

Electrostatics —

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

The European Standard EN 61340-4-4:2005 has the status of a
British Standard

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National foreword

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Electrostatics**Part 4-4: Standard test methods for specific applications –
Electrostatic classification of flexible intermediate bulk containers (FIBC)
(IEC 61340-4-4:2005)****Electrostatique**

Partie 4-4: Méthodes d'essai normalisées
pour des applications spécifiques -
Classification électrostatique
des grands récipients pour vrac souples
(GRVS)
(CEI 61340-4-4:2005)

Elektrostatik

Teil 4-4: Normprüfverfahren für spezielle
Anwendungen –
Einordnung flexibler Schüttgutbehälter
(FIBC) in elektrostatischer Hinsicht
(IEC 61340-4-4:2005)

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CENELEC

European Committee for Electrotechnical Standardization
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Foreword

The text of document 101/211/FDIS, future edition 1 of IEC 61340-4-4, prepared by IEC TC 101, Electrostatics and SC 3, Performance requirements and texts for means of packaging, packages and unit loads, of ISO TC 122, Packaging, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61340-4-4 on 2005-10-01.

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Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61340-4-4:2005 was approved by CENELEC as a European Standard without any modification.

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INTRODUCTION

Flexible intermediate bulk containers (FIBC) are widely used for the storage, transportation and handling of powdered, flaked or granular material. Typically, they are constructed from woven polypropylene fabric in the form of cubic bags of about 1 m³ volume. The fabric used may be a single layer, a multi-layer laminate, or a coated fabric. Untreated polypropylene is a good electrical insulator, as is often the case with the products placed in FIBC. There is ample opportunity for the generation of electrostatic charge during filling and emptying operations and in unprotected FIBC high levels of charge can quickly build up. In such cases electrostatic discharges are inevitable and can be a severe problem when FIBC are used in flammable environments.

A flammable environment can be generated when handling fine powders that create dust clouds or thin layers of powder, both of which can be ignited by electrostatic discharges. A flammable environment can also be generated when using gases or volatile solvents. In these industrial situations there is clearly a need to eliminate incendive electrostatic discharges.

As with any industrial equipment, a thorough risk assessment should always be conducted before using FIBC in potentially hazardous situations. This International Standard describes test methods that can be used by manufacturers, specifiers and end-users as part of a risk assessment of any FIBC intended for use within a flammable or explosive environment. However, it does not include procedures for evaluating the specific risks of electrostatic discharges arising from products within FIBC, e.g. cone discharges, or from equipment used near FIBC.

CAUTION: The test methods specified in this standard involve the use of high voltage power supplies and flammable gases that may present hazards if handled incorrectly, particularly by unqualified or inexperienced personnel. Users of this standard are encouraged to carry out proper risk assessments and pay due regard to local regulations before undertaking any of the test procedures.

ELECTROSTATICS –

Part 4-4: Standard test methods for specific applications – Electrostatic classification of flexible intermediate bulk containers (FIBC)

1 Scope

This part of IEC 61340 describes procedures for evaluating the ignition risk presented by electrostatic discharges from FIBC to flammable or explosive environments.

The requirements of this standard are applicable to all types of FIBC, tested as manufactured, prior to usage, intended for use without liners in flammable or explosive environments with minimum ignition energy of more than 0,14 mJ, and where the charging currents do not exceed 3,0 μ A.

NOTE 0,14 mJ is the minimum ignition energy normally quoted for methanol. Although more sensitive materials exist, methanol has the lowest minimum ignition energy of any material that is likely to be present when FIBC are emptied. 3,0 μ A is the highest charging current likely to be found in common industrial processes. This combination of minimum ignition energy and charging current represents the most severe conditions that might be expected in practice.

Compliance with the requirements of this standard does not mitigate the need for full risk assessment.

The test methods included in this standard may be used in association with other performance requirements, for example when a risk assessment has shown the minimum ignition energy of concern is less than 0,14 mJ or charging currents greater than 3,0 μ A are present.

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.

IEC 60243-1, *Electric strength of insulating materials – Test methods – Part 1: Tests at power frequencies*

IEC 60243-2, *Electric strength of insulating materials – Test methods – Part 2: Additional requirements for tests using direct voltage*

ISO 21898, *Packaging – Flexible intermediate bulk containers (FIBCs) for non-dangerous goods*

ASTM E582, *Standard test method for minimum ignition energy and quenching distance in gaseous mixtures*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply. Other definitions are as given in IEC 61340-1-2 and ISO 21898.

3.1

quenching

effect of solid objects acting as heat sinks in close proximity to gas

3.2

critical quenching distance

maximum separation distance between opposing electrodes below which quenching prevents ignition at a specified energy

NOTE For ignitions to take place, the gap between electrodes should be greater than the critical quenching distance.

3.3

flammable substance

substance in the form of gas, vapour, liquid, solid, or mixture of these, capable of propagating combustion when subjected to an ignition source

3.4

explosive atmosphere

mixture with air, under atmospheric conditions, of flammable substances in the form of gases, vapours, mists or dusts in which, after ignition has occurred, combustion spreads to the entire unburned mixture

3.5

hazardous explosive atmosphere

explosive atmosphere which, if it explodes, causes damage

3.6

minimum ignition energy

least electrical energy of a spark discharge required to ignite a gaseous mixture as determined by the procedure specified in ASTM E582

3.7

charging current

quantity of charge per unit time flowing into FIBC

3.8

cone discharge

energetic discharge running outwards across the surface from the top of highly charged, non-conductive powder heaps in large containers

4 Labelling

Flexible intermediate bulk containers (FIBC), for which claims of compliance with this standard are made, shall be durably marked by means of a permanently attached label, or other means, with at least the following information:

- a) number of standard, i.e. IEC 61340-4-4;
- b) either the phrase (for FIBC meeting the requirements of 5.3):
“Static control: use is acceptable in hazardous explosive atmospheres with minimum ignition energies $\geq 0,14$ mJ/charging currents $\leq 3,0$ μ A”,

or the phrase (for FIBC only meeting the requirements of 5.2):

“Propagating brush discharge control: use is acceptable only in the absence of flammable gases and vapours and in the absence of dust clouds with ignition energies of 3 mJ or less”;

- c) the phrase “Electrical properties may be affected by general usage, contamination and re-cycling, or if an inner bag or liner is used”;
- d) for FIBC earthed during testing the phrase “FIBC shall be properly earthed according to manufacturer’s instructions”;
- e) for FIBC not earthed during testing the phrase “FIBC does not require earthing”;
- f) the phrase “Any conductive objects within 1 m of the FIBC in operation shall be earthed”.

NOTE Unearthed conductive objects within 1 m of an FIBC in operation may become charged by induction or from corona discharging of the FIBC.

It is the responsibility of FIBC manufacturers to ensure the sample(s) tested are representative of the production FIBC to which labels shall be attached. When considering type testing, users shall refer to ISO 21898. For the purposes of electrostatic testing, the presence or absence of a liner constitutes a change of type.

5 Requirements

5.1 General remarks

A FIBC intended for use in the presence of a flammable material or in a hazardous explosive atmosphere shall not itself produce incendiary discharges. The absence of incendiary discharges shall be verified for at least the smallest and largest sizes of FIBC of a particular design by meeting one of the requirements listed in 5.2 and 5.3 when tested as manufactured, prior to usage. For the purposes of type testing where a range of outlet sizes are available, ignition testing according to 7.2 shall be carried out on test FIBC with an outlet size that is the smaller of a) (400 ± 50) mm, or b) the maximum outlet size for the type under test.

NOTE Compliance with the requirements of this standard may not extend to FIBC that have been contaminated or degraded through use, or are used contrary to manufacturers’ recommendations. Where it is intended that FIBC be used for multiple fill/clean/empty cycles, it is recommended that tests be conducted on packages to determine the maximum number of such cycles for the products to be handled in order to ensure that end of life performance complies with the requirements of this clause.

5.2 Requirements for dust environments with ignition energies greater than 3 mJ

To ensure propagating brush discharges cannot occur across the walls of a FIBC intended for use in the presence of combustible dusts but in the absence of flammable vapours or gases, it shall be constructed from materials having an electrical breakdown voltage of less than or equal to 6 kV when tested according to 7.1.