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**Sensory analysis — Methodology  
— General guidance for measuring  
odour, flavour and taste detection  
thresholds by a three-alternative  
forced-choice (3-AFC) procedure**

*Analyse sensorielle — Méthodologie — Recommandations générales  
pour le mesurage des seuils de détection d'odeur, de flaveur et de goût  
par une technique à choix forcé de 1 parmi 3 (3-AFC)*

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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)).

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For an explanation on 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 the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 34, *Food Products*, Subcommittee SC 12, *Sensory analysis*.

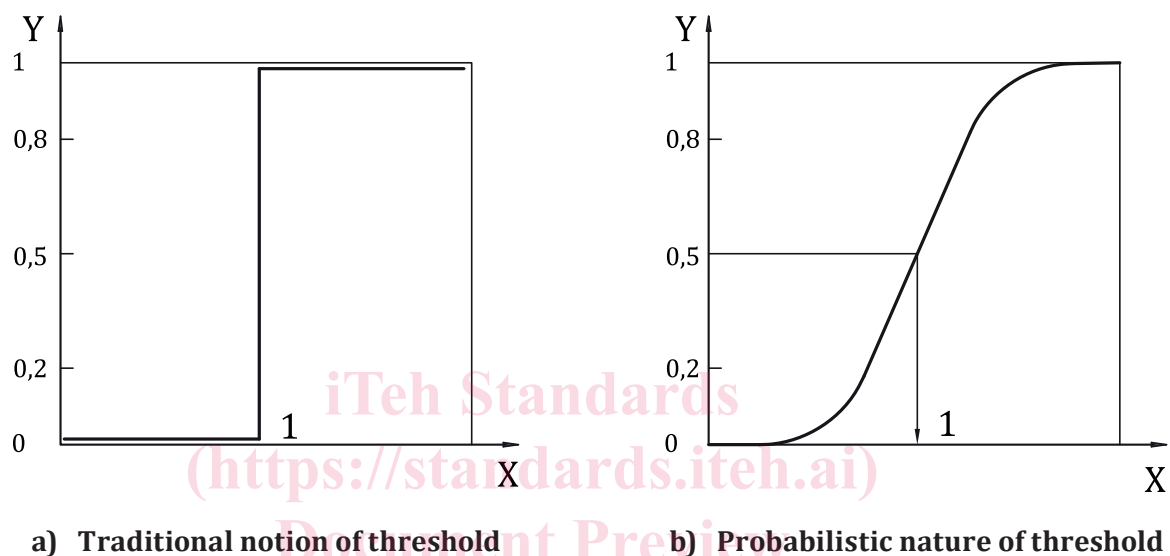
This second edition cancels and replaces the first edition (ISO 13301:2002), which has been technically revised. The following changes have been made:

- the bibliographic references have been updated;
- Additional instructions regarding the use of spreadsheet programs have been added;
- typographical errors in tables and examples have been corrected.

## Introduction

The concept of “threshold” has wide use in sensory analysis and is often used in the literature on sensory studies of food and drink. Data on sensory thresholds to stimuli are used in sensory studies in two main ways: as measures of the sensitivity of assessors or groups of assessors to specific stimuli; and as measures of the ability of substances to evoke sensory responses in assessors. In the first, the value of the threshold is taken as a description of an assessor’s performance; in the latter, as a measure of a property of the substance.

The term “threshold” was introduced by 19th century psychophysicists and used to denote a stimulus concentration above which the stimulus could be detected, and below which it could not [see [Figure 1 a\)](#)].



### Key

X concentration of stimulus,  $x$

Y probability of detection,  $p_d$

1 threshold

**Figure 1 — Traditional notion and probabilistic nature of threshold**

However, in practice the graph of the probability of detection<sup>1)</sup> against the intensity of the stimulus is always an ogive [see [Figure 1 b\)](#)], and it is convenient to assume, for purposes of calculation, that the threshold fluctuates so that a particular stimulus concentration exceeds it on some occasions but not on others. The threshold can then be obtained as an estimate of the median of these momentary values, i.e. as the stimulus concentration for which the probability of detection is 0,5. The threshold defined in this way has analogies with median effect levels used in branches of biology such as pharmacology and toxicology, which are concerned with the effect of chemicals on organisms.

Where detection thresholds of a particular substance in air or water have been measured in more than one laboratory, the reported values often span two or three orders of magnitude or more[[6](#)][[10](#)][[14](#)]. This range is greater than can be expected from experimental errors alone or from differences in the processing of data; but it probably can be accounted for by difference in concepts of thresholds between laboratories, and differences in experimental procedure. Reference [\[6\]](#) suggests a procedure for standardizing detection thresholds in air.

1) This document is based on the use of the 3-AFC method of presenting the stimuli, and the probability of detection,  $p_d$ , is modelled as  $p_d = 1,5 \times p_c - 0,5$ , where  $p_c$  is the probability of a correct selection. This is strictly a “guessing model” of the assessor’s behaviour. It is not a psychometric model of the assessor’s decision process, such as a signal-detection model, which could also be applied, see Reference [\[13\]](#).