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**Fine bubble technology — Agricultural applications —**

Part 2:  
**Test method for evaluating the  
promotion of the germination of  
barley seeds**



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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 documents 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](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 281, *Fine bubble technology*.

A list of all parts in the ISO 23016 series can be found on the ISO website.

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](http://www.iso.org/members.html).

## Introduction

Considering the increasing use of fine bubble technology in agriculture, this document has been developed to establish standards in this area, with particular focus on promoting the germination and growth of barley seeds.

The use of fine bubble technology in agriculture has been confirmed to benefit various types of agricultural products and has attracted the interest of various countries. Application of the technology to leafy vegetables in agriculture is already well-established, and this is being expanded to seed germination and growth as well. Worldwide as well, standardization of fine bubble technology in the field of agriculture is not only being spotlighted but is being conducted in practice at a rapid pace. The technology is expected to blossom rapidly.

Fine bubble technology has been applied successfully not only in agriculture but also in the fields of environmental science, food, marine products, medicine, etc. Wide-ranging progress in standardizing the technology is being made in these fields. The achievement of standardization in various fields is expected to result in increased worldwide recognition of fine bubble technology in the future.



# Fine bubble technology — Agricultural applications —

## Part 2:

## Test method for evaluating the promotion of the germination of barley seeds

### 1 Scope

This document specifies a method to test the promotion of the germination of barley seeds, using ultrafine bubble (UFB) water produced from an ultrafine bubble water generating system. The performance of the method is assessed by measuring the ratio of barley seed germination.

### 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 20480-1, *Fine bubble technology — General principles for usage and measurement of fine bubbles — Part 1: Terminology*

ISO 20480-2, *Fine bubble technology — General principles for usage and measurement of fine bubbles — Part 2: Categorization of the attributes of fine bubbles*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 20480-1 and ISO 20480-2 and the following apply.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

#### 3.1

##### **germination**

appearance of a sprout of at least 1 mm of length

[SOURCE: ISO 18763:2016, 3.7, modified — "root" has been replaced by "sprout".]

#### 3.2

##### **immersion**

act of immersing unprocessed barley seeds in ultrafine bubble water or control water

#### 3.3

##### **ultrafine bubble generating system**

##### **UFB generating system**

equipment that uses water and air to generate ultrafine bubbles by mechanical action

Note 1 to entry: Ultrafine bubbles (UFB) are bubbles with a diameter of less than 1 µm. See ISO 20480-1.