the addition of an ultraviolet (UV) absorber and/or an antioxidant is taken. However, modification by coating is not taken as stabilization.

3.6.2 electrostatic conductivity treatment

treatment for modifying the electrostatic behaviour of FIBC

3.6.3 insect-repellent and rat-proof treatment

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

3.6.4 flame-retardant treatment

treatment to impart flame resistance to FIBC

4 Classification and symbol

The classification and symbol of FIBC shall be as given in table 2.

Table 2 Classification and symbol of FIBC

Classification		Symbol
Heavy-duty reusable FIBC type I		RI
Heavy-duty reusable FIBC type J	Class 1	RJ1
	Class 2	RJ2
Standard-duty reusable FIBC		CST
Single-trip FIBC		CSI

5 Material, construction and design

5.1 Material

5.1.1 General

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 to performance specified in **5.1.2** for each separate batch of materials.

The properties of the materials may 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. The FIBC manufacturer should use materials suitable for recycling.

5.1.2 Performance

The material performance shall be as follows.

- a) For the water resistance of the body material, the tensile strength test and the tearing strength test shall be carried out in accordance with Annex JA and Annex JB. After it is completely immersed in water for $25 \text{ h} \pm 1 \text{ h}$, at least 85 % of the strength before immersion in water shall remain.

For the water resistance of the sling belt and the sling rope, the tensile strength test shall be carried out in accordance with Annex JC and after it is completely immersed in water for $25 \text{ h} \pm 1 \text{ h}$, at least 85 % of the strength before immersion in water shall remain.

For this measurement, after the test piece is dried, it shall be conditioned at a temperature of $23 \text{ °C} \pm 2 \text{ °C}$ and a relative humidity of $(50 \pm 5) \%$ for $60 \text{ min} \pm 5 \text{ min}$, and the test shall be carried out under the same condition.

- b) For the weatherability of the body material, the sling belt and the sling rope, even after the test is carried out in accordance with the test method (method A or method B) specified in Annex A, at least 70 % of the initial strength for the heavy-duty reusable FIBC type J and at least 50 % of the initial strength for others shall remain.

- c) For the initial strength of the sling belt and the sling rope, the tensile strength test shall be carried out in accordance with Annex JC, and the following strength shall be held.

$$F \geq s \times W/n$$

where, F : tensile strength (N)

s : material safety factor

In the case of heavy-duty reusable FIBC type I and heavy-duty reusable FIBC type J: 8

In the case of standard-duty reusable flexible FIBC and single-trip FIBC: 6

W : load equivalent to maximum filling mass (N)

n : number of sling ropes or sling belts, provided that for FIBC in which the sling device is comprised of the body material, number of sling devices, and number of sling ropes or sling belts is usually as shown in figure 2.

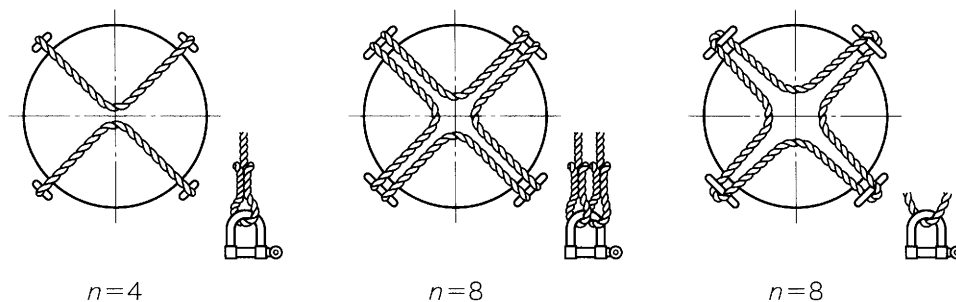


Figure 2 Number of sling ropes and sling belts

- d) For the thermal resistance of the body material, there shall be no adhesion, fissure, breakage, crack, peeling of coating film and other abnormalities on the surface of material when the test is carried out in accordance with the test method specified in Annex JD.
- e) For the low temperature resistance of the body material, there shall be no adhesion, fissure, breakage, crack, peeling of coating film and other abnormalities on the surface of material when the test is carried out in accordance with the test method specified in Annex JE.
- f) For the crumpling resistance of the body material, there shall be no adhesion, fissure, breakage, crack, peeling of coating film and other abnormalities on the surface of material when the test is carried out in accordance with the test method specified in Annex JF.

5.2 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.

5.3 Design filling height

The designed filling height of FIBC shall be between 0.5 and 2 times the shortest horizontal dimension of the base.

NOTE 1 For FIBC with a circular cross-section, the shortest horizontal dimension is normally the diameter of the bottom of FIBC base.

For FIBC with a square base, the shortest horizontal dimension is normally the shortest side.

NOTE 2 The height of walls of FIBC should not exceed 2 times the shortest dimension of the base of FIBC.

NOTE 3 The design filling height refers to the numeric value obtained by dividing the volume of filling contents by the bottom area of FIBC.

5.4 Shape and dimension

The shape and dimension of FIBC shall be as follows.

- a) The shape of FIBC shall be tubular or square.
- b) The dimension of FIBC shall be as agreed between the parties concerned with delivery. The dimensional tolerances shall be as given in table 3.

The measurement method of dimensions shall be in accordance with Annex JG.

Table 3 Dimensional tolerances

		Specified location	Dimensional tolerance
Height		Wall height	$\pm 3 \%$
Base	Tubular	Diameter	$\pm 2 \%$
	Square	Each side	$\pm 2 \%$

5.5 FIBC volume and maximum filling mass

The FIBC volume shall be 3 000 L or less, and the maximum filling mass shall be 3 000 kg.

6 Product test

6.1 Test conditions

The test for FIBC shall be carried out for each classification as given in table 4.

Table 4 Test conditions for each classification of FIBC

Classification		Sym- bol	Cyclic top lift test		Compression/ stacking test	Drop impact test
			Cyclic top lift load	Final load ^{a)}		
Heavy-duty reusable FIBC type I		RI	6 × SWL 70 cycles	8 × SWL 1 time	4 × SWL 6 h	SWL × height 0.8 m
Heavy-duty reusable FIBC type J	Class 1	RJ1	2 × SWL 70 cycles	5 × SWL 1 time		
	Class 2	RJ2	2 × SWL 70 cycles	5 × SWL 1 time		
Standard-duty reusable FIBC		CST	4 × SWL 70 cycles	6 × SWL 1 time		
Single-trip FIBC		CSI	2 × SWL 30 cycles	5 × SWL 1 time		
			Annex B		Annex C	Annex JH
Note ^{a)} Final load = safety factor (5, 6 or 8) × safe working load (SWL)						

6.2 Type test

The test for FIBC shall be carried out for each type as follows.

Although the type test is normally carried out for each type, the test may be carried out for each type category for FIBC which are regarded to be the same in performance.

- Cyclic top lift test
- Compression and stacking test
- Drop impact test For testing leading to certification, the following specimens shall be prepared and the following tests shall be carried out by using each specimen.

Specimen 1: Top lift test carried out by using FIBC of which the height dimension of wall is shortest

Specimen 2: Compression and stacking test carried out by using FIBC of which the height dimension of wall is longest

Specimen 3: Drop impact test carried out by using FIBC of which the height dimension of wall is arbitrary

In order to satisfy this Standard, all specimens shall endure each test.

For the type of FIBC of which the height dimension of wall is determined as one classification, specimen 1, specimen 2 and specimen 3 shall be submitted and it shall be examined that the test is endured.

After the test, one bag among the specimen 1 to the specimen 3 should be durably identified and retained for reference in any later complaint or arbitration.

6.3 Preparation of FIBC

6.3.1 Filling

The filling height of FIBC to be tested shall be $80_{+5}^0\%$ of the height of FIBC wall.

The FIBC shall be filled with either one of the following.

- a) Simulated contents, e.g. plastics granules, having following properties
- bulk density 500 kg/m³ to 900 kg/m³
 - grain diameter 3 mm to 12 mm
 - angle of repose 30° to 35°

- b) Actual contents where their use will not itself be a hazard

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

NOTE 2 For the specimen of the drop impact test, the mass equivalent to the safe working load (SWL) shall be filled.

NOTE 3 The angle of repose in **a)** refers to the angle between the ridgeline of the cone generated and the horizontal plane when particulate matter is made to drop on one point of the horizontal plane calmly.

6.3.2 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 the standard condition at a temperature of 23 °C ± 2 °C and a relative humidity of (50 ± 5) %.

6.4 Performance

6.4.1 Cyclic top lift performance

The cyclic top lift test shall be carried out in accordance with Annex B and table 4, 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 beyond the outer surface of FIBC, except through the discharging spout, where this is a design feature.
- c) There shall be no loss of contents.
- d) No deterioration of the walls and base which renders FIBC unsafe for transport or storage.

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

6.4.2 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 walls and base which renders FIBC unsafe for transport or storage.

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

6.4.3 Drop impact performance

The drop impact test shall be carried out in accordance with Annex JH and the following criteria shall apply.

- a) There shall be no loss of contents.
- b) No deterioration of the walls and base which renders FIBC unsafe for transport or storage.

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

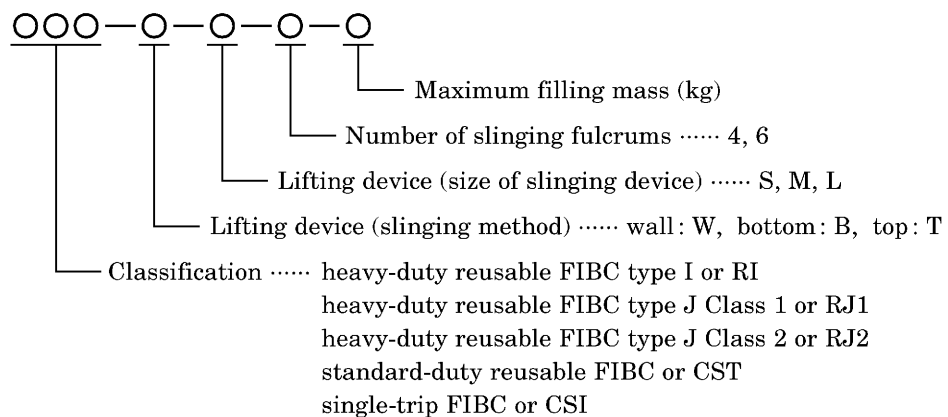
7 Marking

All FIBCs shall be durably marked by means of a permanently attached label, or printed on walls so that the following information is easily visible and readable.

An example of layout of the marked label is shown in figure 3.

- a) Name and address of the manufacturer
- b) Number of Japanese Industrial Standard and FIBC type symbol or type category symbol (see example)

Example :



- c) Name and address of the supplier
- d) Maximum filling mass (kg) and safe working load (SWL) (N)
- e) FBIC volume (L)
- f) Safety factor (SF), i.e. applied 5, 6 or 8
- g) Number of stacks
- h) Number and date issued of type-test report

- i) Year and month of manufacture of FIBC
- j) Pictogram of recommended handling methods (see figure 3)
- k) Detail of any special treatments as defined in **3.6** (if required)
- l) Contents when FIBC is certified in relation to a specific product (if required)

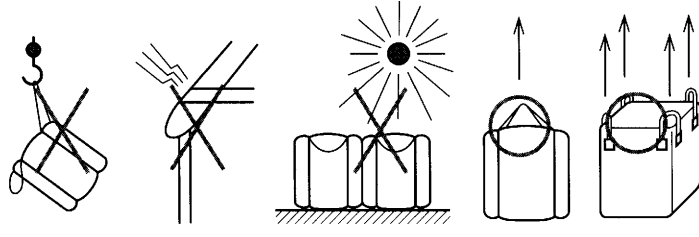
Name and address of manufacturer	
Type and type category of manufacturer	
Maximum filling mass: kg Volume: L Safety factor (SF): : 1 Number of stacks: stacks Safe working load (SWL): N	
	Type-test report number
	Type-test report date issued
	Name of designated laboratory
	Name of certification institute
	Number of Standard: JIS Z 1651
	Classification of FIBC
	Year and month of manufacture of FIBC
	Special treatment (if required)
	Contents of FIBC (if required)
Recommended handling method	
Danger  Caution 	
Name and address of the dealer (if required)	

Figure 3 Example of marking label